

+GF+

Industry Process Automation

Plan, Build, Operate

Planning Fundamentals
Industrial Piping Systems
Process Automation

Planning Fundamentals

Industrial Piping Systems

Process Automation

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Planning Fundamentals

Industrial Piping Systems

Process Automation

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Preface

GF Piping Systems is a major global provider of complete piping solutions for many demanding applications in various market segments. Founded in 1802, Georg Fischer started the first production of malleable iron fittings in 1864 and today is recognized as the pioneer in the development of corrosion-free plastic piping systems for the safe and reliable conveyance of liquids and gases. This technical handbook reflects more than 60 years of our experience and know-how in the designing and manufacturing of plastic piping systems. Today, our product portfolio consists of more than 60'000 products and we are supporting our customers with products and services day to day around the globe.

The scope of these planning fundamentals is to offer a valuable support in planning and selection of the proper materials and the most suitable product range for all main industrial applications. In addition, the handbook provides extensive information about all jointing technologies for plastic materials and gives technical advises in the installation of pipes, fittings, valves, measurements and control, as well as actuation.

We strongly believe that the professional planning and the proper use of our comprehensive product range are the base for reliability, safety and high quality.

We hope that, in this handbook, you will find the qualified support that you need for your daily work. In case of special applications our worldwide technical engineers will be glad to assist you.

We would like to thank everyone, who continues to support GF Piping Systems in its mission to delivering more value to customers, through superior piping systems.

Schaffhausen, 10/2021

Planning Fundamentals of Valves and Automation

Overview of Valves and Automation

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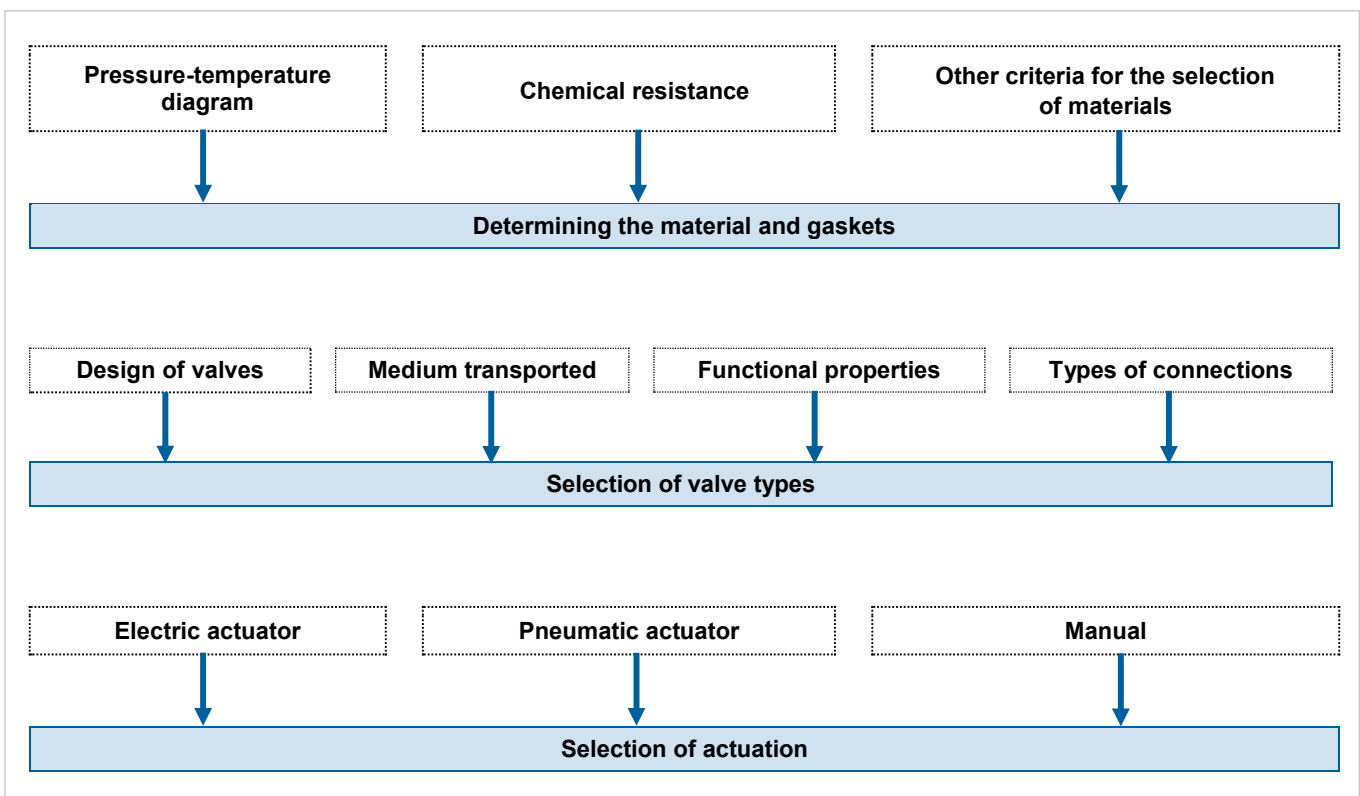
1 General

1.1 Advantages

- Available from manual valves to automatic valves
- Interfaces for pneumatic or electrical actuators
- Economical
- Good controllability
- Long service life
- Wide dimension range
- Suitable for media containing particulates
- Wide selection of materials and sealing materials

1.2 Products and applications

In order to make the right selection for the valve, the following factors are important:




1.3 Handling

The following are general installation notes to provide an overview of the correct handling and use of valves.

Intended use

Valves are intended exclusively for shutting off, conveying, controlling or dosing media within the permissible pressure and temperature range of the piping systems in which they have been installed. A valve and its material of construction are intended to be used within their respective chemical resistance and physical limitations.

- The chemical resistance limitations of all individual materials of construction are intended to be taken into consideration when making material selections. Selected valve materials are intended to be used applications that have been confirmed to be within their chemical resistance limitations.

 Valve body, gaskets, diaphragms, backing diaphragm, housing and mechanical components can be damaged or harmed in their function due to lack of chemical resistance, external influences, wear of the diaphragm and diffusion effects.


Requirements for user and operator responsibility


- Observe generally accepted accident prevention regulations.
- Use the product only as intended.
- Only use intended spare parts and materials from GF Piping Systems.
- Inspect all products for damage or defects before installation. Any damage or defects shall be remedied at the instruction of GF Piping Systems.
- Do not use any damaged or faulty product. Dispose damaged product immediately.
- Ensure that piping system installers are qualified as per relevant GF Piping System certification requirements and that piping systems are inspected regularly by qualified inspector.
- Have product and accessories installed only by persons who have the necessary training, knowledge or experience.
- Train all operators, installers and inspectors on any locally applicable regulations or guidelines concerning occupational safety and environmental protections.
- Ensure operators, installers and inspectors are familiar with, understand and observe the instruction manuals and notes therein for all products relevant to their employment responsibilities.

Transport and storage

The product must be handled, transported and stored with care. Please note the following points:

- Protect the product from mechanical damage (shock, impact, vibration, etc.).
- Transport and/or store products in unopened original packaging.
- Protect the product and its packaging from thermal damage.
- Protect the products from dust, dirt and moisture. It is important that the connections are neither damaged by mechanical nor thermal influences.

 Valves may only be used in accordance with their respective installation manuals, available at www.gfps.com

 If replacement components are required, only the corresponding spare parts suggested by GF Piping Systems are intended to be used.

2 Application area

The design of the valves supplied by GF Piping Systems is based on the following design standards:

- EN ISO 16135: Industrial valves – Ball valves made of thermoplastic materials
- EN ISO 16136: Industrial valves – Butterfly valves of thermoplastic materials
- EN ISO 16137: Industrial valves – Check valves of thermoplastic materials
- EN ISO 16138: Industrial valves – Diaphragm valves of thermoplastic materials
- EN ISO 16139: Industrial valves – Gate valves of thermoplastic materials
- EN ISO 21787: Industrial valves – Valves of thermoplastic materials

The valves fully comply with the requirements set out in the above standards. Ambient conditions must be considered during the engineering design process as they may lead to physical restrictions of the products, such as permitted line pressure or maximum temperature.

3 Material Selection

3.1 Pressure-temperature diagram

When making a material selection, the pressure-temperature (PT) curves must be considered. These curves show the corresponding rated pressure at a given temperature and can be beneficial in material selection because they can vary greatly between different thermoplastics. It is important to note that the PT curve of a valve can differ from those for pipe and fitting of like material and therefore the PT curves of valves, pipe and fittings should be considered together when making a material selection.

i Detailed information is available in the different valve chapters.

3.2 Chemical resistance

Thermoplastic piping systems are used in a diverse array of applications, many of which include aggressive liquids and gases. The chemical resistance properties of a material must be considered when making a material selection and it is vital that the selected material is suitable for the intended application. Our [online tool ChemRes PLUS](#) can serve as a useful guide in this process. It contains information concerning the core thermoplastic and elastomeric materials that make up the GF Piping Systems product range and the media they directly contact either through their respective environments or through external influences.

i For our online tool ChemRes PLUS, go to <https://www.gfps.com/com/en/downloads-tools/online-tools/chemical-resistance.html>

3.3 Other criteria for the selection of material

The following criteria must be taken into consideration when selecting the material:

- Internal pressure
- Ground and traffic loads
- Cold
- Heat
- UV radiation
- Chemical environment
- Vacuum
- Water hammer
- Steam pressure
- Diffusion
- Static electricity
- Flammable substances
- Explosive environment
- Corrosion
- Humidity
- Ambient temperature
- Medium temperature

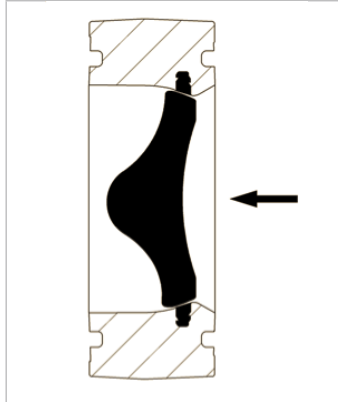
⚠ Proper handling and regular maintenance of valves are important factors for maintaining their maximum service life.

4 Product selection criteria

4.1 Valve designs

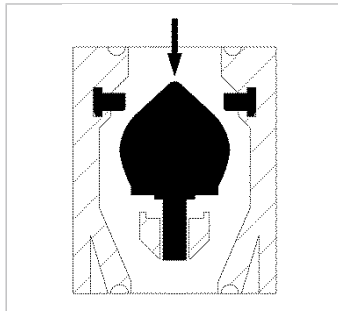
Butterfly valve

The butterfly valve controls the flow by using a circular disk or vane with its pivot axis at right angles to the direction of flow in the pipe. The butterfly valve requires a minimum of space and is used both for open/close and control services.



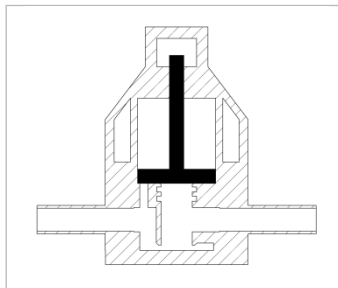
Ventilating valve and ventilating and bleed valve

For the ventilating and bleed valve, an innovative float provides a complete and reliable venting of piping systems and tanks. At the same time, the valve prevents a media overflow. The ventilating valve is used wherever a safe and controlled air supply must be ensured. The float has the contours of a spherical surface in the sealing zone and is completely aligned with the sealing ring. The double bearing of the float additionally prevents it from jamming, even in very rapid closing movements.



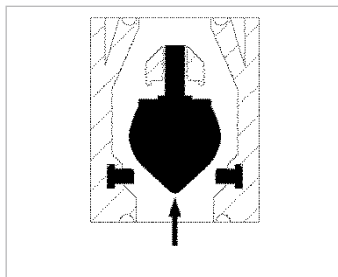
Pressure retaining valve

If the inlet pressure rises above the set value, the pressurized valve piston is lifted against the spring force. Consequently, the valve opens and there is a reduction of pressure in the outlet pipe. The valve closes and the output pressure is reduced until the preset spring tension and output pressure are at an equilibrium of forces.



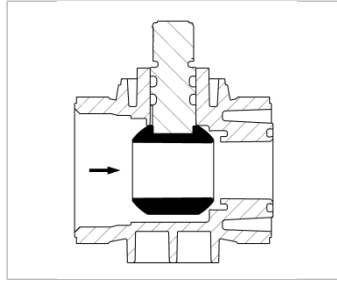
Cone check valve

The unique check cone to prevent the backflow of media forms the core of the valve. The optimized flow geometry reduces the flow resistance and the pressure loss to a minimum. Thanks to new sealing zone and specially designed profile seal, the valve is sealed, even during very fast closing movements. The check cone has the contour of a sphere in the sealing zone. The double bearing of the cone also prevents jamming. Malfunctions are thus excluded.



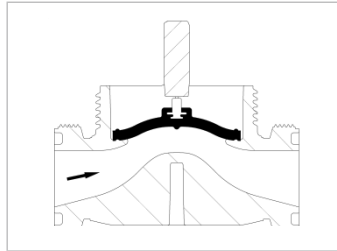
Ball valve

The ball valve is similar in concept to the plug valve but uses a rotating ball with a hole through it that allows straight-through flow in the open position and shuts off flow when the ball is rotated 90° to block the flow passage. This valve is used for open/close functions and also for throttling services.



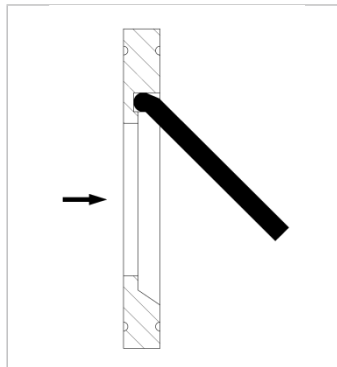
Diaphragm valve

The diaphragm valve has a flexible diaphragm that is moved by means of a spindle pin. When the pressure pin is located in the lower position, the diaphragm is pushed onto a stage and the flow is interrupted. Diaphragm valves are well suited for corrosive, abrasive and dirty as well as for media containing solids.



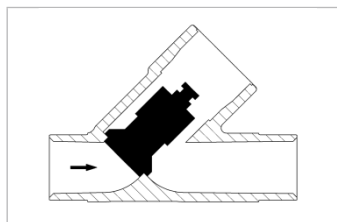
Wafer check valve

If a medium flows in the flow direction, it opens up the disc of the wafer check valve and thus allows flow in the intended direction. If the medium pressure falls below a certain limit, the wafer closes again.



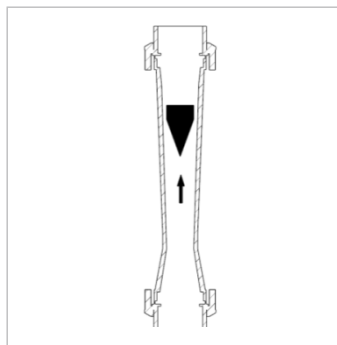
Angle seat check valve

The angle seat check valve has a plunger, which is arranged in the middle of the valve and presses on a flat stamp or seat. The valve opens, as soon as the flow of the media lifts the cone.



Variable area flow meter

A variable area flow meter consists of a conical tube that is passed by the medium from bottom to top. In this conical pipe is a vertically moving float. If a medium flows at a sufficient flow rate upwards through the vertically mounted taper tube, the float is raised to the point at which a state of equilibrium sets in between the lifting force of the medium and the weight of the float. Since the mean flow rate is proportional to the quantity flowing through per unit of time, this state of equilibrium corresponds to the measurement of the current flow rate.



4.2 Medium transported

Type	Free of foreign particles	Containing particles, crystallizing	Viscous	Gaseous
Ball valve	+	0	+	+
Diaphragm valve	+	+	+	0
Butterfly valve	+	0	0	0
Check valve	+	0	0	+
Wafer check valve	+	0	0	0
Angle seat check valve and angle seat valve	+	0	0	0
Pressure regulating valve	+	0	-	x
Ventilating and bleed valve	+	0	0	+
Solenoid valve	+	-	0	+
Variable area flow meter	+	-	+	+
Strainer	+	0	+	+

- + Recommended
- 0 Conditionally suitable
- Not recommended
- x Not possible / non-existing

4.3 Functional properties

Type	Adjustable	Position indicator	Full Port	Leakproof under vacuum	Triggering pressure surge
Ball valve	0	Z	+	0	- ¹⁾
Diaphragm valve	+	Z	-	0	+
Butterfly valve	0	Z	-	+	- ¹⁾
Check valve	x	x	-	+	0
Wafer check valve	x	x	-	0	0
Angle seat check valve and angle seat valve	x	x	-	0	0
Pressure regulating valve	+	-	-	-	0
Ventilating valve and ventilating and bleed valve	-	-	-	0	0
Solenoid valve	-	+	-	0	0
Variable area flow meter	-	+	-	Z	+
Strainer	-	-	-	0	+

- + Recommended
- 0 Conditionally suitable
- Not recommended
- Z Available for accessories
- x Not possible / non-existing
- ¹⁾ Ensure that actuation is slow (valve, pneumatic valve with throttle)

4.4 Types of connections

Different types of valve connections offer varying advantages and features that should be considered when selecting a valve connection type.

i For more information, see Planning Fundamentals, chapter 4, part 5 "Jointing technology".

Spigot	Union	Flange
Permanent connection	Flexible	Non-permanent connection
Reduces potential of contaminates	Large variety of unions according to standards	Many standard parts from different suppliers available
Eliminates the need for elastomeric joint seals	Non-permanent connection	Can be disassembled with standard tools
Reasonable price	Uniform surface pressure on jointing face	Variable in sealing materials
Decreased cost	Variable in sealing materials	Common jointing method in CPI and energy

The following tables list the most common types of thermoplastic valve connections and the materials that each are offered on by GF Piping Systems as a standard.

Sockets



Name	Solvent cement socket	Threaded socket	Fusion socket
Standard	ASTM, BS, ISO, JIS	ISO, JIS/RC, brass, NPT, RP	ISO
Material	ABS, PVC-C, PVC-U	ABS, PVC-C, PVC-U, PVDF, PP-H, brass	PE100, PP-H, PVDF

Spigot



Name	Solvent cement spigot	Threaded spigot	Socket fusion spigot	Butt fusion spigot
Standard	ISO	R	ISO	ISO
Material	PVC-C, PVC-U	Brass	PP-H, PVDF	PE100, PP-H, PP-R, PVDF

Flange



Name	Fixed flange	Backing flange
Standard	ANSI, ISO, JIS	ANSI, ISO, JIS
Material	PVC-U, PVC-C, PP-H, PVC-U, PVDF	PP-St, PVC-U, PP-H, PVDF

Union nuts



Name	Union nut
Standard	PVC-C, PVC-U, ABS, PROGEF Standard, PP-H, PVDF, SYGEF Standard

Others



Name	Alternative end available upon request e.g. blind connection part
Standard	Alternative materials available upon request

5 Overview of actuators

An actuator operates a valve by utilizing either an electronic motor or compressed fluid. There are a wide variety of electric and pneumatic actuators types designed for specific functions and applications.

Electric actuators range from the very simple to the highly specialized with a broad spectrum of options such as voltage, environmental ratings and control logic. They are preferred in remote applications and wherever compressed air is not available.

Pneumatic actuators are generally less complex than electric actuators. They are most commonly operated by compressed air and control by a pilot solenoid valve.

All GF Piping Systems' actuated ball and butterfly valve are controlled by part turn rotary actuators. Meaning the actuators' movement is rotational but cannot rotate a full 360°. Most part turn actuators are designed for 90° movement.

All GF Piping Systems' diaphragm valves are controlled by a linear actuator. Linear actuators typically utilize a piston to control a valve with push-pull action.

The following table provides an overview of each actuator and shows the special features of the different actuator types.

5.1 Electric actuator

Advantages

- Ease of installation
- Easily defined performance characteristics.
- Low energy consumption in switching pauses
- More than two programmable end positions possible without the use of a positioner
- Easy to maintain
- Accessories are often inertial to the actuator housing
- Ease of environmental protection
- Wide range of monitoring and control accessories for intelligent automated systems.

Characteristics

- Relatively high initial costs
- Low maintenance costs
- Long cycle time
- Precisions valve position control

Common Accessory

- Heating element
- Fail-safe return unit Adapters for various interface patterns
- Actuator monitoring
- Positioner
- Position Feedback
- Bus Communication
- Local control station

5.2 Pneumatic actuator

Advantages

- Spring return position
- Output proportional to control pressure
- Mechanically defined end position
- Accessories external to actuator housing
- Fast control times
- Wide torque range, from 8 Nm up to 3,840 Nm
- Typically small torque variations between sizes
- Small footprint

Small footprint characteristics

- Low initial costs
- Short cycle time
- Easy to maintain
- Electric pilot valve required
- Compressed air required
- Intermediate positions require more effort (positioner)

Common accessory

- Position feedback
- Stroke limiter
- Digital positioners
- Bus communication
- Adapters for various interface patterns
- Local control station
- Exotic coatings

5.3 Electromagnetic actuator

Advantages

- Short switching time
- High switching frequency
- Defined end position
- Easy to maintain

Characteristics

- Maximum operating pressure 6 bar
- Maximum operating pressure depending on DN
- Differential pressure required for servo-controlled solenoid valves
- Permanent demand for electricity in the open position
- Sensitive against solids when servo-controlled
- Flow control requires high effort

Versions

- Direct-acting solenoid valves
- Servo-controlled solenoid valves
- Pilot valves

6 Term definition for technical data

6.1 Pressure-temperature diagram

The following conditions must be fulfilled in order for the data contained in the pressure-temperature (PT) curves, specific to respective valve types, to remain accurate.

Low-stress valve installation

The valve must be installed in the piping system in such a manner that the system does not apply any additional stress on the valve, which can have a negative effect on the valve operation.

Fixed points before and after the valve

When thermoplastics are heated/ cooled they will expand/ contract, this phenomenon is called thermal expansion. The effects of thermal expansion should be mitigated in the portions of a piping system in direct proximity of the valve. GF Piping Systems recommends mounting fixed points both before and after the valve.

6.2 Technical data

Operating torque

These diagrams indicate the required torque to fully open/ close a given valve. These are always reference values.

For select valve types, data is also provided to define how much higher the initial breakaway torque can be compared to the operating torque. This occurs when a valve sits in the same position for a long period of time. Breakaway torque is defined as the required torque to start a valve's movement from a stationary position and is especially important to take into account when selecting actuators from other suppliers. Breakaway torque has already been taken into consideration for all GF Piping Systems automatic valves.

Pressure loss

The pressure loss, which occurs when a medium flows through a valve, is required for the hydraulic dimensioning of a piping system. The respective pressure loss for the individual valve types in the completely opened position is given in the pressure loss diagrams in relation to the desired flow rate. Please note the logarithmic axis scale of the flow rate and pressure loss.

Flow characteristics

These curves indicate the percentage Kv or Cv relative to the percent of a valve's stroke, with 0% being fully closed and 100% being fully open. The flow characteristics curves, which are specific to each individual valve type, are also given in graph form.

Flow coefficients

Flow coefficients are characteristic values for the flow rate through a valve at a specific pressure loss over the valve. These values are indicated in tables specific to the different valve types and are only applicable to valves that are fully open.

They are given in the following units:

- Kv 100 value in l/min at 1 bar pressure loss
- Kv 100 value in m³/h at 1 bar pressure loss
- Cv 100 value in US gal/min at 1 psi pressure loss

The flow rate for any intermediate position of the valve is determined by multiplying the flow coefficient and the percentage of the flow coefficient from the flow characteristics curve.

6.3 Tightening torques

For valves with flange connections, the recommended bolt torque and the number of bolts are given. Suggested bolt lengths are also given but note that these values can change depending on the flange adapters and rings used for the connection. Required bolt torque can also vary with seal type, with profile gaskets and o-rings seals requiring less torque than flat gaskets.

6.4 Conversion factors

Kv - Cv

In Europe, the kv value is measured in m³/h at 16°C and a pressure loss of 1 bar. In the US the Cv value is measured in US gal/min at a temperature of 60°F and a pressure loss of 1 psi. The conversion equation between these two values is as follows:

$$C_v = \frac{264.1722}{60} \cdot \sqrt{\frac{1}{14.50377}} \cdot k_v = 1.15761 \cdot k_v$$

C_v	Value (US gal/min)
k_v	Value (Europe m ³ /h)
1 m ³	264.1722 (US gal)
1 bar	14.50377 (psi)

	Kv (m ³ /h)	Kv (l/min)	Cv (gal/min)	Cv (m ³ /h)
Kv	1	16.67	1.1561	1
Kv	0.06	1	0.069	0.06
Cv	0.865	14.42	1	0.865

Planning Fundamentals of Valves and Automation

Valves – Ball Valves

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1 2-way Ball Valves

1.1 Ball Valve Type 546 Pro, manually operated



1.1.1 Product description

The Ball Valve Type 546 Pro is the ideal valve for use in applications ranging from simple water applications right up to demanding chemical processes. Its modular construction guarantees simple operation, flexibility, universal automation options and the greatest possible process safety.

Function

The ball valve uses a rotating ball with a hole through it that allows straight-through flow in the open position and shuts off flow when the ball is rotated 90° to block the flow passage. This valve is mainly used for open/close functions and for regulating services.

Applications

- Chemical process industry
- Water treatment
- Microelectronics
- Measurement and control
- Shipbuilding
- Food & beverage

Benefits/features

The Ball Valve Type 546 Pro modular design always adapts the actual requirements. Whether electric, pneumatic or manual operation, including optional accessories, it flexibly meets all requirements.

- Lockable lever equipped as standard
- Manual valve or automatic valve with/without electrical position feedback
- Ergonomic hand lever with integrated tool to open the union bushing
- Labeling in lever (optional)
- Integrated fixation system with mounted threaded inserts as standard
- Spacers keep the level of the piping system constant and simplify installation
- Individual online configuration is possible
- Unique Data Matrix Code for traceability
- Oil-free and LABS-cleaned version
- Very high flow rate
- Universal interface makes a combination with all actuators possible
- Manual spring return unit (dead man lever)
- Relief well to avoid gas accumulation possible (e.g. for H2O2)

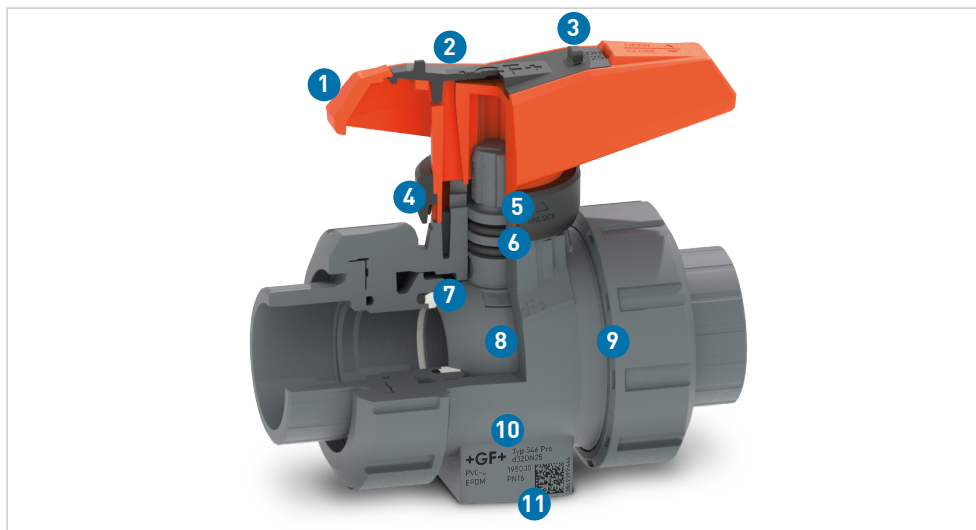
Flow media

Neutral and aggressive media with a small amount of particles/solids. The chemical resistance is independent of the selected valve material ([see online tool ChemRes PLUS](#)).

Transport of compressed air

Ball valves Type 546 Pro are suitable for compressed air regulation up to 10 bar (at 20 °C). The compressed air must be dry and free of oil.

1.1.2 Technical basics



- ① Ergonomic lever, lockable as standard
- ② Quick-label on request
- ③ Integrated tool for the union bush
- ④ Interface for flexible automation and accessories
- ⑤ Reinforced security break point in the stem interface
- ⑥ Double stem seals
- ⑦ Dynamic backing seal
- ⑧ Smooth spherical surface
- ⑨ Saw tooth thread suitable for plastics
- ⑩ Fastening system with integrated threaded bushes
- ⑪ Data-Matrix-Code

With the backing seals, the ball has a floating position. This results in preloading and hence a constant seal. Stem, backing, housing and connection seals are made of EPDM or FKM.

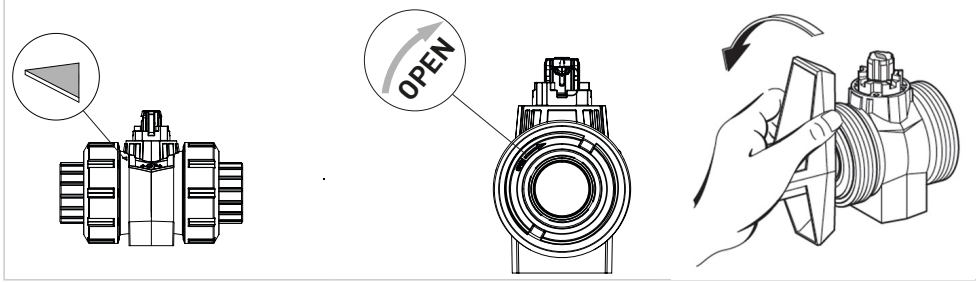
The stems with predefined break point above the upper O-ring help prevent leaks to the outside in case of damage for manual valves. The new designed security break point in the interface allows the user to replace the coupling piece within a few minutes and without interruption if an automated valve is subject to wear.



All ball valves in DN10 – 100 are available as radially removable valves with two threaded connections according to EN ISO 16135.

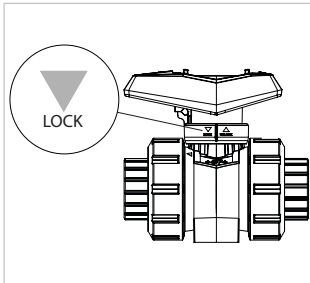
Union bushing

The design of the hand lever serves as a tool for installing the union bushings. The union bushing has a reverse thread in order to avoid unintentional opening when removing the coupling nuts or the thread connections.



Locking function

Move the ball valve to the desired open or closed position and press down the locking ring. Attach lock to eye to protect lever from unauthorized access.



Valve handling

Removing the lever

When removing the lever, the locking ring must be in the open position (top).

Installation notes

When installing the ball valve, ensure that it is always installed into the system in an opened ball position.

Selection of lubricant

All seals should be lubricated with a silicone-based grease. Using the wrong lubricants can damage the material of the ball valve or seals.

- Mineral oil-based and Vaseline (petrolatum) are not appropriate.
- For silicone-free ball valves, please consult the special manufacturer's instructions.

Maintenance notes

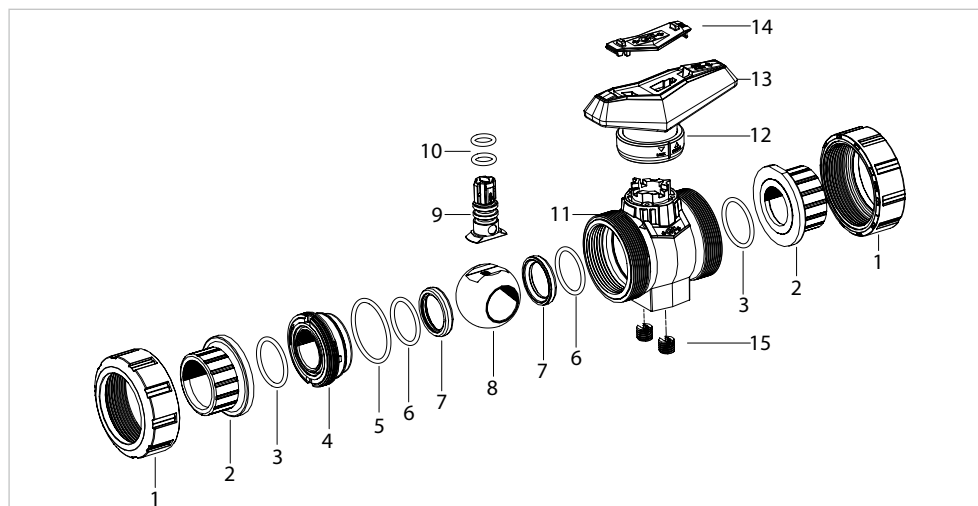
Ball valves require no maintenance under normal operating conditions (clear water). However, the following measures must be considered:

- Regularly check that no medium escapes to the outside.
- We recommend a function test for ball Type valves that are kept permanently in the same position 1 – 2 times per year to check functionality.



Installation and maintenance must be performed according to the corresponding installation instructions. The installation manual is included with the product, see also the online product catalogue at www.gfps.com

1.1.3 Technical data



- ① Union nut
- ② Connecting part
- ③ Union seal
- ④ Union bush
- ⑤ Body seal
- ⑥ Backing seal
- ⑦ Ball seal
- ⑧ Ball
- ⑨ Stem
- ⑩ Stem seals
- ⑪ Body
- ⑫ Locking ring
- ⑬ Lever (lockable)
- ⑭ Lever clip
- ⑮ Threaded insert

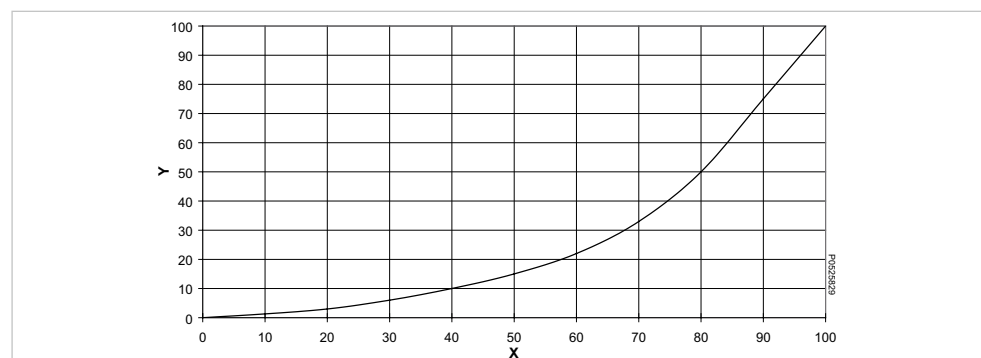
Specification

Dimensions	d16/DN10 – d110/DN100 (d160/DN150), 3/8" – 4" (6")	
Materials	Valve body	PVC-U, PVC-C, ABS, PP-H, PVDF
	Lever	PP-GF30
Gasket materials	O-rings	EPDM, FKM, FFKM
	Ball seal	PTFE, PVDF
Pressure levels	ABS / PP-H	PN10
	PVC-U / PVC-C / PVDF	PN16
Connections	Fusion / solvent cement sockets	ISO, ASTM, JIS, BS
	Fusion / solvent cement spigot	ISO
	Threaded socket	Rp, NPT, Rc
	Backing flange	ISO, ANSI, BS, JIS
	Butt fusion spigots	SDR11 and SDR17.6
	PE100 electrofusion spigot or butt fusion spigot	SDR11 and SDR17.6
Actuation variants	Manually operated (lockable hand lever)	
	Pneumatic FC, FO, DA with and without manual override	
	Electrical AC: 100 – 230 V, AC/DC: 24 V, with / without manual override	
Approvals	DVGW, ACS, ABS, NSF, WRAS, DIBt, RINA, BV, FDA, SEPRO, TSSA	
Flange standards	EN 1092 PN 10, ASME B16.5 Class 150, BS 1560-3.2 Class 150, JIS B2220 10K	
Third-party actuators	EN ISO 5211	
Leakage requirement	ISO 9393-2, EN 12266 (leak rate A)	
Marking	EN ISO 16135	
	DataMatrix-Code with production data	
Product standard	ISO 9393-1, EN ISO 16135	

Kv 100 values

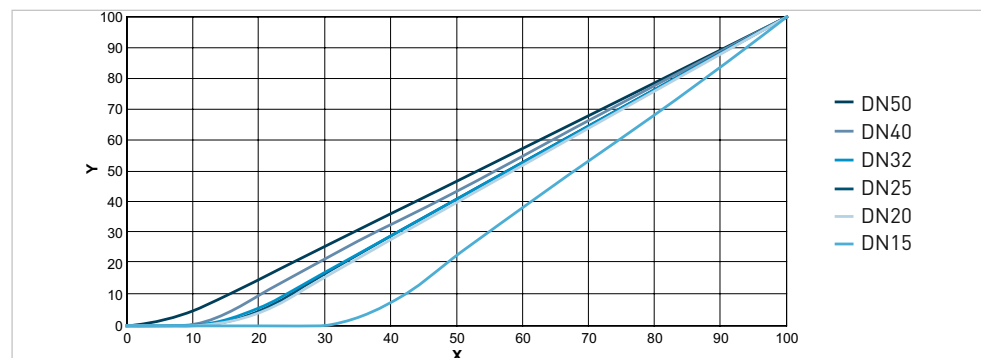
DN (mm)	Inch (inch)	d (mm)	Type 546 Pro			Linear Ball Valve Type 546 Pro		
			Kv 100 (l/min)	Cv 100 (gal/min)	Kv 100 (m ³ /h)	Linear ball valve Kv 100 (l/min)	Linear ball valve Cv 100 (gal/min)	Linear ball valve Kv 100 (m ³ /h)
10	3/8	16	70	4.9	4			
15	1/2	20	185	12.9	11	90	6	5
20	3/4	25	350	24.5	21	166	12	10
25	1	32	700	49.0	42	235	16	14
32	1 1/4	40	1000	70.0	60	417	29	25
40	1 1/2	50	1600	112.0	96	626	44	38
50	2	63	3100	217.1	186	781	55	47
65	2 1/2	75	5000	350.0	300			
80	3	90	7000	490.0	420			
100	4	110	11000	770.0	660			

Flow characteristics Type 546 Pro



X Opening angle (%)
Y Kv, Cv value (%)

Flow characteristics for linear Ball Valve Type 546 Pro



X Opening angle (%)
Y Kv, Cv value (%)



For dimensions d20/DN15, d25/DN20, d32/DN25, d40/DN32, d50/DN40 and d63/DN50, a special ball with linear flow characteristics is available.

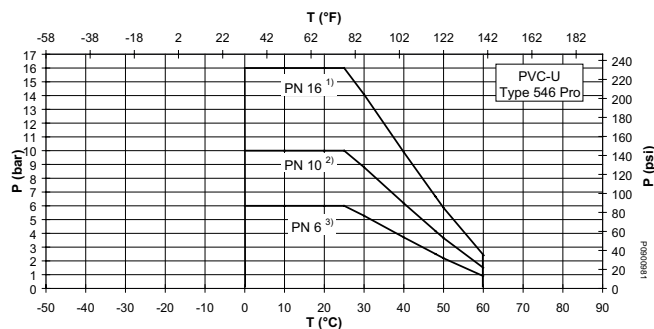
Pressure-temperature diagrams

The following pressure-temperature diagrams are based on a service life of 25 years and water or similar media.

T Temperature (°C, °F)

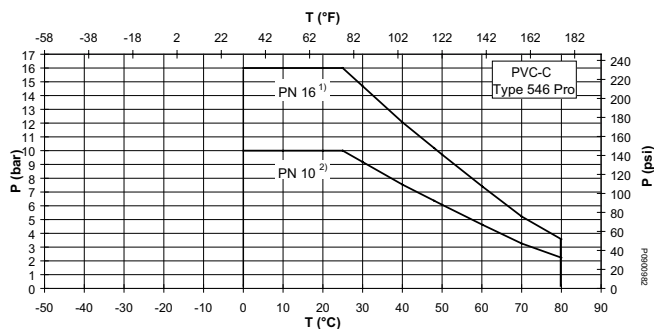
P Permissible pressure (bar, psi)

PVC-U



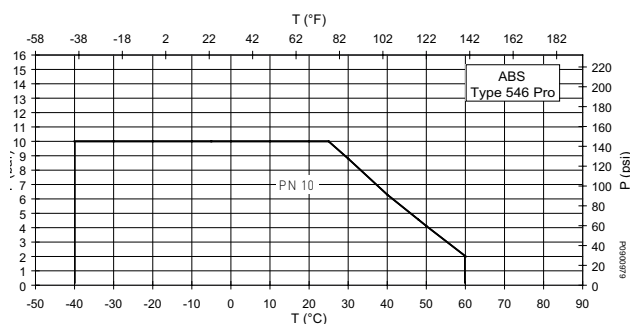
- 1) The central part of the ball valve is designed for the nominal pressure PN16
- 2) Depending on the connection, the nominal pressure is reduced to PN10
- 3) Depending on the connection, the nominal pressure is reduced to PN6

PVC-C

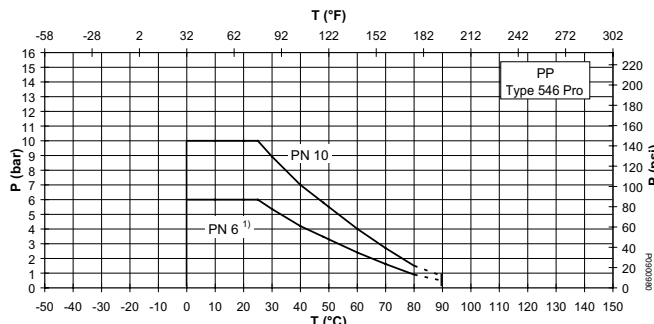


- 1) The central part of the ball valve is designed for the nominal pressure PN16
- 2) Depending on the connection, the nominal pressure is reduced to PN10

ABS

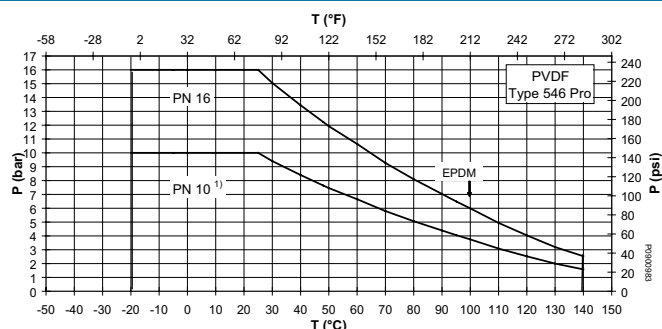


PP



- 1) For example, ball valve with butt fusion spigot PP or PE100, SDR 17

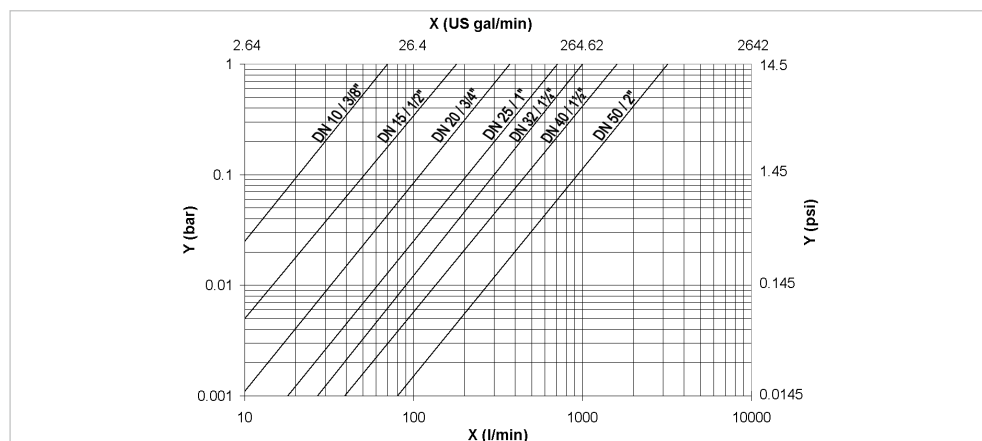
PVDF



- 1) For example, ball valve with threaded socket EPDM gasket up to max. 100 °C

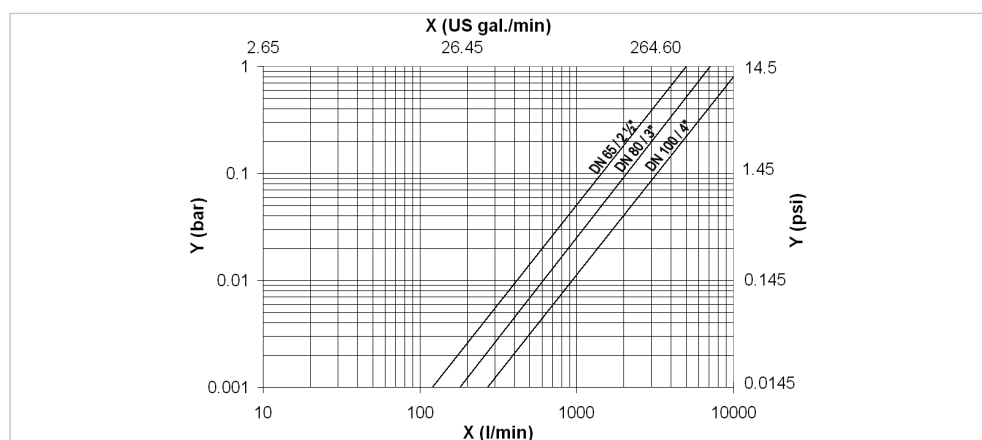
Pressure losses

d16/DN10 – d63/DN50



- X Flow rate
(l/min, US gal/min)
- Y Pressure loss Δp (bar, psi)

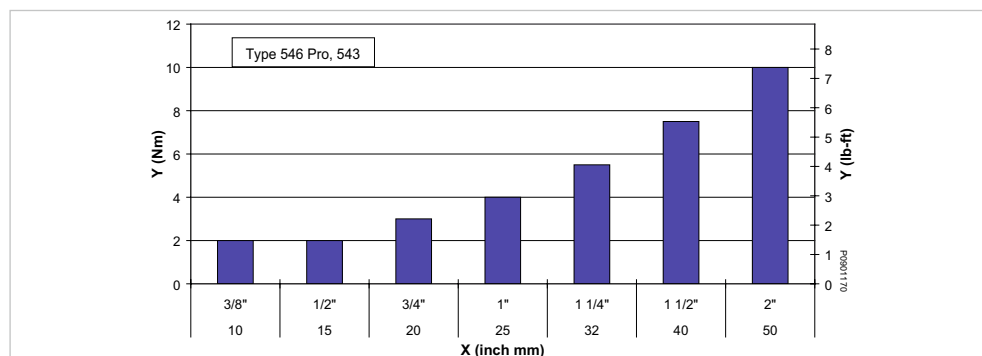
d75/DN65 – DN100



- X Flow rate
(l/min, US gal/min)
- Y Pressure loss Δp (bar, psi)

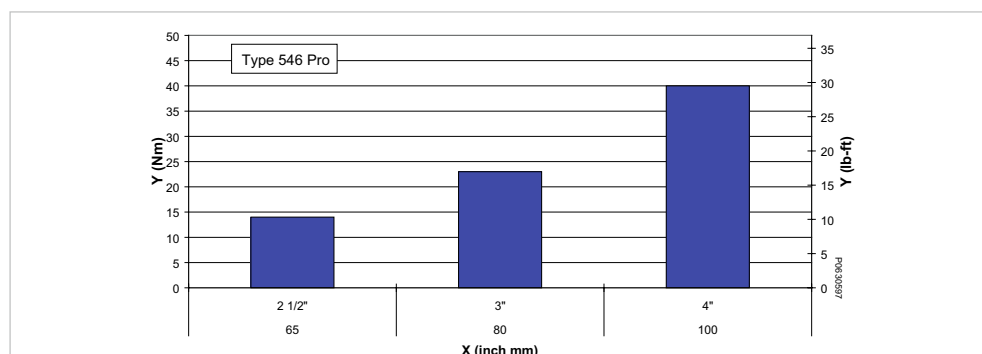
Operating torque

DN10 – DN50



- X Nominal diameter DN (mm, inch)
- Y Tightening torque (Nm, lb-ft)
- Average values at nominal pressure. Depending on the application (e.g. operating speed, fluid, temperature, etc.) about 2 times the operating torque should be taken for sizing actuators.

DN65 – DN100



- X Nominal diameter DN (mm, inch)
- Y Tightening torque (Nm, lb-ft)
- Average values at nominal pressure. Depending on the application (e.g. operating speed, fluid, temperature, etc.) about 2 times the operating torque should be taken for sizing actuators.

Reference values for tightening torque of screws

Flange connections with profile flange seal or flat gaskets

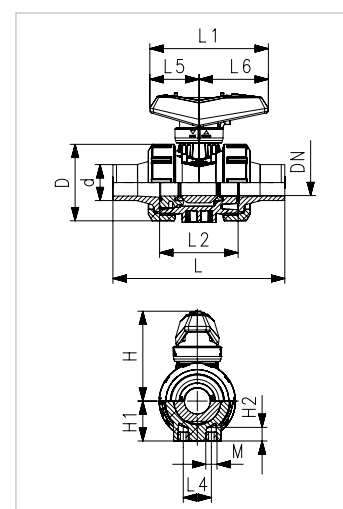
d (mm)	DN (mm)	Inch (inch)	Total number of screws (for 2 flange connections) standard nut (Height 0.8 x d) ¹⁾	Torque (Reference values) Profile flange gasket ²⁾		Torque (Reference values) Flat gasket	
				(Nm)	(lb-ft)	(Nm)	(lb-ft)
20	15	½	8 x M12 x 50	10	7.4	10	7.4
25	20	¾	8 x M12 x 55	10	7.4	10	7.4
32	25	1	8 x M12 x 60	10	7.4	15	11
40	32	1 ¼	8 x M16 x 70	15	11	20	15
50	40	1 ½	8 x M16 x 70	15	11	25	18
63	50	2	8 x M16 x 80	20	15	35	26
75	65	2 ½	8 x M16 x 90	25	18	50	37
90	80	3	16 x M16 x 100	15	11	30	22
110	100	4	16 x M20 x 130	20	15	35	26

- ¹⁾ For valve ends Type 546 Pro made of PP in combination with backing flanges, use half of the standard nut height
- ²⁾ Preferred gasket Type (suited for plastics)

1.1.4 Dimensions

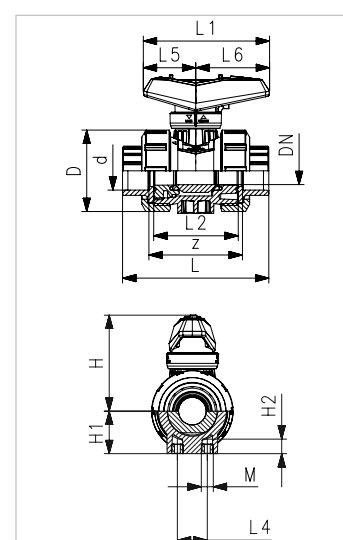
Ball Valve Type 546 Pro with solvent cement spigots or socket fusion spigots, metric

d (mm)	DN (mm)	D (mm)	H (mm)	H1 (mm)	H2 (mm)	L (mm)	L1 (mm)	L2 (mm)	L4 (mm)	L5 (mm)	L6 (mm)	M
16	10	50	54	27	12	114	72	56	25	26	46	M6
20	15	50	54	27	12	124	72	56	25	26	46	M6
25	20	58	66	30	12	144	93	65	25	34	59	M6
32	25	68	71	36	12	155	93	71	25	34	59	M6
40	32	84	85	44	15	175	110	85	45	41	69	M8
50	40	97	92	51	15	193	110	89	45	41	69	M8
63	50	124	108	64	15	224	128	101	45	49	79	M8
75	65	166	149	85	15	284	270	136	70	64	206	M8
90	80	200	161	105	15	300	270	141	70	64	206	M8
110	100	238	178	123	22	340	320	164	120	64	256	M12



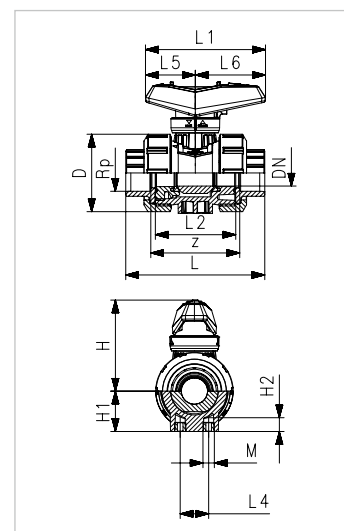
Ball Valve Type 546 Pro with solvent cement sockets, fusion sockets or threaded sockets, metric

d (mm)	DN (mm)	D (mm)	H (mm)	H1 (mm)	H2 (mm)	L (mm)	L1 (mm)	L2 (mm)	L4 (mm)	L5 (mm)	L6 (mm)	z (mm)	M
16	10	50	54	27	12	92	72	56	25	26	46	68	M6
20	15	50	54	27	12	95	72	56	25	26	46	67	M6
25	20	58	66	30	12	110	93	65	25	34	59	76	M6
32	25	68	71	36	12	124	93	71	25	34	59	82	M6
40	32	84	85	44	15	147	110	85	45	41	69	98	M8
50	40	97	92	51	15	157	110	89	45	41	69	99	M8
63	50	124	108	64	15	184	128	101	45	49	79	111	M8
75	65	166	149	85	15	233	270	136	70	64	206	148	M8
90	80	200	161	105	15	254	270	141	70	64	206	156	M8
110	100	238	178	123	22	301	320	164	120	64	256	178	M12



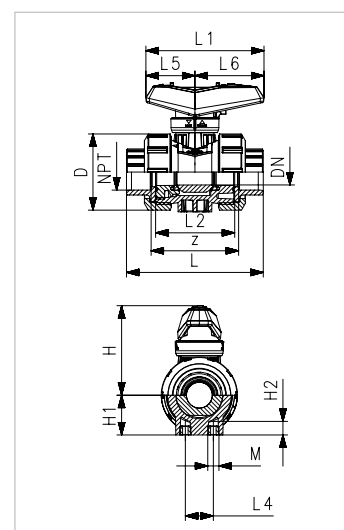
Ball Valve Type 546 Pro with solvent cement sockets RP, fusion sockets RP or threaded sockets Rp

Rp	DN	D	H	H1	H2	L	L1	L2	L4	L5	L6	z	M
inch	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	
3/8	10	50	54	27	12	92	72	56	25	26	46	64	M6
1/2	15	50	54	27	12	95	72	56	25	26	46	63	M6
3/4	20	58	66	30	12	110	93	65	25	34	59	73	M6
1	25	68	71	36	12	124	93	71	25	34	59	79	M6
1 1/4	32	84	85	44	15	147	110	85	45	41	69	94	M8
1 1/2	40	97	92	51	15	157	110	89	45	41	69	95	M8
2	50	124	108	64	15	184	128	101	45	49	79	108	M8
2 1/2	65	166	149	85	15	233	270	136	70	64	206	144	M8
3	80	200	161	105	15	254	270	141	70	64	206	151	M8
4	100	238	178	123	22	301	320	164	120	64	256	174	M12



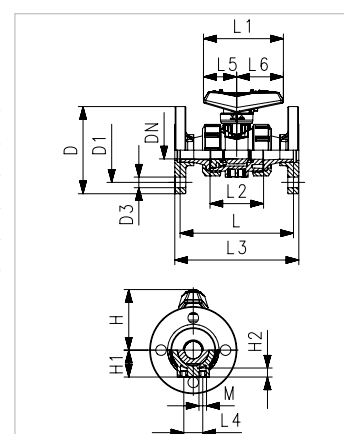
Ball Valve Type 546 Pro with solvent cement sockets NPT, fusion sockets NPT or threaded sockets NPT

Rp	DN	D	H	H1	H2	L	L1	L2	L4	L5	L6	z	M
inch	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	
3/8	10	50	54	27	12	92	72	56	25	26	46	64	M6
1/2	15	50	54	27	12	95	72	56	25	26	46	63	M6
3/4	20	58	66	30	12	110	93	65	25	34	59	73	M6
1	25	68	71	36	12	124	93	71	25	34	59	79	M6
1 1/4	32	84	85	44	15	147	110	85	45	41	69	94	M8
1 1/2	40	97	92	51	15	157	110	89	45	41	69	95	M8
2	50	124	108	64	15	184	128	101	45	49	79	108	M8
2 1/2	65	166	149	85	15	233	270	136	70	64	206	144	M8
3	80	200	161	105	15	254	270	141	70	64	206	151	M8
4	100	238	178	123	22	301	320	164	120	64	256	174	M12



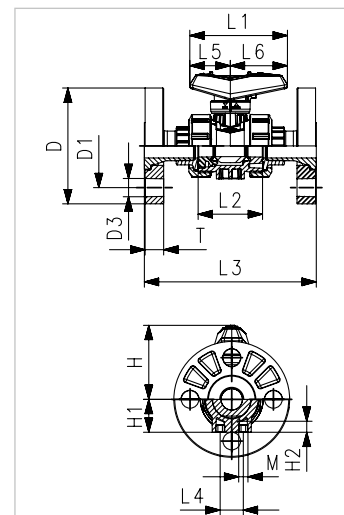
Ball Valve Type 546 Pro with fixed flanges serrated, metric

d	DN	D	D1	D3	H	H1	H2	L	L1	L2	L3	L4	L5	L6	M
(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	
20	15	94	65	14	87	27	12	120	82	56	130	25	35	47	M6
25	20	103	75	14	104	30	12	139	105	65	149	25	44	62	M6
32	25	115	85	14	115	36	12	150	105	71	160	25	44	62	M6
40	32	138	100	18	139	44	15	170	131	85	180	45	57	74	M8
50	40	147	110	18	152	51	15	189	131	89	197	45	57	74	M8
63	50	162	125	18	181	64	15	220	152	101	228	45	66	86	M8



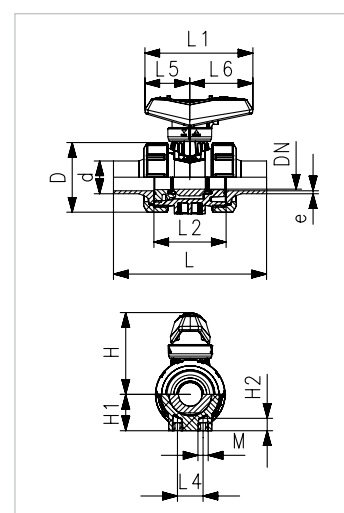
Ball Valve Type 546 Pro with backing flanges, metric

d (mm)	DN (mm)	D (mm)	D1 (mm)	D3 (mm)	H (mm)	H1 (mm)	H2 (mm)	L1 (mm)	L2 (mm)	L3 (mm)	L4 (mm)	L5 (mm)	L6 (mm)	M (mm)
20	15	96	70	15	87	27	12	82	56	143	25	35	47	M6
25	20	101	75	15	104	30	12	105	65	171	25	44	62	M6
32	25	126	90	19	115	36	12	105	71	187	25	44	62	M6
40	32	135	100	19	139	44	15	131	85	190	45	57	74	M8
50	40	140	105	19	152	51	15	131	89	212	45	57	74	M8
63	50	156	120	19	181	64	15	152	101	234	45	66	86	M8
75	65	176	140	19	235	85	15	269	136	290	70	64	206	M8
90	80	186	150	19	266	105	15	269	141	310	70	64	206	M8
110	100	210	175	19	301	123	22	319	164	350	120	64	256	M12



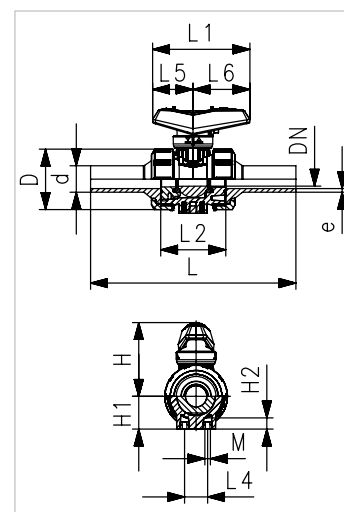
Ball Valve Type 546 Pro with butt fusion spigots short, metric

d (mm)	DN (mm)	D (mm)	H (mm)	H1 (mm)	H2 (mm)	L (mm)	L1 (mm)	L2 (mm)	L4 (mm)	L5 (mm)	L6 (mm)	M (mm)	e (mm)
20	15	50	54	27	12	130	72	56	25	26	46	M6	1.9
25	20	58	66	30	12	144	93	65	25	34	59	M6	2.3
32	25	68	71	36	12	151	93	71	25	34	59	M6	2.9
40	32	84	85	44	15	171	110	85	45	41	69	M8	3.7
50	40	97	92	51	15	190	110	89	45	41	69	M8	4.6
63	50	124	108	64	15	221	128	101	45	49	79	M8	5.8



Ball Valve Type 546 Pro with butt fusion spigots long, metric

d (mm)	DN (mm)	D (mm)	H (mm)	H1 (mm)	H2 (mm)	L (mm)	L1 (mm)	L2 (mm)	L4 (mm)	L5 (mm)	L6 (mm)	M (mm)	e (mm)
20	15	50	54	27	12	193	72	56	25	26	46	M6	1.9
25	20	58	66	30	12	218	93	65	25	34	59	M6	2.3
32	25	68	71	36	12	224	93	71	25	34	59	M6	2.9
40	32	84	85	44	15	250	110	85	45	41	69	M8	3.7
50	40	97	92	51	15	271	110	89	45	41	69	M8	4.6
63	50	124	108	64	15	321	128	101	45	49	79	M8	5.8



1.1.5 Accessories

Double sensor for electrical position feedback

After being mounted in the valve or in the interface module, the double sensor is used to signal the CLOSED or OPEN position of the valve via an electric signal to a controller, supplied by the customer. The switching states are also output optically via two integrated LEDs.

DN (mm)	LED signal color	Function
10 - 50	Closed: Green / Open: Red	PNP
10 - 50	Closed: Red / Open: Green	PNP



Suitable connection cables available as accessories

Spring reset unit, manual actuation (dead man's switch)

The spring reset unit (dead man's switch) is installed onto the GF Ball Valve Type 546 Pro and ensures that the ball valve is closed automatically as soon as the handle is released. It is opened against the spring force.

DN (mm)
DN10/15
DN20/25



Interface module, manual actuated


With the manually actuated interface module the open or closed position of the Ball Valve Type 546 Pro can be transmitted via an electric signal to a customer control.


DN (mm)
DN10/15
DN20/25
DN32/40
DN50



Interface module, automatic actuated

With the help of the automatically actuated interface module, electric or pneumatic actuators can be attached on the Ball Valve Type 546 Pro, which allows the automation of the ball valve's change of position. In addition, an interface is available for the installation of an electrical position feedback indicator.

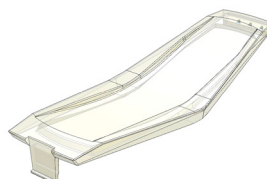
DN (mm)	Pneumatic GF actuators PA11/PA21	Electric GF actuators EA15/ EA25/dEA
DN10/15		
DN20		
DN25		
DN32		
DN40		
DN50		

DN (mm)	Norm actuators
DN10-15 SW09	
DN10-15 SW11/14	
DN20-25 SW09	
DN20-25 SW11/14	
DN32-40 SW11/14	
DN50 SW11/14	

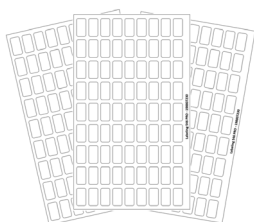
Transparent lever clip

Type 546 Pro ball valves can be quickly and easily labelled with the most important information. Operation and maintenance can thus be made safer, faster and clearer. In addition, there are various standards which prescribe a clear marking of the pipeline.

DN (mm)	
DN10/15	10 pcs.
DN20/25	10 pcs.
DN32/40	5 pcs.
DN50	5 pcs.



Printing sheets for ball valve labelling



Further accessories

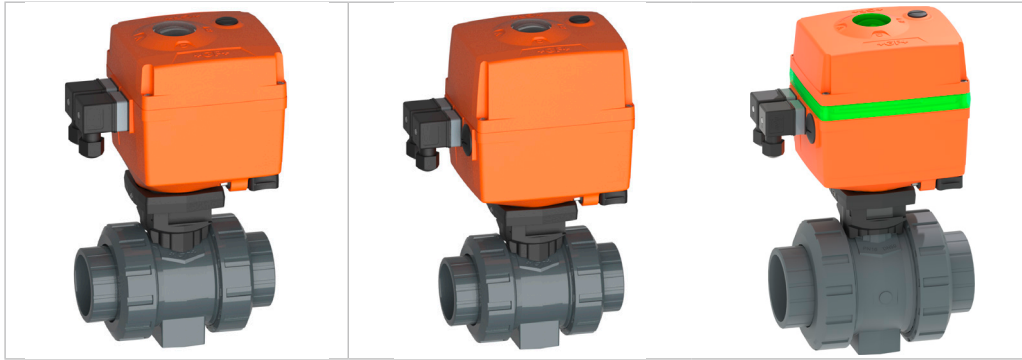
- Hand lever extension
- Adapter for padlocks
- Tool for disassembling interface modules
- Additional limit switches

i For further information on accessories, refer to the online product catalogue at www.gfps.com

■ Mobile apps and online tools to support configuration and calculation at www.gfps.com/tools



1.2 Ball Valve Type 546 Pro electric (Types 127, 179–184)



Type 127
With electric actuator EA15

Type 179 – 184
With electric actuators EA and dEA

1.2.1 Product description

Type 127

The Type 127 is designed for automated standard applications with no special demands. The Ball Valve Type is based on the Ball Valve Type 546 Pro and the electric actuator EA15

Type 179 – 184

The 179 – 184 series is designed as modular adjustable ball valves for applications which demand special process requirements. Ball valves are based on the Ball Valve Type 546 Pro and the electric actuators EA or the smart electric actuator dEA.

Applications

- Chemical process industry
- Water treatment
- Microelectronics
- Measurement and control
- Ship building
- Food & beverage

Benefits/features

Type 127

- Electrical feedback with additional limit switches of different designs integrated into the actuator or multifunction module
- Integrated emergency manual override
- Optional: Fail-safe return unit with or without integrated battery pack

Type 179 – 184

- Electrical feedback with additional limit switches of different designs integrated into the actuator or in the multifunction module (optional 4-20 mA with Positioner)
- Rotation angle up to 355°; Preset to 0°-90°
- Up to 3 freely selectable stop positions (open/middle/close)
- Integrated emergency manual override
- Optional: Fail-safe return unit with or without integrated battery pack
- Optional: Cycle time monitoring
- Optional: Cycle counter
- Optional: Cycle time extension
- Optional: Motor current monitoring
- Optional: Positioner

Flow media

Neutral and aggressive media with a small amount of particles/solids. The chemical resistance is independent of the selected valve material ([see online tool ChemRes PLUS](#)).

1.2.2 Technical basics

Differences between types 127 and 179 – 184

	Type 127	Type 179	Type 180	Type 181	Type 182	Type 183	Type 184
PVC-U	✓	✓			✓	✓	✓
PVC-C	✓	✓			✓		✓
ABS	✓	✓				✓	
PP-H	✓		✓				✓
PVDF				✓			✓
ISO	✓	✓	✓	✓			
ASTM	✓		✓	✓	✓		
BS	✓					✓	
JIS	✓						✓

- The actuators are manufactured according to the specification of EN 61010-1, EC 89/336/EEC-EMV 73/23/EEC, LVD.
- All actuators have the CE marking.
- The actuator housings are made of PPGF (fiberglass-reinforced polypropylene) and external, stainless steel screws with low flammability.
- All electric actuators have an emergency manual override and an optical position indicator.

Properties of electric actuators

Actuator	Cycle time	Nominal torque	Actuating cycles at 20 °C	Duty cycle at 25 °C/15min
EA15	5s/90°	10Nm	150 000	40%
EA25 / dEA25	5s/90°	10 Nm	250 000	100%
EA45 / dEA45	6s /90°	20 Nm	100 000	50%
EA120 / dEA120	15s/90°	60 Nm	100 000	50%
EA250 / dEA250	20s/90°	100 Nm	75 000	35%



All electric actuators have an IP67 rating in accordance with EN 60529 (with vertical installation and appropriate cable connection).

Valve handling

Installation notes

During installation, ensure that the actuator is correctly built onto and connected to the correct valve. In order to guarantee control provided on the customer side, the following points must be observed:

- Actuate valves with 90° rotary movement.
- Indicate the previously calibrated end positions of the valve via an electrical signal to the aforementioned system control.

In case of interruption in the supply voltage, ensure that the actuator remains in the current position. For this, installation of an emergency manual override or reset unit is recommended (refer to "Accessories").

Maintenance notes

Set maintenance intervals as per the conditions of use (e.g., actuating cycles, medium, ambient temperature). As part of the regular system inspection, carry out the following maintenance activities:

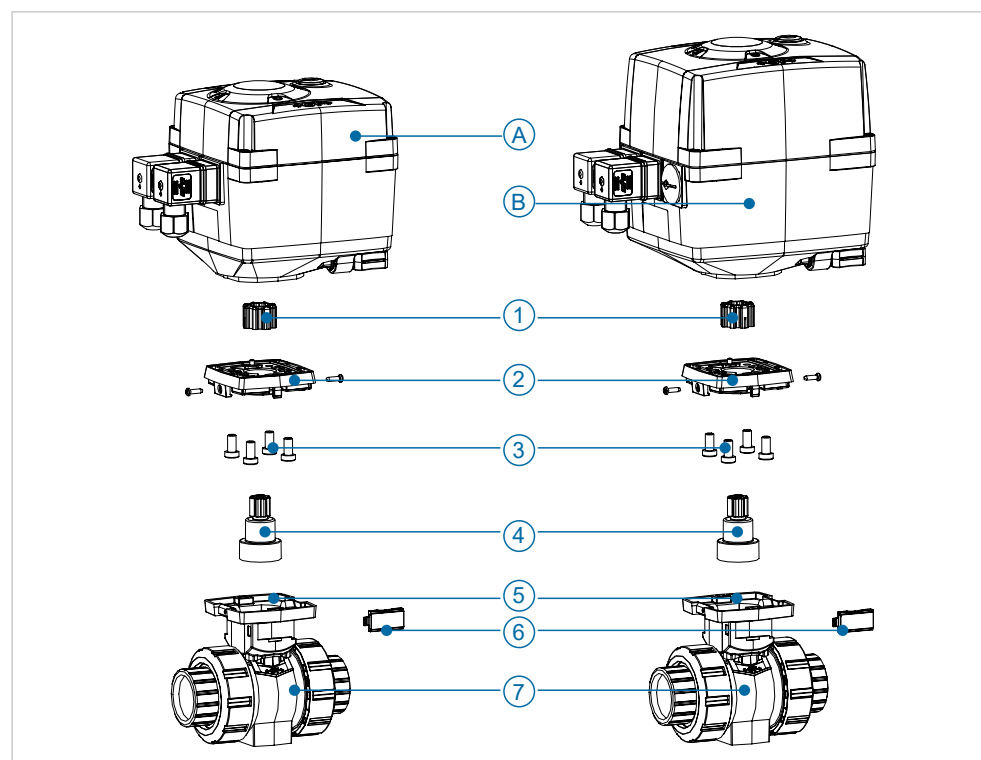
- Regularly check that no medium escapes to the outside.
- We recommend a function test for ball type valves that are kept permanently in the same position 1 – 2 times per year to check functionality.
- Check that cover of the emergency manual override is correctly fitted. If necessary, fit cover.
- Check that housing cover of the actuator is fitted with 4 screws. Insert screws if necessary.
- Check if grating noises are coming from the actuator. Replace actuator, see assembly instructions for building valve with actuator.
- Check that position display matches signal of the control. If necessary, adjust limit switches.

For frequent control operations or due to chemical attack on the sealing material, it may become necessary to replace parts inside the valve.



Installation and maintenance must be performed according to the corresponding installation instructions. The installation manual is included with the product, see also the online product catalog at www.gfps.com

1.2.3 Technical Data



- A Actuator Type EA15
- B Actuator Type EA25/EA45/EA120
- ① Adapter
- ② Adapter plate
- ③ PT screws
- ④ Coupling piece
- ⑤ Interface housing
- ⑥ Labelling clip
- ⑦ Ball Valve Type 546 Pro

Specification

Dimensions	Type 127	EA15	d16/DN10 – d63/DN50
	Type 179-184	EA25	d16/DN10 – d63/DN50
		EA45	d75/DN65
		EA120	d90/DN80 – d110/DN100
Base type	Type 546 Pro		
Materials	Type 127, 179-184	PVC-U, PVC-C, ABS, PP-H, PVDF	
Seal materials		EPDM, FKM, FFKM, NBR	
Pressure levels		PN10	
Connections		Socket, spigot, flanges, threaded socket	
Connection standards	ISO, BS, ASTM, JIS		

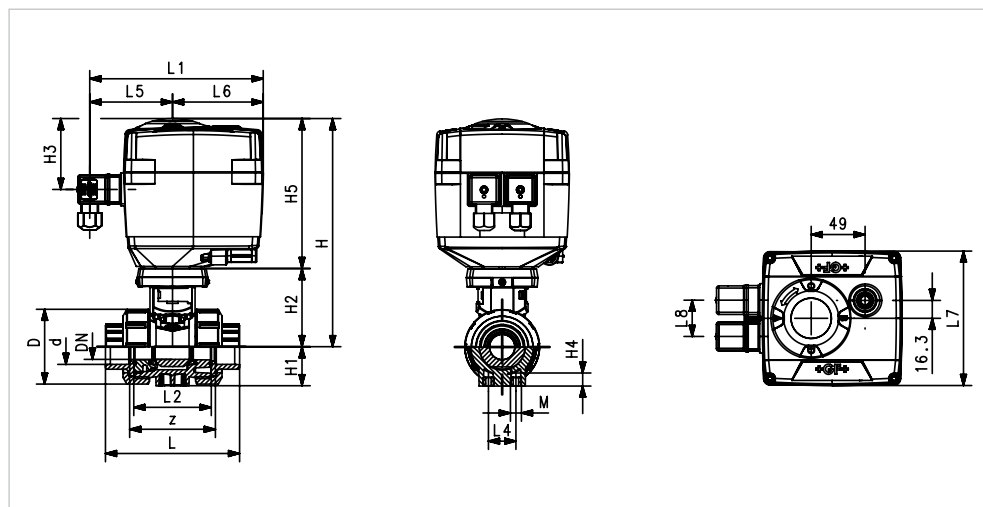


The following technical data can be found in the Planning Fundamentals under "Ball Valve Type 546 Pro, manually operated":

- Pressure-temperature diagram
- Pressure loss
- Flow characteristics
- Kv values
- Reference values for fastening screws

1.2.4 Dimensions

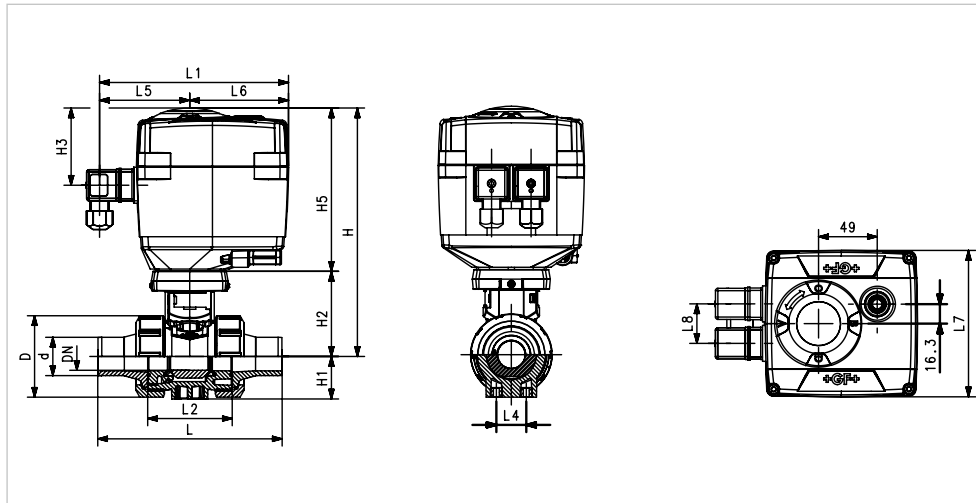
Type 127 solvent cement sockets



d (mm)	DN (mm)	D (mm)	H (mm)	H1 (mm)	H2 (mm)	H3 (mm)	H5 (mm)
16	10	50	200	27	64	64	137
20	15	50	200	27	64	64	137
25	20	58	209	30	73	64	137
32	25	68	209	36	73	64	137
40	32	84	220	44	84	64	137
50	40	97	220	51	84	64	137
63	50	124	243	64	106	64	137

L (mm)	L1 (mm)	L2 (mm)	L4 (mm)	L5 (mm)	L6 (mm)	L7 (mm)	L8 (mm)	z (mm)
92	161	56	25	77	83	122	33	64
95	161	56	25	77	83	122	33	64
110	161	65	25	77	83	122	33	72
123	161	71	25	77	83	122	33	79
146	161	85	45	77	83	122	33	94
157	161	89	45	77	83	122	33	95
183	161	101	45	77	83	122	33	107

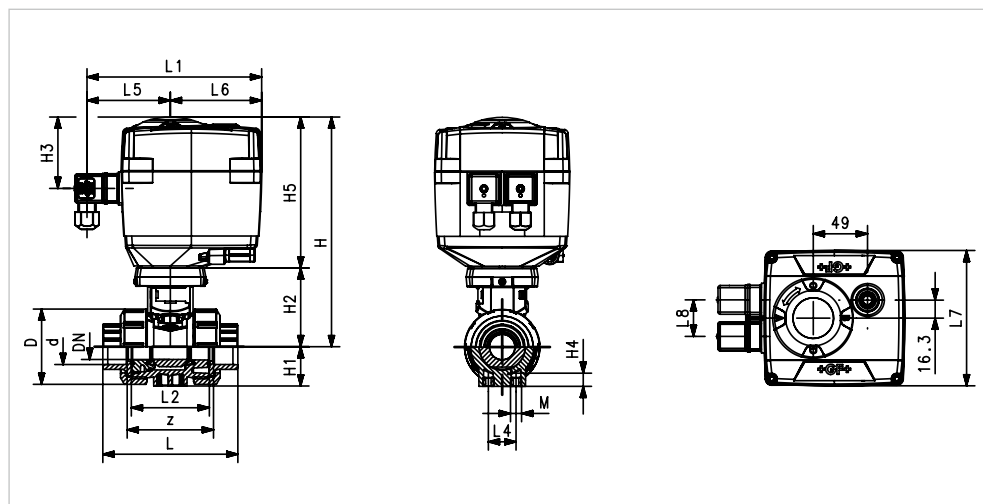
Type 127 Solvent cement spigots



d (mm)	DN (mm)	D (mm)	H (mm)	H1 (mm)	H2 (mm)	H3 (mm)	H5 (mm)
16	10	50	200	27	64	64	137
20	15	50	200	27	64	64	137
25	20	58	209	30	73	64	137
32	25	68	209	36	73	64	137
40	32	84	220	44	84	64	137
50	40	97	220	51	84	64	137
63	50	124	243	64	106	64	137

L (mm)	L1 (mm)	L2 (mm)	L3 (mm)	L4 (mm)	L5 (mm)	L6 (mm)	L7 (mm)	L8 (mm)
114	161	56	130	25	77	83	122	33
124	161	56	130	25	77	83	122	33
144	161	65	150	25	77	83	122	33
154	161	71	160	25	77	83	122	33
174	161	85	180	45	77	83	122	33
194	161	89	200	45	77	83	122	33
224	161	101	230	45	77	83	122	33

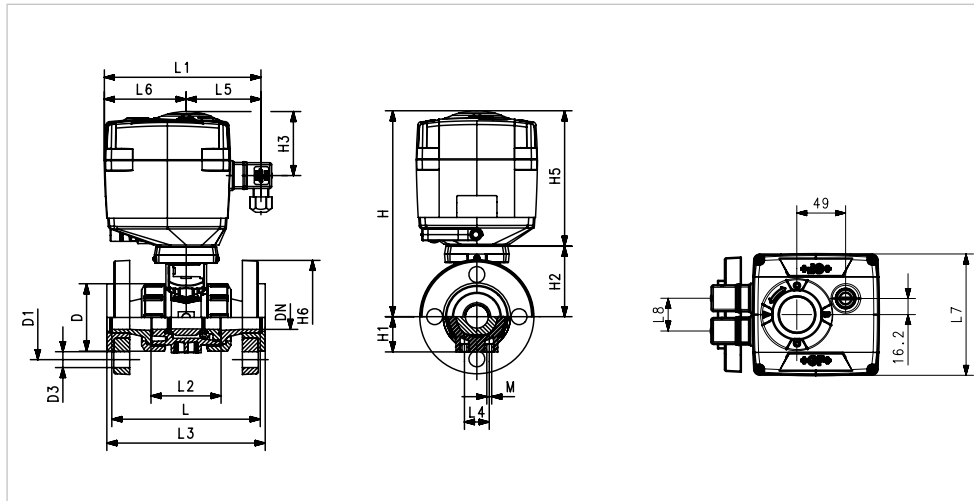
Type 127 threaded sockets Rp



Rp Zoll	DN (mm)	D (mm)	H (mm)	H1 (mm)	H2 (mm)	H3 (mm)	H5 (mm)
3/8	10	50	200	27	64	64	137
1/2	15	50	200	27	64	64	137
3/4	20	58	209	30	73	64	137
1	25	68	209	36	73	64	137
1 1/4	32	84	220	44	84	64	137
1 1/2	40	97	220	51	84	64	137
2	50	124	243	64	106	64	137

L (mm)	L1 (mm)	L2 (mm)	L4 (mm)	L5 (mm)	L6 (mm)	L7 (mm)	L8 (mm)	z (mm)
92	161	56	25	77	83	122	33	64
95	161	56	25	77	83	122	33	64
110	161	65	25	77	83	122	33	72
123	161	71	25	77	83	122	33	79
146	161	85	45	77	83	122	33	94
157	161	89	45	77	83	122	33	95
183	161	101	45	77	83	122	33	107

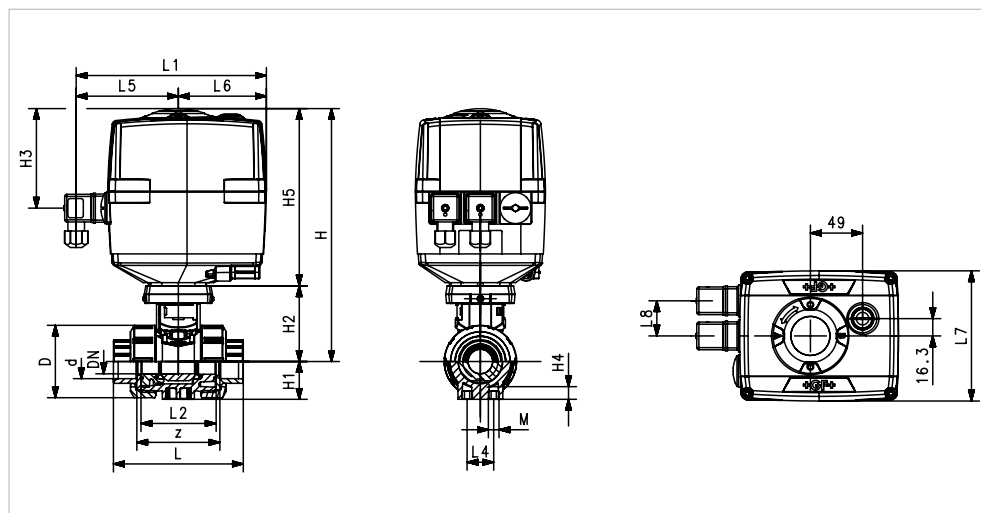
Type 127 fixed flange serrated, metric



d (mm)	DN (mm)	D (mm)	H (mm)	H1 (mm)	H2 (mm)	H3 (mm)	H5 (mm)	H6 (mm)
20	15	50	201	27	64	65	138	48
25	20	58	210	30	73	65	138	53
32	25	68	210	36	73	65	138	58
40	32	84	221	44	84	65	138	70
50	40	97	221	51	84	65	138	75
63	50	124	244	64	106	65	138	83

L (mm)	L1 (mm)	L2 (mm)	L3 (mm)	L4 (mm)	L5 (mm)	L6 (mm)	L7 (mm)	L8 (mm)
124	160	56	130	25	77	83	122	33
144	160	65	150	25	77	83	122	33
154	160	71	160	25	77	83	122	33
174	160	85	180	45	77	83	122	33
194	160	89	200	45	77	83	122	33
224	160	101	230	45	77	83	122	33

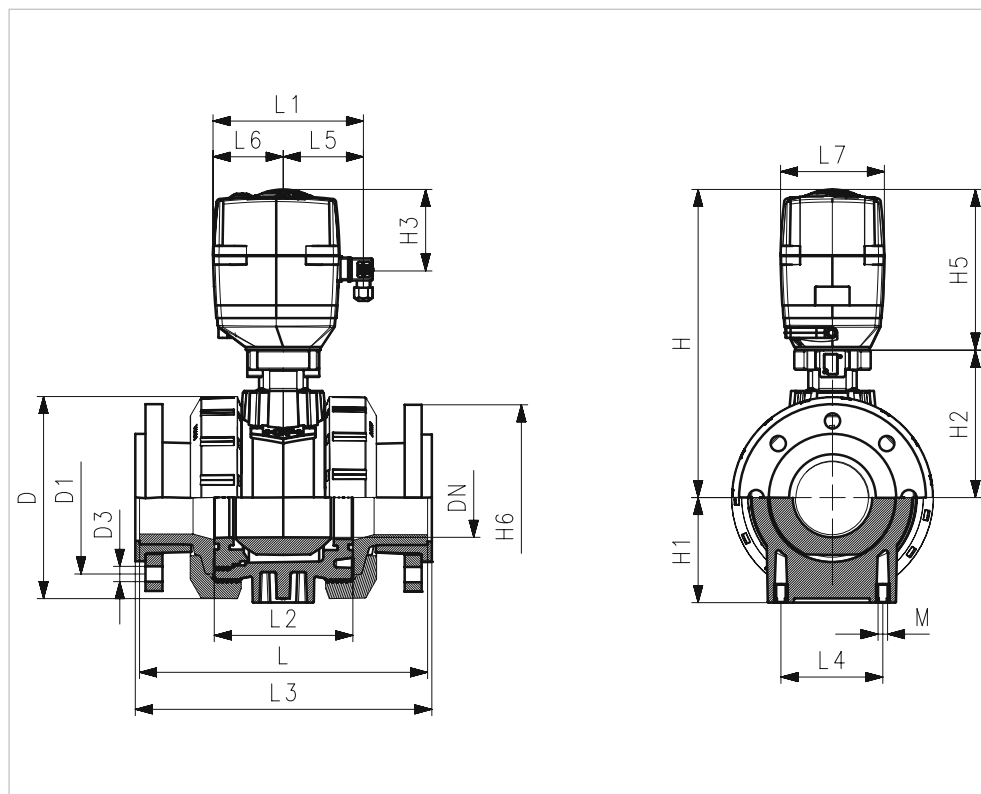
Type 179 – 184 with solvent cement sockets, metric



d (mm)	DN (mm)	D (mm)	H (mm)	H1 (mm)	H2 (mm)	H3 (mm)	H5 (mm)
16	10	50	231	27	64	94	167
20	15	50	231	27	64	94	167
25	20	58	240	30	73	94	167
32	25	68	240	36	73	94	167
40	32	84	251	44	84	94	167
50	40	97	251	51	84	94	167
63	50	124	273	64	106	94	167
75	65	166	346	85	156	94	190
90	80	200	358	105	168	94	190
110	100	238	365	123	175	94	190

L (mm)	L1 (mm)	L2 (mm)	L4 (mm)	L5 (mm)	L6 (mm)	L7 (mm)	z (mm)
92	180	56	25	97	83	122	64
95	180	56	25	97	83	122	64
110	180	65	25	97	83	122	72
123	180	71	25	97	83	122	79
146	180	85	45	97	83	122	94
157	180	89	45	97	83	122	95
183	180	101	45	97	83	122	107
233	180	136	70	98	83	122	144
254	180	141	70	98	83	122	151
301	180	164	120	98	83	122	174

Type 179 – 184 backing flanges PP ST, metric



d (mm)	DN (mm)	D (mm)	H (mm)	H1 (mm)	H2 (mm)	H3 (mm)	H5 (mm)	H6 (mm)
75	65	166	346	85	156	94	190	93
90	80	200	358	105	168	94	190	100
110	100	238	365	123	175	94	190	110

L (mm)	L1 (mm)	L2 (mm)	L3 (mm)	L4 (mm)	L5 (mm)	L6 (mm)	L7 (mm)	L8 (mm)
284	180	136	290	70	98	83	122	66
300	180	141	310	70	98	83	122	66
340	180	164	350	120	98	83	122	66

1.2.5 Accessories

EA15 / EA25 / EA45 / EA120 / EA250:

- Fail-safe return unit with or without integrated battery package
- AS-interface plug on module
- Limit switch assembly kits for multi function module AgNi, Au, NPN, PNP

EA25 / EA45 / EA120 / EA250:

- Monitoring board with cycle time extension, cycle time monitoring, cycle cycle time monitoring, cycle counter and motor current monitoring
- Positioner board for modulating operation with 4-20 mA Feedback and integrated motor current monitoring
- Profibus DP V0 plug-on module



For further information on accessories, refer to the online product catalog at www.gfps.com

1.3 Ball Valve Type 546 Pro electric (Type 104)



Type 104

With electric actuator EA04

1.3.1 Product description

Available in PVC-U, PVC-C and PP-H, the Ball Valve Type 104 from GF Piping Systems is an efficient solution for less demanding applications. Type 104 is based on the same industrial ball Type valve that GF Piping Systems utilizes in other applications. This means that the valve can be removed and serviced. With a duty cycle of 75 %, the valve is suited for a low to median number of actuations.

Applications

- Chemical process industry
- Microelectronics
- Measurement and control
- Shipbuilding
- Food & beverage

Benefits/features

- Optical position indicator
- Integrated emergency manual override
- Multi-colour led status light as standard
- Integrated mounting inserts for attaching the valve
- All actuators have the CE marking.

Flow media

Neutral and aggressive media with a small amount of particles/solids. The chemical resistance depends on the selected valve material ([see online tool ChemRes PLUS](#)).

1.3.2 Technical basics

Valve handling

Installation notes

During installation, ensure that the actuator is correctly built onto and connected to the correct valve.

The following points must be observed:

- Actuate valves with 90° rotary movement
- Indicate the previously calibrated end positions of the valve via electrical signal to the aforementioned system control
- In case of interruption in the power supply, ensure that the actuator remains in the current position. For this, installation of an emergency manual override or reset unit is recommended

Maintenance notes

Set maintenance intervals as per the conditions of use (e. g. actuating cycles, medium, ambient temperature). As part of the regular system inspection, carry out the following maintenance activities:

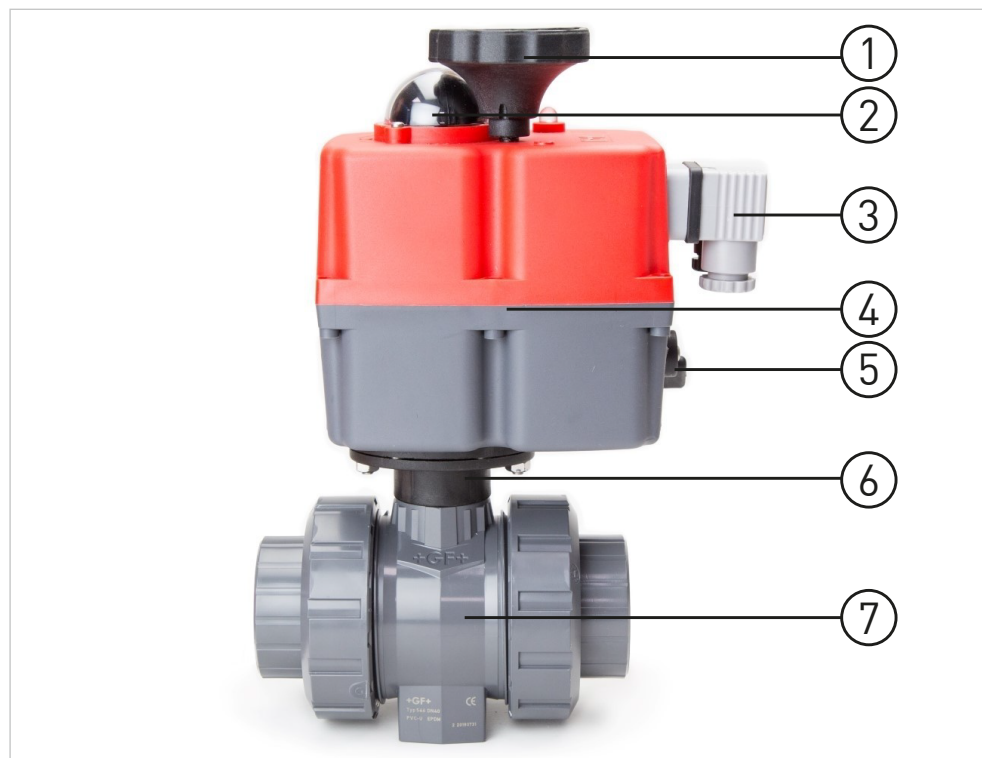
- Regularly check that no medium escapes to the outside
- We recommend a function test for ball valves that are kept permanently in the same position 1 – 2 times per year to check functionality
- Check that cover of the emergency manual override is correctly fitted. If necessary, fit cover
- Check that housing cover of the actuator is fitted with all screws. Insert screws if necessary
- Check if grating noises are coming from the actuator. Replace actuator, see assembly instructions for installing ball valve with electric actuator
- Check that position display matches signal from the controller
- If necessary, adjust limit switches

For frequent control operations or due to chemical attack on the sealing material, it may become necessary to replace parts inside the valve.



Installation and maintenance must be performed according to the corresponding installation instructions. The installation manual is included with the product, see also the online product catalog at www.gfps.com

1.3.3 Technical data



- ① Emergency manual override
- ② Position indicator
- ③ Connection for control voltage/feedback
- ④ Electric actuator EA04
- ⑤ Switch emergency manual override
- ⑥ Assembly kit
- ⑦ Ball Valve Type 546 Pro

Specification

Dimensions	Type 104	EA04	d16/DN10 – d63/DN50
Ball valve	Type 546 Pro		
Materials	PVC-U, PVC-C, PP-H		
Gasket materials	EPDM, FKM		
Pressure rating	PN10		
Connections	Socket, Spigot, NPT thread		
Nominal torque	20Nm		
Voltage	85 - 240 V AC/DC		
Standards	ISO, BS, ASTM, JIS		



The following technical data can be found in the Planning Fundamentals under "Ball Valve Type 546 Pro, manually operated":

- Pressure-temperature diagram
- Pressure loss
- Flow characteristics
- Kv values
- Reference values for screw fastenings



1.3.4 Accessories

- Reset unit
- Heating element
- Operating time extension, monitoring, operating cycle counting
- Motor current monitoring
- Position detection
- Positioner
- Limit switch assembly kits AgNi, Au, NPN, PNP, NAMUR
- AS interface plug-on module



For further information on accessories, refer to the online product catalog at www.gfps.com

1.4 Ball Valve Type 546 Pro pneumatic (Type 230–235)

	
Type 230 – 235 With pneumatic actuators PA11 – PA45 Without manual override	Type 230 – 235 With pneumatic actuators PA11 – PA45 With manual override

1.4.1 Product description

The 230 – 235 series is designed as a modular adjustable ball valve for applications which demand special process requirements. Ball valves of types 230, 231, 232, 233, 234 and 235 are based on the Ball Valve Type 546 Pro and the electric actuators PA11, PA21, PA30 and PA45.

Applications

- Chemical process industry
- Water treatment
- Microelectronics
- Measurement and control
- Shipbuilding
- Cooling

Benefits/features

- Electrical feedback when manually actuating valve
- Long service life with more than 25,000 cycles
- Pressure connector based on NAMUR standard
- Optional with emergency manual override
- Compact design
- For FC/FO stroke limitation possible

Flow media

Neutral and aggressive media with a small amount of particles/solids. The chemical resistance is dependent on the selected valve material ([see online tool ChemRes PLUS](#)).

1.4.2 Technical basics

Differences between Types 230 – 235

	Type 230	Type 231	Type 232	Type 233	Type 234	Type 235
PVC-U	✓			✓	✓	✓
PVC-C	✓			✓	✓	✓
ABS	✓			✓	✓	
PP		✓				✓
PVDF			✓			✓
ISO	✓	✓	✓			
ASTM		✓		✓		
BS					✓	
JIS						

- The actuators are available with the functions fail-safe to close (FC), fail-safe to open (FO) and double-acting (DA) and have an optical position indicator.
- The housing of the actuator is made of fiberglass-reinforced polypropylene (PP-GF) and therefore has low flammability.
- For simple installation of positioners, limit switches and accessories, actuators need to have an integrated NAMUR interface. For reliable electrical feedback, the valve should be equipped with a multifunction module that is installed between valve body and actuator.

i Pneumatic actuators are differentiated with regard to the valve sizes by actuators 1 (for valve sizes DN10 – 25 mm) and actuators 2 (for valve sizes DN32 – 50 mm).

Valve handling

Installation notes

- Ensure that the ball valves are actuated with a drive torque of 2.8 to 7 bar via control pressure and up to a drive torque of 20 Nm.
- Control these valves to the OPEN and CLOSED positions via a built-in solenoid valve. The solenoid valve must be either supplied ex GF works or already mounted by the customer.
- Indicate these positions OPEN and CLOSED via an electric signal to the system control, if the actuator is equipped for this with the respective subassembly.

Maintenance notes

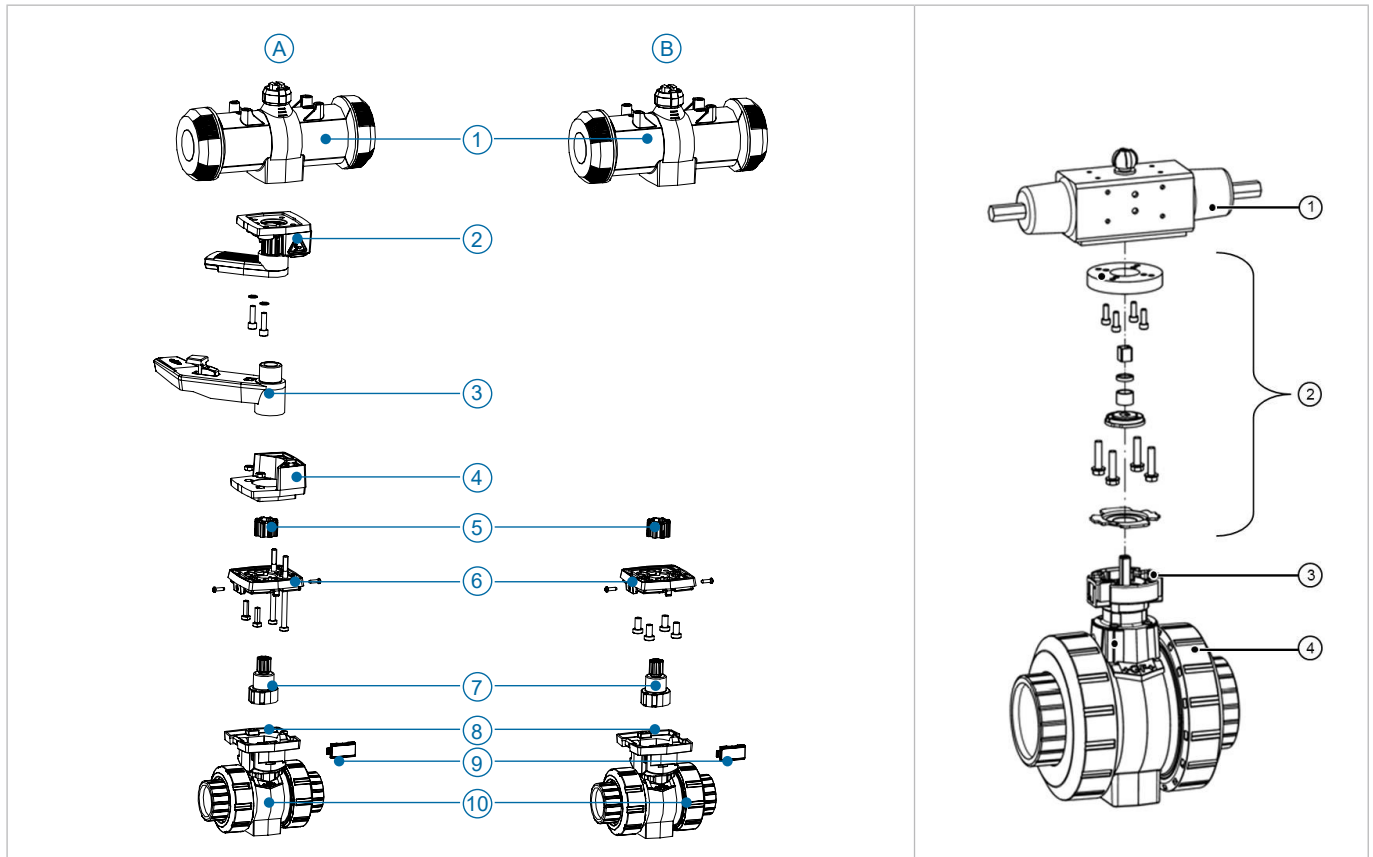
Ball valves require no maintenance under normal operating conditions (clear water). However, the following measures must be considered:

- Regularly check that no medium escapes to the outside.
- We recommend a function test for ball Type valves that are kept permanently in the same position 1 – 2 times per year to check functionality.

For frequent control operations or due to chemical attack on the sealing material, it may become necessary to replace parts inside the valve. For this purpose, the valve must be removed from the piping system.

⚠ Installation and maintenance must be performed according to the corresponding installation instructions. The installation manual is part of the product, see also the online product catalog at www.gfps.com

1.4.3 Technical data



A Type 230 – 235 with manual override

B Type 230 – 235 without manual override

① Actuator types PA11 and PA21

② Coupling lever with intermediate piece on top

③ Control lever

④ Intermediate piece below

⑤ Adapter

⑥ Adapter plate

⑦ Coupling piece

⑧ Interface housing

⑨ Labelling clip

⑩ Ball Valve Type 546 Pro

① Actuator types PA 30, 35, 40 and 45

② Coupling with screws

③ Multifunctional module

④ Ball Valve Types 546 Pro DN65 – DN100

Specification

Dimensions	PA11	DN10 – DN25
	PA21	DN32 – DN50
	PA30	DN65
	PA40	DN80 – DN100
Base type	546 Pro	
Materials	PVC-U, PVC-C, ABS, PP-H, PVDF	
Gasket materials	O-ring	EPDM, FKM
	Ball	PTFE, PVDF
Pressure rating	PN10	
Connections	Socket, spigot, flanges, threaded socket	
Standards	ISO, BS, ASTM, JIS	

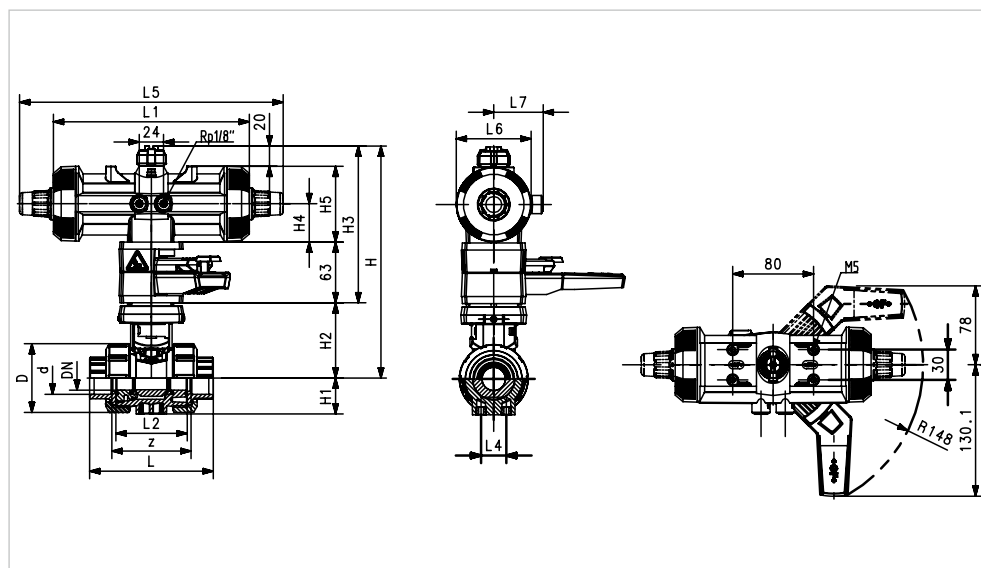
i The following technical data can be found in the Planning Fundamentals under Ball Valve Type 546 Pro, manually operated:

- Pressure-temperature diagram
- Pressure loss
- Flow characteristics
- Kv values
- Reference values for fastening screws

1.4.4 Dimensions

Type 230 – 235 (DN10 – DN50) with manual override, solvent cement socket

Ball Valve Type 546 Pro, with solvent cement sockets, metric with pneumatic actuators PA11 and PA21 with stroke limiter and emergency manual override



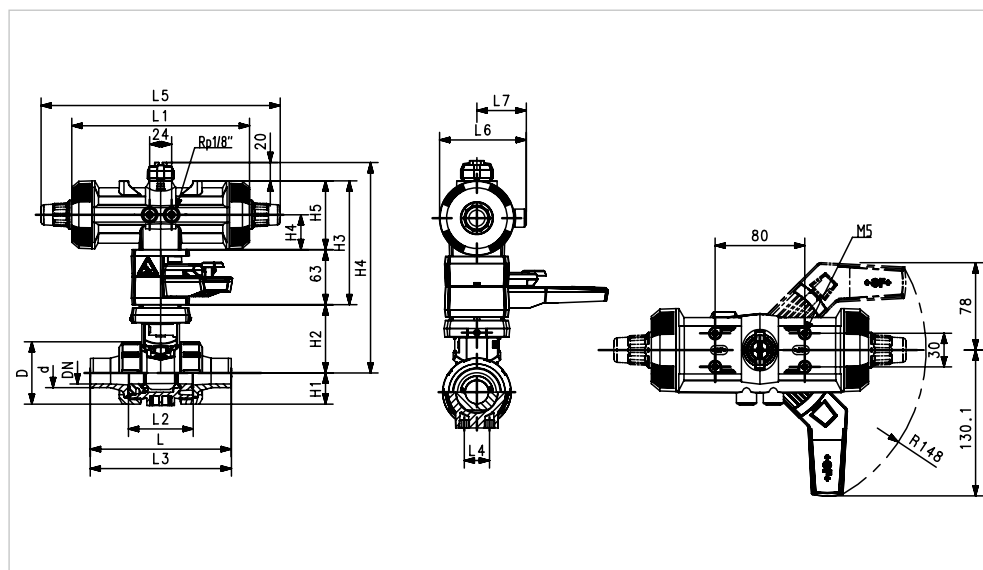
d (mm)	DN (mm)	D (mm)	H (mm)	H1 (mm)	H2 (mm)	H3 (mm)	H4 (mm)	H5 (mm)
16	10	50	229.5	26.5	61.5	168	40	97
20	15	50	229.5	26.5	61.5	168	40	97
25	20	58	238.5	30	70.5	168	40	97
32	25	68	238.5	35.5	70.5	168	40	97
40	32	84	270.6	44	83.6	187	51	115
50	40	97	270.6	50.5	83.6	187	51	115
63	50	124	293	64	106	187	51	115

d (mm)	L ¹⁾ (mm)	L1 (mm)	L2 (mm)	L4 (mm)	L5 (mm)	L6 (mm)	L7 (mm)	z (mm)
16	92	194	56	25	261	76	48	64
20	95	194	56	25	261	76	48	64
25	110	194	65	25	261	76	48	72
32	123	194	71	25	261	76	48	79
40	146	224	85	45	305	95	59	94
50	157	224	89	45	305	95	59	94
63	183	224	101	45	305	95	59	107

¹⁾ L applies to PVC-U, PVC-C and ABS; for PP and PVDF see "Manual valve"

Type 230 – 235 (DN10 – DN50) with manual override, spigots/flanges

Ball Valve Type 546 Pro, with solvent cement spigot, metric with pneumatic actuators PA11 and PA21 with stroke limiter and emergency manual override



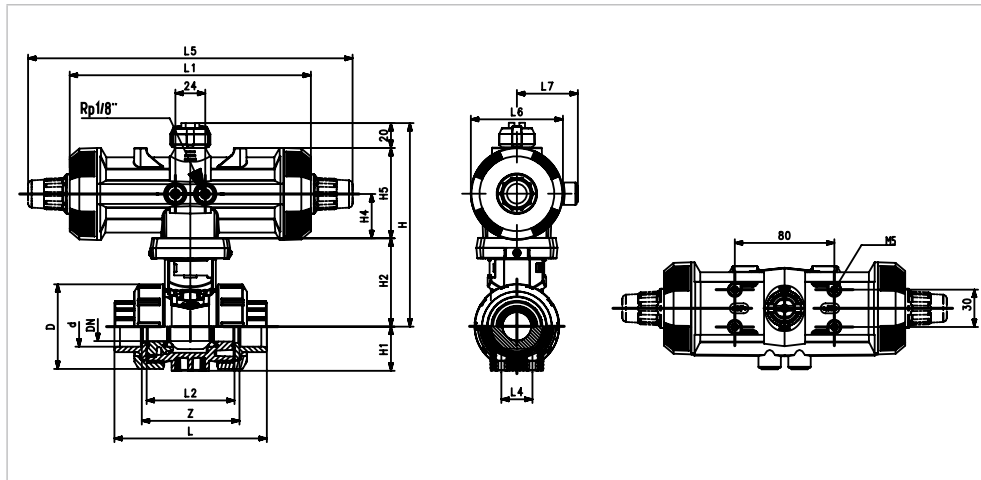
d (mm)	DN (mm)	D (mm)	H (mm)	H1 (mm)	H2 (mm)	H3 (mm)	H4 (mm)	H5 (mm)
16	10	50	229.5	26.5	61.5	168	40	97
20	15	50	229.5	26.5	61.5	168	40	97
25	20	58	238.5	30	70.5	168	40	97
32	25	68	238.5	35.5	70.5	168	40	97
40	32	84	270.6	44	83.6	187	51	115
50	40	97	270.6	50.5	83.6	187	51	115
63	50	124	293	64	106	187	51	115

d (mm)	L ¹⁾ (mm)	L1 (mm)	L2 (mm)	L3 (mm)	L4 (mm)	L5 (mm)	L6 (mm)	L7 (mm)
16	114	194	56		25	261	76	48
20	124	194	56	130	25	261	76	48
25	144	194	65	150	25	261	76	48
32	154	194	71	160	25	261	76	48
40	174	224	85	180	45	305	95	59
50	194	224	89	200	45	305	95	59
63	224	224	101	230	45	305	95	59

¹⁾ L applies to PVC-U, PVC-C and ABS; for PP and PVDF see manual valve

Type 230 – 235 (DN10 – DN50) without manual override, solvent cement socket

Ball Valve Type 546 Pro, with solvent cement sockets, metric with pneumatic actuators PA11 and PA21 with stroke limiter



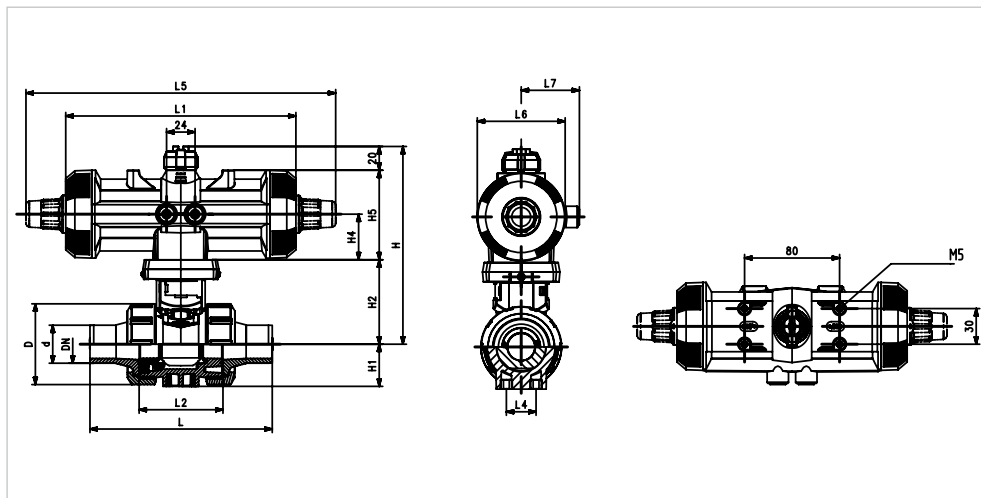
d (mm)	DN (mm)	D (mm)	H (mm)	H1 (mm)	H2 (mm)	H4 (mm)	H5 (mm)
16	10	50	166.5	26.5	61.5	40	97
20	15	50	166.5	26.5	61.5	40	97
25	20	58	175.5	30	70.5	40	97
32	25	68	175.5	35.5	70.5	40	97
40	32	84	209.6	44	83.6	51	115
50	40	97	209.6	50.5	83.6	51	115
63	50	124	232	64	106	51	115

d (mm)	L ¹⁾ (mm)	L1 (mm)	L2 (mm)	L4 (mm)	L5 (mm)	L6 (mm)	L7 (mm)	z (mm)
16	92	194	56	25	261	76	48	64
20	95	194	56	25	261	76	48	64
25	110	194	65	25	261	76	48	72
32	123	194	71	25	261	76	48	79
40	146	224	85	45	305	95	59	94
50	157	224	83	45	305	95	59	95
63	183	224	101	45	305	95	59	107

¹⁾ L applies to PVC-U, PVC-C and ABS; for PP and PVDF see manual valve

Type 230 – 235 (DN10 – DN50) without manual override, spigots/flanges

Ball Valve Type 546 Pro, with solvent cement spigot, metric with pneumatic actuators PA11 and PA21 with stroke limiter



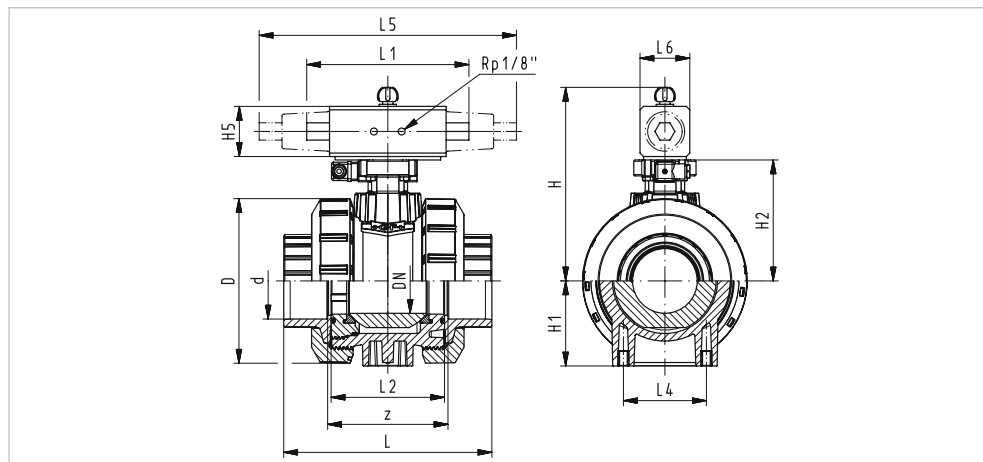
d (mm)	DN (mm)	D (mm)	H (mm)	H1 (mm)	H2 (mm)	H4 (mm)	H5 (mm)
16	10	50	166.5	26.5	61.5	40	97
20	15	50	166.5	26.5	61.5	40	97
25	20	58	175.5	30	70.5	40	97
32	25	68	175.5	35.5	70.5	40	97
40	32	84	209.6	44	83.6	51	115
50	40	97	209.6	50.5	83.6	51	115
63	50	124	232	64	106	51	115

d (mm)	L ¹⁾ (mm)	L1 (mm)	L2 (mm)	L3 (mm)	L4 (mm)	L5 (mm)	L6 (mm)	L7 (mm)
16	114	194	56		25	261	76	48
20	124	194	56	130	25	261	76	48
25	144	194	65	150	25	261	76	48
32	154	194	71	160	25	261	76	48
40	174	224	85	180	45	305	95	59
50	194	224	89	200	45	305	95	59
63	224	224	101	230	45	305	95	59

¹⁾ L applies to PVC-U, PVC-C and ABS; for PP and PVDF see manual valve

Type 230 – 235 (DN65 – DN100) without manual override, solvent cement socket

Ball Valve Type 546 Pro, with solvent cement sockets, metric with pneumatic actuators PA35, PA40 and PA45 with stroke limiter



d (mm)	DN (mm)	D (mm)	H1 (mm)	H2 (mm)	z (mm)	L ¹⁾ (mm)	L2 (mm)	L4 (mm)
75	65	166	85	156	144	233	136	70
90	80	200	105	168	151	254	141	70
110	100	238	123	175	174	301	164	120

¹⁾ L applies to PVC-U, PVC-C and ABS; for PP and PVDF see manual valve

Single Acting FC/F0

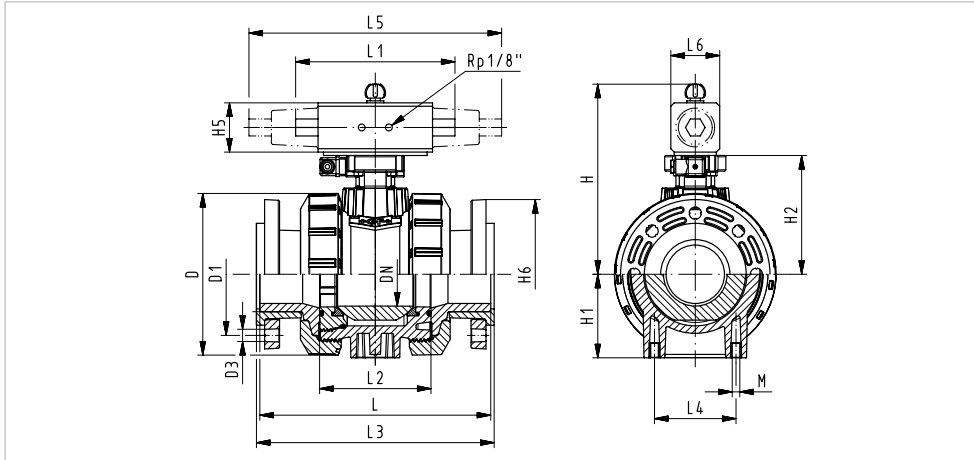
d (mm)	DN (mm)	Actuator Type	H (mm)	H5 (mm)	L5 (FC/F0) (mm)	L6 (mm)
75	65	PA35	279.1	83.3	325.2	83.3
90	80	PA40	294.8	87	359.5	87
110	100	PA40	289.8	87	359.5	87

Double Acting DA

d (mm)	DN (mm)	Antr. Typ	H (mm)	H5 (mm)	L1 (DA) (mm)	L6 (mm)
75	65	PA35	256.3	64.5	196.1	64.5
90	80	PA40	277.2	70.4	205.6	70.4
110	100	PA45	292.1	83.3	242	83.3

Dimensions for Types 230 – 235 (DN65 – DN100) without manual override, spigots/flanges

Ball Valve Type 546 Pro, with solvent cement spigot, metric with pneumatic actuators PA35, PA40 and PA45 with stroke limiter



d (mm)	DN (mm)	D (mm)	H1 (mm)	H2 (mm)	H6 (mm)	L ¹⁾ (mm)	L2 (mm)	L3 (mm)	L4 (mm)
75	65	166	85	156	93	233	136	290	70
90	80	200	105	168	100	254	141	310	70
110	100	238	123	175	110	301	166	350	120

¹⁾ L applies to PVC-U, PVC-C and ABS; for PP and PVDF see manual valve

Single Acting FC/FO

d (mm)	DN (mm)	Actuator Type	H (mm)	H5 (mm)	L5 (FC/FO) (mm)	L6 (mm)
75	65	PA35	279.1	83.3	325.2	83.3
90	80	PA40	294.8	87	359.5	87
110	100	PA40	289.8	87	359.5	87

Double Acting DA

d (mm)	DN (mm)	Antr. Typ	H (mm)	H5 (mm)	L1 (DA) (mm)	L6 (mm)
75	65	PA35	256.3	64.5	196.1	64.5
90	80	PA40	277.2	70.4	205.6	70.4
110	100	PA45	292.1	83.3	242	83.3

1.4.5 Accessories

- Emergency manual override -10 – +50 °C
- Limit switch box for electrical position feedback
- 3/2-way pilot solenoid valve MNL532
- Pilot valve cluster PV2000
- Digital positioner DRS500
- AS interface



For further information on accessories, refer to the online product catalog at www.gfps.com

1.5 Ball Valve Type 542



1.5.1 Product description

The manual Ball Valve Type 542 offers uncompromising quality and is available in various materials and connection variants.

Function

The ball valve uses a rotating ball with a hole through it that allows straight-through flow in the open position and shuts off flow when the ball is rotated 90° to block the flow passage. This valve is primarily used for open/close functions and for throttling services.

Applications

From simple water to manual applications in demanding processes.

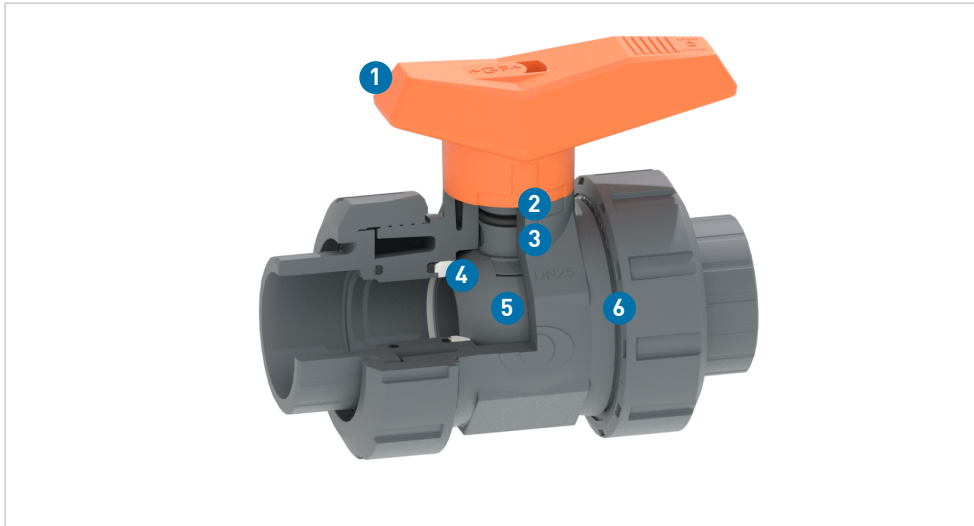
Benefits/features

- Ball seals: PE (blue lever) / PTFE (red lever)
- Very high flow rate
- Same installation length as Ball Valve Type 546 Pro
- Possibility of attaching a valve marking

Flow media

Neutral and aggressive media with a small amount of particles/solids. The chemical resistance is independent of the selected valve material ([see online tool ChemRes PLUS](#)).

1.5.2 Technical basics



- ① Ergonomic lever
- ② Reinforced security break point in the stem interface
- ③ Double stem seals
- ④ Dynamic backing seal
- ⑤ Smooth spherical surface
- ⑥ Saw tooth thread suitable for plastics

With the backing seals, the ball has a floating position. This results in preloading and hence a constant seal. Stem, backing, housing and connection seals are made of EPDM or FKM.

Valve handling

Installation notes

When installing the ball valve, ensure that it is always installed into the system in an opened ball position.

Selection of lubricant

All seals should be lubricated with a silicone-based grease. Using the wrong lubricants can damage the material of the ball valve or seals.

- Mineral oil-based and Vaseline (petrolatum) are not appropriate.

Maintenance notes

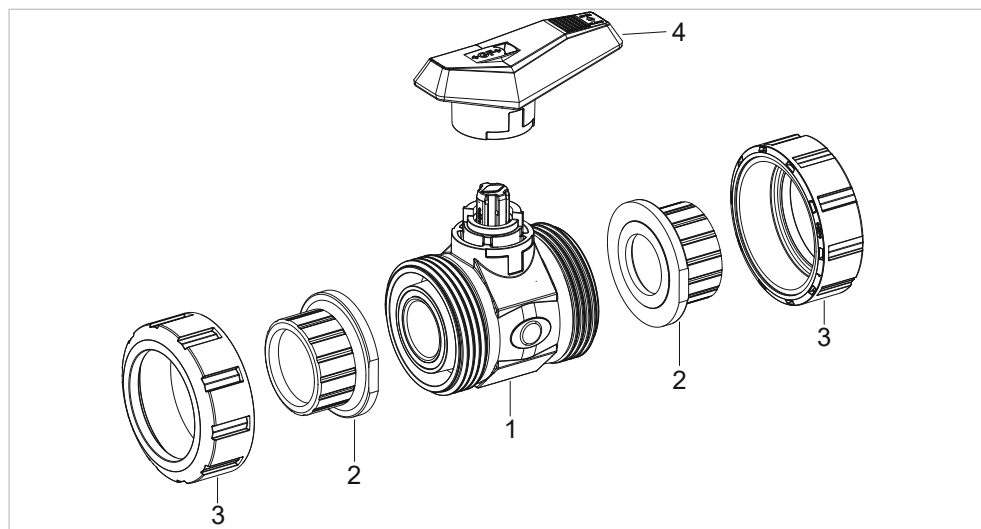
Ball valves require no maintenance under normal operating conditions (clear water). However, the following measures must be considered:

- Regularly check that no medium escapes to the outside.
- We recommend a function test for ball Type valves that are kept permanently in the same position 1 – 2 times per year to check functionality.



Installation and maintenance must be performed according to the corresponding installation instructions. The installation manual is included with the product, see also the online product catalogue at www.gfps.com

1.5.3 Technical data



- ① Housing
- ② End connection
- ③ Union nut
- ④ Hand lever

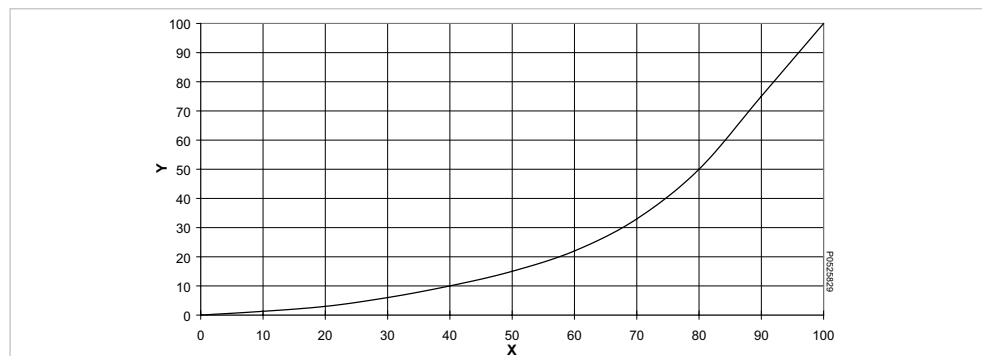
Specification

Dimensions	d16/DN10 – d63/DN50, 3/8" – 2"	
Materials	Central part	PVC-U, PVC-C, PP-H
	Lever	PP-GF30
Gasket materials	O-rings	EPDM, FKM
	Ball seal	PTFE, PE
Pressure levels	PP	PN10
	PVC-U, PVC-C	PN16
Connections	Fusion / solvent cement sockets	ISO, ASTM, JIS, BS
	Fusion / solvent cement spigot	ISO
	Threaded socket	Rp, NPT, Rc
	Backing flange	ISO, ANSI, BS, JIS
	Butt fusion spigots	SDR11 and SDR17.6
	PE100 electrofusion spigot or butt fusion spigot	SDR11 and SDR17.6

Kv 100 values

DN (mm)	Inch (inch)	d (mm)	Kv 100 (l/min)	Cv 100 (gal/min)	Kv 100 (m³/h)
10	3/8	16	70	4.9	4
15	1/2	20	185	12.9	11
20	3/4	25	350	24.5	21
25	1	32	700	49.0	42
32	1 1/4	40	1000	70.0	60
40	1 1/2	50	1600	112.0	96
50	2	63	3100	217.1	186
65	2 1/2	75	5000	350.0	300
80	3	90	7000	490.0	420
100	4	110	11000	770.0	660

Flow characteristics



X Opening angle (%)
Y Kv, Cv value (%)

Pressure-temperature diagrams

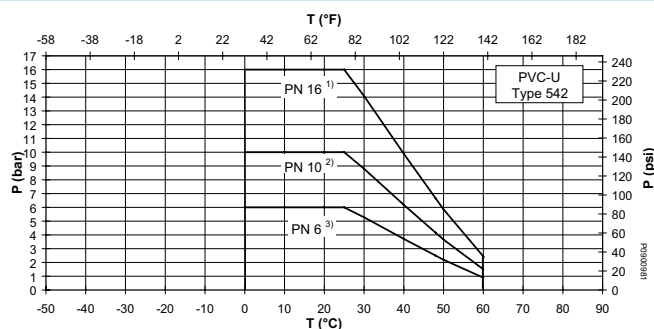
The following pressure-temperature diagrams are based on a service life of 25 years and water or similar media.

T Temperature (°C, °F)

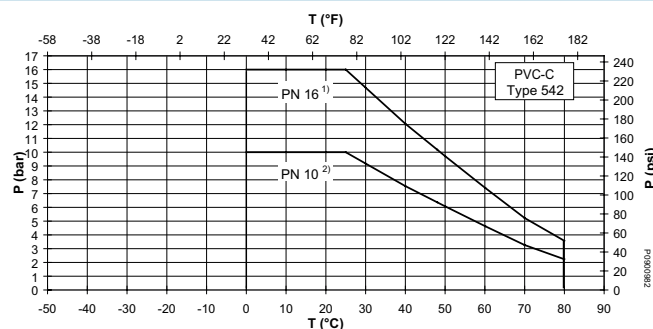
P Permissible pressure (bar, psi)

PVC-U

PVC-C

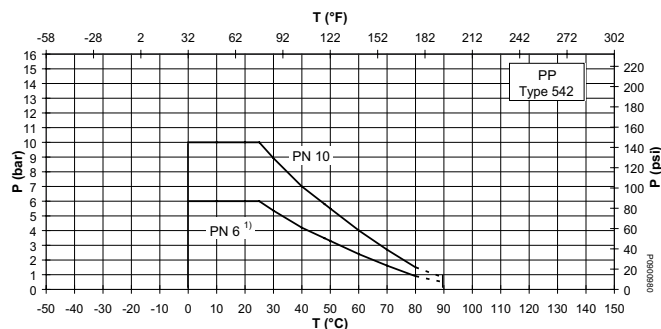


- 1) The central part of the ball valve is designed for the nominal pressure PN16
- 2) Depending on the connection, the nominal pressure is reduced to PN10
- 3) Depending on the connection, the nominal pressure is reduced to PN6



- 1) The central part of the ball valve is designed for the nominal pressure PN16
- 2) Depending on the connection, the nominal pressure is reduced to PN10

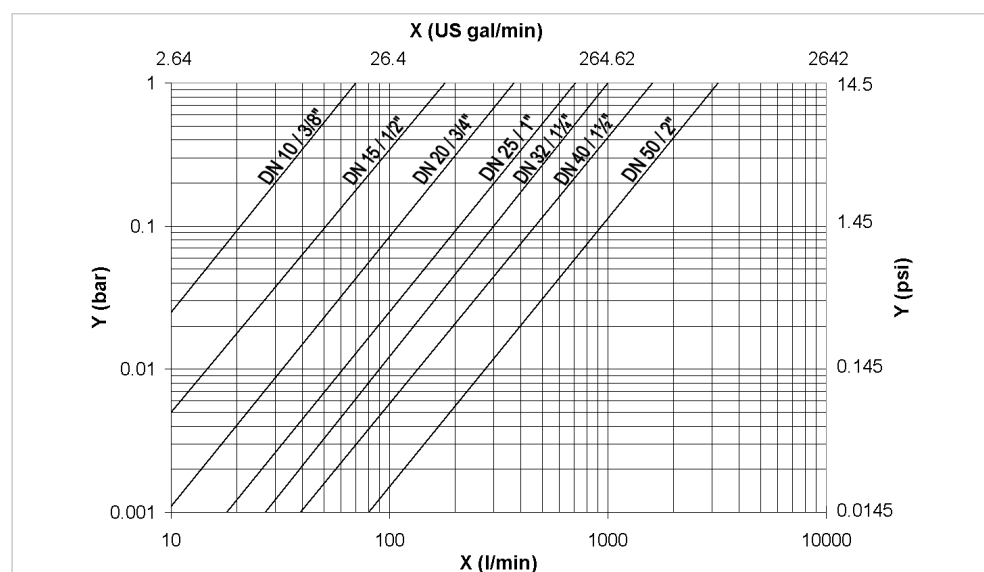
PP



- 1) For example, ball valve with butt fusion spigot PP or PE100, SDR 17

Pressure losses

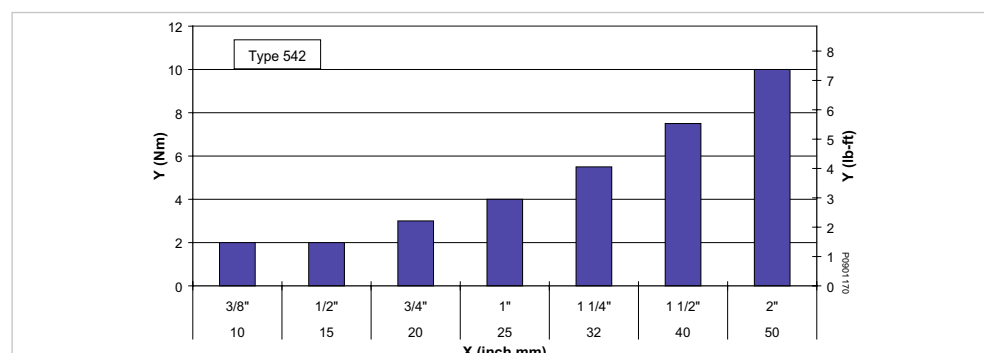
d16/DN10 – d63/DN50



- X Flow rate
(l/min, US gal/min)
Y Pressure loss Δp (bar, psi)

Operating torque

DN10 – DN50



- X Nominal diameter DN (mm, inch)
Y Tightening torque (Nm, lb-ft)

Reference values for tightening torque of screws

Flange connections with profile flange seal or flat gaskets

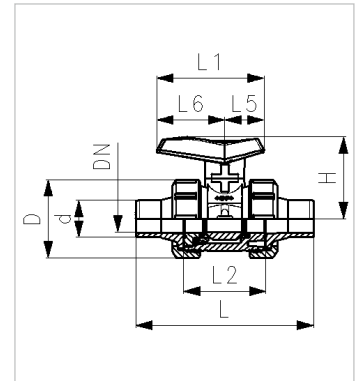
d	DN	Inch	Total number of screws (for 2 flange connections) standard nut (Height 0.8 x d) ¹⁾	Torque (Reference values) Profile flange gasket ²⁾		Torque (Reference values) Flat gasket	
				(Nm)	(lb-ft)	(Nm)	(lb-ft)
20	15	1/2	8 x M12 x 50	10	7.4	10	7.4
25	20	3/4	8 x M12 x 55	10	7.4	10	7.4
32	25	1	8 x M12 x 60	10	7.4	15	11
40	32	1 1/4	8 x M16 x 70	15	11	20	15
50	40	1 1/2	8 x M16 x 70	15	11	25	18
63	50	2	8 x M16 x 80	20	15	35	26

- 1) For valve ends Type 542 made of PP in combination with backing flanges, use half of the standard nut height
2) Preferred gasket Type (suited for plastics)

1.5.4 Dimensions

Ball Valve Type 542 with cemented spigots, metric

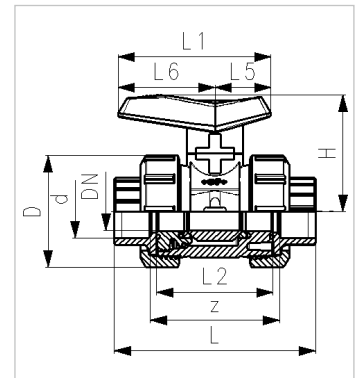
d (mm)	DN (mm)	D (mm)	H (mm)	L (mm)	L1 (mm)	L2 (mm)	L5 (mm)	L6 (mm)
16	10	50	54	114	72	56	26	46
20	15	50	54	124	72	56	26	46
25	20	58	66	144	93	65	34	59
32	25	68	71	155	93	71	34	59
40	32	84	85	175	110	85	41	69
50	40	97	92	193	110	89	41	69
63	50	124	108	224	128	101	49	79



Ball Valve Type 542 with cemented sockets, fusion sockets or threaded sockets*

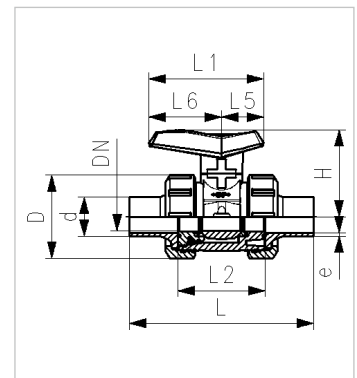
d (mm)	DN (mm)	D (mm)	H (mm)	L (mm)	L1 (mm)	L2 (mm)	L5 (mm)	L6 (mm)	z (mm)
16	10	50	54	92	72	56	26	46	64
20	15	50	54	95	72	56	26	46	53
25	20	58	66	110	93	65	34	59	73
32	25	68	71	124	93	71	34	59	79
40	32	84	85	147	110	85	41	69	94
50	40	97	92	157	110	89	41	69	95
63	50	124	108	184	128	101	49	79	108

*example PVC-U with cemented sockets



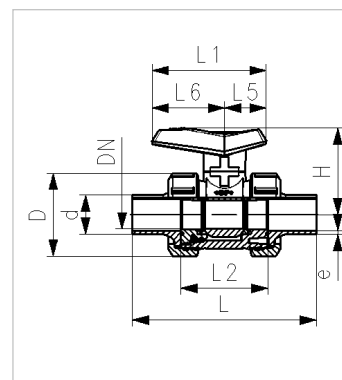
Ball Valve Type 542 with butt fusion spigots, metric

d (mm)	DN (mm)	D (mm)	H (mm)	L (mm)	L1 (mm)	L2 (mm)	L5 (mm)	L6 (mm)	e (mm)
20	15	50	54	130	72	56	26	46	1.9
25	20	58	66	144	93	65	34	59	2.3
32	25	68	71	151	93	71	34	59	2.9
40	32	84	85	171	110	85	41	69	3.7
50	40	97	92	189	110	89	41	69	4.6
63	50	124	108	220	128	101	49	79	5.8



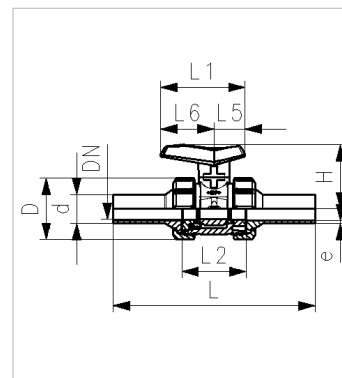
Ball Valve Type 542 with PE butt fusion spigots short, metric

d (mm)	DN (mm)	D (mm)	H (mm)	L (mm)	L1 (mm)	L2 (mm)	L5 (mm)	L6 (mm)	e (mm)
20	15	50	54	130	72	56	26	46	1.9
25	20	58	66	144	93	65	34	59	2.3
32	25	68	71	151	93	71	34	59	2.9
40	32	84	85	171	110	85	41	69	3.7
50	40	97	92	189	110	89	41	69	4.6
63	50	124	108	220	128	101	49	79	5.8



Ball Valve Type 542 with PE butt fusion spigots long, metric

d (mm)	DN (mm)	D (mm)	H (mm)	L (mm)	L1 (mm)	L2 (mm)	L5 (mm)	L6 (mm)	e (mm)
20	15	50	54	193	72	56	26	46	1.9
25	20	58	66	218	93	65	34	59	2.3
32	25	68	71	224	93	71	34	59	2.9
40	32	84	85	250	110	85	41	69	3.7
50	40	97	92	271	110	89	41	69	4.6
63	50	124	108	321	128	101	49	79	5.8



Further accessories

i For further information on accessories, refer to the online product catalogue at www.gfps.com

■ Mobile apps and online tools to support configuration and calculation at www.gfps.com/tools



1.6 Metering Ball Valve Type 523



1.6.1 Product description

The strength of the metering Ball Valve Type 523 is its ability to reliably control flow even at very low flowrates. The easy to read indicator and uniquely notched ball make precisely controlling media possible.

Applications

- Chemical process
- Life science
- Microelectronics
- Measurement and control
- Water treatment
- Shipbuilding
- Food & beverage

Benefits/features

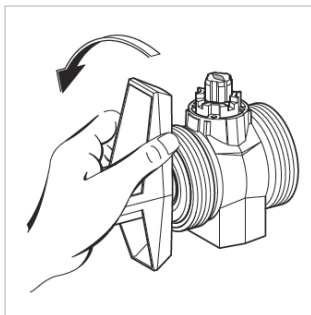
- 180° scale for fine adjustment
- V-notch ball specifically designed for flow control
- True union for easy installation and removal
- Handle with integrated tool for seat carrier adjustment and removal

Flow media

Neutral and aggressive media with a small amount of particles/solids. The chemical resistance is dependent on the selected valve material ([see online tool ChemRes PLUS](#)).

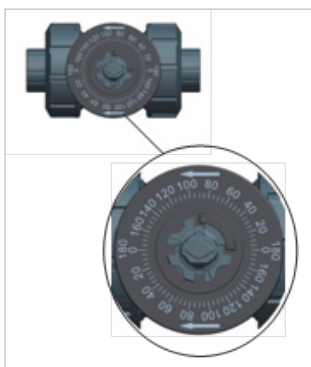
1.6.2 Technical basics

- With the backing seals, the ball has a floating position. This results in preloading and hence a constant seal. Stem, backing, housing and connection seals are made of EPDM or FKM.
- The stems with rated break point above the upper O-ring help prevent leaks to the outside in case of damage.
- The design of the hand lever serves as a tool for installing the screw-in fitting. Screw-in fittings have a reverse thread in order to avoid unintentional opening when removing the coupling nuts or the thread connections.



i All ball valves in DN10–15 are true union according to EN ISO 16135 for simple installation and removal from the piping system.

Reading the current flow is possible in all positions, thanks to the new circular scale, which is reflected in the center. The arrows on the scale indicate the direction of flow.



Valve handling

Installation notes

When installing the ball valve, ensure that it is always installed into the system in an opened ball position.

Selection of lubricant

All seals should be lubricated with a silicone-based grease. Using the wrong lubricants can damage the material of the ball valve or seals.

- Mineral oil-based and Vaseline (petrolatum) are not appropriate.
- For silicon-free ball valves, please consult the special manufacturer's instructions.

Maintenance notes

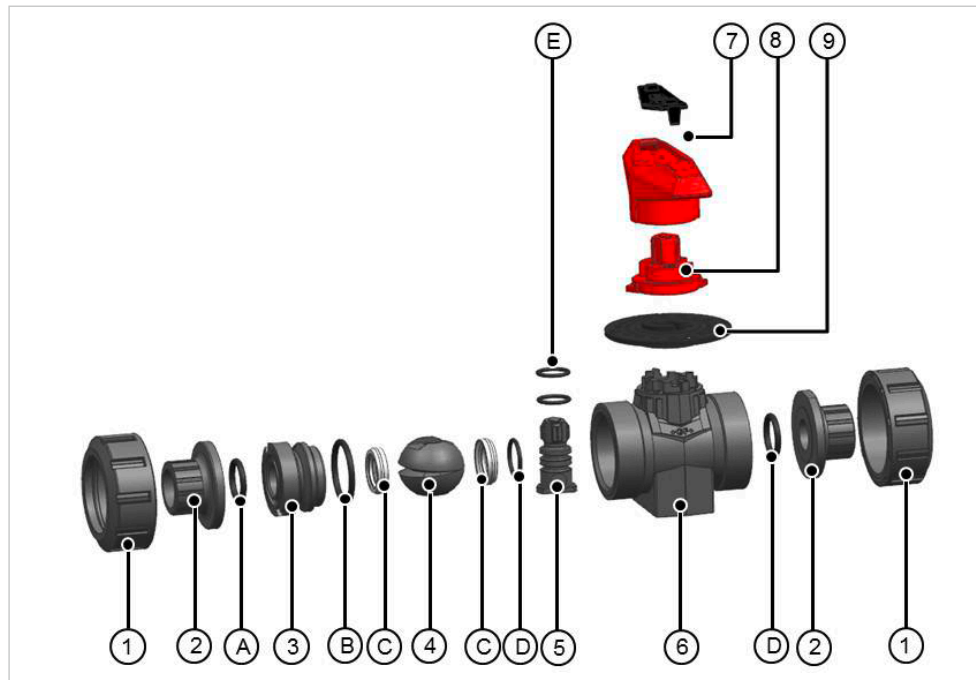
Ball valves require no maintenance under normal operating conditions (clear water). However, the following measures must be considered:

- Regularly check that no medium escapes to the outside.
- We recommend cycling valves 1-2 times per year that are permanently kept in the same position to check for functionality.



Installation and maintenance must be performed according to the corresponding installation instructions. The installation manual is included with the product, see also the online product catalog at www.gfps.com

1.6.3 Technical data



- ① Union nut
- ② Valve end
- ③ Seat carrier
- ④ Ball
- ⑤ Stem
- ⑥ Housing
- ⑦ Hand lever
- ⑧ Position indicator
- ⑨ Index plate
- A Face seal
- B Body seal
- C Backing seal
- D Face seal
- E Stem seal

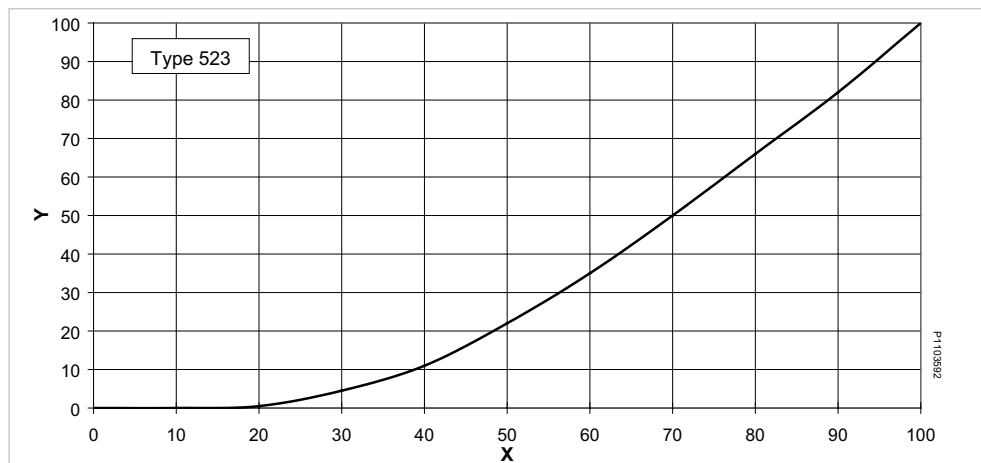
Specification		
Dimensions	d16/DN10 – d20/DN15, 3/8" – 1/2"	
Materials	Valve body	PVC-U, PVC-C, PP-H, PVDF
	Lever	PP-GF30
	O-rings	EPDM, FKM
Seal materials	Ball seal	PTFE
Rated pressure	PN16/10	
Actuation variants	Manually operated	
	Fusion / solvent cement sockets	ISO, ASTM, JIS, BS
	Fusion / solvent cement spigots	ISO
	Threaded socket	Rp, NPT, Rc
	Backing flange	ISO, ANSI, BS, JIS
Connections	Butt fusion spigots	ISO
Approvals	DVGW, ACS, ABS, NSF, WRAS, DIBt, RINA, BV, FDA, SEPRO, TSSA	

Kv 100 values

DN (mm)	Inch (inch)	d (mm)	Kv 100 (l/min)	Cv 100 US (Gal./min)	Kv 100 (m³/h)
10	3/8	16	11	0.8	0.7
15	1/2	20	20	1.4	1.2

The kv values for each intermediate valve position can be determined by using the flow value characteristics and the kv 100 values.

Flow characteristics

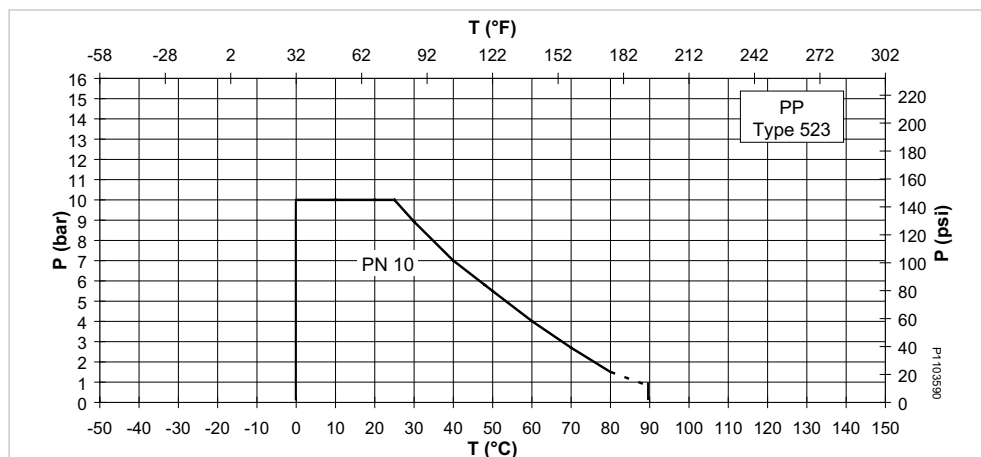


X Opening angle (%)
Y Kv, Cv value (%)

Pressure-temperature diagrams

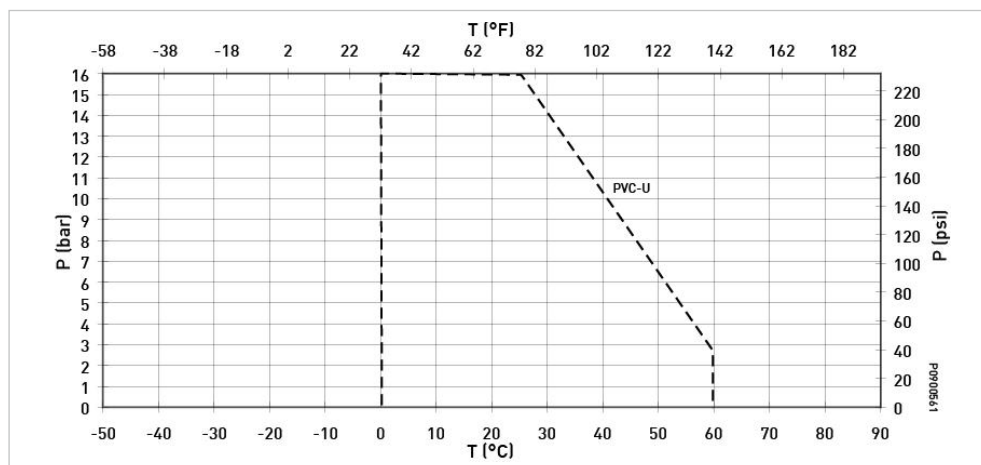
The pressure-temperature diagram is based on a service life of 25 years and use with water or similar media.

PP

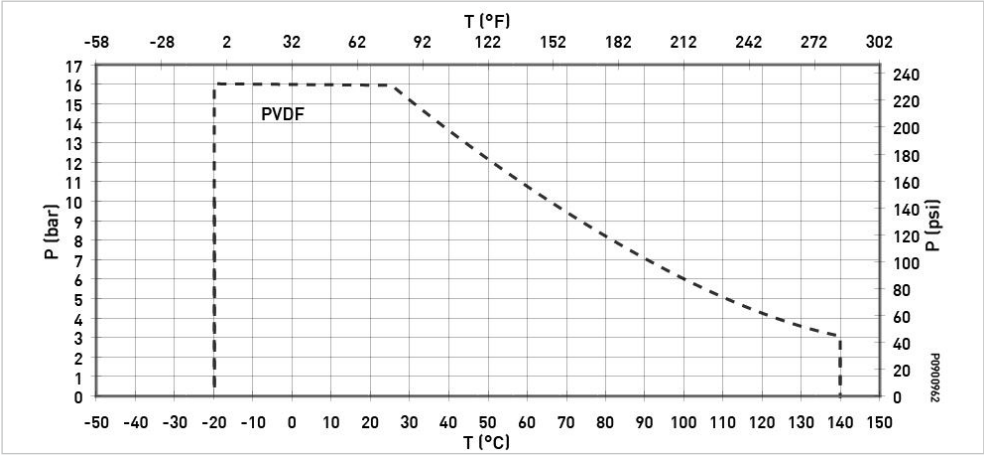


T Temperature (°C, °F)
P Permissible pressure (bar, psi)

PVC-U

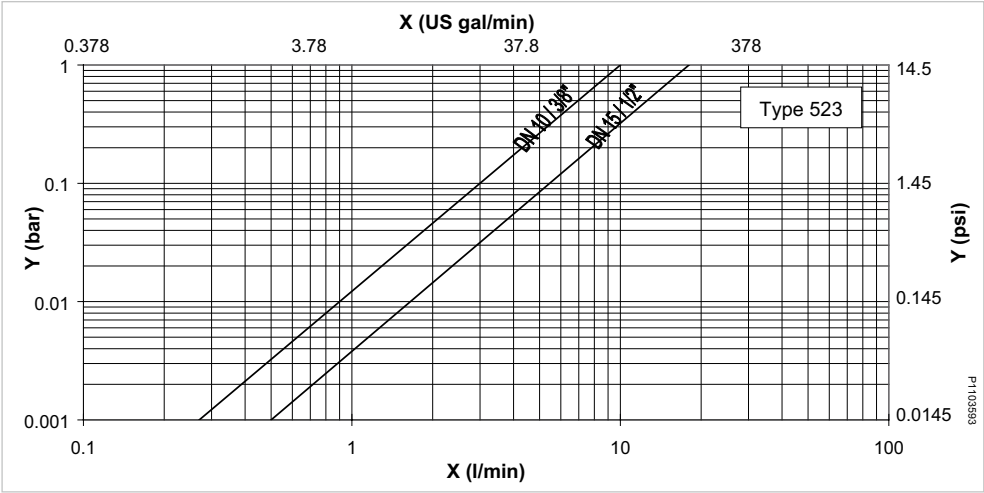


PVDF



⚠ For applications in the dashed temperature range, please contact your GF representative.

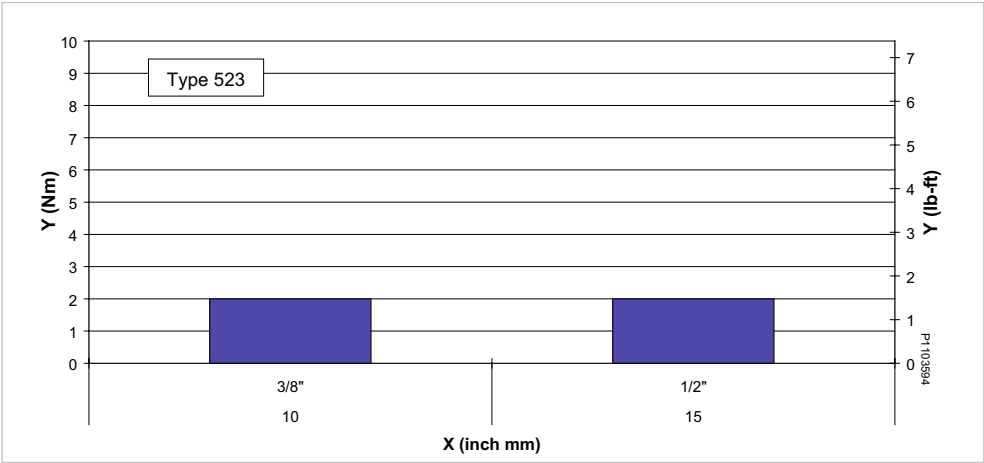
Pressure losses



- X Flow rate (l/min, US gal/min)
- Y Pressure loss Δp (bar, psi)

VI

Operating torque



- X Nominal diameter DN (mm, inch)
- Y Operating torque (Nm, lb-ft)

Reference values for tightening torque of flange bolts

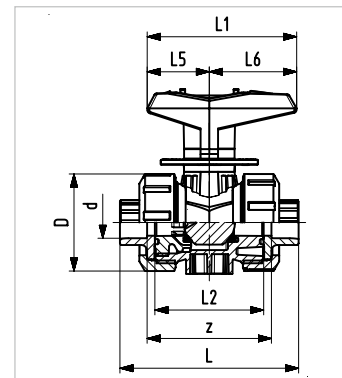
d (mm)	DN (mm)	DN (inch)	Total number of screws (for 2 flange connections) Standard nut (Height 0.8 x d)	Torque (Reference values) Profiled flange seal ¹		Torque (Reference values) Flat gasket	
				(Nm)	(lb-ft)	(Nm)	(lb-ft)
20	15	½	8 x M12 x 50	10	7.4	10	7.4

- 1) For valve ends Type 523 made of PP in combination with backing flanges, use half of the standard nut height
- 2) Preferred gasket Type (suited for plastics)

1.6.4 Dimensions

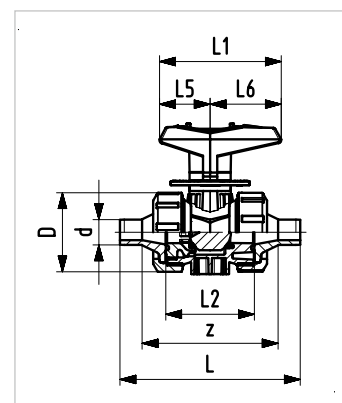
Solvent cement sockets, metric

d (mm)	DN (mm)	D (mm)	H (mm)	H1 (mm)	L (mm)	L1 (mm)	L2 (mm)	L5 (mm)	L6 (mm)
16	10	50	68	27	92	77	56	32	45
20	15	50	68	27	95	77	56	32	45



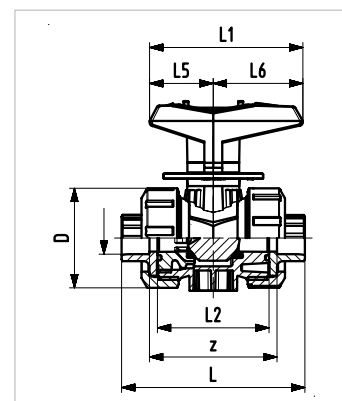
Solvent cement spigot, metric

d (mm)	DN (mm)	D (mm)	H (mm)	H1 (mm)	L (mm)	L1 (mm)	L2 (mm)	L4 (mm)	L6 (mm)
16	10	50	68	27	114	77	56	25	32
20	15	50	68	27	124	77	56	25	32



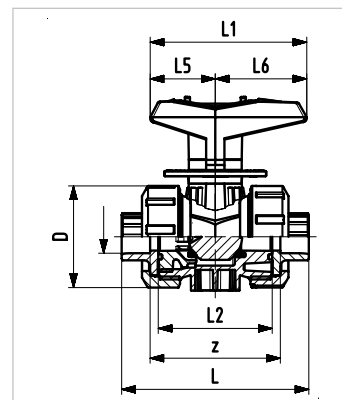
Solvent cement sockets, JIS

d (mm)	DN (mm)	D (mm)	H (mm)	H1 (mm)	L (mm)	L1 (mm)	L2 (mm)	L5 (mm)	L6 (mm)
½	15	50	68	27	95	77	56	32	45



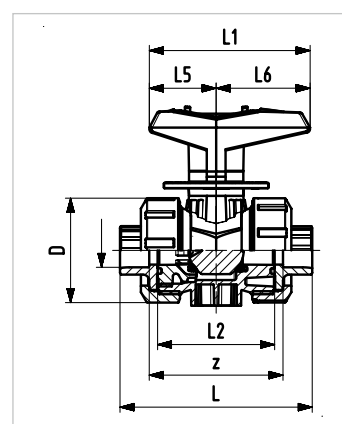
Solvent cement sockets, inch BS

Inch (inch)	DN (mm)	D (mm)	H (mm)	H1 (mm)	L (mm)	L1 (mm)	L2 (mm)	L4 (mm)	L5 (mm)	L6 (mm)
3/8	10	50	68	27	92	77	56	25	32	45
1/2	15	50	68	27	95	77	56	25	32	45



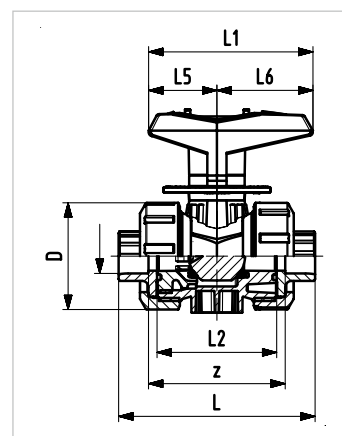
Solvent cement sockets, inch ASTM

Inch (inch)	DN (mm)	D (mm)	H (mm)	H1 (mm)	H2 (mm)	L (mm)	L1 (mm)	L2 (mm)	L4 (mm)	L5 (mm)
3/8	10	50	68	27	12	105	77	56	25	32
1/2	15	50	68	27	12	150	77	56	25	32



Threaded sockets Rp

Inch (inch)	DN (mm)	D (mm)	H (mm)	H1 (mm)	L (mm)	L1 (mm)	L2 (mm)	L4 (mm)	L5 (mm)	L6 (mm)
3/8	10	50	68	27	95	77	56	25	32	45
1/2	15	50	68	27	100	77	56	25	32	45



For further information on accessories, refer to the online product catalogue at www.gfps.com

Mobile apps and online tools to support configuration and calculation at www.gfps.com/tools



1.7 Ball Valve Type 374



Ball Valve Type 374

1.7.1 Product description

The Ball Valve Type 374 is an affordable and high quality manual valve that was developed specially for use in non-critical water applications. Its construction ensures simple maintenance and hence a long service life. Its compact construction is an advantage for use in confined spaces such as filtering modules.

Function

The ball valve uses a rotating ball with a hole through it that allows straight-through flow in the open position and shuts off flow when the ball is rotated 90° to block the flow passage. This valve is used primarily for open/close functions and also for throttling services.

Applications

- Swimming Pools, leisure parks and SPA's
- Building Technology
- Water treatment
- Fountains and municipal landscaping
- Irrigation
- Fish farming and aquaculture
- Other applications in which non aggressive chemical media is conveyed through the piping system

Benefits/features

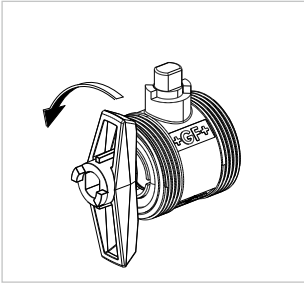
- Double union for easy installation and removal
- Ergonomic hand lever with integrated tool for removing/adjusting the union bushing
- Simple maintenance and long service life
- Simple installation and removal due to compact construction
- Low torque opening and closing
- Double O-ring sealing on the stem
- Very compact "Z" dimension
- Wide range from 16mm to 110mm and from ½" to 4"

Flow media

Non-solid, neutral and non-aggressive media. The chemical resistance depends on the selected valve material ([see online tool ChemRes PLUS](#)).

1.7.2 Technical basics

- With the backing seals, the ball has a floating position. This results in preloading and hence a constant seal. Stem, backing, housing and connection seals are made of EPDM.
- The design of the hand lever serves as a tool for a micro adjustment of the ball support.



All ball valves in DN10 – 100 are available as radially removable valves with two threaded connections according to EN ISO 16135.

Valve handling

Installation notes

When installing the ball valve, ensure that it is always installed into the system in an opened ball position.

Maintenance notes

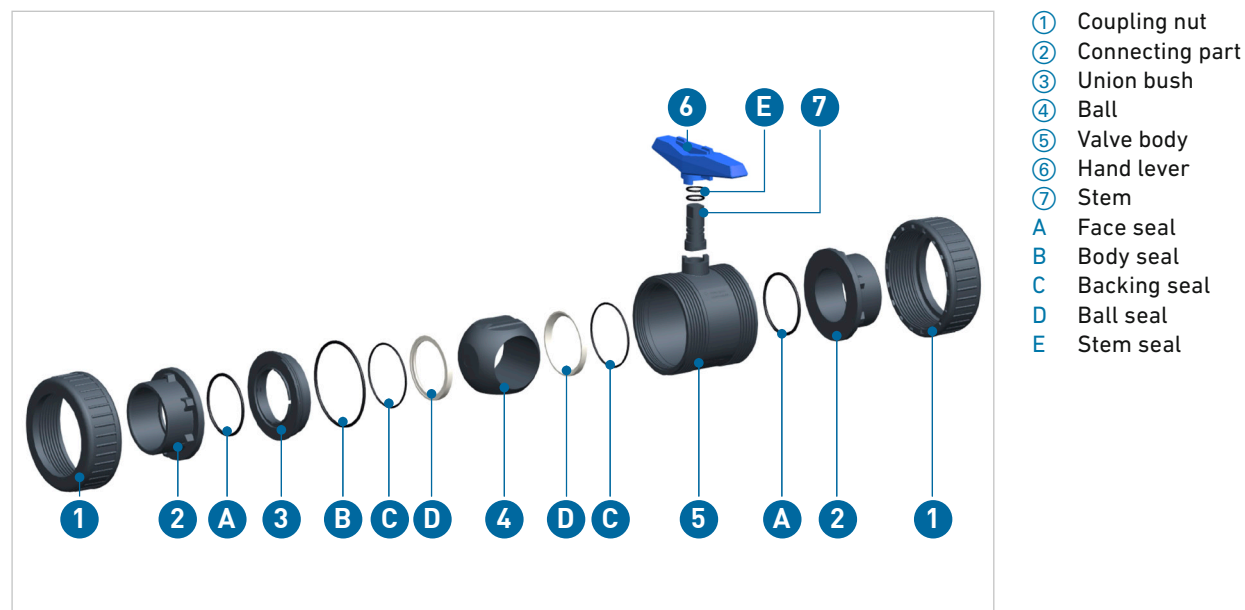
Ball valves require no maintenance under normal operating conditions (clear water). However, the following measures must be considered:

- Regularly check that no medium escapes to the outside.
- We recommend a function test for ball Type valves that are kept permanently in the same position 1 – 2 times per year to check functionality.



Installation and maintenance must be performed according to the corresponding installation instructions. The installation manual is included with the product, see also the online product catalogue at www.gfps.com

1.7.3 Technical data



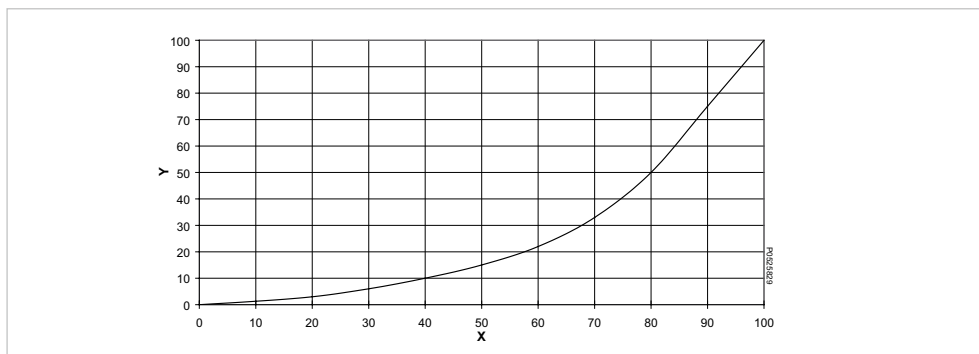
Specification		
Dimensions	d16/DN10 – d110/DN100, 3/8" – 4"	
Materials	Valve body	PVC-U
	Lever	PVC-U
Gasket materials	O-rings	EPDM
	Ball seal	PE/PTFE
Pressure levels	DN10 – 50	PN16
	DN65 – 100	PN10
Actuation variants	Manually operated	
Connections	Solvent cement sockets	ISO, BS, ASTM/ANSI
	Threaded sockets	NPT, Rp
	Butt fusion spigots, long	PE100 SDR11 ISO
Approvals	NSF 61, WRAS	

Kv 100 values

DN (mm)	inch (inch)	d (mm)	Kv 100 (l/min)	Cv 100 (US Gal./min)	Kv 100 (m³/h)
10	3/8	16	70	4.9	4
15	1/2	20	185	12.9	11
20	3/4	25	350	24.5	21
25	1	32	700	49.0	42
32	1 1/4	40	1000	70.0	60
40	1 1/2	50	1600	112.0	96
50	2	63	3100	217.1	186
65	2 1/2	75	5000	350.0	300
80	3	90	7000	490.0	420
100	4	110	11000	770.0	660

The kv values for each intermediate valve position can be determined by using the flow value characteristics and the kv 100 values.

Flow characteristics



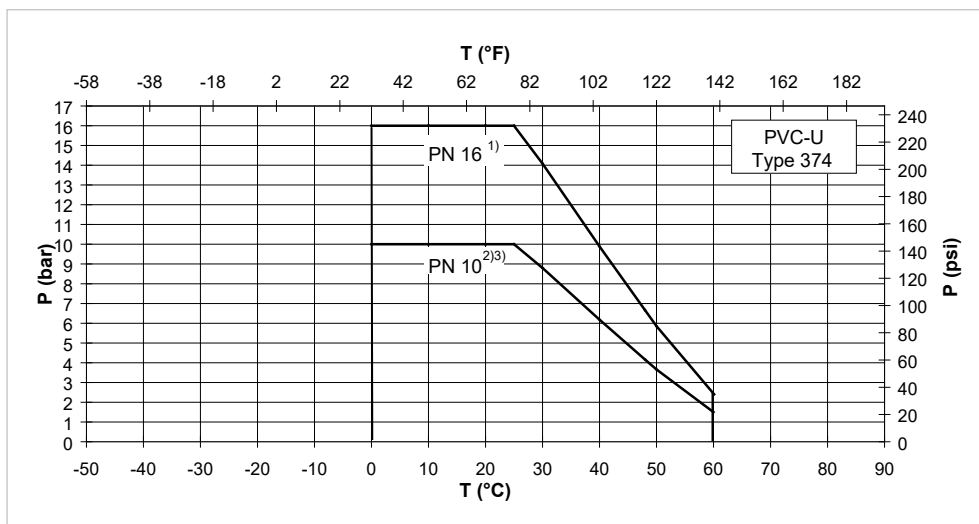
X Opening angle (%)
Y Kv, Cv value (%)

Pressure-temperature diagrams

The following pressure-temperature diagrams are based on a service life of 25 years and water or similar media.

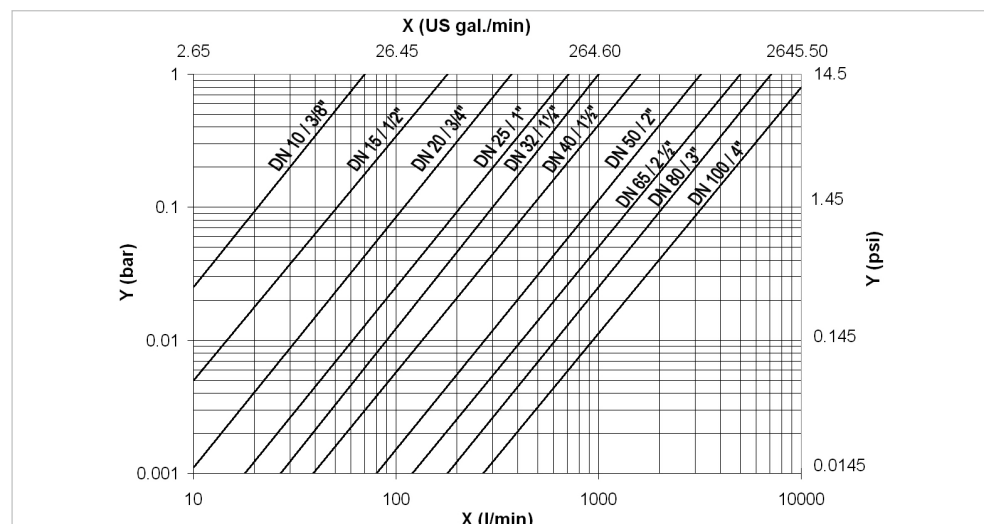
T Temperature (°C, °F)

P Permissible pressure (bar, psi)



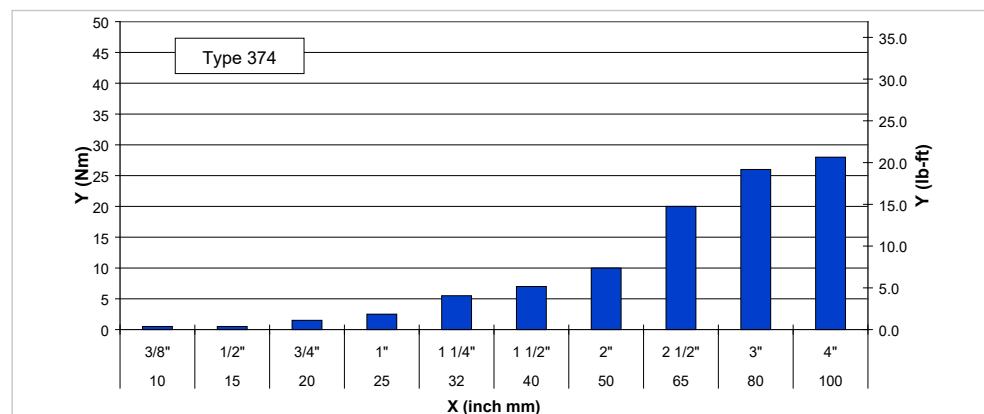
- 1) For the nominal diameters DN10-DN50 the central part of the ball valve is designed for the nominal pressure PN16
- 2) For nominal diameters DN10-DN50, the nominal pressure is reduced to PN10 depending on the connection
- 3) For the nominal diameters DN65-DN100 the central part of the ball valve is designed for nominal pressure PN10

Pressure losses



- X Flow rate
(l/min, US gal./min)
- Y Pressure loss Δp (bar, psi)

Operating torque

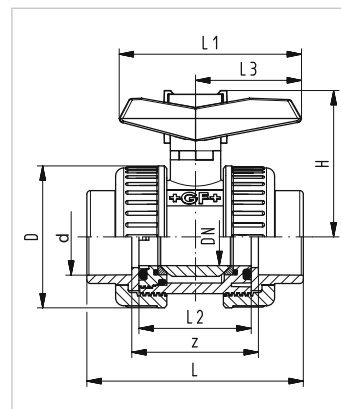


- X Nominal diameter DN (mm, inch)
- Y Tightening torque (Nm, lb-ft)

1.7.4 Dimensions

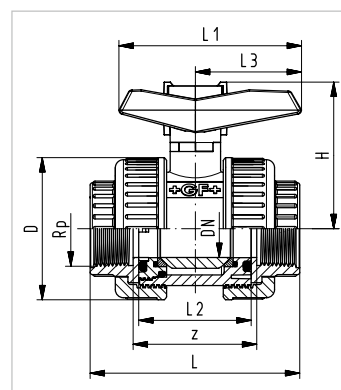
With solvent cement sockets, metric

d (mm)	DN (mm)	D (mm)	H (mm)	L (mm)	L1 (mm)	L2 (mm)	L3 (mm)	z (mm)
16	10	50	55	76	67	42	40	48
20	15	50	55	80	67	42	40	48
25	20	59	61	91	77	48	45	53
32	25	68	69	102	87	54	51	58
40	32	80	81	120	102	62	59	68
50	40	94	91	140	119	72	70	78
63	50	115	113	169	146	86	84	93
75	65	145	129	206	179	110	103	118
90	80	168	146	242	209	128	120	140
110	100	210	179	282	250	150	141	160



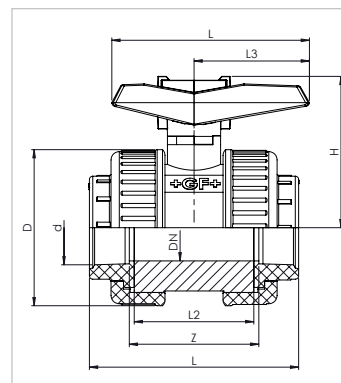
With threaded sockets, Rp

Rp (inch)	DN (mm)	D (mm)	H (mm)	L (mm)	L1 (mm)	L2 (mm)	L3 (mm)	z (mm)
3/8	15	50	55	76	67	42	40	48
1/2	15	50	55	80	67	42	40	48
3/4	20	59	61	91	77	48	45	53
1	25	68	69	102	87	54	51	58
1 1/4	32	80	81	116	102	62	59	68
1 1/2	40	94	91	126	119	72	70	78
2	50	115	113	149	146	86	84	93
2 1/2	65	145	129	184	179	110	103	118
3	80	168	146	212	209	128	120	140
4	100	210	179	244	250	150	141	160



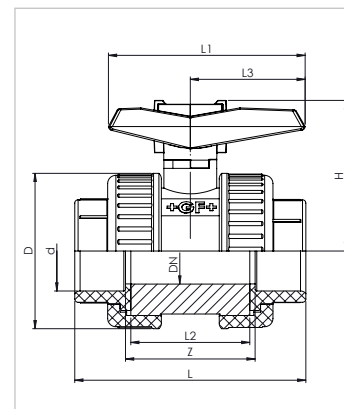
With threaded sockets, NPT

NPT (inch)	DN (mm)	D (mm)	H (mm)	L (mm)	L1 (mm)	L2 (mm)	L3 (mm)	z (mm)
1/2	15	50	55	88	67	42	40	48
3/4	20	59	61	91	77	48	45	53
1	25	68	69	102	87	54	51	58
1 1/4	32	80	81	116	102	62	59	68
1 1/2	40	94	91	126	119	72	70	78
2	50	115	113	149	146	86	84	93
2 1/2	65	145	129	184	179	110	103	118
3	80	168	146	212	209	128	120	140
4	100	210	179	244	250	150	141	160



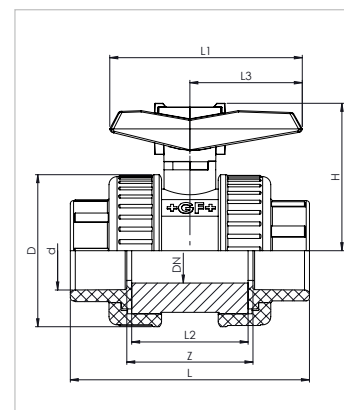
With solvent cement sockets, BS

d (inch)	DN (mm)	D (mm)	H (mm)	L (mm)	L1 (mm)	L2 (mm)	L3 (mm)	z (mm)
1/2	15	50	55	80	67	42	40	48
3/4	20	59	61	91	77	48	45	53
1	25	68	69	102	87	54	51	58
1 1/4	32	80	81	120	105	62	59	68
1 1/2	40	94	91	140	119	72	70	78
2	50	115	113	169	146	86	84	93
2 1/2	65	145	129	206	179	110	103	118
3	80	168	146	242	209	128	120	140
4	100	210	179	282	250	150	141	160



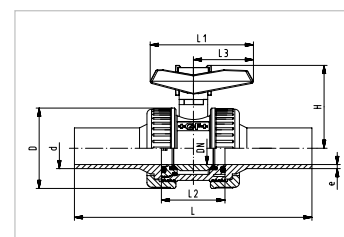
With solvent cement sockets, ASTM

d (inch)	DN (mm)	D (mm)	H (mm)	L (mm)	L1 (mm)	L2 (mm)	L3 (mm)	z (mm)
1/2	15	50	55	92	67	42	40	48
3/4	20	59	61	104	77	48	45	53
1	25	68	69	116	87	54	51	58
1 1/4	32	80	81	130	102	62	59	68
1 1/2	40	94	91	140	119	72	70	78
2	50	115	113	169	146	86	84	93
2 1/2	65	145	129	206	179	110	103	118
3	80	168	146	242	209	128	120	140
4	100	210	179	282	250	150	141	160



With butt fusion spigot, long

d (mm)	DN (mm)	D (mm)	H (mm)	L (mm)	L1 (mm)	L2 (mm)	L3 (mm)	e (mm)
20	15	95	55	175	67	42	40	1.8
25	20	105	61	195	77	48	45	2.3
32	25	115	69	247	87	54	51	2.9
40	32	140	81	233	102	62	59	3.6
50	40	150	91	265	119	72	70	4.5
63	50	165	113	278	146	86	84	5.7
75	65	185	129	348	179	110	103	6.8
90	80	200	146	350	209	128	120	8.2
110	100	220	179	412	250	150	141	10



1.8 Ball Valve Type 375



Ball Valve Type 375

1.8.1 Product description

The Ball Valve Type 375 is an affordable manual ball valve that was developed specially for use in water applications or with non-critical chemicals. Its construction ensures simple maintenance and hence a long service life. Its compact construction makes possible simple installation into and removal from the piping system.

Function

The ball valve uses a rotating ball with a hole through it that allows straight-through flow in the open position and shuts off flow when the ball is rotated 90° to block the flow passage. This valve is used primarily for open/close functions and also for throttling services.

Applications

- Water treatment
- Non-critical chemicals

Benefits/features

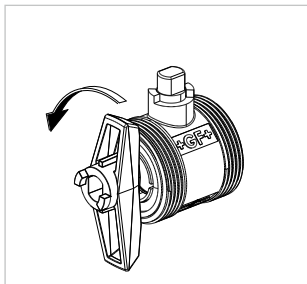
- Manual valve for water applications and non-critical media
- Ergonomic hand lever with integrated tool for removing/adjusting the union bushing
- Simple maintenance and long service life
- Simple installation and removal due to compact construction
- PTFE ball seat
- Double o-ring on the stem
- Very compact "Z" dimension
- Wide range from 16mm to 110mm and from ½" to 4"

Flow media

Non-solid, neutral and non-aggressive media. The chemical resistance depends on the selected valve material ([see online tool ChemRes PLUS](#)).

1.8.2 Technical basics

- With the backing seals, the ball has a floating position. This results in preloading and hence a constant seal. Stem, backing, housing and connection seals are made of EPDM or FKM.
- The design of the hand lever serves as a tool for a micro adjustment of the ball support.



i All ball valves in DN10 – 100 are available as radially removable valves with two threaded connections according to EN ISO 16135.

Valve handling

Installation notes

When installing the ball valve, ensure that it is always installed into the system in an opened ball position.

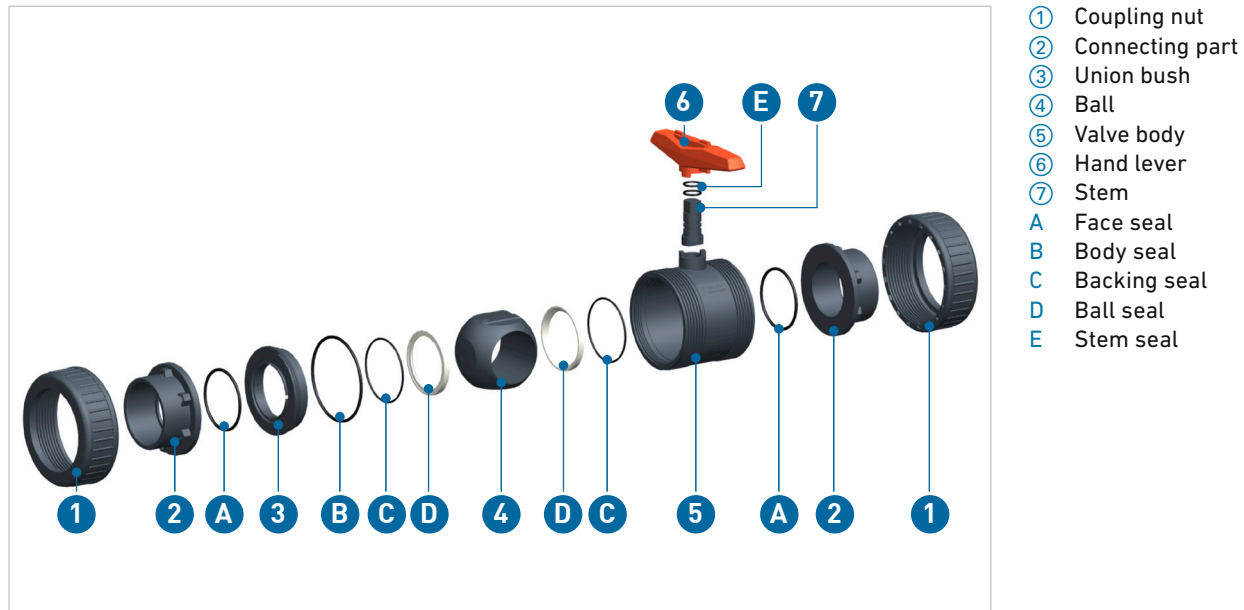
Maintenance notes

Ball valves require no maintenance under normal operating conditions (clear water). However, the following measures must be considered:

- Regularly check that no medium escapes to the outside.
- We recommend a function test for ball Type valves that are kept permanently in the same position 1 – 2 times per year to check functionality.

⚠ Installation and maintenance must be performed according to the corresponding installation instructions. The installation manual is included with the product, see also the online product catalogue at www.gfps.com

1.8.3 Technical data



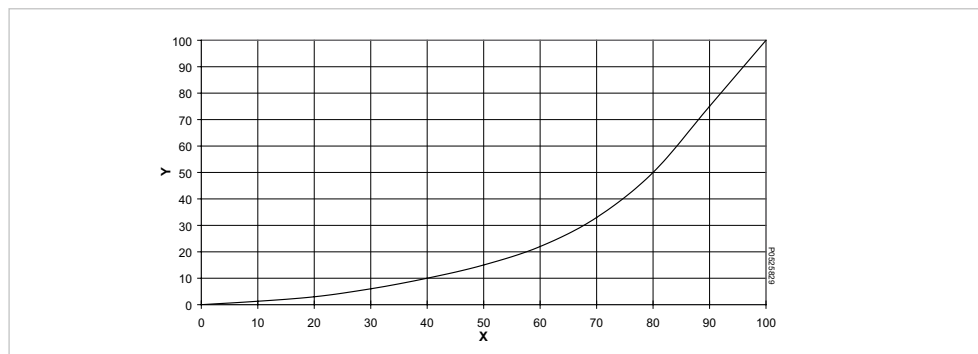
Specification		
Dimensions	d16/DN10 – d110/DN100, 3/8" – 4"	
Materials	Valve body	PVC-U, PVC-C
	Lever	PVC-U
Gasket materials	O-rings	EPDM, FKM
	Ball seal	PTFE
Pressure levels	DN10 – 50	PN16
	DN65 – 100	PN10
Actuation variants	Manually operated	
Connections	Solvent cement sockets	ISO, BS, ASTM/ANSI
	Threaded sockets	NPT, Rp
	Butt fusion spigots, long	PE100 SDR11 ISO
Approvals	ACS, NSF 61, WRAS	

Kv 100 values

DN (mm)	inch (inch)	d (mm)	Kv 100 (l/min)	Cv 100 (US Gal./min)	Kv 100 (m³/h)
10	3/8	16	70	4.9	4
15	1/2	20	185	12.9	11
20	3/4	25	350	24.5	21
25	1	32	700	49.0	42
32	1 1/4	40	1000	70.0	60
40	1 1/2	50	1600	112.0	96
50	2	63	3100	217.1	186
65	2 1/2	75	5000	350.0	300
80	3	90	7000	490.0	420
100	4	110	11000	770.0	660

The kv values for each intermediate valve position can be determined by using the flow value characteristics and the kv 100 values.

Flow characteristics



X Opening angle (%)
Y Kv, Cv value (%)

Pressure-temperature diagrams

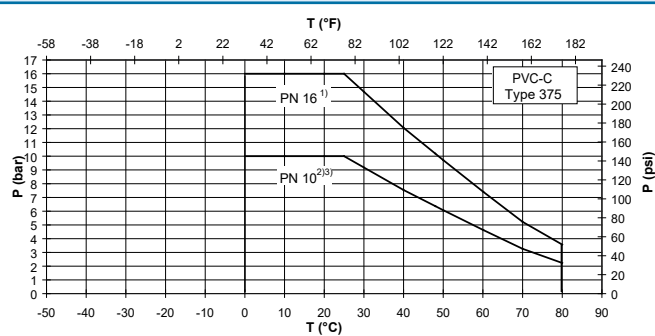
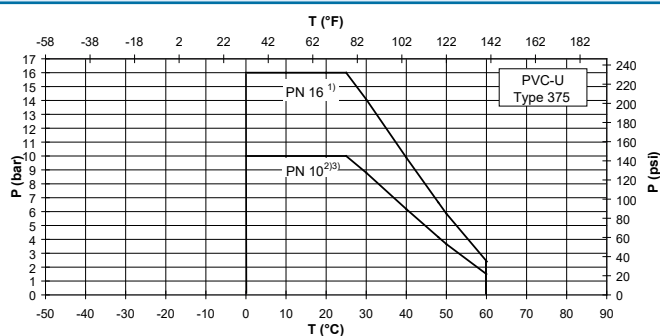
The following pressure-temperature diagrams are based on a service life of 25 years and water or similar media.

T Temperature (°C, °F)

P Permissible pressure (bar, psi)

PVC-U

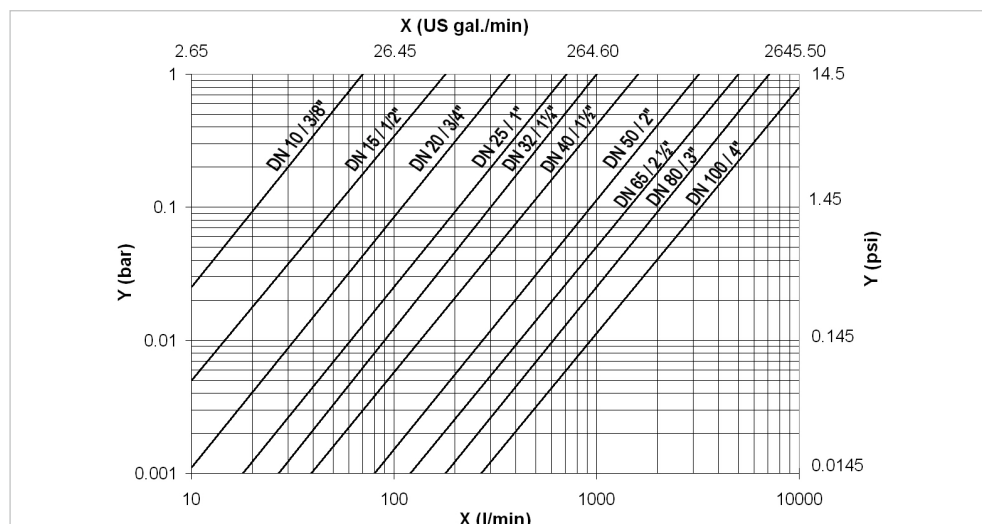
PVC-C



- 1) For the nominal diameters DN10 - DN50 the central part of the ball valve is designed for the nominal pressure PN16
- 2) For nominal diameters DN10 - DN50, the nominal pressure is reduced to PN10 depending on the connection

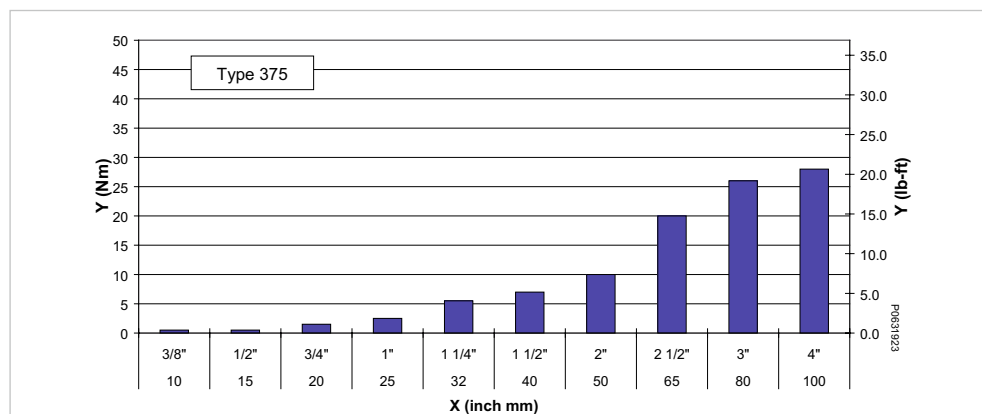
- 3) For the nominal diameters DN65 - DN100 the central part of the ball valve is designed for nominal pressure PN10

Pressure losses



- X Flow rate
(l/min, US gal/min)
Y Pressure loss Δp (bar, psi)

Operating torque

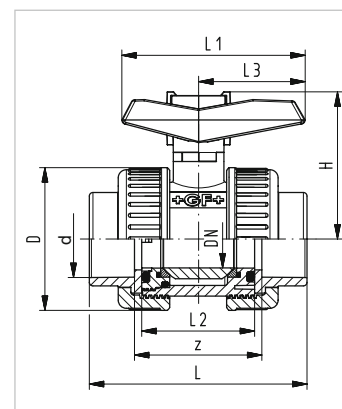


- X Nominal diameter DN (mm, inch)
Y Tightening torque (Nm, lb-ft)

1.8.4 Dimensions

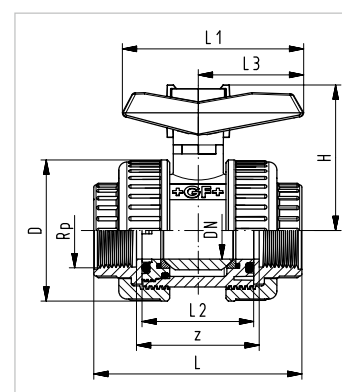
With solvent cement sockets, metric

d (mm)	DN (mm)	D (mm)	H (mm)	L (mm)	L1 (mm)	L2 (mm)	L3 (mm)	z (mm)
16	10	50	55	76	67	42	40	48
20	15	50	55	80	67	42	40	48
25	20	59	61	91	77	48	45	53
32	25	68	69	102	87	54	51	58
40	32	80	81	120	102	62	59	68
50	40	94	91	140	119	72	70	78
63	50	115	113	169	146	86	84	93
75	65	145	129	206	179	110	103	118
90	80	168	146	242	209	128	120	140
110	100	210	179	282	250	150	141	160



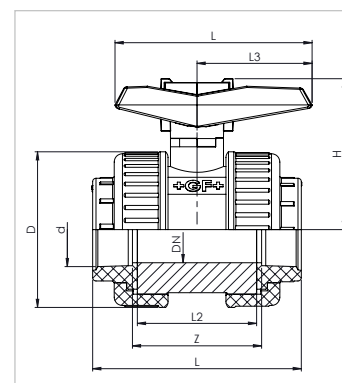
With threaded sockets, Rp

Rp (inch)	DN (mm)	D (mm)	H (mm)	L (mm)	L1 (mm)	L2 (mm)	L3 (mm)	z (mm)
3/8	15	50	55	76	67	42	40	48
1/2	15	50	55	80	67	42	40	48
3/4	20	59	61	91	77	48	45	53
1	25	68	69	102	87	54	51	58
1 1/4	32	80	81	116	102	62	59	68
1 1/2	40	94	91	126	119	72	70	78
2	50	115	113	149	146	86	84	93
2 1/2	65	145	129	184	179	110	103	118
3	80	168	146	212	209	128	120	140
4	100	210	179	244	250	150	141	160



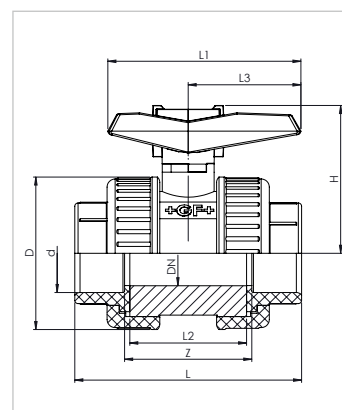
With threaded sockets, NPT

NPT (inch)	DN (mm)	D (mm)	H (mm)	L (mm)	L1 (mm)	L2 (mm)	L3 (mm)	z (mm)
1/2	15	50	55	88	67	42	40	48
3/4	20	59	61	91	77	48	45	53
1	25	68	69	102	87	54	51	58
1 1/4	32	80	81	116	105	62	59	68
1 1/2	40	94	91	126	119	72	70	78
2	50	115	113	149	146	86	84	93
2 1/2	65	145	129	184	179	110	103	118
3	80	168	146	212	209	128	120	140
4	100	210	179	244	250	150	141	160



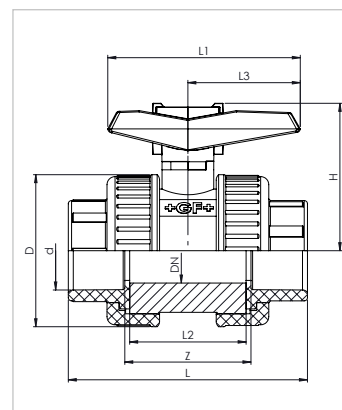
With solvent cement sockets, BS

d (inch)	DN (mm)	D (mm)	H (mm)	L (mm)	L1 (mm)	L2 (mm)	L3 (mm)	z (mm)
1/2	15	50	55	80	67	42	40	48
3/4	20	59	61	91	77	48	45	53
1	25	68	69	102	87	54	51	58
1 1/4	32	80	81	120	105	62	59	68
1 1/2	40	94	91	140	119	72	70	78
2	50	115	113	169	146	86	84	93
2 1/2	65	145	129	206	179	110	103	118
3	80	168	146	242	209	128	120	140
4	100	210	179	282	250	150	141	160



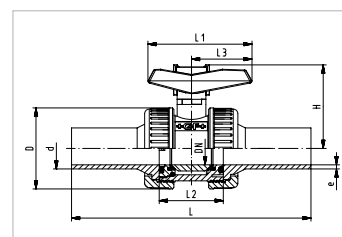
With solvent cement sockets, ASTM

d (inch)	DN (mm)	D (mm)	H (mm)	L (mm)	L1 (mm)	L2 (mm)	L3 (mm)	z (mm)
1/2	15	50	55	92	67	42	40	48
3/4	20	59	61	104	77	48	45	53
1	25	68	69	116	87	54	51	58
1 1/4	32	80	81	130	102	62	59	68
1 1/2	40	94	91	140	119	72	70	78
2	50	115	113	169	146	86	84	93
2 1/2	65	145	129	206	179	110	103	118
3	80	168	146	242	209	128	120	140
4	100	210	179	282	250	150	141	160

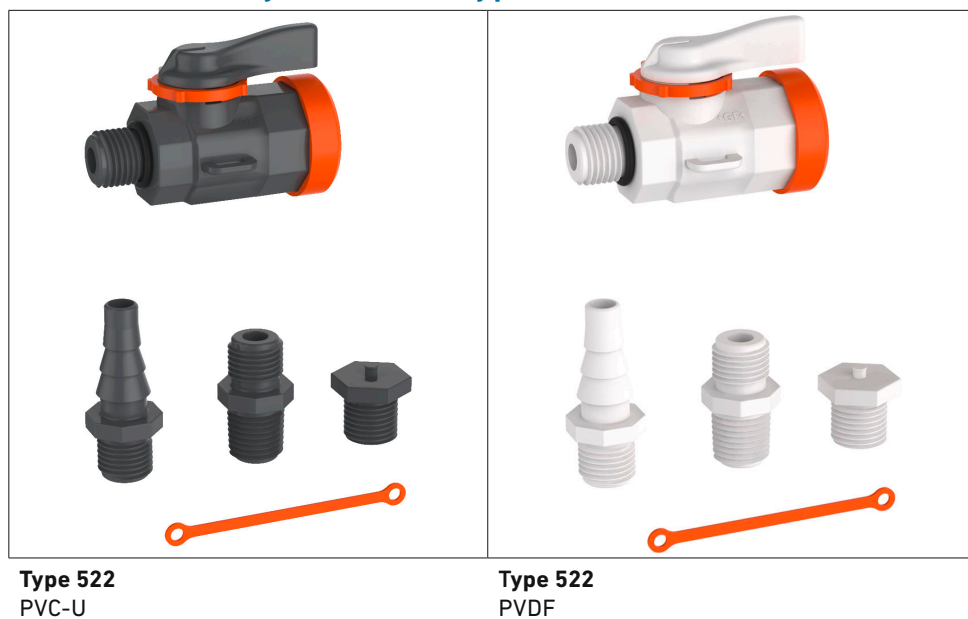


With butt fusion spigot, long

d (mm)	DN (mm)	D (mm)	H (mm)	L (mm)	L1 (mm)	L2 (mm)	L3 (mm)	e (mm)
20	15	95	55	175	67	42	40	1.8
25	20	105	61	195	77	48	45	2.3
32	25	115	69	247	87	54	51	2.9
40	32	140	81	233	102	62	59	3.6
50	40	150	91	265	119	72	70	4.5
63	50	165	113	278	146	86	84	5.7
75	65	185	129	348	179	110	103	6.8
90	80	200	146	350	209	128	120	8.2
110	100	220	179	412	250	150	141	10



1.9 Laboratory Ball Valve Type 522



1.9.1 Product description

The laboratory ball valve type 522 is the ideal valve for use in laboratory applications. It is available in diameter DN6 in the materials PVC-U and PVDF, as well as with BSP or NPT thread. The various connection options and other accessories are supplied as standard.

Function

The ball valve uses a rotating ball with a hole through it that allows straight-through flow in the open position and shuts off flow when the ball is rotated 90° to block the flow passage. This valve is mainly used for open/close functions and for regulating services.

Applications

- Laboratory applications
- Dosing
- Sample taking

Benefits/features

- ideal for laboratory applications
- Lock and metering ring for protection of sampling ball valve from any unwarranted opening
- Lock and metering ring for adjustment of ball opening angles
- Sampling ball valve can be 100% opened at any time by removing the lock and metering ring
- Compact design
- Low weight
- Corrosion resistant
- PVDF Sampling ball valve is Oil & Silicone-free

Flow media

Neutral and aggressive media with a small amount of particles/solids. The chemical resistance is independent of the selected valve material ([see online tool ChemRes PLUS](#)).

1.9.2 Valve handling

Installation notes

When installing the ball valve, ensure that it is always installed into the system in an opened ball position.

Maintenance notes

Ball valves require no maintenance under normal operating conditions (clear water). However, the following measures must be considered:

- Regularly check that no medium escapes to the outside.
- We recommend a function test for ball Type valves that are kept permanently in the same position 1 – 2 times per year to check functionality.

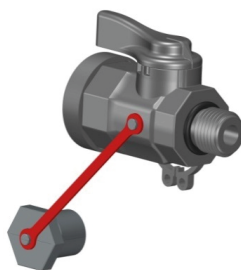


Installation and maintenance must be performed according to the corresponding installation instructions. The installation manual is included with the product, see also the online product catalogue at www.gfps.com

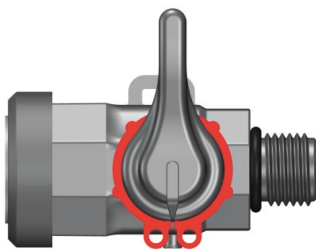
Additional features



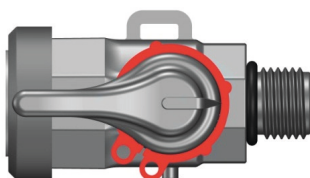
When not in use, lock and metering ring can be hung on sampling ball valve body.



When not in use, plug can be fixed with the clip tie on the sampling ball valve body.



In closed position, the lock and metering ring protects the valve against unwarranted opening.

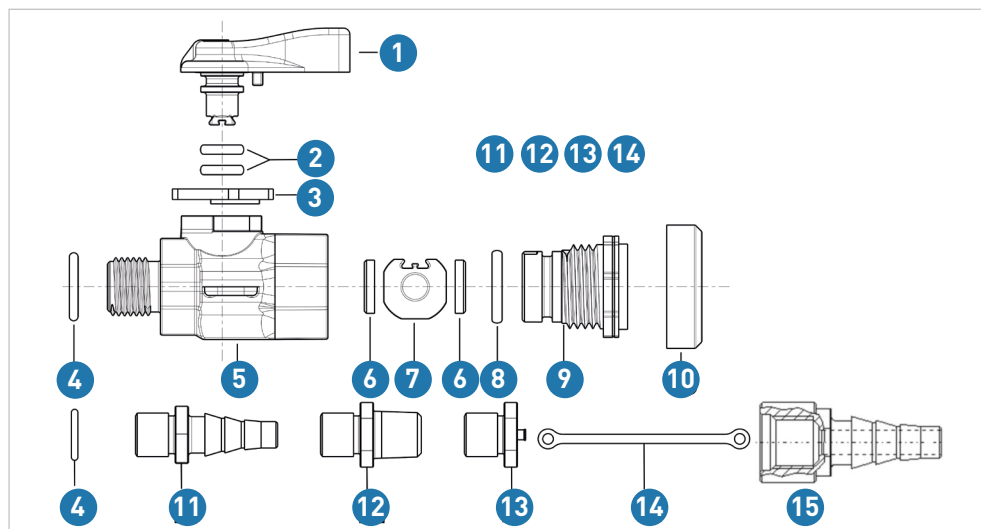


In open position, the locking ring protects the valve against unwarranted closing.



The three metering marks serves as guidance for flow regulation.

1.9.3 Technical data

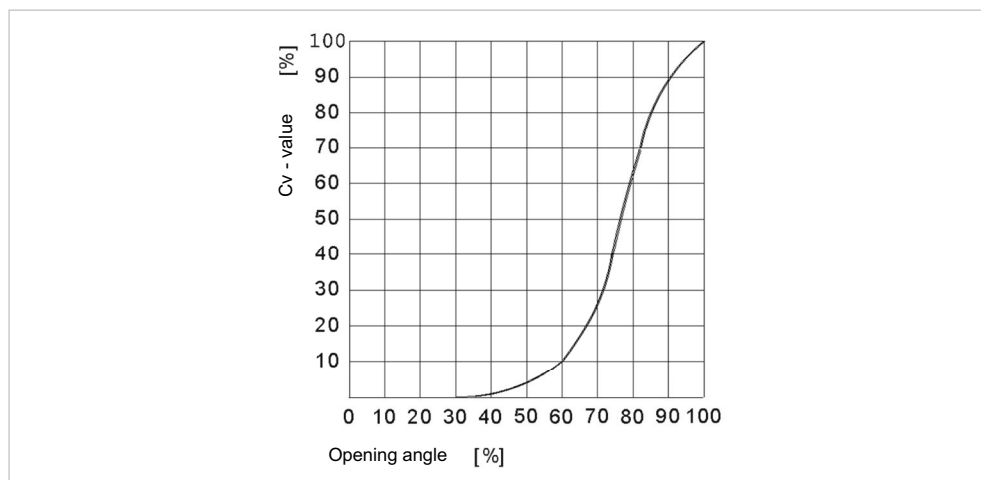


- ① Handle
- ② O rings
- ③ Blocking and dosage ring
- ④ O rings
- ⑤ Housing
- ⑥ Ball seat ring
- ⑦ Ball
- ⑧ O rings
- ⑨ Pressure ring
- ⑩ Safety clip
- ⑪ Hose connector AG
- ⑫ Double nipple
- ⑬ Blanking plug
- ⑭ Fastening clip
- ⑮ Hose connector IG

Specifications

Dimensions	d10/DN6	
Materials	Valve body and lever	PVC-U, PVDF
Gasket materials	O rings	EPDM, FPM
	Ball seating joint	PTFE
Pressure level	PN10	
Connections PVC-U	Body	BSP, NPT
	Hose nozzle	BSP, NPT
	Double nipple	BSP - NPT, NPT - NPT
	Plug	BSP
Connections PVDF	Gehäuse	BSP, NPT
	Hose nozzle - male thread	BSP
	Double nipple	BSP, NPT
	Plug	BSP
Approvals	PVC-U	NSF, FDA, WRAS, ACS, KTW, KIWA
	PVDF	NSF, FDA

Flow characteristics



- X Opening angle (%)
- Y kv, Cv value (%)

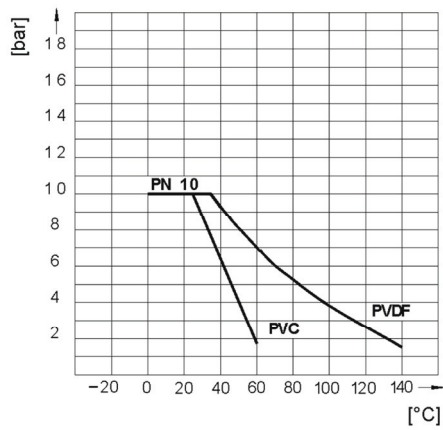
Pressure-temperature diagrams

The following pressure-temperature diagrams are based on a service life of 25 years and water or similar media.

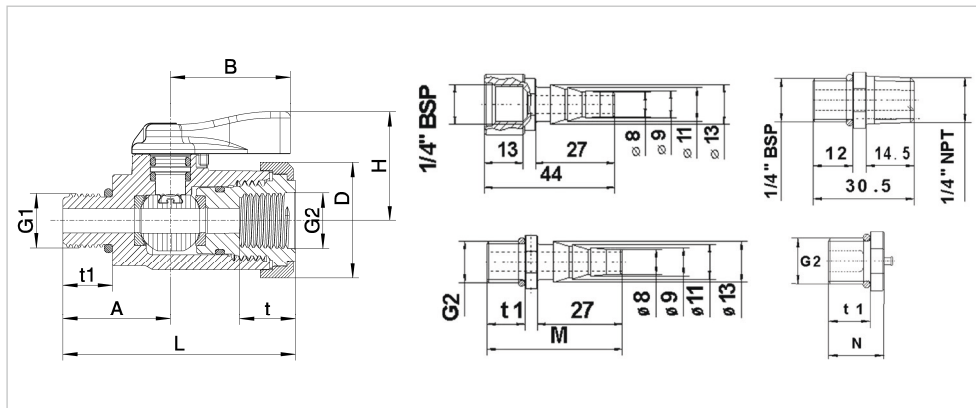
T Temperature (°C, °F)

P Permissible pressure (bar, psi)

PVC-U, PVDF



Dimensions



	G1	G2	A	B	D	H	L	M	N	t	t1	PN
PVC-U	1/4" BSP	1/4" BSP	26	29	28	26.5	56	43	16	13.5	12	10
	3/8" BSP	1/4" BSP	26	29	28	26.5	56	43	16	13.5	12	10
	1/4" NPT	1/4" NPT	28.5	29	28	26.5	58.5	45.5	18.5	13.5	14.5	10
PVDF	1/4" BSP	1/4" BSP	26	28.2	28	26	56	43	16	13.2	12	10
	1/4" NPT	1/4" NPT	28.5	28.2	28	26	58.5	45.5	18.5	13.2	14.5	10



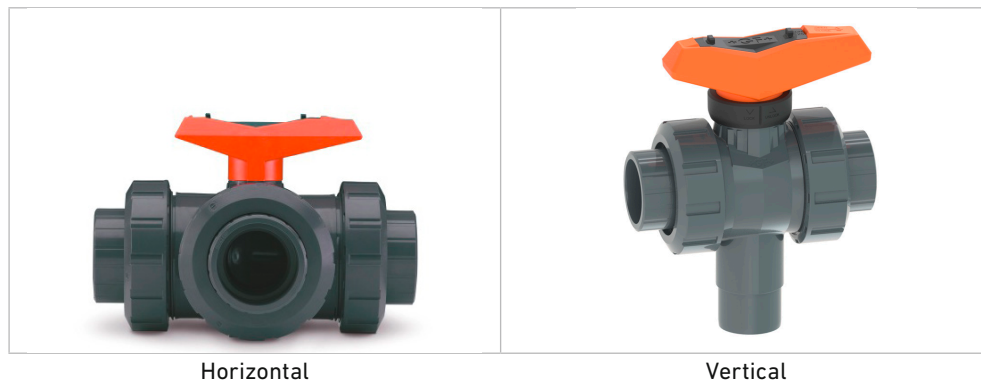
For further information on accessories, refer to the online product catalogue at www.gfps.com

Mobile apps and online tools to support configuration and calculation at www.gfps.com/tools



2 3-way Ball Valves

2.1 3-way Ball Valve Type 543, manually operated



2.1.1 Product description

Ball Valve Type 543 is the perfect valve for all mixing and diverting processes. The availability in horizontal design with L or T-ball and vertical design with L or tripod ball makes many application options possible. Diverting, mixing, distributing or even shutting off a medium are only a few possibilities.

Applications

- Chemical process industry
- Seawater desalinization systems
- Life science industry
- Microelectronics
- Measurement and control
- Water treatment
- Diverting function in shipbuilding

Benefits/features

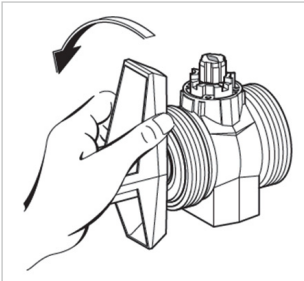
- Ideal diverting and mixing fitting
- Ball with L-port / T-port
- Dimension range DN10 – DN50
- Lever material made of fiberglass-reinforced polypropylene (PP-GF)
- 90° end stop standard, 180° end stop on request
- Tool integrated into lever
- Very good flow properties
- Long service life
- Automation with electrical or pneumatic actuator possible

Flow media

Neutral and aggressive media with a small amount of particles/solids. The chemical resistance depends on the selected valve material ([see online tool ChemRes PLUS](#)).

2.1.2 Technical basics

- With the backing seals, the ball has a floating position. This results in preloading and hence a constant seal. Stem, backing, housing and connection seals are made of EPDM or FKM.
- The stems with rated break point above the upper O-ring help prevent leaks to the outside in case of damage.
- The design of the hand lever serves as a tool for installing the screw-in fitting. Screw-in fittings have a reverse thread in order to avoid unintentional opening when removing the coupling nuts or the thread connections.



i All ball valves in DN10 – 50 are available as radially removable fittings with two threaded connections according to EN ISO 16135.

Valve handling

Installation notes

When installing the ball valve, ensure that it is always installed into the system in an opened ball position.

Selection of lubricant

All seals should be lubricated with a silicone-based grease. Using the wrong lubricants can damage the material of the ball valve or seals.

- Mineral oil-based and Vaseline (petrolatum) are not appropriate.
- For silicone-free ball valves, please consult the special manufacturer's instructions.

Maintenance notes

Ball valves require no maintenance under normal operating conditions (clear water). However, the following measures must be considered:

- Regularly check that no medium escapes to the outside.
- We recommend a function test for ball Type valves which are kept permanently in the same position 1 – 2 times per year to check functionality.

! Installation and maintenance must be performed according to the corresponding installation instructions. The installation manual is included with the product, see also the online product catalogue at www.gfps.com

Versions

The Ball Valve Type 543 is available as a horizontal and vertical version. The horizontal valve can be ordered with L- or T-port ball. The vertical fitting comes in the L-port configuration or with an optional tripod ball.

Type 543, horizontal

The decision whether to use a 3-way ball valve with L-port or T-port depends on the desired functions the valve has to perform:

<p>L-port: diverting, shutting off (two inputs closed)</p>	<p>T-port: diverting function, mixing function, throughput</p>

L-port

<p>A-C open</p>	<p>A-B-C open</p>	<p>B-C open</p>	<p>A-B open</p>	<p>Closed</p>
<p>Diverting function in the base position</p>	<p>Mixing function with decreased flow</p>	<p>Diverting function</p>	<p>Outlet closed, passage open with decreased flow</p>	<p>Shutting off function</p>

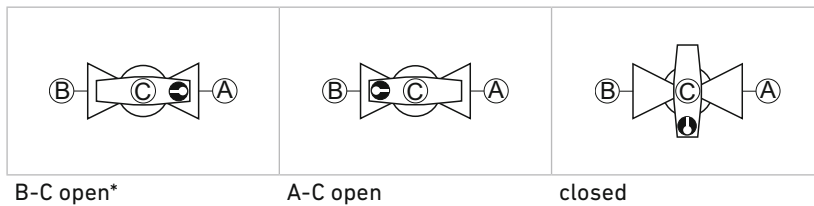
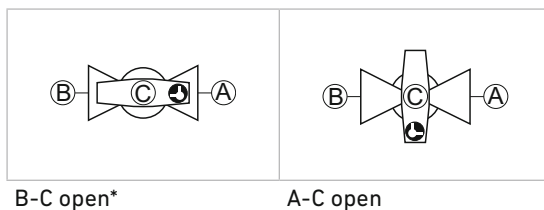
T-port

<p>A-B-C open</p>	<p>B-C open</p>	<p>A-B open</p>	<p>A-C open</p>
<p>Diverting function in the base position</p>	<p>Diverting function</p>	<p>Outlet closed, passage opened</p>	<p>Diverting function</p>

Type 543, vertical

The decision whether to use a 3-way ball valve with L- or tripod-port depends on the desired functions the valve has to perform:

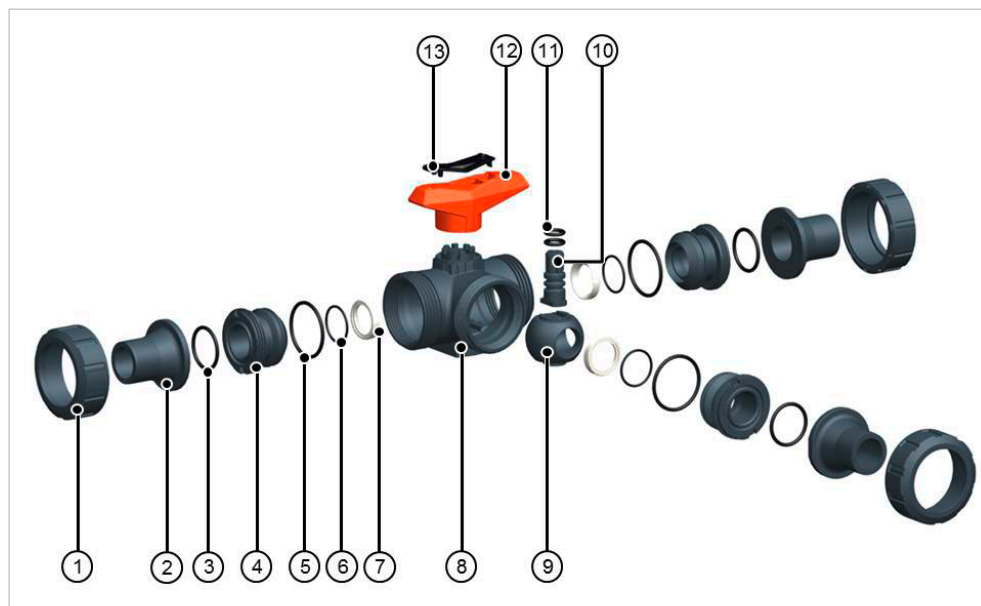
- L-port: diverting function, closing (two ports closed)
- Tripod port: diverting, change from B-C open to A-C open with 90° turn of the lever

**L-port****Tripod-port**

*Normal position

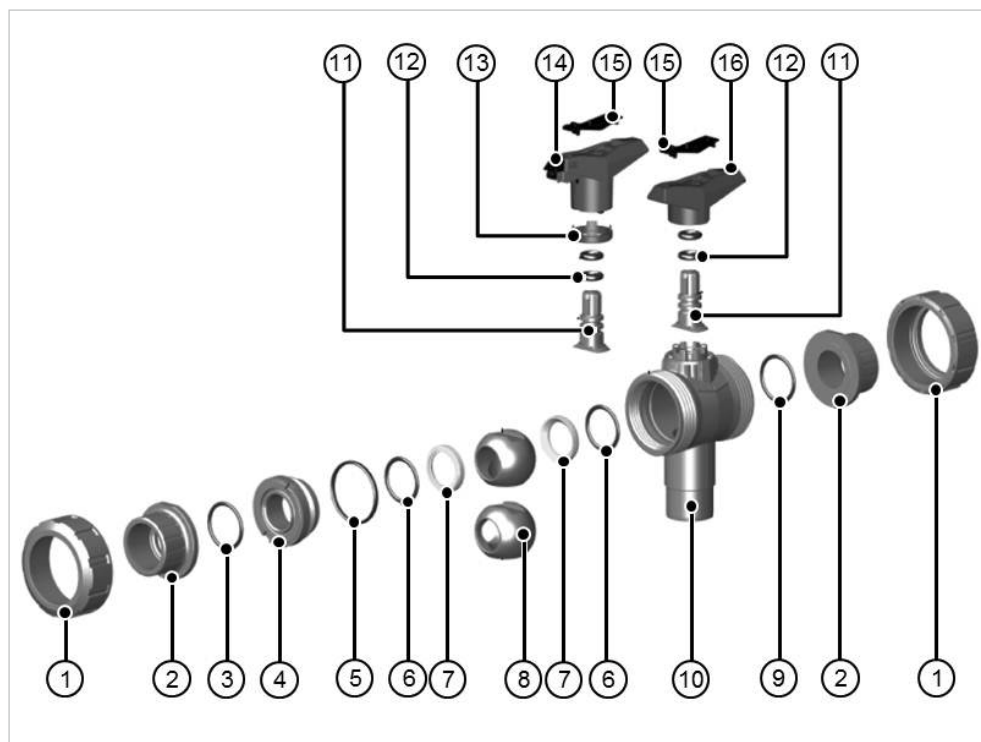
2.1.3 Technical data

Ball valve, horizontal



- ① Coupling nut
- ② Connecting part
- ③ Connection part gasket
- ④ Union bushing
- ⑤ Body seal
- ⑥ Backing seal
- ⑦ Ball seal
- ⑧ Housing
- ⑨ Ball L/T
- ⑩ Stem
- ⑪ Stem seal
- ⑫ Standard hand lever
- ⑬ Hand lever clip

Ball valve, vertical



- ① Coupling nut
- ② Connecting part
- ③ Connection part gasket
- ④ Union bushing
- ⑤ Body seal
- ⑥ Backing seal
- ⑦ Ball seal
- ⑧ Ball
- ⑨ Body seal
- ⑩ Housing
- ⑪ Stem
- ⑫ Stem seal
- ⑬ Spacer
- ⑭ Multifunctional hand lever
- ⑮ Hand lever clip
- ⑯ Standard hand lever

Specification

Dimensions	d16/DN10 – d63/DN50, 3/8" – 2"	
	Valve body, horizontal	PVC-U, PVC-C, ABS, PP-H, PVDF
Materials	Valve body, vertical	PVC-U, ABS
	Lever	PP-GF 30
Gasket materials	O-rings	EPDM, FKM, FFKM
	Ball seal	PTFE, PVDF
Pressure levels	PN10	
Actuation variants, horizontal	Manually operated	
	Pneumatically or electrically actuated	
	Ball with L/T port 180° end stop on request	
	Multifunctional handle optional	
Actuation variants, vertical	Manual; electric and pneumatic (only with tripod ball) actuation	
	Ball with L-Port and tripod port	
	Multifunctional handle optional	
	Fusion / solvent cement sockets	ISO, ASTM, JIS, BS
Connections	Fusion / solvent cement spigot	ISO
	Threaded socket	Rp, NPT, Rc
	PE100 electrofusion spigot or butt fusion spigot in SDR11	
Approvals	DVGW, ACS, ABS, NSF, WRAS, DIBt, TA Luft, RINA, BV, FDA, SEPRO, TSSA	

Pressure-temperature diagrams

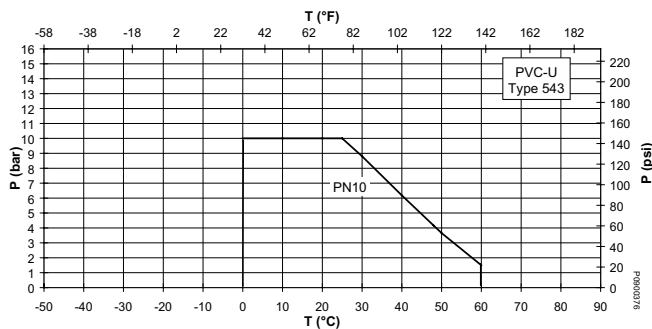
The pressure-temperature diagram is based on a service life of 25 years using water or similar media.

T Temperature (°C, °F)

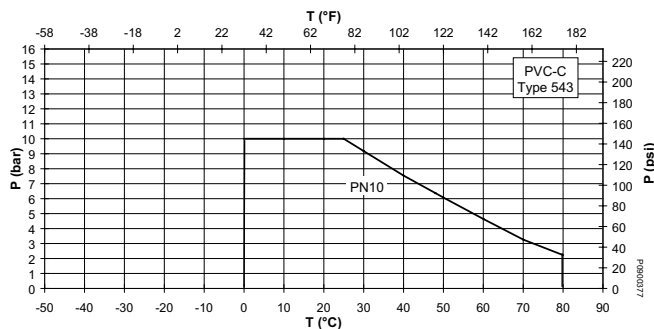
P Permissible pressure (bar, psi)

EPDM sealing to max. 100 °C

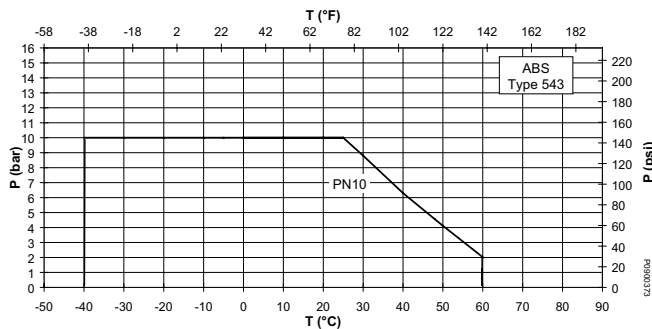
PVC-U



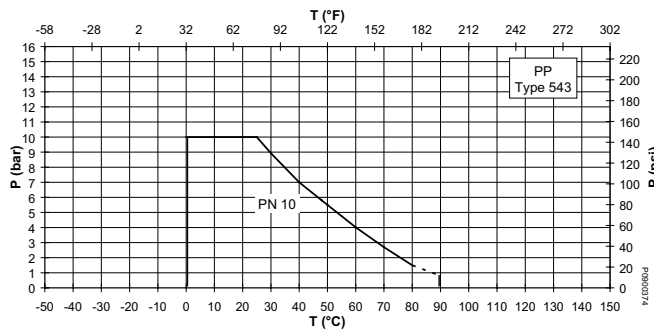
PVC-C



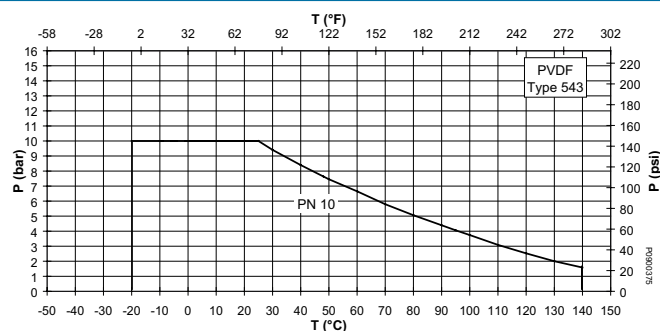
ABS



PP



PVDF



Pressure losses and flow characteristics

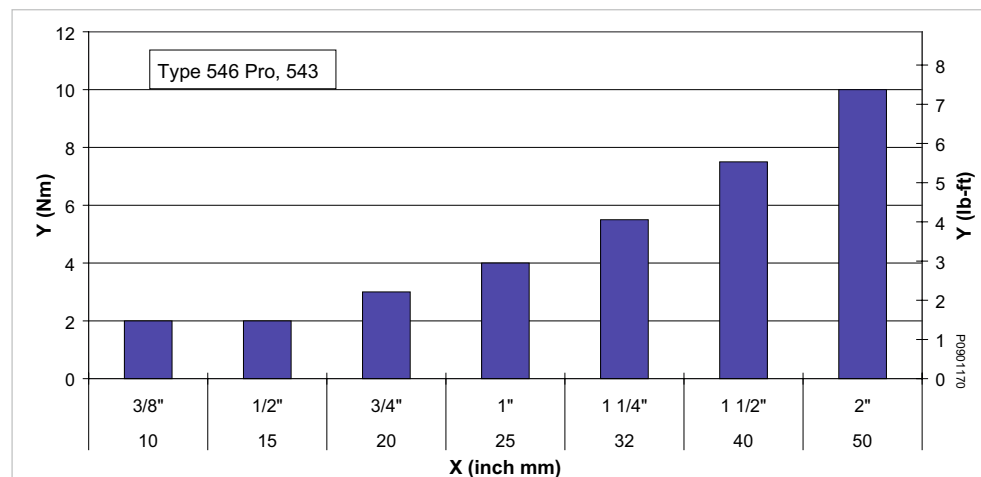
X Flow rate (l/min, US gal/min)

Y Pressure loss Δp (bar, psi)

a Opening angle (°)

kv kv, Cv value (%)

Operating torque



X Nominal diameter DN (mm, inch)

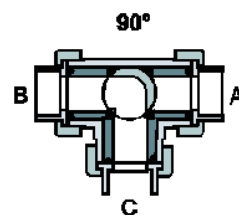
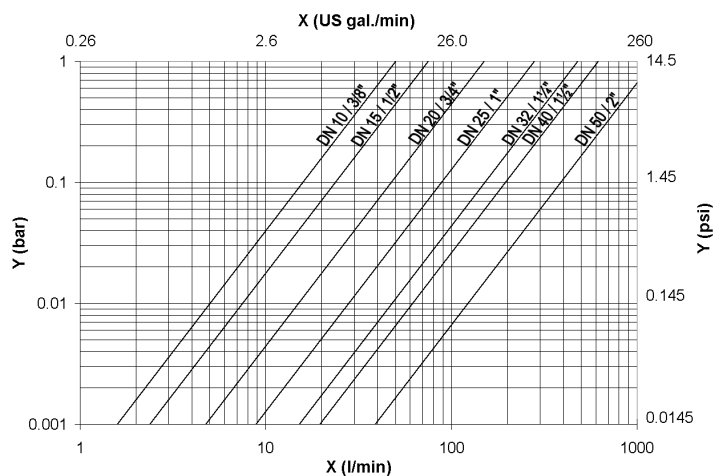
Y Tightening torque (Nm, lb-ft)

Average values at nominal pressure. Depending on the application (e.g. operating speed, fluid, temperature, etc.) about 2 times the operating torque should be taken for sizing actuators.

2.1.4 Characteristics – Ball Valve Type 543 horizontal: Ball with L-port

Flow direction C → B, B → C, A → C, C → A

Pressure loss



Medium: Water, 20 °C

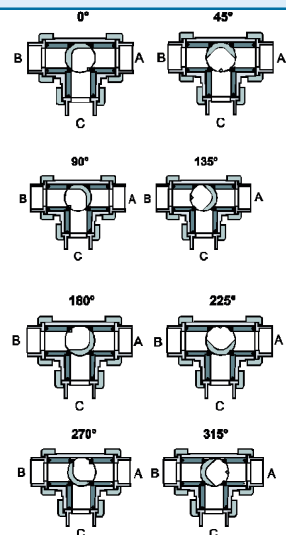
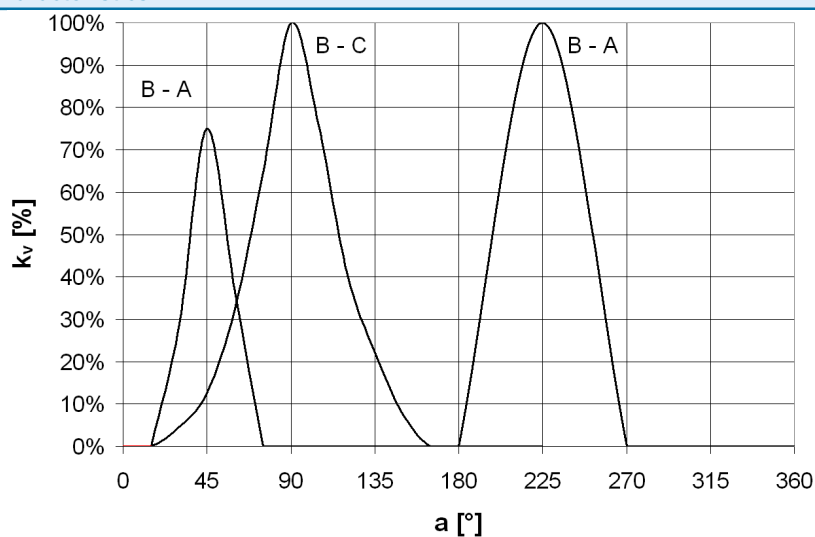
X Flow rate (l/min, US-gal/min)

Y Pressure loss Δp (bar, psi)

Kv 100 Values

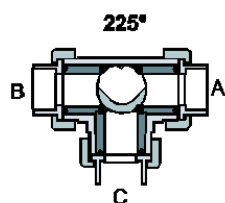
DN (mm)	Zoll (inch)	d (mm)	Kv 100 (l/min)	Cv 100 (gal/min)	Kv 100 (m³/h)
10	3/8	16	50	3.5	3
15	1/2	20	75	5.3	4.5
20	3/4	25	150	10.5	9
25	1	32	280	19.6	16.8
32	1 1/4	40	480	33.6	28.8
40	1 1/2	50	620	43.4	37
50	2	63	1230	86.1	74

Flow characteristics



Flow direction B → A

Ball position



Medium: Water, 20 °C

X Flow rate (l/min, US-gal/min)

Y Pressure loss Δp (bar, psi)

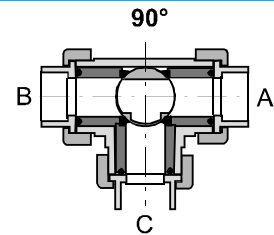
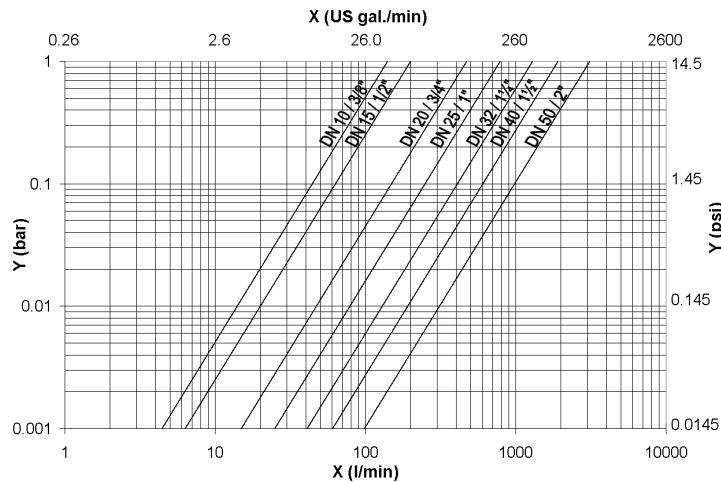
Kv 100 values

DN (mm)	Zoll (inch)	d (mm)	Kv 100 (l/min)	Cv 100 (gal/min)	Kv 100 (m ³ /h)
10	3/8	16	10	0.7	0.6
15	1/2	20	15	1.1	0.9
20	3/4	25	30	2.1	1.8
25	1	32	50	3.5	3
32	1 1/4	40	90	6.3	5.4
40	1 1/2	50	110	7.7	6.6
50	2	63	220	15.4	13.2

2.1.5 Characteristics – Ball Valve Type 543 horizontal: Ball with T-port

Flow direction B → A

Pressure loss

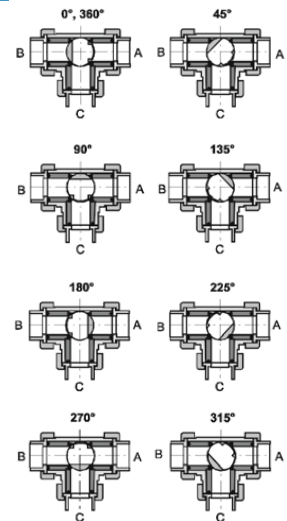
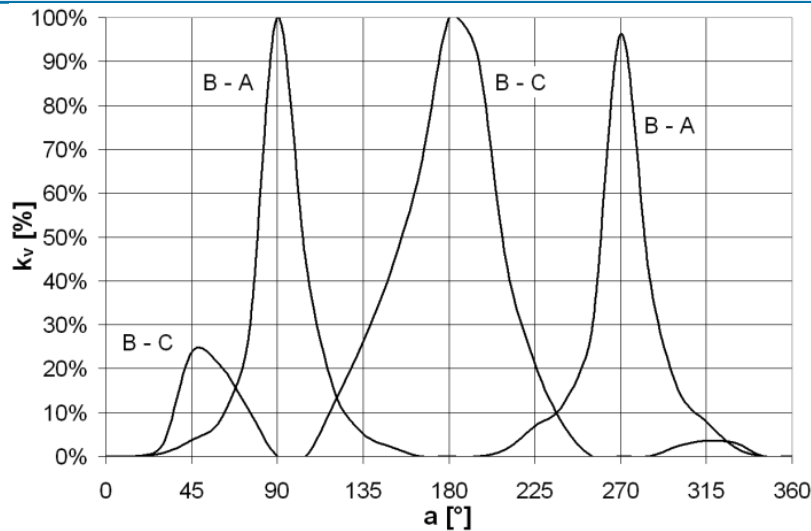


Medium: Water, 20 °C
X Flow rate (l/min, US-gal/min)
Y Pressure loss Δp (bar, psi)

Kv 100 values

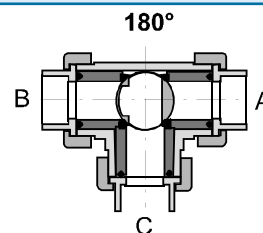
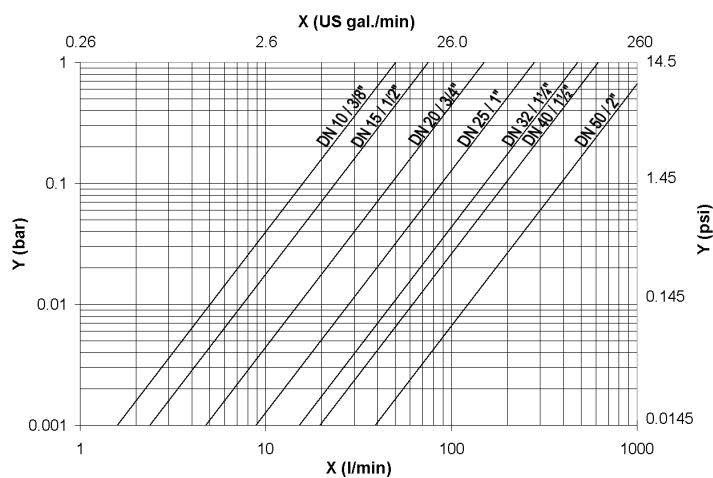
DN (mm)	Zoll (inch)	d (mm)	Kv 100 (l/min)	Cv 100 (gal/min)	Kv 100 (m ³ /h)
10	3/8	16	140	9.8	8.4
15	1/2	20	200	14	12.0
20	3/4	25	470	32.9	28.2
25	1	32	793	55.5	47.8
32	1 1/4	40	1290	90.3	77.4
40	1 1/2	50	1910	133.7	115
50	2	63	3100	217	186

Flow characteristics



Flow direction B → C

Pressure loss

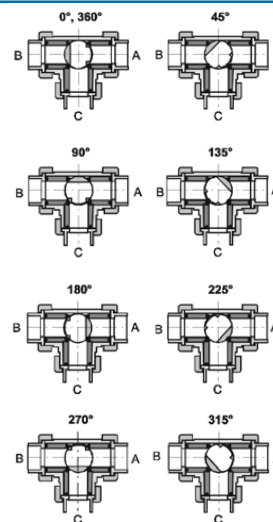
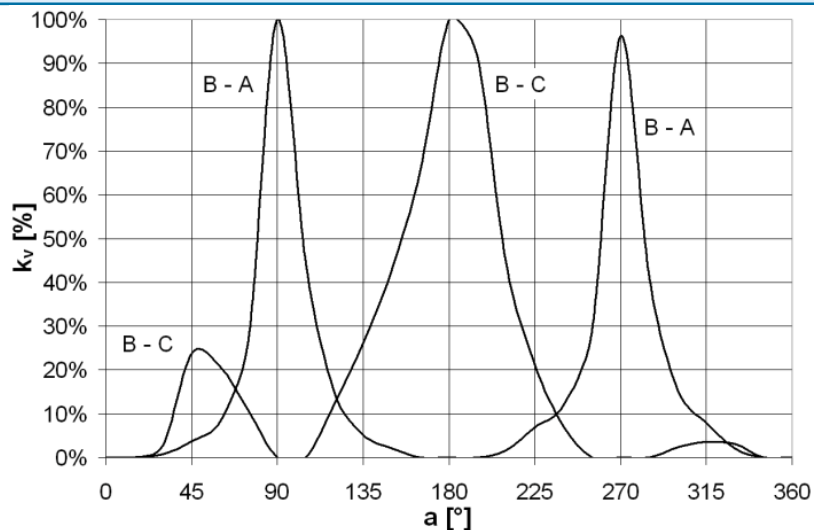


Medium: Water, 20 °C
X Flow rate (l/min, US-gal/min)
Y Pressure loss Δp (bar, psi)

Kv 100 values

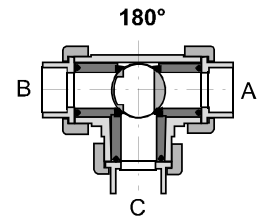
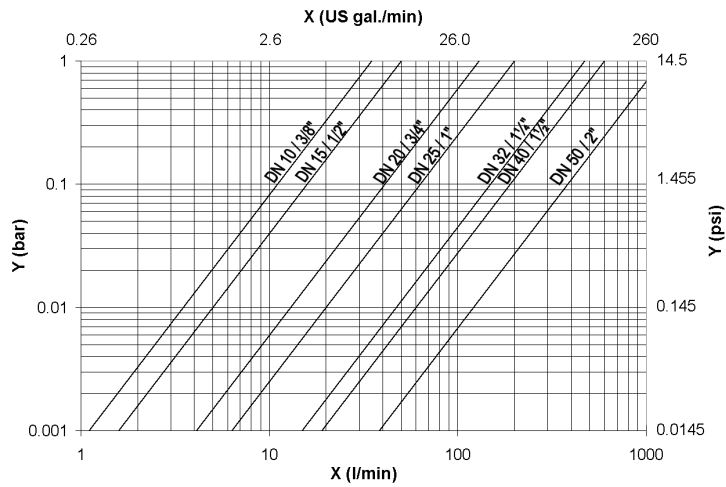
DN (mm)	Zoll (inch)	d (mm)	Kv 100 (l/min)	Cv 100 (gal/min)	Kv 100 (m³/h)
10	3/8	16	40	2.8	2.4
15	1/2	20	70	4.9	4.2
20	3/4	25	150	10.5	9
25	1	32	250	17.5	15
32	1 1/4	40	470	32.9	28
40	1 1/2	50	600	42	36
50	2	63	1210	84.7	73

Flow characteristics



Flow direction C → B, C → A

Pressure loss

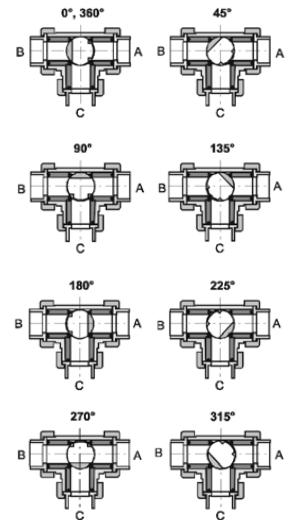
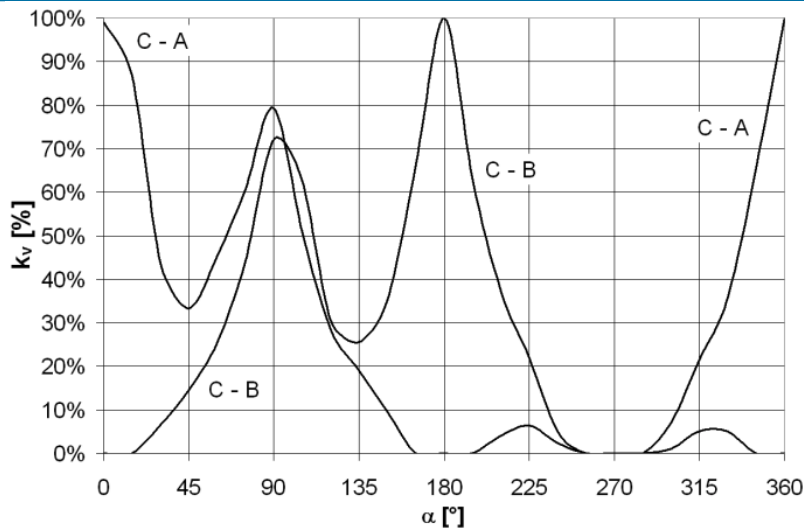


Medium: Water, 20 °C
 X Flow rate (l/min, US-gal/min)
 Y Pressure loss Δp (bar, psi)

Kv 100 values

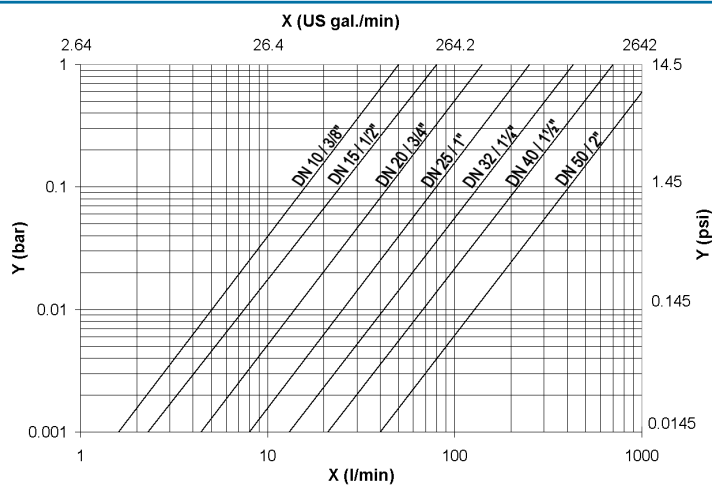
DN (mm)	Zoll (inch)	d (mm)	Kv 100 (l/min)	Cv 100 (gal/min)	Kv 100 (m³/h)
10	3/8	16	35	2.5	2.1
15	1/2	20	50	3.5	3
20	3/4	25	130	9.1	7.8
25	1	32	200	14	12
32	1 1/4	40	380	26.6	23
40	1 1/2	50	470	32.9	28
50	2	63	890	62.3	53

Flow characteristics



2.1.6 Characteristics – Ball Valve Type 543 vertikal: Ball with L-port

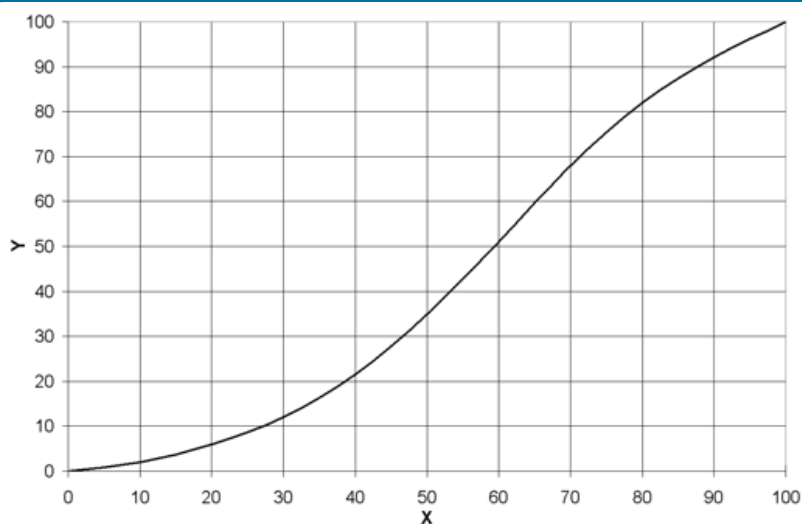
Pressure loss



Kv 100 values

DN (mm)	Zoll (inch)	d (mm)	Kv 100 (l/min)	Kv 100 (m ³ /h)
10	3/8	16	50	3
15	1/2	20	80	4.8
20	3/4	25	140	8.4
25	1	32	250	15
32	1 1/4	40	430	26
40	1 1/2	50	700	42
50	2	63	1300	78

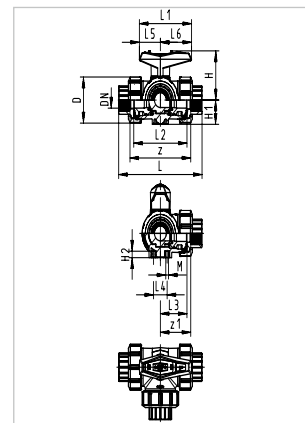
Flow characteristics



2.1.7 Dimensions – Ball Valve Type 543 horizontal: Ball with L-port

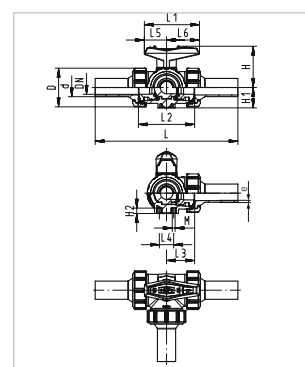
Solvent cement socket, metric

d (mm)	D (mm)	L (mm)	L1 (mm)	L2 (mm)	L3 (mm)	L4 (mm)	L5 (mm)	L6 (mm)	H (mm)	H1 (mm)	H2 (mm)	M (mm)	z (mm)	z1 (mm)	closest inch
16	50	109	77	73	36	25	32	45	57	28	8	6	81	40	3/8
20	50	112	77	73	36	25	32	45	57	28	8	6	81	40	1/2
25	58	131	97	86	43	25	39	58	67	32	8	6	94	47	3/4
32	68	151	97	99	50	25	39	58	73	36	8	6	107	54	1
40	84	181	128	120	60	45	54	74	90	45	9	8	130	65	1 1/4
50	97	205	128	137	69	45	54	74	97	51	9	8	143	72	1 1/2
63	124	261	152	179	89	45	66	87	116	65	9	8	185	92	2



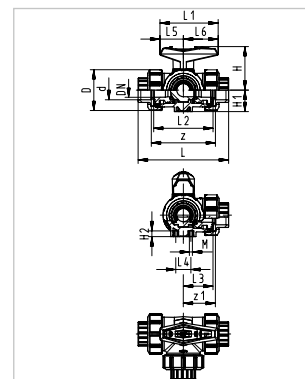
Threaded socket Rp

Rp Inch	D (mm)	L (mm)	L1 (mm)	L2 (mm)	L3 (mm)	L4 (mm)	L5 (mm)	L6 (mm)	H (mm)	H1 (mm)	H2 (mm)	M (mm)	z (mm)	z1 (mm)
3/8	50	113	77	73	36	25	32	45	57	28	8	6	87	43
1/2	50	117	77	73	36	25	32	45	57	28	8	6	85	42
3/4	58	135	97	86	43	25	39	58	67	32	8	6	100	50
1	68	155	97	99	50	25	39	58	73	36	8	6	113	57
1 1/4	84	179	128	120	60	45	54	74	90	45	9	8	134	67
1 1/2	97	201	128	137	69	45	54	74	97	51	9	8	155	78
2	124	255	152	179	89	45	66	87	116	65	9	8	199	99



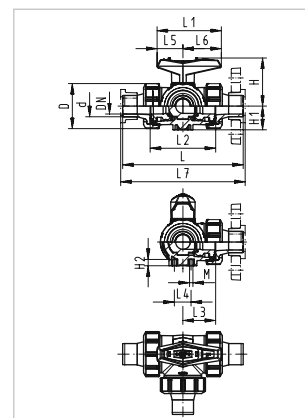
Solvent cement spigot, metric

d (mm)	D (mm)	L (mm)	L1 (mm)	L2 (mm)	L3 (mm)	L4 (mm)	L5 (mm)	L6 (mm)	L7 (mm)	H (mm)	H1 (mm)	H2 (mm)	M (mm)	Closest inch
16	50	131	77	73	36	25	32	45	137	57	28	8	6	3/8
20	50	141	77	73	36	25	32	45	147	57	28	8	6	1/2
25	58	165	97	86	43	25	39	58	171	67	32	8	6	3/4
32	68	182	97	99	50	25	39	58	188	73	36	8	6	1
40	84	209	128	120	60	45	54	74	215	90	45	9	8	1 1/4
50	97	242	128	137	69	45	54	74	248	97	51	9	8	1 1/2
63	124	302	152	179	89	45	66	87	308	116	65	9	8	2



Butt fusion spigot, long

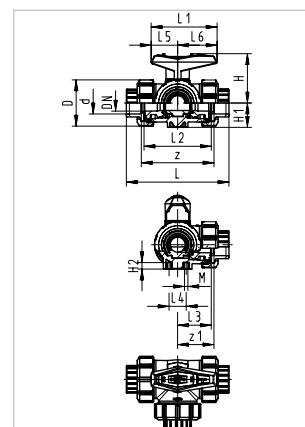
d (mm)	D (mm)	L (mm)	L1 (mm)	L2 (mm)	L3 (mm)	L4 (mm)	L5 (mm)	L6 (mm)	H (mm)	H1 (mm)	H2 (mm)	M (mm)	e (mm)	Closest inch
20	50	210	77	73	36	25	32	45	57	28	8	6	2.3	1/2
25	58	237	97	86	43	25	39	58	67	32	8	6	2.3	3/4
32	68	251	97	99	50	25	39	58	73	36	8	6	3	1
40	84	283	128	120	60	45	54	74	90	45	9	8	3.7	1 1/4
50	97	319	128	137	69	45	54	74	97	51	9	8	4.6	1 1/2
63	124	399	152	179	89	45	66	87	116	65	9	8	5.8	2



2.1.8 Dimensions – Ball Valve 543 horizontal: Ball with T-port

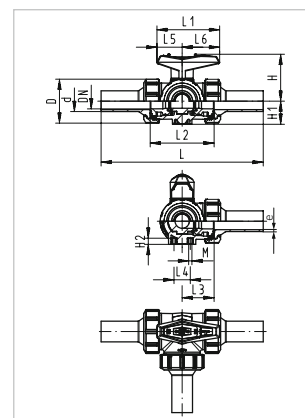
Solvent cement socket, metric

d (mm)	D (mm)	L (mm)	L1 (mm)	L2 (mm)	L3 (mm)	L4 (mm)	L5 (mm)	L6 (mm)	H (mm)	H1 (mm)	H2 (mm)	M (mm)	z (mm)	z1 (mm)	Closest inch
16	50	109	77	73	36	25	32	45	57	28	8	6	81	40	3/8
20	50	112	77	73	36	25	32	45	57	28	8	6	81	40	1/2
25	58	131	97	86	43	25	39	58	67	32	8	6	94	47	3/4
32	68	151	97	99	50	25	39	58	73	36	8	6	107	54	1
40	84	181	128	120	60	45	54	74	90	45	9	8	130	65	1 1/4
50	97	205	128	137	69	45	54	74	97	51	9	8	143	72	1 1/2
63	124	261	152	179	89	45	66	87	116	65	9	8	185	92	2



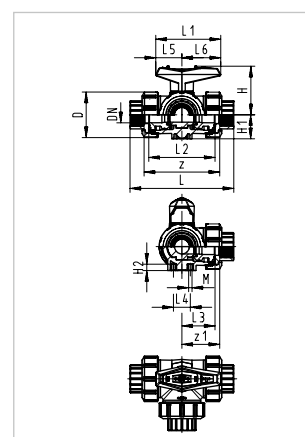
Threaded socket Rp

Rp inch	D (mm)	L (mm)	L1 (mm)	L2 (mm)	L3 (mm)	L4 (mm)	L5 (mm)	L6 (mm)	H (mm)	H1 (mm)	H2 (mm)	M (mm)	z (mm)	z1 (mm)
3/8	50	113	77	73	36	25	32	45	57	28	8	6	87	43
1/2	50	117	77	73	36	25	32	45	57	28	8	6	85	42
3/4	58	135	97	86	43	25	39	58	67	32	8	6	100	50
1	68	155	97	99	50	25	39	58	73	36	8	6	113	57
1 1/4	84	179	128	120	60	45	54	74	90	45	9	8	134	67
1 1/2	97	201	128	137	69	45	54	74	97	51	9	8	155	78
2	124	255	152	179	89	45	66	87	116	65	9	8	199	99



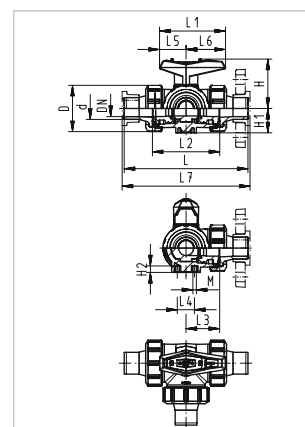
Solvent cement spigot, metric

d (mm)	D (mm)	L (mm)	L1 (mm)	L2 (mm)	L3 (mm)	L4 (mm)	L5 (mm)	L6 (mm)	L7 (mm)	H (mm)	H1 (mm)	H2 (mm)	M (mm)	closest inch
16	50	131	77	73	36	25	32	45	137	57	28	8	6	3/8
20	50	141	77	73	36	25	32	45	147	57	28	8	6	1/2
25	58	165	97	86	43	25	39	58	171	67	32	8	6	3/4
32	68	182	97	99	50	25	39	58	188	73	36	8	6	1
40	84	209	128	120	60	45	54	74	215	90	45	9	8	1 1/4
50	97	242	128	137	69	45	54	74	248	97	51	9	8	1 1/2
63	124	302	152	179	89	45	66	87	308	116	65	9	8	2



Butt fusion spigot, long

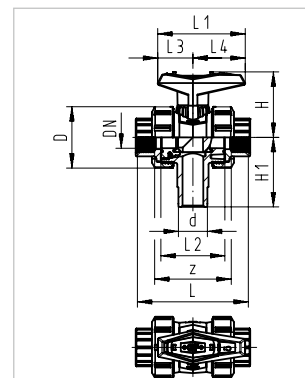
d (mm)	D (mm)	L (mm)	L1 (mm)	L2 (mm)	L3 (mm)	L4 (mm)	L5 (mm)	L6 (mm)	H (mm)	H1 (mm)	H2 (mm)	M (mm)	e (mm)	closest (mm)
20	50	210	77	73	36	25	32	45	57	28	8	6	2.3	1/2
25	58	237	97	86	43	25	39	58	67	32	8	6	2.3	3/4
32	68	251	97	99	50	25	39	58	73	36	8	6	3	1
40	84	283	128	120	60	45	54	74	90	45	9	8	3.7	1 1/4
50	97	319	128	137	69	45	54	74	97	51	9	8	4.6	1 1/2
63	124	399	152	179	89	45	66	87	116	65	9	8	5.8	2



2.1.9 Dimensions – Ball Valve Type 543 vertical: Ball with L-port

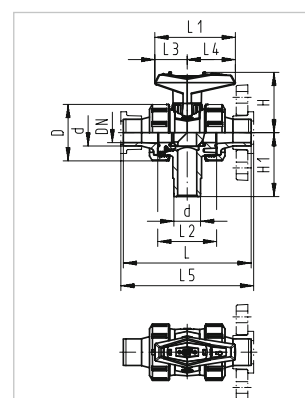
Solvent cement socket, metric

d (mm)	D (mm)	L (mm)	L1 (mm)	L2 (mm)	L3 (mm)	L4 (mm)	H (mm)	H1 (mm)	z (mm)	closest inch
16	50	92	77	56	32	45	57	62	64	3/8
20	50	95	77	56	32	45	57	62	64	1/2
25	58	111	97	66	39	58	67	72	74	3/4
32	68	123	97	71	39	58	73	77	79	1
40	84	146	128	85	54	74	90	87	95	1 1/4
50	97	157	128	89	54	74	97	97	95	1 1/2
63	124	183	152	101	66	87	116	112	107	2



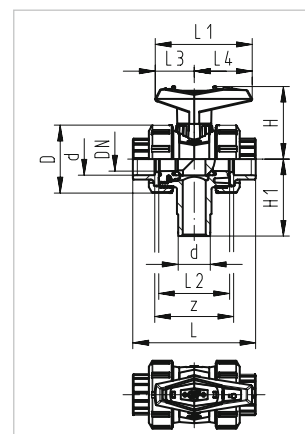
Threaded socket Rp

Rp inch	D (mm)	L (mm)	L1 (mm)	L2 (mm)	L3 (mm)	L4 (mm)	H (mm)	H1 (mm)	z (mm)
3/8	50	96	77	56	32	45	57	62	69
1/2	50	99	77	56	32	45	57	62	67
3/4	58	115	97	66	39	58	67	72	78
1	68	127	97	71	39	58	73	77	85
1 1/4	84	144	128	85	54	74	90	87	100
1 1/2	97	153	128	89	54	74	97	97	106
2	124	177	152	101	66	87	116	112	121



Solvent cement spigot, metric

d (mm)	D (mm)	L (mm)	L1 (mm)	L2 (mm)	L3 (mm)	L4 (mm)	L5 (mm)	H (mm)	H1 (mm)	closest inch
16	50	114	77	56	32	45	120	57	62	3/8
20	50	124	77	56	32	45	130	57	62	1/2
25	58	144	97	66	39	58	150	67	72	3/4
32	68	154	97	71	39	58	160	73	77	1
40	84	174	128	85	54	74	180	90	87	1 1/4
50	97	194	128	89	54	74	200	97	97	1 1/2
63	124	224	152	101	66	87	230	116	112	2



2.1.10 Accessories

- Multifunctional module
- Multifunctional hand lever with ratchet settings, lockable
- Hand lever extension
- Mounting block
- Klip-it pipe clips
- Klip-it spacers
- 90° – 180° stop

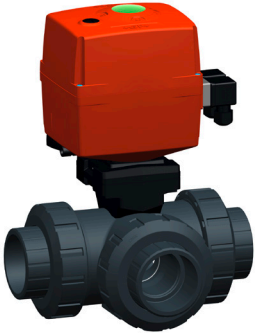
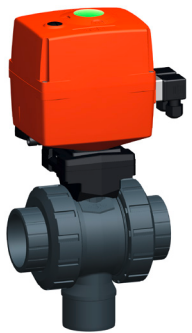


For further information on accessories, refer to the online product catalogue at www.gfps.com

Mobile apps and online tools to support configuration and calculation at www.gfps.com/tools



2.2 3-way Ball Valve Type 543 electric (Types 167–170)

	
Type 167 – 170 With electric actuator EA or smart electric actuator dEA, horizontal	Type 167 – 170 With electric actuator or smart electric actuator dEA, vertical

2.2.1 Product description

The 167 – 170 series is designed as a modular upgradeable 3-way ball valve for mixing and diverting applications which demand special process requirements. Ball valves of types 167 – 170 are based on the Ball Valve Type 543 and the electric actuator EA or the smart electric actuator dEA.

Applications

- Chemical process industry
- Seawater desalinization systems
- Life science industry industry
- Microelectronics
- Measurement and control
- Water treatment
- Diverting function in shipbuilding

Benefits/features

- Electrical feedback with additional limit switches of different designs integrated into the actuator or in the multifunction module (optional 4-20 mA with Positioner)
- Rotation angle up to 355°; Preset to 0°-90°
- Up to 3 freely selectable stop positions (open/middle/close)
- Integrated emergency manual override
- Optional: Fail-safe return unit with or without integrated battery pack
- Optional: Cycle time monitoring
- Optional: Cycle counter
- Optional: Cycle time extension
- Optional: Motor current monitoring

Flow media

Neutral and aggressive media with a small amount of particles/solids. The chemical resistance is independent of the selected valve material ([see online tool ChemRes PLUS](#)).

2.2.2 Technical basics

Differences between types 167 – 170

	Type 167, horizontal	Type 168, horizontal	Type 169, horizontal	Type 170, vertical
PVC-U	✓			✓
PVC-C	✓			
ABS	✓			✓
PP-H		✓		
PVDF			✓	
ISO	✓	✓	✓	✓
ASTM	✓	✓	✓	
BS	✓			
JIS	✓			✓

- The actuators are manufactured according to the specification of EN 61010-1, EC 89/336/EEC-EMV 73/23/EEC, LVD.
- All actuators have the CE marking.
- The actuator housings are made of PPGF (fiberglass-reinforced polypropylene) and external, stainless steel screws with low flammability.
- All electric actuators have an emergency manual override and an optical position indicator.

Properties of electric actuators

Actuator	Cycle time	Nominal torque	Actuating cycles at 20 °C	Duty cycle at 20 °C
EA25/dEA25	5 s/90°	10 Nm	250 000	100 %

i Also, the electric actuators have a protection rating 65 as per EN 60529 – IP67 (with vertical cable connection and wall bushing) at a voltage of 100 – 230 V, 50 – 60 Hz or 24 V, 50 – 60 Hz.

Valve handling

Installation notes

During installation, ensure that the actuator is correctly built onto and connected to the correct valve. In order to guarantee control provided on the customer side, the following points must be observed:

- Actuate valves with 90° rotary movement.
- Indicate the previously calibrated end positions of the valve via an electrical signal to the aforementioned system control.
- In case of interruption in the supply voltage, ensure that the actuator remains in the current position. For this, installation of an emergency manual override or reset unit is recommended (refer to "Accessories").

Maintenance notes

Set maintenance intervals as per the conditions of use (e.g., actuating cycles, medium, ambient temperature). As part of the regular system inspection, carry out the following maintenance activities.

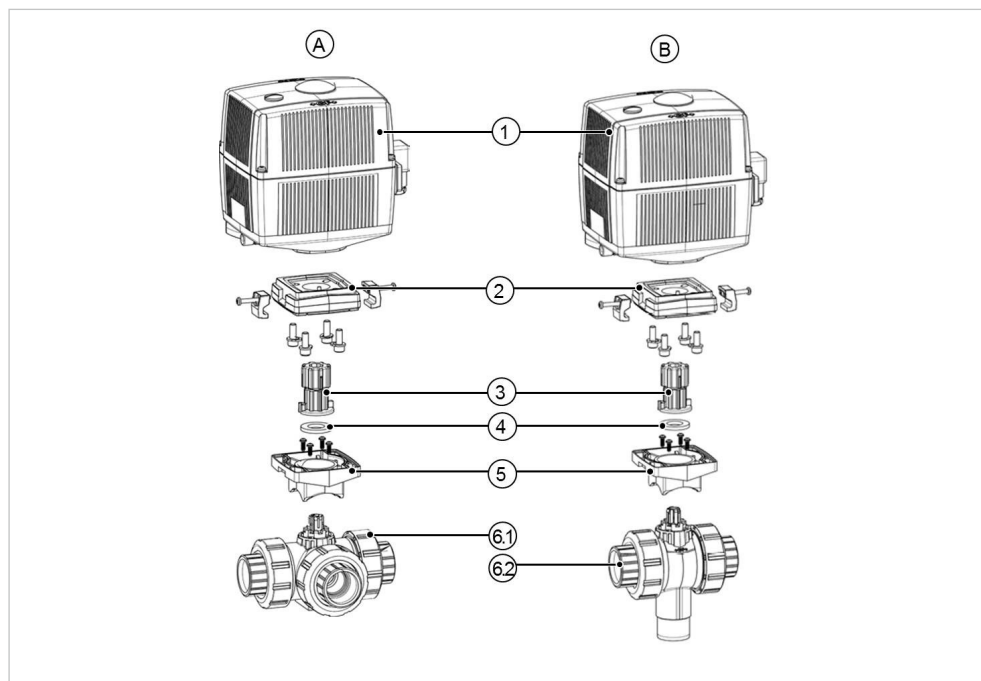
- Regularly check that no medium escapes to the outside.
- We recommend a function test for ball type valves that are kept permanently in the same position 1 – 2 times per year to check functionality.
- Check that cover of the emergency manual override is correctly fitted. If necessary, fit cover.
- Check that housing cover of the actuator is fitted with 4 screws. Insert screws if necessary.
- Check if grating noises are coming from the actuator. Replace actuator, see assembly instructions for building valve with actuator.
- Check that position display matches signal of the control. If necessary, adjust limit switches.

For frequent control operations or due to chemical attack on the sealing material, it may become necessary to replace parts inside the valve.



Installation and maintenance must be performed according to the corresponding installation instructions. The installation manual is included with the product, see also the online product catalog at www.gfps.com

2.2.3 Technical data



- A Ball Valve Types 167 – 169
- B Ball Valve Type 170
- ① Electric actuator EA/dEA
- ② Adapter plate
- ③ Coupling
- ④ Spacer
- ⑤ MF housing
- 6.1 3-way Ball Valve Type 543, horizontal
- 6.2 3-way Ball Valve Type 543, vertical

Specification

Dimensions	D16/DN10 – d63/DN50	
Base type	Type 543	
Actuator type	EA25/dEA25	
Materials	PVC-U, PVC-C, ABS, PP-H, PVDF	
Gasket materials	O-ring	FKM, EPDM
	Ball	PTFE, PVDF
Pressure rating	PN10	
Connections	Sockets, spigots, threaded sockets	
Standards	ISO, BS, ASTM, JIS	



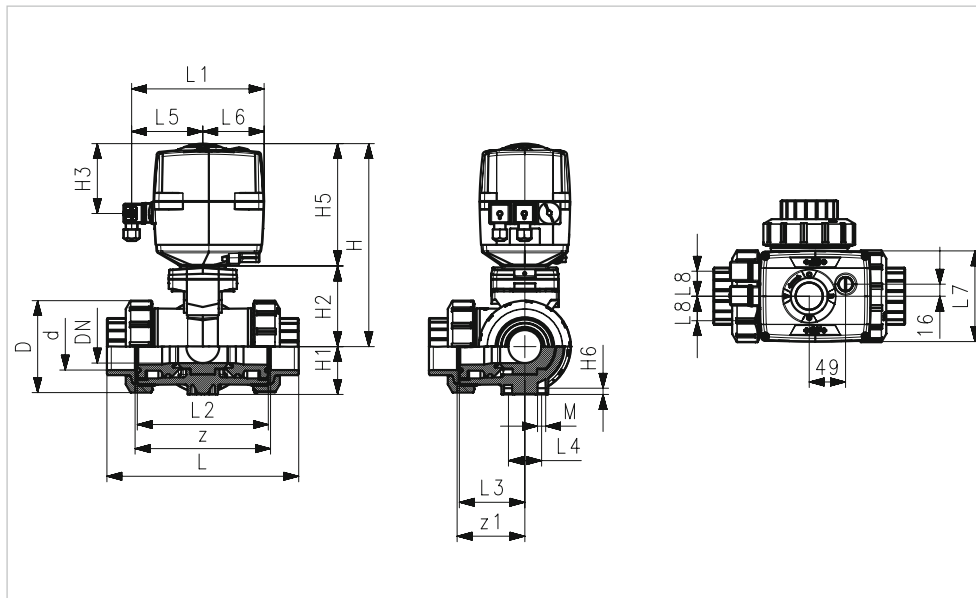
The following technical data can be found in the Planning Fundamentals under "Ball Valve Type 543, manually operated":

- Pressure-temperature diagram
- Pressure loss
- Flow characteristics
- Kv values
- Reference values for screw fastenings

2.2.4 Dimensions

Ball Valve Type 167

PVC-U, PVC-C, ABS with solvent cement sockets

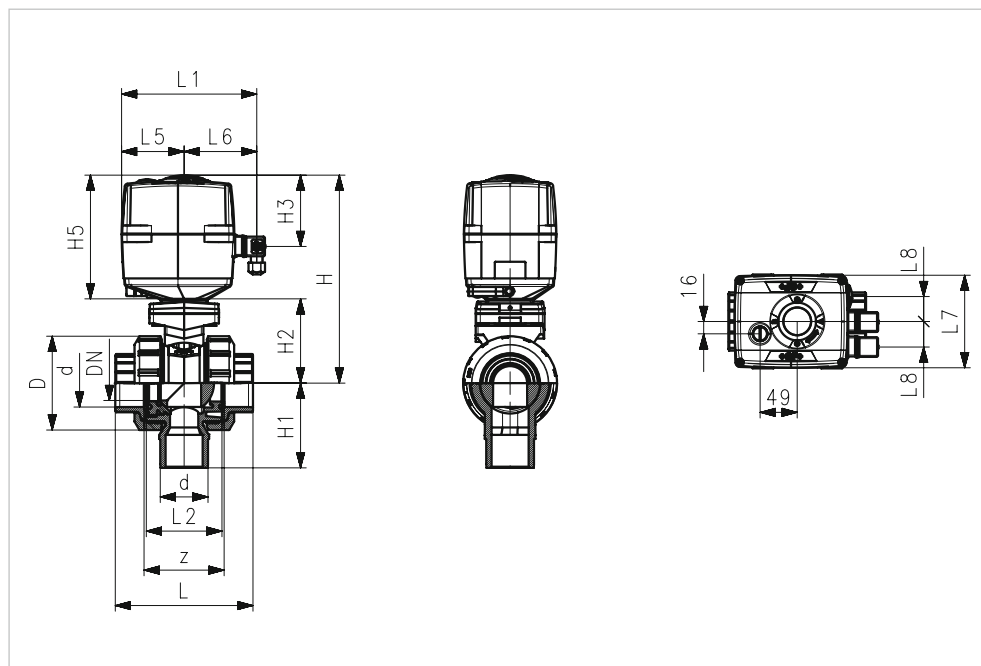


d (mm)	DN (mm)	D (mm)	H (mm)	H1 (mm)	H2 (mm)	H3 (mm)	H5 (mm)	H6 (mm)
16	10	50	231	28	64	94	167	8
20	15	50	231	28	64	94	167	8
25	20	58	240	32	73	94	167	8
32	25	68	240	36	73	94	167	8
40	32	84	251	45	84	94	167	9
50	40	97	251	51	84	94	167	9
63	50	124	273	65	106	94	167	9

d (mm)	L (mm)	L1 (mm)	L2 (mm)	L3 (mm)	L4 (mm)	L5 (mm)	L6 (mm)	L7 (mm)	L8 (mm)	M	z (mm)	z1 (mm)
16	109	180	73	36	25	97	83	122	33	6	81	40
20	112	180	73	36	25	97	83	122	33	6	81	40
25	131	180	86	43	25	97	83	122	33	6	94	47
32	151	180	99	50	25	97	83	122	33	6	107	54
40	181	180	120	60	45	97	83	122	33	8	130	65
50	205	180	137	69	45	97	83	122	33	8	143	72
63	261	180	179	89	45	97	83	122	33	8	185	92

Ball Valve Type 170

PVC-U, ABS with solvent cement sockets



d (mm)	DN (mm)	D (mm)	H (mm)	H1 (mm)	H2 (mm)	H3 (mm)	H5 (mm)	L (mm)
16	10	50	231	62	64	94	167	92
20	15	50	231	62	64	94	167	95
25	20	58	240	72	73	94	167	111
32	25	68	240	77	73	94	167	123
40	32	84	251	87	84	94	167	146
50	40	97	251	97	84	94	167	157
63	50	124	273	112	106	94	167	183

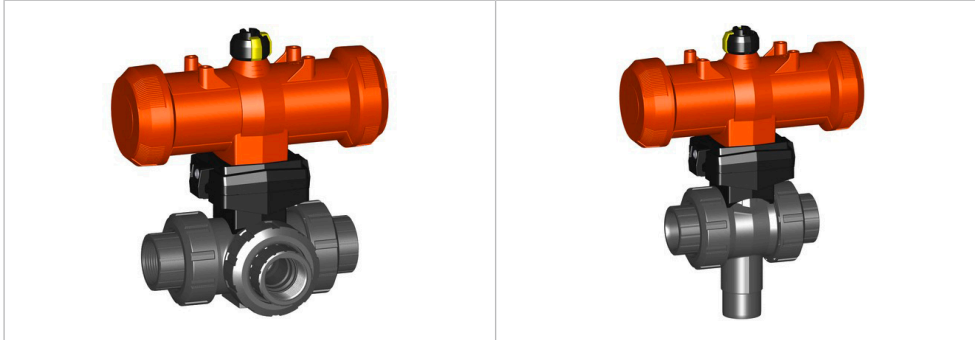
d (mm)	L1 (mm)	L2 (mm)	L5 (mm)	L6 (mm)	L7 (mm)	L8 (mm)	z (mm)
16	180	56	97	83	122	33	64
20	180	56	97	83	122	33	64
25	180	66	97	83	122	33	74
32	180	71	97	83	122	33	79
40	180	85	97	83	122	33	95
50	180	89	97	83	122	33	95
63	180	101	97	83	122	33	107

2.2.5 Accessories

- Fail-safe return unit with or without integrated battery package
- AS-interface plug on module
- Limit switch assembly kits for multi function module AgNi, Au, NPN, PNP
- Monitoring board with cycle time extension, cycle time monitoring, cycle cycle time monitoring, cycle counter and motor current monitoring
- Positioner board for modulating operation with 4-20 mA Feedback and integrated motor current monitoring
- Profibus DP V0

i For further information on accessories, refer to the online product catalog at www.gfps.com

2.3 3-way Ball Valve Type 543 pneumatic (Type 285–288)



Type 285 – 288, horizontal
With pneumatic actuators PA11 and PA21

Type 285 – 288, vertical
With pneumatic actuators PA11 and PA21

2.3.1 Product description

Ball valves of types 258 – 288 are based on Ball Valve Type 543 and pneumatic actuators PA11 and PA21. The 285 to 288 series is designed as a modular upgradeable 3-way ball valve for mixing and diverting applications which demand special process requirements.

Applications

- Chemical process industry
- Seawater desalinization systems
- Life science industry industry
- Microelectronics
- Measurement and control
- Water treatment
- Diverting function in shipbuilding

Benefits/features

- Compact design and modular construction of the valves
- Preloaded spring packages, standard version FC, DA; (FO on request)
- Short switching time
- For FC/FO stroke limitation possible
- Control air connection according to NAMUR

Flow media

Neutral and aggressive media with a small amount of particles/solids. The chemical resistance is dependent on the selected valve material ([see online tool ChemRes PLUS](#)).

2.3.2 Technical basics

Differences between Type 285 – 288

	Type 285, horizontal	Type 286, horizontal	Type 287 horizontal	Type 288, vertical ¹⁾
PVC-U	✓			✓
PVC-C	✓			
ABS	✓			
PP-H		✓		
PVDF			✓	
ISO	✓	✓	✓	✓
ASTM	✓	✓	✓	
BS	✓			
JIS	✓			✓

¹⁾ With special tripod ball. For further information, please contact a GF Piping Systems representative.

- The pneumatic actuators are available with the functions fail-safe to close (FC), fail-safe to open (FO) and double-acting (DA) and have an optical position indicator.
- The housing of the actuator is made of fiberglass-reinforced polypropylene (PP-GF) and therefore has low flammability.
- For simple installation of positioners, limit switches and accessories, actuators need to have an integrated NAMUR interface. For reliable electrical feedback, the valve should be equipped with a multifunction module that is installed between valve body and actuator.



Pneumatic actuators are distinguished with regard to the valve sizes by actuators 1 (for valve sizes DN10 – 25 mm) and actuators 2 (for valve sizes DN32 – 50 mm).

Valve handling

Installation notes

- Ensure that the ball valves are actuated with a drive torque of 2.8 to 7 bar via control pressure and up to a drive torque of 20 Nm.
- Depending on the actuator type, double-acting (Type designation DA) or single-acting with spring for fail-safe to CLOSE (Type designation FC) or single-acting for fail-safe to OPEN (Type designation FO).
- Control these valves to the OPEN and CLOSED positions via a built-in solenoid valve. The solenoid valve must be either supplied outside of the GF factory or mounted by the customer.
- Indicate these positions OPEN and CLOSED via an electric signal to the system control, if the actuator is equipped for this with the respective subassembly.
- Enable control of these positions through manual operation in case of failure in the compressed air supply, if the actuator is equipped for this with the respective subassembly.

Maintenance notes

Ball valves require no maintenance under normal operating conditions (clear water). However, the following measures must be considered:

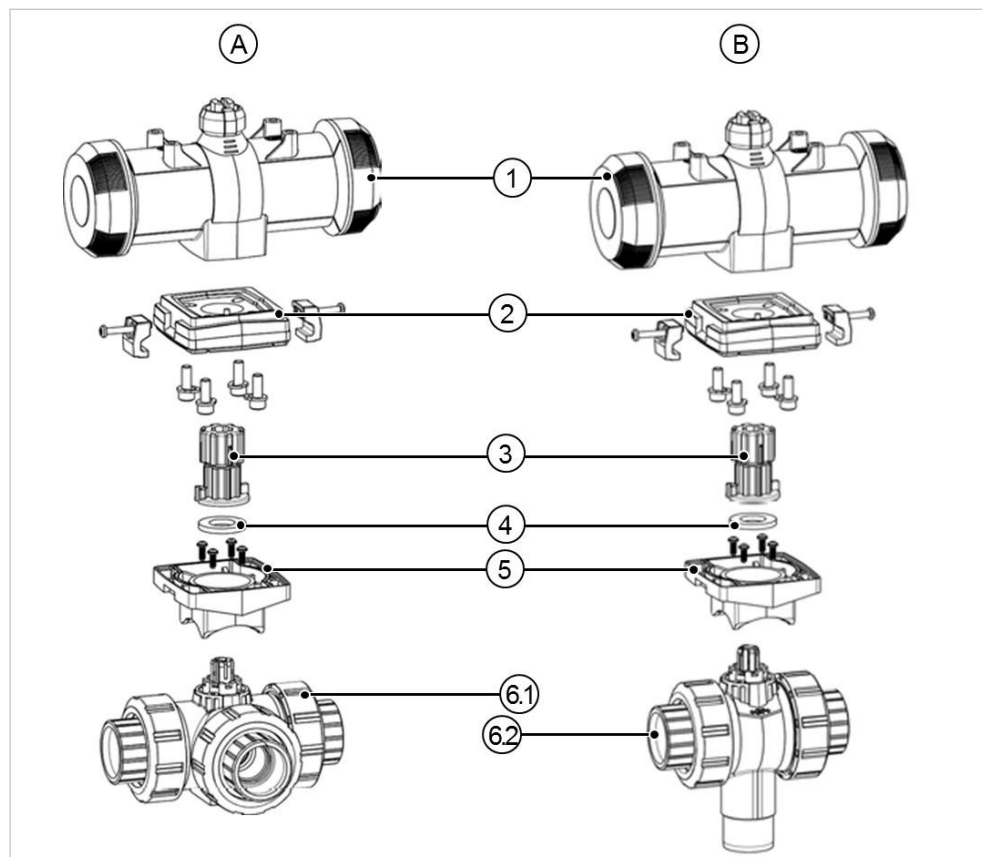
- Regularly check that no medium escapes to the outside.
- We recommend a function test for ball type valves that are kept permanently in the same position 1 – 2 times per year to check functionality.

For frequent control operations or due to chemical attack on the sealing material, it may become necessary to replace parts inside the valve. For this purpose, the valve must be removed from the piping system.



Installation and maintenance must be performed according to the corresponding installation instructions. The installation manual is included with the product, see also the online product catalog at www.gfps.com

2.3.3 Technical data



A Type 285 – 287

B Type 288

① Pneumatic actuators PA11 and PA21

② Adapter plate

③ Coupling

④ Spacer

⑤ MF housing

6.1 3-way Ball Valve Type 543, horizontal

6.2 3-way Ball Valve Type 543, vertical

Specification

Dimensions	Type 285 – 288	PA11	DN10 – DN25
		PA21	DN32 – DN50
Base type	Type 285 – 287	Type 543 –, horizontal	
	Type 288	Type 543, vertical	
Materials	PVC-U, ABS, PP-H, PVDF		
Gasket materials	O-ring gasket	EPDM, FKM, PTFE, PVDF	
Pressure rating	PN10		
Connections	Socket, spigot, threaded socket		
Standards	ISO, BS, ASTM, JIS		

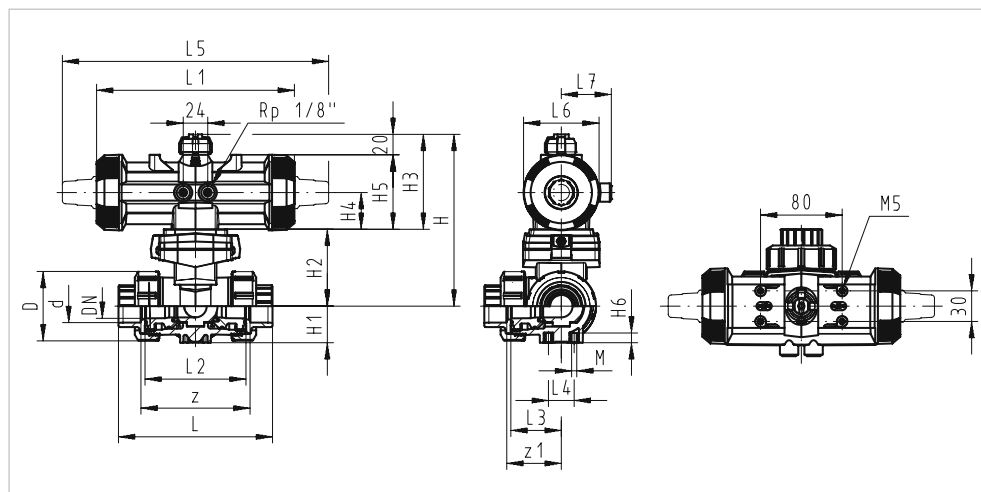


The following technical data can be found in the Planning Fundamentals under "Ball Valve Type 546 Pro, manually operated":

- Pressure-temperature diagram
- Pressure loss
- Flow characteristics
- Kv values
- Reference values for fastening screws

2.3.4 Dimensions

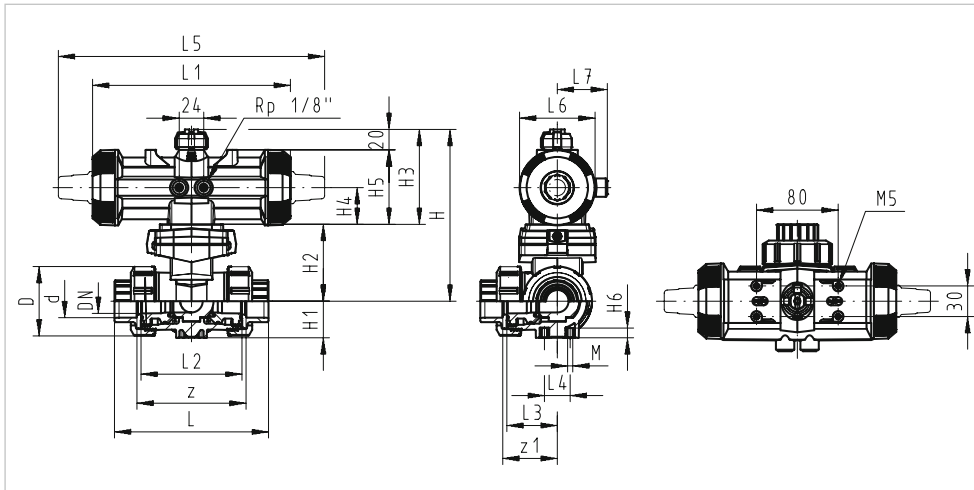
Type 285 PVC-U, PVC-C, ABS with solvent cement sockets



d (mm)	DN (mm)	D (mm)	H (mm)	H1 (mm)	H2 (mm)	H3 (mm)	H4 (mm)	H5 (mm)	H6 (mm)
16	10	50	159	28	62	97	40	77	8
20	15	50	159	28	62	97	40	77	8
25	20	58	168	32	71	97	40	77	8
32	25	68	168	36	71	97	40	77	8
40	32	84	203	45	84	119	51	99	9
50	40	97	203	51	84	119	51	99	9
63	50	124	225	65	106	119	51	99	9

d (mm)	L (mm)	L1 (mm)	L2 (mm)	L3 (mm)	L4 (mm)	L5 (mm)	L6 (mm)	L7 (mm)	M	z (mm)	z1 (mm)
16	109	194	73	36	25	261	76	48	6	81	40
20	112	194	73	36	25	261	76	48	6	81	40
25	131	194	86	43	25	261	76	48	6	94	47
32	151	194	99	50	25	261	76	48	6	107	54
40	181	224	120	60	45	305	95	59	8	130	65
50	205	224	137	69	45	305	95	59	8	143	72
63	261	224	179	89	45	305	95	59	8	185	92

Type 285 – 287: PROGEF, SYGEF with fusion sockets



d (mm)	DN (mm)	D (mm)	H (mm)	H1 (mm)	H2 (mm)	H3 (mm)	H4 (mm)	H5 (mm)	H6 (mm)
16	10	50	159	28	62	97	40	77	8
20	15	50	159	28	62	97	40	77	8
25	20	58	168	32	71	97	40	77	8
32	25	68	168	36	71	97	40	77	8
40	32	84	203	45	84	119	51	99	9
50	40	97	203	51	84	119	51	99	9
63	50	124	225	65	106	119	51	99	9

d (mm)	L (mm)	L1 (mm)	L2 (mm)	L3 (mm)	L4 (mm)	L5 (mm)	L6 (mm)	L7 (mm)	M	z (mm)	z1 (mm)
16	110	194	72	36	25	261	76	48	6	82	41
20	112	194	72	36	25	261	76	48	6	82	41
25	129	194	85	43	25	261	76	48	6	97	49
32	146	194	98	50	25	261	76	48	6	110	55
40	170	224	118	60	45	305	95	59	8	132	66
50	193	224	135	69	45	305	95	59	8	151	76
63	244	224	176	89	45	305	95	59	8	188	94

2.3.5 Accessories

- Emergency manual override -10 – +50 °C
- Limit switch box for electrical position feedback
- 3/2-way pilot solenoid valve MNL532
- NAMUR connection plate
- Pilot valve cluster PV2000
- Digital positioner DRS500
- AS interface



For further information on accessories, refer to the online product catalog at www.gfps.com

Planning Fundamentals of Valves and Automation

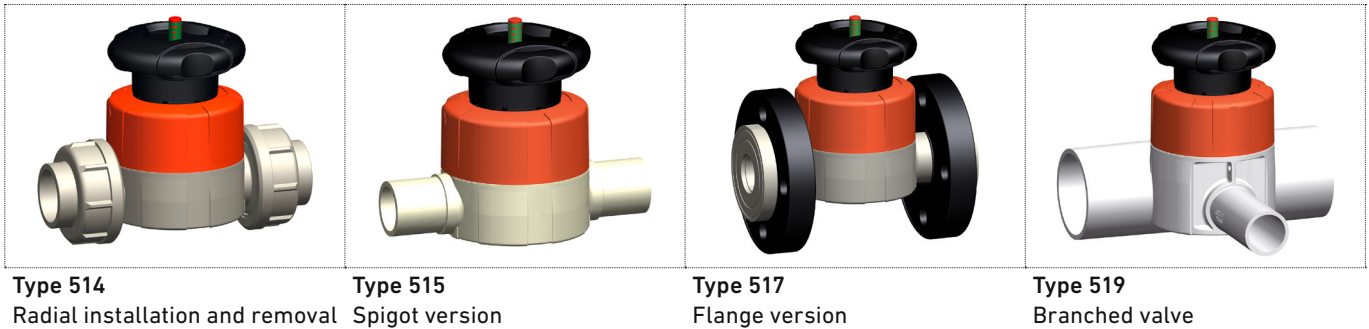
Valves – Diaphragm Valves

Content

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1.2	Diaphragm Valve Type 317	134
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1 Diaphragm Valves, manually operated

1.1 Diaphragm Valve Type 514, 515, 517, 519



1.1.1 Product description

Diaphragm valves of the Type 5 series from GF Piping Systems are used for regulating, closing, controlling and monitoring volume flows. Especially when transporting contaminated, aggressive or abrasive media, this Type of valve has decisive advantages thanks to its simple function and optimized construction. Only the valve body and diaphragm come into contact with the medium.

The valve is suitable for use with gases and liquids and can be used in any location and drained completely.

Unlike other Valve Types, no pressure surges can be caused by closing the diaphragm valve. GF Piping Systems offers this Valve Type as a manually operated valve and automatic valve.

Applications

- Chemical process industry
- Microelectronics
- Water treatment
- Cooling
- Control applications

Benefits/features

- Full plastic valve without metal screws
- No corrosion due to aggressive media/environment
- Constant leak-tightness in the event of changes in temperature without tightening screws
- Plastic-appropriate, highly stable connection of upper part and valve body by means of a buttress thread
- Maximum flow and linear characteristic curves for easier control
- Diaphragm geometry for longer service life
- Integrated handwheel locking device
- Valve is free of dead space, sealing web lies close to the pipe wall

Possible flow media

Contaminated, solid or ultrapure media.

Liquid and gaseous medium which do not negatively affect the physical and chemical properties of the respective housing and diaphragm material during normal mode.

Information on chemical resistance is available from the GF Piping Systems Sales Company or at www.gfps.com.

1.1.2 Technical basics

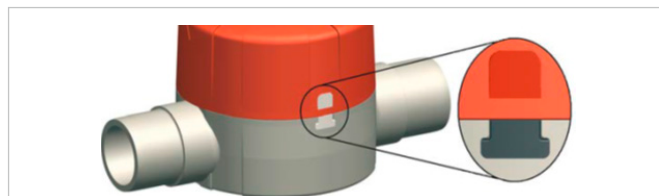
The upper part of the housing is made of PPGF (fiberglass-reinforced polypropylene) and is screwed to the lower part of the housing using a central plastic nut, which avoids exposed metal screws. The handwheel is lockable as a standard. The two-colored position indicator pin indicates the current position of the diaphragm.

i All diaphragm valves are manufactured in accordance with EN ISO 16138.

Indicator for diaphragm material

The color of the index plate on the valve body shows the Type of diaphragm material:

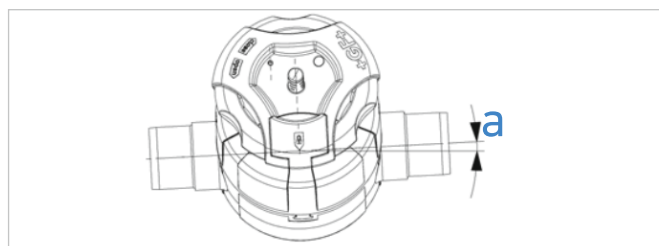
Color	Diaphragm material
Black	EPDM
White	PTFE/EPDM
Green	PTFE/FKM
Red	FKM
Blue	NBR



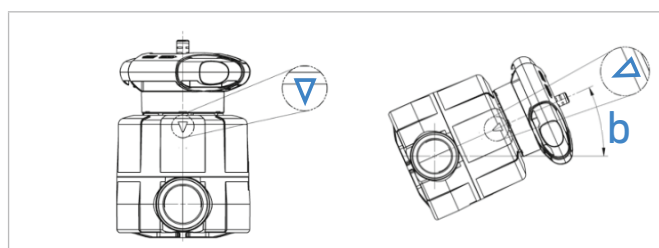
Installation angle for optimal draining of the valve

To achieve optimal draining, GF Piping Systems recommends installing the individual dimensions in accordance with the corresponding angle (a and b). An installation inclination of about 1° to 2° is not taken into consideration with the stated angles.

Dimension	Angle a for types 514, 515, 517
d20/DN15	2
d25/DN20	2
d32/DN25	3
d40/DN32	4
d50/DN40	5
d63/DN50	7

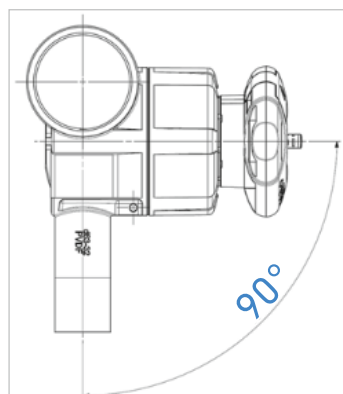


Dimension	Angle b for types 514, 515, 517
d20/DN15	27
d25/DN20	24
d32/DN25	25
d40/DN32	23
d50/DN40	24
d63/DN50	22



Optimum angle with one of the triangle legs horizontal.

Emptying angle for Type 519 (3-way valve) is 90°, independent of the dimension



Integrated fastening and PP mounting blocks

Integrated mounting

ENSAT® bushings on the underside of the valve allow simple and stable attachment of the diaphragm valve. With this, the forces that can occur when operating the valve (e.g. breakaway torque) are absorbed and therefore not transferred to the piping system.



PP mounting block for diaphragm valves

The mounting blocks for diaphragm valves help compensate for the different distances from the mounting surface to the pipe axis, even when using different dimensions. The blocks can also be used for the PVC diaphragm Valve Type 514 to compensate for the coupling nut to the mounting surface.

- Material: PP-GF15, black
- 5 sizes, numbered from 1 to 5
- Adjustable, in order to achieve the desired height

Valve handling

Installation notes

- Please note that thermal expansion due to changes in temperature can lead to longitudinal and bending forces in the pipeline.
- Ensure that the diaphragm valve is mounted as a fixed point, and thus install the pipe bracket directly in front of and behind the diaphragm valve
- Ensure that only the indicated control pressures are applied when operating and that the diaphragm is used in optimal regulating mode.

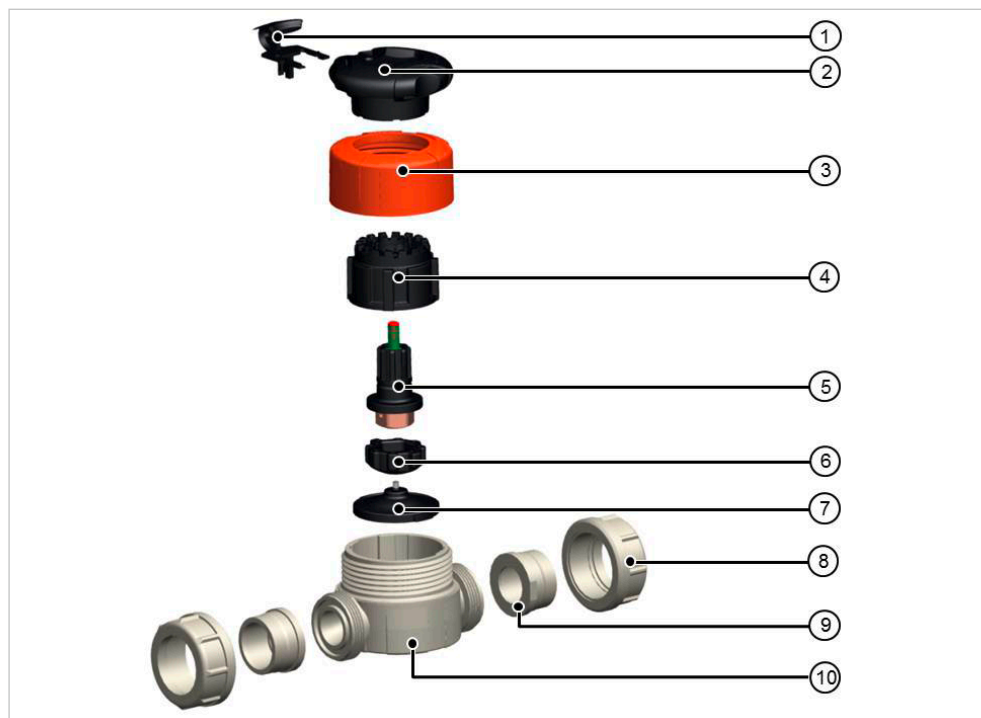
Selection of lubricants

Gaskets and spare parts can be mounted with silicon-based grease. Other lubricants may corrode the diaphragm valve material or diaphragm. Therefore, never use mineral-oil-based grease or Vaseline. Pay attention to special instructions for silicon-free and High Purity diaphragm valves.



Installation and maintenance must be performed in accordance with the corresponding installation manual. The installation manual is provided with the product, see also the online product catalog at www.gfps.com

1.1.3 Technical data



- ① Handwheel locking device
- ② Handwheel
- ③ Central housing nut
- ④ Inner housing
- ⑤ Spindle assembly incl. diaphragm holder
- ⑥ Pressure piece
- ⑦ Diaphragm
- ⑧ Coupling nut
- ⑨ Insert
- ⑩ Valve body

Specification

Approved media		Liquid and gaseous media which, in normal operation, do not adversely affect the physical and chemical properties of the respective housing and diaphragm material. Information on chemical resistance is available from the Georg Fischer Sales Company or at www.gfps.com .				
Dimensions		Type 514	d20/DN15 – d63/DN50, ½" - 2"			
		Type 517	d20/DN15 – d63/DN50, ½" - 2"			
		Type 515	d20/DN15 – d63/DN50, ½" - 2"			
		Type 519	d20/DN15 – d20/DN15, ½"; d160/DN150 – d63/DN50, 4"- 2"			
Materials	Valve body	Type 514	PVC-U, PVC-C, ABS, PP-H, PVDF, PVDF-HP			
		Type 515	PVC-U, PVC-C, ABS, PP-H, PP-N, PVDF, PVDF-HP			
		Type 517	PVC-U, PVC-C, PP-H, PVDF, PVDF-HP			
		Type 519	PP-H, PP-N, PVDF-HP			
	Housing nut	PPGF 30 for PN10 PPSGF40 for PN 16 (only for water applications)				
		Gasket/ diaphragm ¹⁾	Diaphragm	NBR	FKM	EPDM
O-Ring	EPDM		FKM	EPDM	PTFE	
Operating temperature ²⁾ (valve body material)		PVC-U	0 to 60 °C			
		PVC-C	0 to 80 °C			
		ABS	-30 to 60 °C			
		PP	0 to 80 °C			
		PVDF	-20 to 140 °C			
Pressure levels		PN16	PVC-U, PVDF, PVDF-HP (dependant from threaded bush)			
		PN10	PVC-U, PVC-C, ABS, PP-H, PP-N, PVDF, PVDF-HP			
Actuation variants		Manually operated				
		Pneumatic (see Type DIASTAR)				

Specification		
Connections	Type 514	Screw connection with solvent cement sockets, threaded sockets, fusion sockets, butt fusion spigots
	Type 515	Solvent cement spigot, socket fusion spigot, butt fusion spigot
	Type 517	Fixed flange, backing flange
	Type 519	3-way valve with butt fusion spigot
Approvals	ACS, FDA, DIBt	

¹⁾ Other combinations on request.

²⁾ According to pressure-temperature diagram. Temperature ranges may vary depending on the seal material combination.

Kv 100 values

Type 514 – 517

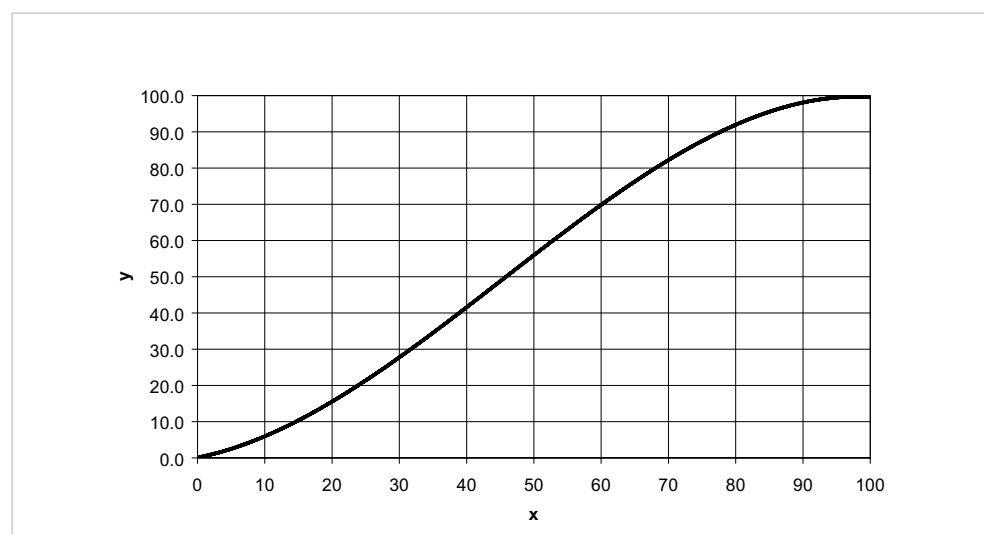
Dim. (mm)	DN (mm)	Inch (inch)	Kv 100 (l/min)	Cv 100 (gal/min)	Kv 100 (m³/h)
20	15	½	125	9	8
25	20	¾	271	19	16
32	25	1	481	33	29
40	32	1 ¼	759	52	45
50	40	1 ½	1263	87	76
63	50	2	1728	119	104

Type 519

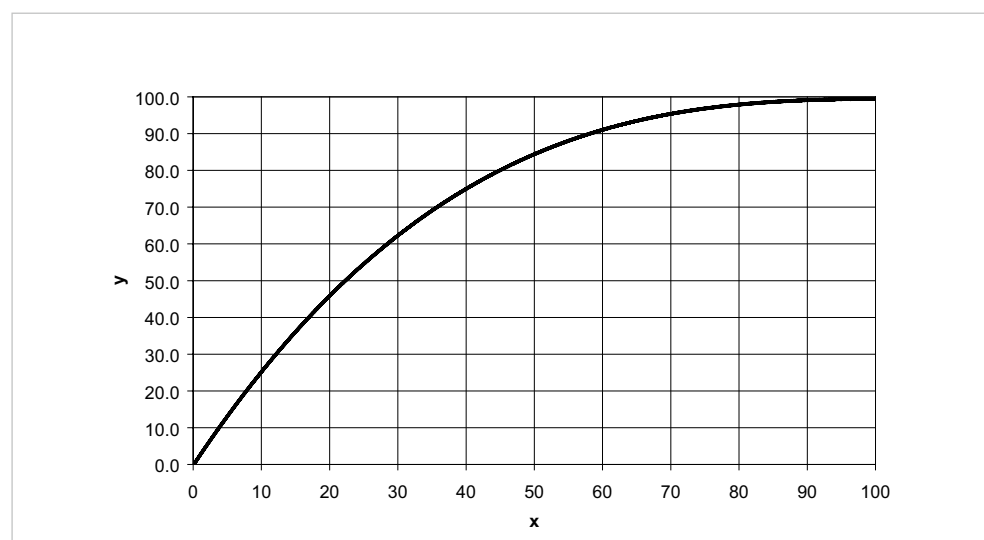
d (mm)	DN (mm)	Zoll (inch)	d1 (mm)	DN1 (mm)	Zoll1 (inch)	Kv 100 (l/min)	Cv 100 (gal/min)	Kv 100 (m³/h)
20	15	½	20	15	½	57	4	3
25	20	¾	20	15	½	89	6	5
25	20	¾	25	20	¾	118	8	7
32	25	1	20	15	½	80	6	5
32	25	1	25	20	¾	105	7	6
32	25	1	32	25	1	231	16	14
40	32	1 ¼	20	15	½	85	6	5
40	32	1 ¼	25	20	¾	119	8	7
40	32	1 ¼	32	25	1	153	11	9
40	32	1 ¼	40	32	1 ¼	187	13	11
50	40	1 ½	20	15	½	86	6	5
50	40	1 ½	25	20	¾	160	11	10
50	40	1 ½	32	25	1	206	14	12
50	40	1 ½	40	32	1 ¼	524	36	31
50	40	1 ½	50	40	1 ½	667	46	40
63	50	2	20	15	½	84	6	5
63	50	2	25	20	¾	150	11	9
63	50	2	32	25	1	184	13	11
63	50	2	40	32	1 ¼	471	32	28
63	50	2	50	40	1 ½	610	42	37
63	50	2	63	50	2	747	52	45
90	80	3	20	15	½	82	6	5
90	80	3	25	20	¾	103	7	6
90	80	3	32	25	1	129	9	8
90	80	3	50	40	1 ½	623	43	37
90	80	3	63	50	2	696	48	42
110	100	4	20	15	½	78	5	4
110	100	4	25	20	¾	103	7	6
110	100	4	32	25	1	131	9	8

d (mm)	DN (mm)	Zoll (inch)	d1 (mm)	DN1 (mm)	Zoll1 (inch)	Kv 100 (l/min)	Cv 100 (gal/min)	Kv 100 (m ³ /h)
110	100	4	50	40	1 ½	604	42	36
110	100	4	63	50	2	661	46	40
140	125	5	32	25	1	146	10	9
140	125	5	40	32	1 ¼	382	26	23
140	125	5	50	40	1 ½	440	30	26
140	125	5	63	50	2	502	35	30
160	150	6	32	25	1	139	10	8
160	150	6	40	32	1 ¼	382	26	23
160	150	6	50	40	1 ½	436	30	26
160	150	6	63	50	2	498	34	30

Flow characteristics Type 514–517



Flow characteristics Type 519

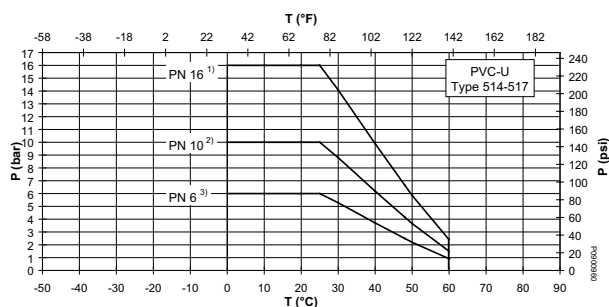


Pressure-temperature diagrams

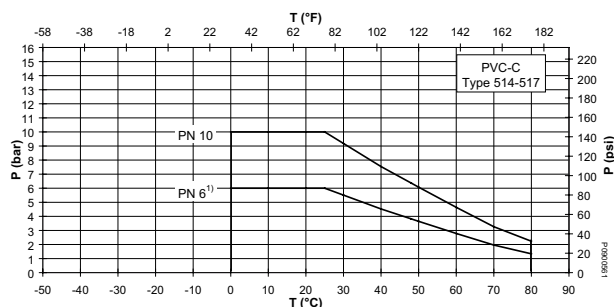
T Temperature (°C, °F)

P Permissible pressure (bar, psi)

PVC-U



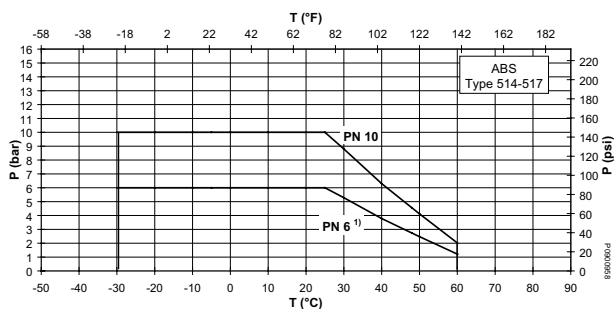
PVC-C



- 1) Only with black PPS housing nut for water applications
- 2) Depending on the connection type and actuator, the nominal pressure is reduced to PN10
- 3) Depending on the connection type and actuator, the nominal pressure is reduced to PN6

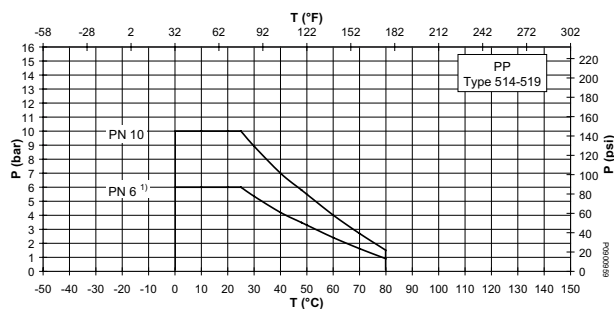
- 1) Depending on the connection type and actuator, the nominal pressure is reduced to PN6

ABS



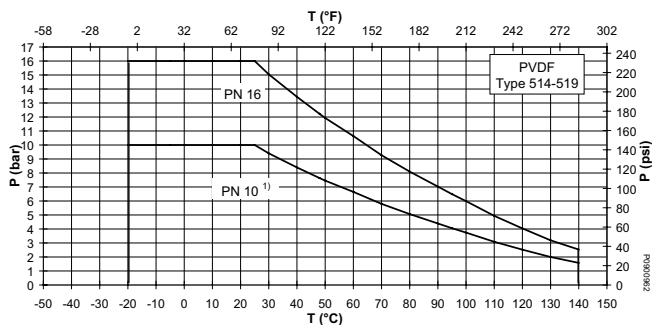
- 1) Depending on the connection type and actuator, the nominal pressure is reduced to PN6

PP



- 1) Depending on the connection type, actuator and sealing material, the nominal pressure is reduced to PN6

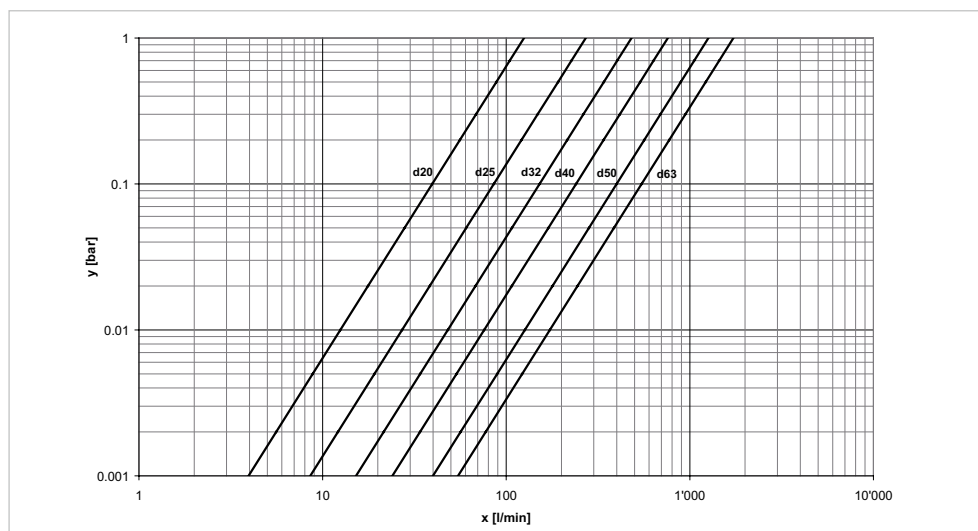
PVDF



- 1) PN16 only with black PPS housing nut. Depending on the connection type and actuator, the nominal pressure is reduced to PN10

Pressure losses

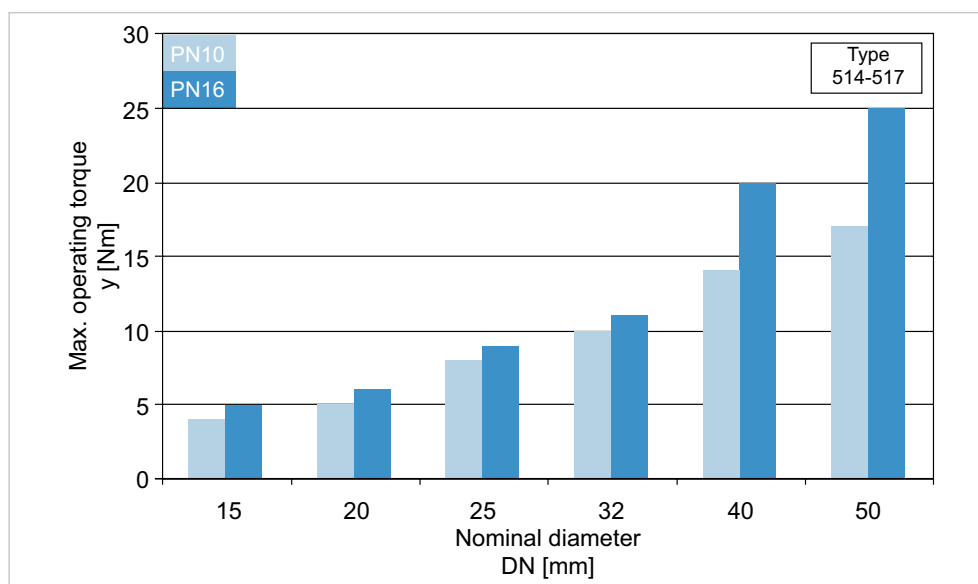
Type 514 – 517



- X Flow rate
(l/min, US gal/min)
Y Pressure loss Δp (bar, psi)

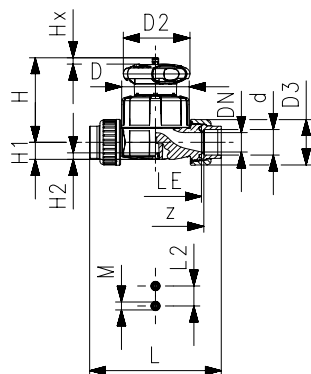
Operating torque

Type 514 – 517



1.1.4 Dimensions

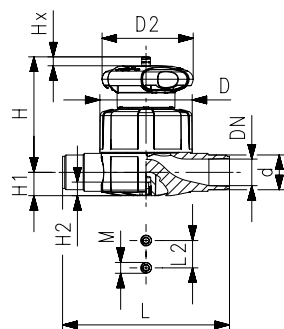
Type 514



- L₁ – Threaded socket
- L₂ – Solvent cement socket
- L₃ – Fusion socket
- L₄ – Butt fusion spigot

Dim. (mm)	DN (mm)	Inch (inch)	D (mm)	D2 (mm)	D3 (mm)	L ₁ (mm)	L ₂ (mm)	L ₃ (mm)	L ₄ (mm)	L ₂ (mm)	H (mm)	H1 (mm)	H2 (mm)	M	z (mm)	LE (mm)	z for (mm)	Hx (mm)
20	15	½	65	65	43	128	128	128	196	25	73	14	12	M6	96	90	100	7
25	20	¾	80	65	51	152	152	150	221	25	81	18	12	M6	114	108	118	10
32	25	1	88	87	58	166	166	162	234	25	107	22	12	M6	122	116	126	13
40	32	1 ¼	101	87	72	192	192	184	260	45	115	26	15	M8	140	134	144	15
50	40	1 ½	117	135	83	222	222	210	284	45	148	32	15	M8	160	154	164	19
63	50	2	144	135	100	266	266	148	321	45	166	39	15	M8	190	184	194	25

Type 515



- L₅ – Fusion spigot
- L₆ – Solvent cement spigot
- L₇ – Butt fusion spigots

Dim. (mm)	DN (mm)	inch (inch)	D (mm)	D2 (mm)	L ₅ (mm)	L ₆ (mm)	L ₇ (mm)	L ₂ (mm)	H (mm)	H1 (mm)	H2 (mm)	M	Hx (mm)
20	15	½	65	65	124	124	124	25	73	14	12	M6	7
25	20	¾	80	65	144	144	144	25	81	18	12	M6	10
32	25	1	88	87	155	154	154	25	107	22	12	M6	13
40	32	1 ¼	101	87	176	174	174	45	115	26	15	M8	15
50	40	1 ½	117	135	193	194	194	45	148	32	15	M8	19
63	50	2	144	135	223	224	223	45	166	39	15	M8	25

D (mm)	d1 (mm)	DN (mm)	inch (inch)	DN1 (mm)	Zoll 1 (inch)	DN2 (mm)	Zoll 2 (inch)	D (mm)	D2 (mm)	L _s (mm)	L1 (mm)	L3 (mm)	L4 (mm)	H (mm)	H1 (mm)	Hx (mm)
63	40	50	2	32	1 ¼	50	1	144	135	225	192	220	39	170	39	25
63	50	50	2	40	1 ½	50	2	144	135	225	192	220	39	170	39	25
63	63	50	2	50	2	50	2	144	135	225	192	220	39	170	39	25
90	20	80	3	15	½	25	1	88	87	205	159	190	47	140	21.5	13
90	25	80	3	20	¾	25	1	88	87	205	159	190	47	140	21.5	13
90	32	80	3	25	1	25	1	88	87	205	159	190	47	140	21.5	13
90	50	80	3	40	1 ½	50	2	144	135	254	207	250	51	184	39	25
90	63	80	3	50	2	50	2	144	135	254	207	250	51	184	39	25
110	20	100	4	15	½	25	1	88	87	227	171	190	56	149	21.5	13
110	25	100	4	20	¾	25	1	88	87	227	171	190	56	149	21.5	13
110	32	100	4	25	1	25	1	88	87	227	171	190	56	149	21.5	13
110	50	100	4	40	1 ½	50	2	144	135	276	219	250	60	194	39	25
110	63	100	4	50	2	50	2	144	135	276	219	250	60	194	39	25
140	32	125	5	25	1	25	1	87	87	258	186	310	70	155	21.5	25
140	40	125	5	32	1 ¼	50	2	144	135	291	219	310	78	204	39	50
140	50	125	5	40	1 ½	50	2	144	135	291	219	310	78	204	39	50
140	63	125	5	50	2	50	2	144	135	291	219	310	78	204	39	50
160	32	150	6	25	1	25	1	87	87	278	196	310	81	161	21.5	25
160	40	150	6	32	1 ¼	50	2	144	135	301	219	310	87	213	39	50
160	50	150	6	40	1 ½	50	2	144	135	301	219	310	87	213	39	50
160	63	150	6	50	2	50	2	144	135	301	219	310	87	213	39	50

1.1.5 Accessories

- Electrical position indicator with Ag Ni or AU limit switch

i For further information on accessories, refer to the online product catalog at www.gfps.com

- Mobile apps and online tools to support configuration and calculation at www.gfps.com/tools



1.2 Diaphragm Valve Type 317



1.2.1 Product description

Diaphragm Valve Type 317 is distinguished in particular by its compact, short design, and is available in the dimensions DN65 to DN150.

Type 317 is connected to the piping by means of flanges.

GF Piping Systems offers the option of using a lockable handwheel in order to make the process even safer. This is an important and useful function for all areas of application of diaphragm valves.

For automated plants, the valves are also available with pneumatic actuator of the DIASTAR type.

Function

Diaphragm valves from GF Piping Systems are used for regulating, controlling as well as closing monitoring volume flows. Especially when transporting contaminated, aggressive or abrasive media, this type of valve has decisive advantages thanks to its simple function and optimized construction. Only the valve body and the diaphragm come into contact with the medium.

Applications

- Controlling pure and ultrapure media
- Applications with high viscosity and solid content
- Chemical dosing
- Water treatment

Benefits/features

- Reliable plastic valve for controlling neutral, aggressive, gaseous and liquid media
- None of the components come into contact with the medium
- Reliable and durable
- Flexible sealing element
- Integrated attachment and hence no transfer of operating forces to the piping system
- Position indicator

Possible flow media

Contaminated, solid or ultrapure media.

1.2.2 Technical basics

The upper part of the housing is made of PPGF (fiberglass-reinforced polypropylene) and is screwed to the lower part of the housing with four bolts, which avoids exposed metal screws. A position indicator integrated into the handle is required for determining the diaphragm position.



All diaphragm valves of Type 317 in metric sizes are manufactured with flange versions DN65–DN150, and in accordance with EN ISO 16138.

Valve handling

Installation notes

In piping systems that are subject to changes in temperature, longitudinal and bending forces are created when thermal expansion is prevented. To avoid compromising the functioning of the valve, these forces must be absorbed through appropriate fixed points in front of and behind the valve. Diaphragm valves and pipes must be aligned with one another so that the valve is not subjected to superimposed loads.

Ensure that the valve is open and not under pressure. Using a calibrated torque wrench, all four screws must be evenly tightened crosswise to screw positions in accordance with the recommended torques.

Integrated mounting

The diaphragm valve includes an integrated mounting insert. Mounting plates help to compensate different distances from the mounting surface to the pipe axis. They are adapted to the pipe clips from GF Piping Systems. With the integrated inserts, the forces that can be generated when operating the valve are absorbed (e.g., breakaway torque). Because of this, no operating forces are transferred to the piping system.

Selection of lubricants

Gaskets and spare parts can be mounted with silicon-based grease. Other lubricants may chemically attack the diaphragm valve material or diaphragm. Therefore, never use mineral-oil-based grease or Vaseline. Pay attention to special instructions for silicon-free and high purity diaphragm valves.

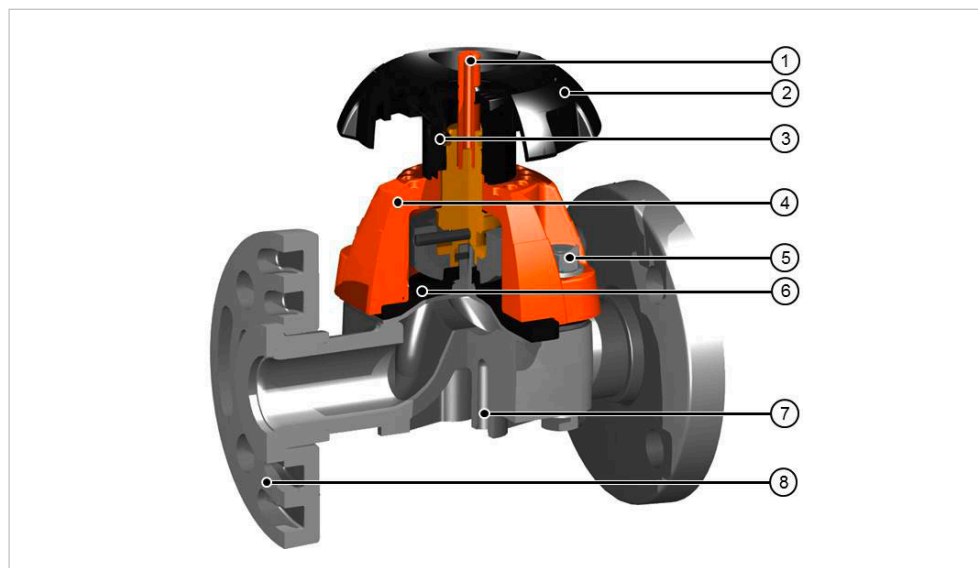
Maintenance notes

Check the connection between the upper part and valve body for leak-tightness at regular intervals. Leaky threaded connections must be tightened. We recommend that you actuate continuously opened or closed valves once to twice a year to check their function.



Installation and maintenance must be performed in accordance with the corresponding installation manual. The installation manual is provided with the product, see also the online product catalog at www.gfps.com

1.2.3 Technical data



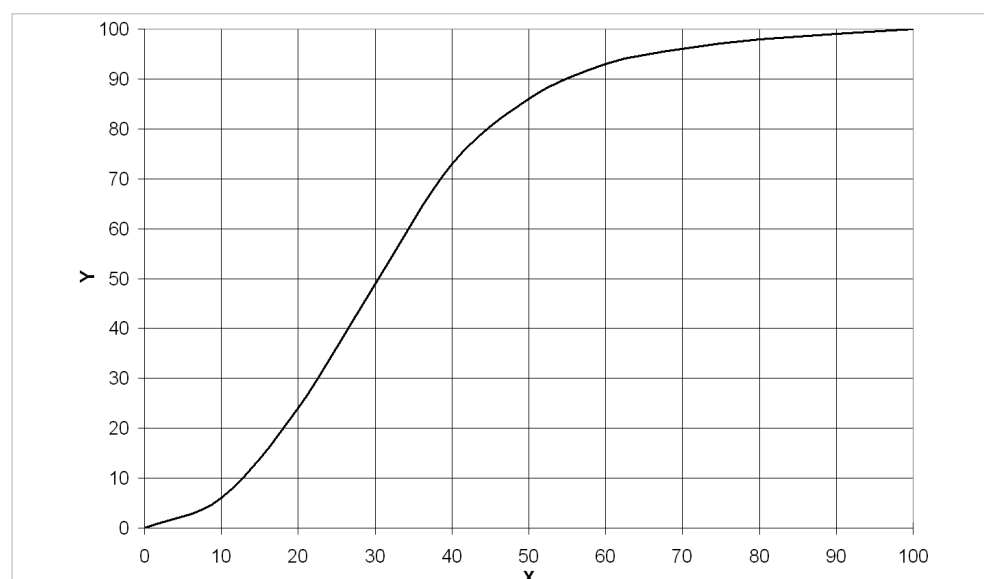
- ① Position Indicator
- ② Handwheel
- ③ Sealing disk
- ④ Upper part
- ⑤ Threaded connection
- ⑥ Diaphragm
- ⑦ Fastening thread
- ⑧ Flange connector

Specification		
Dimensions	d75/DN65 - d160/DN150	
Materials	Upper part	PPGF 30
	Handwheel	PP; PVC-U; PP TSG
Gasket/diaphragm materials	NBR; EPDM; PTFE/EPDM; FKM;	
Pressure levels	PN10	
	PN6 from DN100	
Actuation variants	Manually operated	
	Pneumatically actuated (see DIASTAR 025)	
Connections	Backing flange	DN65
	Fixed flange	from DN80
Accessories	DN65	Lockable handwheel
Approvals	ACS, FDA, DIBt, MPA, NAMSA	

Kv 100 values

DN (mm)	Inch (inch)	d (mm)	Kv 100 (l/min)	Cv 100 US (gal./min)	Kv 100 (m³/h)
65	2 ½	75	992	69.5	59.5
80	3	90	1700	119	102
100	4	110	2700	189	162
150	6	160	6033	422.3	362

Flow characteristics



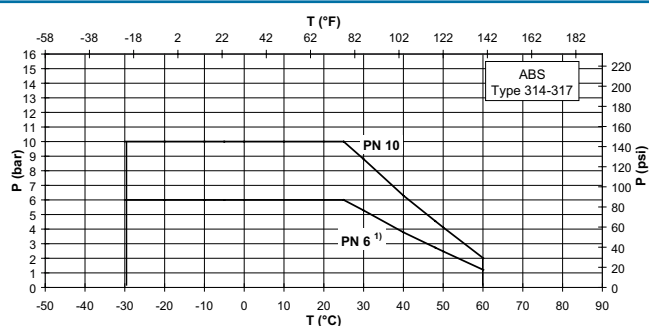
X Open angle (%)
Y Kv, Cv value (%)

Pressure-temperature diagrams

T Temperature (°C, °F)

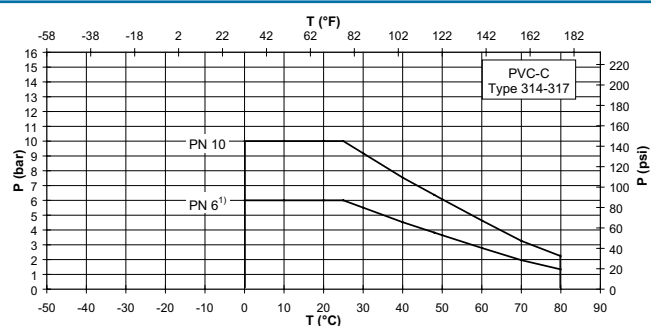
P Permissible pressure (bar, psi)

ABS



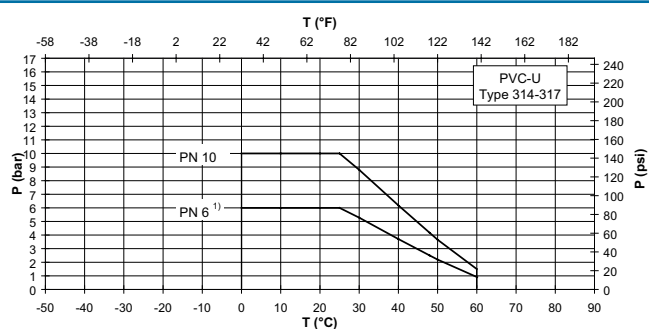
¹⁾ Only Type 317, manually operated DN100 and DN150

PVC-C



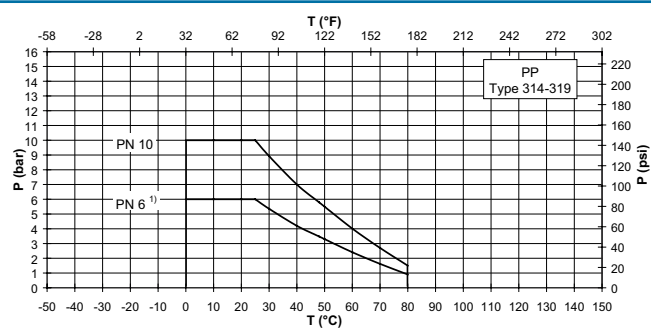
¹⁾ Only Type 317, manually operated DN100 and DN150

PVC-U



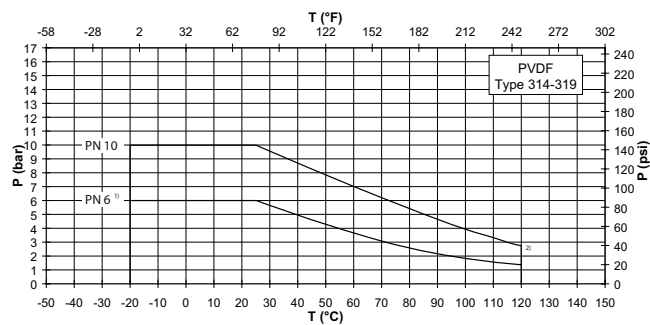
¹⁾ Only Type 317, manually operated DN100 and DN150

PP



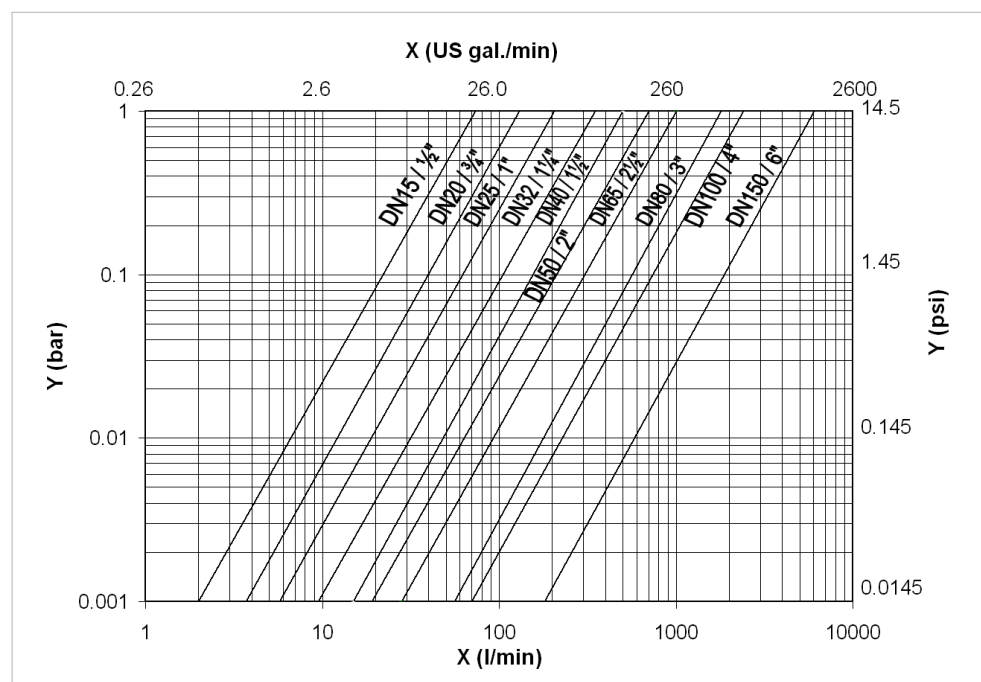
¹⁾ Only Type 317, manually operated DN100 and DN150

PVDF



- 1) Only Type 317, manually operated DN100 and DN150
- 2) Higher temperature after consultation

Pressure losses



- X Flow rate
(l/min, US gal./min)
- Y Pressure loss Δp (bar, psi)

Reference values for tightening torque of flange connection screws of type 317

d (mm)	DN (mm)	Inch (inch)	Total number of screws	Torque (Nm)	Torque (lbf)
75	65	2 ½	8 x M16 x 85	25	222
90	80	3	16 x M16 x 95	15	133
110	100	4	16 x M16 x 100	20	177
160	150	6	16 x M16 x 110	35	310

Tightening torque for diaphragms of Type 317

d (mm)	DN (mm)	Tightening torques for elastomer diaphragms		Tightening torque for PTFE diaphragms	
		(Nm)	(lbf)	(Nm)	(lbf)
75	65	25	221.3	25	221.3
90	80	30	265.5	30	265.5
110	100	30	265.5	30	265.5
160	150	40	354.0	40	354.0

Operating torque for handwheel

DN (mm)	Inch (inch)	Tightening torque (Nm)
65	2 ½	20
80	3	30
100	4	45
150	6	140

1.2.4 Dimensions

DN65		DN80-100		DN150	

d (mm)	DN (mm)	Inch (inch)	D (mm)	D1 (mm)	D2 (mm)	D3 (mm)	L (mm)	L1 (mm)	L2 (mm)	L3 (mm)	H (mm)	H1 (mm)	H2 (mm)	M	Hx (mm)
75	65	2 ½	185	145	152	18	290		70		201	46	15	M8	30
90	80	3	200	160	270	18	310	35	120		265	57	23	M12	40
110	100	4	225	180	270	18	350	35	120		304	69	23	M12	50
160	150	6	285	240	400	32	480	26	100	200	437	108	23	M12	70

i For further information on accessories, refer to the online product catalog at www.gfps.com

Mobile apps and online tools to support configuration and calculation at www.gfps.com/tools



2 Diaphragm Valves, electric

2.1 e-DIASTAR for Types 514, 515 and 517



Diaphragm Valve Type 514 with e-DIASTAR actuator

2.1.1 Product description

The e-DIASTAR system is based on the diaphragm Valve Type 514 (threaded sockets) and Type 515 (spigots), on which the electric actuator EA-MT is mounted. The diaphragm Valve Type 517 (flange) can be retrofitted after installation. The electric actuator EA-MT opens and closes the diaphragm valve fully automatic.

The e-DIASTAR is used to regulate, close and control volume flows automatically. Especially when transporting contaminated, aggressive or abrasive media, this type of valve has decisive advantages thanks to its simple function and optimized construction. Only the valve body and the replaceable diaphragm are in contact with the medium.

Applications

- Chemical process industry
- Microelectronics
- Water treatment
- Cooling
- Control applications

Actuator benefits/features

- Multiturn actuator
- Adjustable integrated heating
- 7-segment error display
- Position feedback (open/close)
- Fully automatic end position teach-in
- Integrated emergency manual override
- Retrofit set includes: Conversion kit with drive, half shells and screws

Valve benefits/features

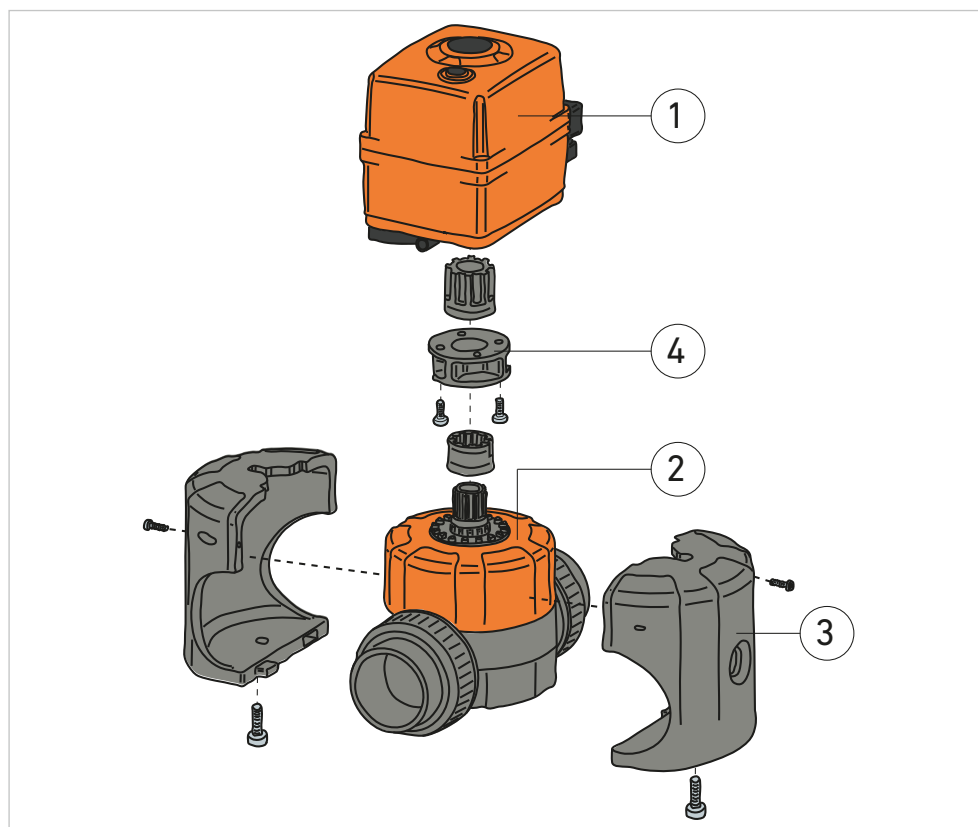
- Full plastic valve without metal screws
- No corrosion due to aggressive media/environment
- Constant leak-tightness in the event of changes in temperature without tightening screws
- Plastic-appropriate, highly stable connection of upper part and valve body by means of a buttress thread
- Maximum flow and linear characteristic curves for easier control
- Diaphragm geometry for longer service life

Possible flow media

- Contaminated, solid or ultrapure media

2.1.2 Technical data

The standard version of the EAMT electric actuator consists of the following elements:



- ① Electric actuator EAMT
- ② Diaphragm valve
- ③ Assembly shells
- ④ Intermediate elements

Specification diaphragm valve

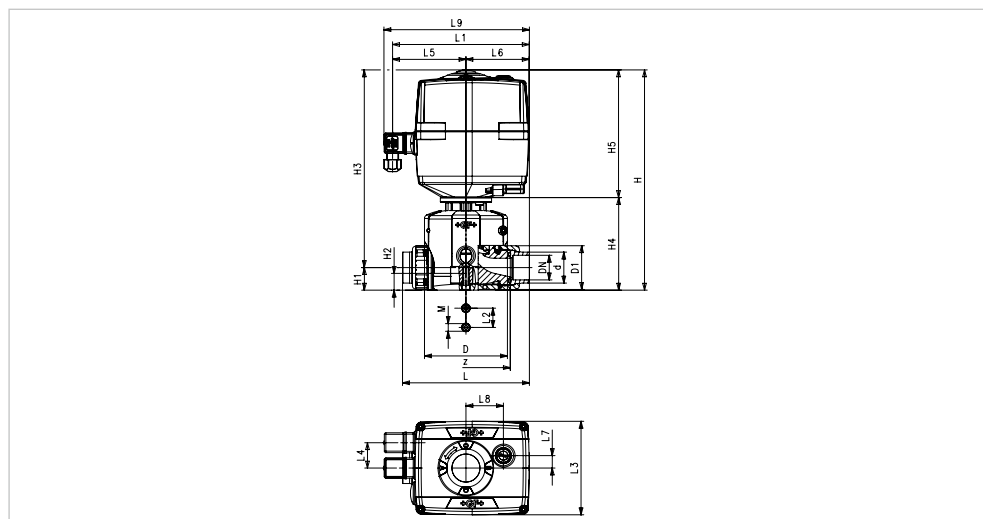
Dimensions	d32/DN25 and d63/DN50, ¾" - 2"	
Valve body materials	Type 514	PVC-U, PVC-C, ABS, PP-H, PVDF Retrofittable: PVDF-HP
	Type 515	PVC-U, PVC-C, ABS, PP-H, PVDF Retrofittable: PVDF-HP
	Type 517 (on request)	PVC-U, PVC-C, PP-H, PVDF
Housing nut materials	PPGF 30	
Gasket/diaphragm materials	EPDM, PTFE/EPDM, NBR, FKM, PTFE/FKM	
Pressure levels	DN25: PN10	
	DN50: PN6	
Connections	Type 514	Screw connection
	Type 515	Spigot
	Type 517 (on request)	Flange
Approvals	ACS, FDA, DIBt, CE	

Specification EAMT	
Power input max.	65 VA
Current (calculated)	0.55A at 100V 0.24A at 230V 2.5A at 24V
Power Supply	AC: 100 – 230 V, 50/60 Hz AC/DC: 24 V, 50/60 Hz
Supply voltage tolerance	-10%...+15%
Mechanical interface	F05* (WS 11/14)
Duty cycle	50 %
Cycle time open/close	DN25: ≈ 85 sec. DN50: ≈ 130 sec.
Tested cycles (at 20 °C and Mdn)	5000
Weight	2.2 kg / 4.85 lbs
Actuating angle	Multiturn
Protection class	IP 65 (IP67) ¹⁾ per EN 60529 Designed for wet & dry locations (NEC), designed for indoor use (UV light may cause discoloration)
Pollution degree	Operation: Pollution Level 3 Commissioning (open housing cover): Only in controlled environments of pollution level 2
Overload protection	Current/time dependent, resetting
Overvoltage category	II
Fuse	Internal: SMD fuse 2 A, not replaceable. Req. external breakers on all live wires: Rated Current: max. 16A Trip Curve: C, Standards Compliance: UL489, CSA C22.2 No. 5.1, IEC 60947-2
Ambient temp.	-10 °C to +50 °C (14°F to 122°F)
Max. installation altitude	2000m above sea level (AMSL)
Feedback relays	Mono-stable change-over contacts Either max 6A @ 230VAC or 24VDC, no mixed voltage potentials allowed!
Recommended connecting cable	AWG 18-16, UL/cUL AWM 4486 min. 125°C 1000V , outside diameter 8-13mm (cable glands), 4-9mm (DIN-connectors)
Allowable humidity	Max. 90 % relative humidity, non-condensing
Housing material	Housing: PP-GF (POLYFLAM, RPP 4225 CS1) Inspection glass: Udel P-1700 (CL2611) Assembly shells and intermediate elements: PPGF 30

¹⁾ When used with cable glands and vertical installation.

2.1.3 Dimensions

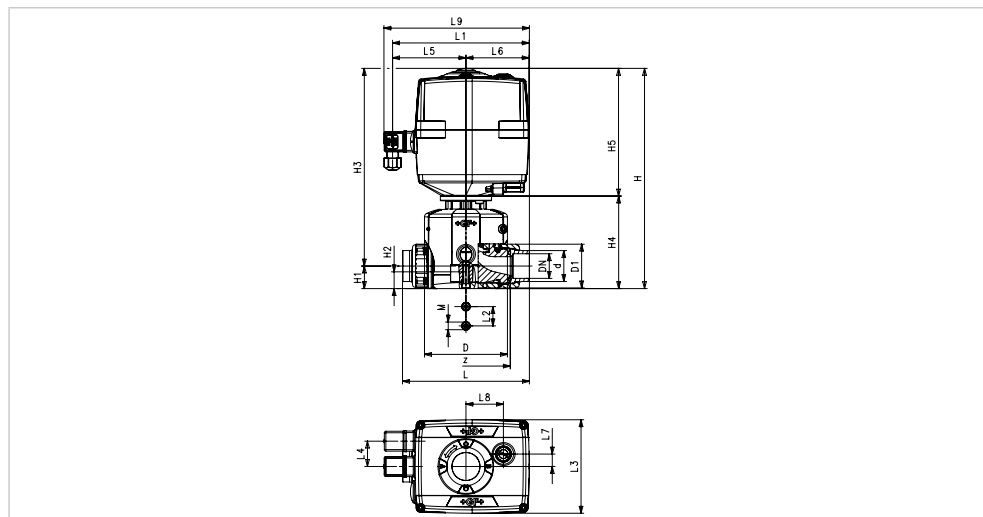
e-DIASTAR Type 514 with solvent cement sockets metric



d (mm)	DN (mm)	DN (inch)	D1 (mm)	H (mm)	H1 (mm)	H2 (mm)	H3 (mm)	H4 (mm)	M (mm)	L (mm)	L1 (mm)
32	25	1	58	286	30	20	256	121	M6	166	180
63	50	2	101	341	52.5	28.5	288.5	176	M8	266	180

d (mm)	DN (mm)	DN (inch)	L2 (mm)	L3 (mm)	L4 (mm)	L5 (mm)	L6 (mm)	L7 (mm)	L8 (mm)	D (mm)
32	25	1	25	122	33	97	82.5	16	49	108.5
63	50	2	45	122	33	97	82.5	16	49	168

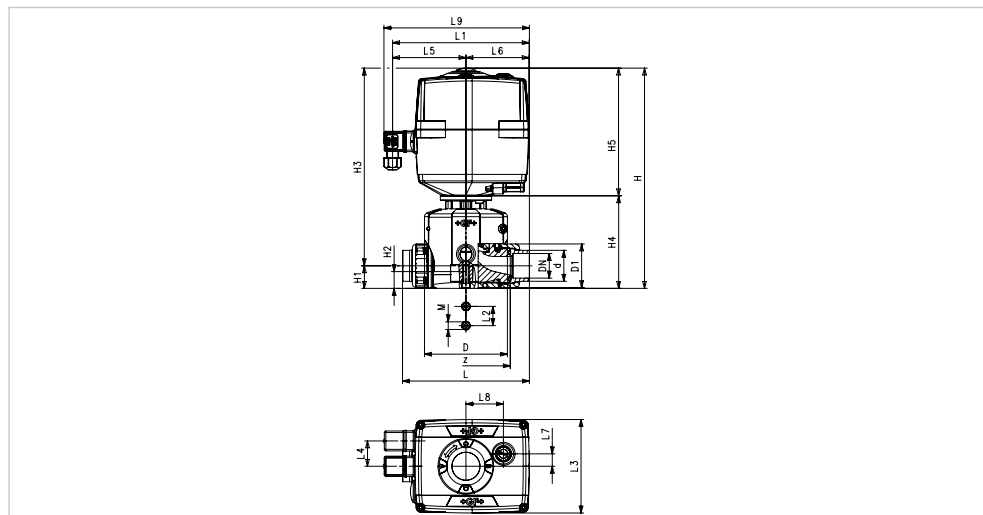
e-DIASTAR Type 514 with solvent cement sockets BS



d (mm)	DN (mm)	DN (inch)	D1 (mm)	H (mm)	H1 (mm)	H2 (mm)	H3 (mm)	H4 (mm)	M (mm)	L (mm)	L1 (mm)
32	25	1	58	286	30	20	256	121	M6	170	180
63	50	2	101	341	52.5	28.5	288.5	176	M8	265	180

d (mm)	DN (mm)	DN (inch)	L2 (mm)	L3 (mm)	L4 (mm)	L5 (mm)	L6 (mm)	L7 (mm)	L8 (mm)	D (mm)
32	25	1	25	122	33	97	82.5	16	49	108.5
63	50	2	45	122	33	97	82.5	16	49	168

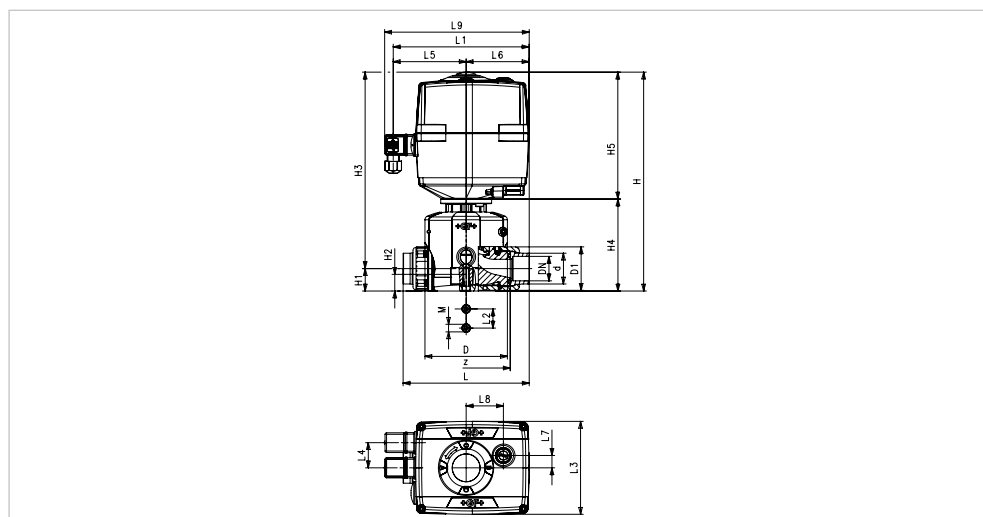
e-DIASTAR Type 514 with solvent cement sockets ASTM



d (mm)	DN (mm)	DN (inch)	D1 (mm)	H (mm)	H1 (mm)	H2 (mm)	H3 (mm)	H4 (mm)	M (mm)	L (mm)	L1 (mm)
32	25	1	58	286	30	20	256	121	M6	166	180
63	50	2	101	341	52.5	28.5	288.5	176	M8	266	180

d (mm)	DN (mm)	DN (inch)	L2 (mm)	L3 (mm)	L4 (mm)	L5 (mm)	L6 (mm)	L7 (mm)	L8 (mm)	D (mm)
32	25	1	25	122	33	97	82.5	16	49	108.5
63	50	2	45	122	33	97	82.5	16	49	168

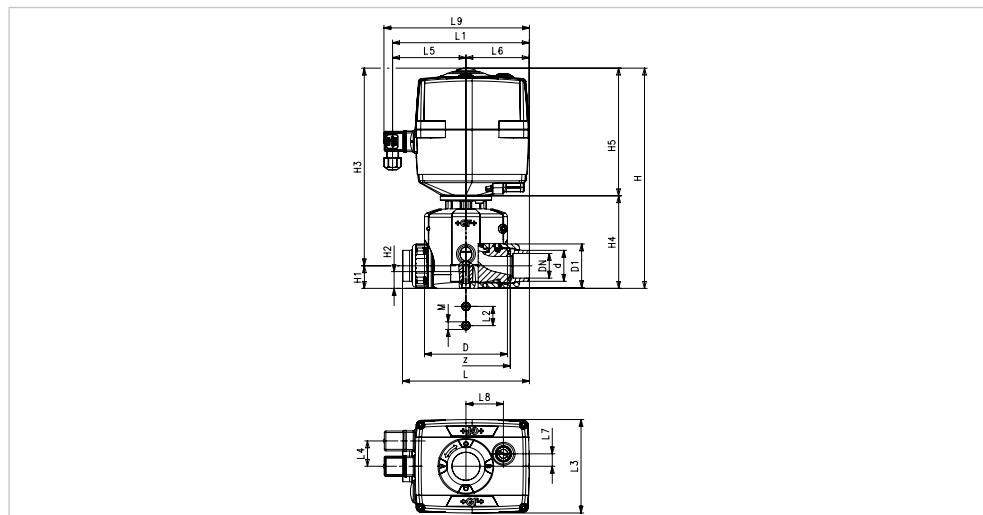
e-DIASTAR Type 514 with solvent cement sockets JIS



d (mm)	DN (mm)	DN (inch)	D1 (mm)	H (mm)	H1 (mm)	H2 (mm)	H3 (mm)	H4 (mm)	M (mm)	L (mm)	L1 (mm)
32	25	1	58	286	30	20	256	121	M6	170	180
63	50	2	101	341	52.5	28.5	288.5	176	M8	265	180

d (mm)	DN (mm)	DN (inch)	L2 (mm)	L3 (mm)	L4 (mm)	L5 (mm)	L6 (mm)	L7 (mm)	L8 (mm)	D (mm)
32	25	1	25	122	33	97	82.5	16	49	108.5
63	50	2	45	122	33	97	82.5	16	49	168

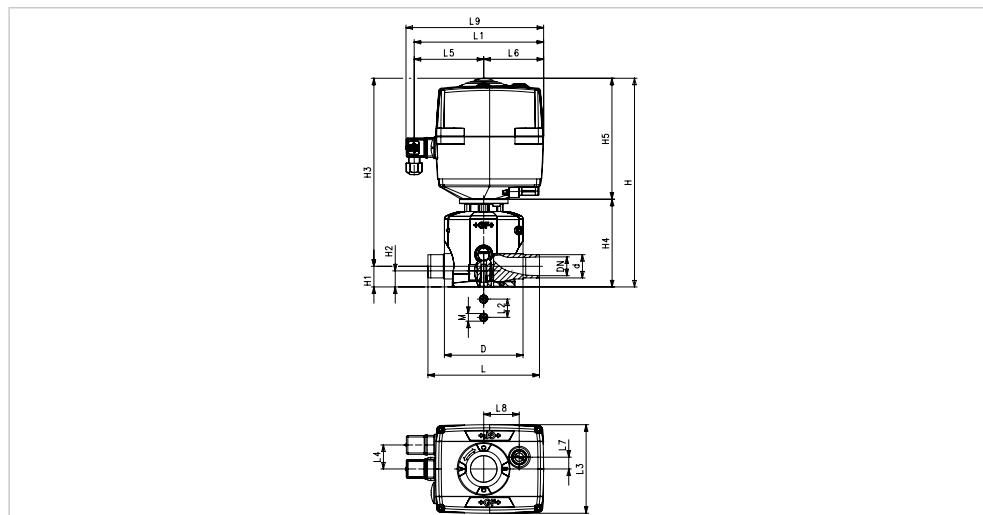
e-DIASTAR Type 514 with fusion sockets metric



d (mm)	DN (mm)	DN (inch)	D1 (mm)	H (mm)	H1 (mm)	H2 (mm)	H3 (mm)	H4 (mm)	M (mm)	L (mm)	L1 (mm)
32	25	1	62	287	30	20	256	121	M6	166	180
63	50	2	105	341	52.5	28.5	288.5	176	M8	266	180

d (mm)	DN (mm)	DN (inch)	L2 (mm)	L3 (mm)	L4 (mm)	L5 (mm)	L6 (mm)	L7 (mm)	L8 (mm)	D (mm)
32	25	1	25	122	33	97	82.5	16	49	108.5
63	50	2	45	122	33	97	82.5	16	49	168

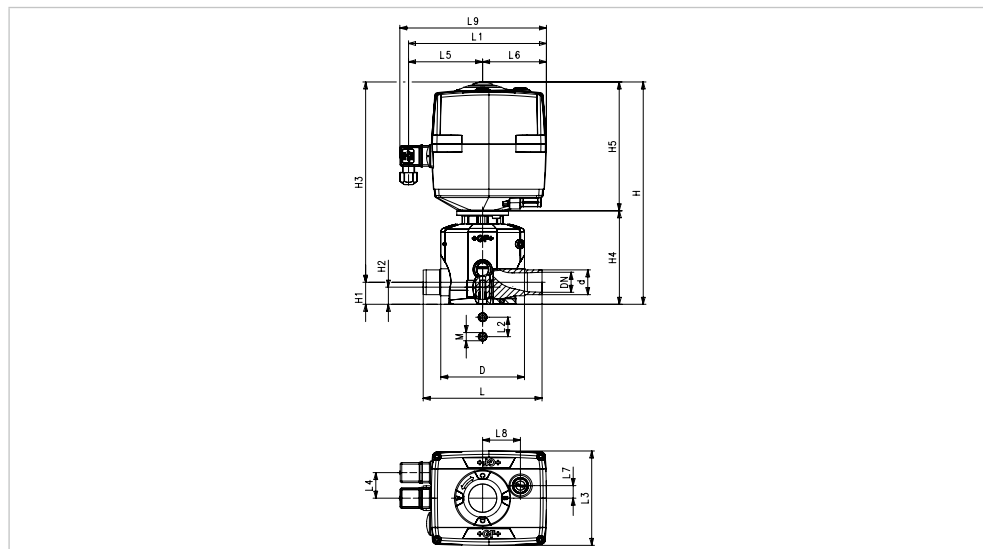
e-DIASTAR Type 515 with solvent cement spigots metric



d (mm)	DN (mm)	DN (inch)	D1 (mm)	H (mm)	H1 (mm)	H2 (mm)	H3 (mm)	H4 (mm)	M (mm)	L (mm)	L1 (mm)
32	25	1	58	286	30	20	256	121	M6	154	180
63	50	2	101	341	52.5	28.5	288.5	176	M8	223	180

d (mm)	DN (mm)	DN (inch)	L2 (mm)	L3 (mm)	L4 (mm)	L5 (mm)	L6 (mm)	L7 (mm)	L8 (mm)	D (mm)
32	25	1	25	122	33	97	82.5	16	49	108.5
63	50	2	45	122	33	97	82.5	16	49	168

e-DIASTAR Type 51x with socket fusion spigots metric



d (mm)	DN (mm)	DN (inch)	D1 (mm)	H (mm)	H1 (mm)	H2 (mm)	H3 (mm)	H4 (mm)	M (mm)	L (mm)	L1 (mm)
32	25	1	58	286	30	20	256	121	M6	154	180
63	50	2	101	341	52.5	28.5	288.5	176	M8	223	180

d (mm)	DN (mm)	DN (inch)	L2 (mm)	L3 (mm)	L4 (mm)	L5 (mm)	L6 (mm)	L7 (mm)	L8 (mm)	D (mm)
32	25	1	25	122	33	97	82.5	16	49	108.5
63	50	2	45	122	33	97	82.5	16	49	168

Kv 100-values

Type 514 – 517

Dim. (mm)	DN (mm)	Zoll (inch)	kv 100 (l/min)	Cv 100 (gal/min)	kv 100 (m³/h)
32	25	1	442	31	27
63	50	2	1575	109	95

2.1.4 Accessories

- Fail-safe return unit with integrated battery pack
- External fail-safe return unit
- Positioner 4-20 mA
- EA Demo Box



For further information on accessories, refer to the online product catalog at www.gfps.com

3 Diaphragm Valves, pneumatic

3.1 DIASTAR Type Six, Ten, TenPlus and Sixteen



3.1.1 Product description

DIASTAR Six

The DIASTAR Six is an affordable solution with a long service life for elastomer diaphragms with up to 6 bar media pressure. The actuator is compact and combines high quality with the basic functions of a pneumatic actuator. It is available with the control function fail safe to close (FC), but does not include any additional accessories.

DIASTAR Ten

Optimally suited for standard applications of up to 10 bar media pressure. Uncomplicated integration into the plant automation possible through the appropriate interface. Available with the control functions fail safe to close (FC), fail safe to open (FO) and double-acting (DA). Option of using PTFE diaphragms for aggressive chemicals.

DIASTAR TenPlus

This actuator is for high performance applications that require high closing forces. Regulation of up to 10 bar media pressure on both sides, such as occurs in ring pipe systems, is possible with this actuator. Available with the control function fail safe to close (FC), as well as in all diaphragm and pipe materials. An accessory interface for simple system integration is integrated.

DIASTAR Sixteen

This is the strongest actuator in the portfolio of GF Piping Systems. The high closing power in combination with the special housing nut guarantees safe regulation of media pressures of up to 16 bar in water applications. The actuator is equipped with an integrated accessory interface for system integration and is also available with the control functions fail safe to close (FC), fail safe to open (FO) and double-acting (DA).

Function

Diaphragm valves from GF Piping Systems are used for regulating, as well as closing, controlling and monitoring volume flows. Especially when transporting contaminated, aggressive or abrasive media, this type of valve has decisive advantages thanks to its simple function and optimized construction. Only the valve body and diaphragm come into contact with the medium.

The valve is suited for use with gases and liquids and can be installed in any location and completely drained. By applying pressure to the actuator, and through the force of the integrated spring assemblies (FC, FO), the position of the diaphragms is controlled and regulated.

Benefits/features

- Full plastic pipe valves without metal screws
- No corrosion caused by aggressive media
- Constant leak-tightness in the event of changes in temperature without tightening screws
- Plastic-appropriate, highly stable connection of upper part and valve body by means of a buttress thread
- Simple regulation via maximum flow and linear characteristic curve
- Optimized diaphragm geometry for a longer lifetime
- 90° rotatable air connection for flexible installation

Possible flow media

Contaminated, containing solids or ultrapure media.

Liquid and gaseous medium which do not negatively affect the physical and chemical properties of the respective housing and diaphragm material during normal mode.

Information on chemical resistance is available from the GF Piping Systems Sales Company or at www.gfps.com.

Applications

- Chemical process industry
- Microelectronics
- Water treatment
- Cooling
- Control applications

3.1.2 Technical basics

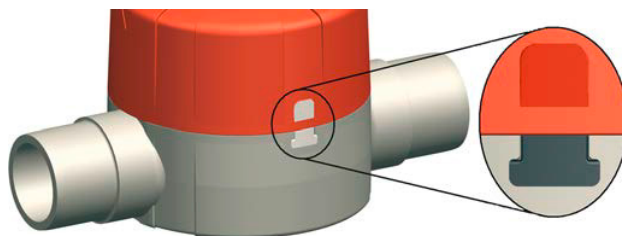
The actuators are available with the functions fail safe to close (FC), fail safe to open (FO) and double-acting (DA). The valves have an integrated optical position indicator. The actuator housings are made of PPGF (fiberglass-reinforced polypropylene). Actuators of the FC design have pre-tensioned spring assemblies made of galvanized steel, for safe operation and safe maintenance of the actuator.

i All diaphragm valves are manufactured in accordance with EN ISO 16138. The upper housing made of PPGF (fiberglass-reinforced polypropylene) is screwed together with the lower housing using a central plastic nut, which avoids exposed metal screws.

Indicator for diaphragm material

The color of the index plate on the valve body shows the type of diaphragm material:

Color	Diaphragm material
Black	EPDM
White	PTFE/EPDM
Green	PTFE/FKM
Red	FKM
Blue	NBR



Differentiation in functionalities – FC, FO, DA

Function	Name
FC	Fail safe to close
FO	Fail safe to open
DA	Fail safe double-acting

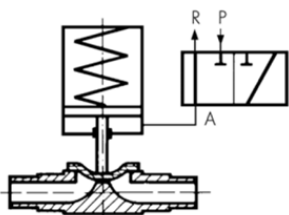
FC mode	FO mode	DA mode
In the non-operative state, the valve is closed by means of spring resistance. When the actuator is pressurized with the control pressure (bottom connection), the valve opens. When the control pressure escapes, the valve is closed via spring resistance.	In the non-operative state, the valve is opened by means of spring resistance. When the actuator is pressurized with the control pressure (top connection), the valve closes. When the control pressure escapes, the valve is opened via spring resistance.	The valve has no defined basic position. The valve is opened and closed by applying control pressure to the corresponding connection (top connection for closing, bottom connection for opening).

Selection of the solenoid valve and associated connecting thread

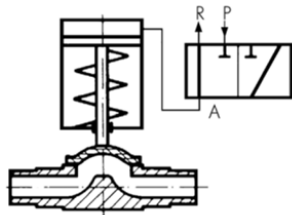
3/2-way solenoid valves are used to control single acting actuators (FC). They are mounted either directly to the actuator using a hollow screw or via a multiple connection plate or valve clusters, as required.

3/2-way solenoid valves are used to control single acting actuators (FO). They are mounted either directly to the actuator using a hollow screw or via a multiple connection plate or valve clusters, as required.

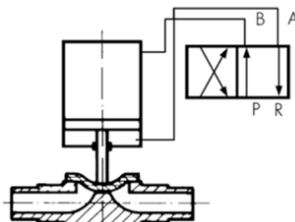
4/2-way or 5/2-way solenoid valves are used to control double-acting actuators (DA). They can be mounted either directly to the actuator using a NAMUR connector plate or via valve clusters.



FC mode with a 3/2-way solenoid valve for bottom connection



FO mode with a 3/2-way solenoid valve for top connection



The DA mode with a 4/2- or 5/2-way solenoid valve. Both connections are used.

Control pressure

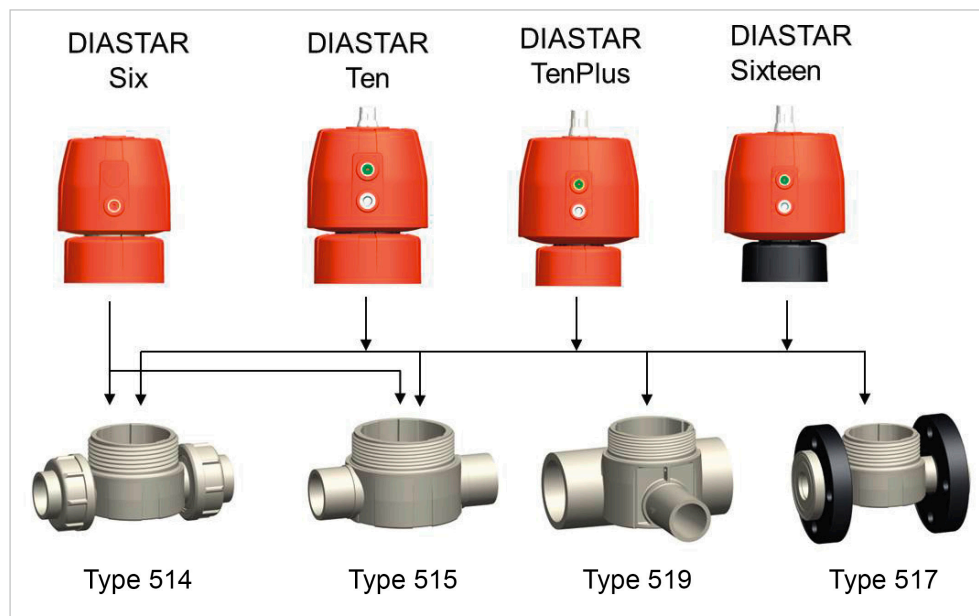
Function FC	Function FO	Function DA
6 bar maximum for function FC; low control pressures possible by reducing the spring assemblies. Depending on dimension, see table of pressure stages and control pressure diagrams.	5 bar maximum for the FO function. For dimension DN50 and from a medium pressure of 10 bar, the max. control pressure is 6 bar. Depending on the dimension, see table of pressure stages and control pressure diagrams.	5 bar maximum for the DA function. For dimension DN50 and from a medium pressure of 10 bar, the max. control pressure is 6 bar. Depending on the dimension, see table of pressure stages and control pressure diagrams.
Compressed air classes (ISO 8573-1) 2 or 3 at -10°C and 3 or 4 at T>0°C	Compressed air classes (ISO 8573-1) 2 or 3 at -10°C and 3 or 4 at T>0°C	Compressed air classes (ISO 8573-1) 2 or 3 at -10°C and 3 or 4 at T>0°C
From a medium pressure of 10 bar, the control pressure must be throttled (set actuator operating time to approx. 3s).	From a medium pressure of 10 bar, the exhaust air of the control pressure must be throttled (set actuator operating time to approx. 3s).	From a medium pressure of 10 bar, the exhaust air of the control pressure must be throttled (set actuator operating time to approx. 3s).
Temperature of the control medium max. 40°C	Temperature of the control medium max. 40°C	Temperature of the control medium max. 40°C
	Depending on the medium pressure, low control pressures can be selected.	Depending on the medium pressure, low control pressures can be selected.

Note: For optimum valve life, it is recommended to set the control pressure based on the medium pressure - see control pressure diagrams.

Diaphragms

Diaphragms in this Valve Type are heavily stressed components. In addition to the mechanical stress caused by wear and tear over several actuating cycles, the diaphragms are also subject to wear and tear due to the flow medium. We strongly recommend that you inspect and, if necessary, replace the diaphragms after 50,000 cycles.

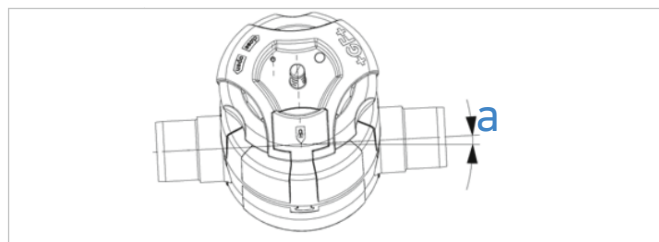
Connections



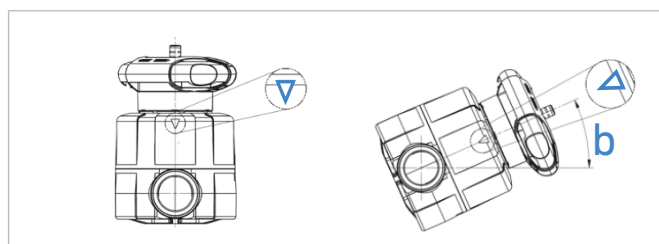
Installation angle for optimal draining of the valve

In order to achieve optimal drainage of these diaphragm valves, GF Piping Systems recommends installing them at the angles (a and b), which correspond to the respective dimension ranges. An installation inclination of about 1° to 2° is not taken into consideration with the stated angles.

Dimension	Angle a for types 514, 515, 517
d20/DN15	2
d25/DN20	2
d32/DN25	3
d40/DN32	4
d50/DN40	5
d63/DN50	7

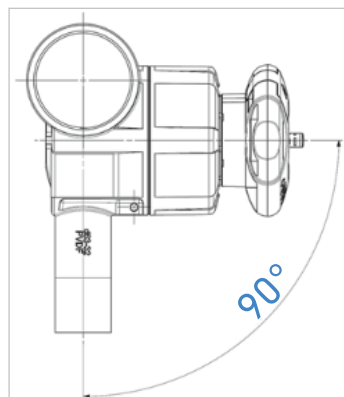


Dimension	Angle a for types 514, 515, 517
d20/DN15	27
d25/DN20	24
d32/DN25	25
d40/DN32	23
d50/DN40	24
d63/DN50	22



Optimum angle with one of the triangle legs horizontal.

Emptying angle for Type 519 is 90°, regardless of the dimension



Integrated fastening and PP mounting blocks

Integrated mounting

The diaphragm valve includes an integrated mounting. With this, the forces that can occur when operating the valve (e.g. breakaway torque) are absorbed. Thanks to the integrated mounting, operation forces are not transmitted to the piping system.

PP mounting block for diaphragm valves

The mounting blocks are designed to allow differently sized GF diaphragm valves to be aligned on the same pipe axis by equalizing the different heights from the mounting surface to the pipe axis. The blocks can also be used for the PVC diaphragm Valve Type 514 for equalizing the coupling nut with the mounting surface.

- Material: PP-GF15, black
- 5 sizes, numbered from 1 to 5
- Can be plugged together to achieve the desired height

Valve handling

Installation notes

Relation between the pipe pressure and spring assemblies

The closing forces of the actuators were designed for the specified PN pressure level. Operation with low pipe pressure can cause increased diaphragm wear. In order to extend the diaphragm life span, the number of spring assemblies can be reduced. For the specific dimensioning, please contact your representative at GF Piping Systems.



DIASTAR Six

For low pressure applications

- DN20 to DN50
- FC-function
- Cost effective



DIASTAR Ten

All-rounder for standard applications

- DN15 to DN50
- FC-, FO and DA-function



DIASTAR TenPlus

Use only when pressure is applied from both sides

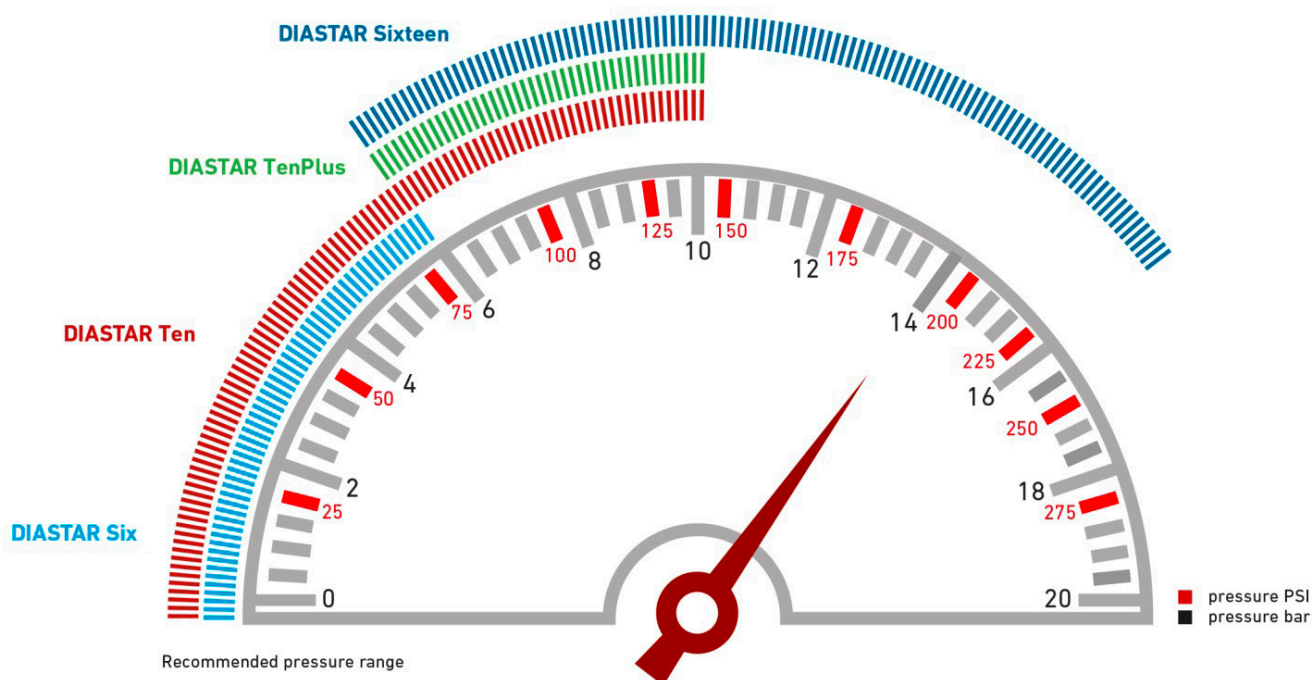
- DN15 to DN50
- FC-function



DIASTAR Sixteen

For water applications with high pressure

- DN15 to DN50
- FC-, FO-, DA-function



- The pneumatic diaphragm valve DIASTAR Six can be used from 0 to 6 bar. If the pipe pressure is below 2 bar, a reduction in the spring assemblies should be considered.
- The pneumatic diaphragm valve DIASTAR Ten is suitable for use with a pipe pressure from 0 to 10 bar. For optimal valve lifespan, note that the spring assemblies should be reduced in the event of pipe pressures < 2 bar.
- For pipe pressures from 4-6 to 10 bar, DIASTAR TenPlus should be used on both sides.
- The DIASTAR Sixteen should be used for pipe pressures between 6 and 16 bar. When using with a pipe pressure below 8 bar, the adjustment of the spring assemblies is recommend.

Ensure that the diaphragm valve and the spring assemblies are each designed in accordance with the medium pressure. Reducing the spring assemblies leads to a reduced closing force. When the medium pressure rises, the valve cannot close or cannot close completely if spring assemblies are missing. This can have a negative impact on the process.

Maintenance notes

We recommend regular inspection of the diaphragm and the valve body, at the latest after:

- 100,000 operations at less than 10 bar nominal pressure at 20 °C with water
- 50,000 operations at more than 10 bar nominal pressure at 20 °C with water

Should the flow medium show increased temperatures, chemicals, or particles that cause abrasion, we recommend more frequent monitoring. The diaphragm can be controlled by professionally dismounting the housing nut.

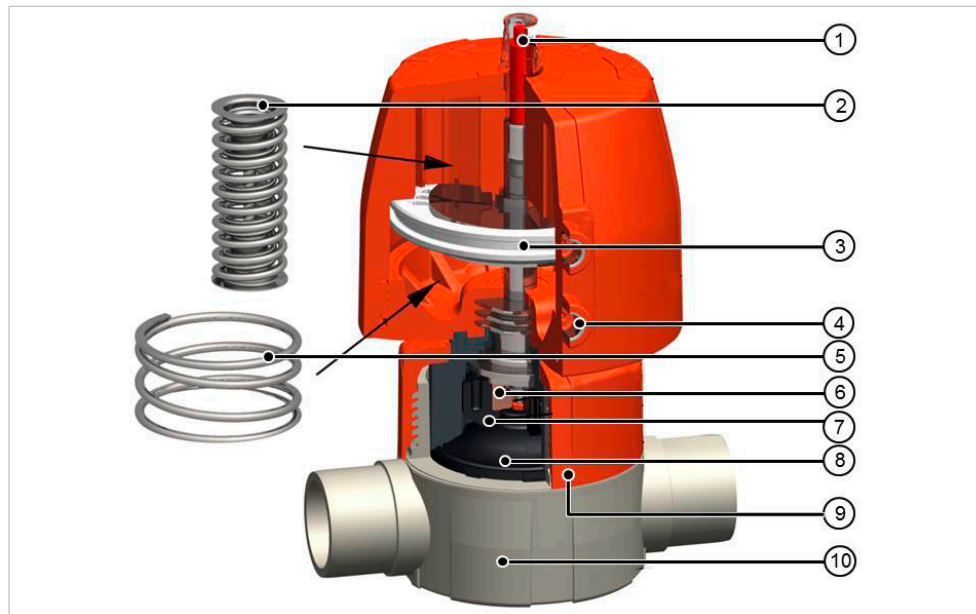


Installation and maintenance must be performed in accordance with the corresponding installation manual. The installation manual can be downloaded via the QR code on the enclosed quick start guide, see also the online product catalog at www.gfps.com

Tips for installation

- The direction of flow and mounting position may be chosen freely.

3.1.3 Technical data



- ① Optical position indicator with cap
 - ② Pre-loaded spring assemblies for FC mode
 - ③ Lifting piston
 - ④ Air connections
 - ⑤ Spring for FO mode
 - ⑥ Diaphragm holder
 - ⑦ Pressure piece
 - ⑧ Diaphragms
 - ⑨ All-plastic housing
 - ⑩ Valve body
- DA mode does not use any springs.

























Specification

Approved media		Liquid and gaseous media which, in normal operation, do not adversely affect the physical and chemical properties of the respective housing and diaphragm material. Information on chemical resistance is available from the Georg Fischer Sales Company or at www.gfps.com .				
Dimensions		Type Six	d20/DN15 – d63/DN50, ½" – 2"			
		Type Ten	d20/DN15 – d63/DN50, ½" – 2"			
		Type TenPlus	d20/DN15 – d63/DN50, ½" – 2"			
		Type Sixteen	d20/DN15 – d63/DN50, ½" – 2"			
Materials	Valve body	Type Six	PVC-U, PVC-C, ABS, PP-H			
		Type Ten	PVC-U, PVC-C, ABS, PP-H, PP-N, PVDF, PVDF-HP			
		Type TenPlus	PVC-U, PVC-C, ABS, PP-H, PP-N, PVDF, PVDF-HP			
		Type Sixteen	PVC-U, PVC-C, ABS, PVDF, PVDF-HP			
	Housing nut	PPGF 30 for PN10				
		PPSGF40 for PN16 (only for water applications)				
	Gasket/ diaphragm ¹⁾	Membrane	NBR	FKM	EPDM	PTFE
O-Ring	EPDM	FKM	EPDM	FKM		
Operating tempera- ture ²⁾ (valve body material)		PVC-U	0 to 60 °C			
		PVC-C	0 to 80 °C			
		ABS	-30 to 60 °C			
		PP	0 to 80 °C			
		PVDF	-20 to 140 °C			
Functions		Type Six	FC			
		Type Ten	FC, FO, DA			
		Type TenPlus	FC			
		Type Sixteen	FC, FO, DA			
Actuation		Pneumatic				
Pressure ratings		Type Six	PN6			
		Type Ten	PN10			
		Type TenPlus	PN10 on both sides			
		Type Sixteen	PN16			
Approvals		ACS, FDA, DIBt, TA Luft, NAMSA				

¹⁾ Other combinations on request.

²⁾ According to pressure-temperature diagram. Temperature ranges may vary depending on the seal material combination.

Actuator sizes DIASTAR

DN	Six FC	Ten DA/F0/FC	Sixteen FC	Sixteen DA/F0
15	 1	 1	 2	 1
20	 2	 2	 2	 2
25	 2	 2	 3	 2
32	 3	 3	 4	 3
40	 3	 4	 5	 4
50	 3	 4	 5	 4

Kv 100 values

Type 514 – 517

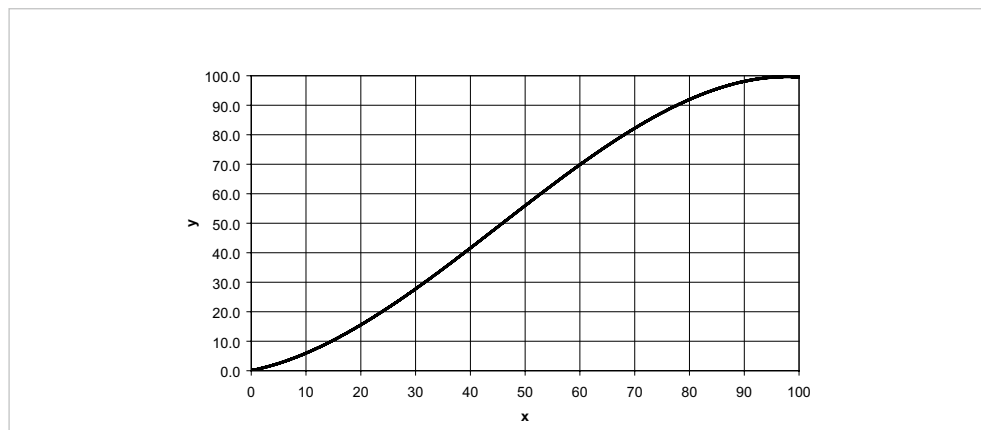
Dim. (mm)	DN (mm)	inch (inch)	kv 100 (l/min)	Cv 100 (gal/min)	kv 100 (m³/h)
20	15	½	125	9	8
25	20	¾	271	19	16
32	25	1	481	33	29
40	32	1 ¼	759	52	45
50	40	1 ½	1263 (960 ¹⁾)	87	76
63	50	2	1728 (1181 ¹⁾)	119	104

1) DIASTAR SIX

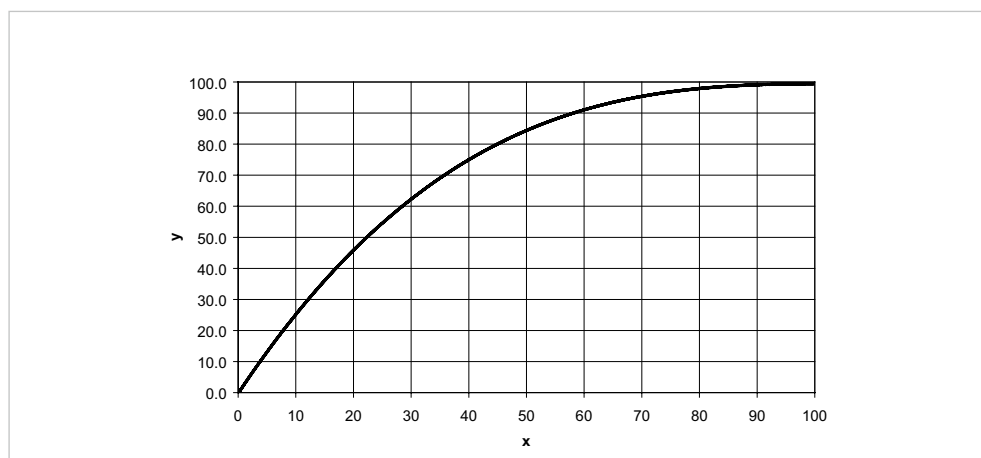
Type 519

Dim. (mm)	DN (mm)	Inch (inch)	d1 (mm)	DN1 (mm)	Inch (inch)	kv 100 (l/min)	Cv 100 (gal/min)	kv 100 (m³/h)
20	15	½	20	15	½	57	4	3
25	20	¾	20	15	½	89	6	5
25	20	¾	25	20	¾	118	8	7
32	25	1	20	15	½	80	6	5
32	25	1	25	20	¾	105	7	6
32	25	1	32	25	1	231	16	14
40	32	1 ¼	20	15	½	85	6	5
40	32	1 ¼	25	20	¾	119	8	7
40	32	1 ¼	32	25	1	153	11	9
40	32	1 ¼	40	32	1 ¼	187	13	11
50	40	1 ½	20	15	½	86	6	5
50	40	1 ½	25	20	¾	160	11	10
50	40	1 ½	32	25	1	206	14	12
50	40	1 ½	40	32	1 ¼	524	36	31
50	40	1 ½	50	40	1 ½	667	46	40
63	50	2	20	15	½	84	6	5
63	50	2	25	20	¾	150	11	9
63	50	2	32	25	1	184	13	11
63	50	2	40	32	1 ¼	471	32	28
63	50	2	50	40	1 ½	610	42	37
63	50	2	36	50	2	747	52	45
90	80	3	20	15	½	82	6	5
90	80	3	25	20	¾	103	7	6
90	80	3	32	25	1	129	9	8
90	80	3	50	40	1 ½	623	43	37
90	80	3	36	50	2	696	48	42
110	100	4	20	15	½	78	5	4
110	100	4	25	20	¾	103	7	6
110	100	4	32	25	1	131	9	8
110	100	4	50	40	1 ½	604	42	36
110	100	4	36	50	2	661	46	40

Flow characteristics Type 514 – 517



Flow characteristics Type 519



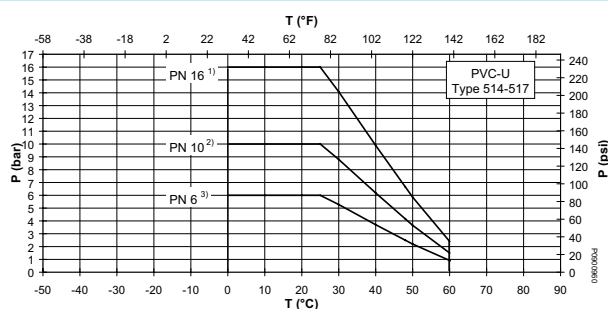
Pressure-temperature diagrams

The following pressure-temperature diagrams are based on a lifetime of 25 years and water or similar media.

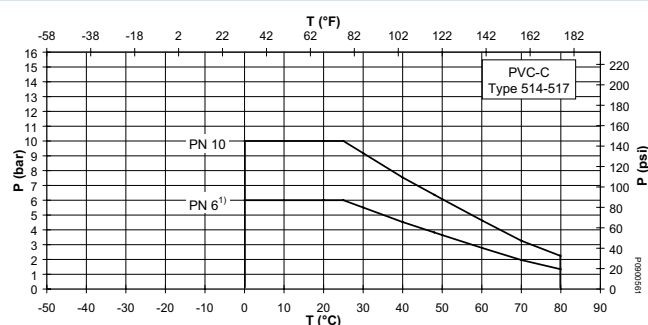
T Temperature (°C, °F)

P Permissible pressure (bar, psi)

PVC-U



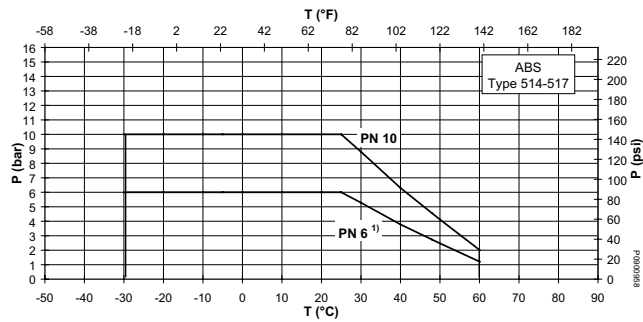
PVC-C



- 1) Only with black housing nut
- 2) Depending on the connection type and actuator, the nominal pressure is reduced to PN10
- 3) Depending on the connection type and actuator, the nominal pressure is reduced to PN6

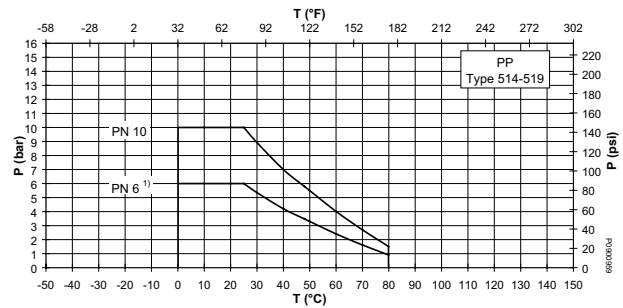
- 1) Depending on the connection type and actuator, the nominal pressure is reduced to PN6

ABS



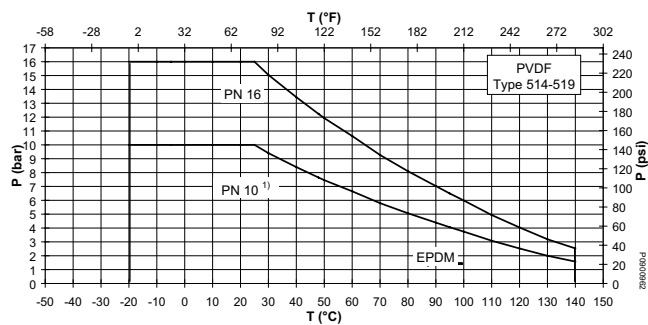
- 1) Depending on the connection type and actuator, the nominal pressure is reduced to PN6

PP



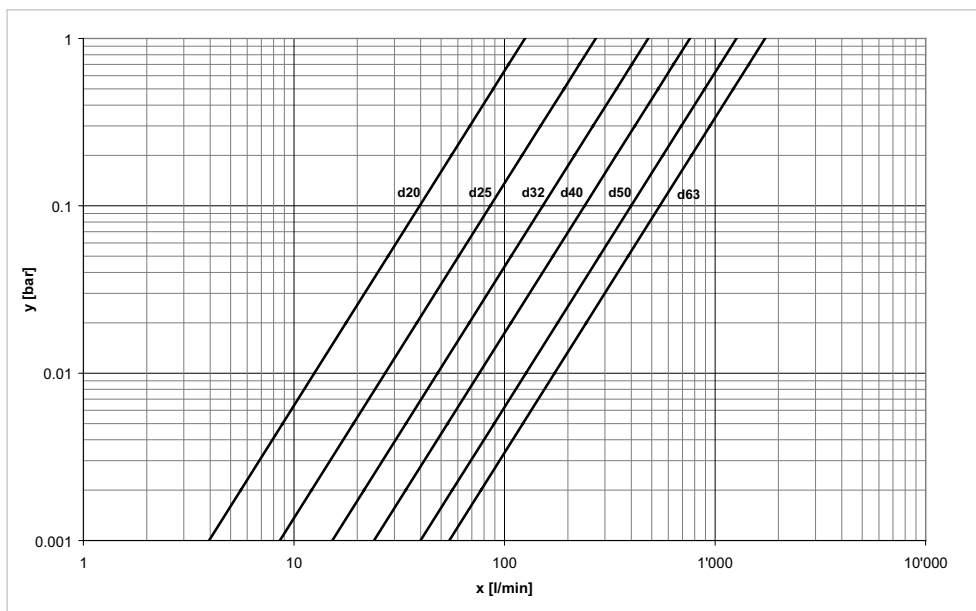
- 1) Depending on the connection type and actuator, the nominal pressure is reduced to PN6

PVDF



- 1) PN16 only with black PPS housing nut. Depending on the connection type and actuator, the nominal pressure is reduced to PN10

Pressure losses



- X Flow rate
(l/min, US gal/min)
Y Pressure loss Δp (bar, psi)

Air connection


	DIASTAR Six (FC)	DIASTAR Ten (FC/FO/DA)	DIASTAR Ten Plus (FC)	DIASTAR Sixteen (FC)	(FO/DA)
20DN15	G 1/8"	G 1/8"	G 1/8"	G 1/8"	
25DN20	G 1/8"	G 1/8"	G 1/8"	G 1/8"	
32DN25	G 1/8"	G 1/8"	G 1/8"	G 1/8"	
40DN32	G 1/8"	G 1/8"	G 1/4"	G 1/4"	G 1/8"
50DN40	G 1/8"	G 1/4"	G 1/4"	G 1/4"	
63DN50	G 1/8"	G 1/4"	G 1/4"	G 1/4"	

Control volume



	DIASTAR Six (FC) [dm ³]	DIASTAR Ten (FC) [dm ³]	DIASTAR Ten (FO) [dm ³]	DIASTAR Ten (DA) [dm ³]		DIASTAR Ten Plus (FC) [dm ³]	DIASTAR Sixteen (FC) [dm ³]
				close	open		
20DN15	0.04	0.04	0.07	0.07	0.04	0.10	0.10
25DN20	0.12	0.12	0.20	0.20	0.12	0.12	0.12
32DN25	0.12	0.12	0.23	0.23	0.12	0.22	0.22
40DN32	0.24	0.24	0.44	0.44	0.24	0.40	0.40
50DN40	0.24	0.42	0.86	0.86	0.42	0.70	0.70
63DN50	0.24	0.44	0.86	0.86	0.44	0.80	0.80

Pressure ratings



DIASTAR Six FC

Valve body material	PVC-U, PVC-C, ABS, PP-H, PP-N	
	Pressure rating [bar]	Max. control pressure ²⁾ [bar]
DN	EPDM¹⁾	
20DN15	6	2.6
25DN20	6	3.8
32DN25	6	3.8
40DN32	6	3.8
50DN40	6	3.8
63DN50	6	5.5
Medium pressure	 One sided applied	

DIASTAR Ten FC

Valve body material	PVC-U, PVC-C, ABS, PP-H, PVDF, PVDF-HP, PP-N		
	Pressure rating [bar]		Max. control pressure ²⁾ [bar]
DN	EPDM¹⁾	PTFE	
20DN15	10	10/6*	5.4
25DN20	10	10/6*	5.4
32DN25	10	10/6*	5.4
40DN32	10	10/6*	5.4
50DN40	10	10/6*	5.4
63DN50	10	6/5	5.4
Medium pressure	 One sided applied	 One sided applied	

DIASTAR Ten F0/DA

Valve body material	PVC-U, PVC-C, ABS, PP-H, PVDF, PVDF-HP, PP-N		
	Pressure rating [bar]		Max. control pressure ²⁾ [bar]
DN	EPDM¹⁾	PTFE	EPDM¹⁾
20DN15	10	10/6*	4.5
25DN20	10	10/6*	4.5
32DN25	10	10/6*	4.5
40DN32	10	10/6*	4.5
50DN40	10	10/6*	3.5
63DN50	10	10/6*	3.5
Medium pressure	 One sided applied	 One sided applied	



*With medium pressure applied on both sides.

¹⁾ Also applies to other elastomer diaphragms such as FKM, NBR, etc.



²⁾ At 0 bar medium pressure.

³⁾ At 10 bar medium pressure.

DIASTAR Ten Plus FC

Valve body material	PVC-U, PVC-C, ABS, P-H, PVDF, PVDF-HP		
	Pressure rating [bar]	Max. control pressure ²⁾ [bar]	
DN	EPDM ¹⁾	PTFE	
20DN15	10	10	5.4
25DN20	10	10	5.4
32DN25	10	10	5.4
40DN32	10	10	5.4
50DN40	10	10	5.4
63DN50	10	10	5.4
Medium pressure			
	Both sides applied	Both sides applied	

DIASTAR Sixteen FC

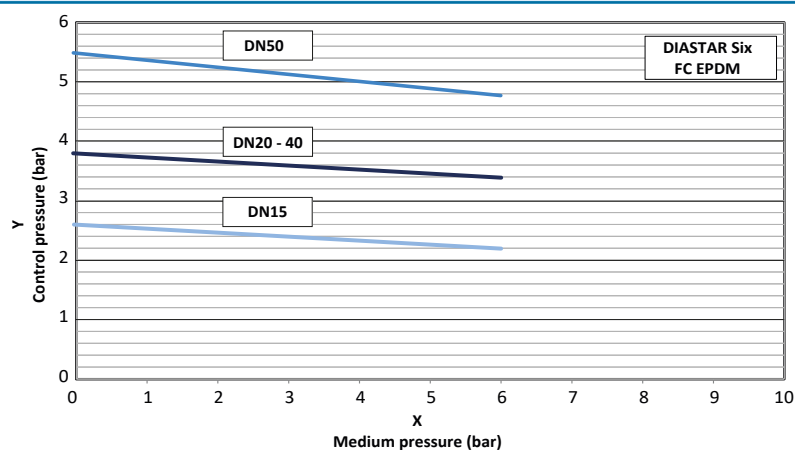
Valve body material	PVC-U, PVDF, PVDF-HP		
	Pressure rating [bar]	Max. control pressure ²⁾ [bar]	
DN	EPDM ¹⁾	PTFE	
20DN15	16	16	5.5
25DN20	16	16	5.5
32DN25	16	16	5.5
40DN32	16	16	5.5
50DN40	16	16	5.5
63DN50	16	10	5.5
Medium pressure			
	One sided applied	One sided applied	

¹⁾ Also applies to other elastomer diaphragms such as FKM, NBR, etc.

²⁾ At 0 bar medium pressure.

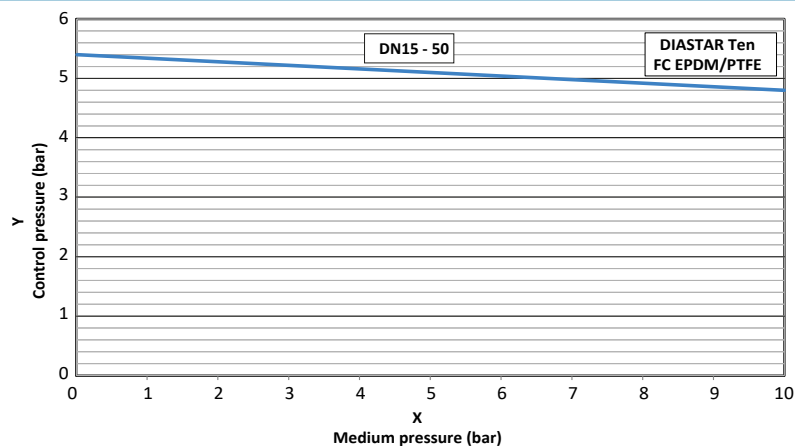
Control pressure diagrams

DIASTAR Six FC with EPDM* diaphragm



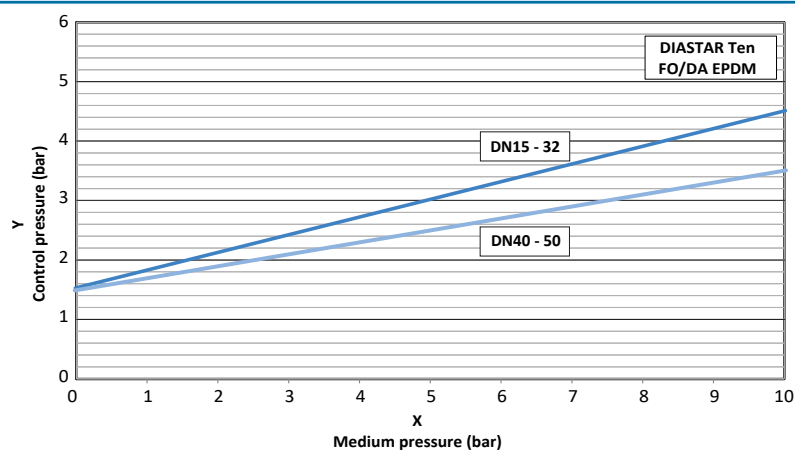
X Media pressure
Y Control pressure

DIASTAR Ten FC with EPDM* or PTFE diaphragm



X Media pressure
Y Control pressure

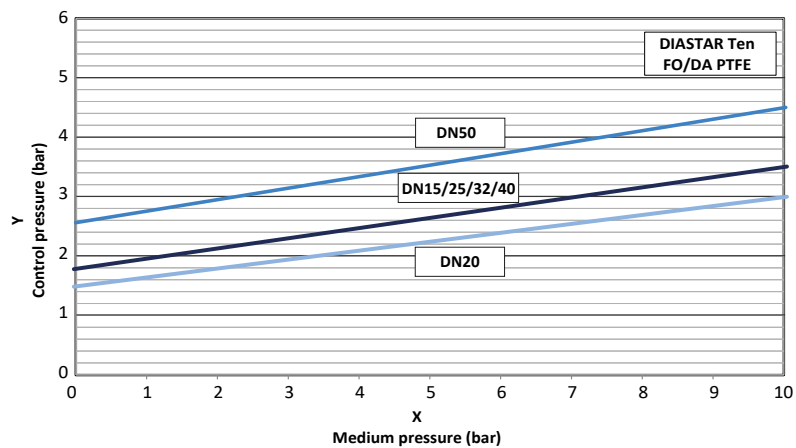
DIASTAR Ten FO and DA with EPDM* diaphragm



X Media pressure
Y Control pressure

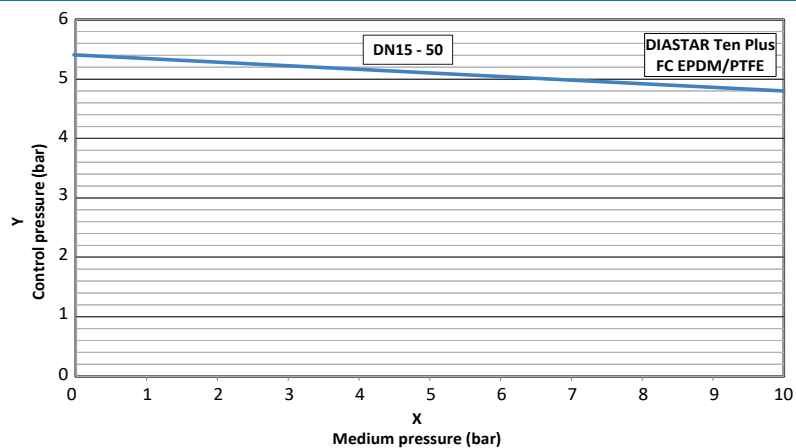
* also applies to other elastomer diaphragms such as FKM, NBR, etc.

DIASTAR Ten FO and DA with PTFE diaphragm



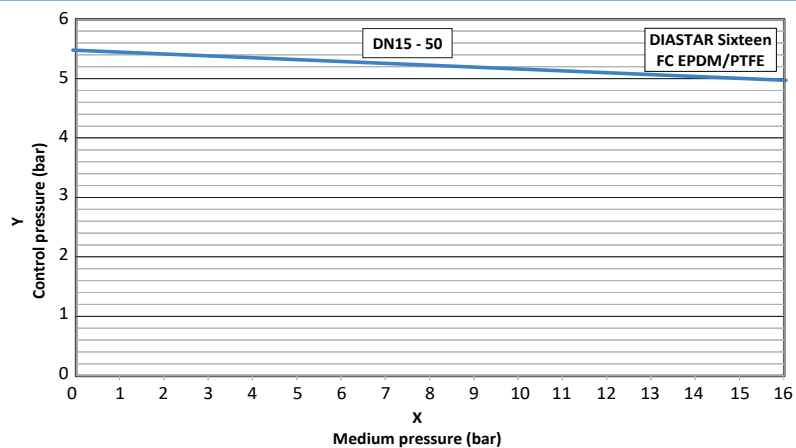
X Media pressure
Y Control pressure

DIASTAR Ten Plus FC with EPDM* or PTFE diaphragm



X Media pressure
Y Control pressure

DIASTAR Sixteen FC with EPDM* or PTFE diaphragm

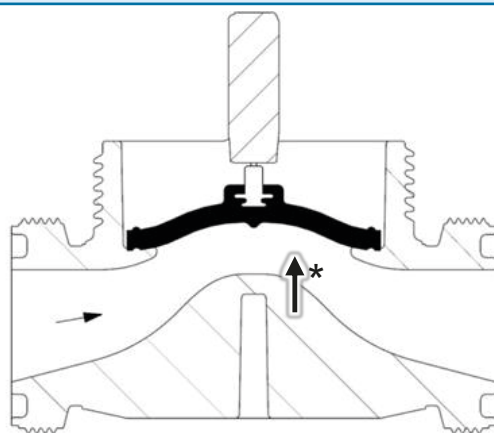


X Media pressure
Y Control pressure

* also applies to other elastomer diaphragms such as FKM, NBR, etc.

Valve stroke

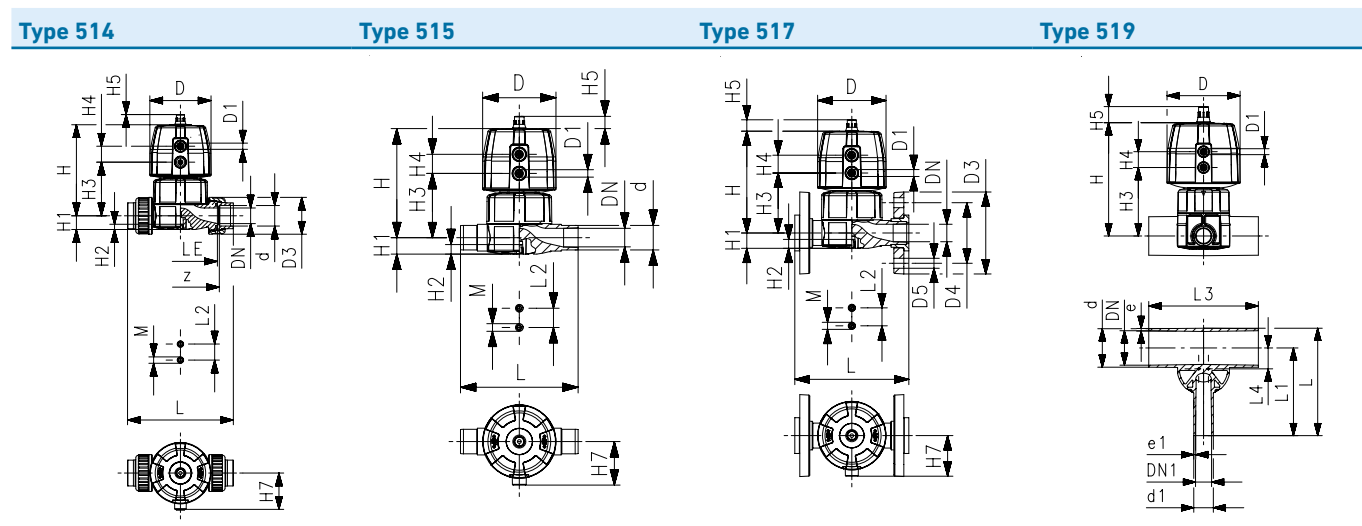
Valve stroke



* Max. Valve stroke

DN (mm)	Actuator		Valve stroke Reference (mm)
	Size	Version	
15	1	Six, 604/605	6.0
	1	Ten	6.0
			6.0
20	2	Sixteen	6.0
	2	Six	9.0
	2	Ten	9.0
25	2	Sixteen	9.0
	2	Six	12.0
	2	Ten	12.0
32	3	Sixteen	12.0
	3	Six	14.0
	3	Ten	14.0
40	4	Sixteen	14.0
	3	Six	14.0
	4	Ten	14.0
50			14.0
	5	Sixteen	14.0
	3	Six	14.0
			14.0
	4	Ten	22.0
	5	Sixteen	22.0

3.1.4 Dimensions



DIASTAR Six FC (Type 514 – 517)

Dim. (mm)	DN (mm)	Inch (inch)	D (mm)	D1 (inch)	D4 (mm)	D5 (mm)	L(1) (mm)	L(2) (mm)	L(3) (mm)	L(4) (mm)	L(5) (mm)	L(6) (mm)	L(7) (mm)
20	15	½	68	⅝	65	14	128	128	128	224	196	124	124
25	20	¾	96	⅝	75	14	152	152	150	250	221	144	144
32	25	1	96	⅝	85	14	166	166	162	262	234	154	154
40	32	1 ¼	120	⅝	100	18	192	192	184	296	260	174	174
50	40	1 ½	120	⅝	110	18	222	222	210	328	284	194	194
63	50	2	120	⅝	125	18	266	266	248	370	321	224	224

Dim. (mm)	DN (mm)	Inch (inch)	L(8) (mm)	L(9) (mm)	L2 (mm)	H (mm)	H1 (mm)	H2 (mm)	H3 (mm)	H7 (mm)	M	Z (mm)	LE	z for L(3)	Hx (mm)
20	15	½	124	130	25	101	14	12	60	43	M6	96	90	100	7
25	20	¾	144	150	25	132	18	12	73	57	M6	114	108	118	10
32	25	1	154	160	25	143	22	12	84	57	M6	122	116	126	13
40	32	1 ¼	174	180	45	173	26	15	99	69	M8	140	134	144	14
50	40	1 ½	194	200	45	193	32	15	119	69	M8	160	154	164	16
63	50	2	224	230	45	205	39	15	132	69	M8	190	184	194	16

DIASTAR Ten FC (Type 514 – 517)

Dim. (mm)	DN (mm)	Inch (inch)	D (mm)	D1 (inch)	D4 (mm)	D5 (mm)	L(1) (mm)	L(2) (mm)	L(3) (mm)	L(4) (mm)	L(5) (mm)	L(6) (mm)	L(7) (mm)	L(8) (mm)
20	15	½	68	⅝	65	14	128	128	128	224	196	124	124	124
25	20	¾	96	⅝	75	14	152	152	150	250	221	144	144	144
32	25	1	96	⅝	85	14	166	166	162	262	234	154	154	154
40	32	1 ¼	120	⅝	100	18	192	192	184	296	260	174	174	174
50	40	1 ½	150	¾	110	18	222	222	210	328	284	194	194	194
63	50	2	150	¾	125	18	266	266	248	370	321	224	224	224

Dim. (mm)	DN (mm)	inch (inch)	L(9) (mm)	L2 (mm)	H (mm)	H1 (mm)	H2 (mm)	H3 (mm)	H4 (mm)	H5 (mm)	H7 (mm)	M	z (mm)	LE	z for L(3)	Hx (mm)
20	15	½	130	25	101	14	12	60	24	16	43	M6	96	90	100	7
25	20	¾	150	25	132	18	12	73	25	16	57	M6	114	108	118	10
32	25	1	160	25	143	22	12	84	25	16	57	M6	122	116	126	13
40	32	1 ¼	180	45	173	26	15	99	26	26	69	M8	140	134	144	15
50	40	1 ½	200	45	214	32	15	119	36	26	88	M8	160	154	164	19
63	50	2	230	45	226	39	15	132	36	26	88	M8	190	184	194	23

DIASTAR Ten FO/DA (Type 514 – 517)

Dim. (mm)	DN (mm)	Inch (inch)	D (mm)	D1 (inch)	D4 (mm)	D5 (mm)	L(1) (mm)	L(2) (mm)	L(3) (mm)	L(4) (mm)	L(5) (mm)	L(6) (mm)	L(7) (mm)	L(8) (mm)
20	15	½	68	⅛	65	14	128	128	128	224	196	124	124	124
25	20	¾	96	⅛	75	14	152	152	150	250	221	144	144	144
32	25	1	96	⅛	85	14	166	166	168	262	234	154	154	154
40	32	1 ¼	120	⅛	100	18	192	192	184	296	260	174	174	174
50	40	1 ½	150	¼	110	18	222	222	210	328	284	194	194	194
63	50	2	150	¼	125	18	266	266	248	370	321	224	224	224

Dim. (mm)	DN (mm)	Inch (inch)	L(9) (mm)	L2 (mm)	H (mm)	H1 (mm)	H2 (mm)	H3 (mm)	H4 (mm)	H5 (mm)	H7 (mm)	M	z (mm)	LE	z for L(3)	Hx (mm)
20	15	½	130	25	101	14	12	60	24	16	43	M6	96	90	100	7
25	20	¾	150	25	132	18	12	73	25	16	57	M6	114	108	118	10
32	25	1	160	25	147	22	12	84	25	16	57	M6	122	116	126	13
40	32	1 ¼	180	45	173	26	15	99	26	26	69	M8	140	134	144	15
50	40	1 ½	200	45	214	32	15	119	36	26	88	M8	160	154	164	19
63	50	2	230	45	226	39	15	132	36	26	88	M8	190	184	194	23

DIASTAR Ten FO/DA (Type 519)

Dim. (mm)	d1 (mm)	DN (mm)	inch (inch)	DN1 (mm)	Zoll1 (inch)	DN2 (mm)	Inch2 (inch)	D (mm)	D1 (inch)	L(6) (mm)	L1 (mm)	L3 (mm)	L4 (mm)	H (mm)	H3 (mm)	H4 (mm)	H5 (mm)	Hx (mm)
20	20	15	½	15	½	15	½	68	⅛	117	96	162	12	104	63	24	16	7
25	20	20	¾	15	½	20	¾	96	⅛	133	108	162	16	131	73	25	16	10
25	25	20	¾	20	¾	20	¾	96	⅛	133	108	162	16	131	73	25	16	10
32	20	25	1	15	½	20	¾	96	⅛	142	120	162	19	135	76	25	16	10
32	25	25	1	20	¾	20	¾	96	⅛	142	120	162	19	135	76	25	16	10
32	32	25	1	25	1	25	1	96	⅛	145	120	160	19	143	84	25	16	13
40	20	32	1 ¼	15	½	25	1	96	⅛	149	128	180	23	151	92	25	16	13
40	25	32	1 ¼	20	¾	25	1	96	⅛	149	128	180	23	151	92	25	16	13
40	32	32	1 ¼	25	1	25	1	96	⅛	149	128	180	23	151	92	25	16	13
40	40	32	1 ¼	32	1 ¼	25	1	96	⅛	174	153	180	23	151	92	25	16	13
50	20	40	1 ½	15	½	20	¾	96	⅛	160	134	180	27	148	90	25	16	10
50	25	40	1 ½	20	¾	25	1	96	⅛	160	134	180	28	156	97	25	16	13
50	32	40	1 ½	25	1	25	1	96	⅛	160	134	180	28	156	97	25	16	13
50	40	40	1 ½	32	1 ¼	50	2	150	¼	209	169	209	33	224	129	36	26	23
50	50	40	1 ½	40	1 ½	50	2	150	¼	209	169	209	33	224	129	36	26	23
63	20	50	2	15	½	20	2	96	⅛	177	144	180	33	155	96	25	16	10
63	25	50	2	20	¾	25	1	96	⅛	177	144	180	35	163	104	25	16	13
63	32	50	2	25	1	25	1	96	⅛	177	144	180	35	163	104	25	16	13
63	40	50	2	32	1 ¼	50	2	150	¼	225	192	220	39	230	136	36	26	23
63	50	50	2	40	1 ½	50	2	150	¼	225	192	220	39	230	136	36	26	23
63	63	50	2	50	2	50	2	150	¼	225	192	220	39	230	136	36	26	23
90	20	80	3	15	½	25	1	96	⅛	205	159	190	47	176	117	25	16	13
90	25	80	3	20	¾	25	1	96	⅛	205	159	190	47	176	117	25	16	13
90	32	80	3	25	1	25	1	96	⅛	205	159	190	47	176	117	25	16	13
90	50	80	3	40	1 ½	50	2	150	¼	254	207	250	51	244	150	36	26	23
90	63	80	3	50	2	50	2	150	¼	254	207	250	51	244	150	36	26	23
110	20	100	4	15	½	25	1	96	⅛	227	171	190	56	185	126	25	16	13
110	25	100	4	20	¾	25	1	96	⅛	227	171	190	56	185	126	25	16	13
110	32	100	4	25	1	25	1	96	⅛	277	171	190	56	185	126	25	16	13
110	50	100	4	40	1 ½	50	2	150	¼	276	219	250	60	254	160	36	26	23
110	63	100	4	50	2	50	2	150	¼	276	219	250	60	254	160	36	26	23

DIASTAR TenPlus FC (Type 514 – 517)

Dim. (mm)	DN (mm)	Inch (inch)	D (mm)	D1 (inch)	D4 (mm)	D5 (mm)	L(1) (mm)	L(2) (mm)	L(3) (mm)	L(4) (mm)	L(5) (mm)	L(6) (mm)	L(7) (mm)	L(8) (mm)
20	15	½	96	⅜	65	14	128	128	128	224	196	124	124	124
25	20	¾	96	⅜	75	14	152	152	152	250	221	144	144	144
32	25	1	120	⅜	85	14	166	166	166	262	234	154	154	154
40	32	1 ¼	150	¼	100	18	192	192	192	296	260	174	174	174
50	40	1 ½	180	¼	110	18	222	222	222	328	284	194	194	194
63	50	2	180	¼	125	18	266	266	266	370	321	224	224	224

Dim. (mm)	DN (mm)	Inch (inch)	L(9) (mm)	L2 (mm)	H (mm)	H1 (mm)	H2 (mm)	H3 (mm)	H4 (mm)	H5 (mm)	H7 (mm)	M	z (mm)	z for L(3)	Hx (mm)
20	15	½	130	25	127	14	12	68	25	16	57	M6	96	100	7
25	20	¾	150	25	132	18	12	73	25	16	57	M6	114	118	10
32	25	1	160	25	167	22	12	93	26	26	69	M6	122	126	13
40	32	1 ¼	180	45	196	26	15	101	36	26	88	M8	140	144	15
50	40	1 ½	200	45	239	32	15	124	37	26	103	M8	160	164	19
63	50	2	230	45	251	39	15	137	37	26	103	M8	190	194	23

DIASTAR TenPlus FC (Type 519)

Dim. (mm)	d1 (mm)	DN (mm)	Inch (inch)	DN1 (mm)	Inch1 (inch)	DN2 (mm)	Inch2 (inch)	D (mm)	D1 (inch)	L(6) (mm)	L1 (mm)	L3 (mm)	L4 (mm)	H (mm)	H3 (mm)	H4 (mm)	H5 (mm)	Hx (mm)
20	20	15	½	15	½	15	½	96	⅜	117	96	162	12	103	71	25	16	7
25	20	20	¾	15	½	20	¾	96	⅜	133	108	162	16	131	72	25	16	10
25	25	20	¾	20	¾	20	¾	96	⅜	133	108	162	16	131	72	25	16	10
32	20	25	1	15	½	20	¾	96	⅜	142	120	162	19	135	76	25	16	10
32	25	25	1	20	¾	20	¾	96	⅜	142	120	162	19	135	76	25	16	10
32	32	25	1	25	1	25	1	120	⅜	145	120	160	19	167	93	26	26	13
40	20	32	1 ¼	15	½	25	1	120	⅜	149	128	180	23	175	101	26	26	13
40	25	32	1 ¼	20	¾	25	1	120	⅜	149	128	180	23	175	101	26	26	13
40	32	32	1 ¼	25	1	25	1	120	⅜	149	128	180	23	175	101	26	26	13
40	40	32	1 ¼	32	1 ¼	25	1	120	⅜	174	153	180	23	175	101	26	26	13
50	20	40	1 ½	15	½	20	¾	96	⅜	160	134	180	27	148	90	25	16	10
50	25	40	1 ½	20	¾	25	1	120	⅜	160	134	180	28	180	106	26	26	13
50	32	40	1 ½	25	1	25	1	120	⅜	160	134	180	28	180	106	26	26	13
50	40	40	1 ½	32	1 ¼	50	2	180	¼	209	169	209	33	249	135	37	26	23
50	50	40	1 ½	40	1 ½	50	2	180	¼	209	169	209	33	249	135	37	26	23
63	20	50	2	15	½	20	2	96	⅜	177	144	180	33	155	96	25	16	10
63	25	50	2	20	¾	25	1	120	⅜	177	144	180	35	187	113	26	26	13
63	32	50	2	25	1	25	1	120	⅜	177	144	180	35	187	113	26	26	13
63	40	50	2	32	1 ¼	50	2	180	¼	225	192	220	39	255	141	37	26	23
63	50	50	2	40	1 ½	50	2	180	¼	225	192	220	39	255	141	37	26	23
63	63	50	2	50	2	50	2	180	¼	225	192	220	39	255	141	37	26	23
90	20	80	3	15	½	25	1	120	⅜	205	159	190	47	200	126	26	26	13
90	25	80	3	20	¾	25	1	120	⅜	205	159	190	47	200	126	26	26	13
90	32	80	3	25	1	25	1	120	⅜	205	159	190	47	200	126	26	26	13
90	50	80	3	40	1 ½	50	2	180	¼	254	207	250	51	269	155	37	26	23
90	63	80	3	50	2	50	2	180	¼	254	207	250	51	269	155	37	26	23
110	20	100	4	15	½	25	1	120	⅜	227	171	190	56	209	135	26	26	13
110	25	100	4	20	¾	25	1	120	⅜	227	171	190	56	209	135	26	26	13
110	32	100	4	25	1	25	1	120	⅜	277	171	190	56	209	135	26	26	13
110	50	100	4	40	1 ½	50	2	180	¼	276	219	250	60	279	165	37	26	23
110	63	100	4	50	2	50	2	180	¼	276	219	250	60	279	165	37	26	23

DIASTAR Sixteen FC (Type 514 – 517)

Dim. (mm)	DN (mm)	Inch (inch)	D (mm)	D1 (inch)	D4 (mm)	D5 (mm)	L(1) (mm)	L(2) (mm)	L(3) (mm)	L(4) (mm)	L(5) (mm)	L(6) (mm)	L(7) (mm)	L(8) (mm)
20	15	½	96	⅛	65	14	128	128	128	224	196	124	124	124
25	20	¾	96	⅛	75	14	152	152	152	250	221	144	144	144
32	25	1	120	⅛	85	14	166	166	162	262	234	154	154	154
40	32	1 ¼	150	¼	100	18	192	192	184	296	260	174	174	174
50	40	1 ½	180	¼	110	18	222	222	210	328	284	194	194	194
63	50	2	180	¼	125	18	266	266	248	370	321	224	224	224

Dim. (mm)	DN (mm)	Inch (inch)	L(9) (mm)	L2 (mm)	H (mm)	H1 (mm)	H2 (mm)	H3 (mm)	H4 (mm)	H5 (mm)	H7 (mm)	M	z (mm)	z for L(3)	Hx (mm)
20	15	½	130	25	127	14	12	68	25	16	57	M6	96	100	7
25	20	¾	150	25	132	18	12	73	25	16	57	M6	114	118	10
32	25	1	160	25	167	22	12	93	26	26	69	M6	122	126	13
40	32	1 ¼	180	45	196	26	15	101	36	26	88	M8	140	144	15
50	40	1 ½	200	45	239	32	15	124	37	26	103	M8	160	164	19
63	50	2	230	45	251	39	15	137	37	26	103	M8	190	194	23

DIASTAR Sixteen FC (Type 519)

Dim. (mm)	d1 (mm)	DN (mm)	Inch (inch)	DN1 (mm)	Inch1 (inch)	DN2 (mm)	Inch2 (inch)	D (mm)	D1 (inch)	L(6) (mm)	L1 (mm)	L3 (mm)	L4 (mm)	H (mm)	H3 (mm)	H4 (mm)	H5 (mm)	Hx (mm)
20	20	15	½	15	½	15	½	96	⅛	117	96	162	12	130	71	25	16	7
25	20	20	¾	15	½	20	¾	96	⅛	133	108	162	16	131	72	25	16	10
25	25	20	¾	20	¾	20	¾	96	⅛	133	108	162	16	131	72	25	16	10
32	20	25	1	15	½	20	¾	96	⅛	142	120	162	19	135	76	25	16	10
32	25	25	1	20	¾	20	¾	96	⅛	142	120	162	19	135	76	25	16	10
32	32	25	1	25	1	25	1	120	⅛	145	120	160	19	167	93	296	26	13
40	20	32	1 ¼	15	½	25	1	120	⅛	149	128	180	23	175	101	26	26	13
40	25	32	1 ¼	20	¾	25	1	120	⅛	149	128	180	23	175	101	26	26	13
40	32	32	1 ¼	25	1	25	1	120	⅛	149	128	180	23	175	101	26	26	13
40	40	32	1 ¼	32	1 ¼	25	1	120	⅛	174	153	180	23	175	101	26	26	13
50	20	40	1 ½	15	½	20	¾	96	⅛	160	134	180	27	148	90	25	16	10
50	25	40	1 ½	20	¾	25	1	120	⅛	160	134	180	28	180	106	26	26	13
50	32	40	1 ½	25	1	25	1	120	⅛	160	134	180	28	180	106	26	26	13
50	40	40	1 ½	32	1 ¼	50	2	180	¼	209	169	209	33	249	135	37	26	23
50	50	40	1 ½	40	1 ½	50	2	180	¼	209	169	209	33	249	135	37	26	23
63	20	50	2	15	½	20	2	96	⅛	177	144	180	33	155	96	25	16	10
63	25	50	2	20	¾	25	1	120	⅛	177	144	180	35	187	113	26	26	13
63	32	50	2	25	1	25	1	120	⅛	177	144	180	35	187	113	26	26	13
63	40	50	2	32	1 ¼	50	2	180	¼	225	192	220	39	255	141	37	26	23
63	50	50	2	40	1 ½	50	2	180	¼	225	192	220	39	255	141	37	26	23
63	63	50	2	50	2	50	2	180	¼	225	192	220	39	255	141	37	26	23
90	20	80	3	15	½	25	1	120	⅛	205	159	190	47	200	126	26	26	13
90	25	80	3	20	¾	25	1	120	⅛	205	159	190	47	200	126	26	26	13
90	32	80	3	25	1	25	1	120	⅛	205	159	190	47	200	126	26	26	13
90	50	80	3	40	1 ½	50	2	180	¼	254	207	250	51	269	155	37	26	23
90	63	80	3	50	2	50	2	180	¼	254	207	250	51	269	155	37	26	23
110	20	100	4	15	½	25	1	120	⅛	227	171	190	56	209	135	26	26	13
110	25	100	4	20	¾	25	1	120	⅛	227	171	190	56	209	135	26	26	13
110	32	100	4	25	1	25	1	120	⅛	277	171	190	56	209	135	26	26	13
110	50	100	4	40	1 ½	50	2	180	¼	276	219	250	60	279	165	37	26	23
110	63	100	4	50	2	50	2	180	¼	276	219	250	60	279	165	37	26	23

3.1.5 Accessories

- Stroke limiter / emergency manual override
- Solenoid pilot Valve Type PV94, PV95, MNL532, PV2000
- Feedback – ER55, ER52 and ER53
- Positioner – Type SPC
- Bus communication – AS interface



For further information on accessories, refer to the online product catalog at www.gfps.com

- Mobile apps and online tools to support configuration and calculation at www.gfps.com/tools



3.2 Diaphragm Valve Type 604/605



3.2.1 Product description

Diaphragm Valve Type 604/605 with integrated pneumatic actuator has a broad range of application, particularly when high actuating cycles, different control functions and chemical-resistant diaphragms are required.

Function

Pneumatic diaphragm valves from GF Piping Systems are used for regulating, as well as closing, controlling and monitoring volume flows. Especially when transporting solid or aggressive media, this Valve Type has decisive advantages due to its simple function, compact construction and optimized flow geometry. Only the valve body and diaphragm come into contact with the medium.

Unlike other Valve Types, no pressure surges can be caused by closing the diaphragm valve.

Applications

- Chemical process industry
- Dosing applications
- Water distribution

Benefits/features

- High actuating cycles
- Compact construction
- Fully plastic design without metal screws
- No corrosion caused by aggressive media
- Constant leak-tightness in the event of changes in temperature without tightening screws
- Long service life through optimized diaphragm geometry and Longlife variants
- Maintenance-free
- For easy installation and removal
- Maximum flow and linear characteristic curves for easier control

Possible flow media

The valve is suitable for use with gases, as well as solids and aggressive media.

3.2.2 Technical basics

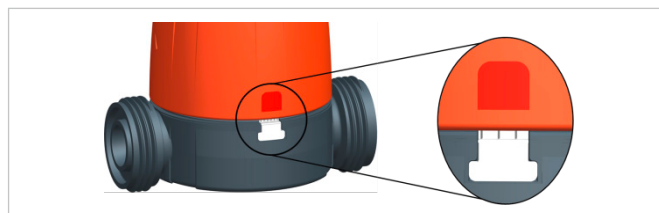
The actuators are available with the functions fail safe to close (FC), fail safe to open (FO) and double-acting (DA). Actuators in the FC design have pre-tensioned spring assemblies made of galvanized steel for safer operation and safer maintenance of the actuator.

i All diaphragm valves are manufactured in accordance with EN ISO 16138. The upper housing made of PPGF (fiberglass-reinforced polypropylene) is screwed together with the lower housing using a central plastic nut, which avoids exposed metal screws.

Indicator for diaphragm material

The color of the index plate on the valve body shows the Type of diaphragm material:

Diaphragm	Index plate color
EPDM	Black
FKM	Red
PTFE/EPDM	White
PTFE/FKM	Green



Indicator for Valve Type

Type 604	Type 605
Connection: Union	Connection: Spigot

Differentiation in functionalities – FC, FO, DA

Function	Name
FC	Fail safe to close
FO	Fail safe to open
DA	Fail safe double-acting

FC mode	FO mode	DA mode
In the non-operative state, the valve is closed by means of spring resistance. When the actuator is pressurized with the control medium (bottom connection), the valve opens. When the control medium escapes, the valve is closed via spring resistance.	In the non-operative state, the valve is opened by means of spring resistance. When the actuator is pressurized with the control medium (top connection), the valve closes. When the control medium escapes, the valve is opened via spring resistance.	The valve has no defined basic position. The valve is opened and closed by applying control pressure to the corresponding connection (top connection for closing, bottom connection for opening).

Control medium

FC mode	FO mode	DA mode
	Max. 6 bar	Max. 5 bar
	ISO 8573-1 pressurized air classes 2 or 3 at 10 °C, ISO 8573-1 pressurized air classes 3 or 4 at T > 0 °C	
	Temperature of control medium: max. 40 °C	
	Depending on the operating pressure, lower control pressures can be selected	

Valve handling

Installation notes

Valve failure due to the wrong choice of material

The valve body, gaskets, diaphragms, diaphragm support, housing and mechanical components can be damaged or impaired in their function due to lack of chemical resistance, external influences, wear of the diaphragm or diffusion effects. Please consult the "List of chemical resistance".

Use of lubricants

Use of lubricants on the threaded connection between the housing nut and valve body causes stress fractures. Do not use lubricants on the threaded connection between the housing nut and valve body.

Heat expansion due to changes in temperature

Due to temperature changes, longitudinal or bending forces may occur in the pipes through thermal expansion.

The following points should be noted here:

- Mount the diaphragm valve as a fixed point or
- Mount the pipe bracket directly in front of and after the diaphragm valve
- Mount the diaphragm valve and pipe such that they are flush

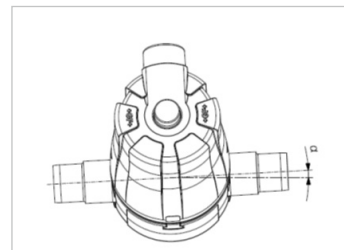


The plastic thread must not be tightened to more than 2 Nm at the control air connection. No tapered threads may be used.

Installation angle for optimal draining of the valve

To achieve optimal draining, GF Piping Systems recommends installing the individual dimensions in accordance with the corresponding angle (a and b). An installation inclination of about 1 - 2° is not taken into consideration with the stated angles.

Dimension	Angle a
d20/DN15	2



Integrated fastening and PP mounting blocks

ENSAT® bushings on the underside of the valve allow simple and stable attachment of the diaphragm valve. With this, the forces that can occur when operating the valve (e.g. breakaway torque) are absorbed and therefore not transferred to the piping system.



Diaphragms

Diaphragms in this Valve Type are heavily stressed components. In addition to the mechanical stress caused by wear and tear over several actuating cycles, the diaphragms are also subject to wear and tear due to the flow medium. We strongly recommend that you inspect and, if necessary, replace the diaphragms after 50,000 cycles. In the case of abrasive media, the inspection of the diaphragms should take place regularly at short intervals.

Maintenance notes

The valve is nearly maintenance-free with the optimized Longlife diaphragms in FKM or EPDM. In particular when using abrasive and aggressive media, we recommend inspecting the diaphragms after approx. 50,000 cycles.

If necessary, the diaphragms should be exchanged in order to ensure optimal function of the valve. If diaphragms are used under special conditions (e.g., higher temperatures, media with abrasive effect, chemicals), more frequent checks are recommended.



Installation and maintenance must be performed in accordance with the corresponding installation manual. The installation manual is provided with the product, see also the online product catalog at www.gfps.com

Tips for installation

- The direction of flow and the mounting position may be chosen freely.
- In types with FC or FO mode, the free control air connection contains the bleed bore. Keep this open and protect it from contamination.

Closing times

The most important factors that determine the closing time are:

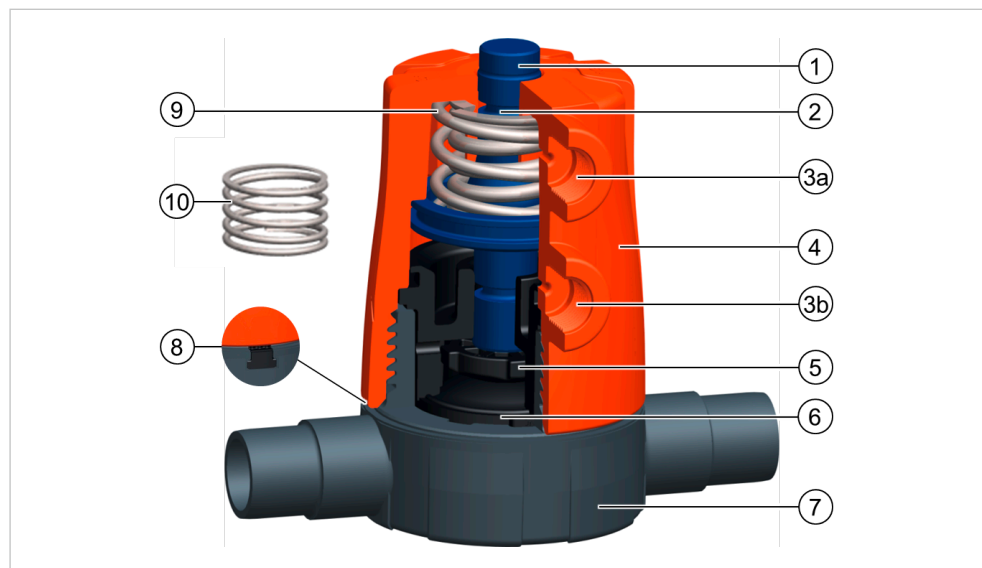
- Volume of control medium
- Spring resistance

The following options are available for optimizing the closing times:

- Remove upper O-ring on the piston
- Increase the bleed bore from 2 mm to 4 mm

	Volume of compressed air (dm ³)	Closing speed at max. 6 bar (ms)	Lag (ml)
Type 604/605 Standard	0.02	114	238
Larger ventilation bore	0.02	66	138
Without upper O-ring	0.02	77	160

3.2.3 Technical data



- ① Optical position indicator
- ② Piston
- ③a Connection for control air FO
- ③b Connection for control air FC
- ③a + ③b Connection for control air DA
- ④ Upper part with plastic thread
- ⑤ Pressure piece
- ⑥ Diaphragm
- ⑦ Valve body
- ⑧ Indicator for diaphragm material
- ⑨ Spring for control function FC
- ⑩ Spring for control function FO

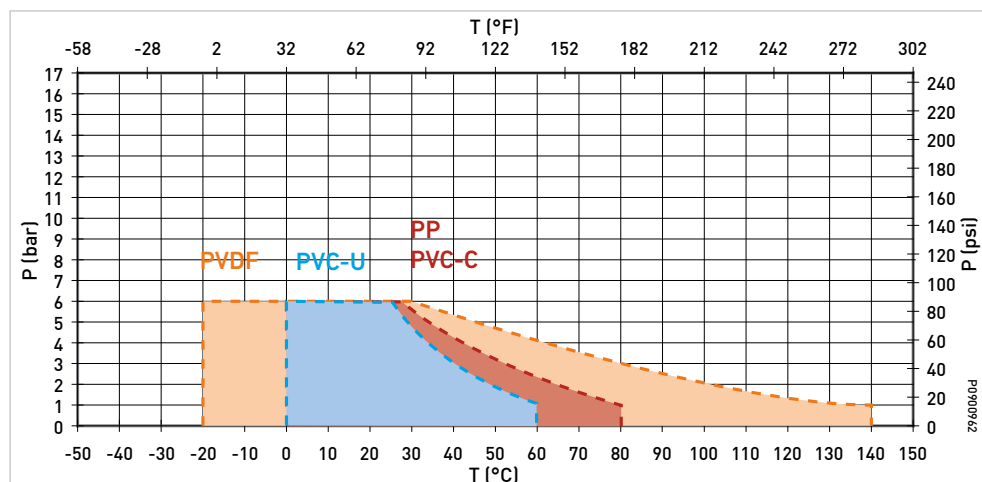
Specification

Dimensions	d20/DN15	
Materials	Valve body	PVC-U, PVC-C, PP-H, PVDF, others upon request
	Diaphragms	EPDM, FKM, PTFE/EPDM, PTFE/FKM
	Spring	Spring steel EN 10270-1 SH (C) Deltatone
Gasket materials	NBR	
Connections	Screw connection with solvent cement sockets, threaded sockets, fusion sockets, butt fusion spigots	
	Solvent cement spigots, butt fusion spigots	
Pressure level	PN6	
Approvals	ACS, FDA, DIBt	

Kv 100 values

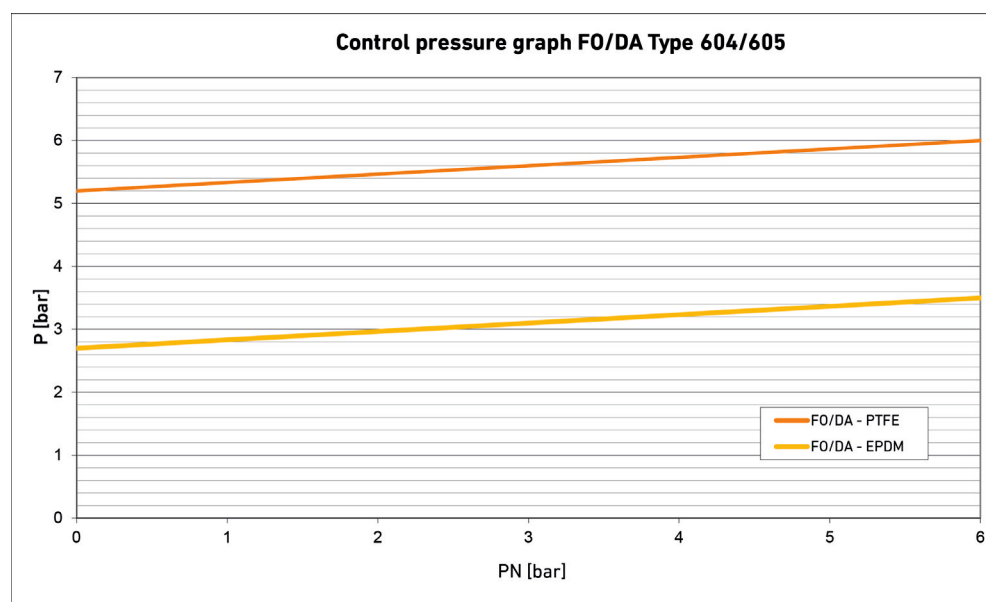
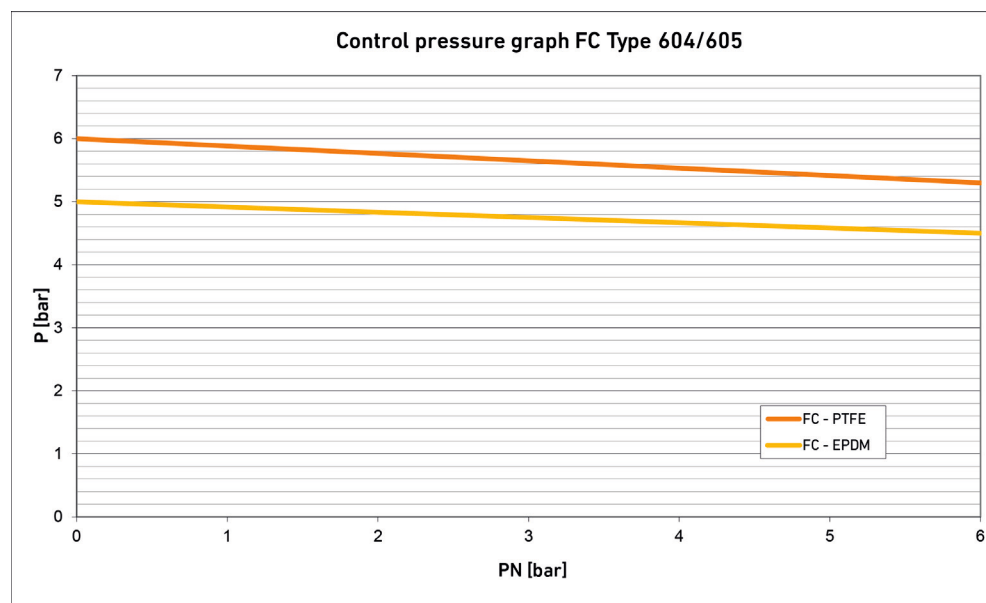
DN (mm)	Inch (inch)	d (mm)	Kv 100 (L/min)	Kv 100 (m³/h)	Kv 100 (Gpm)
15	½	20	125	7.5	0.55

Pressure-temperature diagrams



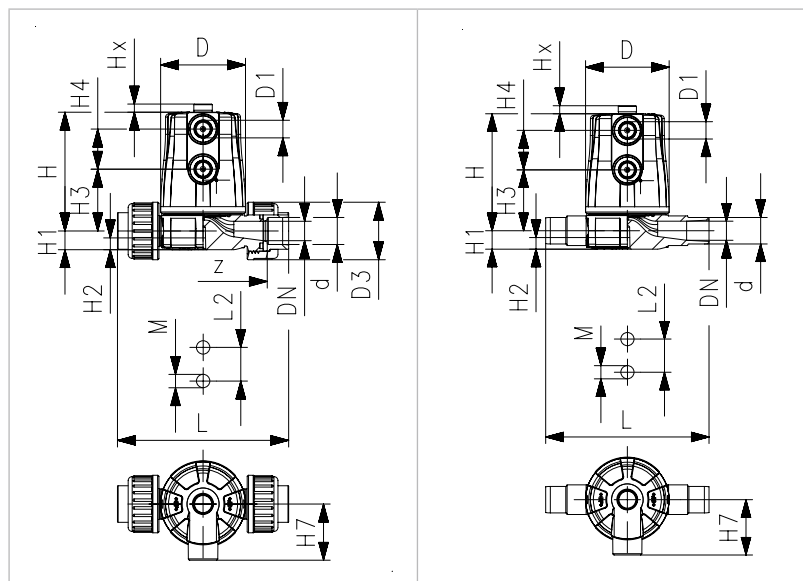
T Temperature (°C, °F)
P Permissible pressure (bar, psi)

Control pressure diagrams



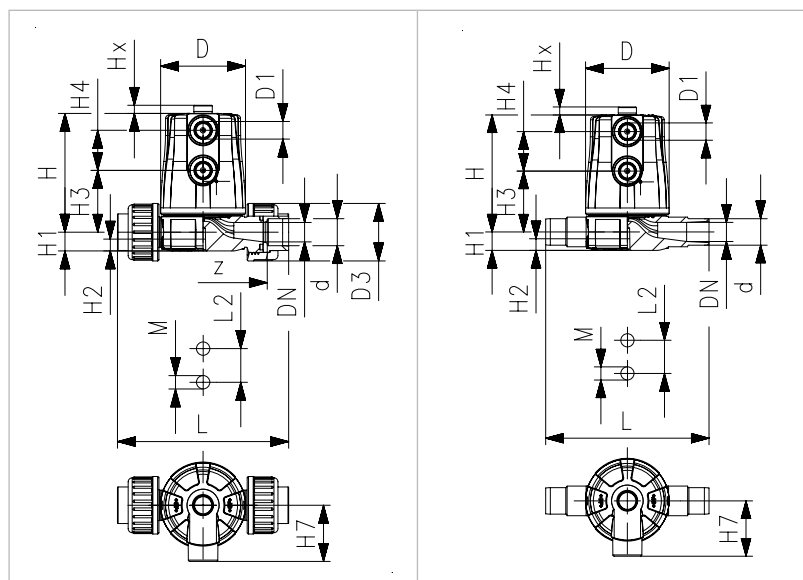
3.2.4 Dimensions

PVC-U



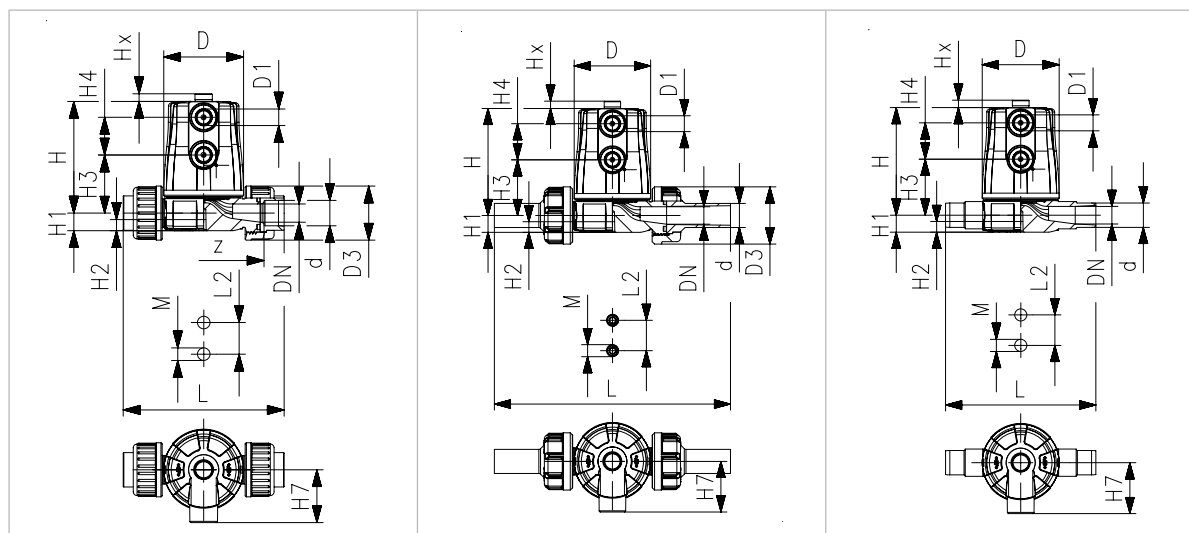
Join- ing	d (mm)	DN (mm)	Size (inch)	D (mm)	D1_G (mm)	D3 (mm)	H (mm)	H1 (mm)	H2 (mm)	H3 (mm)	H4 (mm)	H7 (mm)	L (mm)	L2 (mm)	M (mm)	Z (mm)	Lift (Hx)
ASTM Socket	20	15	½	65	¼	43	89	14	12	46	30	42	140.6	25	M6	96	6
Metric Socket	20	15	½	65	¼	43	89	14	12	46	30	42	128	25	M6	96	6
Rp Socket	20	15	½	65	¼	43	89	14	12	46	30	42	128	25	M6	102	6
Metric Spigot	20	15	½	65	¼		89	14	12	46	30	42	124	25	M6		6

PVC-C



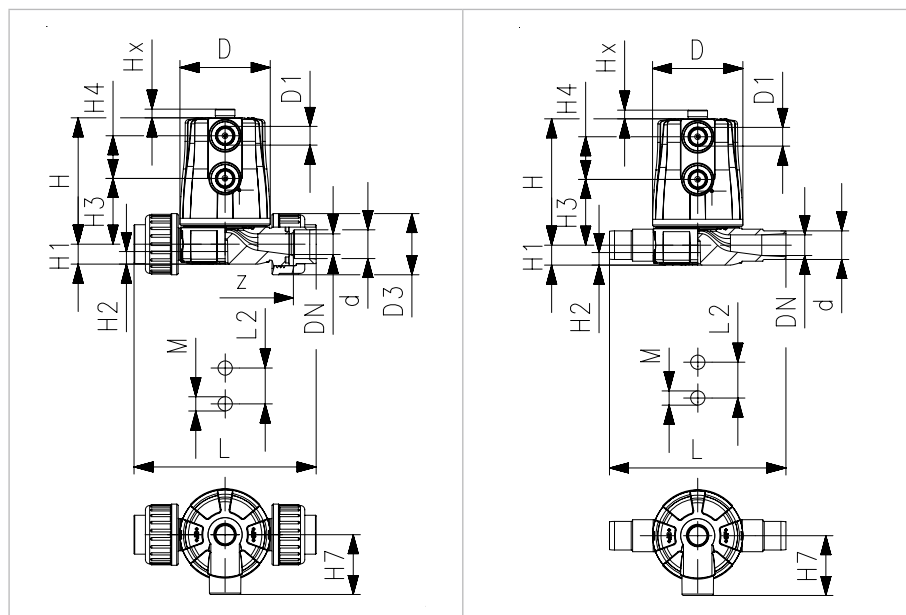
Join- ing	d (mm)	DN (mm)	Size (inch)	D (mm)	D1_G (mm)	D3 (mm)	H (mm)	H1 (mm)	H2 (mm)	H3 (mm)	H4 (mm)	H7 (mm)	L (mm)	L2 (mm)	M (mm)	Z (mm)	Lift (Hx)
Metric Socket	20	15	½	65	¼	43	89	14	12	46	30	42	131	25	M6	99	6
Metric Spigot	20	15	½	65	¼		89	14	12	46	30	42	124	25	M6		6

PP-H



Joining	d (mm)	DN (mm)	Size (inch)	D (mm)	D1_G (mm)	D3 (mm)	H (mm)	H1 (mm)	H2 (mm)	H3 (mm)	H4 (mm)	H7 (mm)	L (mm)	L2 (mm)	M (mm)	Z (mm)	Lift (Hx)
Metric Socket	20	15	½	65	¼	48	89	14	12	46	30	42	128	25	M6	96	6
Metric Unions Spigot	20	15	½	65	¼	48	89	14	12	46	30	42	196	25	M6	100	6
Metric Spigot	20	15	½	65	¼		89	14	12	46	30	42	124	25	M6	100	6

PVDF



Joining	d (mm)	DN (mm)	Size (inch)	D (mm)	D1_G (mm)	D3 (mm)	H (mm)	H1 (mm)	H2 (mm)	H3 (mm)	H4 (mm)	H7 (mm)	L (mm)	L2 (mm)	M (mm)	Z (mm)	Lift (Hx)
Metric Socket	20	15	½	65	¼	43	89	14	12	46	30	42	128	25	M6	96	6
Metric Unions Spigot	20	15	½	65	¼	43	89	14	12	46	30	42	196	25	M6	100	6
Metric Spigot	20	15	½	65	¼	43	89	14	12	46	30	42	124	25	M6		6

3.3 DIASTAR Type 025



3.3.1 Product description

The DIASTAR 025 has the highest closing forces in the portfolio of pneumatically actuated diaphragm valves and is available with the functions FC (fail safe to close), FO (fail safe to open) and DA (double-acting).

The valve is thus used wherever high pipe pressures of up to 10 bar need to be controlled on on both sides.

Function

Pneumatic diaphragm valves from GF Piping Systems are used for regulating, as well as closing, controlling and monitoring volume flows. Especially when transporting contaminated, aggressive or abrasive media, this type of valve has decisive advantages thanks to its simple function and optimized construction. Only the valve body and diaphragm come into contact with the medium.

Applications

- Control applications
- Controlling pure and ultrapure media
- Water treatment
- Chemical dosing
- Applications with higher viscosity and solids content

Benefits/features

- Safe transport of aggressive media
- Adapting closing forces to medium pressure through reduction of spring assemblies
- High corrosion resistance
- Maximum system safety
- Safe maintenance and minimal downtime
- Wide range of materials available
- Broad spectrum of applications
- Quick retrofitting through simple integration of accessories

Possible flow media

Contaminated, solid or ultrapure media.

3.3.2 Technical basics

The upper part of the housing is made of PPGF (fiberglass-reinforced polypropylene) and is screwed to the lower part of the housing using a central plastic nut, which avoids exposed metal screws. A position indicator integrated into the handle is required for determining the diaphragm position.

i All PVC-U diaphragm valves in metric sizes are flange variants DN65 – DN150. All diaphragm valves are manufactured in accordance with EN ISO 16138.

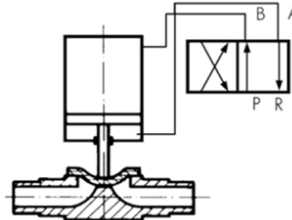
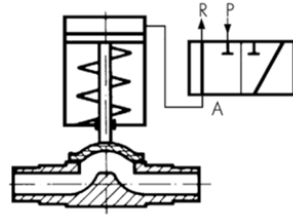
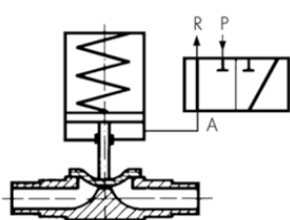
Differentiation in functionalities – FC, FO, DA

Function	Name
FC	Fail safe to close
FO	Fail safe to open
DA	Fail safe double-acting

FC mode	FO mode	DA mode
In the non-operative state, the valve is closed by means of spring resistance. When the actuator is pressurized with the control medium (bottom connection), the valve opens. When the control medium escapes, the valve is closed via spring resistance.	In the non-operative state, the valve is opened by means of spring resistance. When the actuator is pressurized with the control medium (top connection), the valve closes. When the control medium escapes, the valve is opened via spring resistance.	The valve has no defined basic position. The valve is opened and closed by applying control pressure to the corresponding connection (top connection for closing, bottom connection for opening).

Selection of the solenoid valve and associated connecting thread

3/2-way solenoid valves are used to control single acting actuators (FC). They are mounted either directly to the actuator using a hollow screw or via a multiple connection plate or valve clusters, as required.	3/2-way solenoid valves are used to control single acting actuators (FO). They are mounted either directly to the actuator using a hollow screw or via a multiple connection plate or valve clusters, as required.	4/2-way or 5/2-way solenoid valves are used to control double-acting actuators (DA). They can be mounted either directly to the actuator using a NAMUR connector plate or via valve clusters.
--	--	---



FC mode of operation with a 3/2-way solenoid valve for bottom connection.	FO mode with a 3/2-way solenoid valve for top connection.	The DA mode with a 4/2- or 5/2-way solenoid valve. Both connections are used.
---	---	---

Relation between pipe pressure and spring assemblies

The closing force of the actuators were designed for the specified PN pressure level. Operation with very low pipe pressure can cause increased diaphragm wear. In order to extend the diaphragm life span with low pipe pressure, the number of spring assemblies can be reduced. For the specific dimensioning, please contact your representative at GF Piping Systems.

Control medium

FC mode	FO mode	DA mode
Compressed air classes (ISO 8573-1): 2 or 3 for -10 °C and 3 or 4 for T > 0 °C	When the medium pressure exceeds 10 bar, the control pressure must be throttled by exhaust air (adjust actuating time to approx. 3 s)	When the medium pressure exceeds 10 bar, the control pressure must be throttled using exhaust air (adjust actuating time to approx. 3 s)
Temperature of control medium: max. 40 °C	Compressed air classes (ISO 8573-1): 2 or 3 for -10 °C and 3 or 4 for T > 0 °C	Compressed air classes (ISO 8573-1): 2 or 3 for -10 °C and 3 or 4 for T > 0 °C
When the medium pressure exceeds 10 bar, the control pressure must be throttled using exhaust air (adjust actuating time to approx. 3 s)	Temperature of control medium: max. 40 °C	Temperature of control medium: max. 40 °C
The corresponding control pressure diagrams can be found in the "Technical data" section	Depending on the working pressure PN, lower control pressures may be selected	Depending on the working pressure PN, lower control pressures may be selected

Tightening torques for valve housing

The valve body and pneumatic actuator are firmly connected by means of metal screws. Due to the different coefficients of thermal expansion of plastic and metal, it is essential – especially in the event of temperature changes within the pipe or if there are large temperature differences between the medium and the ambient temperature – to tighten the screws regularly to guarantee that the valve is continuously leak-tight. Tightening is recommended even after the first change in temperature.

The screws must be tightened crosswise to the stated tightening torques so that the housing is pressed together evenly. The valve is open. For valves with a stroke limiter installed, the valve must be reset following replacement.

Tightening torques

Dim. (mm)	DN (mm)	Inch (inch)	Tightening torque
75	65	2 ½	25
90	80	3	30
110	100	4	30
160	150	6	40

Diaphragms

Diaphragms in this Valve Type are heavily stressed components. In addition to the mechanical stress caused by wear and tear over several actuating cycles, the diaphragms are also subject to wear and tear due to the flow medium. We strongly recommend that you inspect and, if necessary, replace the diaphragms after 50,000 cycles. In the case of abrasive media, the inspection of the diaphragms should take place regularly at short intervals. An inspection can be quickly performed at any time by opening the connection screws between the actuator and the lower part of the valve. The elastomer diaphragms with threaded bolts can be removed at any time by turning counterclockwise. PTFE diaphragms with bayonet joints can be turned 90° in any direction and then removed.

Changing the gaskets

The pistons and spindle seals can wear after a certain amount of time, depending on the area of use and control medium. This can be noticed through a loss of air or discharge sounds. GF Piping Systems provides replacement gasket sets.

Adapting spring assemblies to operating conditions

Valves with the FC (fail safe to close) control function are equipped with pre-tensioned spring assemblies. By loosening the screws connecting the actuator and flow body, the spring assemblies are relieved to such an extent that the actuator can be opened without additional equipment.

Valves with the control function FO (fail safe to open) have no pre-tensioned spring assemblies, which is why this actuator can only be opened at the factory.

Valve handling

Installation notes

Ensure that the diaphragm valve and spring assemblies are designed for the pipe pressure. Reducing the spring assemblies leads to a reduced closing force. When the pipe pressure rises, the valve cannot close or cannot close completely if spring assemblies are missing. This can have a negative impact on the process.

Maintenance notes

Maintenance interval	Maintenance activity
Regularly	Check the connection between the upper part and valve body for leak-tightness.
1 - 2 x per year	Actuate continuously opened or closed diaphragm valves to check their function.



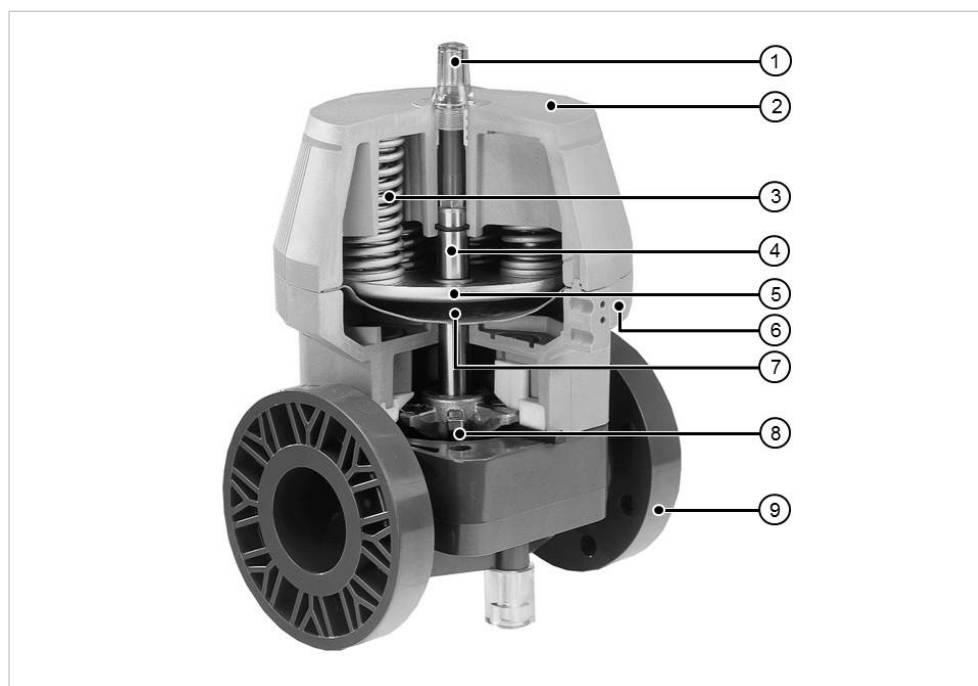
Installation and maintenance must be performed in accordance with the corresponding installation manual. The installation manual is provided with the product, see also the online product catalog at www.gfps.com

Tips for installation

- The direction of flow and mounting position may be chosen freely.
- The valve is attached via threaded sleeves that are injected into the flow body.
- The actuator can be optionally activated by the control media.
 - Compressed air (oil-free)
 - Neutral gases
 - Liquids upon request

Variable operating and control pressures are possible by adapting the number of spring assemblies to the operating conditions.

3.3.3 Technical data



- ① Optical position indicator
- ② All-plastic housing, PP-GF
- ③ Pre-tensioned springs
- ④ Lifting spindle group, rust-free steel
- ⑤ Diaphragm plate
- ⑥ NAMUR interface for control air
- ⑦ Control diaphragms
- ⑧ Pressure piece
- ⑨ Valve body

Specification	
Dimensions	d75/DN65 – d160/DN150, 2 ½" – 6
Pressure levels	PN10, from DN100: PN6
Valve body materials	PVC-U, PVC-C, ABS, PP-H, PVDF, PVDF-HP
Housing materials	PPGF-30 (polypropylene, 30 % fiberglass-reinforced)
Piston	PPGF-30 white (polypropylene, 30 % fiberglass-reinforced)
Pressure spindle	Stainless steel 1.4104
Metal inserts	Stainless steel 1.4305
Gaskets	NBR
Springs	Galvanized steel
Gasket/diaphragm materials	EPDM, PTFE/EPDM, FKM, FFKM, CSM, NBR
Functions	FC, FO, DA
Connecting thread control air	G ¼"
Allowable control pressure	Max. 6 bar for FC mode Max. 5 bar for FO, DA mode
Control volume for pneumatic actuator	FC
	FO
	DA
	d75/DN65 d110/DN100 d110/DN100 d110/DN100, d75/DN65 d110/DN100
	d90/DN80 d160/DN150 d160/DN15 d160/DN 150 d90/DN80 d160/DN 150
	2.2 dm ³ 3.8 dm ³ 4.4 dm ³ 7.6 dm ³ 4.4dm ³ 2.2 dm ³ 7.6 dm ³ 3.8 dm ³
Ambient temperature	-10 °C to 50 °C
Approvals	ACS, FDA, DIBt, TA Luft, NAMSA

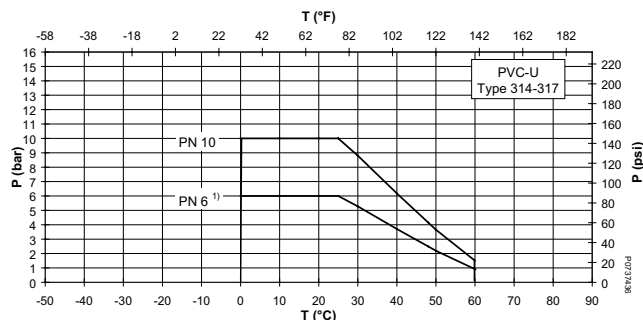
Pressure-temperature diagrams

The following pressure-temperature diagrams are based on a lifetime of 25 years and water or similar media.

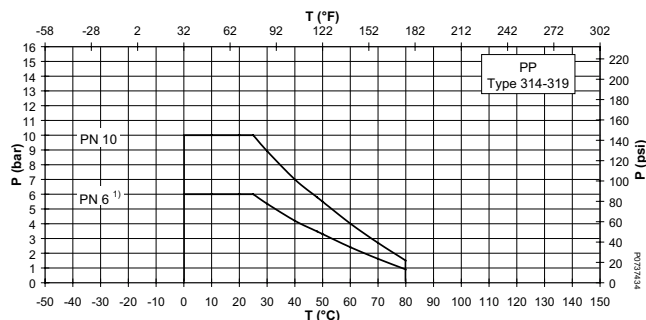
T Temperature (°C, °F)

P Permissible pressure (bar, psi)

PVC-U



PP-H

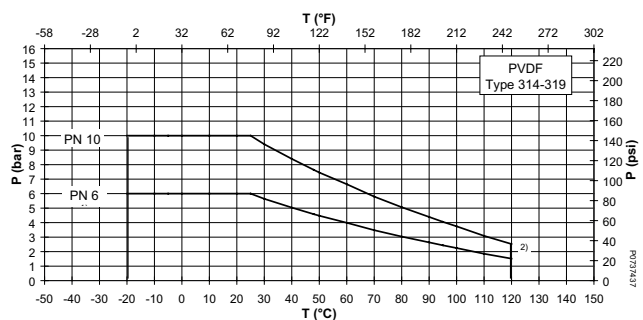


1) DIASTAR 025 DN100 and DN150

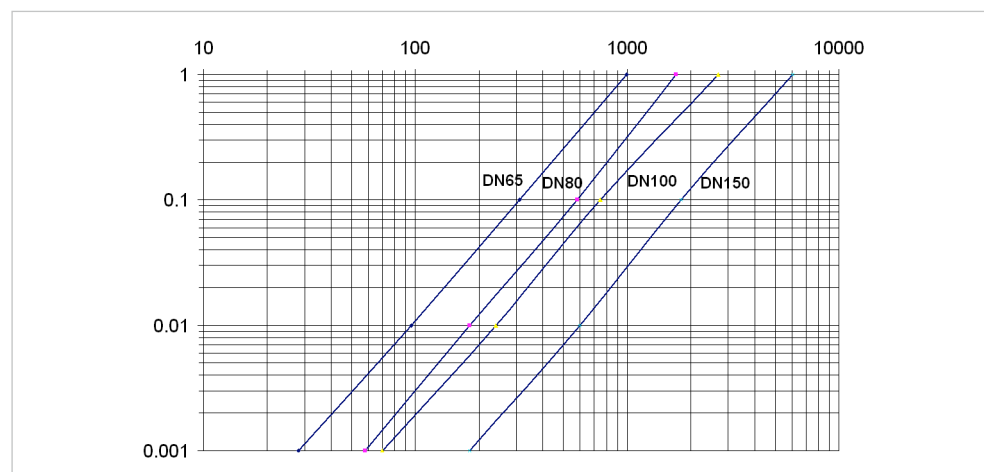
2) Depending on the connection type and actuator, the nominal pressure is reduced to PN10

3) Depending on the connection type and actuator, the nominal pressure is reduced to PN6

PVDF



Pressure losses

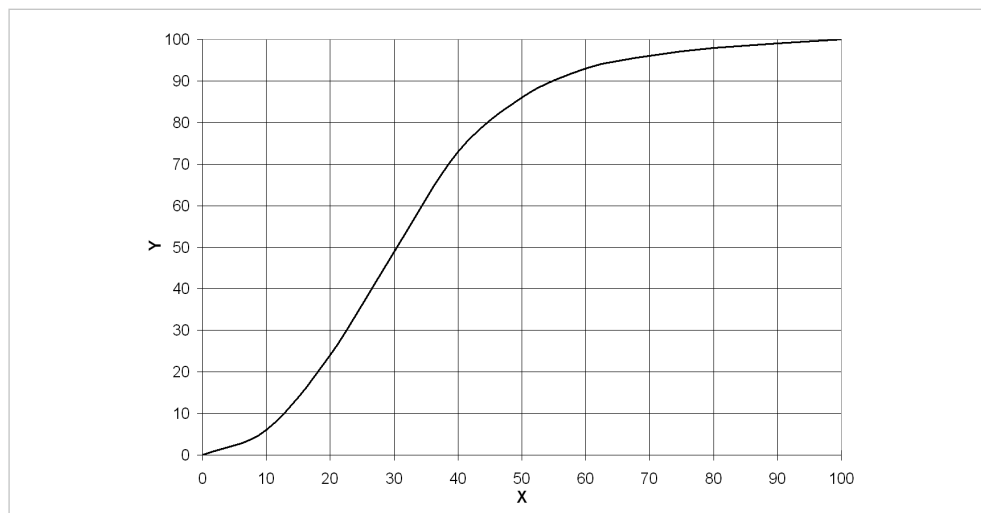


X Flow rate

(l/min, US gal/min)

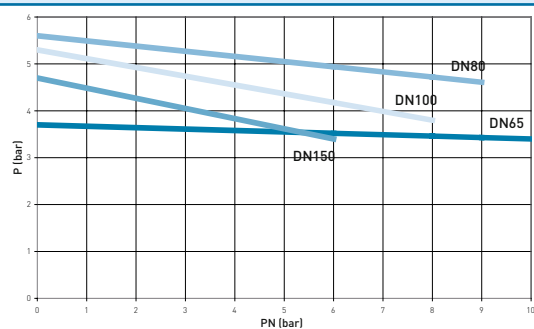
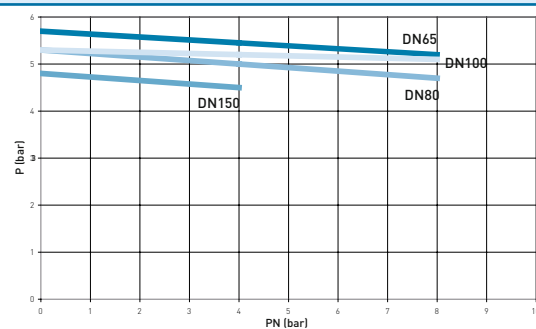
Y Pressure loss Δp (bar, psi)

Flow characteristics

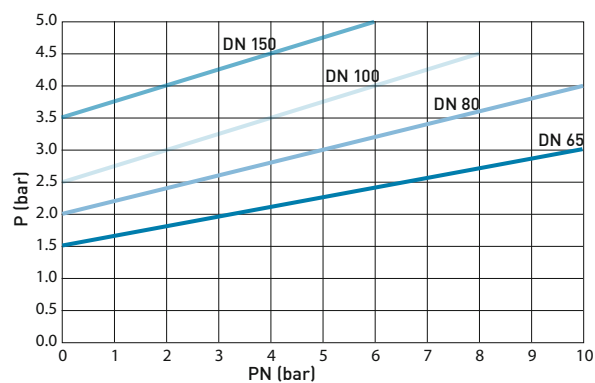


X Open angle (%)
Y Kv, Cv value (%)

Control pressure diagrams for actuator

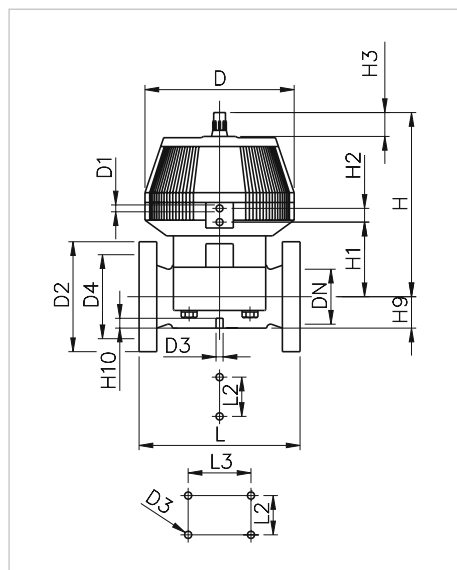
Fail safe to close (FC)
with EPDM diaphragmFail safe to close (FC)
with PTFE diaphragm

Fall safe to open (FO/DA)



3.3.4 Dimensions

DIASTAR 025 DN65 - DN150



Dim. (mm)	DN (mm)	Inch (inch)	D (mm)	D1 (G)	D2 (mm)	D3 (mm)	D4 (mm)	L (mm)	l3 (mm)	l3 (mm)	H (mm)	H1 (mm)	H2 (mm)	H3 (mm)	H9 (mm)	H10 (inch)	Stroke
75	65	2 1/2	280	1/4	185	M8	145	290	70		298	148	24	46	46	15	30
90	80	3	280	1/4	200	M12	160	310	120		302	150	24	46	57	15	35
110	100	4	335	1/4"	225	M12	180	350	120		409	176	24	46	69	20	40
160	150	6	335	1/4	285	M12	240	480	100	200	201	237	24	46	108	20	40

Weight

DN (mm)	PVC-U (kg)	PP-H (kg)	PVDF (kg)
65	13.6	13.7	14.2
80	17.4	16.0	18.7
100	24.7	22.8	26.5
150	35.0	33.4	38.2

3.3.5 Accessories

- Stroke limiter / emergency manual override
- Solenoid pilot Valve Type PV94, PV95, MNL532, PV2000
- Feedback – ER55 ER52 and ER53
- Positioner – Type SPC
- Bus communication – AS interface

i For further information on accessories, refer to the online product catalog at www.gfps.com

■ Mobile apps and online tools to support configuration and calculation at www.gfps.com/tools



Planning Fundamentals of Valves and Automation

Valves – Butterfly Valves

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1 Butterfly Valves, plastic

1.1 Butterfly Valve Type 565

Preliminary data for DN250-300

				
Type 565 Butterfly Valve with bare shaft	Type 565 Butterfly Valve with hand lever	Type 565 Butterfly Valve with reduction gear	Type 565 Butterfly Valve with pneumatic actuator	Type 565 Butterfly Valve with electric actuator

1.1.1 Product description

The plastic Butterfly Valve Type 565 is the best choice for optimizing piping systems built for water applications and a wide range of other applications. This new generation comes at a significantly lower initial cost, and will save even more thanks to its lower static weight, requiring less energy for both operation and transportation. Installing the Butterfly Valve Type 565 is quick and easy, but thanks to its extremely high durability, it will be almost maintenance-free during its long service life.

Direct replacement: The Butterfly Valve Type 565 comes in the same installation length as metal solutions and can replace them without any additional rework on the pipes.

60 % lighter: Can be lifted installed by a single person in just a few minutes. Facilitates planning and reduces the need for costly transportation and personnel.

Highly reliable: High-performance thermoplastics protect from abrasion and corrosion. A longer system lifetime, reduction of maintenance costs and production stops are the results.

Automated and digitized: Prepared for being actuated by wide range of electric and pneumatic actuators. Future-proof through compatibility with wirelessly controlled Smart Actuators. Prepared mounting option for end position detection sensors.

Sustainable: Long service life as well as corrosion-resistant due to the use of high-quality plastic materials. Significant energy and resource reduction during transport and installation due to low weight.

Information via DataMatrix code: The DataMatrix code simplifies the storage of all technical information for each individual valve and thus enables individual traceability. The perfect identification of each individual Type 565 butterfly valve allows easy installation, maintenance and repair.

Automation through use as a process and control valve

Thanks to a wide range of accessories, butterfly valves can be equipped with the appropriate pneumatic or electric actuators and thus used as process and control valves. Double sensors enable hereby the end position detection (open/closed disc).



Type 565 Butterfly Valve with electric actuator



Type 565 Butterfly Valve with smart actuator



Type 565 Butterfly Valve with pneumatic actuator



Double sensor for end position detection

Applications

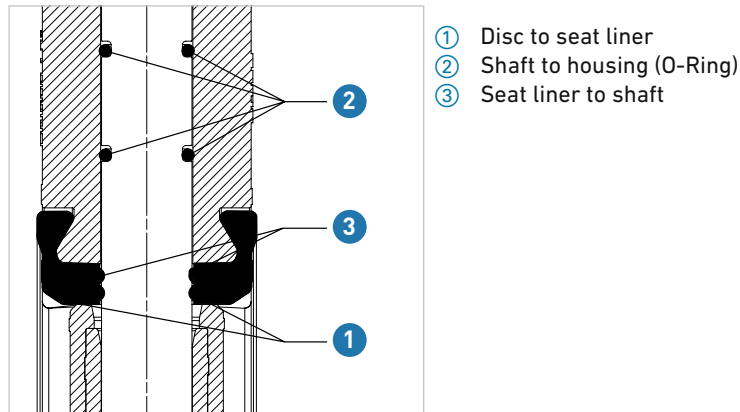
Suitable for water and water treatment applications (e.g. sea water, drinking water and industrial water):

- Drinking water process
- Industrial process water
- Industrial waste water
- Municipal waste water
- Desalination plant
- Aquarium/ Oceania
- Swimming pools
- Cruise ships
- Offshore
- Vessels and merchant fleet

1.1.2 Technical basics

Sealings

The sealing of the shaft is ensured by:



The beads of the collar seal the flange connection. No additional flange seals are required.

Installation notes

Use Type 565 Butterfly Valve only as an intermediate butterfly valve (wafer style), no end-of-line (lug style) installation allowed.

As a connecting piece, GF Piping Systems recommends valve ends or flange adapters with smooth jointing faces, together with flanges made of PVC-U or PP-V. In the case of BB/VSB with a fluted jointing face, a flat gasket may also be used in individual cases.

Ensure that the following requirements are met before installation: Make sure that only butterfly valves are installed whose pressure class, connection type, connection dimensions and materials correspond to the operating conditions.

Chamfering of valve end / flange adapter

When using the specified valve ends / flange adapters from GF Piping Systems, chamfering is not necessary, because the disc does not touch the valve end / flange adapter or the flange adapters are already chamfered. If you want to install valve ends/flange adapters of a different brand, then please make sure that the inside diameter (int) of the valve end / flange adapter is greater than the output measure (Q1) of the disc. If necessary, chamfer the valve end / flange adapter.

Maintenance notes

In normal operation, butterfly valves do not require maintenance. It is nonetheless recommended to perform maintenance on butterfly valves after 5,000 actuation cycles at most. The following steps must be taken when doing so:

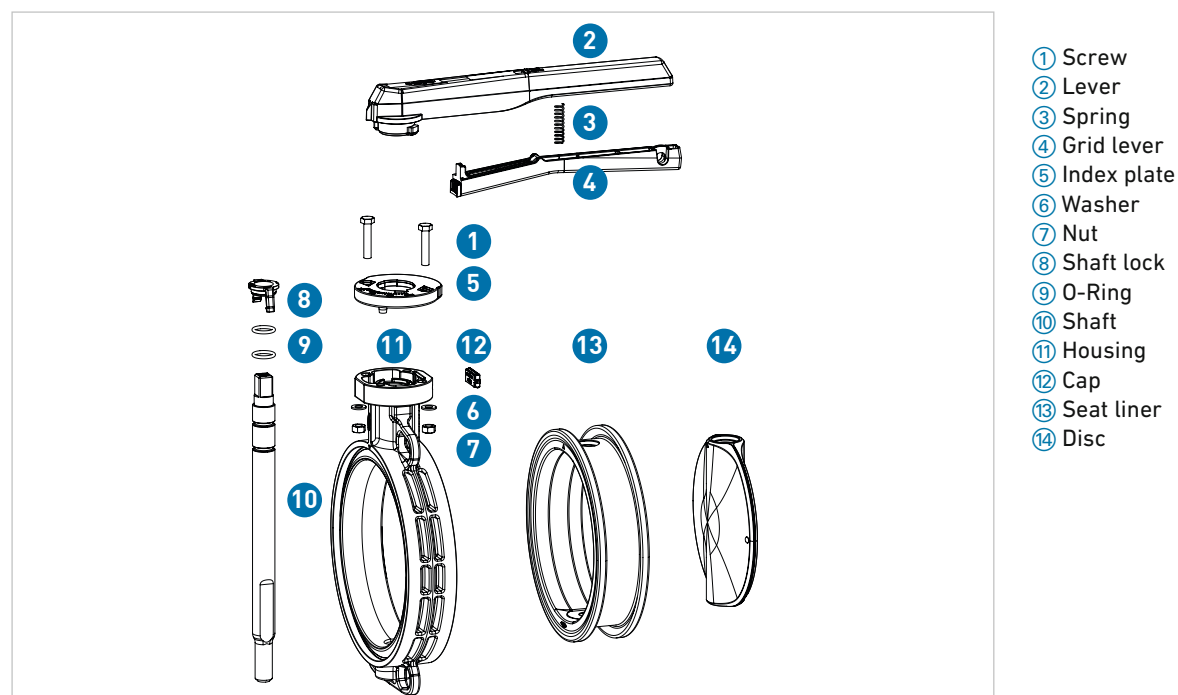
- Regularly check that no medium escapes to the outside. If medium exits from the flange connections, tighten them.
- We recommend operating the butterfly valves that are kept permanently in the same position 1 or 2 x a year to check their functionality.
- Depending on the operating conditions, the collars should be lubricated periodically with (silicon-based) grease.
- It is recommended that you check and, if necessary, replace the O-rings when removing the shaft.



Installation and maintenance must be performed according to the corresponding installation instructions. To be found at www.gfps.com

1.1.3 Technical data

Specifications



Specifications

Dimensions	d63/DN50 – d315/DN300, 2" – 12"					
Materials	Lever, grid lever, index plate, shaft lock, housing	② ④ ⑤ ⑧ ⑪	Polyamide PA6-60			
	Disc (outside)	⑭	PVDF			
	Disc (inside)	⑭	Polyamide PA6-60			
	O-Ring, seat liner	⑨ ⑬	EPDM or FKM			
	Screw, washer, nut, shaft	① ⑥ ⑦ ⑩	Stainless steel			
	Spring	③	Stainless spring steel			
	Cap	⑫	EPDM			
Pressure ratings	Manual actuated		Electric actuated		Pneumatic actuated	
	DN50-150	PN16	DN50-200	PN10	DN50-250	PN10
	DN200-250	PN10	DN250	PN6	DN300	PN6
	DN300	PN6	DN300	PN4		
Flange standards	ISO 7005 PN10/16, EN 1092 PN10/16, DIN 2501 PN10/16, ANSI/ASME B 16.5 Class 150, BS 1560: 1989 Class 125/150; BS 4504 PN10/16, JIS B 2220 10K, JIS B 2239 10K					
Actuator interface	EN ISO 5211					
Actuation variants	Manually operated (lockable hand lever or manual reduction gear)					
	Pneumatic actuated: FC, FO, DA					
	Electric actuated: EA25-250 AC: 100 – 230 V, AC/DC: 24 V, Smart actuator dEA					
Approvals	Multiple approvals available on request					
	Leak test		ISO 9393-2, EN 12266 (leak rate A), ISO 5208 (Rate A)			

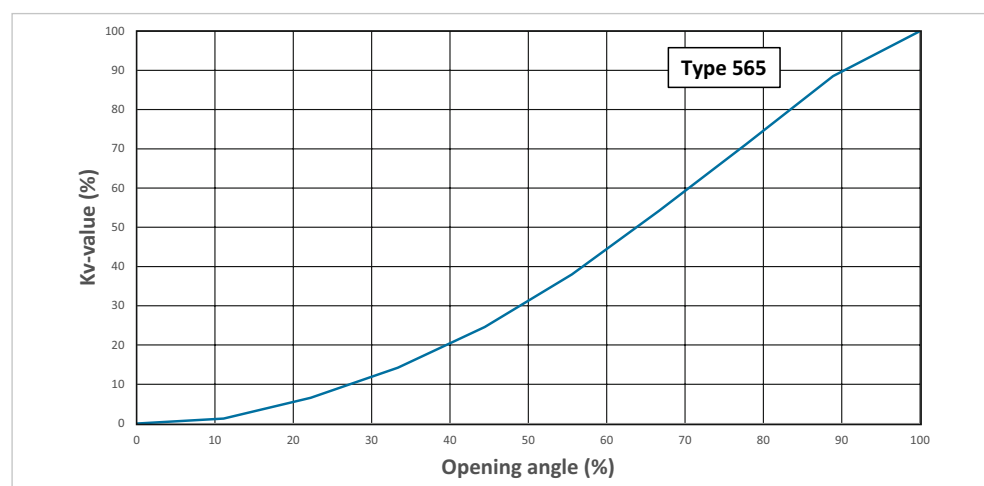
Flow characteristics

Kv 100-values

DN (mm)	d (mm)	Inch (")	Kv 100 (l/min)	Cv 100 (US gal./min)	Kv 100 (m³/h)
50	63	2	1445	101	87
65	75	2 ½	2530	177	152
80	90	3	4020	281	241
100	110	4	5850	400	351
125	140	5	11900	832	714
150	160	6	18050	1262	1083
200	225	8	43667	3052	2620
250	280	10	*	*	*
300	315	12	*	*	*

* On request

Flow characteristics according to opening angle



Operating torques

DN (mm)	d (mm)	Inch (")	Operating torque @ maximum operating pressure (Nm)
50	63	2	15
65	75	2 ½	20
80	90	3	25
100	110	4	40
125	140	5	50
150	160	6	60
200	225	8	160
250	280	10	250
300	315	12	300

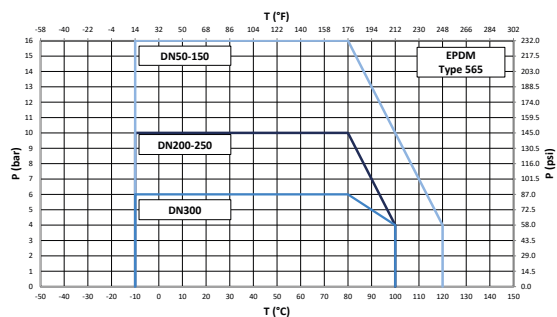
Pressure-temperature diagrams

The following pressure-temperature diagrams are based on a lifetime of 25 years and water or similar media.

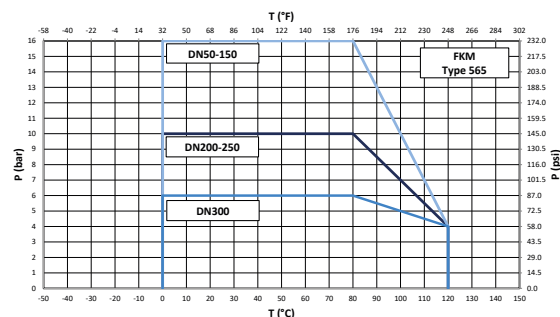
T Temperature (°C, °F)

P Permissible pressure (bar, psi)

EPDM (DN50 – DN300)

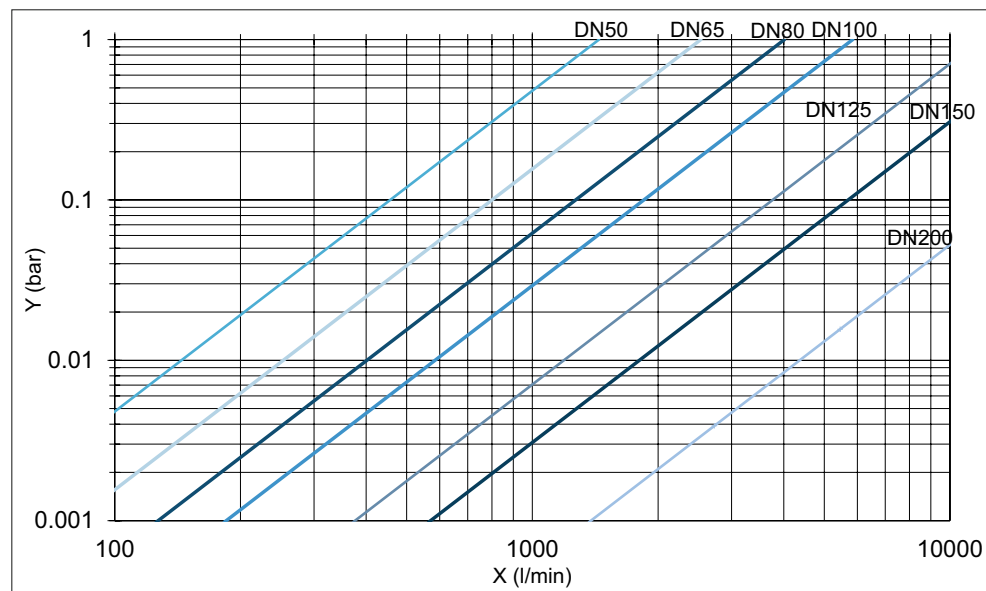


FKM (DN50 – DN300)



Pressure losses

DN50 – DN200



- X Flow rate (l/min, US gal/min)
- Y Pressure loss Δp (bar, psi)

Standard values for screw fastening

DN50 – DN300 in ISO flange connections

DN (mm)	d (mm)	Inch (")	Screws ISO*	Tightening torque	
				(Nm)	Inch-lbs
50	63	2	4 x M16 x 140mm	25	221
65	75	2 ½	4 x M16 x 140mm	25	221
80	90	3	8 x M16 x 150mm	25	221
100	110	4	8 x M16 x 160mm	30	265
125	140	5	8 x M16 x 170mm	35	310
150	160	6	8 x M20 x 180mm	40	352
200	225	8	8 x M20 x 200mm	60	531
250	280	10	12 x M20 x 220mm	80	708
300	315	12	12 x M20 x 250mm	80	708

*for PVC-U socket flange adaptors and PP-V flange

DN50 – DN300 in ANSI flange connections

DN (mm)	d (mm)	Inch (")	Screws ANSI*	Tightening torque	
				(Nm)	Inch-lbs
50	63	2	4 x 5/8" x 5 1/2"	25	221
65	75	2 ½	4 x 5/8" x 5 1/2"	25	221
80	90	3	4 x 5/8" x 6"	25	221
100	110	4	8 x 5/8" x 6 1/2"	30	265
125	140	5	8 x 3/4" x 6 3/4"	35	310
150	160	6	8 x 3/4" x 7"	40	352
200	225	8	8 x 3/4" x 8"	60	531
250	280	10	12 x 7/8" x 8 1/2"	80	708
300	315	12	12 x 7/8" x 10"	80	708

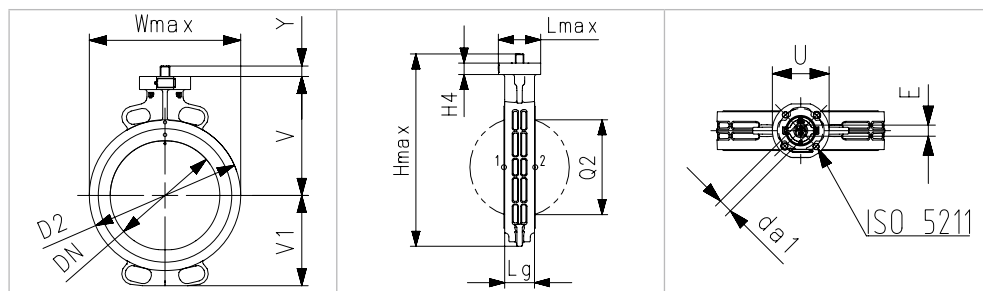
*for PVC-U socket flange adaptors and PP-V flange



Components and tightening torques can be determined using the online tool "Perfect Flange Connection Tool" under the following link:
<https://www.gfps.com/perfectflangeconnection>

1.1.4 Dimensions

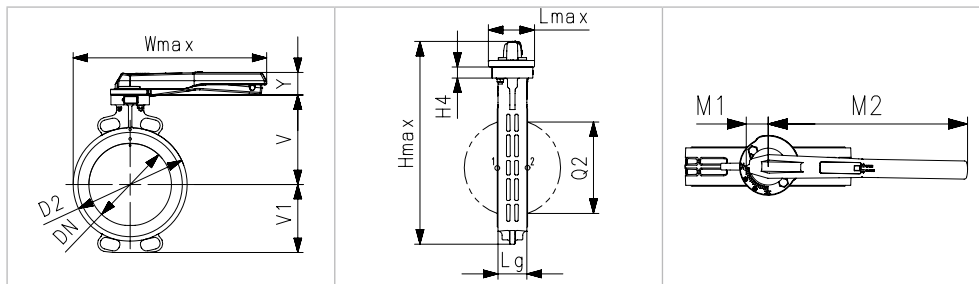
Butterfly Valve Type 565 DN50 – DN300 with free shaft end



Dimensions			Housing dimensions							
DN (mm)	d (mm)	Inch (")	D2 (mm)	Wmax (mm)	Lmax (mm)	Hmax (mm)	H4 (mm)	V (mm)	V1 (mm)	Lg (mm)
50	63	2	100.0	118.5	85.5	222.5	23.0	133.5	63.0	43.0
65	75	2 ½	121.0	132.5	85.5	248.5	23.0	140.0	82.0	46.0
80	90	3	138.0	138.0	85.5	261.0	23.0	146.0	89.0	46.0
100	110	4	158.5	158.5	85.5	286.0	23.0	166.5	104.0	52.0
125	140	5	187.0	187.0	85.5	313.5	23.0	180.0	118.0	56.0
150	160	6	213.0	213.0	85.5	337.5	23.0	189.0	130.5	56.0
200	225	8	267.0	267.0	85.5	387.0	23.0	209.5	159.0	60.0
250	280	10	325.5	325.5	125.5	499.0	23.0	262.5	195.5	68.0
300	315	12	380.0	380.0	125.5	555.0	23.0	284.5	230.5	78.0

Dimensions			Housing dimensions					Q	Weight
DN (mm)	d (mm)	Inch (")	Acc. to ISO 5211	da1 (mm)	E (mm)	U (mm)	Y (mm)	Q2 (mm)	Weight (kg)
50	63	2	F07	14.1	11.0	90.0	27.0	28.5	1.0
65	75	2 ½	F07	14.1	11.0	90.0	27.0	44.0	1.2
80	90	3	F07	14.1	11.0	90.0	27.0	63.5	1.4
100	110	4	F07	18.1	14.0	90.0	16.0	84.0	2.2
125	140	5	F07	18.1	14.0	90.0	16.0	110.5	2.9
150	160	6	F07	22.2	17.0	90.0	19.0	137.5	3.8
200	225	8	F07	22.2	17.0	90.0	18.0	190.5	5.2
250	280	10	F10	28.2	22.0	125.0	41.0	239.0	9.5
300	315	12	F10	28.2	22.0	125.0	41.0	285.5	13.7

Butterfly Valve Type 565 DN50 – DN200 with hand lever

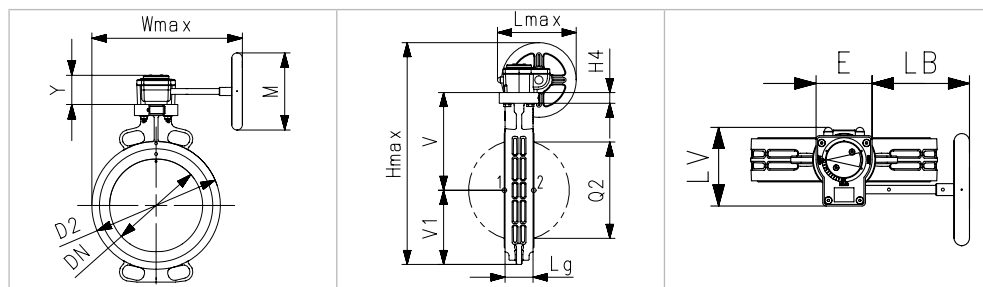


Dimensions			Housing dimensions							
DN (mm)	d (mm)	Inch (")	D2 (mm)	Wmax (mm)	Hmax (mm)	Lmax (mm)	H4 (mm)	V (mm)	V1 (mm)	Lg (mm)
50	63	2	100.0	264.0	249.5	96.0	23.0	133.5	63.0	43.0
65	75	2 ½	121.0	271.0	275.5	96.0	23.0	140.0	82.0	46.0
80	90	3	138.0	273.5	288.0	96.0	23.0	146.0	89.0	46.0
100	110	4	158.5	334.0	324.0	96.0	23.0	166.5	104.0	52.0
125	140	5	187.0	348.0	351.0	96.0	23.0	180.0	118.0	56.0
150	160	6	213.0	426.0	372.5	96.0	23.0	189.0	130.5	56.0
200	225	8	267.0	453.0	422.0	96.0	23.0	209.5	159.0	60.0

Dimensions			Actuator			Q	Weight
DN (mm)	d (mm)	Inch (")	M1 (mm)	M2 (mm)	Y (mm)	Q2 (mm)	Weight (kg)
50	63	2	35.5	204.5	53.0	28.5	1.4
65	75	2 ½	35.5	204.5	53.0	44.0	1.6
80	90	3	35.5	204.5	53.0	63.5	1.8
100	110	4	35.5	254.5	53.0	84.0	2.7
125	140	5	35.5	254.5	53.0	110.5	3.3
150	160	6	35.5	319.5	53.0	137.5	4.3
200	225	8	35.5	319.5	53.0	190.5	5.7

VI

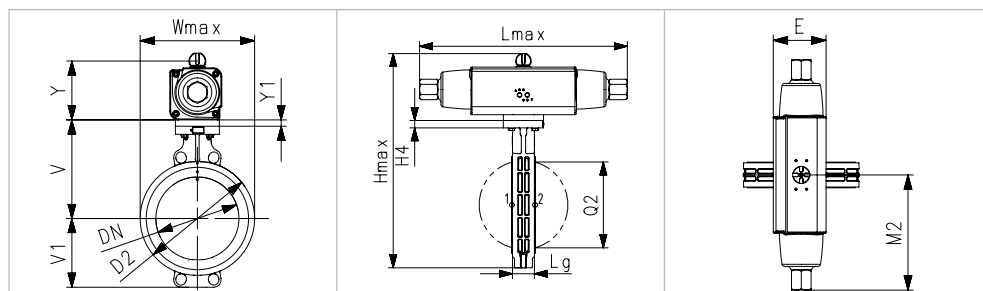
Butterfly Valve Type 565 DN50 – DN300 with manual reduction gear



Dimensions			Housing dimensions							
DN (mm)	d (mm)	Inch (")	D2 (mm)	Wmax (mm)	Hmax (mm)	Lmax (mm)	H4 (mm)	V (mm)	V1 (mm)	Lg (mm)
50	63	2	100.0	238.5	303.0	169.0	23.0	133.5	63.0	43.0
65	75	2 ½	121.0	246.0	329.0	169.0	23.0	140.0	82.0	46.0
80	90	3	138.0	248.5	341.5	169.0	23.0	146.0	89.0	46.0
100	110	4	158.5	258.5	377.5	169.0	23.0	166.5	104.0	52.0
125	140	5	187.0	272.0	405.0	169.0	23.0	180.0	118.0	56.0
150	160	6	213.0	285.5	426.5	169.0	23.0	189.0	130.5	56.0
200	225	8	267.0	312.5	475.5	169.0	23.0	209.5	159.0	60.0
250	280	10	325.5	360.5	603.0	212.5	23.0	262.5	195.5	68.0
300	315	12	380.0	387.5	659.5	212.5	23.0	284.5	230.5	78.0

Dimensions			Actuator					Q	Weight
DN (mm)	d (mm)	Inch (")	E (mm)	LB (mm)	LV (mm)	M (mm)	Y (mm)	Q2 (mm)	Weight (kg)
50	63	2	80.0	128.0	112.5	160.0	61.5	28.5	3.1
65	75	2 ½	80.0	128.0	112.5	160.0	61.5	44.0	3.3
80	90	3	80.0	128.0	112.5	160.0	61.5	63.5	3.5
100	110	4	80.0	128.0	112.5	160.0	61.5	84.0	4.3
125	140	5	80.0	128.0	112.5	160.0	61.5	110.5	5.0
150	160	6	80.0	128.0	112.5	160.0	61.5	137.5	5.8
200	225	8	80.0	128.0	112.5	160.0	61.5	190.5	7.2
250	280	10	100.0	135.5	130.0	200.0	68.5	239.0	13.4
300	315	12	100.0	135.5	130.0	200.0	68.5	285.5	17.6

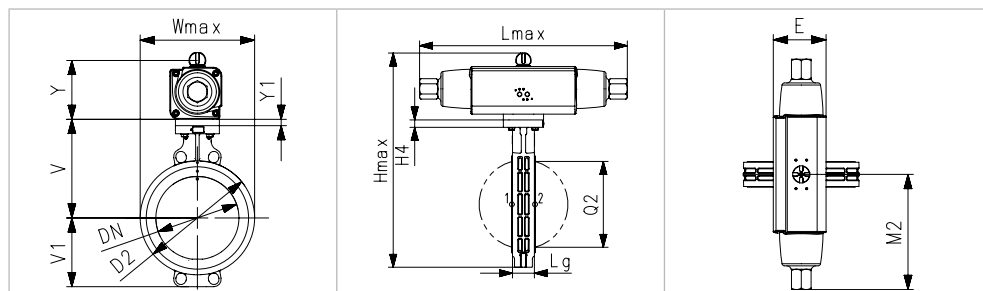
Butterfly Valve Type 565 DN50 – DN300 with pneumatic actuator FC/F0



Dimensions			Housing dimensions							
DN (mm)	d (mm)	Inch (")	D2 (mm)	Wmax (mm)	Hmax (mm)	Lmax (mm)	H4 (mm)	V (mm)	V1 (mm)	Lg (mm)
50	63	2	100.0	118.5	309.5	274.5	23.0	133.5	63.0	43.0
65	75	2 ½	121.0	132.5	335.5	275.5	23.0	140.0	82.0	46.0
80	90	3	138.0	138.0	361.0	325.5	23.0	146.0	89.0	46.0
100	110	4	158.5	158.5	385.5	359.5	23.0	166.5	104.0	52.0
125	140	5	187.0	187.0	447.5	418.0	23.0	180.0	118.0	56.0
150	160	6	213.0	213.0	472.5	434.0	23.0	189.0	130.5	56.0
200	225	8	267.0	267.0	545.5	547.5	23.0	209.5	159.0	60.0
250	280	10	325.5	325.5	666.0	681.0	23.0	262.5	195.5	68.0
300	315	12	380.0	380.0	742.5	681.0	23.0	284.5	230.5	78.0

Dimensions			Actuator				Q	Weight
DN (mm)	d (mm)	Inch (")	E (mm)	M2 (mm)	Y (mm)	Y1 (mm)	Q2 (mm)	Weight (kg)
50	63	2	70.5	137.2	98.5	15.0	28.5	3.3
65	75	2 ½	70.5	137.2	98.5	15.0	44.0	3.6
80	90	3	83.5	162.6	111.5	15.0	63.5	4.4
100	110	4	87.0	179.8	115.0		84.0	6.1
125	140	5	107.5	209.0	149.5		110.5	8.2
150	160	6	111.5	217.0	153.5		137.5	11.0
200	225	8	135.0	273.6	177.0		190.5	16.9
250	280	10	148.0	323.0	190.0	18.0	239.0	26.2
300	315	12	168.0	340.5	210.5	18.0	285.5	33.3

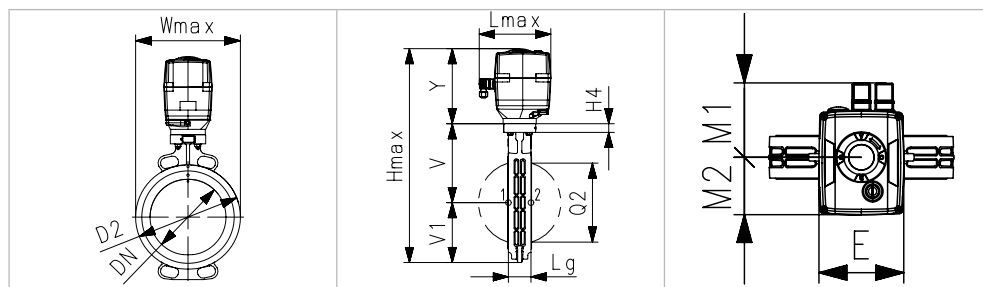
Butterfly Valve Type 565 DN50 – DN300 with pneumatic actuator Double DA



Dimensions			Housing dimensions							
DN (mm)	d (mm)	Inch (")	D2 (mm)	Wmax (mm)	Hmax (mm)	Lmax (mm)	H4 (mm)	V (mm)	V1 (mm)	Lg (mm)
50	63	2	100.0	118.5	303.5	196.5	23.0	133.5	63.0	43.0
65	75	2 ½	121.0	132.5	329.5	196.5	23.0	140.0	82.0	46.0
80	90	3	138.0	138.0	348.0	206.0	23.0	146.0	89.0	46.0
100	110	4	158.5	158.5	381.5	242.0	23.0	166.5	104.0	52.0
125	140	5	187.0	187.0	409.0	242.0	23.0	180.0	118.0	56.0
150	160	6	213.0	213.0	468.5	290.5	23.0	189.0	130.5	56.0
200	225	8	267.0	267.0	522.0	314.0	23.0	209.5	159.0	60.0
250	280	10	325.5	325.5	636.0	340.0	23.0	262.5	195.5	68.0
300	315	12	380.0	380.0	709.5	382.5	23.0	284.5	230.5	78.0

Dimensions			Actuator				Q	Weight
DN (mm)	d (mm)	Inch (")	E (mm)	M2 (mm)	Y (mm)	Y1 (mm)	Q2 (mm)	Weight (kg)
50	63	2	64.5	98.5	92.5	15.0	28.5	2.7
65	75	2 ½	64.5	98.5	92.5	15.0	44.0	3.0
80	90	3	70.5	103.0	98.5	15.0	63.5	3.5
100	110	4	83.5	121.0	111.5		84.0	4.7
125	140	5	83.5	121.0	111.5		110.5	5.4
150	160	6	107.5	145.5	149.5		137.5	8.0
200	225	8	111.5	157.0	153.5		190.5	11.2
250	280	10	118.0	170.0	160.0	18.0	239.0	17.6
300	315	12	135.0	191.5	177.0	18.0	285.5	23.6

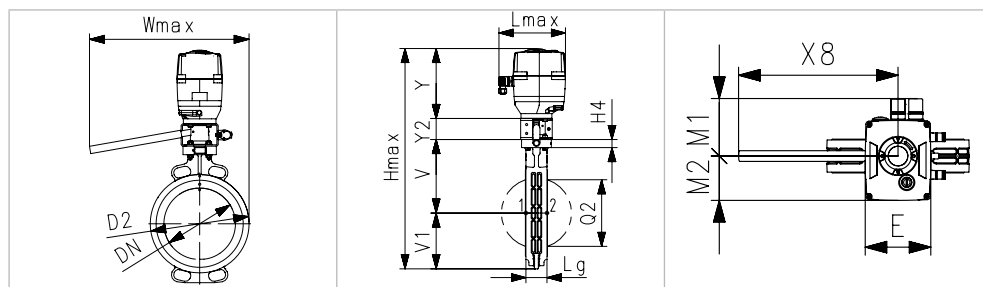
Butterfly Valve Type 565 DN50 – DN300 with electric actuator EA45-250



Dimensions			Housing dimensions							
DN (mm)	d (mm)	Inch (")	D2 (mm)	Wmax (mm)	Hmax (mm)	Lmax (mm)	H4 (mm)	V (mm)	V1 (mm)	Lg (mm)
50	63	2	100.0	122.5	377.5	190.0	23.0	133.5	63.0	43.0
65	75	2 ½	121.0	132.5	411.5	190.0	23.0	140.0	82.0	46.0
80	90	3	138.0	137.5	424.0	190.0	23.0	146.0	89.0	46.0
100	110	4	158.5	158.5	459.5	190.0	23.0	166.5	104.0	52.0
125	140	5	187.0	187.0	487.5	190.0	23.0	180.0	118.0	56.0
150	160	6	213.0	213.0	518.5	190.0	23.0	189.0	130.5	56.0
200	225	8	267.0	267.0	568.0	190.0	23.0	209.5	159.0	60.0
250	280	10	325.5	325.5	674.5	190.0	23.0	262.5	195.5	68.0
300	315	12	380.0	380.0	731.0	190.0	23.0	284.5	230.5	78.0

Dimensions			Actuator				Q	Weight
DN (mm)	d (mm)	Inch (")	E (mm)	M1 (mm)	M2 (mm)	Y (mm)	Q2 (mm)	Weight (kg)
50	63	2	122.5	107.5	83.0	166.5	28.5	3.4
65	75	2 ½	122.5	107.5	83.0	189.5	44.0	4.7
80	90	3	122.5	107.5	83.0	189.5	63.5	4.8
100	110	4	122.5	107.5	83.0	189.5	84.0	5.8
125	140	5	122.5	107.5	83.0	189.5	110.5	6.4
150	160	6	122.5	107.5	83.0	199.5	137.5	9.0
200	225	8	122.5	107.5	83.0	199.5	190.5	10.5
250	280	10	122.5	107.5	83.0	216.5	239.0	15.2
300	315	12	122.5	107.5	83.0	216.5	285.5	19.4

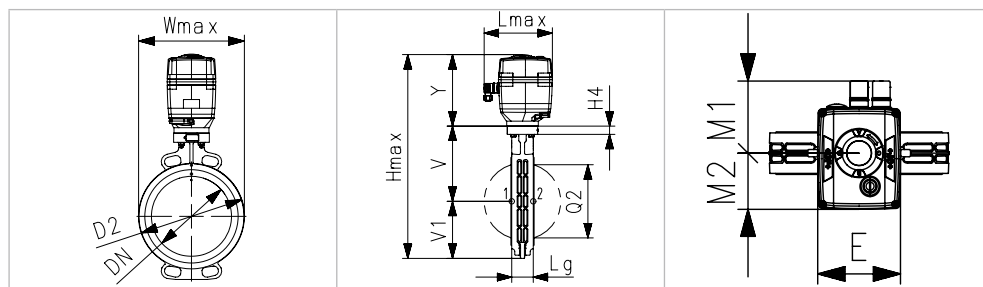
Butterfly Valve Type 565 DN50 – DN200 with electric actuator EA45-250 and manual override



Dimensions			Housing dimensions							
DN (mm)	d (mm)	Inch (")	D2 (mm)	Wmax (mm)	Hmax (mm)	Lmax (mm)	H4 (mm)	V (mm)	V1 (mm)	Lg (mm)
50	63	2	100.0	385.5	96.0	190.0	23.0	133.5	63.0	43.0
65	75	2 ½	121.0	385.5	96.0	190.0	23.0	140.0	82.0	46.0
80	90	3	138.0	385.5	96.0	190.0	23.0	146.0	89.0	46.0
100	110	4	158.5	385.5	96.0	190.0	23.0	166.5	104.0	52.0
125	140	5	187.0	385.5	189.5	190.0	23.0	180.0	118.0	56.0
150	160	6	213.0	385.5	106.0	190.0	23.0	189.0	130.5	56.0
200	225	8	267.0	385.5	106.0	190.0	23.0	209.5	159.0	60.0

Dimensions			Actuator						Q	Weight
DN (mm)	d (mm)	Inch (")	E (mm)	M1 (mm)	M2 (mm)	X8 (mm)	Y (mm)	Y2 (mm)	Q2 (mm)	Weight (kg)
50	63	2	122.5	107.5	83.0	297.5	189.5	60.0	28.5	5.6
65	75	2 ½	122.5	107.5	83.0	297.5	189.5	60.0	44.0	5.9
80	90	3	122.5	107.5	83.0	297.5	189.5	60.0	63.5	6.0
100	110	4	122.5	107.5	83.0	297.5	189.5	60.0	84.0	6.8
125	140	5	122.5	107.5	83.0	297.5	189.5	60.0	110.5	7.4
150	160	6	122.5	107.5	83.0	297.5	199.5	60.0	137.5	10.0
200	225	8	122.5	107.5	83.0	297.5	199.5	60.0	190.5	11.5

Butterfly Valve Type 565 DN50 – DN300 with smart electric actuator dEA




Dimensions			Housing dimensions							
DN (mm)	d (mm)	Inch (")	D2 (mm)	Wmax (mm)	Hmax (mm)	Lmax (mm)	H4 (mm)	V (mm)	V1 (mm)	Lg (mm)
50	63	2	100.0	122.5	377.5	190.0	23.0	133.5	63.0	43.0
65	75	2 ½	121.0	132.5	411.5	190.0	23.0	140.0	82.0	46.0
80	90	3	138.0	137.5	424.0	190.0	23.0	146.0	89.0	46.0
100	110	4	158.5	158.5	459.5	190.0	23.0	166.5	104.0	52.0
125	140	5	187.0	187.0	487.5	190.0	23.0	180.0	118.0	56.0
150	160	6	213.0	213.0	518.5	190.0	23.0	189.0	130.5	56.0
200	225	8	267.0	267.0	568.0	190.0	23.0	209.5	159.0	60.0
250	280	10	325.5	325.5	674.5	190.0	23.0	262.5	195.5	68.0
300	315	12	380.0	380.0	731.0	190.0	23.0	284.5	230.5	78.0

Dimensions			Actuator				Q	Weight
DN (mm)	d (mm)	Inch (")	E (mm)	M1 (mm)	M2 (mm)	Y (mm)	Q2 (mm)	Weight (kg)
50	63	2	122.5	107.5	83.0	166.5	28.5	3.4
65	75	2 ½	122.5	107.5	83.0	189.5	44.0	4.7
80	90	3	122.5	107.5	83.0	189.5	63.5	4.8
100	110	4	122.5	107.5	83.0	189.5	84.0	5.8
125	140	5	122.5	107.5	83.0	189.5	110.5	6.4
150	160	6	122.5	107.5	83.0	199.5	137.5	9.0
200	225	8	122.5	107.5	83.0	199.5	190.5	10.5
250	280	10	122.5	107.5	83.0	216.5	239.0	15.2
300	315	12	122.5	107.5	83.0	216.5	285.5	19.4

1.1.5 Accessories

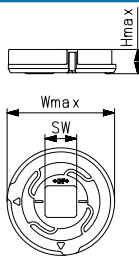
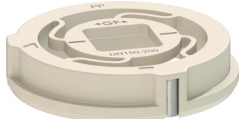
Double Sensor for electrical position feedback

After being mounted in the valve or in the interface module, the double sensor is used to signal the CLOSED or OPEN position of the valve via an electric signal to a controller, supplied by the customer. The switching states are also output optically via two integrated LEDs.

Code	Open Signal color	Closed Signal color	Output circuit	Product picture
198546001	LED red	LED green	PNP	
198546002	LED green	LED red	PNP	

i Suitable connection cable code 198546150 available as an accessory.

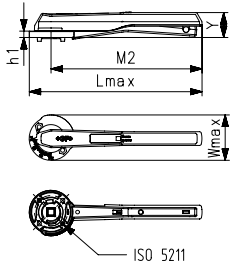
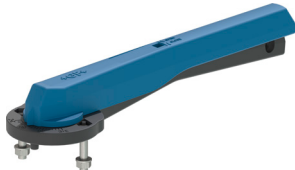
Switching ring for Double Sensor

DN (mm)	Code	Gemäss ISO 5211	SW (mm)	Wmax (mm)	Hmax (mm)	Dimensions	Product picture
50 - 80	199565900	F07	11	57.7	12.5		
100 - 125	199565901	F07	14	57.7	12.5		
150 - 200	199565902	F07	17	57.7	12.5		
250 - 300	199565903	F10	22.1	79.8	12.5		

i For manually operated valves an additional switching ring is required. For electrically or pneumatically operated valves, the switching ring is already pre-assembled.


Hand lever

Hand lever incl. fastening screws.

DN (mm)	Code	Wmax (mm)	Lmax (mm)	Gemäss ISO 5211	h1 (mm)	M2 (mm)	Y (mm)	Dimensions	Product picture
50-80	199565906	96	251	F07	13.5	204.5	53		
100-125	199565907	96	301	F07	13.5	254.5	53		
150-200	199565908	96	366	F07	13.5	319.5	53		


Reduction gear

For valve operation via a manual gear with handwheel.

DN (mm)	Code	Product picture
50-200	161483471	
250-300	161483472	


Electric Actuator EA25-250

The EA45/120/250 electric actuator is mounted on a valve (e.g. ball valve or butterfly valve) and connected to a control system provided by the customer. It actuates the valve with a rotary movement of up to 180°.

DN (mm)	Code	Type	Spannung	Torque max.	Acc. to ISO 5211	Product picture
50	198153184	EA45	AC 100-230V	45 Nm	F05* (WS 11/14)	
50	198153185	EA45	AC/DC 24V	45 Nm	F05* (WS 11/14)	
50 - 125	198153186	EA120	AC 100-230V	120 Nm	F07 (WS17)	
50 - 125	198153187	EA120	AC/DC 24V	120 Nm	F07 (WS17)	
150 - 300	198153188	EA250	AC 100-230V	250 Nm	F07 (WS17)	
150 - 300	198153189	EA250	AC/DC 24V	250 Nm	F07 (WS17)	

Smart Actuator dEA45-250

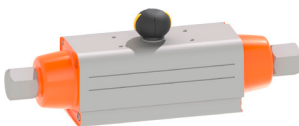
The Smart Actuator dEA45/120/250 is mounted on a valve (e.g. ball valve or butterfly valve) and connected to a control system provided by the customer. It actuates the valve with a rotary movement up to 180°. The Smart Actuator offers wireless connectivity via NFC and Wi-Fi Direct, as well as control and reading of process data via downloadable App.

DN (mm)	Code	Type	Spannung	Torque max.	Acc. to ISO 5211	Product picture
50	198153194	dEA45	AC 100-230V	45 Nm	F05* (WS 11/14)	
50	198153195	dEA45	AC/DC 24V	45 Nm	F05* (WS 11/14)	
50 - 125	198153196	dEA120	AC 100-230V	120 Nm	F07 (WS17)	
50 - 125	198153197	dEA120	AC/DC 24V	120 Nm	F07 (WS17)	
150 - 300	198153198	dEA250	AC 100-230V	250 Nm	F07 (WS17)	
150 - 300	198153199	dEA250	AC/DC 24V	250 Nm	F07 (WS17)	


Pneumatic Actuator PA30-70

The PA30 - PA90 pneumatic actuator can be mounted on any rotary valves with an interface according to ISO 5211.

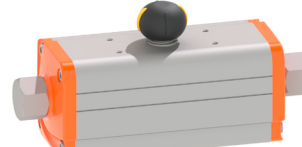
Single-acting FC

DN (mm)	Code	Type	Torque max.	Acc. to ISO 5211	Product picture
50 - 65	198811617	PA30	30 Nm	F05/07	
80	198811601	PA35	53 Nm	F05/07	
100	198811609	PA40	60 Nm	F05/07	
125	198811603	PA45	90 Nm	F07/10	
150	198811610	PA55	180 Nm	F07/10	
200	198811652	PA60	240 Nm	F07/10/12	
250	198811607	PA65	360 Nm	F10/12	
300	198811612	PA70	480 Nm	F10/12	

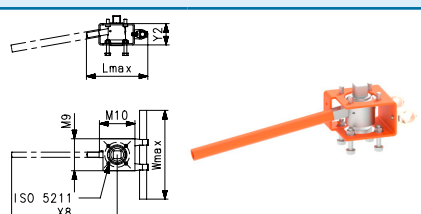

Single-acting F0

DN (mm)	Code	Typ	Torque max.	Acc. to ISO 5211	Product picture
50 - 65	198811627	PA30	30 Nm	F05/07	
80	198811628	PA35	53 Nm	F05/07	
100	198811629	PA40	60 Nm	F05/07	
125	198811630	PA45	90 Nm	F07/10	
150	198811631	PA55	180 Nm	F07/10	
200	198811653	PA60	240 Nm	F07/10/12	
250	198811633	PA65	360 Nm	F10/12	
300	198811634	PA70	480 Nm	F10/12	

Double-acting DA

DN (mm)	Code	Typ	Torque max.	Acc. to ISO 5211	Product picture
50 - 65	198811618	PA35	46 Nm	F03/05	
80	198811619	PA40	60 Nm	F05/07	
100 - 125	198811604	PA45	106 Nm	F05/07	
150	198811606	PA55	180 Nm	F07/10	
200	198811614	PA60	240 Nm	F07/10	
250	198811608	PA65	360 Nm	F07/10	
300	198811615	PA70	480 Nm	F10/12	

Manual override

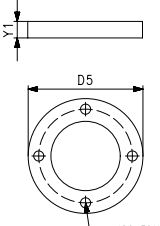
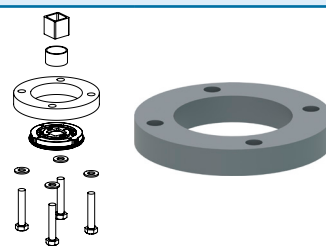
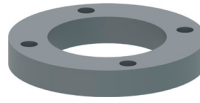
DN (mm)	Code	Acc. to ISO 5211	Lmax (mm)	Wmax (mm)	M9 (mm)	M10 (mm)	X8 (mm)	Y2 (mm)	Dimensions	Product picture
50 - 80	199565914	F07	172	250	90	100	298	60		
100 - 125	199565915	F07	172	250	90	100	298	60		
150 - 200	199565916	F07	172	250	90	100	298	60		

Intermediate elements

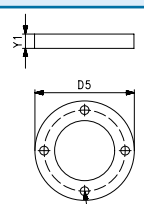
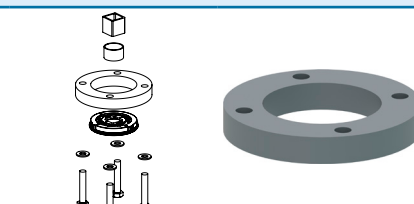
Intermediate elements are required as a connection between valve and Actuator. The intermediate elements include different screws, hexagon nuts, washer, switching rings, etc. (depends on actuator and dimension).

Note: The switching ring for the double sensor for electrical position feedback is supplied with each intermediate element.

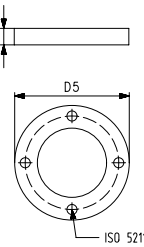
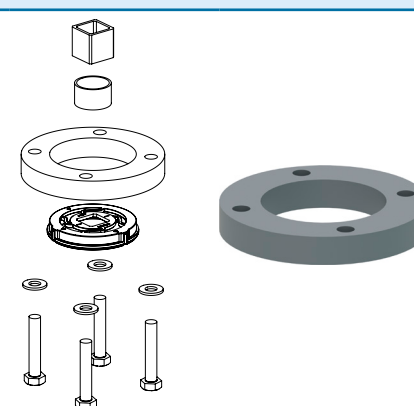
For reduction gear

DN (mm)	Code	Reduction gear	Acc. to ISO 5211	D5 (mm)	Y1 (mm)	Dimensions	Product picture
50 - 80	199565917	161483471	F07		17		
100 - 125	199565918	161483471	F07				
150 - 200	199565919	161483471	F07				
250 - 300	199565913	161483472	F07/F10	125	17		

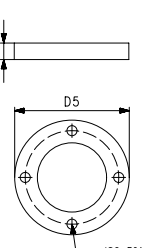
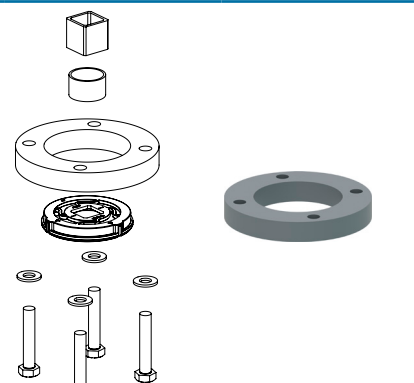
For Electric actuators EA45-250, dEA45-250

DN (mm)	Code	Type	Acc. to ISO 5211	D5 (mm)	Y1 (mm)	Dimensions	Product picture
50	199565909	EA45	F05/F07	90	15		
50 - 80	199565910	xEA120-250	F07				
100 - 125	199565911	xEA120-250	F07				
150 - 200	199565912	xEA250	F07				
250 - 300	199565913	xEA250	F07/F10	125	17		

For Pneumatic actuators, function FC/F0

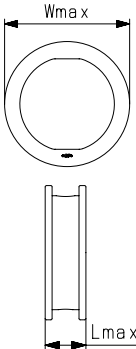

DN (mm)	Code	Type	Acc. to ISO 5211	D5 (mm)	Y1 (mm)	Dimensions	Product picture
50	199565921	PA30	F05/F07	90	15		
65	199565921	PA30	F05/F07	90	15		
80	199565922	PA35	F05/F07	90	15		
100	199565923	PA40	F07				
125	199565924	PA45	F07				
150	199565925	PA50	F07				
200	199565929	PA60	F07/F10	125	18		
250	199565927	PA65	F10	125	18		
300	199565928	PA70	F10	125	18		

For Pneumatic actuators, function DA

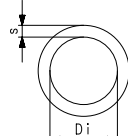

DN (mm)	Code	Type	Acc. to ISO 5211	D5 (mm)	Y1 (mm)	Dimensions	Product picture
50	199565920	PA35	F05/F07	90	15		
65	199565920	PA35	F05/F07	90	15		
80	199565921	PA40	F05/F07	90	15		
100	199565923	PA45	F07				
125	199565923	PA45	F07				
150	199565925	PA55	F07				
200	199565925	PA60	F07	125	18		
250	199565926	PA65	F10	125	18		
300	199565927	PA70	F10	125	18		

Replacement parts

Replacement seat liner

DN (mm)	EPDM	FKM	L _{max} (mm)	W _{max} (mm)	Dimensions	Product picture
50	199565930	199565940	45.2	85.5		
65	199565931	199565941	48.4	105.5		
80	199565932	199565942	48.4	122.5		
100	199565932	199565943	54.6	142.5		
125	199565934	199565944	59	169.5		
150	199565935	199565945	59	194.5		
200	199565936	199565946	63	248		
250	199565937	199565947	72	304		
300	199565938	199565948	82.8	358		

Replacement o-ring

DN (mm)	EPDM	FKM	Di	s	Dimensions	Product picture
50-80	199565951	199565961	13.95	2.62		
100-125	199565952	199565962	17.13	2.62		
150-200	199565953	199565963	20.22	3.53		
250-300	199565954	199565964	24.99	3.53		







For further information see www.gfps.com/565

■ Mobile apps and online tools to support configuration and calculation at www.gfps.com/tools



1.2 Butterfly Valve Type 567/578

			
Type 567 Standard for wafer style installation	Type 567 For fine adjustment	Type 567 Manual reduction gear	Type 578 For lug style and wafer style installation

1.2.1 Product description

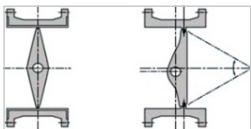
Butterfly valves of types 567 and 578 are corrosion-resistant and reliable control and shut-off valves that can be used in most applications in industrial water treatment, the chemical process industry, chemical trade, galvanization and in power plants. The valves are intended for wafer style and lug style applications. They are compact, varied and reliable. The valve is modular in design, allowing individual system parts to be exchanged at any time.

Function

Butterfly valves of types 567 and 578 have a double-eccentric mode of action and are of modular construction.

Double eccentric operating principle

The disc does not touch the seal in the open position. The disc can be quickly unscrewed from the gasket, ensuring low wear and tear. Pressure surges in the direction of flow can be absorbed more readily.



Use as a process and control valve

The butterfly valves can be equipped with corresponding pneumatic or electrical actuators and used as process and regulating valves. With extensive accessories, such as the integrated electrical position indicator. This enables direct feedback of the axis position in the valve head flange by means of limit switches and thereby an exact determination of the position of the valve disc.

Benefits/features

Type 567

- High corrosion resistance: all components that come into contact with media are made of plastic
- Low wear and tear: up to 50 % lower operation torque than centric valves
- Leak-tightness within and without: double, internal axis gasket on both sides
- On standard versions, the lever is in increments of 5 degrees

Type 578

- Use as lugged valve with threaded bushes integrated into the housing
- Lower weight than metallic butterfly valves due to use of fiberglass-reinforced plastic as housing material
- High corrosion resistance: all components that come into contact with media are made of plastic
- Low wear and tear: up to 50 % lower operating torque than centric valves
- Leak-tightness within and without: double, internal axis gasket on both sides

Flow media

- Very well suited for liquid media
- Suited for gaseous media
- Conditionally suited for media containing solids
- Conditionally suited for viscous media

Applications

- Industrial water treatment
- Seawater desalinization
- Swimming pools
- Aquariums/oceanariums
- Chemical process industry
- Surface engineering
- Power plant construction

Valve handling

Installation notes

Differentiation between and use of the types concerned

- Use butterfly Valve Type 567 only as a wafer style valve.
- Use butterfly Valve Type 578 as either a wafer style or a lug style valve.

As a connecting piece, GF Piping Systems recommends valve ends or flange adapters with smooth jointing faces, together with flanges made of PVC-U, PP-V, PP/steel or UP-GF. In the case of BB/VSB with a fluted jointing face, a flat gasket may also be used in individual cases.

Requirements for installation

Ensure that the following conditions are satisfied prior to installation:

- Make sure that the butterfly valves to be installed correspond specifically to the pressure rating, Type of connection, dimension and materials of the particular application.
- Perform a function test. To do this, close and re-open the butterfly valve.
- Only install butterfly valves that function without problems.

Maintenance notes

In normal operation, butterfly valves do not require maintenance. It is nonetheless recommended to perform maintenance on butterfly valves after 5,000 actuation cycles at most. The following steps must be taken when doing so:

- Regularly check that no medium escapes to the outside. If medium exits from the flange connections, tighten them.
- We recommend operating the butterfly valves that are kept permanently in the same position 1 or 2 x a year to check their functionality.
- Depending on the operating conditions, the collars should be lubricated periodically with (silicon-based) grease.
- It is recommended that you check and, if necessary, replace the O-rings when removing the bearing bushings.

i Installation and maintenance must be performed in accordance with the corresponding installation manual. The installation manual is provided with the product, see also the online product catalog at www.gfps.com

Tips for installation

Chamfering of valve end / flange adapter

When using the specified valve ends / flange adapters from GF Piping Systems, chamfering is not necessary, because the disc does not touch the valve end / flange adapter or the flange adapters are already chamfered. If you want to install valve ends/flange adapters of a different brand, then please make sure that the inside diameter (int) of the valve end / flange adapter is greater than the output measure (Q1) of the disc. If necessary, chamfer the valve end / flange adapter.

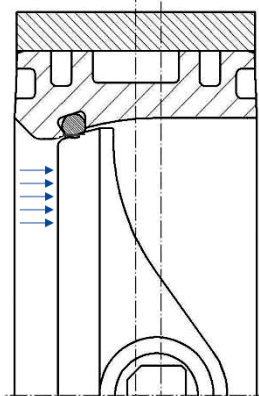
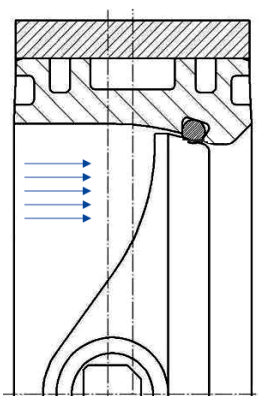
Installation as a lugged valve

If a valve is installed as a lugged valve and pressure is applied to it, it must be closed with a blind flange (or blind cover and counterflange), in order to prevent personal injury or property damage in the event of leaks and/or impermissible opening.

Recommendation of installation direction

A-B

B-A



The installation direction A-B is recommended, if increased safety in the event of pressure surges is required.

If lower torques are important when opening and closing the butterfly valve, installation direction B-A is recommended.

1.2.2 Technical data



- ① Hand lever clip
- ② Lever
- ③ Grid positioning
- ④ Lever handle, lockable
- ⑤ Outer housing
- ⑥ Inner housing
- ⑦ Flange seal
- ⑧ Profile seal
- ⑨ Disc

Specification

Dimensions	Type 567	d63/DN50 – d630/DN600, 2" – 24"					
	Type 578	d63/DN50 – d315/DN300, 2" – 12"					
Materials	Disc / inner housing	PVC-U, PVC-C, ABS, PP-H, PVDF					
	Outer housing	PP-GF30					
Gasket materials	EPDM, FKM, FKM/PTFE						
Pressure ratings	Manual actuation		Electric actuated		Pneumatic actuated		
	DN50-300	PN10	DN50-200	PN10	DN50-250	PN10	
	DN350-400	PN6	DN250	PN6	DN300-450	PN5	
	DN450	PN5	≥ DN300	PN4	≥ DN500	PN4	
	≥ DN500	PN4					
Connections	Flanges	PVC-U, PVC-C, ABS, PP-H, PVDF, PE according to ISO 7005 PN 10, EN 1092 PN 10, DIN 2501 PN 10, ANSI/ASME B 16.5 Class 150, BS 1560: 1989, BS 4504, JIS B 2220					
	Flange adapters	PVC-U, PVC-C, ABS, PP-H SDR 11: PE100 SDR 11 or 17.6, PVDF					
	Backing flange	PVC-U, PP					
Actuation variants	Manually operated (hand lever or manual reduction gear)						
	Lockable hand lever						
	Pneumatically actuated FC, FO, DA						
	Electrically actuated AC: 100 – 230 V, AC/DC: 24 V						
Approvals	General						ACS, ABS, DIBt, TA Luft, BV, TSSA, DNV-GL, LR, NSF61, NSF 1970
Overall length	ISO 5752 / EN 558 DN50-200 Series 25, DN25-300 Series 16						
Flange standards	EN 1092 PN 10, ASME B16.5 Class 150, BS 1560-3.2 Class 150, JIS B2220 10K						
Interface head flange	EN ISO 5211						
Tightness requirement	ISO 9393-2, EN 12266 (leak rate A)						
Marking	EN ISO 16136						

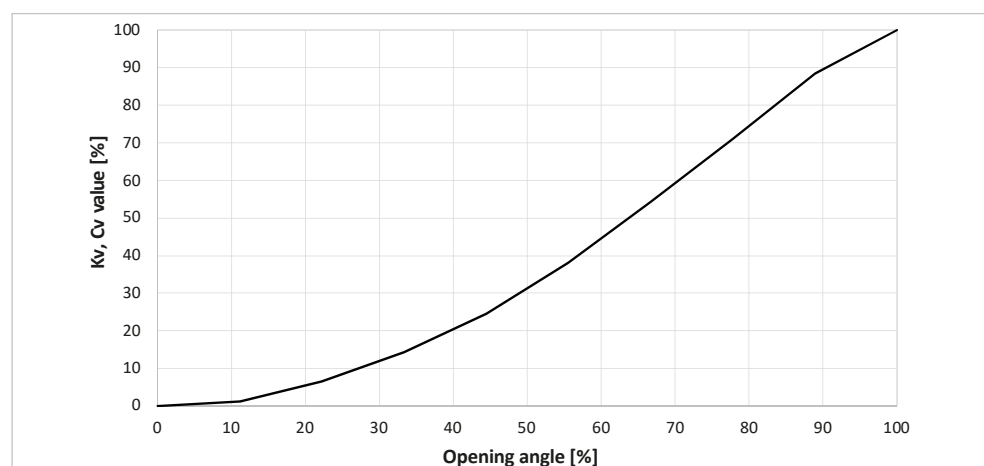
Specification

Product standard ISO 9393-1, EN ISO 16136

Kv 100 values

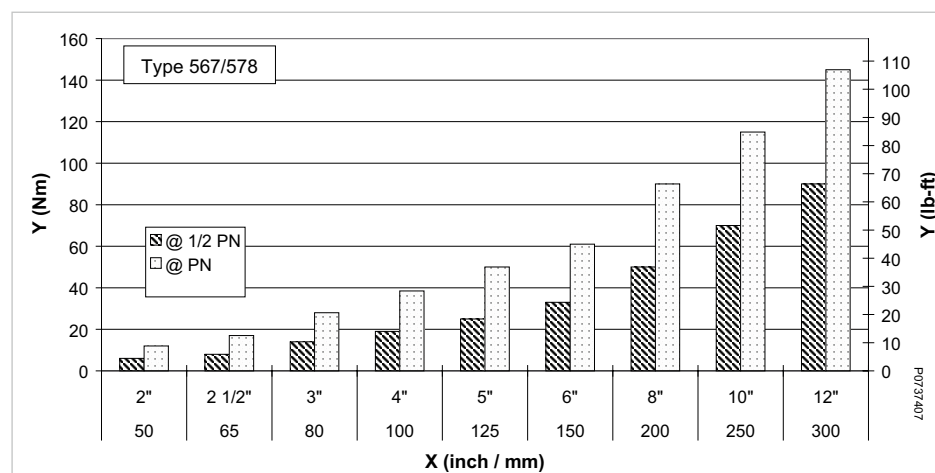
DN (mm)	Inch (inch)	d (mm)	Kv 100 (l/min)	Cv 100 (US gal./min)	Kv 100 (m ³ /h)
50	2	63	740	52	44
65	2 ½	75	1500	105	90
80	3	90	2400	168	144
100	4	110	3800	266	228
125	5	140	8600	602	516
150	6	160	11 400	798	684
200	8	225	19 900	1393	1194
250	10	280	34 000	2380	2040
300	12	315	50 000	3500	3000
350	14	335	90 000	6300	5400
400	16	400	115 000	8050	6900
450	18	450	155 000	10 850	9300
500	20	500	204 000	14 280	12 240
600	24	630	265 000	18 550	15 900

Flow characteristics



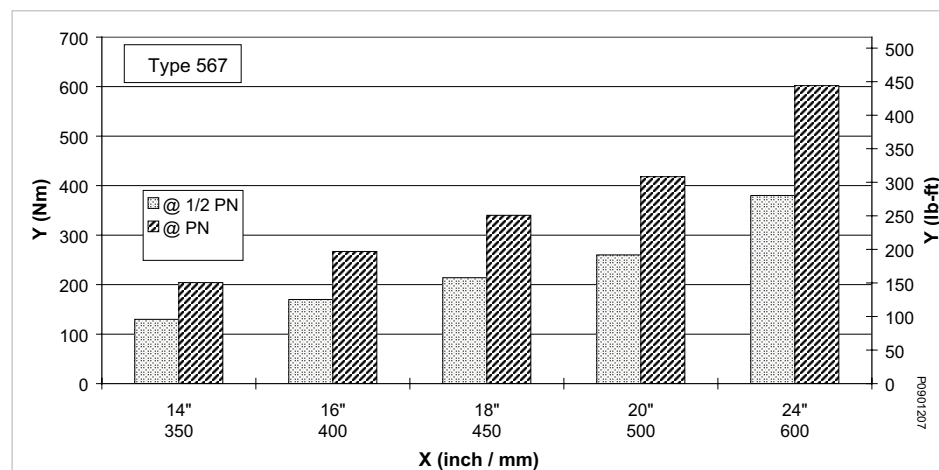
Operating torque

DN50 – DN300 for opening/closing (standard valve, as delivered)



X Nominal diameter DN
(mm, inch)
Y Tightening torque
(Nm, lb-ft)

DN350 – DN600



X Nominal diameter DN (mm, inch)
Y Tightening torque (Nm, lb-ft)

Depending on the operation conditions (e.g. control time, medium, temperature, etc.) the stated operating torque can increase up to 4 times.

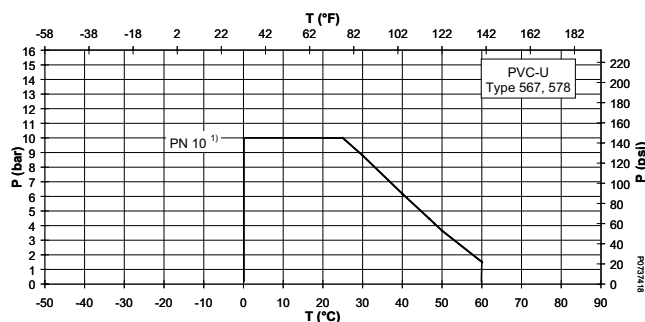
Pressure-temperature diagrams

The following pressure-temperature diagrams are based on a lifetime of 25 years and water or similar media.

T Temperature (°C, °F)

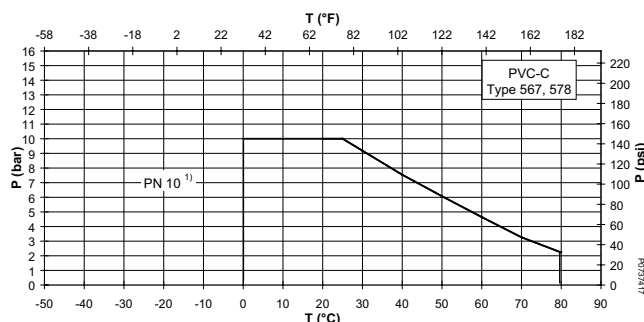
P Permissible pressure (bar, psi)

PVC-U (DN50 – DN300)



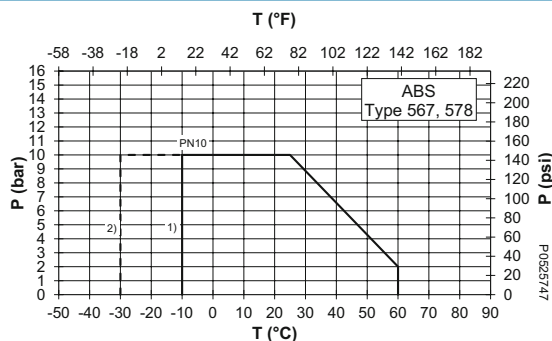
1) DN50 – DN300

PVC-C (DN50 – DN300)



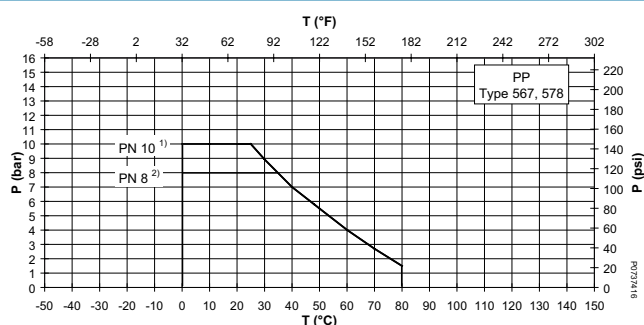
1) DN50 – DN300

ABS (DN50 – DN300)



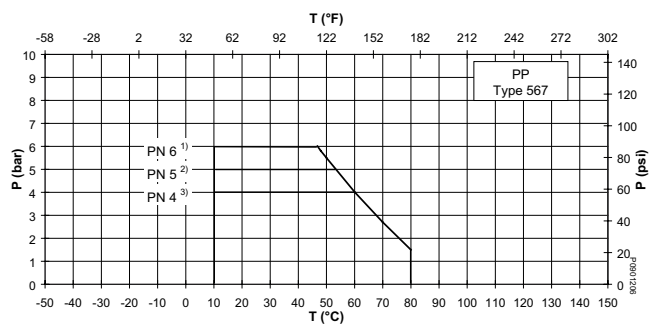
- 1) with standard Type 567/578
2) - with PE flange adapter: only with COOL-FIT version of Type 567
- with ABS flange adapter: with standard Type 567 in installation direction A-B, or with COOL-FIT version of Type 567

PP (DN50 – DN300)

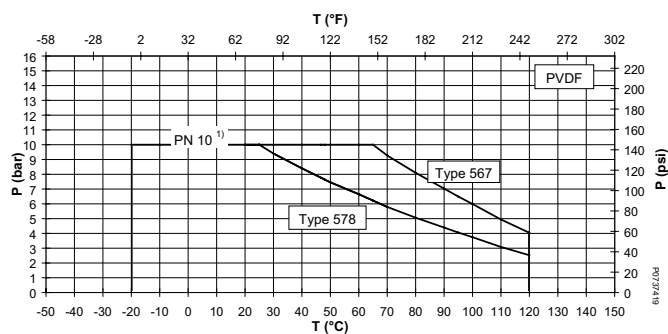


- 1) DN50 – DN200
2) DN250 – DN300

PP (DN350 – DN600)



PVDF (DN50 – DN300)

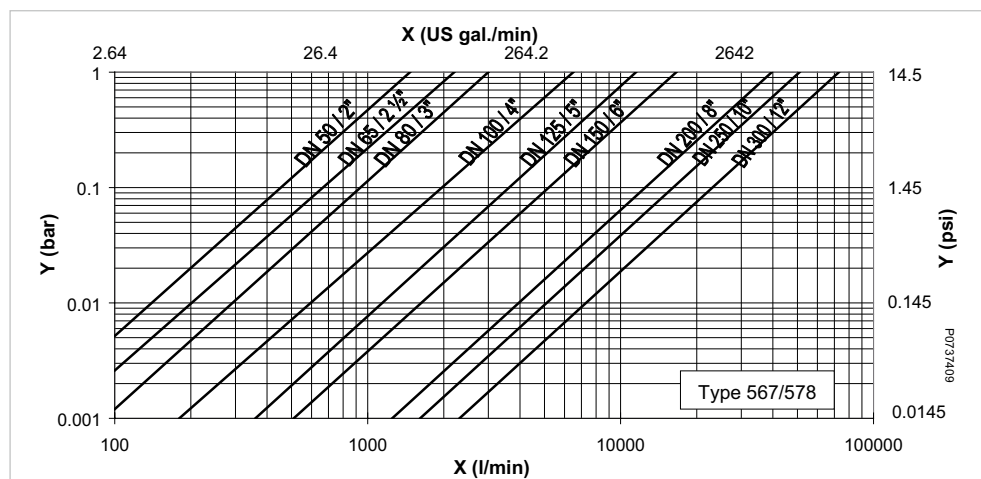


- 1) DN350 – DN400
2) DN450
3) DN500 – DN600

- 1) DN50 – DN300

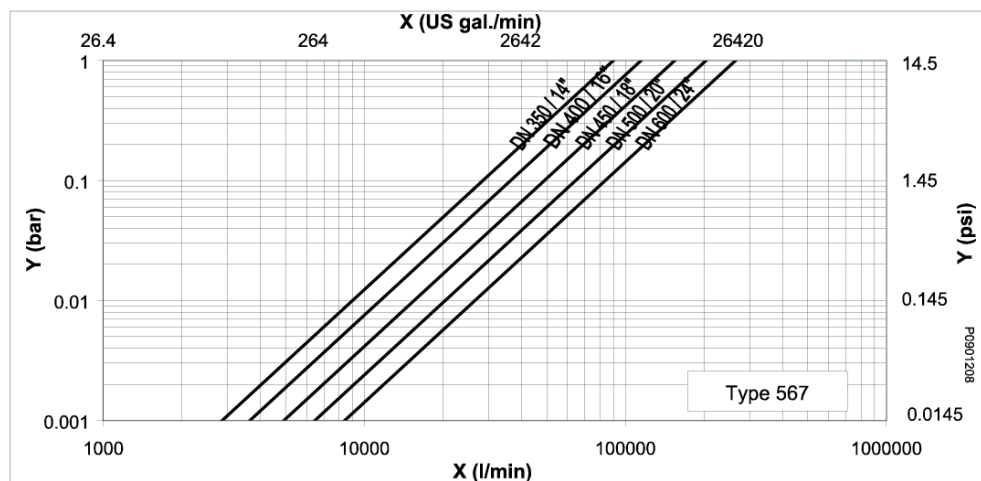
Pressure losses

DN50 – DN300



- X Flow rate
(l/min, US gal/min)
Y Pressure loss Δp (bar, psi)

DN350 – DN600



- X Flow rate
(l/min, US gal/min)
Y Pressure loss Δp (bar, psi)

Reference values for tightening torque of screws

DN50 – DN300

Reference values for tightening torque of screws AK Type 567/578 in ISO flange connections

d (mm)	DN (mm)	Inch (inch)	Total number of screws	Maximum screw tightening torque	
				(Nm)	Inch-lbs
63	50	2	4 x M16 x 140mm	25	221
75	65	2 ½	4 x M16 x 140mm	25	221
90	80	3	8 x M16 x 150mm	25	221
110	100	4	8 x M16 x 180mm	30	265
140	125	5	8 x M16 x 200mm	35	310
160	150	6	8 x M20 x 220mm	40	352
225	200	8	8 x M20 x 220mm	50	442
280	250	10	8 x M20 x 300mm	80	708
315	300	12	12 x M20 x 300mm	80	708

DN50 – DN300

Reference values for tightening torque of screws AK Type 567/578 in ANSI flange connections

d (mm)	DN (mm)	Inch (inch)	Total number of screws	Maximum screw tightening torque	
				(Nm)	Inch-lbs
63	50	2	4 x ⅝ x 3	25	221
75	65	2 ½	4 x ⅝ x 3 ½	25	221
90	80	3	4 x ⅝ x 3 ¾	25	221
110	100	4	8 x ⅝ x 4	30	265
140	125	5	8 x ¾ x 4 ½	35	310
160	150	6	8 x ¾ x 4 ¾	40	352
225	200	8	8 x ⅞ x 5 ¼	50	442
280	250	10	8 x ⅞ x 6	80	708
315	300	12	12 x ⅞ x 6 ½	80	708

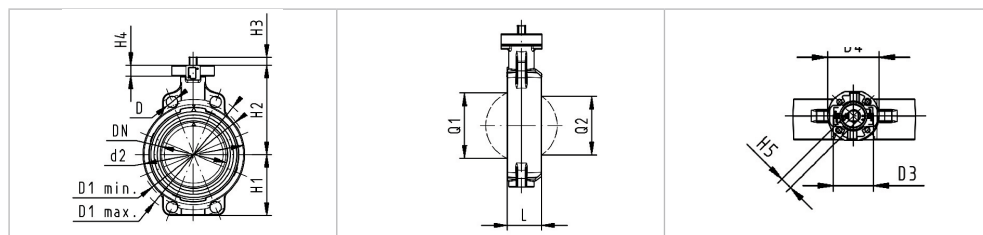
DN350 – DN600

Reference values for tightening torque of screws AK Type 567/578

d (mm)	DN (mm)	Inch (inch)	Maximum screw tightening torque	
			(Nm)	(lb-ft)
355	350	14	80	59
400	400	16	100	74
450	450	18	100	74
500	500	20	100	74
630	600	24	100	74

1.2.3 Dimensions

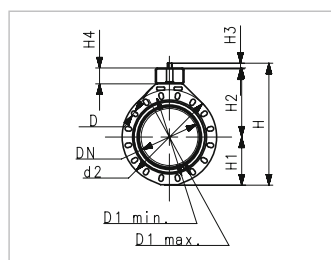
Butterfly Valve Type 567 with open shaft end DN50 – DN300



d (mm)	DN (mm)	D (mm)	D1 _{min} (mm)	D1 _{max} (mm)	d2 (mm)	D3 (mm)	D4 (mm)	H (mm)
63	50	19	120.0	125.0	104	70	90	264
75	65	19	139.7	145.0	115	70	90	277
90	80	19	150.0	160.0	131	70	90	289
110	100	19	175.0	190.0	161	70	90	325
140	125	23	210.0	215.9	187	70	90	352
160	150	24	241.3	241.3	215	70	90	373
225	200	23	290.0	295.0	267	70	90	435
280	250	25	353.0	362.0	329	102	125	554
315	300	25	400.0	432.0	379	102	125	598

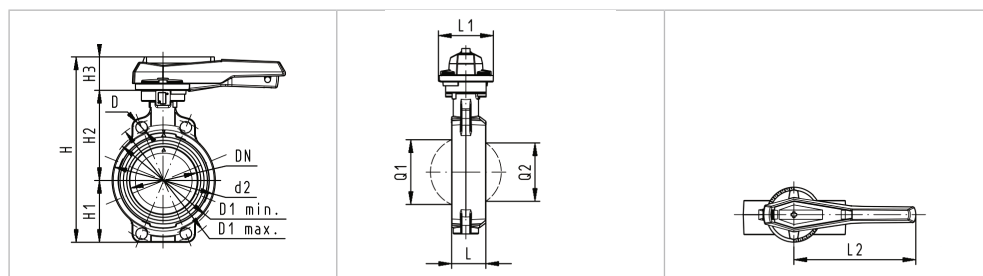
H1 (mm)	H2 (mm)	H3 (mm)	H4 (mm)	H5 (mm)	L (mm)	Q1 (mm)	Q2 (mm)
77	134	27	23	11	45	40	
83	140	27	23	11	46	54	35
89	146	27	23	11	49	67	50
104	167	16	23	14	56	88	74
117	181	16	23	14	64	113	97
130	189	19	23	17	72	139	123
158	210	19	23	17	73	178	169
205	264	40	23	22	113	210	207
228	285	40	23	22	113	256	253

Butterfly Valve Type 567 with open shaft end DN350 – DN600



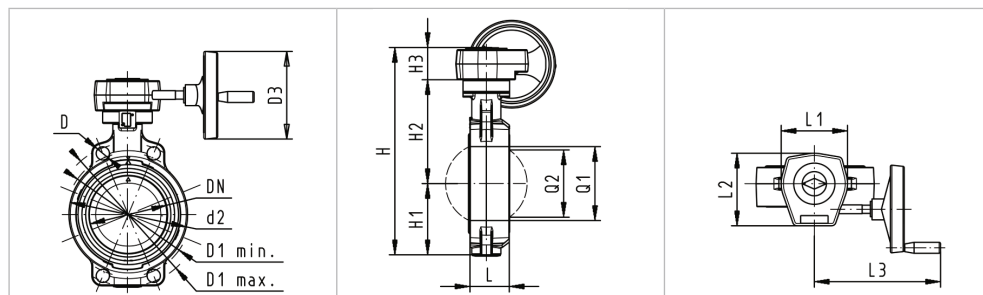
d (mm)	DN (mm)	inch (inch)	PN (bar)	D1 _{min} (mm)	D1 _{max} (mm)	d2 (mm)	H1 (mm)	H2 (mm)	H3 (mm)	H4 (mm)
d355	DN350	14"	6	445	477	535	268	410	31	100
d400	DN400	16"	6	510	540	595	300	435	31	100
d450	DN450	18"	5	565	578	635	320	520	35	120
d500	DN500	20"	4	620	635	700	350	550	35	120
d630	DN600	24"	4	725	750	813	420	610	35	120

Butterfly Valve Type 567 with hand lever DN50 – DN300



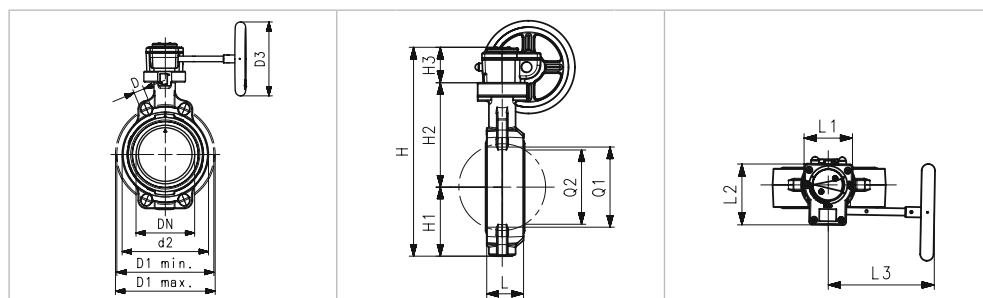
d (mm)	DN (mm)	D (mm)	D1 _{min} (mm)	D1 _{max} (mm)	d2 (mm)	H (mm)	H1 (mm)	H2 (mm)	H3 (mm)	L (mm)	L1 (mm)	L2 (mm)	Q1 (mm)	Q2 (mm)
63	50	19	120.0	125.0	104	264	77	134	54	45	106	205	40	
75	65	19	139.7	145.0	115	277	83	140	54	46	106	205	54	35
90	80	19	150.0	160.0	131	289	89	146	54	49	106	205	67	50
110	100	19	175.0	190.0	161	325	104	167	55	56	106	255	88	74
140	125	23	210.0	215.9	187	352	117	181	55	64	106	255	113	97
160	150	24	241.3	241.3	215	373	130	189	55	72	106	255	139	123
225	200	23	290.0	295.0	267	435	158	210	67	73	140	408	178	169
280	250	25	353.0	362.0	329	554	205	264	85	113	149	408	210	207
315	300	25	400.0	432.0	379	598	228	285	85	113	149	408	256	253

Butterfly Valve Type 567 with manual reduction gear DN50 – DN300



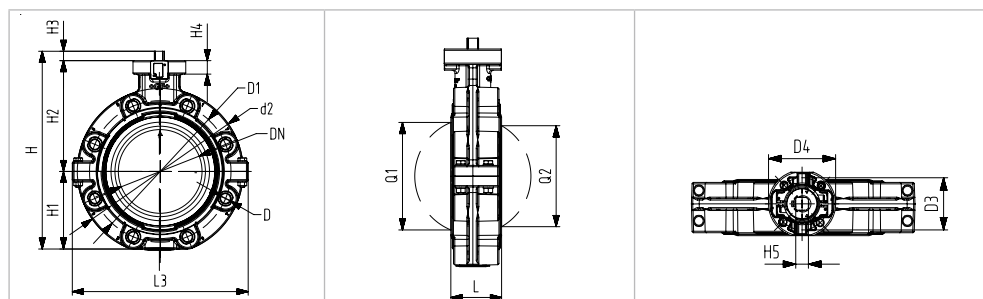
d (mm)	DN (mm)	D1 _{min} (mm)	D1 _{max} (mm)	d2 (mm)	D3 (mm)	H (mm)	H1 (mm)	H2 (mm)	H3 (mm)	L (mm)	L1 (mm)	L2 (mm)	L3 (mm)	Q1 (mm)	Q2 (mm)
63	50	120.0	125.0	104	160	278	77	134	60	45	120	132	236	40	
75	65	139.7	145.0	115	160	291	83	140	60	46	120	132	236	54	35
90	80	150.0	160.0	131	160	303	89	146	60	49	120	132	236	67	50
110	100	175.0	190.5	161	160	339	104	167	60	56	120	132	236	88	74
140	125	210.0	215.9	187	160	365	117	181	60	64	120	132	236	113	97
160	150	241.3	241.3	215	160	387	130	189	60	72	120	132	236	139	123
225	200	290.0	295.0	267	160	436	158	210	60	73	120	132	236	178	169
280	250	353.0	362.0	329	160	529	205	264	60	113	134	151	261	210	207
315	300	400.0	432.0	379	160	573	228	285	60	113	134	151	261	256	253

Butterfly Valve Type 567 with manual reduction gear DN350 – DN600



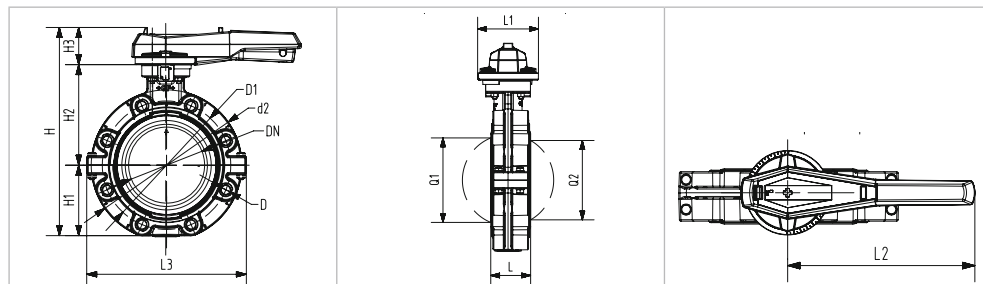
d (mm)	DN (mm)	D1 _{min} (mm)	D1 _{max} (mm)	d2 (mm)	D3 (mm)	H (mm)	H1 (mm)	H2 (mm)	H3 (mm)	L (mm)	L1 (mm)	L2 (mm)	L3 (mm)	Q1 (mm)	Q2 (mm)
355	14	445	477	535	200	747	268	410	69	129	180	168	218	325	305
400	16	510	540	595	200	831	300	435	69	169	180	195	218	353	350
450	18	565	578	635	250	921	320	520	81	179	220	195	240	393	390
500	20	620	635	700	350	994	350	550	94	190	220	226	260	444	440
630	24	725	750	813	350	1124	420	610	94	209	220	260	260	530	527

Butterfly Valve Type 578 with open shaft end DN50 – DN300



d (mm)	d inch	DN (mm)	d2 (mm)	D	D ANSI	D1 (mm)	D1 _{ANSI} (mm)	H (mm)	H1 (mm)	H2 (mm)	H3 (mm)	L (mm)	L1 (mm)	L2 (mm)	L3 (mm)	Q1 (mm)	Q2 (mm)
63	2	50	160	M16	UNC 5/8	125	120.6	265	77	134	27	45	23	205	165	40	
75	2½	65	180	M16	UNC 5/8	145	139.7	277	83	140	27	46	23	205	182	54	35
90	3	80	195	M16	UNC 5/8	160	152.4	289	89	146	27	49	23	205	210	67	50
110	4	100	226	M16	UNC 5/8	180	190.5	328	106	167	16	56	23	255	240	88	74
140	5	125	258	M16	UNC ¾	210	215.9	357	121	181	16	64	23	255	272	113	97
160	6	150	284	M20	UNC ¾	240	241.3	377	133	189	19	72	23	255	300	139	123
225	8	200	341	M20	UNC ¾	295	298.4	436	159	210	19	73	23	408	360	178	169
280	10	250	412	M20	UNC ¾	350	362.0	536	205	264	40	113	23	408	440	210	207
315	12	300	482	M20	UNC ¾	400	431.8	586	234	285	40	113	23	408	510	256	253

Butterfly Valve Type 578 with hand lever DN50 – DN300



D	d	DN	d2	D	D	D1	D1	D3	H	H1	H2	H3	L	L1	L2	L3	L4	Q1	Q2
(mm)	(inch)	(mm)	(mm)		ANSI	(mm)	ANSI	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)
63	2	50	160	M16	UNC 5/8	125	120.6	150	261	77	134	50	45	110	120	165	155	40	
75	2½	65	180	M16	UNC 5/8	145	139.7	150	273	83	140	50	46	110	120	182	155	54	35
90	3	80	195	M16	UNC 5/8	160	152.4	150	285	89	146	50	49	110	120	210	155	67	50
110	4	100	226	M16	UNC 5/8	180	190.5	150	323	106	167	50	56	110	120	240	155	88	74
140	5	125	258	M16	UNC ¾	210	215.9	150	352	121	181	50	64	110	120	272	155	113	97
160	6	150	284	M20	UNC ¾	240	241.3	150	372	133	189	50	72	110	120	300	155	139	123
225	8	200	341	M20	UNC ¾	295	298.4	150	419	159	210	50	73	110	120	360	155	178	169
280	10	250	412	M20	UNC 7/8	350	362.0	200	524	205	264	55	113	130	140	440	200	210	207
315	12	300	482	M20	UNC 7/8	400	431.8	200	574	234	285	55	113	130	140	510	200	256	253

1.2.4 Accessories

Integrated electrical position indicator (IER)

- Position indicator in combination with actuators
- For manual valve as well as for manual reduction gear

General technical data of the electrical position indicator:

- Protection rating with DIN plug (2) IP65
- Protection rating with cable gland IP67
- Ambient temperature: -10 °C to +50 °C

Assignment of the electrical position indicator to butterfly valve of types 567 and 578:

Shaft	Dimension
1	11 mm DN50 – DN80
2	14 mm DN100 – DN125
3	17 mm DN150 – DN200

i For further information on accessories, refer to the online product catalog at www.gfps.com

■ Mobile apps and online tools to support configuration and calculation at www.gfps.com/tools



1.3 Butterfly Valve Type 145/146/147

			
Type 145 Wafer style, in accordance with all standards	Type 146 For lug style and wafer style applications, in accordance with ISO/DIN	Type 147 For lug style and wafer style applications, in accordance with ANSI	Type 145 - 147 With smart electric actuator dEA

1.3.1 Product description

The electrically actuated butterfly valve of types 145, 146 and 147 from GF Piping Systems consists of the valve body, butterfly Valve Types 567 and 578 with the electric actuator EA or the smart electric actuator dEA. It can be used under the most varied conditions and enables a broad range of applications.

With the optional positioner, it goes from being a simple open/close valve to a precise flow control device integrated into systems controlled by PLCs and other computerized instrumentation

Applications

- Industrial water treatment
- Seawater desalinization
- Swimming pools
- Aquariums/oceanariums
- Chemical process industry
- Surface engineering
- Power plant construction

Benefits/features

Type 145

- Emergency manual override on actuator
- Rated for 150 PSI / 10 bar (bidirectional)
- EPDM, FKM or PTFE gaskets
- UL certified
- Double eccentric, off-center shaft for reduced wear and a lower operating torque
- Special O-ring design eliminates the need for flange seals
- With the optional positioner, it goes from being a simple open/close valve to a precise flow control device

Type 146/147

- Designed for lug style and wafer style applications
- Type 146: butterfly Valve Type 578 with EN/ISO-compatible flange connection dimensions and electrical actuation
- Type 147: butterfly Valve Type 578 with ANSI-compatible flange connection dimensions and electrical actuation
- With the optional positioner, it goes from being a simple open/close valve to a precise flow control device

Flow media

- Very well suited for liquid media
- Suited for gaseous media
- Conditionally suited for solid media
- Conditionally suited for viscous media

1.3.2 Technical basics

The electrically actuated butterfly valves are equipped with the following actuators:

Dimension	Type of actuator	Voltage
DN50 – DN85	EA45 / dEA45	100 – 230 V ~ or 24 V
DN80 – DN100	EA120 / dEA120	100 – 230 V ~ or 24 V
DN200 – DN300	EA250 / dEA250	100 – 230 V ~ or 24 V
DN350	Valpes VS300	100 – 240 or 400 V three-phase
DN400 – DN500	Valpes VT600	240 V and 400 V three-phase
DN600	Valpes VT1000	240 V and 400 V three-phase

Valve handling

Installation notes

Differentiation between and use of the types concerned

- Use butterfly Valve Type 567 only as a wafer style valve.
- Use butterfly Valve Type 578 as either a wafer style or a lug style valve.

As a connecting piece, GF Piping Systems recommends valve ends or flange adapters with smooth jointing faces, together with flanges made of PVC-U, PP-V, PP/steel or UP-GF. In the case of BB/VSB with a fluted jointing face, a flat gasket may also be used in individual cases. If a valve is installed as a lugged valve and pressure is applied to it, it must be closed with a blind flange (or blind cover and counterflange), in order to prevent personal injury or property damage in the event of leaks and/or impermissible opening.

Requirements for installation

Ensure that the following conditions are satisfied prior to installation:

- Make sure that the butterfly valves to be installed correspond specifically to the pressure rating, Type of connection, dimension and materials of the particular application.
- Perform a function test. To do this, close and re-open the butterfly valve.
- Only install butterfly valves that function without problems.

Maintenance notes

In normal operation, butterfly valves do not require maintenance. It is nonetheless recommended to perform maintenance on butterfly valves after 5,000 actuation cycles at most. The following steps must be taken when doing so:

- Regularly check that no medium escapes to the outside. If medium exits from the flange connections, tighten them.
- We recommend operating the butterfly valves which are kept permanently in the same position 1 or 2 x a year to check their functionality.
- Depending on the operating conditions, the collars should be lubricated periodically with (silicon-based) grease.
- It is recommended that you check and, if necessary, replace the O-rings when removing the bearing bushings.



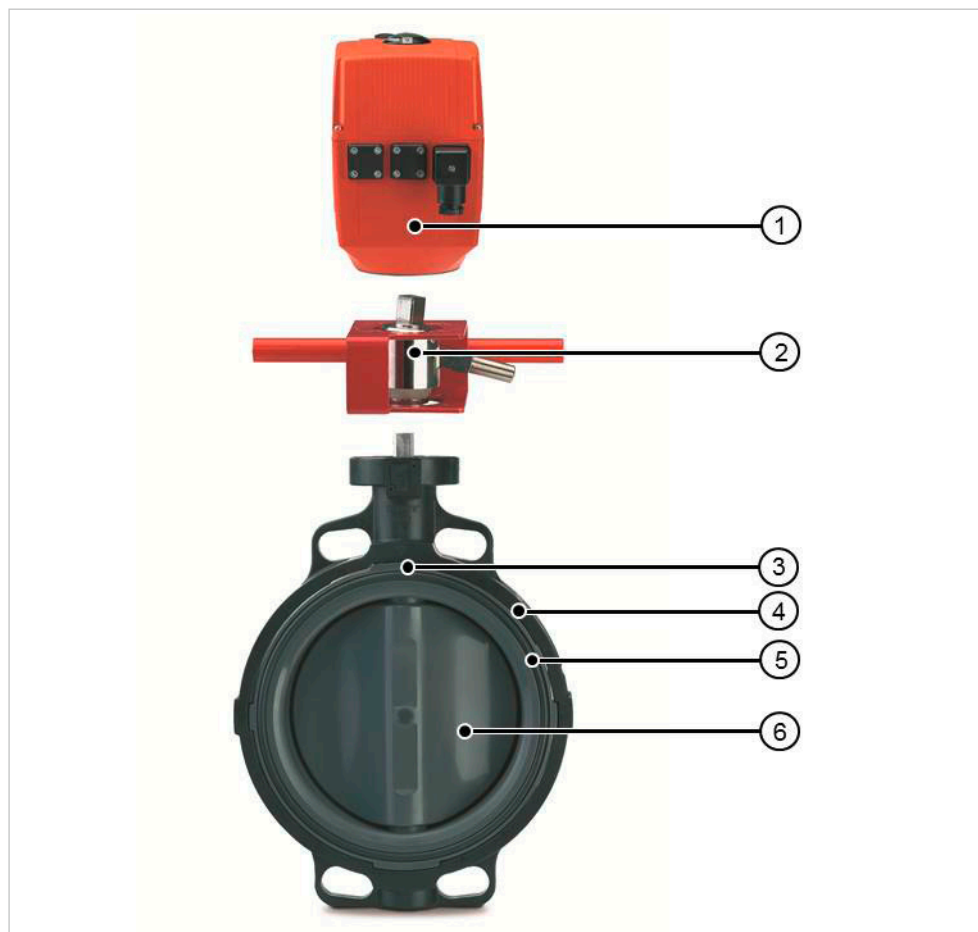
Installation and maintenance must be performed in accordance with the corresponding installation manual. The installation manual is provided with the product, see also the online product catalog at www.gfps.com

Tips for installation

Chamfering of valve end / flange adapter

When using the specified valve ends / flange adapters from GF Piping Systems, chamfering is not necessary, because the disc does not touch the valve end/flange adapter or the flange adapters are already chamfered. If you want to install valve ends / flange adapters of a different brand, then please make sure that the inside diameter (int) of the valve end / flange adapter is greater than the output measure (Q1) of the disc. If necessary, chamfer the valve end / flange adapter.

1.3.3 Technical data



- ① Electric actuator
- ② Manual override (optional)
- ③ Inner housing
- ④ Outer housing
- ⑤ Flange seal
- ⑥ Disc

Specification

Dimensions	Type 145 wafer style	d63/DN50 – d315/DN600, 2" – 24"
	Type 146/147	d63/DN50 – d225/DN300, 2" – 12"
	Lug style and wafer style applications	
Base type	Type 567	
	Type 578	
Materials	Disc / inner housing	PVC-U, PVC-C, ABS; PP-H, PVDF
	Outer housing	PP-GF30
Gasket materials	EPDM, FKM, FKM/PTFE	
Pressure ratings	Type 145, 146, 147	PN4 – PN10
Actuator type	Type 145	EA45, EA120, EA250 (DN350 – DN600 Valves)
	Type 146/147	EA45, EA120, EA250
Connections	Flanges	PVC-U, PVC-C, ABS, PP-H, PVDF, PE according to ISO 7005 PN 10, EN 1092 PN 10, DIN 2501 PN 10, ANSI/ASME B 16.5 Class 150, BS 1560: 1989, BS 4504, JIS B 2220
	Flange adapters	PVC-U, PVC-C, ABS, PP-H, SDR 11: PE100 SDR 11 or SDR 17.6, PVDF
	Backing flanges	PVC-U, PP-st / PP-V
Standards	Type 145	All standards
	Type 146	ISO/DIN
	Type 147	ANSI
Approvals	ACS, ABS, DIBt, TA Luft, BV, TSSA, DNV, GL, LR, NSF61, NSF 1970	

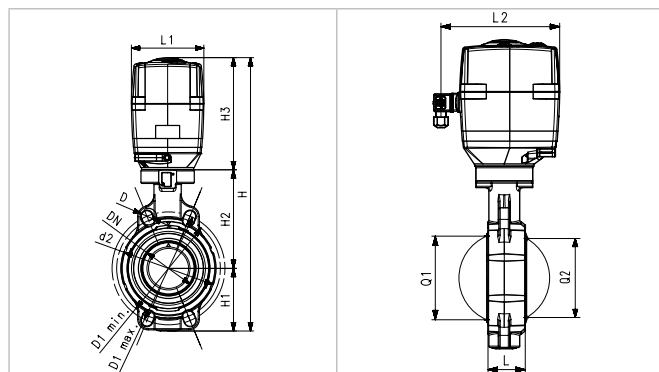


The following technical data can be found in the Planning Fundamentals under Butterfly Valve Type 567/578, manually operated:

- Pressure-temperature diagram
- Pressure loss
- Flow characteristics
- Kv values
- Reference values for screw fastenings

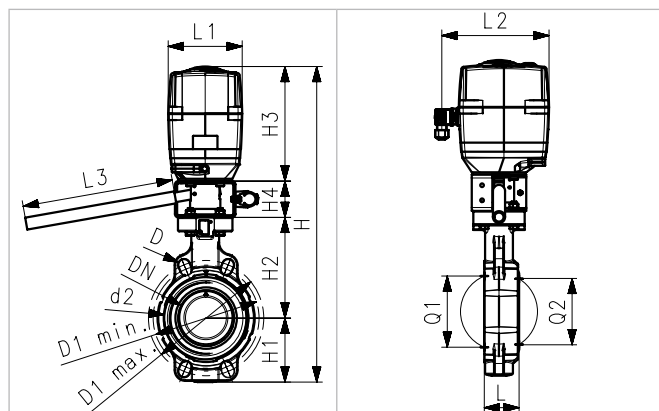
1.3.4 Dimensions

Butterfly Valve Type 145 with electrical actuator, without manual override DN50 – DN300



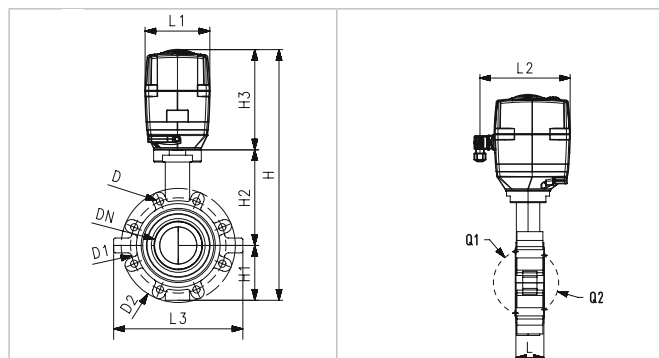
d (mm)	Inch (inch)	DN (mm)	Act. Type	d2 (mm)	D (mm)	D1 _{min} (mm)	D1 _{max} (mm)	H (mm)	H1 (mm)	H2 (mm)	H3 (mm)	L (mm)	L1 (mm)	l2 (mm)	Q1 (mm)	Q2 (mm)
63	2	50	EA45	104	19	120	125	400	77	134	188	45	122	180	40	
75	2 ½	65	EA45	115	19	140	145	413	83	140	188	46	122	180	54	35
90	3	80	EA120	131	19	150	160	428	89	146	188	49	122	180	67	50
110	4	100	EA120	161	19	175	131	460	104	167	188	56	122	180	88	74
140	5	125	EA120	187	23	210	216	481	117	181	188	64	122	180	113	97
160	6	150	EA120	215	24	241	241	508	130	189	188	72	122	180	139	123
225	8	200	EA250	267	23	290	295	575	158	210	208	73	122	180	178	169
280	10	250	EA250	329	25	353	362	677	205	264	208	113	122	180	210	207
315	12	300	EA250	379	25	400	432	721	228	285	208	113	122	180	256	253

Butterfly Valve Type 145 with electrical actuator, with manual override DN50 – DN200



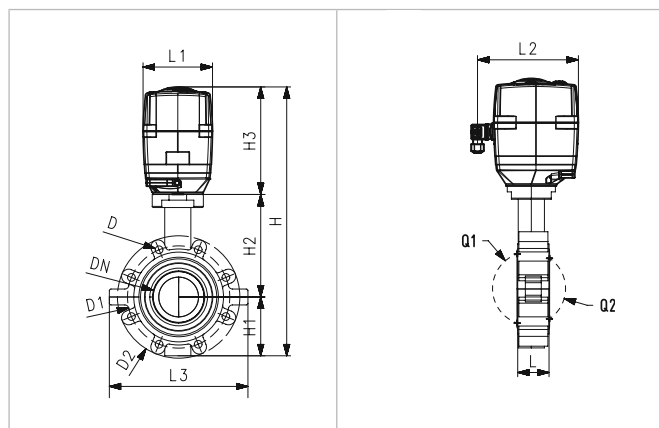
d (mm)	Inch (inch)	DN (mm)	Act. Type	d2 (mm)	D (mm)	D1 _{min} (mm)	D1 _{max} (mm)	H (mm)	H1 (mm)	H2 (mm)	H3 (mm)	L (mm)	L1 (mm)	l2 (mm)	l3 (mm)	Q1 (mm)	Q2 (mm)
63	2	50	EA120	104	19	120	125	475	77	134	188	45	122	180	250	40	
75	2 ½	65	EA120	115	19	140	145	488	83	140	188	46	122	180	250	54	35
90	3	80	EA120	131	19	150	160	488	89	146	188	49	122	180	250	67	50
110	4	100	EA120	161	19	175	131	520	104	167	188	56	122	180	250	88	74
140	5	125	EA120	187	23	210	216	547	117	181	188	64	122	180	250	113	97
160	6	150	EA120	215	24	241	241	568	130	189	188	72	122	180	250	139	123
225	8	200	EA250	267	23	290	295	635	158	210	208	73	122	180	250	178	169

Butterfly Valve Type 146 with electrical actuator, without manual override DN50 – DN300



d (mm)	DN (mm)	Antr. Type	d2 (mm)	D (mm)	D1 (mm)	H (mm)	H1 (mm)	H2 (mm)	H3 (mm)	L (mm)	L1 (mm)	L2 (mm)	L3 (mm)	Q1 (mm)	Q2 (mm)
63	50	EA45	160	M16	125	399	77	134	188	45	122	180	165	40	
75	65	EA45	180	M16	145	411	83	140	188	46	122	180	182	54	35
90	80	EA120	195	M16	160	423	89	146	188	49	122	180	210	67	50
110	100	EA120	226	M16	180	461	106	167	188	56	122	180	240	88	74
140	125	EA120	258	M16	210	490	121	181	188	64	122	180	272	113	97
160	150	EA120	284	M20	240	510	133	189	188	72	122	180	300	139	123
225	200	EA250	341	M20	295	577	159	210	208	73	122	180	360	178	169
280	250	EA250	412	M20	350	677	205	264	208	113	122	180	440	210	207
315	300	EA250	482	M20	400	727	234	285	208	113	122	180	510	256	253

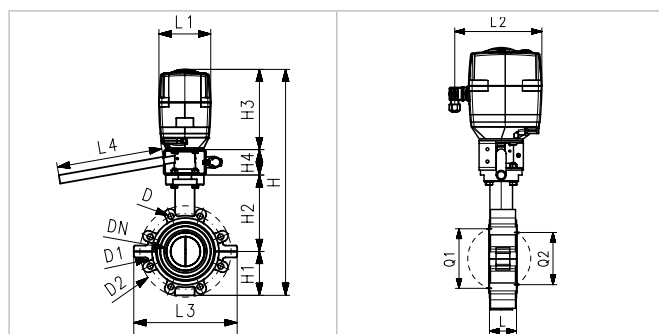
Butterfly Valve Type 147 with electrical actuator, without manual override DN50 – DN300



d inch	DN (mm)	Antr. Type	d2 (mm)	D ANSI	D1 (mm)	H (mm)	H1 (mm)	H2 (mm)	H3 (mm)	L (mm)	L1 (mm)	L2 (mm)	L3 (mm)	Q1 (mm)	Q2 (mm)
2	50	EA45	160	UNC 5/8	120.6	399	77	134	188	45	122	180	165	40	
2½	65	EA45	180	UNC 5/8	139.7	411	83	140	188	46	122	180	182	54	35
3	80	EA120	195	UNC 5/8	152.4	423	89	146	188	49	122	180	210	67	50
4	100	EA120	226	UNC 5/8	190.5	461	106	167	188	56	122	180	240	88	74
5	125	EA120	258	UNC ¾	215.9	490	121	181	188	64	122	180	272	113	97
6	150	EA120	284	UNC ¾	241.3	510	133	189	188	72	122	180	300	139	123
8	200	EA250	341	UNC ¾	298.4	577	159	210	208	73	122	180	360	178	169
10	250	EA250	412	UNC 7/8	362.0	677	205	264	208	113	122	180	440	210	207
12	300	EA250	482	UNC 7/8	431.8	727	234	285	208	113	122	180	510	256	253

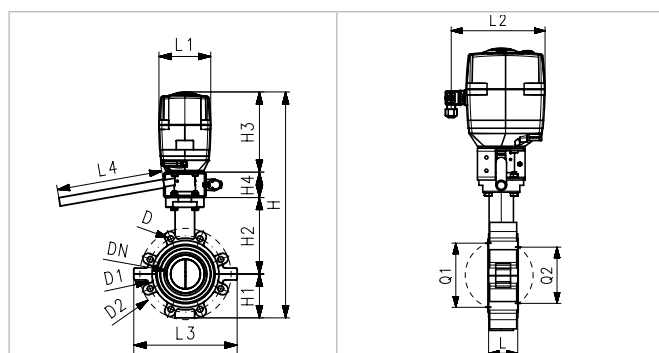
Dimensions in accordance with ANSI/ASME B16.5 Class 150

Butterfly Valve Type 146 with electrical actuator, with manual override DN50 – DN200



d (mm)	DN (mm)	Antr Type	d2 (mm)	D	D1 (mm)	H (mm)	H1 (mm)	H2 (mm)	H3 (mm)	H4 (mm)	L (mm)	L1 (mm)	l2 (mm)	l3 (mm)	L4 (mm)	Q1 (mm)	Q2 (mm)
63	50	EA45	160	M16	125	459	77	134	188	60	45	122	180	165	200	40	
75	65	EA45	180	M16	145	471	83	140	188	60	46	122	180	182	200	54	35
90	80	EA120	195	M16	160	483	89	146	188	60	49	122	180	210	200	67	50
110	100	EA120	226	M16	180	521	106	167	188	60	56	122	180	240	250	88	74
140	125	EA120	258	M16	210	550	121	181	188	60	64	122	180	272	250	113	39
160	150	EA120	284	M20	240	570	133	189	188	60	72	122	180	300	250	139	123
225	200	EA250	341	M20	295	637	159	210	208	60	73	122	180	360	250	178	169

Butterfly Valve Type 147 with electrical actuator, with manual override DN50 – DN200



Inch (inch)	DN (mm)	Act. Type	d2 (mm)	D	D1 (mm)	H (mm)	H1 (mm)	H2 (mm)	H3 (mm)	H4 (mm)	L (mm)	L1 (mm)	l2 (mm)	l3 (mm)	L4 (mm)	Q1 (mm)	Q2 (mm)
2	50	EA45	160	UNC 5/8	120.6	459	77	134	188	60	45	122	180	165	200	40	
2 1/2	65	EA45	180	UNC 5/8	139.7	471	83	140	188	60	46	122	180	182	200	54	35
3	80	EA120	195	UNC 5/8	152.4	483	89	146	188	60	49	122	180	210	200	67	50
4	100	EA120	226	UNC 5/8	190.5	521	106	167	188	60	56	122	180	240	250	88	74
5	125	EA120	258	UNC 3/4	215.9	550	121	181	188	60	64	122	180	272	250	113	97
6	150	EA120	284	UNC 3/4	241.3	570	133	189	188	60	72	122	180	300	250	139	123
8	200	EA250	341	UNC 3/4	298.4	637	159	210	208	60	73	122	180	360	250	178	169

Dimensions in accordance with ANSI/ASME B16.5 Class 150

1.3.5 Accessories

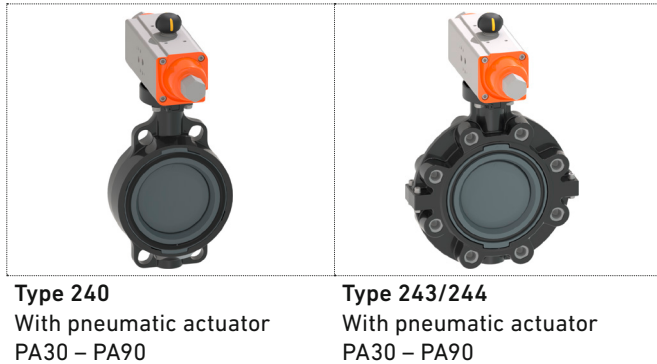
- Position feedback
- Reset unit
- Operating time monitoring, operating cycle counting, motor current monitoring
- Positioner

i For further information on accessories, refer to www.gfps.com

■ Mobile apps and online tools to support configuration and calculation at www.gfps.com/tools



1.4 Butterfly Valve Type 240/243/244



1.4.1 Product description

The pneumatically actuated Butterfly Valves of types 240, 243 and 244 from GF Piping Systems consist of the valve body of the butterfly Valve Types 567 or 578, combined with the pneumatic actuator series PA30-90. They can be used under the most varied conditions and enable a broad range of applications.

The pneumatic butterfly valves are of modular construction and ideal for process automation. Together with the optionally available pilot valves and the position feedback, they comprise a compact and simultaneously reliable process valve.

Applications

- Industrial water treatment
- Chemical process industry
- Seawater desalinization
- Swimming pools
- Aquariums/oceanariums
- Surface Treatment

Benefits/features

Type 240

- Valve body: PP-GF30
- Low operating torque and low wear on gasket due to double-eccentric operating principle
- Dimension range DN50/2" to DN600/24"
- Low weight and excellent corrosion resistance
- Reliable pneumatic valve control

Type 243/244

- Valve housing: PP-GF30 with stainless steel (1.4408) threaded inserts
- Low operating torque and low wear on gasket through double-eccentric operating principle
- Lugged installation possible
- Low weight and excellent corrosion resistance
- Reliable pneumatic valve control

Flow media

- Very well suited for liquid media
- Suited for gaseous media
- Conditionally suited for media containing solids
- Conditionally suited for viscous media

Valve handling

Installation notes

Differentiation between and use of the types concerned

- Use butterfly Valve Type 567 only as a wafer style valve.
- Use butterfly Valve Type 578 as either a wafer style or lug style valve.

As a connecting piece, GF Piping Systems recommends valve ends or flange adapters with smooth jointing faces, together with flanges made of PVC-U, PP-V, PP/steel or UP-GF. In the case of the flange adaptor has a serrated jointing face, a flat gasket may also be used in individual cases.

If a valve is installed as a lugged valve and pressure is applied to it, it must be closed with a blind flange (or blind cover and counterflange), in order to prevent personal injury or property damage in case of leaks and/or impermissible opening.

Requirements for installation

Ensure that the following conditions are satisfied prior to installation:

- Make sure that the butterfly valves to be installed correspond specifically to the pressure rating, Type of connection, dimension and materials of the particular application.
- Perform a function test. To do this, close and re-open the butterfly valve.
- Only install butterfly valves that function without problems.

Maintenance notes

In normal operation, butterfly valves do not require maintenance. It is nonetheless recommended to perform maintenance on butterfly valves after 5,000 actuation cycles at most. The following steps must be taken when doing so:

- Regularly check that no medium escapes to the outside. If medium exits from the flange connections, tighten them.
- We recommend operating the butterfly valves that are kept permanently in the same position 1 or 2 x a year to check their functionality.
- Depending on the operating conditions, the collars should be lubricated periodically with (silicon-based) grease.
- It is recommended that you check and, if necessary, replace the O-rings when removing the bearing bushings.



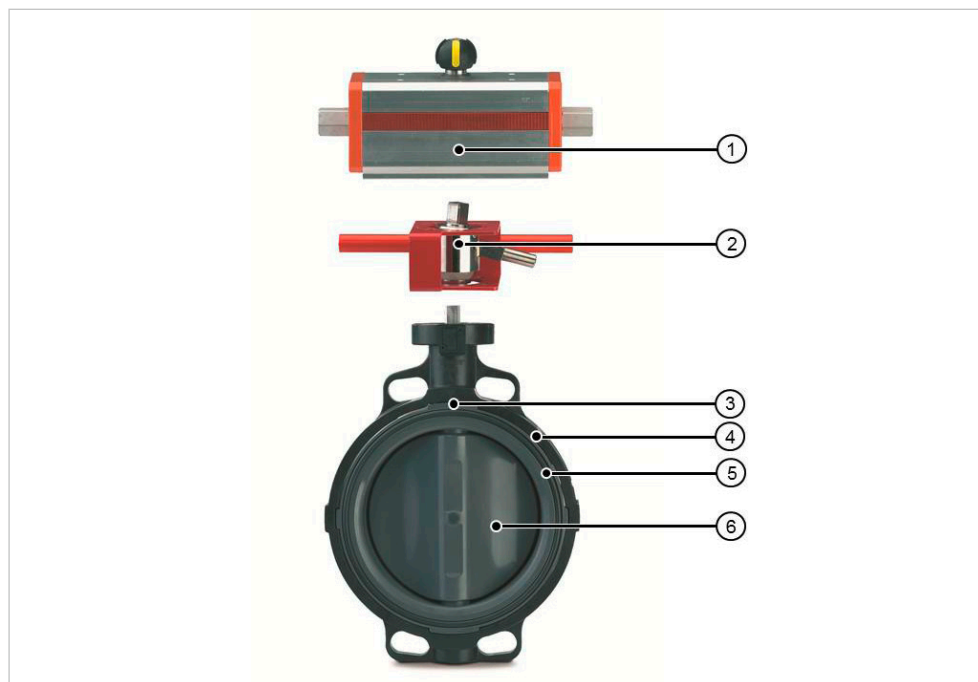
Installation and maintenance must be performed in accordance with the corresponding installation manual. The installation manual is provided with the product, see also the online product catalog at www.gfps.com

Tips for installation

Chamfering of valve end / flange adapter

When using the specified valve ends / flange adapters from GF Piping Systems, chamfering is not necessary, because the disc does not touch the valve end / flange adapter or the flange adapters are already chamfered. If you want to install valve ends / flange adapters of a different brand, then please make sure that the inside diameter (int) of the flange adapter / stub is greater than the output measure (Q1) of the disc. If necessary, chamfer the valve end / flange adapter.

1.4.2 Technical data



- ① Pneumatic actuator, double-acting (optional: single-acting)
- ② Manual override (optional)
- ③ Inner housing
- ④ Outer housing
- ⑤ Flange seal
- ⑥ Disc

Specification

Dimensions	Type 240	d63/DN50 – d630/DN600, 2" – 24"
	Type 243/244	d63/DN50 – d300/DN315, 2" – 12"
Base type	Type 567	
	Type 578	
Materials	Disc / inner housing	PVC-U, PVC-C, ABS, PP-H, PVDF
	Outer housing	PP-GF30
Gasket materials	EPDM, FKM, FKM/PTFE	
Pressure ratings	Type 240, 243, 244	PN4 – PN10
Actuator type	Type 240, 243, 244	PA30 – 90
Connections	Flanges	PVC-U, PVC-C, ABS, PP-H, PVDF, PE according to ISO 7005 PN 10, EN 1092 PN 10, DIN 2501 PN 10, ANSI/ASME B 16.5 Class 150, BS 1560: 1989, BS 4504, JIS B 2220
	Flange adapters	PVC-U, PVC-C, ABS, PP-H, SDR 11: PE100 SDR 11 or SDR 17.6, PVDF
	Backing flange	PVC-U, PP-St / PP-V
Standards	Type 240	All standards
	Type 243	ISO/DIN
	Type 244	ANSI
Approvals	ACS, ABS, DIBt, TA Luft, BV, TSSA, DNV, GL, LR, NSF61, NSF 1970	

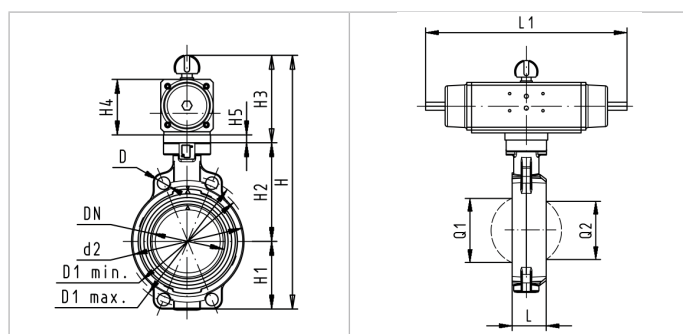


The following technical data can be found in the Planning Fundamentals under Butterfly Valve Type 567/578, manually operated:

- Pressure-temperature diagram
- Pressure loss
- Flow characteristics
- Kv values
- Reference values for screw fastenings

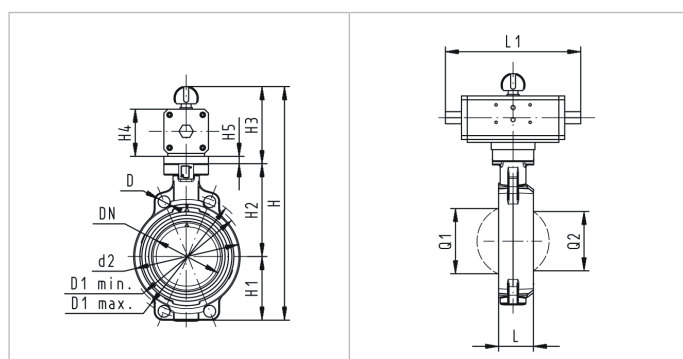
1.4.3 Dimensions

Butterfly Valve Type 240 FC/FO with pneumatic actuator DN50 – DN600



d (mm)	d (inch)	DN (mm)	Act.type	d2 (mm)	D (mm)	D1 _{min} (mm)	D1 _{max} (mm)	H (mm)	H1 (mm)	H2 (mm)	H3 (mm)	H4 (mm)	H5 (mm)	L (mm)	L1 (mm)	Q1 (mm)	Q2 (mm)
63	2	50	PA30	104	19	120	125	327.2	77	134	116.2	70.4	18	45	274.4	40	
75	2 ½	65	PA30	115	19	140	145	339.2	83	140	116.2	70.4	18	46	274.4	54	35
90	3	80	PA35	131	19	150	160	364.1	89	146	129.1	83.3	18	49	325.2	67	50
110	4	100	PA40	161	19	175	191	385.8	104	167	114.8	87		56	359.5	88	74
140	5	125	PA45	187	23	210	216	447.5	117	181	149.5	107.5		64	418	113	97
160	6	150	PA50	215	24	241	241	472.1	130	189	153.1	111.1		72	433.9	139	123
225	8	200	PA55	267	23	290	295	528	158	210	160	118		73	498.3	178	169
280	10	250	PA60 FC	329	25	353	362	663.9	205	264	194.9	135	18	113	547.3	210	207
280	10	250	PA70 FO	329	25	353	362	702.1	205	264	233.1	168	23	113	681	210	207
315	12	300	PA65 FC	379	25	400	432	721	228	285	208	148	18	113	646	256	253
315	12	300	PA70 FO	379	25	400	432	746.1	228	285	233.1	168	23	113	681	256	253
355	14	350	APS190	535	29	445	477	863	268	410	185	155	27	129	360	325	305
400	16	400	APS210	595	29	510	540	941	300	435	206	176	27	169	380	353	350
450	18	450	APS240	635	32	565	578	1046	320	520	206	176	36	179	380	393	390
500	20	500	APS240	700	32	620	635	1130	350	550	230	200	36	190	462	444	440
630	24	600	APS270	813	35	725	750	1330	420	610	300	250	36	209	530	530	527

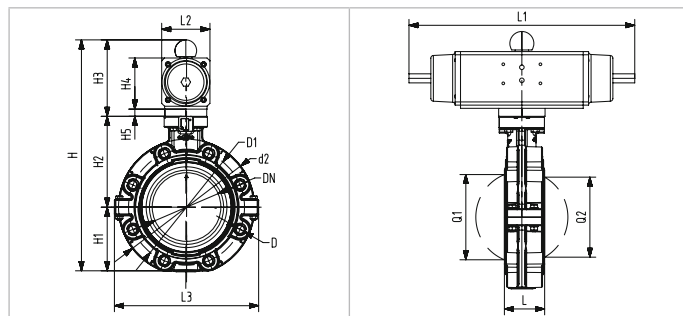
Butterfly Valve Type 240 DA with pneumatic actuator DN50 – DN600



d (mm)	d (inch)	DN (mm)	Act. type	d2 (mm)	D (mm)	D1 _{min} (mm)	D1 _{max} (mm)	H (mm)	H1 (mm)	H2 (mm)	H3 (mm)	H4 (mm)	H5 (mm)	L (mm)	L1 (mm)	Q1 (mm)	Q2 (mm)
63	2	50	PA35	104	19	120	125	321.3	77	134	110.3	64.5	18	45	196.1	40	
75	2 ½	65	PA35	115	19	140	145	333.3	83	140	110.3	64.5	18	46	196.1	54	35
90	3	80	PA40	131	19	150	160	351.2	89	146	116.2	70.4	18	49	205.6	67	50
110	4	100	PA45	161	19	175	191	382.1	104	167	111.1	83.3		56	242	88	74
140	5	125	PA45	187	23	210	216	409.1	117	181	111.1	83.3		64	242	113	97
160	6	150	PA55	215	24	241	241	468.5	130	189	149.5	107.5		72	290.2	139	123
225	8	200	PA55	267	23	290	295	517.5	158	210	149.5	107.5		73	290.2	178	169
280	10	250	PA65	329	25	353	362	647	205	264	178	118	18	113	339.6	210	207
315	12	300	PA65	379	25	400	432	691	228	285	178	118	18	113	339.6	256	253

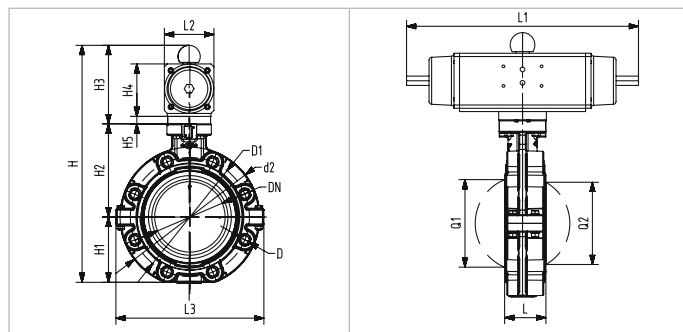
d (mm)	d (inch)	DN (mm)	Act. type	d2 (mm)	D (mm)	D1 _{min} (mm)	D1 _{max} (mm)	H (mm)	H1 (mm)	H2 (mm)	H3 (mm)	H4 (mm)	H5 (mm)	L (mm)	L1 (mm)	Q1 (mm)	Q2 (mm)
355	14	350	APD140	535	29	445	477	863	268	410	185	155	27	129	360	325	305
400	16	400	APD160	595	29	510	540	941	300	435	206	176	27	169	380	353	350
450	18	450	APD160	635	32	565	578	1046	320	520		176	36	179	380	393	390
500	20	500	APD190	700	32	620	635	1130	350	550		200	36	190	462	444	440
600	24	600	APD190	813	35	725	750	1330	420	610		250	36	209	530	530	527

Butterfly Valve Type 243 FC/FO with pneumatic actuator DN50 – DN300



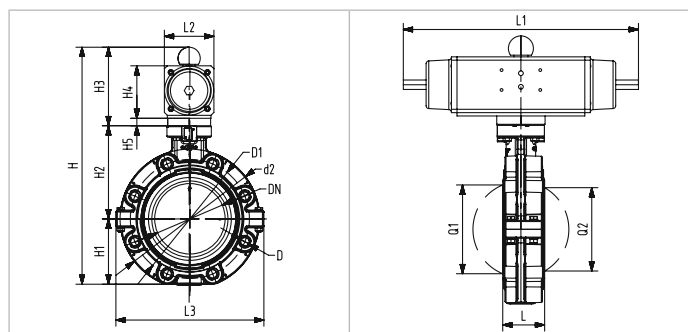
d (mm)	DN (mm)	Act.type	d2 (mm)	D (mm)	D1 (mm)	H (mm)	H1 (mm)	H2 (mm)	H3 (mm)	H4 (mm)	H5 (mm)	L (mm)	L1 (mm)	L2 (mm)	L3 (mm)	Q1 (mm)	Q2 (mm)
63	50	PA30	160	M16	125	327.2	77	134	116.2	70.4	18	45	274.4	70.4	165	40	
75	65	PA30	180	M16	145	339.2	83	140	116.2	70.4	18	46	274.4	70.4	182	54	35
90	80	PA35	195	M16	160	364.1	89	146	129.1	83.3	18	49	325.2	83.3	210	67	50
110	100	PA40	226	M16	180	387.8	106	167	114.8	87		56	359.5	87	240	88	74
140	125	PA45	258	M16	210	451.5	121	181	149.5	107.5		64	418	107.5	272	113	39
160	150	PA50	284	M20	240	475.1	133	189	153.1	111.1		72	433.9	111.1	300	139	123
225	200	PA55	341	M20	295	529	159	210	160	118		73	498.3	118	360	178	169
280	250	PA60 FC	412	M20	350	663.9	205	264	194.9	135	18	113	547.3	134.9	440	210	207
280	250	PA70 FO	412	M20	350	702.1	205	264	233.1	168	23	113	681	168	440	210	207
315	300	PA65 FC	482	M20	400	727	234	285	208	148	18	113	646	148	510	256	253
315	300	PA70 FO	482	M20	400	752.1	234	285	233.1	168	23	113	681	168	510	256	253

Butterfly Valve Type 243 DA with pneumatic actuator DN50 – DN300



d (mm)	DN (mm)	Act.type	d2 (mm)	D (mm)	D1 (mm)	H (mm)	H1 (mm)	H2 (mm)	H3 (mm)	H4 (mm)	H5 (mm)	L (mm)	L1 (mm)	L2 (mm)	L3 (mm)	Q1 (mm)	Q2 (mm)
63	50	PA35	160	M16	125	321.3	77	134	110.3	64.5	18	45	196.1	64.5	165	40	
75	65	PA35	180	M16	145	333.3	83	140	110.3	64.5	18	46	196.1	64.5	182	54	35
90	80	PA40	195	M16	160	351.2	89	146	116.2	70.4	18	49	205.6	70.4	210	67	50
110	100	PA45	226	M16	180	384.1	106	167	111.1	83.3		56	242	83.3	240	88	74
140	125	PA45	258	M16	210	413.1	121	181	111.1	83.3		64	242	83.3	272	113	39
160	150	PA55	284	M20	240	471.5	133	189	149.5	107.5		72	290.2	107.5	300	139	123
225	200	PA55	341	M20	295	518.5	159	210	149.5	107.5		73	290.2	107.5	360	178	169
280	250	PA65	412	M20	350	647	205	264	178	118	18	113	339.6	118	440	210	207
315	300	PA65	482	M20	400	697	234	285	178	118	18	113	339.6	118	510	256	253

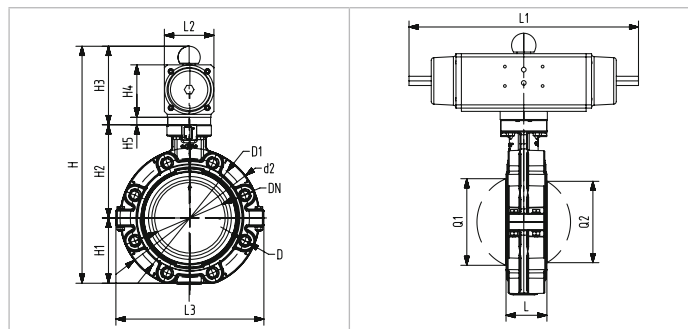
Butterfly Valve Type 244 FC/FO with pneumatic actuator DN50 – DN300



Inch (inch)	DN (mm)	Act.type	d2 (mm)	D ANSI	D1 (mm)	H (mm)	H1 (mm)	H2 (mm)	H3 (mm)	H4 (mm)	H5 (mm)	L (mm)	L1 (mm)	L2 (mm)	L3 (mm)	Q1 (mm)	Q2 (mm)
2	50	PA30	160	UNC 5/8	121	327.2	77	134	116.2	70.4	18	45	274.4	70.4	165	40	
2 1/2	65	PA30	180	UNC 5/8	140	339.2	83	140	116.2	70.4	18	46	274.4	70.4	182	54	35
3	80	PA35	195	UNC 5/8	152	364.1	89	146	129.1	83.3	18	49	325.2	83.3	210	67	50
4	100	PA40	226	UNC 5/8	191	387.8	106	167	114.8	87		56	359.5	87	240	88	74
5	125	PA45	258	UNC 3/4	216	451.5	121	181	149.5	107.5		64	418	107.5	272	113	97
6	150	PA50	284	UNC 3/4	241	475.1	133	189	153.1	111.1		72	433.9	111.1	300	139	123
8	200	PA55	341	UNC 3/4	298	529	159	210	160	118		73	498.3	118	360	178	169
10	250	PA60 FC	412	UNC 7/8	362	663.9	205	264	194.9	135	18	113	547.3	135	440	210	207
10	250	PA70 FO	412	UNC 7/8	362	702.1	205	264	233.1	168	23	113	681	168	440	210	207
12	300	PA65 FC	482	UNC 7/8	432	727	234	285	208	148	18	113	646	148	510	256	253
12	300	PA70 FO	482	UNC 7/8	432	752.1	234	285	233.1	168	23	113	681	168	510	256	253

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Butterfly Valve Type 244 DA with pneumatic actuator DN50 – DN300



Zoll (inch)	DN (mm)	Act.type	d2 (mm)	D ANSI	D1 (mm)	H (mm)	H1 (mm)	H2 (mm)	H3 (mm)	H4 (mm)	H5 (mm)	L (mm)	L1 (mm)	L2 (mm)	L3 (mm)	Q1 (mm)	Q2 (mm)
2	50	PA35	160	UNC 5/8	121	321.3	77	134	110.3	64.5	18	45	196.1	64.5	165	40	
2 1/2	65	PA35	180	UNC 5/8	140	333.3	83	140	110.3	64.5	18	46	196.1	64.5	182	54	35
3	80	PA40	195	UNC 5/8	152	351.2	89	146	116.2	70.4	18	49	205.6	70.4	210	67	50
4	100	PA45	226	UNC 5/8	191	384.1	106	167	111.1	83.3		56	242	83.3	240	88	74
5	125	PA45	258	UNC 3/4	216	413.1	121	181	111.1	83.3		64	242	83.3	272	113	97
6	150	PA55	284	UNC 3/4	241	471.5	133	189	149.5	107.5		72	290.2	107.5	300	139	123
8	200	PA55	341	UNC 3/4	298	518.5	159	210	149.5	107.5		73	290.2	107.5	360	178	169
10	250	PA65	412	UNC 7/8	362	647	205	264	178	118	18	113	339.6	118	440	210	207
12	300	PA65	482	UNC 7/8	432	697	234	285	178	118	18	113	339.6	118	510	256	253

Dimensions in accordance with ANSI/ASME B16.5 Class 150

Standard design butterfly valve with pneumatic actuator

d (mm)	Inch (inch)	DN (mm)	Butterfly valve interface	Actuator type single-acting	Actuator type double-acting
63	2	50	F07/11 mm	PA30	PA35
75	2 ½	65	F07/11 mm	PA30	PA35
90	3	80	F07/11 mm	PA35	PA40
110	4	100	F07/14 mm	PA40	PA45
140	5	125	F07/14 mm	PA45	PA45
160	6	150	F07/17 mm	PA50	PA55
225	8	200	F07/17 mm	PA55	PA55
280	10	250	F10/22 mm	PA65	PA65
315	12	300	F10/22 mm	PA70	PA70
355	14	350	F10/22 mm	Revac AG190 SR	Revac AG-DA 127
400	16	400	F12/27 mm	Revac AG190 SR	Revac AG-DA 143
450	18	450	F14/35 mm	Revac AG210 SR	Revac AG-DA 160
500	20	500	F14/35 mm	Revac AG210 SR	Revac AG-DA 160
600	24	600	F14/35 mm	Revac AG254 SR	Revac AG-DA 190

1.4.4 Accessories

- Pilot valve detached or directly installed in voltages 24 V DC/AC, 110 V AC and 230 V AC
- Positioner
- Limit switch (mechanical, AG/NI, inductive, integrated in valve body or via additional limit switch box)
- Stroke limiter
- Manual override for all sizes up to d225/DN200 mm
- AS interface module with integrated position feedback and pilot solenoid valve
- Electric-pneumatic positioner (4 – 20 mA) or 3 – 15 PSI
- Detachable manual override

i For further information on accessories, please refer to the on-line product catalogue at www.gfps.com

■ Mobile apps and online tools to support configuration and calculation at www.gfps.com/tools



2 Butterfly Valves, metal

2.1 Butterfly Valve Type 038/039

			
Type 038 With hand lever Wafer or lug style valve	Type 038 Manual reduction gear Wafer or lug style valve	Type 039 With hand lever Wafer style valve	Type 039 Manual reduction gear Wafer style valve

2.1.1 Product description

Metal butterfly valves are ideal for shutting off and controlling the flow of liquid media in pipelines. They offer high temperature and pressure resistance as well as outstanding resistance to corrosion.

Function

Metal butterfly and control Valve Types 038 and 039 can be universally used and are intended exclusively for shutting off, conveying and dosing media in the allowable pressure and temperature range or for controlling flow in piping systems into which they have been installed. The easy installation of the valves between pipe flanges guarantees reliable operation and sealing.

The Rilsan-coating of the valve body and the ductile iron valve disk provide a high resistance against corrosion. The butterfly valves are also available in a standard version with a stainless steel valve disk.

Applications

- Water treatment
- Chemical process industry
- Cooling water facilities
- Power plant
- Shipbuilding

Benefits/features

- Good flow characteristics
- Rilsan/epoxy-coating: good chemical resistance
- Easy installation
- Space-saving installation
- Large dimensions to DN1200
- Compact design
- Varied applications
- Low maintenance and high cost efficiency
- KTW / DVGW / WRAS certification

Flow media

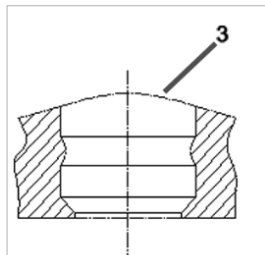
Not recommended for media containing solids.

2.1.2 Technical basics

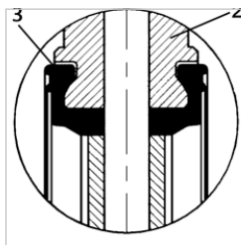
Shaft sealing

Shaft sealing is guaranteed by:

1. Special profile of the collar in the area of the shaft seal.
2. Fixation of the collar with the valve housing



Longitudinal section of the collar



Cross-section of the valve housing with collar

The outer grooves of the collar seal the flange connection. No additional flange seals are required.

Valve handling

Differentiation between and use of respective types

- Use butterfly Valve Type 039 only as a wafer style valve
- Use butterfly Valve Type 038 as either a wafer style or a lug style valve

Installation notes

- Make sure that the butterfly valves to be installed correspond specifically to the pressure rating, Type of connection, dimension and materials of the particular application.
- Perform a function test. To do this, close and re-open the butterfly valve.
- Only install butterfly valves that function without trouble.

Maintenance notes

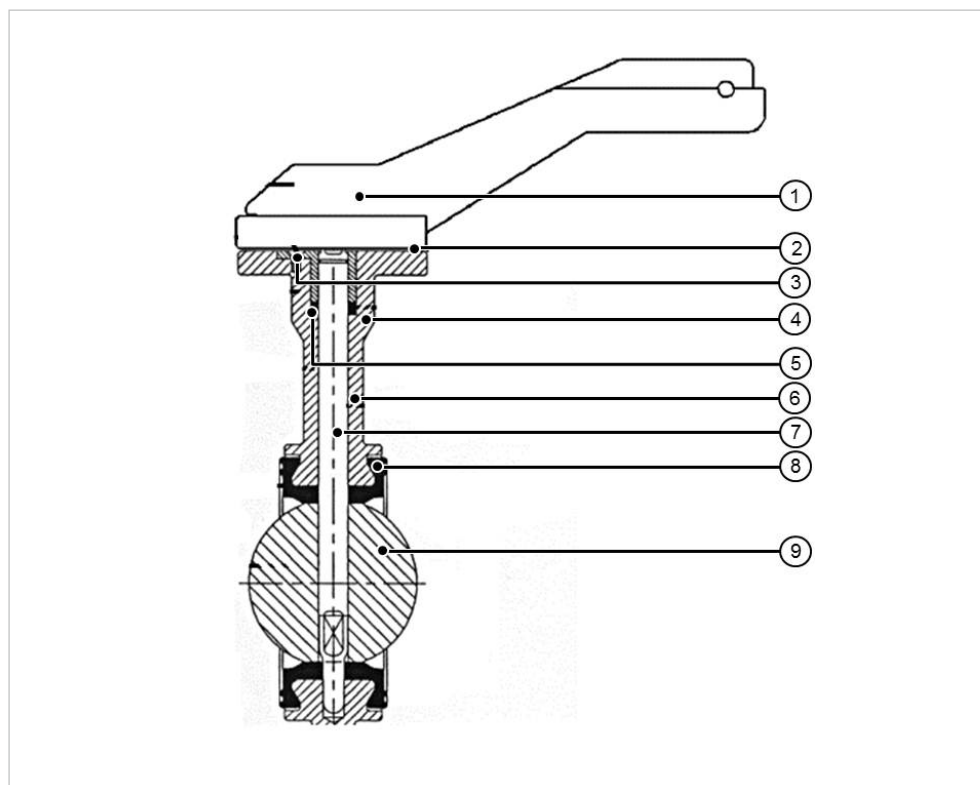
In normal operation, butterfly valves do not require maintenance. It is nonetheless recommended to perform maintenance on butterfly valves after 5,000 actuation cycles at most. The following steps must be taken when doing so:

- Regularly check that no medium escapes to the outside. If medium exits from the flange connections, tighten them.
- We recommend operating butterfly valves that are kept permanently in the same position 1 – 2 times per year to check their functionality.
- Depending on the operating conditions, the collars should be lubricated periodically with grease (silicone-based grease).



Installation and maintenance must be performed according to the corresponding installation instructions. The installation manual is included with the product, see also the online product catalog at www.gfps.com

2.1.3 Technical data



- ① Hand lever
- ② Ten-position plate
- ③ Screw for bushing
- ④ Bushing
- ⑤ Shaft sealing
- ⑥ Valve housing
- ⑦ Shaft
- ⑧ Collar
- ⑨ Valve disc

Specification

Dimensions	Type 038 wafer or lug style	DN50 – DN600, 2" – 24"	
	Type 039 wafer style	DN50 – DN1200, 2" – 48"	
Materials	Disc	Ductile cast iron Rilsan/epoxy-coated	
		Stainless steel	
		Aluminum bronze	
	Outside housing	Ductile cast iron	
Gasket materials	EPDM, FKM, others upon request		
Pressure ratings	Type 038, 039	PN10/16	
Actuation variants	Manually operated		
	Pneumatically actuated FC, FO, DA		
	Electrically actuated AC: 100 – 230 V, AC/DC: 24 V		
Connections	Flange connections	EN1092-1	PN10/PN16
		DIN2501	PN10/PN16
		ANSI B16.5	Class 150
	Valve flange	ISO/DIN, BS, ASTM	
Standards	Type 038	ISO/DIN, ASTM	
	Type 039	All standards	
Approvals	KTW, DVGW, ACS, WRAS		

Kv 100 values

Nominal diameter DN		Opening angle (m ³ /h)							
(mm)	(inch)	20°	30°	40°	50°	60°	70°	80°	90°
50	2"	7	16	26	43	69	110	170	190
65	2 ½"	9	22	38	60	95	155	250	280
80	3"	14	33	57	95	150	240	370	430
100	4"	24	54	95	155	240	400	620	710
125	5"	38	86	155	240	390	640	950	1100
150	6"	52	120	220	345	550	950	1400	1600
200	8"	95	220	345	600	950	1600	2400	2800
250	10"	155	345	610	950	1600	2600	4000	4700
300	12"	220	510	860	1500	2300	3800	5900	6900
350	14"	290	660	1200	1900	2900	4800	7800	8600
400	16"	380	860	1600	2400	3900	6400	9500	11 200
450	18"	490	1100	2000	3100	5000	8300	12 900	15 500
500	20"	610	1400	2500	4000	6200	10 300	15 500	19 000
600	24"	860	2000	3400	5500	8600	14 700	22 400	25 900
650	26"	980	2300	4000	6100	10 400	16 650	25 850	31 500
700	28"	1100	2600	4600	6700	12 200	18 600	29 300	37 100
750	30"	1300	3100	5200	8500	13 800	22 400	34 500	40 500
800	32"	1800	3600	6600	9700	16 600	28 300	43 200	52 300
900	36"	2200	4500	7800	12 900	19 800	32 800	51 700	60 300
1000	40"	3100	5300	8700	16 000	24 100	42 200	62 100	78 400
1050	42"	3400	5900	9600	17 700	26 600	46 600	68 400	86 200
1100	44"	3800	6500	10 600	19 500	29 300	51 300	75 100	95 100
1200	48"	4500	7800	12 700	23 300	35 200	61 500	90 700	114 400

Operating torque

Nominal diameter DN (mm)	Inch (inch)	Operating pressure 10 bar (Nm)	Operating pressure 16 bar (Nm)
50	2"	15	15
65	2 ½"	20	20
80	3"	25	25
100	4"	40	40
125	5"	50	50
150	6"	60	60
200	8"	160	160
250	10"	250	250
300	12"	300	300
350	14"	900	
400	16"	1200	
450	18"	1650	
500	20"	2300	
600	24"	4100	

Reference values for tightening torque of screws

Use of PVC-U flange adapters

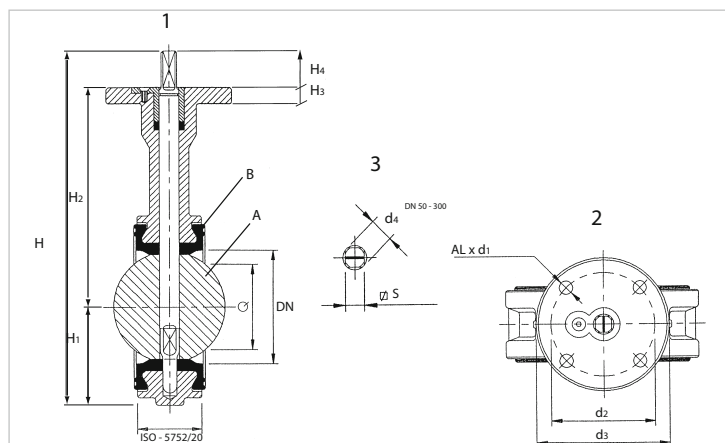
DIN PN16 / PN10 Standard								Required screws for Type 039 wafer butterfly valve With PVC-U flange adapters					Required screws for Type 038 lug style butterfly valve With PVC-U flange adapters		
Butterfly valve				Flange (DIN-2632)				Studs		Nuts			Screws		
PN (bar)	DN (mm)	inch (inch)	Housing width A	Flange thickness B	Hole distanceC	Number of holes N°	Outer ø D	Length L	Thread M	Number N°	Thread M	Number N°	Length L	Thread M	Number N°
16	50	2"	43	18	125	4	165	150	M16	4	M16	8	50	M16	
16	65	2 ½"	46	18	145	4	185	155	M16	4	M16	8	55	M16	4
16	80	3"	46	20	160	8	200	155	M16	8	M16	16	55	M16	8
16	100	4"	52	20	180	8	220	165	M16	8	M16	16	60	M16	8
16	125	5"	56	22	210	8	250	180	M16	8	M16	16	65	M16	8
16	150	6"	56	22	240	8	285	190	M20	8	M20	16	70	M20	8
16	200	8"	60	24	295	12	340	220	M20	8	M20	16	80	M20	8
16	250	10"	68	26	355	12	405	230	M20	8	M20	16	90	M20	8
16	300	12"	78	28	410	12	460	255	M20	12	M20	16	100	M20	12
10	350	14"	78	30	470	16	520	275	M20	16	M20	32			
10	400	16"	102	32	525	16	580	310	M24	16	M24	32			

Use flange adapter PP and PE100

DIN PN16 / PN10 Standard								Required screws for Type 039 Wafer butterfly flange With flange adapter PP- and PE100					Required screws Type 038 with flange adapter PP and PE 100		
Butterfly valve				Flange (DIN-2632)				Studs		Nuts			Screws		
PN (bar)	DN (mm)	Inch (inch)	Housing width A	Flange thickness B	Hole distance øC	Number of holes N°	Outer øD	Length L	Thread M	Number N°	Thread M	Number N°	Length L	Thread M	Number N°
16	50	2"	43	18	125	4	165	160	M16	4	M16	8	55	M16	4
16	65	2 ½"	46	18	145	4	185	165	M16	4	M16	8	60	M16	4
16	80	3"	46	20	160	8	200	170	M16	8	M16	16	60	M16	8
16	100	4"	52	20	180	8	220	175	M16	8	M16	16	65	M16	8
16	125	5"	56	22	210	8	250	200	M16	8	M16	16	80	M16	8
16	150	6"	56	22	240	8	285	210	M20	8	M20	16	80	M20	8
16	200	8"	60	24	295	12	340	230	M20	8	M20	16	90	M20	8
16	250	10"	68	26	355	12	405	250	M20	8	M20	16	100	M20	8
16	300	12"	78	28	410	12	460	270	M20	12	M20	16	110	M20	12
10	350	14"	78	30	470	16	520	340	M20	16	M20	32			
10	400	16"	102	32	525	16	580	380	M24	16	M24	32			
10	500	20"	126	34	650	20	715	470	M24	20	M24	40			
10	600	24"	146	36	770	20	840	420	M27	20	M27	40			

2.1.4 Dimensions

Butterfly Valve Types 038 and 039 with open shaft end DN50 – DN1200



Type 038			Butterfly valve ¹⁾							Actuation flange ²⁾					Shaft end ³⁾		
d	DN	inch			Q	L	H	H1	H2	Type	d1	d2	d3	H3	H4	d4	ΦS
(mm)	(mm)	(inch)	(kg)	(Nm)	(mm)	(mm)	(mm)	(mm)	(mm)		(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)
63	50	2"	3.2	24	32	43	215	63	140	F-07	9	70	90	12	26	14	11
75	65	2 ½"	4.3	30	51	46	241	73	152	F-07	9	70	90	12	26	14	11
90	80	3"	6.0	39	69	46	256	81	159	F-07	9	70	90	12	26	14	11
110	100	4"	8.0	59	89	52	295	97	178	F-07	9	70	90	14	30	18	14
140	125	5"	9.8	78	115	56	323	112	191	F-07	9	70	90	14	30	18	14
160	150	6"	12.0	98	143	56	358	122	203	F-07	9	70	90	15	33	22	17
225	200	8"	18.0	157	194	60	423	149	245	F-07	9	70	90	15	33	22	17
280	250	10"	32.0	209	243	68	521	203	275	F-10	12	102	125	17	47	28	22
315	300	12"	48.0	301	293	78	559	241	315	F-10	12	102	125	17	47	28	22

Type 039			Butterfly valve ¹⁾							Actuation flange ²⁾					Shaft end ³⁾		
d (mm)	DN (mm)	inch (inch)	(kg)	(Nm)	Q (mm)	L (mm)	H (mm)	H1 (mm)	H2 (mm)	Type	d1 (mm)	d2 (mm)	d3 (mm)	H3 (mm)	H4 (mm)	d4 (mm)	ØS (mm)
63	50	2"	3.3	24	32	43	219	53	140	F-07	9	70	90	13	26	14	11
75	65	2 ½"	4.0	30	51	46	241	63	152	F-07	9	70	90	13	26	14	11
90	80	3"	4.3	39	69	46	256	71	159	F-07	9	70	90	13	26	14	11
110	100	4"	5.7	59	89	52	295	87	178	F-07	9	70	90	16	30	18	14
140	125	5"	7.4	78	115	56	323	102	191	F-07	9	70	90	16	30	18	14
160	150	6"	8.9	98	143	56	358	122	203	F-07	9	70	90	17	33	22	17
225	200	8"	13.5	157	194	60	423	149	241	F-07	9	70	90	17	33	22	17
280	250	10"	22.8	209	243	68	521	201	273	F-10	12	102	125	17	47	28	22
315	300	12"	31.7	301	293	78	559	231	311	F-10	12	102	125	17	47	28	22
355	350	14"	43.2	900	332	78	653	291	307	F-12	13	125	150	22	55	36	
400	400	16"	65.2	1200	382	102	732	325	342	F-14	17	140	175	24	65	42	
450	450	18"	84.5	1650	432	113	809	357	387	F-14	17	140	175	27	65	48	
500	500	20"	119.0	2300	478	126	871	381	425	F-14	17	140	175	27	65	48	
630	600	24"	281.0	4100	585	146	1130	488	532	F-25	18	254	300	40	110	72	
700	700	28"	414.0	5500	683	175	1189	506	573	F-25	18	254	300	40	110	72	
800	800	32"	572.0	8100	755	215	1338	578	650	F-25	18	254	300	40	110	72	
900	900	36"	639.0	10000	852	246	1460	643	707	F-25	18	254	300	40	110	98	
1000	1000	40"	918.0	13500	958	280	1594	729	755	F-25	18	254	300	40	110	98	
1200	1200	48"	1760.0	16500	1098	360	1885	855	900	F-30	22	298	350	50	130	120	

- 1) Butterfly valve: kg = net weight
Nm = closing torque
Q = disc outlet diameter
L = mounting length
- 2) Actuation flange:
AL = number of holes (4)
- 3) Shaft end: DN50 – DN300: square end
DN350 – DN1200: key way
Butterfly Valve Type 039
with manual override

Tightening torque for installing the butterfly valve

DN (mm)	Inch (inch)	Max. closing torque	
		(Nm)	(lb-ft)
50	2"	30	22
65	2 ½"	35	26
80	3"	40	30
100	4"	45	33
125	5"	50	37
150	6"	60	44
200	8"	75	55
250	10"	75	55
300	12"	80	59

2.1.5 Accessories

- Lever with fine adjustment
- Mechanical limit switch box

2.2 Butterfly Valve Type 038E/039E



Type 038E

Wafer or lug style with electric valve EA or smart electric valve dEA

Type 039E

Wafer style with electric valve EA or smart electric valve dEA

2.2.1 Product description

The butterfly Valve Types 038E and 039E consists of the basic valve body with the electric actuator EA or the smart electric valve dEA.

The metal butterfly Valve Types 038E and 039E can be used universally as open/close or control valves. The easy installation of the valve between pipe flanges ensures reliable operation and sealing. The Rilsan-coating of the valve body and the ductile iron valve disk provide a high resistance against corrosion. The butterfly valves are also available in a standard version with a stainless steel valve disk.

Function

Butterfly valves of types 038E and 039E are intended for shutting off, conveying and dosing media in the allowable pressure and temperature range or for controlling flow in piping systems into which they have been installed

Applications

- Water treatment
- Chemical process industry
- Cooling water facilities
- Power plant
- Shipbuilding

Benefits/features

- Good flow characteristics
- Simple installation
- Ductile cast iron Rilsan/epoxy-coated
- Reliable automatic open/close and control valves
- Lasting high temperature and pressure resistance
- Low maintenance costs and high cost efficiency
- KTW / DVGW / WRAS certification

Flow media

Not recommended for media containing solids

Valve handling

Differentiation between and use of respective types

- Use butterfly Valve Type 039E only as a wafer style valve
- Use butterfly Valve Type 038E as either a wafer style or a lug style valve

Installation notes

- Make sure that the butterfly valves to be installed correspond specifically to the pressure rating, Type of connection, dimension and materials of the particular application.
- Perform a function test. To do this, close and re-open the butterfly valve.
- Only install butterfly valves that function without trouble.

Maintenance notes

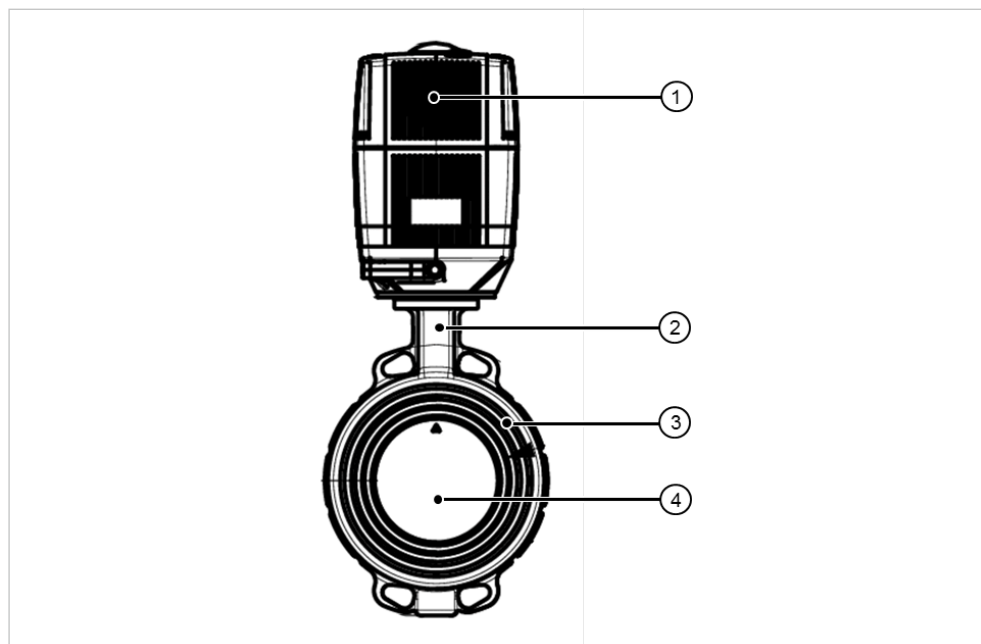
In normal operation, butterfly valves do not require maintenance. It is nonetheless recommended to perform maintenance on butterfly valves after 5,000 actuation cycles at most. The following steps must be taken when doing so:

- Regularly check that no medium escapes to the outside. If medium exits from the flange connections, tighten them.
- We recommend operating butterfly valves that are kept permanently in the same position 1 – 2 times per year to check their functionality.
- Depending on the operating conditions, the collars should be lubricated periodically with grease (silicone-based grease).



Installation and maintenance must be performed according to the corresponding installation instructions. The installation manual is included with the product, see also the online product catalog at www.gfps.com

2.2.2 Technical data



- ① Electric actuator EA or dEA
- ② Outside housing
- ③ Flange seal
- ④ Disc

Specification

Dimensions	Type 038E wafer style or lug style installation	DN50 – DN600, 2" – 24"	
	Type 039E wafer style installation	DN50 – DN1200, 2" – 48"	
Base type	Type 038		
	Type 039		
Materials	Disc	Ductile cast iron Rilsan/epoxy-coated	
		Stainless steel	
		Aluminum bronze	
	Outside housing	Ductile cast iron	
Gasket materials	EPDM, FKM, others upon request		
Pressure levels	Type 038E, 039E	PN10/16	
Actuator type	Type 038E wafer style or lug style installation	EA45/120/250	
	Type 039E wafer style installation	EA45/120/250, Auma	
Connections	Flange connections	EN1092-1	PN10/PN16
		DIN2501	PN10/PN16
		ANSI B16.5	Class 150
	Valve flange	ISO/DIN, BS, ASTM	
Standards	Type 038E	ISO/DIN, ASTM	
	Type 039E	All standards	
Approvals	KTW, DVGW, ACS, WRAS		

Kv 100 values

Nominal diameter DN		Opening angle (m ³ /h)							
(mm)	(inch)	20°	30°	40°	50°	60°	70°	80°	90°
50	2"	7	16	26	43	69	110	170	190
65	2 ½"	9	22	38	60	95	155	250	280
80	3"	14	33	57	95	150	240	370	430
100	4"	24	54	95	155	240	400	620	710
125	5"	38	86	155	240	390	640	950	1100
150	6"	52	120	220	345	550	950	1400	1600
200	8"	95	220	345	600	950	1600	2400	2800
250	10"	155	345	610	950	1600	2600	4000	4700
300	12"	220	510	860	1500	2300	3800	5900	6900
350	14"	290	660	1200	1900	2900	4800	7800	8600
400	16"	380	860	1600	2400	3900	6400	9500	11 200
450	18"	490	1100	2000	3100	5000	8300	12 900	15 500
500	20"	610	1400	2500	4000	6200	10 300	15 500	19 000
600	24"	860	2000	3400	5500	8600	14 700	22 400	25 900
650	26"	980	2300	4000	6100	10 400	16 650	25 850	31 500
700	28"	1100	2600	4600	6700	12 200	18 600	29 300	37 100
750	30"	1300	3100	5200	8500	13 800	22 400	34 500	40 500
800	32"	1800	3600	6600	9700	16 600	28 300	43 200	52 300
900	36"	2200	4500	7800	12 900	19 800	32 800	51 700	60 300
1000	40"	3100	5300	8700	16 000	24 100	42 200	62 100	78 400
1050	42"	3400	5900	9600	17 700	26 600	46 600	68 400	86 200
1100	44"	3800	6500	10 600	19 500	29 300	51 300	75 100	95 100
1200	48"	4500	7800	12 700	23 300	35 200	61 500	90 700	114 400

Reference values for tightening torque of screws

Use of PVC-U flange adaptors

DIN PN16 and PN10 standard								Required screws for Type 039 wa- fer butterfly valve With PVC-U flange adaptors				Required screws for Type 038 lug style butterfly valve With PVC-U flange adaptors			
		Butterfly valve		Flange (DIN-2632)				Studs		Nuts				Screws	
PN (bar)	DN (mm)	Inch (inch)	Housing width A	Flange thickness B	Hole distance øC	Number of holes N°	Outer øD	Length L	Thread M	Number N°	Thread M	Number N°	Length L	Thread M	Number N°
16	50	2"	43	18	125	4	165	150	M16	4	M16	8	50	M16	
16	65	2 ½"	46	18	145	4	185	155	M16	4	M16	8	55	M16	4
16	80	3"	46	20	160	8	200	155	M16	8	M16	16	55	M16	8
16	100	4"	52	20	180	8	220	165	M16	8	M16	16	60	M16	8
16	125	5"	56	22	210	8	250	180	M16	8	M16	16	65	M16	8
16	150	6"	56	22	240	8	285	190	M20	8	M20	16	70	M20	8
16	200	8"	60	24	295	12	340	220	M20	8	M20	16	80	M20	8
16	250	10"	68	26	355	12	405	230	M20	8	M20	16	90	M20	8
16	300	12"	78	28	410	12	460	255	M20	12	M20	16	100	M20	12
10	350	14"	78	30	470	16	520	275	M20	16	M20	32			
10	400	16"	102	32	525	16	580	310	M24	16	M24	32			

Use flanger adapter PP and PE100

DIN PN16 and PN10 standard

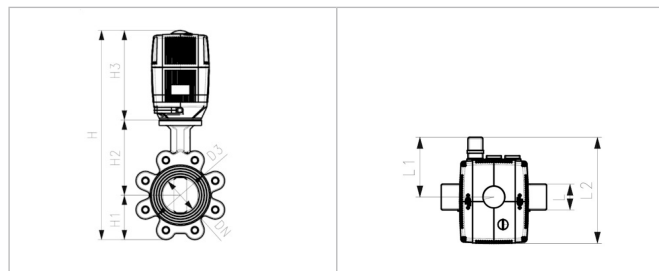
Required screws for Type 039 Wafer butterfly flange with flange adapter PP and PE100

Required screws type 038 with flange adapter PP and PE 100

Butterfly valve Flange (DIN-2632)								Studs		Nuts		Screws			
PN (bar)	DN (mm)	Inch (inch)	Housing width A	Flange thickness B	Hole spacing øC	Number of holes N°	Outer ø ØD	Length L	Thread M	Number N°	Thread M	Number N°	Length L	Thread M	Number N°
16	50	2"	43	18	125	4	165	160	M16	4	M16	8	55	M16	4
16	65	2 ½"	46	18	145	4	185	165	M16	4	M16	8	60	M16	4
16	80	3"	46	20	160	8	200	170	M16	8	M16	16	60	M16	8
16	100	4"	52	20	180	8	220	175	M16	8	M16	16	65	M16	8
16	125	5"	56	22	210	8	250	200	M16	8	M16	16	80	M16	8
16	150	6"	56	22	240	8	285	210	M20	8	M20	16	80	M20	8
16	200	8"	60	24	295	12	340	230	M20	8	M20	16	90	M20	8
16	250	10"	68	26	355	12	405	250	M20	8	M20	16	100	M20	8
16	300	12"	78	28	410	12	460	270	M20	12	M20	16	110	M20	12
10	350	14"	78	30	470	16	520	340	M20	16	M20	32			
10	400	16"	102	32	525	16	580	380	M24	16	M24	32			
10	500	20"	126	34	650	20	715	470	M24	20	M24	40			
10	600	24"	146	36	770	20	840	420	M27	20	M27	40			

2.2.3 Dimensions

Butterfly Valve Type 038E

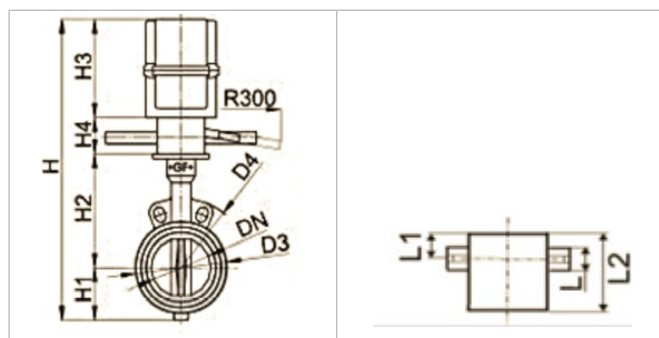


d (mm)	DN (mm)	Inch (inch)	PN (bar)	kv value(Δp=1bar) (l/min)	Cv value (Δp=1psi) (gal(US)/min)
63	50	2	10	3140	220
75	65	2 ½	10	4570	320
90	80	3	10	7140	500
110	100	4	10	11710	820
140	125	5	10	18570	1300
160	150	6	10	27130	1900
225	200	8	10	47130	3300
280	250	10	6	77110	5400
315	300	12	4	114240	8000

d (mm)	DN (mm)	inch (inch)	Type of actuator Type	D3 (mm)	L (mm)	L1 (mm)	L2 (mm)	H (mm)	H1 (mm)	H2 (mm)	H3 (mm)
63	50	2	EA45	65	43	28	122	393	63	140	190
75	65	2 ½	EA120	114	46	28	122	415	73	152	190
90	80	3	EA120	131	46	28	122	430	81	159	190
110	100	4	EA120	152	52	60	220	333	97	178	58
140	125	5	EA120	182	56	60	220	361	112	191	58
160	150	6	EA250	209	56	60	220	383	122	203	58
225	200	8	EA250	262	60	60	220	452	149	245	58
280	250	10	EA250	331	68	70	220	545	203	275	67

d (mm)	DN (mm)	inch (inch)	Type of actuator Type	D3 (mm)	L (mm)	L1 (mm)	L2 (mm)	H (mm)	H1 (mm)	H2 (mm)	H3 (mm)
315	300	12	EA250	380	78	70	220	623	241	315	67

Butterfly Valve Type 039E with manual override



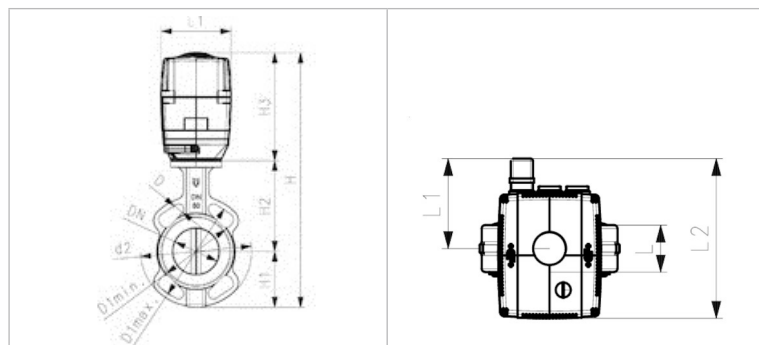
d (mm)	DN (mm)	Inch (inch)	PN (bar)	kv value ($\Delta p=1\text{bar}$) (l/min)	Cv value ($\Delta p=1\text{psi}$) (gal(US)/min)	Q
63	50	2	10	3140	220	32
75	65	2 ½	10	4570	320	51
90	80	3	10	7140	500	69
110	100	4	10	11 710	820	89
140	125	5	10	18 570	1300	115
160	150	6	10	27 130	1900	143
225	200	8	10	47 130	3300	194
280	250	10	10	77 110	5400	243
315	300	12	10	114 240	8000	293
355	350	14	10	143 360		332
400	400	16	10	186 700		382
450	450	18	10	258 390		432
500	500	20	10	316 730		478
630	600	24	10	431 750		585
700	700	28	10	618 333		683
800	800	32	10	675 000		755
900	900	36	10	1 005 200		852
1000	1000	40	10	1 306 930		958
1200	1200	48	10	1 907 050		958

d (mm)	DN (mm)	Inch (inch)	Actuator Type	D3 (mm)	D4 (mm)	L (mm)	L1 (mm)	L2 (mm)
63	50	2	EA45	96	165	43	64	181
75	65	2 ½	EA120	114	185	46	28	181
90	80	3	EA120	131	190	46	28	181
110	100	4	EA250	152	229	52	28	181
140	125	5	EA250	182	254	56	60	220
160	150	6	EA250	209	285	56	60	220
225	200	8	EA250	262	343	60	60	220
280	250	10	EA250	323	333	68	70	220
315	300	12	EA250	373	353	78	70	220
355	350	14	GS80	442	460	78		130
400	400	16	GS80	493	515	102		154
450	450	18	GS100	544	565	113		182
500	500	20	GS125	601	620	126		182
630	600	24	GS125	695	725	146		286
700	700	28	GS125	798	840	175		286
800	800	32	GS160	908	950	215		286
900	900	36	GS160	1004	1050	246		370

d (mm)	DN (mm)	Inch (inch)	Actuator Type	D3 (mm)	D4 (mm)	L (mm)	L1 (mm)	L2 (mm)
1000	1000	40	GS160	1114	1160	280		370
1200	1200	48	GS200	1330	1380	360		1133

d (mm)	DN (mm)	Inch (inch)	Actuator Type	H (mm)	H1 (mm)	H2 (mm)	H3 (mm)	H4 (mm)
63	50	2	EA45	352	53	140	159	60
75	65	2 ½	EA120	374	63	152	159	60
90	80	3	EA120	389	71	159	159	60
110	100	4	EA250	415	87	178	149	60
140	125	5	EA250	443	102	191	149	60
160	150	6	EA250	475	122	203	149	60
225	200	8	EA250	540	149	241	149	60
280	250	10	EA250	671	201	273	197	
315	300	12	EA250	739	231	311	197	
355	350	14	GS80	905	291	307	307	
400	400	16	GS80	974	325	342	307	
450	450	18	GS100	1065	357	387	321	
500	500	20	GS125	1127	381	425	321	
630	600	24	GS125	1350	488	532	330	
700	700	28	GS125	1409	506	573	330	
800	800	32	GS160	1541	578	650	313	
900	900	36	GS160	1673	643	707	323	
1000	1000	40	GS160	1807	729	755	323	
1200	1200	48	GS200	2103	855	900	348	

Butterfly Valve Type 039E without manual override



d (mm)	DN (mm)	inch (inch)	PN (bar)	kv-Wert (Δp=1bar) (l/min)	Cv Wert (Δp=1psi) (gal(US)/min)	Q
63	50	2	10	3140	220	32
75	65	2 ½	10	4570	320	51
90	80	3	10	7140	500	69
110	100	4	10	11 710	820	89
140	125	5	10	18 570	1300	115
160	150	6	10	27 130	1900	143
225	200	8	10	47 130	3300	194
280	250	10	10	77 110	5400	243
315	300	12	10	114 240	8000	293
355	350	14	10	143 360		332
400	400	16	10	186 700		382
450	450	18	10	258 390		432
500	500	20	10	316 730		478
630	600	24	10	431 750		585
700	700	28	10	618 333		683
800	800	32	10	675 000		755

d (mm)	DN (mm)	inch (inch)	PN (bar)	kv-Wert ($\Delta p=1\text{bar}$) (l/min)	Cv Wert ($\Delta p=1\text{psi}$) (gal(US)/min)	Q
900	900	36	10	1 005 200		852
1000	1000	40	10	1 306 930		958
1200	1200	48	10	1 907 050		958

d (mm)	DN (mm)	inch (inch)	Actuator Type	D3 (mm)	D4 (mm)	L (mm)	L1 (mm)	L2 (mm)	H (mm)	H1 (mm)	H2 (mm)	H3 (mm)
63	50	2	EA45	96	165	43	64	181	352	53	140	159
75	65	2 ½	EA120	114	185	46	28	181	374	63	152	159
90	80	3	EA120	131	190	46	28	181	389	71	159	159
110	100	4	EA250	152	229	52	28	181	415	87	178	149
140	125	5	EA250	182	254	56	60	220	443	102	191	149
160	150	6	EA250	209	285	56	60	220	475	122	203	149
225	200	8	EA250	262	343	60	60	220	540	149	241	149
280	250	10	EA250	323	333	68	70	220	671	201	273	197
315	300	12	EA250	373	353	78	70	220	739	231	311	197
355	350	14	GS80	442	460	78		130	905	291	307	307
400	400	16	GS80	493	515	102		154	974	325	342	307
450	450	18	GS100	544	565	113		182	1065	357	387	321
500	500	20	GS125	601	620	126		182	1127	381	425	321
630	600	24	GS125	695	725	146		286	1350	488	532	330
700	700	28	GS125	798	840	175		286	1409	506	573	330
800	800	32	GS160	908	950	215		286	1541	578	650	313
900	900	36	GS160	1004	1050	246		370	1673	643	707	323
1000	1000	40	GS160	1114	1160	280		370	1807	729	755	323
1200	1200	48	GS200	1330	1380	360		1133	2103	855	900	348



More dimensions are available in the product range of butterfly Valve Types 038 and 039 at www.gfps.com

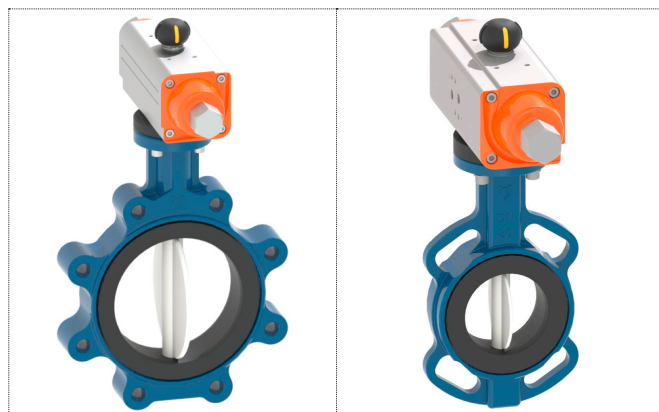
2.2.4 Accessories

- Limit switch boxes



For further information on accessories, refer to the online product catalog at www.gfps.com

2.3 Butterfly Valve Type 038P/039P



Type 038P
Wafer or lug style

Type 039P
Wafer style installation

2.3.1 Product description

Metal butterfly valves are ideal for shutting off and controlling the flow of liquid media in pipelines. They possess high temperature and pressure resistance.

Function

The metal butterfly Valve Types 038P and 039P can be used universally as open/close or control valves. The easy installation of the valve between pipe flanges guarantees reliable operation and sealing. The Rilsan-coating of the valve body and the ductile iron valve disk provide a high resistance against corrosion. The butterfly valves are also available in a standard version with a stainless steel valve disk.

Applications

- Water treatment
- Chemical process industry
- Cooling water facilities
- Power plant
- Shipbuilding

Benefits/features

- Good flow characteristics
- Rilsan/epoxy-coating: good chemical resistance
- Easy installation
- Reliable automatic open/close and control valves
- Lasting high temperature and pressure resistance
- Low maintenance costs and high cost efficient
- KTW / DVGW / WRAS certification

Flow media

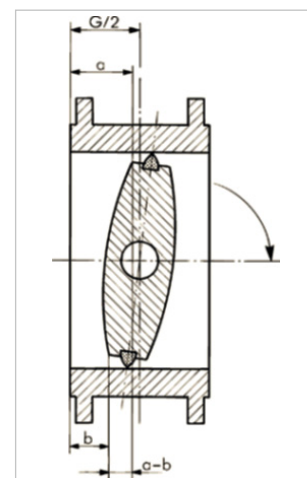
Not recommended for media containing solids

2.3.2 Technical basics

Setting the "Closed" position when setting up actuators for DN50 – DN300

When the butterfly valve is in the CLOSED position, the valve disc is not perfectly perpendicular to the pipe axis. The table below shows the deflection.

DN (mm)	d (mm)	b (mm)
50	63	16
65	75	16
80	90	16
100	110	18
125	140	17
150	160	17
200	225	17
250	280	15
300	315	15



Valve handling

Differentiation between and use of respective types

- Use butterfly Valve Type 039P only as a wafer style valve
- Use butterfly Valve Type 038P as either a wafer style or a lug style valve

Installation notes

- Make sure that the butterfly valves to be installed correspond specifically to the pressure rating, Type of connection, dimension and materials of the particular application.
- Perform a function test. To do this, close and re-open the butterfly valve.
- Only install butterfly valves that function without trouble.


Pneumatic actuator PA30 – PA90

- Actuators without spring accumulator remain in the current position in case of a loss of the control pressure.
- Actuators with spring accumulator go into safety position, in case of failure or after switching off the control pressure, depending on the version of the actuator.
- The actuator is not intended for uses other than those stated here. Failure to observe the instructions contained in this manual will void the manufacturer's liability for the products mentioned above.

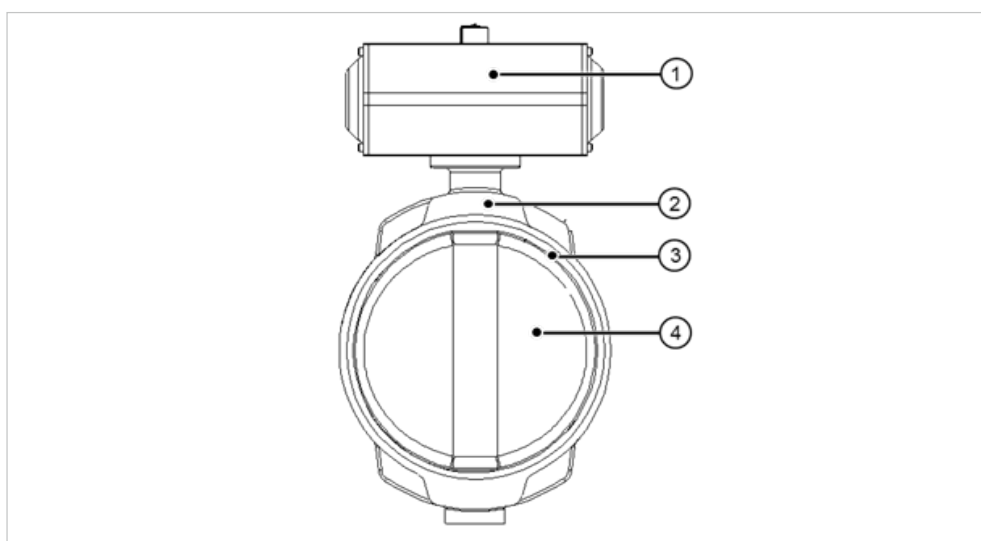
Maintenance notes

In normal operation, butterfly valves do not require maintenance. It is nonetheless recommended to perform maintenance on butterfly valves after 5,000 actuation cycles at most. The following steps must be taken when doing so:

- Regularly check that no medium escapes to the outside. If medium exits from the flange connections, tighten them.
- We recommend operating butterfly valves that are kept permanently in the same position 1 – 2 times per year to check their functionality.
- Depending on the operating conditions, the collars should be lubricated periodically with grease (silicon-base grease).

 Installation and maintenance must be performed according to the corresponding installation instructions. The installation manual is included with the product, see also the online product catalog at www.gfps.com

2.3.3 Technical data



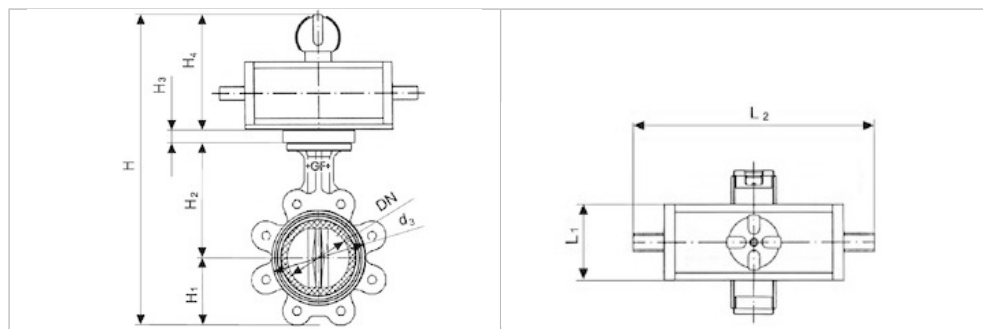
- ① Pneumatic actuator
- ② Outside housing
- ③ Flange seal
- ④ Disc

Specification

Dimensions	Type 038P wafer style or lug style installation	DN50 – DN300, 2” – 12”	
	Type 039P wafer style installation	DN50 – DN1200, 2” – 48”	
Base type	Type 038		
	Type 039		
Materials	Disc	Ductile cast iron Rilsan/epoxy-coated	
		Stainless steel	
		Aluminum bronze	
	Outside housing	Ductile cast iron	
Gasket materials	EPDM, FKM, others upon request		
Pressure levels	Type 038P, 039P	PN10/16	
Actuator type	Type 038P	PA30 – PA90	
	Type 039P	PA30 – PA90	
Connections	Flange connections	EN1092-1	PN10/PN16
		DIN2501	PN10/PN16
		ANSI B16.5	Class 150
	Valve flange	ISO/DIN, BS, ASTM	
Standards	Type 038P	ISO/DIN, ASTM	
	Type 039EP	All standards	
Approvals	KTW, DVGW, ACS, WRAS		

2.3.4 Dimensions

Type 038P



d (mm)	DN (mm)	Inch (inch)	PN (bar)	kv value opening value 90° (Δp=1bar) (m³/h)	Cv value opening value 90° (Δp=1psi) (l/min)
65	50	2	16	190	219.45
75	65	2 ½	16	280	323.4
90	80	3	16	430	496.65
110	100	4	16	710	820.05
140	125	5	16	1100	1270.5
160	150	6	16	1600	1848
225	200	8	16	2800	3234
280	250	10	16	4700	5428.5
315	300	12	16	6900	7969.5

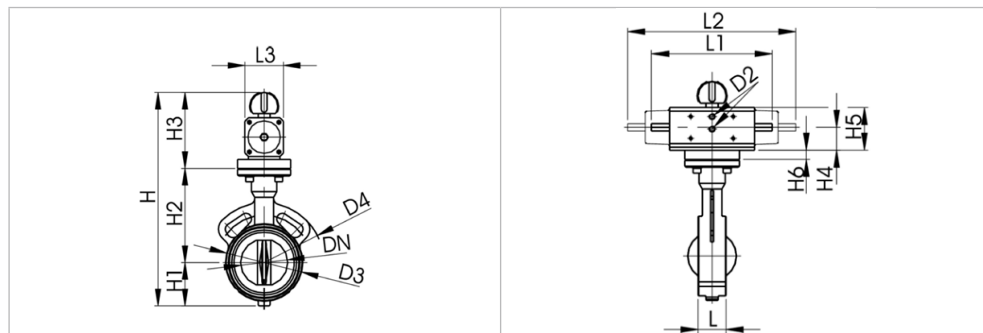
Single-acting FC/FO

d (mm)	Actuator type	d3 (mm)	L1 (mm)	L2 (mm)	H (mm)	H1 (mm)	H2 (mm)	H3 (mm)	H4 (mm)
65	PA30	95	70.4	274.4	313.2	63	140	12	98.2
75	PA30	114	70.4	274.4	335.2	73	152	12	98.2
90	PA35	131	83.3	325.2	366.1	81	159	15	111.1
110	PA40	152	87	359.5	404.8	97	178	15	114.8
140	PA45	182	107.5	418	467.5	112	191	15	149.5
160	PA50	209	111.1	433.9	493.1	122	203	15	153.1
225	PA60	262	134.9	547.3	582.9	149	245	12	176.9
280	PA60	331	134.9	547.3	679.9	203	275	25	176.9
315	PA70	380	168	681	789.1	241	315	23	210.1

Double-acting DA

d (mm)	Actuator type	d3 (mm)	L1 (mm)	L2 (mm)	H (mm)	H1 (mm)	H2 (mm)	H3 (mm)	H4 (mm)
65	PA35	95	64.5	196.1	313.3	63	140	18	92.3
75	PA35	114	64.5	196.1	335.3	73	152	18	92.3
90	PA35	131	64.5	196.1	350.3	81	159	18	92.3
110	PA45	152	83.3	242	401.1	97	178	15	111.1
140	PA45	182	83.3	242	429.1	112	191	15	111.1
160	PA55	209	107.5	290.2	489.5	122	203	15	149.5
225	PA60	262	111.1	313.9	562.1	149	245	15	153.1
280	PA65	331	118	339.6	663	203	275	25	160
315	PA70	380	134.9	382.5	757.9	241	315	25	176.9

Type 039P



d (mm)	DN (mm)	Inch (inch)	L (mm)	H1 (mm)	H2 (mm)	Q (mm)	D3 (mm)	D4 (mm)	kv value opening value 90° (Δp=1bar) (m³/h)	Cv value opening value 90° (Δp=1psi) (l/min)
65	50	2	43	83	140	32	102	165	190	219.45
75	65	2 ½	46	93	152	51	122	185	280	323.4
90	80	3	46	98	159	69	139	190	430	496.65
110	100	4	52	111	178	89	159	229	710	820.05
140	125	5	56	127	191	115	189	254	1100	1270.5
160	150	6	56	143	203	143	214	285	1600	1848
225	200	8	60	172	241	194	269	343	2800	3234
280	250	10	68	204	275	243	331	333	4700	5428.5
315	300	12	78	242	315	293	380	353	6900	7969.5
355	350	14	78	291	307	332	460	442	8600	9933
400	400	16	102	325	342	382	515	493	11200	12936
450	450	18	113	357	387	432	565	544	15500	17902.5
500	500	20	126	381	425	478	620	601	19000	21945
630	600	24	146	488	532	585	725	695	25900	29914.5
700	700	28	175	506	573	683	840	798	37100	42850.5
800	800	32	215	578	650	755	950	908	52300	60406.5
900	900	36	246	643	707	852	1050	1004	51700	59713.5
1000	1000	40	280	729	755	958	1160	1114	78400	90552
1200	1200	48	360	855	900	1098	1380	1330	114400	132132

Single-acting FC/FO

d (mm)	DN (mm)	Inch (inch)	Actuator type	L2 (mm)	L3 (mm)	H (mm)	H3 (mm)	H4 (mm)	H5 (mm)	H6 (mm)	D2 (mm)
65	50	2	PA30	274.4	70.4	333.2	110.2	35.2	70.4	12	1/8"
75	65	2 ½	PA30	274.4	70.4	355.2	110.2	35.2	70.4	12	1/8"
90	80	3	PA35	325.2	83.3	383.1	126.1	42	83.3	15	1/8"
110	100	4	PA40	359.5	87	418.8	129.8	43.5	87	15	1/8"
140	125	5	PA45	418	107.5	482.5	164.5	54	107.5	15	1/8"
160	150	6	PA50	433.9	111.4	514.1	168.1	55.5	111.1	15	1/8"
225	200	8	PA60	547.3	134.9	601.9	188.9	67	134.9	12	1/8"
280	250	10	PA60	547.3	134.9	680.9	201.9	67	134.9	25	1/8"
315	300	12	PA70	681	168	790.1	233.1	84	168	23	¼"
355	350	14	*	590	200	980	382				
400	400	16	*	684	350	1047	380				
450	450	18	*	722	281	1094	350				
500	500	20	*	860	349	1238	432				
630	600	24	*	918	450	1530	540				
700	700	28	*	1550	640	1779	700				
800	800	32	*	1550	640	1928	700				
900	900	36	*	1550	640	2050	700				
1000	1000	40	*	1550	640	2184	700				

* On request, depending on application

d (mm)	DN (mm)	Inch (inch)	Actuator type	L2 (mm)	L3 (mm)	H (mm)	H3 (mm)	H4 (mm)	H5 (mm)	H6 (mm)	D2 (mm)
1200	1200	48	*	2070	850	2630	875				

* On request, depending on application

Double-acting DA

d (mm)	DN (mm)	inch (inch)	Actuator type	L1 (mm)	L3 (mm)	H (mm)	H3 (mm)	H4 (mm)	H5 (mm)	H6 (mm)	D2 (mm)
65	50	2	PA35	196.1	64.5	333.3	110.3	32.3	64.5	18	1/8"
75	65	2 ½	PA35	196.1	64.5	355.3	110.3	32.3	64.5	18	1/8"
90	80	3	PA35	196.1	64.5	367.3	110.3	32.3	64.5	18	1/8"
110	100	4	PA45	242	83.3	415.1	126.1	41.7	83.3	15	1/8"
140	125	5	PA45	242	83.3	444.1	126.1	41.7	83.3	15	1/8"
160	150	6	PA55	290.2	87	510.5	164.5	53.75	107.5	15	1/8"
225	200	8	PA60	313.9	111.1	581.1	168.1	55.6	111.1	15	1/8"
280	250	10	PA65	339.6	118	664	185	59	118	25	1/8"
315	300	12	PA70	382.5	134.9	758.9	201.9	67.5	134.9	25	¼"
355	350	14	*	575	220	888	290				
400	400	16	*	575	220	957	290				
450	450	18	*	684	350	1124	380				
500	500	20	*	684	350	1186	380				
630	630	24	*	8680	349	1452	432				
700	700	28	*	860	349	1511	432				
800	800	32	*	918	450	1738	510				
900	900	36	*	1550	640	2050	700				
1000	1000	40	*	1550	640	2184	700				
1200	1200	48	*	1550	640	2455	700				

* On request, depending on application

2.4 Butterfly Valve Type 044

			
Type 044 with hand lever Wafer style valve	Type 044 with manual gear Wafer style valve	Type 044 with pneumatic actuator FC/FO Wafer style valve	Type 044 with pneumatic actuator DA Wafer style valve

2.4.1 Product description

The butterfly valve type 044 is a high performance butterfly valve which is particularly suitable for applications in the chemical industry due to the materials used.

- Isostatically molded seat liner made of PTFE in 3 mm wall thickness.
- The valve disc and shaft are made out of one single piece of stainless steel micro investment casting.
- The disc is injection molded with a 3mm thick mechanically anchored PFA layer.
- The shape of the valve disc achieves optimum Kv or Cv values, minimizing flow resistance and thus pressure loss.

Benefits/features

- Wafer Style
- 2-piece carbon steel body (ASTM 216 WCB)
- Installation length: EN 558 row 20
- Interface according to DIN EN ISO 5211
- From vacuum to 16 bar (depending on DN and temperature)
- Single-piece axis with square profile
- Intermediate flange DIN PN10, PN16 AND ASME B16.5 150 Lbs. (others on request)
- PTFE seat liner with silicone backing
- Disc 1.4542 stainless steel, in 3 mm thick PFA encapsulated
- Aluminum lever with 6 regulating position and padlock device

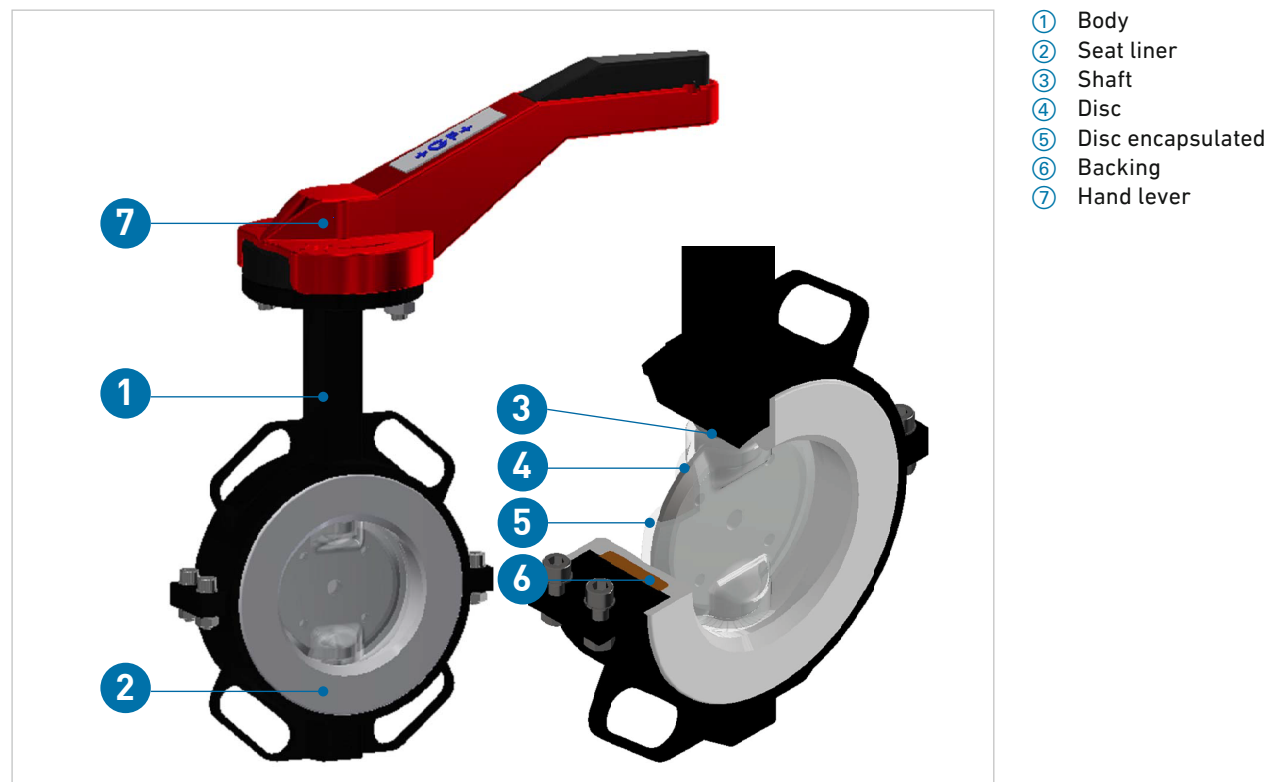
Flow media

- Especially suitable for liquid chemical and corrosive media (demineralized water, acids and solvents)
- Suitable for gaseous media such as exhaust gases, chlorine gas, hydrocarbon, oxygen and vacuum
- Suitable for abrasive and aggressive substances such as wet chlorine, sodium chloride, pigments, brine and sugar solutions
- Suitable for viscous media such as fats, oils, mash, sludge and cellulose mixtures

Applications

- Biotechnology
- Fertilizer Industry
- Semiconductor Industry
- cosmetics industry
- Food Industry
- Seawater desalination RO
- pharmaceutical industry
- Pigment processing systems
- Cleanroom applications
- Ultrapure water treatment

2.4.2 Technical data



Specifications

Dimensions	d63/DN50 – d315/DN300, 2" – 12"		
Materials	Body	①	Carbon steel ASTM A216 GR. WCB
	Seat liner	②	PTFE® (wall thickness ≥ 3 mm)
	Shaft	③	Stainless steel 1.4542
	Disc	④ ⑤	Stainless steel 1.4542, encapsulated with PFA® (wall thickness ≥ 3 mm)
	Backing	⑥	Silicone
	Lever	⑦	Die-cast aluminum
Pressure ratings	DN50 – DN150	PN16	
	DN200 – DN300	PN10	
Interface	DIN EN ISO 5211		
Installation length	EN 558 row 20 or ISO 5752/20		
Actuation variants	Manually operated: Lever , reduction gear with handwheel		
	Pneumatically actuated: FC, FO and DA		
Connections	Flange connections	EN1092-1	PN10/16
		DIN2501	PN10/16
		ANSI B16.5	Class 150
	Valve flange	ISO/DIN, BS, ASTM	
Standards	ISO/DIN		
Approvals	FDA		

Kv100 values (flow characteristics)

Nominal diameter DN		Opening angle (m³/h)							
(mm)	(inch)	20°	30°	40°	50°	60°	70°	80°	90°
50	2"	7	16	26	43	69	110	170	190
65	2 ½"	9	22	38	60	95	155	250	280
80	3"	14	33	57	95	150	240	370	430
100	4"	24	54	95	155	240	400	620	710
125	5"	38	86	155	240	390	640	950	1100
150	6"	52	120	220	345	550	950	1400	1600
200	8"	95	220	345	600	950	1600	2400	2800
250	10"	155	345	610	950	1600	2600	4000	4700
300	12"	220	510	860	1500	2300	3800	5900	6900

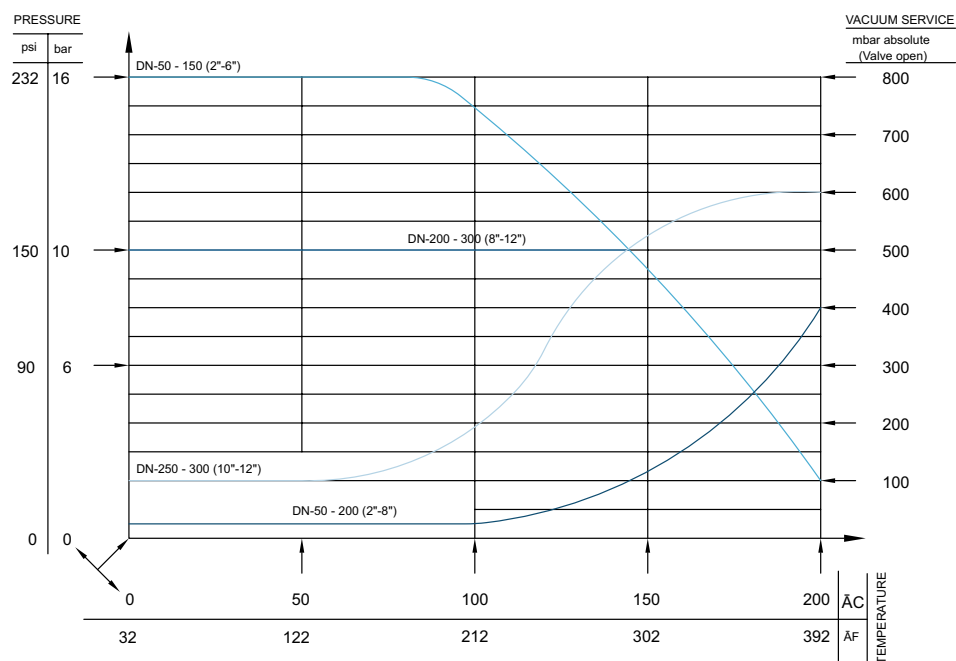
Pressure-temperature diagrams

The following pressure-temperature diagrams are based on a lifetime of 25 years and water or similar media.

T Temperature (°C, °F)

P Permissible pressure (bar, psi)

Type 044 (DN50 – DN300)

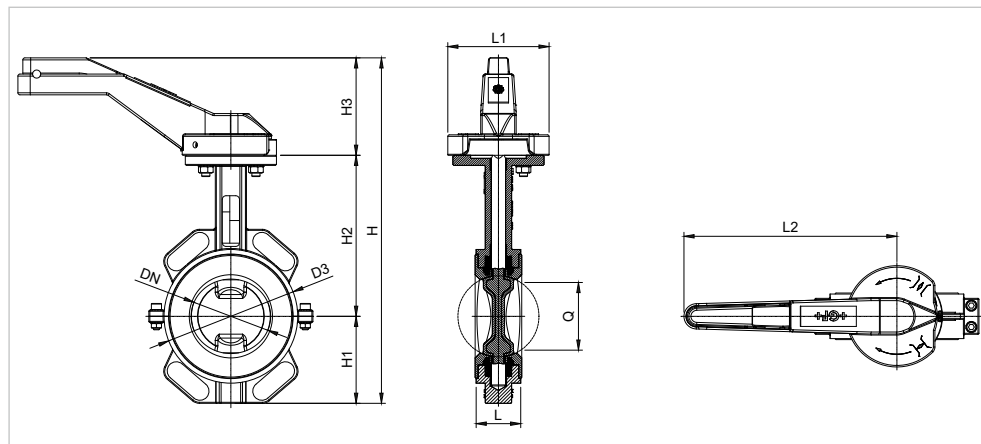


Reference values for tightening torque of screws

DN (mm)	d (mm)	DN (inch)	Total number of screws	Tightening torque	
				Nm	Lbs-Inch
50	63	2"	4 x M16 x 120mm	109	965
65	75	2 ½"	4 x M16 x 125mm	109	965
80	90	3"	8 x M16 x 130mm	109	965
100	110	4"	8 x M16 x 135mm	109	965
125	140	5"	8 x M16 x 140mm	109	965
150	160	6"	8 x M20 x 150mm	212	1876
200	225	8"	8 x M20 x 160mm	212	1876
250	280	10"	12 x M20 x 170mm	212	1876
300	315	12"	12 x M20 x 180mm	212	1876

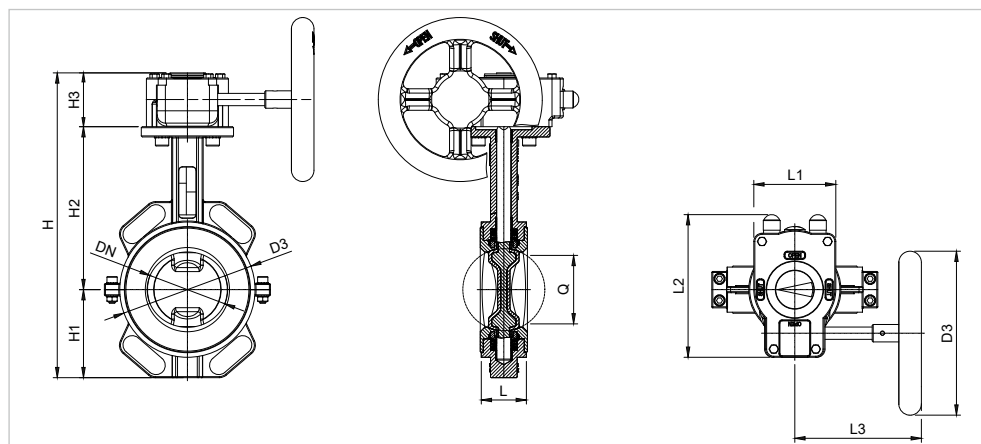
2.4.3 Dimensions

Butterfly Valve Type 044 with hand lever DN50 – DN150



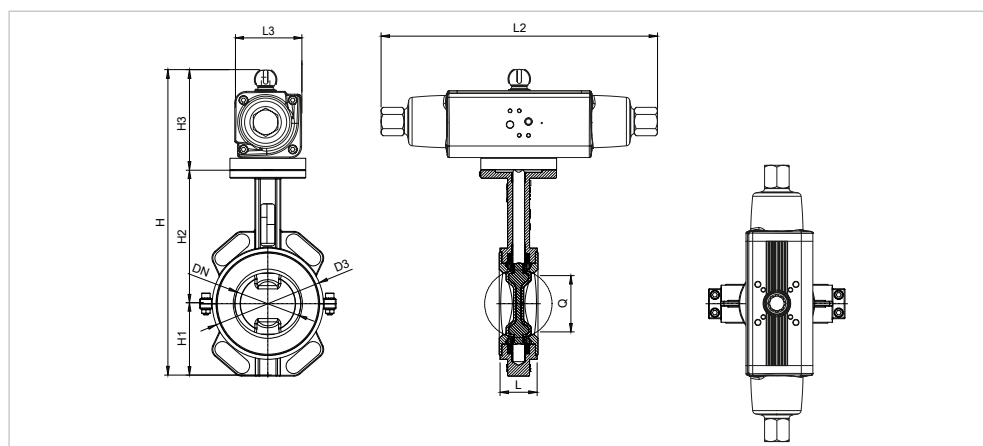
DN (mm)	d (mm)	DN (inch)	D3 (mm)	H (mm)	H1 (mm)	H2 (mm)	H3 (mm)	L (mm)	L2 (mm)	Q (mm)	Weight (kg)
50	63	2"	95	287	57	135	95	43	220	27.4	3.5
65	75	2 ½"	114	303	63	145	95	46	220	46.6	4.2
80	90	3"	132	340	86	159	95	46	220	66.1	4.7
100	110	4"	152	374	105	175	95	52	220	85.5	5.9
125	140	5"	182	403	118	190	95	56	320	110.0	7.6
150	160	6"	207	430	132	203	95	56	320	140.3	8.8

Butterfly Valve Type 044 with manual reduction gear DN50 – DN300



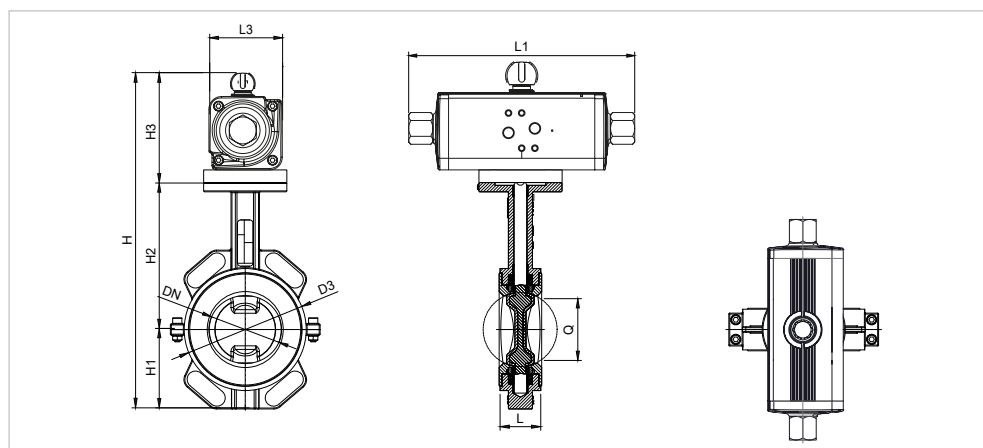
DN (mm)	d (mm)	DN (inch)	D3 (mm)	D5 (mm)	H (mm)	H1 (mm)	H2 (mm)	H3 (mm)	L (mm)	L1 (mm)	L2 (mm)	L3 (mm)	L4 (mm)	Q (mm)	Weight (kg)
50	63	2"	95	140	250.3	57	135	58.3	43	88	145.5	38.5	107.3	27.4	3.3
65	75	2 ½"	114	140	266.3	63	145	58.3	46	88	145.5	38.5	107.3	46.6	4.0
80	90	3"	132	140	303.3	86	159	58.3	46	88	145.5	38.5	107.3	66.1	4.3
100	110	4"	152	140	337.3	104	175	58.3	52	88	145.5	38.5	107.3	85.5	5.7
125	140	5"	182	140	366.3	118	190	58.3	56	88	145.5	38.5	107.3	110.0	7.4
150	160	6"	207	140	393.3	132	206	58.3	56	88	145.5	38.5	107.3	140.3	8.9
200	225	8"	260	140	458.3	160	240	58.3	60	88	145.5	38.5	107.3	188.7	13.5
250	280	10"	327	250	534.6	198	275	62.6	68	102	212.0	52.0	130.0	237.5	22.8
300	315	12"	375	250	604.6	232	310	62.6	78	102	212.0	52.0	130.0	286.6	31.7

Butterfly Valve Type 044 FC with pneumatic actuator DN50 – DN300



DN (mm)	d (mm)	DN (inch)	D3 (mm)	H (mm)	H1 (mm)	H2 (mm)	H3 (mm)	L (mm)	L2 (mm)	L3 (mm)	Q (mm)	Weight (kg)
50	63	2"	95	337	57	135	145	43	281	120	27.4	9.6
65	75	2 ½"	114	353	63	145	145	46	281	120	46.6	10.3
80	90	3"	132	390	86	159	145	46	281	120	66.1	10.8
100	110	4"	152	451	104	175	172	52	310	134	85.5	15.5
125	140	5"	182	480	118	190	172	56	310	134	110.0	17.1
150	160	6"	207	520	132	203	185	56	362	141	140.3	22.2
200	225	8"	260	585	160	240	185	60	362	141	188.7	26.7
250	280	10"	327	742	198	275	270	68	474	196	237.5	58.7
300	315	12"	375	832	232	310	290	78	575	220	286.6	84.0

Butterfly Valve Type 044 DA with pneumatic actuator DN50 – DN300



DN (mm)	d (mm)	DN (inch)	D3 (mm)	H (mm)	H1 (mm)	H2 (mm)	H3 (mm)	L (mm)	L1 (mm)	L3 (mm)	Q (mm)	Weight (kg)
50	63	2"	95	312	57	135	120	43	281	120	27.4	9.6
65	75	2 ½"	114	328	63	145	120	46	281	120	46.6	10.3
80	90	3"	132	365	86	159	120	46	281	120	66.1	10.8
100	110	4"	152	409	104	175	130	52	310	134	85.5	15.5
125	140	5"	182	438	118	190	130	56	310	134	110.0	17.1
150	160	6"	207	480	132	203	145	56	362	141	140.3	22.2
200	225	8"	260	572	160	240	172	60	362	141	188.7	26.7
250	280	10"	327	657	198	275	185	68	474	196	237.5	58.7
300	315	12"	375	747	232	310	205	78	575	220	286.6	84.0

2.4.4 Accessories

Integrated electrical feedback (IER)

- Feedback unit in combination with actuators
- For both manual valve and manual gear

General technical data of the IER:

- Protection class with DIN connector (2): IP65
- Protection class with cable gland: IP67
- Ambient temperature: -10 °C to +50 °C

Assignment of IER to butterfly valves Type 567/578 and 044:

Axis		Dimension
1	11 mm	DN50 – DN80
2	14 mm	DN100 – DN125
3	17 mm	DN150 – DN200
4	22 mm	DN250 – DN300

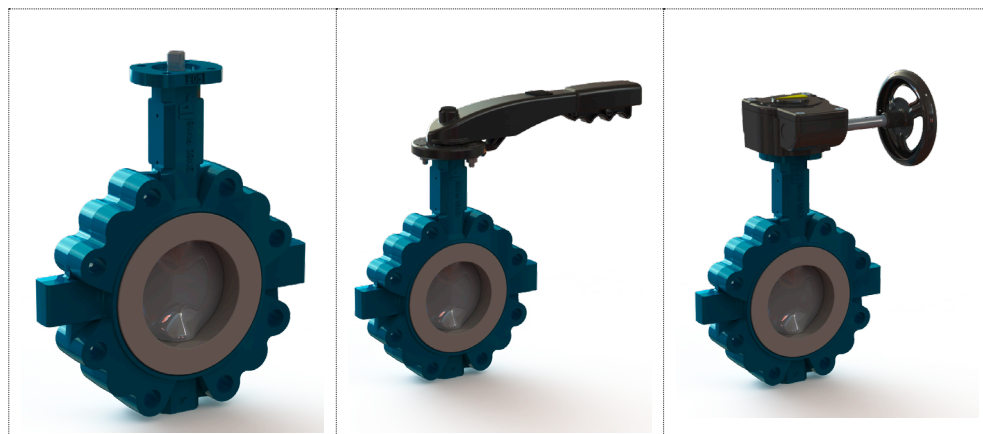


For further information on accessories, refer to the online product catalog at www.gfps.com

■ Mobile apps and online tools to support configuration and calculation at www.gfps.com/tools



2.5 Butterfly Valve Type 065



Type 065
Standard for lug style and
wafer style installation

Type 065
with hand lever

Type 065
with reduction gear

2.5.1 Product description

The Type 065 Butterfly Valve can be used universally as a shut-off or control valve in high purity water treatment or water filtration applications. All valves are cleaned and manufactured for Ultrapure water service.

Benefits/features

- PTFE-lined
- PFA encapsulated one-piece disc
- ANSI 150 and PN10, PN16 bolt pattern
- Pressure ratings up to 16 bar
- Temperature ratings up to 200°C

Flow media

- Ultrapure DI Water
- Hot Ultrapure DI Water

Applications

- Water
- Water Treatment Plants
- Power Generation
- Chemical Processing
- Oil & Gas
- Marine
- Life Science
- Mining/Slurry
- Bulk Handling
- Air Separation
- Steel Industry

2.5.2 Technical basics

Tips for installation

Use lug style valve as either a wafer style or a lug style valve.

Installation as a lugged valve

If a valve is installed as a lugged valve and pressure is applied to it, it must be closed with a blind flange (or blind cover and counterflange), in order to prevent personal injury or property damage in the event of leaks and/or impermissible opening.

Requirements for installation

Ensure that the following conditions are satisfied prior to installation:

- Make sure that the butterfly valves to be installed correspond specifically to the pressure rating, Type of connection, dimension and materials of the particular application.
- Perform a function test. To do this, close and re-open the butterfly valve.
- Only install butterfly valves that function without problems.

Gaskets

There is no need to use gaskets between the flanges and the valve. However, where the valve has to be mounted between flanges which are uneven or slightly distorted, PTFE-envelope gaskets should be fitted.

Maintenance notes

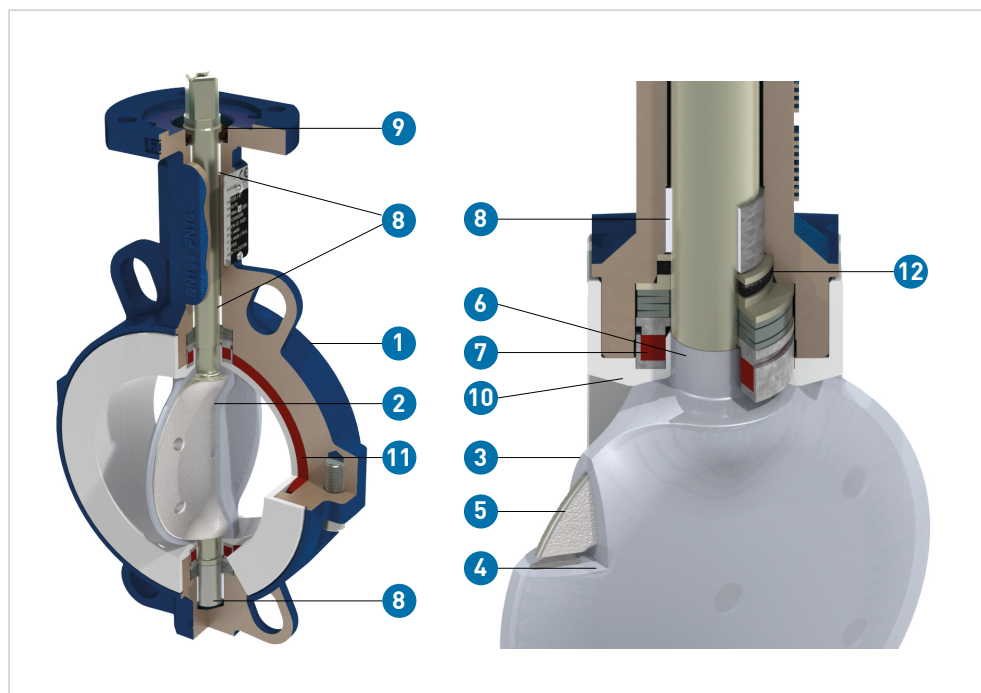
In normal operation, butterfly valves do not require maintenance. It is nonetheless recommended to perform maintenance on butterfly valves after 5,000 actuation cycles at most. The following steps must be taken when doing so:

- Regularly check that no medium escapes to the outside. If medium exits from the flange connections, tighten them.
- We recommend operating the butterfly valves that are kept permanently in the same position 1 or 2 x a year to check their functionality.



Installation and maintenance must be performed in accordance with the corresponding installation manual. The installation manual is provided with the product, see also the online product catalog at www.gfps.com

2.5.3 Technical data



- ① Two-piece body in ductile iron EN-JS 1025
- ② One-piece, blow out proof disc/shaft
- ③ Disc encapsulated with a min. thickness of 3 mm
- ④ Disc encapsulation is mechanically locked with the core
- ⑤ Optimized disc profile to allow high kV flow rate
- ⑥ Encapsulated shaft sealing surface
- ⑦ Life loaded safety shaft sealing
- ⑧ Self-lubricating shaft bushings
- ⑨ Shaft sealed from environment
- ⑩ Chambered liner, to prevent radial cold-flow
- ⑪ Elastomeric backing
- ⑫ TA-Luft VDI 2440 / EN ISO 15848 packing optional

Specification

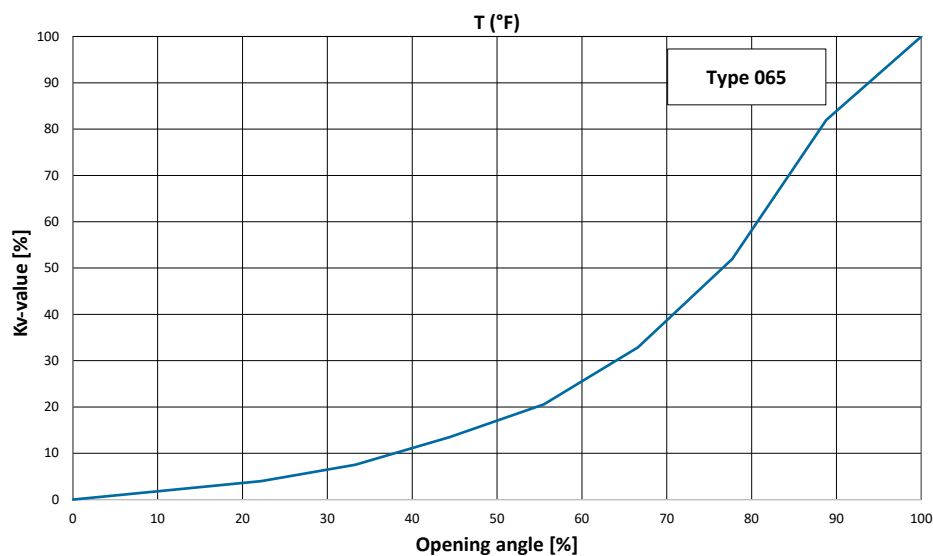
Dimensions		d63/DN50 – d355/DN350, 2" – 14"
Materials	Body	Ductile iron EN-JS 1025 / ≈ ASTM A395 60-40-18, Epoxy coated 80 µm
	Disc/shaft	dimensions 2"-12"
		dimension 14"
	Collar	PTFE
	Backing	EPDM FKM
Pressure ratings	PN16	DN50-150, 2" – 6"
	PN10	DN200-300, 8" – 12"
	PN6	DN350, 14"
Temperature range		-20°C to 200°C, -4°F to 392°F
Connections	Flanges	ANSI cl. 150, PN10, PN16
	Mounting Flanges	EN ISO 5211
Actuation variants	Manually operated (hand lever or manual reduction gear)	
Approvals	FDA and EC 1935/2004, IEC 61508 / 61511, Safety Integrity Level SIL 3, Pressure Equipment Directive 2014/68/EU (PED) appendix 1 for fluids of the groups 1 and 2	
	Multiple approvals available on request	
	Leak test	ISO 9393-2, EN 12266 (leak rate A), ISO 5208 (Rate A)
Special options	High purity: The valve is cleaned, assembled, tested and packaged under cleanroom conditions. US federal standard 209b, class 10000, ISO Class 7 (ISO 14644-1)	

Kv 100 values (Flow characteristics)

DN (mm)	Inch (inch)	d (mm)	d (mm)	Kv 100 (l/min)	Cv 100 (US gal./min)	Kv 100 (m³/h)
50	2	63	63	134	155	8.04
65	2 ½	75	75	227	263	13.62
80	3	90	90	392	455	23.52
100	4	110	110	585	679	35.1
125	5	140	140	1015	1177	60.9
150	6	160	160	1495	1734	89.7
200	8	225	225	3050	3538	183
250	10	280	280	4510	5232	270.6
300	12	315	315	7210	8364	432.6
350	14	335	335	8760	10162	525.6

Flow characteristics

DN (mm)	Inch (inch)	d (mm)	20 (°)	30 (°)	40 (°)	50 (°)	60 (°)	70 (°)	80 (°)	90 (°)
50	2	63	5	11	24	42	64	92	118	134
65	2 ½	75	8	19	41	70	108	155	200	227
80	3	90	15	33	72	125	190	270	335	392
100	4	110	20	48	95	162	255	385	485	585
125	5	140	38	82	165	255	455	645	815	1015
150	6	160	60	130	235	395	645	955	1220	1495
200	8	225	95	230	465	795	1180	1815	2410	3050
250	10	280	175	350	710	1160	1610	2420	3650	4510
300	12	315	265	522	995	1720	2665	3965	5960	7210
350	14	335	350	660	1180	1800	2880	4550	7180	8760

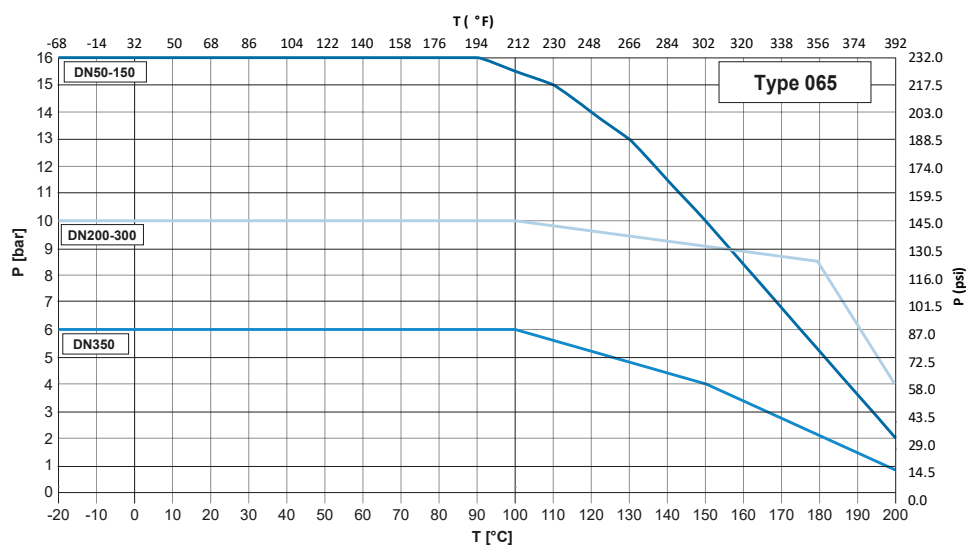


Pressure-temperature diagram

The following pressure-temperature diagrams are based on a lifetime of 25 years and water or similar media.

DN50 – DN350

T Temperature (°C, °F)
P Permissible pressure (bar, psi)



Operating torque

DN (mm)	Zoll (inch)	d (mm)	M (Nm)
50	2	63	25
65	2 ½	75	39
80	3	90	43
100	4	110	73
125	5	140	87
150	6	160	146
200	8	225	189
250	10	280	330
300	12	315	476
350	14	335	675

Depending on the operation conditions (e.g. control time, medium, temperature, etc.) the stated operating torque can increase up to 4 times.

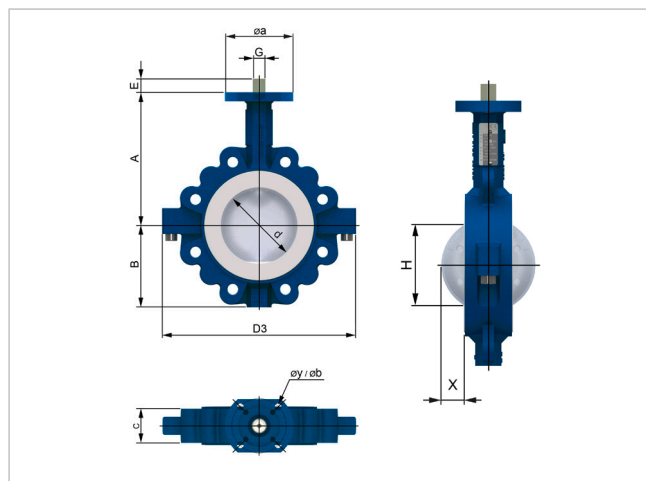
Reference values for tightening torque of screws

Reference values for tightening torque of screws Type 065 in ISO flange connections

DN (mm)	Zoll (inch)	d (mm)	PN10		PN16	
			(Nm)	(Inch-lbs)	(Nm)	(Inch-lbs)
50	2	63	52	460	52	460
65	2 ½	75	52	460	52	460
80	3	90	32	285	32	285
100	4	110	45	396	45	396
125	5	140	55	483	55	483
150	6	160	90	794	90	794
200	8	225	112	993	75	662
250	10	280	116	1028	139	1234
300	12	315	137	1209	164	1451
350	14	335	142	1255	170	1506

2.5.4 Dimensions

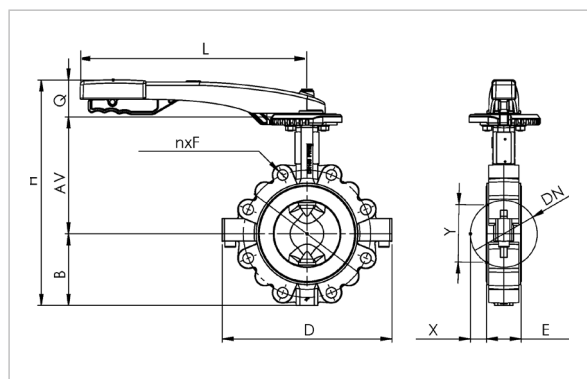
Butterfly Valve Type 065 with open shaft end DN50 – DN350



DN (mm)	Inch (inch)	d ₁ (mm)	d (mm)	A (mm)	B (mm)	C (mm)	H (mm)	X (mm)	D3 (mm)
50	2	63	50	134	68	43	26	9	162
65	2 ½	75	65	145	78	46	39	7	170
80	3	90	80	160	92	46	66	17	216
100	4	110	100	175	107	52	86	24	254
125	5	140	125	194	120	56	112	35	293
150	6	160	150	210	134	56	140	47	315
200	8	225	200	239	162	60	191	70	389
250	10	280	250	275	199	68	241	91	483
300	12	315	300	310	230	78	290	111	543
350	14	335	339	349	254	78	330	131	564

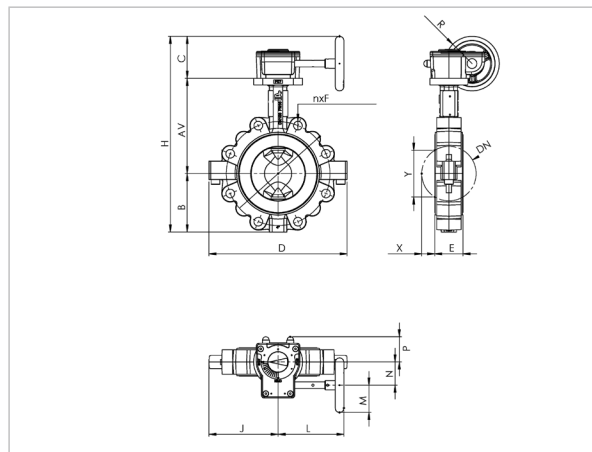
DN (mm)	Inch (inch)	d ₁ (mm)	ISO	a (mm)	y (mm)	b (mm)	G (mm)	E (mm)	Weight (kg)
50	2	63	F05	65	4x7	50	∅ 11	12	3.2
65	2 ½	75	F05	65	4x7	50	∅ 11	12	4.1
80	3	90	F05	65	4x7	50	∅ 11	12	6.2
100	4	110	F05/07	90	4x7/9	50/70	∅ 14	16	9.3
125	5	140	F05/07	90	4x7/9	50/70	∅ 14	16	10.7
150	6	160	F07	90	4x9	70	∅ 17	19	12.9
200	8	225	F07/F10	125	4x9/11	70/102	∅ 17	19	22.3
250	10	280	F10	125	4x11	102	∅ 22	24	32.4
300	12	315	F10	125	4x11	102	∅ 22	24	46.9
350	14	335	F12	155	4x13.5	125	∅ 27	40	87

Butterfly Valve Type 065 with hand lever DN50 – DN150



DN (mm)	Inch (inch)	d ₁ (mm)	H (mm)	B (mm)	AV (mm)	Q (mm)	D (mm)	Y (mm)	X (mm)	E (mm)	L (mm)	Weight (kg)
50	2	63	245	68	134	43	162	26	26	43	240	3.7
80	3	90	295	92	160	43	216	66	66	46	240	6.7
100	4	110	325	107	175	43	254	86	86	52	340	9.9
150	6	160	395	134	210	51	315	140	140	56	340	13.5

Butterfly Valve Type 065 with reduction gear DN50 – DN350



DN (mm)	Inch (inch)	d ₁ (mm)	H (mm)	B (mm)	AV (mm)	C (mm)	D (mm)	Y (mm)	X (mm)	E (mm)	L (mm)	P (mm)	N (mm)	W (mm)	n x F	Weight (kg)
50	2	63	279	68	134	77	162	26	9	43	126	48	43	50	8 x dia 7	4
80	3	90	329	92	160	77	216	66	17	46	126	48	43	50	8 x dia 9	7
100	4	110	359	107	175	77	254	86	24	52	126	48	43	50	8 x dia 9	10.1
150	6	160	454	134	210	110	315	140	47	56	189	48	43	80	8 x dia 9	13.8
200	8	225	511	162	239	110	389	191	70	60	189	48	43	80	8 x ¾" UNC	23.2
250	10	280	633	199	275	159	483	241	91	68	219	56	50	125	8 x dia 13	33.95
300	12	315	699	230	310	159	543	290	111	78	219	56	50	125	8 x dia 13	48.45
350	14	335	796	254	349	193	564	330	131	78	371	83	80	150	12 x 1" UNC	92.4

Mobile apps and online tools to support configuration and calculation at www.gfps.com/tools



Planning Fundamentals of Valves and Automation

Valves – Pressure Regulating Valves

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1 Pressure regulating valves

1.1 Fundamentals of pressure regulating valves

1.1.1 Technical basics

Pressure regulating valves are energy self-sufficient control valves. By means of spring pre-tension, a constant input or output pressure can be set, depending on the design. Pressure reducing valves reduce fluctuating, higher input pressures to a largely constant output pressure. Pressure maintaining valves, also called overflow valves, ensure a largely constant input pressure in the case of pressure fluctuations. In the case of overflow valves, the valve is closed until the set threshold value is reached, then the valve is opened and thereby ensures a balancing of pressure on the input side.

Design of pressure reducing valves (also called pressure regulator)

In the valve, the piston/diaphragm is in balance between the outlet pressure P_2 (outlet side) and the spring force. If the outlet pressure rises above the set value, the diaphragm is lifted against the spring resistance. The valve starts opening until the equilibrium condition is reached again. If the outlet pressure drops below the nominal value, the diaphragm is pressed down by the spring resistance until the state of equilibrium is reached again. The outlet pressure remains largely constant, independent of an increasing or decreasing inlet pressure (as long as the inlet pressure is higher than the outlet pressure).

Design of pressure retaining valves (also called backpressure/relief valve)

The piston/diaphragm position of the valve is in balance between the inlet pressure P_1 (primary side) and the set spring force. If the inlet pressure rises above the set value, the diaphragm is lifted against the spring resistance. The valve opens until a balanced condition is reached again. If the inlet pressure drops below the set value, the diaphragm is pressed down by the spring resistance until a balanced condition is reached again. Hence the inlet pressure remains largely constant independent of increasing or decreasing system pressure (as long as the inlet pressure is greater than the set pressure).

Hysteresis

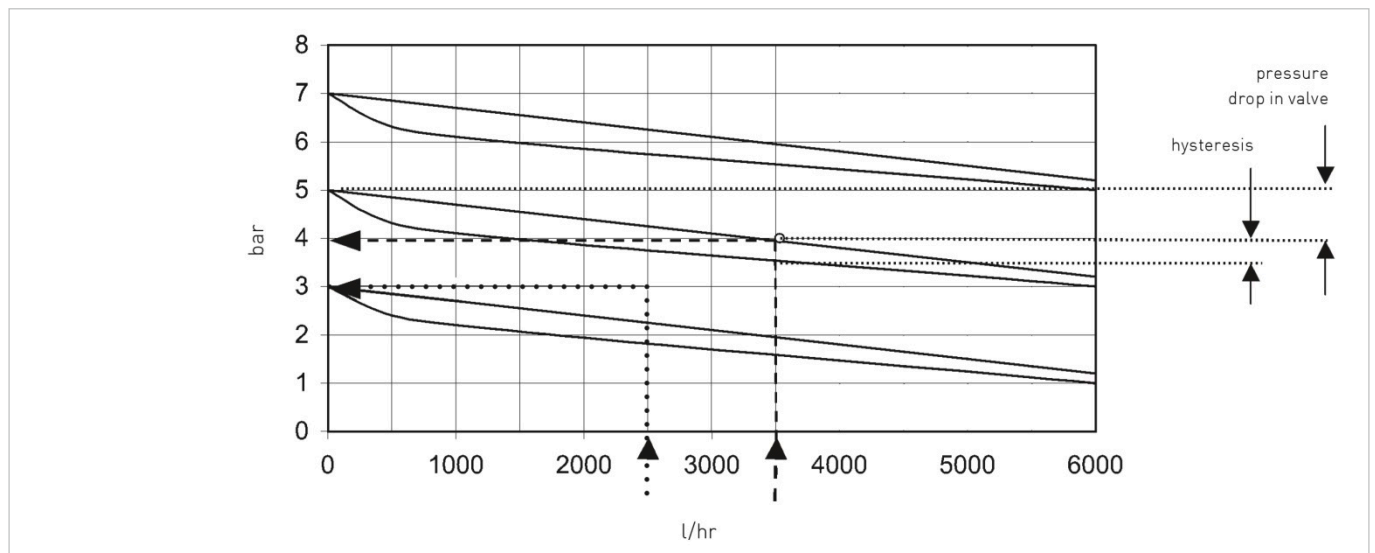
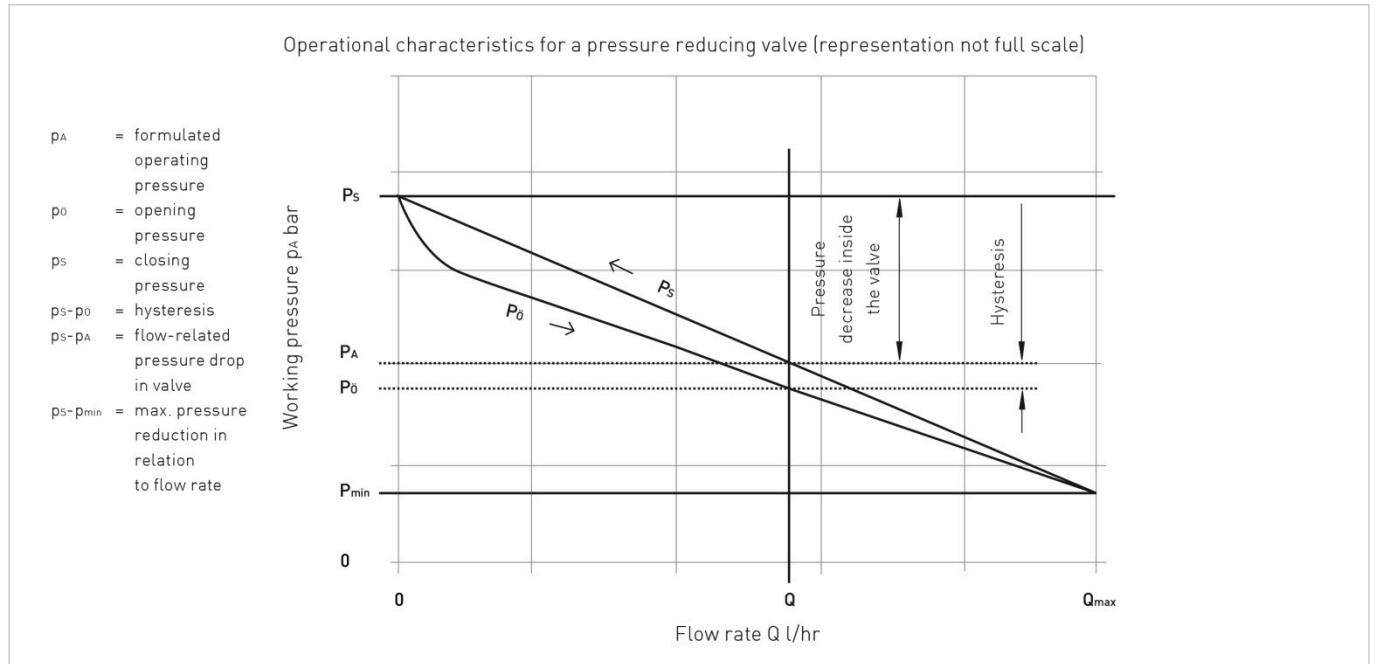
What is hysteresis?

Hysteresis is the difference between opening and closing pressure for a pressure regulating valve at a given flow rate Q . It is the result of frictional force on the cartridge, flow and spring forces. A small hysteresis will lead to increased accuracy in pressure regulation.

Hysteresis Type 582

Difference between opening and closing pressure: approx. 0.1 – 0.4 bar (1.5 – 5.8 psi)

How to measure hysteresis?



Hysteresis curves obtained for a set-pressure (at the outlet) of 7, 5, 3 and 1 bar (both springs) as well as 3 and 1 bar (small spring only). The inlet pressure is held stable at 9 bar. Flow is steadily increased until the maximum is reached and decreased again. To determine hysteresis, the inlet and outlet pressure as well as the flow rate are measured.



For the detailed characteristics of the valve, please refer to the characteristic curves concerned.

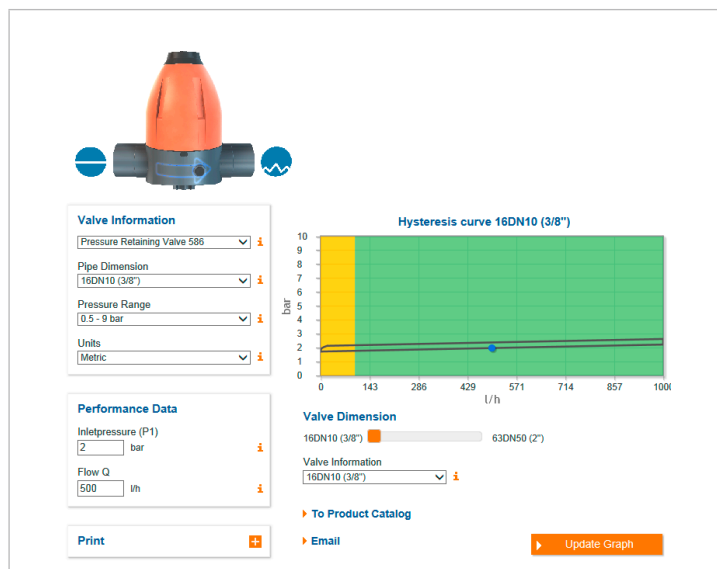
1.1.2 What is pressure drop?

Every piping system produces a pressure drop due to frictional forces acting on the pipe walls, fittings, valves, etc. This pressure drop is unwanted since it essentially is an energy loss for the system. The most important parameters when calculating pressure drop are the flow velocity and the fluid viscosity, although components of the system like valves can also increase energy loss. Drag coefficients ζ therefore have to be taken into consideration when planning a piping system.

1.1.3 Correct valve size

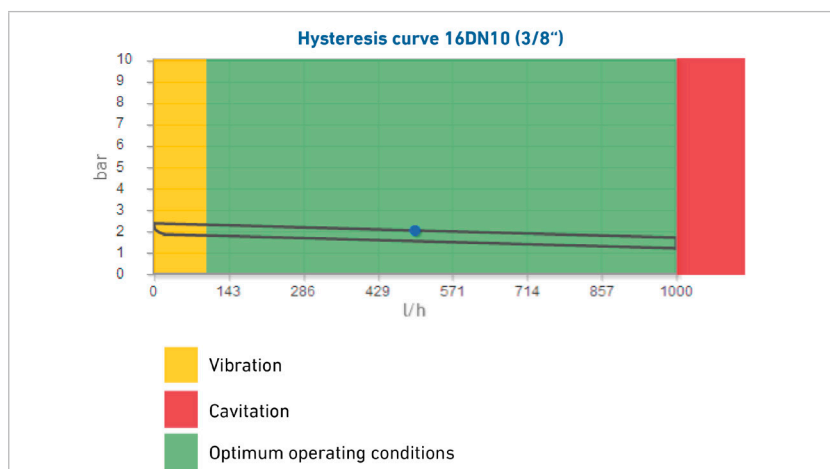
The correct valve size is essential for a system to perform correctly. The dimensions can be determined by simply entering a set of system parameters (pipe size, desired outlet pressure, etc.) into the online tool.

■ The online tool can be accessed at www.gfps.com/prv or using the QR code

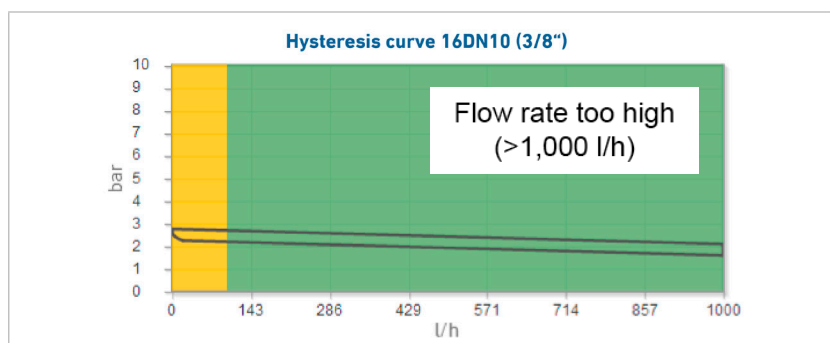


If the online tool is not available, the valve size can also be determined directly using the characteristic curves. The tables show the characteristic curves up to a flow rate of 2 m/s.

In general, a valve size equal to the pipe diameter is a good starting point. Depending on the pressure and flow rate, the operating point will be somewhere on the curve. If this is not the case, your operating conditions might be outside of the valve size flow range (flow rate too high). In addition, if the operating point is within the first 10% of the chart, vibrations may occur. In both of these cases, you will need to choose different valve dimensions for the application.

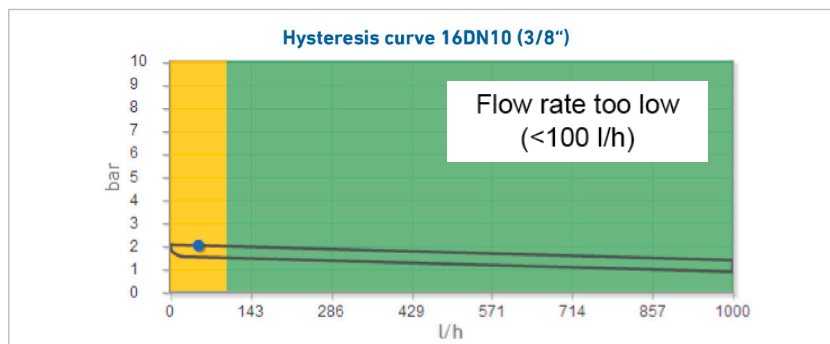


A flow rate that exceeds the maximum value (see graphic below) may lead to cavitation. The selected valve is too small and the next size up should be considered.



If the flow rate is too low (see graphic below), a smaller valve should be chosen for the application.

Valves that are too small lead to vibrations and, as a consequence, reduce the valve lifetime.



Valve handling

General installation notes

- Make sure the pressure and flow rate are within the valve specifications.
- Check valves for damage before installation; do not install damaged valves.
- Ensure tension-free installation of the valves.
- For an optimal flow rate, we recommend installing the valve in an undisturbed area of the pipe and with a 10 x DN minimum distance to manifolds, throttles, other valves, etc.
- The direction of flow is indicated by the arrow on the valve body.
- GF Piping Systems recommends installing a strainer upstream to avoid particles in the flow path.

Installation notes for types V82 and V86

- The direction of flow is indicated by the arrow on the valve body.
- Install strainers in the event of contaminated media or media that contain particulate matter.
- Before putting into operation, check the screw tension on the housing. If necessary, tighten crosswise to the appropriate screw tightening torques.

Maintenance notes

Pressure regulating valves require very little maintenance after installation. However, depending on the flow medium, cleaning is sometimes required. For detailed information, please refer to the appropriate user manual. GF Piping Systems suggest using an isolating valve for this purpose. GF Piping Systems offer a wide range of different isolating valves for every application.

Tips for installation

Pressure regulating Valve Type 582 can also be used in combination with check valves, which are a simple and effective way to prevent backflow. Reducing valves always require back pressure to operate. Normally the piping system generates enough by itself. If trying to test with a small piece of pipe, make sure to provide sufficient back pressure, e.g. using a ball valve at the outlet.

2 Pressure Reducing Valves

2.1 Pressure Reducing Valve Type 582



2.1.1 Product description

A pressure reducing valve reduces the outlet pressure to a specified value.

Function

Downstream pressure (at the outlet) works against the spring resistance and raises the diaphragm until equilibrium of forces is reached. The desired outlet pressure is regulated by means of the spring pre-tensioning. The inlet pressure is not directly related to the outlet pressure. The pressure at the outlet thus remains constant, despite fluctuations at the inlet.

The diaphragm is not influenced by pressure peaks, meaning sensitive measuring devices can be protected downstream.

The set pressure can be increased by turning the spindle at the top of the valve in a clockwise direction. Turning it counterclockwise reduces the set pressure. Inward-pointing arrows, which visualize the direction of flow and the pressure setting, handling easier. Pressure reducing valves are often used to protect downstream devices against overpressure.

Applications

- Water treatment
- Chemical process industry
- Semiconductor industry
- Solar industry

Benefits/features

Easy assembly

- Compact design allows installation even when space is limited
- Radially dismountable
- Integrated assembling aid enables direct assembly of the valve
- Significantly shorter installation length thanks to union connections

Easy operation

- No re-torquing required thanks to central housing nut
- Easily adjustable set pressure
- Constant and stable control behavior
- Leak-resistant in the event of temperature fluctuations
- Low maintenance
- Pressure setting possible even during operation

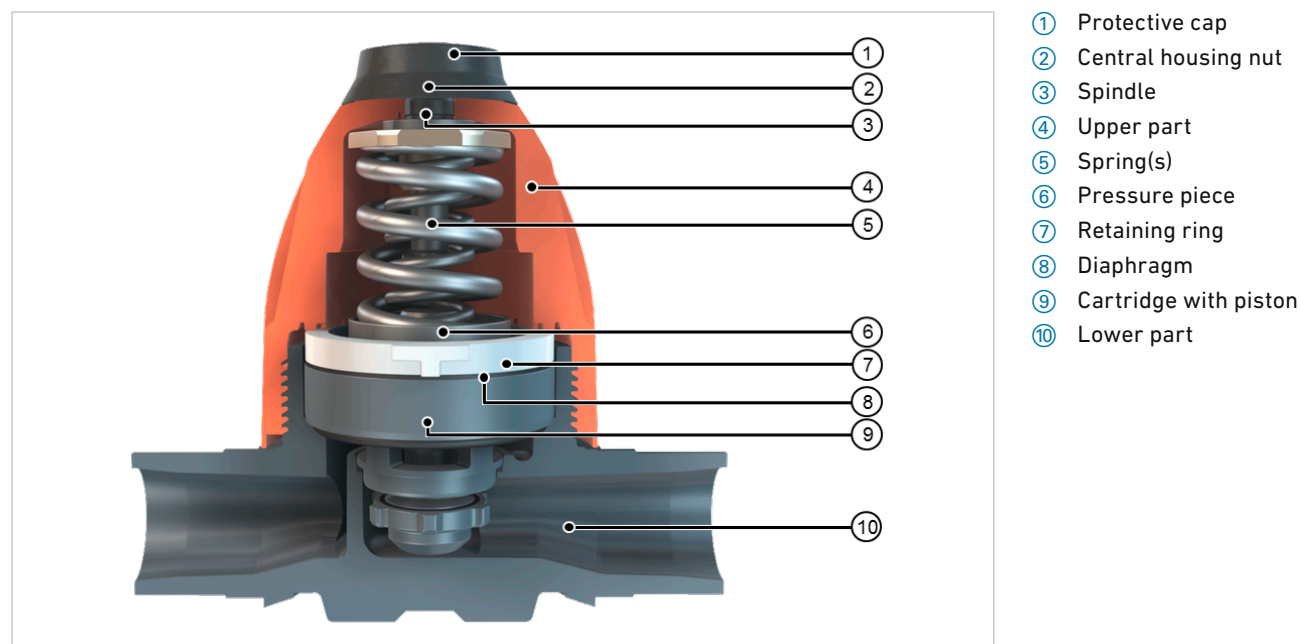
Flexible

- Manometer available as an option for neutral and aggressive media
- Various connection options available thanks to the spigot and union versions
- Low pressure spring set available
- Easy on spare parts thanks to the modular design

Flow media

Neutral and aggressive media with a small amount of particles/solids. The chemical resistance depends on the selected valve material ([see online tool ChemRes PLUS](#)).

2.1.2 Technical data



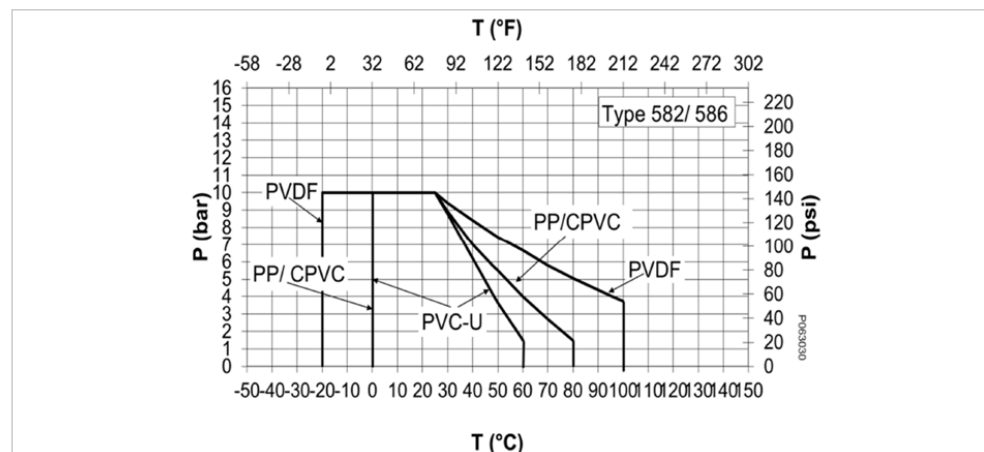
Specification

Dimensions	DN10–DN50 ($\frac{3}{8}$ " – 2")	
Materials	Parts that come into contact with medium (lower part, piston, internal housing)	PVC-U, PVC-C, PP, PVDF, PTFE
	Valve upper part	PP-GF (orange)
Gasket materials	EPDM, FKM	
Diaphragm	EPDM, PTFE	
Pressure level	PN10 @ +20°C (150 psi @ 68°F)	
Setting range	Standard	0.5 – 9.0 bar (7 – 130 psi)
	Optional	0.3 – 3 bar (4 – 44 psi)
Hysteresis	Difference between opening and closing pressure	Approx. 0.1 – 0.4 bar (1.5 – 5.8 psi)
Connections	Lower part with cementing or fusion spigots	
	Lower part with true union Type connection to match all standard GF unions and inserts	
	Available upon request:	
	Various inserts from the GF range, e.g. transition to metal or PE	
Direction of flow	Always corresponds to the the direction of the arrow on the lower part	
Assembly	Threaded inserts are available for safe assembly	
Standards	Pressure test according to ISO 9393	
	Leak rate according to EN 12266	

Kv 100 values

DN (mm)	Inch (inch)	d (mm)	Kv 100 (l/min)	Kv 100 (l/h)	Cv 100 (gpm)
10	3/8	16	45	2700	11.9
15	1/2	20	48	2850	12.5
20	3/4	25	112	6700	29.5
25	1	32	129	7730	34.0
32	1 1/4	40	254	15 240	67.1
40	1 1/2	50	293	17 590	77.4
50	2	63	319	19 170	84.4

Pressure-temperature diagrams



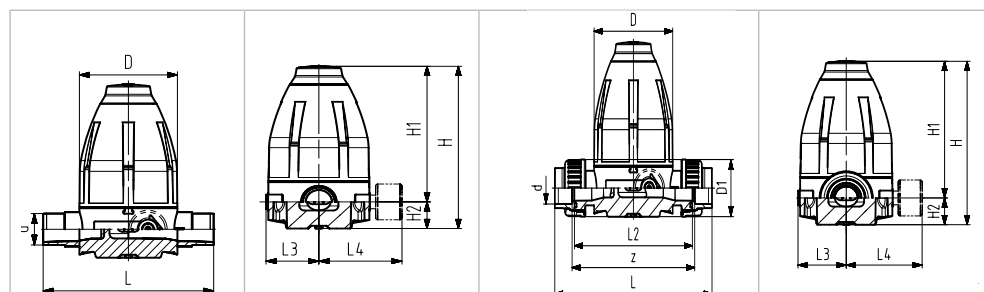
T Temperature (°C, °F)

P Permissible pressure (bar, psi)

The pressure-temperature diagrams are based on a lifetime of 25 years and water or similar media.

2.1.3 Dimensions

Type 582 with threaded connections, cementable and fusionable spigots



All materials

d (mm)	DN (mm)	Inch (inch)	D (mm)	H (mm)	H1 (mm)	H2 (mm)
16 20	10 15	3/8 1/2	79	132	111	21
25 32	20 25	3/4 1	100	177	148	29
40 50	32 40	1 1/4 1 1/2	147	251	207	44
63	50	2	147	251	207	44

All materials if not labeled

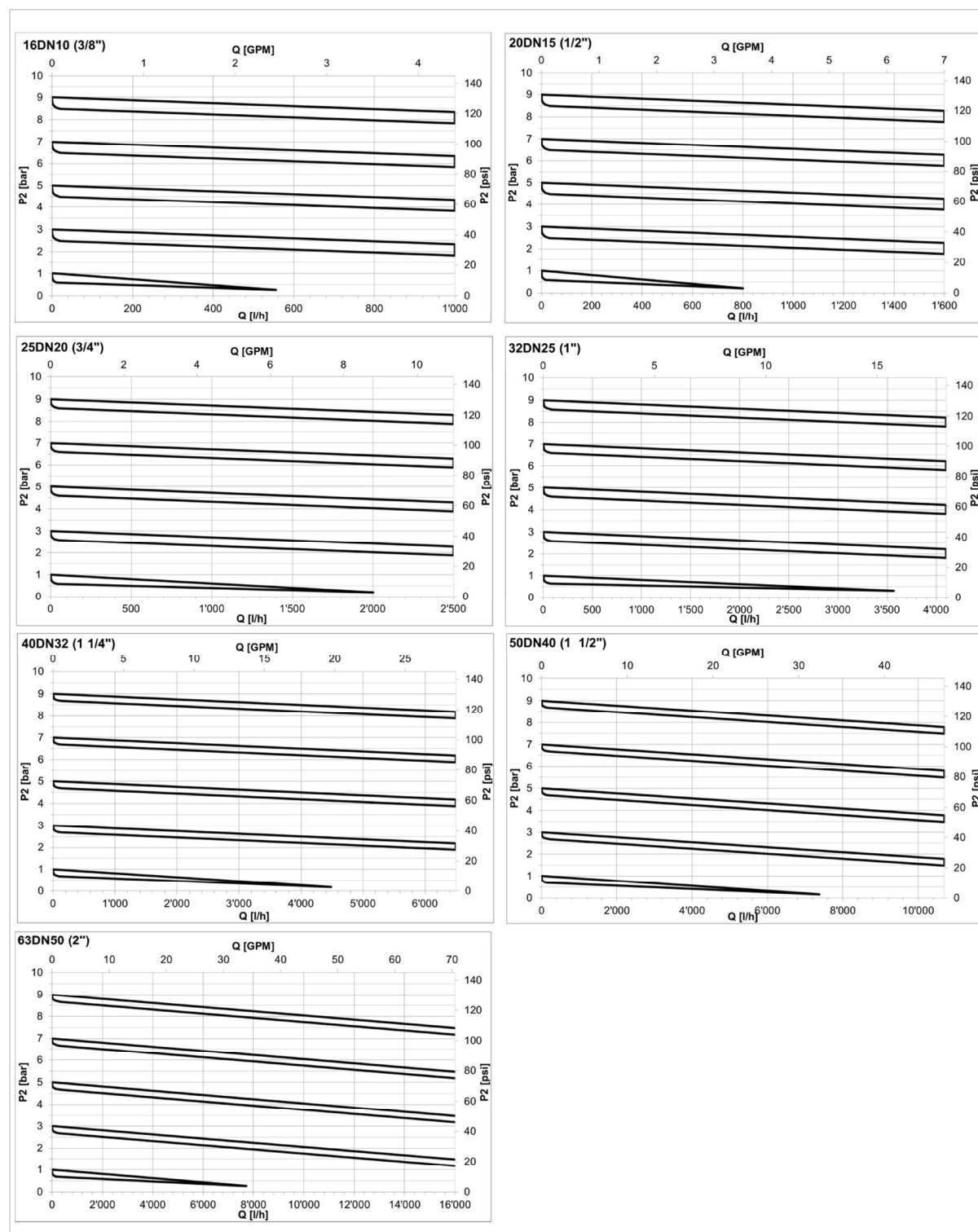
d (mm)	DN (mm)	Inch (inch)	L ¹⁾ PVC/PP (mm)	L ¹⁾ PVDF (mm)	L2 (mm)	L3 (mm)	L4 (mm)	z PVC/PP (mm)	z PVDF (mm)
16 20	10 15	3/8 1/2	134	150	120	42	77	126	130
25 32	20 25	3/4 1	174	190	150	53	88	156	160
40 50	32 40	1 1/4 1 1/2	224	240	205	76	111	211	215

¹⁾ L only for spigot version

d	DN	Inch	L ¹⁾ PVC/PP (mm)	L ¹⁾ PVDF (mm)	I2	I3	L4	z PVC/PP (mm)	z PVDF (mm)
(mm)	(mm)	(inch)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)
63	50	2	244	260	205	76	111	211	215

2.1.4 Characteristics Type 582

The characteristic curves below are valid for the set range 0.5 – 9.0 bar (7 – 130 psi) and show the secondary or outlet pressure P2 over the flow Q in l/h. Parameter is the set pressure pE at Q = 0 l/h. The curves are valid for water at +20 °C and a flow velocity of 2 m/s. A special version set range 0.3 – 3 bar (4 – 44 psi) is available on request.



■ Mobile apps and online tools to support configuration and calculation at www.gfps.com/tools



2.2 Pressure Reducing Valve Type V82



2.2.1 Product description

The pressure reducing Valve Type V82 reduces the system pressure to a specified value.

Function

By using the differential pressure, the pressure reducing valve adjusts itself to the set working pressure. If the outlet pressure increases or decreases to above/below the desired value, the diaphragm is lifted against the spring resistance or pressed down by the spring resistance by the outlet pressure. The pressure reducing valve begins to close/open until the state of equilibrium is reached again. This means that the outlet pressure remains constant, regardless of the rising or dropping inlet pressure.

Applications

- Microelectronics
- Chemical process industry
- Measurement and control
- Water treatment

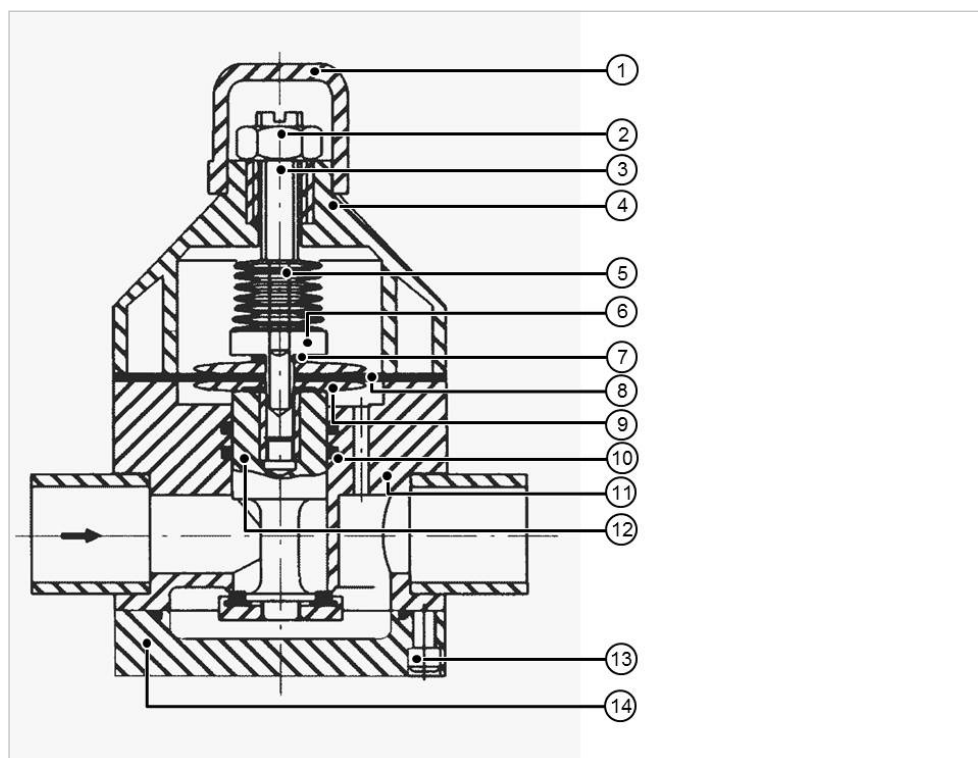
Benefits/features

- No auxiliary energy required
- The working pressure is set with an adjusting screw and locked with a locking nut
- Valves can also be adjusted under working pressure
- Requires practically no maintenance and can be installed in any position
- All parts that come into contact with the medium are made of highly resistant plastics
- The large form of the housing allows good flow values
- Standard version Type V82 with manometer separated from the medium

Flow media

Neutral and aggressive media with a small quantity of particles/solids. The chemical resistance depends on the selected valve material ([see online tool ChemRes PLUS](#)).

2.2.2 Technical data



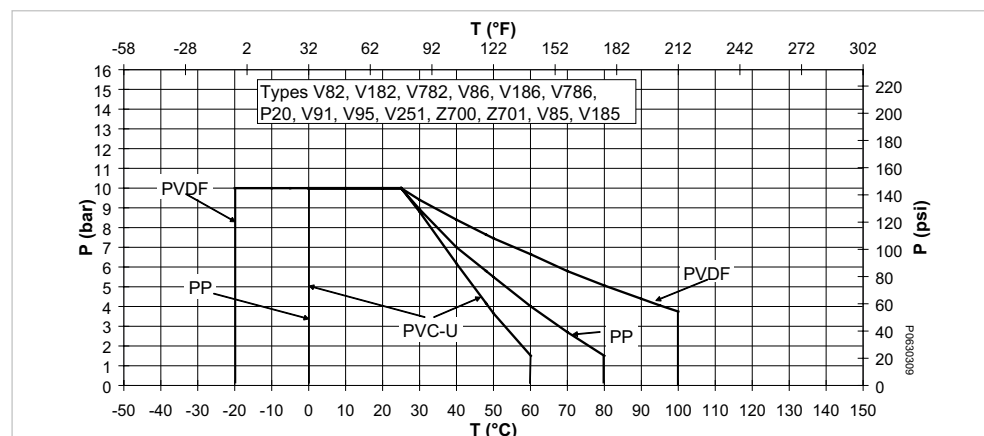
- ① Cap
- ② Locking nut
- ③ Adjusting screw
- ④ Upper valve body
- ⑤ Spring assembly
- ⑥ Allen screw
- ⑦ Washer
- ⑧ Diaphragms
- ⑨ Pressure plate (bottom and top)
- ⑩ O-ring
- ⑪ Valve body
- ⑫ Piston
- ⑬ Allen screws
- ⑭ Valve bottom with O-ring

Specification

Dimensions	d75/DN65 – d110/DN100, 2 ½" – 4"	
Valve body materials	PVC-U, PP, PVDF	
Gasket materials	EPDM	
Diaphragm	EPDM-PTFE-coated	
PN	DN65 – DN80	max. 6 bar
	DN100	max. 4 bar
Adjustment range	DN65 – DN80	0.5 – 5 bar
	DN100	1 – 3 bar
Spring assemblies	Belleville spring	
Connections	Solvent cement spigot	DIN/ISO
	Fusion spigot	DIN/ISO
Standards	Pressure test according to ISO 9393	
	Leak-tightness test according to EN 12260	

Pressure-temperature diagrams

PVC-U, PP-H, PVDF



T Temperature (°C, °F)

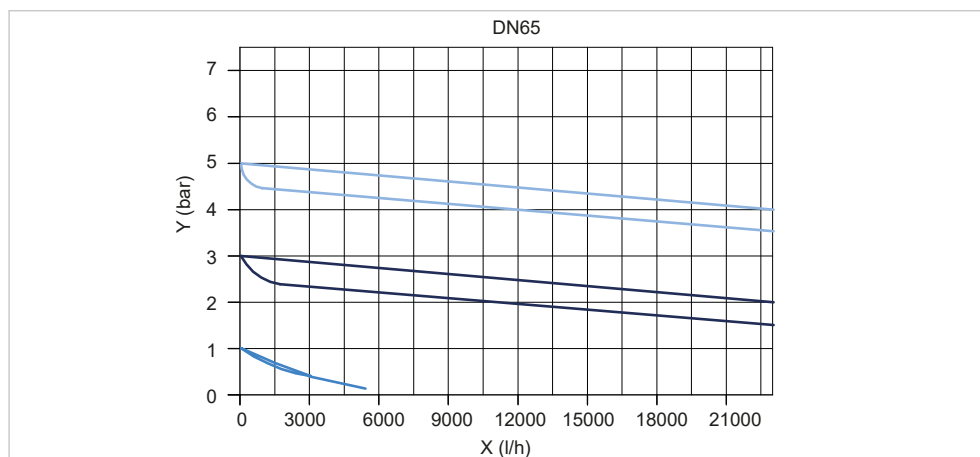
P Permissible pressure (bar, psi)

The pressure-temperature diagram is based on a lifetime of 25 years and water or similar media.

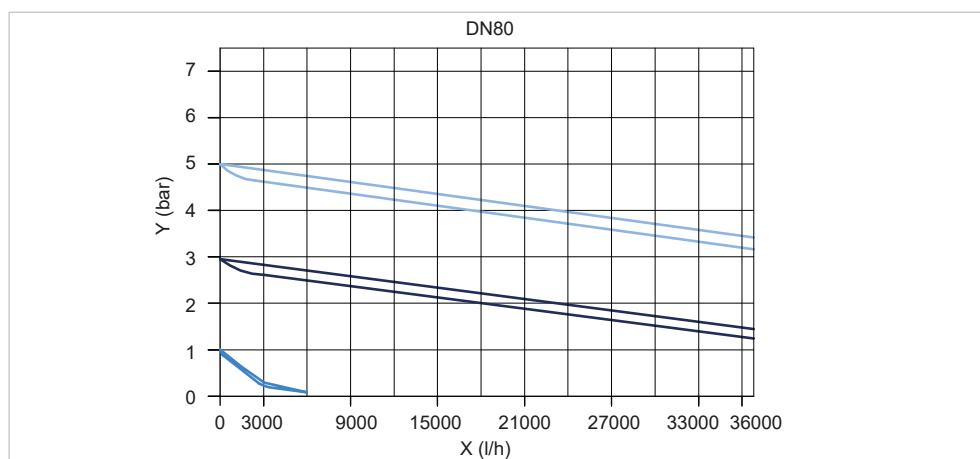
2.2.3 Dimensions

					PVC-U solvent cement spigots PVDF fusion spigots	PVDF-HP/PP butt fusion spigots BCF, IR	PVC-U, PP/ PVDF	PVC-U, PP/PVDF
d (mm)	DN (mm)	øD (mm)	h (mm)	H (mm)	L (mm)	L (mm)	L1 (mm)	L2 (mm)
75	65	200	250	350	300	300		306
90	80	250	305	425	360	360		370
110	100	300	345	495	420	420		430

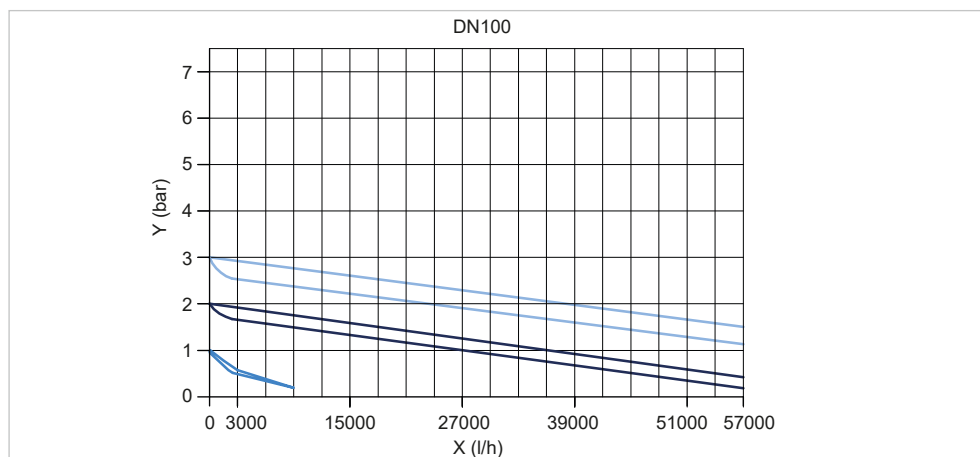
Characteristics Type V82



X Flow rate (l/h)
Y Outlet pressure (bar)



X Flow rate (l/h)
Y Outlet pressure (bar)



X Flow rate (l/h)
Y Outlet pressure (bar)

■ Mobile apps and online tools to support configuration and calculation at www.gfps.com/tools



3 Pressure Retaining Valves

3.1 Pressure Retaining Valve Type 586



3.1.1 Product description

The pressure retaining valve, also called an overflow valve, ensures that the pressure at the valve inlet is held constant.

Function

The pressure retaining valve maintains the line pressure to a set value at the valve inlet. The inlet pressure stays largely constant regardless of pressure fluctuations. The inlet pressure is directly related to the flow.

Applications

- Water treatment
- Chemical process industry
- Semiconductor industry
- Solar industry

Benefits/features

Easy assembly

- Compact design enables installation even when space is limited
- Radially dismountable
- Integrated assembling aid enables direct assembly of the valve
- Significantly shorter installation length thanks to union connections

Easy operation

- No re-torquing required thanks to central housing nut; nominal pressure can be set easily
- Constant and stable control behavior
- Leak-resistant in the event of temperature fluctuations
- Low maintenance
- Pressure setting possible even during operation

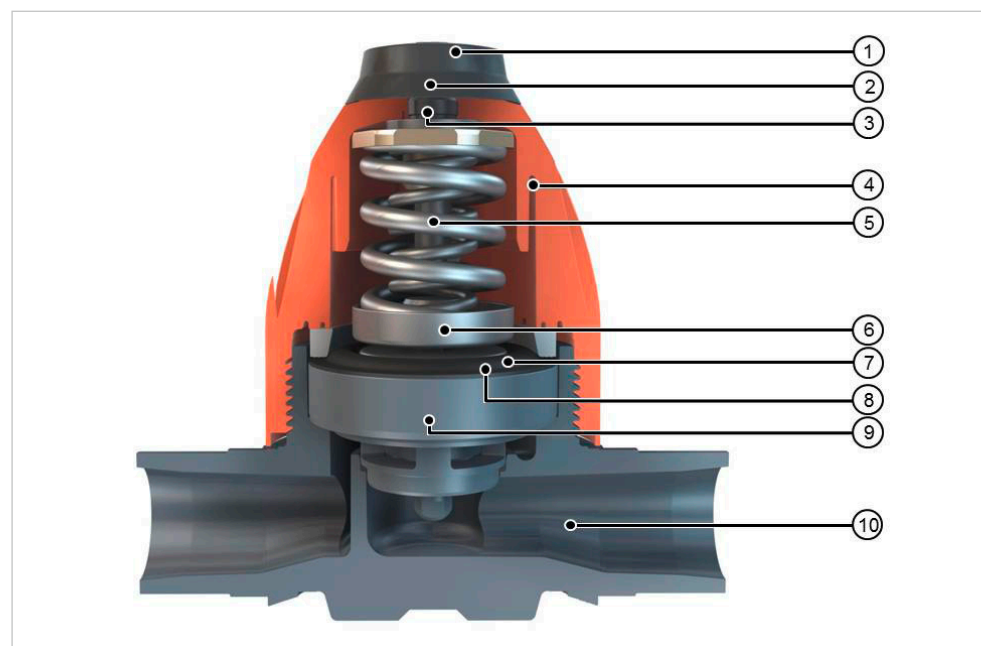
Flexible

- Manometer available as an option for neutral and aggressive media
- Various connection options available thanks to the spigot and union versions
- Low pressure spring set available
- Easy on spare parts thanks to the modular design

Flow media

Neutral and aggressive media with a small quantity of particles/solids. The chemical resistance depends on the selected valve material ([see online tool ChemRes PLUS](#)).

3.1.2 Technical data



- ① Protective cap
- ② Central housing nut
- ③ Spindle
- ④ Upper part
- ⑤ Spring(s)
- ⑥ Pressure piece
- ⑦ Retaining ring
- ⑧ Diaphragm
- ⑨ Cartridge with piston
- ⑩ Lower part

Specification

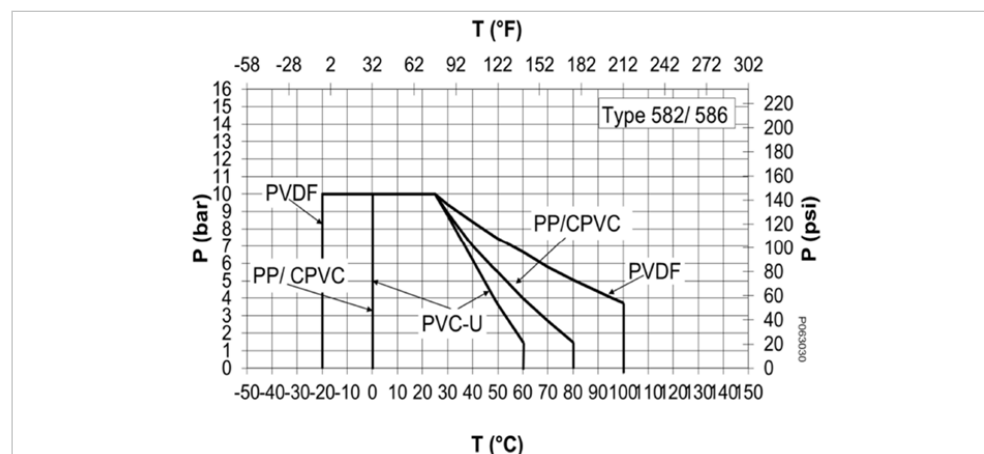
Dimensions	d16/DN10 – d63/DN50, 3/8" – 2"	
Materials	Parts that comes into contact with medium (lower part, piston, internal housing)	PVC-U, PVC-C, PP, PVDF
	Valve upper part	PP-GF (orange)
Gasket materials	EPDM, FKM	
Diaphragm	EPDM/PTFE	
Pressure level	PN10 @ +20°C (150 psi @ 68°F)	
Setting range	Standard	0.5 – 9.0 bar (7 – 130 psi)
	Optional	0.3 – 3 bar (4 – 44 psi)
Hysteresis	Difference between opening and closing pressure: approx. 0.1 – 0.4 bar (1.5 – 5.8 psi)	
Connections	Body with cementing or fusion spigots	
	Lower part with true union Type connection to match all standard GF unions and inserts	
	Available upon request	
	Various inserts from the GF range, for example, transition from metal to PE	
Direction of flow	Always corresponds to the the direction of the arrow on the lower part	
Assembly	Threaded inserts are available for safe assembly	
Standards	Pressure test according to ISO 9393	
	Leak-tightness test according to EN 12260	

Flow values

DN (mm)	Inch (inch)	d (mm)	Kv100		Cv100 (gpm)
			(l/min)	(l/h)	
10	3/8	16	50	3020	3.5
15	1/2	20	53	3150	3.6
20	3/4	25	114	6840	7.9
25	1	32	125	7500	8.6
32	1 1/4	40	263	15 760	18.1
40	1 1/2	50	286	17 140	19.7
50	2	63	293	17 610	20.2

Kv100 at delta p = 1 bar
Cv100 at delta p = 1 psi

Pressure-temperature diagrams



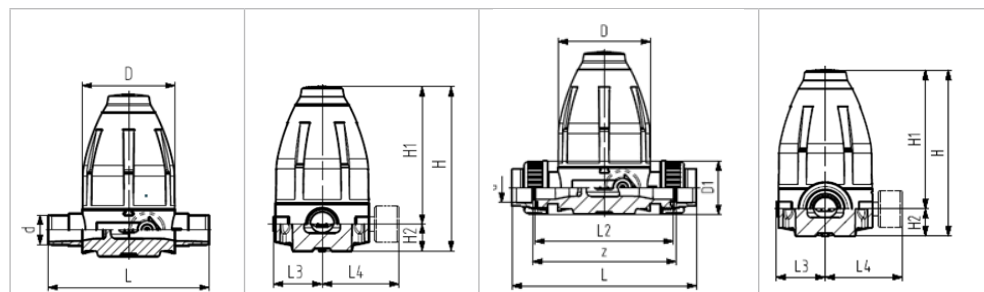
T Temperature (°C, °F)

P Permissible pressure (bar, psi)

The pressure-temperature diagrams are based on a lifetime of 25 years and water or similar media.

3.1.3 Dimensions

Type 586 with threaded connections, cementable and fusionable spigots



All materials

d (mm)		DN (mm)		Inch (inch)		D (mm)	H (mm)	H1 (mm)	H2 (mm)
16	20	10	15	⅜	½	79	132	111	21
25	32	20	25	¾	1	100	177	148	29
40	50	32	40	1 ¼	1 ½	147	251	207	44
63		50		2		147	251	207	44

All materials if not labeled

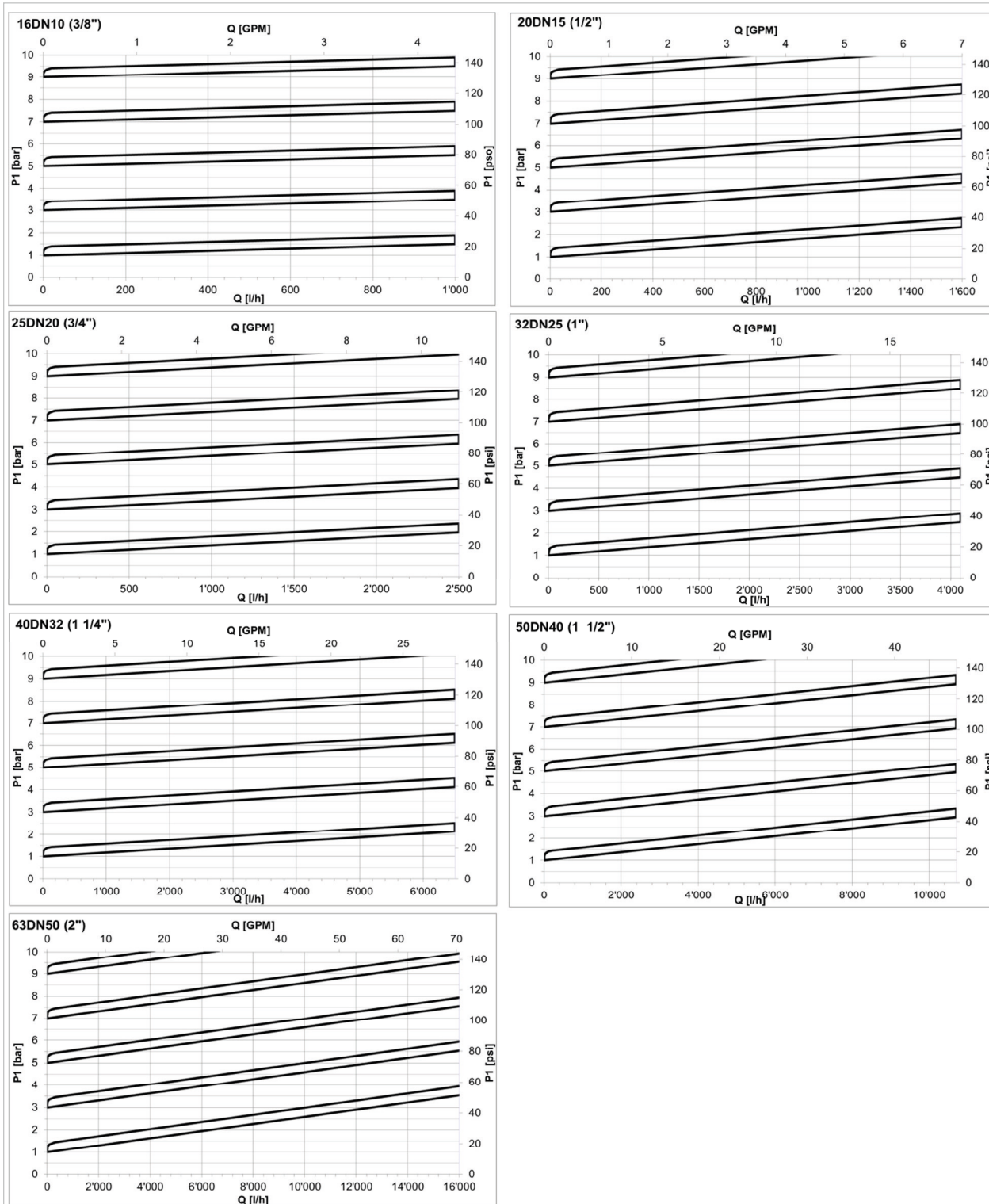
d (mm)		DN (mm)		Inch (inch)		L ¹⁾ PVC/PP	L ¹⁾ PVDF	l2 (mm)	l3 (mm)	L4 (mm)	z PVC/PP	z PVDF
16	20	10	15	¾	½	134	150	120	42	77	126	130
25	32	20	25	¾	1	174	190	150	53	88	156	160
40	50	32	40	1 ¼	1 ½	224	240	205	76	111	211	215
63		50		2		244	260	205	76	111	211	215

¹⁾ L only for spigot version

Characteristics Type 586

The characteristic curves below are valid for the set range 0.5 – 9.0 bar (7 – 130 psi) and show the secondary or outlet pressure P2 over the flow Q in l/h.

Parameter is the set pressure pE at Q = 0 l/h. These curves are valid for water at +20 °C and a flow velocity of 2 m/s. A special version set range 0.3 – 3 bar (4 – 44 psi) is available on request.



■ Mobile apps and online tools to support configuration and calculation at www.gfps.com/tools



3.2 Pressure Retaining Valve Type V86



3.2.1 Product description

The V86 pressure retaining valve serves to keep the working or system-related pressures constant, to balance out pressure pulsation and to reduce pressure peaks in chemical process systems.

Function

If the inlet pressure rises above the set value, the pressurized valve piston is lifted against the spring resistance. As a result, the valve opens and the pressure in the outlet pipe is reduced. The valve closes as soon as the inlet pressure sinks below the pre-set spring tension.

Applications

- Chemical process industry
- Measurement and control
- Water treatment
- Microelectronics

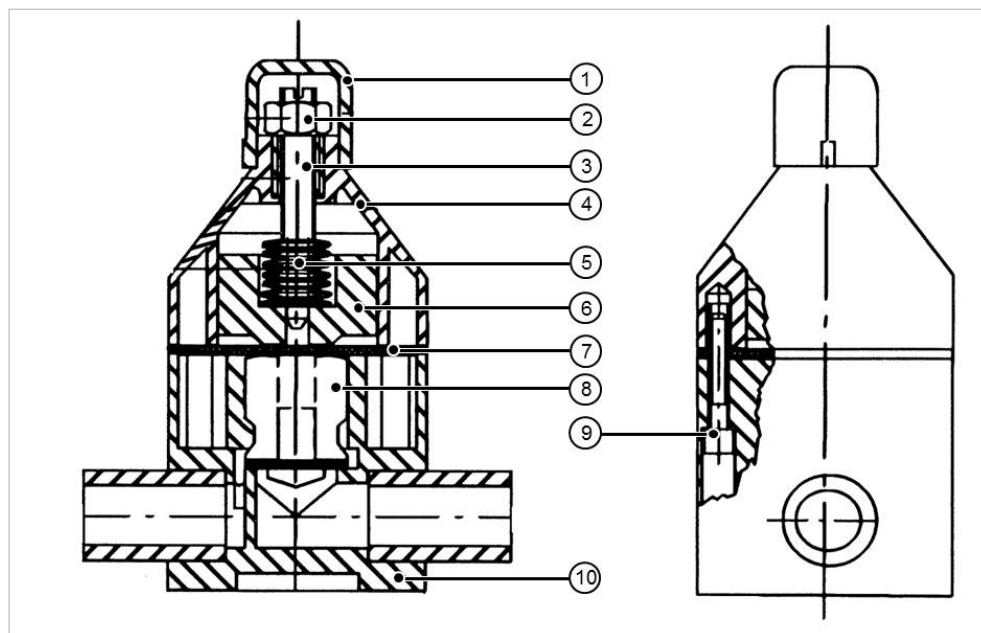
Benefits/features

- No auxiliary energy required
- The working pressure is set with an adjusting screw and locked with a locking nut.
- Valves can also be adjusted under working pressure
- Requires practically no maintenance and can be installed in any position
- All parts that come into contact with the medium are made of highly resistant plastics
- The large form of the housing allows good flow values

Flow media

Neutral and aggressive media with a small quantity of particles/solids. The chemical resistance depends on the selected valve material ([see online tool ChemRes PLUS](#)).

3.2.2 Technical data



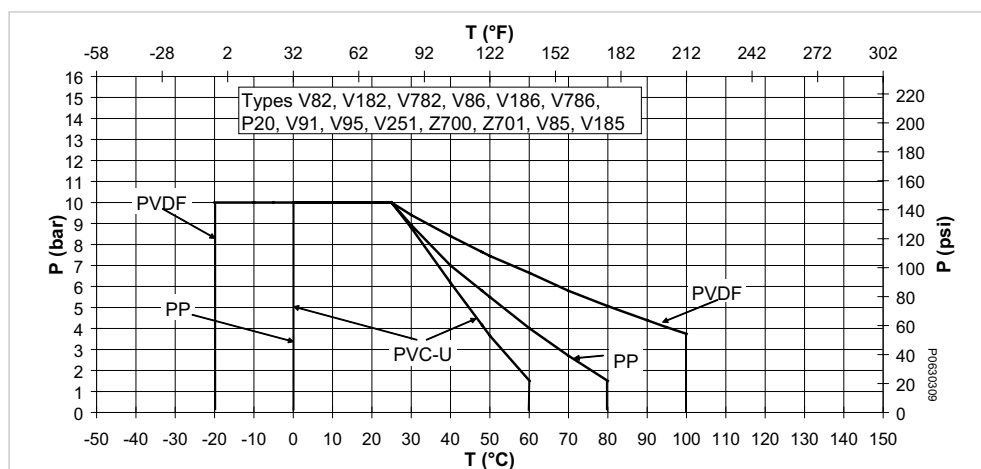
- ① Cap
- ② Locking nut
- ③ Adjusting screw
- ④ Upper valve body
- ⑤ Spring assembly
- ⑥ Pressure piece
- ⑦ Diaphragms
- ⑧ Piston
- ⑨ Cylinder screw
- ⑩ Lower valve body

Specification

Dimensions	d75/DN65 – d110/DN100, 2 ½" – 4"	
Materials	PVC-U, PP, PVDF	
Gasket materials	EPDM	
Diaphragm	EPDM-PTFE-coated	
Pressure level	DN65–DN80	1 – 6 bar
	DN100	1 – 4 bar
Connections	Solvent cement spigot	DIN/ISO
	Fusion spigot	DIN/ISO
Standards	Pressure test according to ISO 9393	
	Leak-tightness test according to EN 12260	

Pressure-temperature diagrams

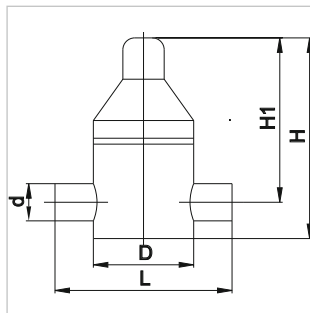
PVC-U, PVC-C, PP-H, PVDF



T Temperature (°C, °F)
P Permissible pressure in bar, psi

The pressure-temperature diagram is based on a lifetime of 25 years and water or similar media.

3.2.3 Dimensions

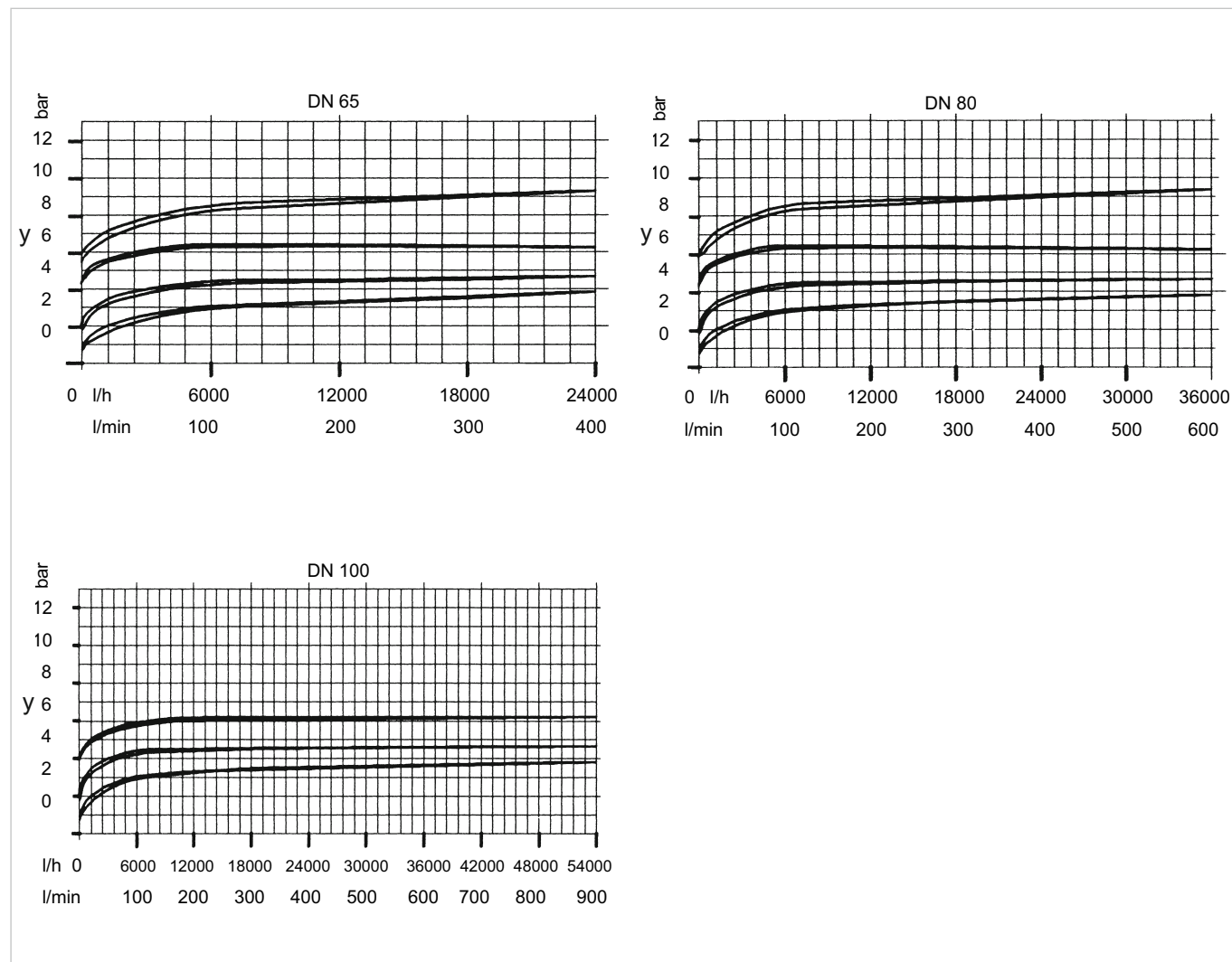


DN (mm)	PVC-U Solvent cement spigot PVDF fusion spigots	PVDF-HP/PP Butt fusion spi- gots BCF/IR					
	L (mm)	L (mm)	L1 (mm)	L2 (mm)	øD (mm)	H (mm)	h (mm)
10	134		140	154	83	137	20
15/20	134	158	140	154	83	137	20
25	174	198	180	185	112	199	27
32	174	202	230	248	165	199	43
40	224	256	230	248	165	290	43
50	244	256	250	252	165	290	43
65	284	284	290	280	180	275	230
80	360	360	310		250	410	320
100	380	380	390		250	485	415

L1 With flange

L2 Union bush

Characteristics Type V86



■ Mobile apps and online tools to support configuration and calculation at www.gfps.com/tools



Planning Fundamentals of Valves and Automation

Valves – Solenoid Valves

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1 Solenoid Valves

1.1 Solenoid Valve Type 157



1.1.1 Product description

Type 157 is a high-quality, direct-acting 2/2-way pivoted armature solenoid valve that can be used for opening or closing. The magnetic system and the media chamber are separated from one another by a separating diaphragm system. The solenoid coils are moulded with a chemically resistant epoxy. The valve is especially suitable for aggressive media.

Function

A solenoid valve is a valve which is actuated by an electromagnet. Their tasks are to release, shut off, dose, distribute or mix gases and liquids. The solenoid valves can switch very fast, and guarantee high reliability and a long lifetime at a low actuator power. Solenoid valves with position measuring can be operated as servo valves.

Applications

- Water treatment
- Process/chemical engineering
- Plant/mechanical engineering
- Semiconductor industry
- Environmental engineering
- Medical engineering
- Apparatus engineering
- Analytical technology

Benefits/features

- PVC-U material: threaded socket with cylindrical female pipe thread Rp
- Circuit functions: A (normally closed - FC) and B (normally open - FO)
- Handle with ratchet setting
- Electrical connection with cable plug
- Protection rating IP65
- Service-friendly and robust manual override
- Direct-acting with isolating diaphragm
- Gasket materials are highly media-resistant
- Maintenance-free pivoted armature technology
- Vibration-proof, block screwed coil system

Flow media

Suited for aggressive media

Valve handling

Electrical connection

Observe the voltage and Type of current as specified on the Type plate.

Voltage tolerance $\pm 10\%$. Connection via cable plug, protection rating IP65.

Cable $3 \times 0.75 \text{ mm}^2$. Flat pin terminal = ground connection.

Cable plug insert can be rotated by $4 \times 90^\circ$.

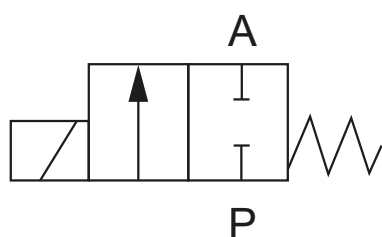
Tightening torque for cable plug attachment 1 Nm.



Installation and maintenance must be performed in accordance with the corresponding installation manual. The installation manual is provided with the product, see also the online product catalog at www.gfps.com

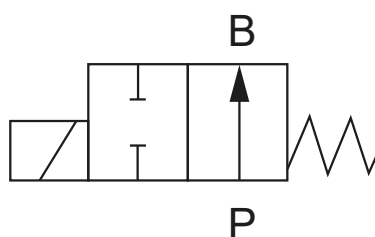
Switching functions

Circuit function A



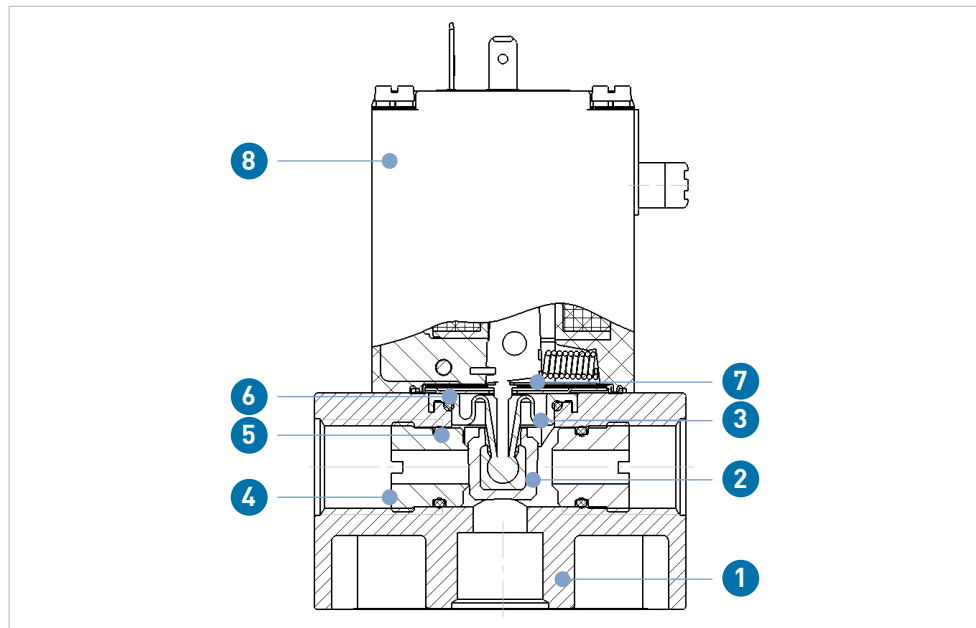
2/2-way valve
(FC, Fail safe to close)

Circuit function B



2/2-way valve
(FO, Fail safe to open)

1.1.2 Technical data



- ① PVC valve housing
- ② FKM gasket
- ③ PTFE rotating stem
- ④ PVC seat
- ⑤ FKM/EPDM O-Ring
- ⑥ PTFE gasket
- ⑦ FKM/EPDM isolating membrane
- ⑧ Epoxy coil

Specification

Nominal diameter	DN2 – DN8	
Valve housing	PVC (resistant according to DIN 8062, 8061)	
Seal material media	FKM	Oxydizing acids and substances, hot oils with additives, salt solutions, waste gases
	EPDM	Alkalis, acids up to medium concentration, alkaline washing and bleaching lyes
Media temperatures	PVC + FKM	-10 to +50 °C
Housing + gasket (combination of materials)	PVC + EPDM	-30 to +50 °C
Ambient temperature	Max. +50 °C	
Viscosity	Max. 37 mm ² /s	
Voltage range	24V 50 Hz, 230V 50Hz, 24V UC*	
Voltage tolerance	±10%	
Switching frequency	Max. 100/min for AC	
	Max. 10/min for UC (high-capacity electronic)	
Rated duty	100 % ED for high-capacity electronic	
	40 % ED (10 min)	
Electrical connection with AC and DC	Plug in accordance with DIN EN 17301-803 Form A for cable plugs	
Protection rating	IP65 with cable plug	
Thermal insulation class of the coil	H	
Mounting position	As desired, preferably with actuator on top	
Weight	0.38 kg	

*UC = Universal Current = AC/DC

Flow rate, pressure range and electrical power consumption

Nominal dia-meter (mm)	Mechanism	Kv value ¹⁾ water (l/min)	Pressure range ²⁾		Power consumption Inrush (electrical)		Power consumption Operation(electrical)	
			AC (bar) ³⁾	DC (bar) ³⁾	AC (VA)	UC (W)	AC (VA/W)	UC (W)
4	A	5 ⁴⁾	0-4	0-2	30	40	15/8	8-12
6	A	10 ⁵⁾	0-2	0-1	30	40	15/8	8-12
8	A	16.7	0-1	0-0.8	30	40	15/8	8-12

¹⁾ Kv value (l/min) at +20 °C, 1 bar pressure at valve inlet and free outlet

²⁾ Pressure data (bar) excess pressure to atmospheric pressure

³⁾ Heat output 8W

⁴⁾ The Kv value is reduced to 4 l/min with sealing material FKM

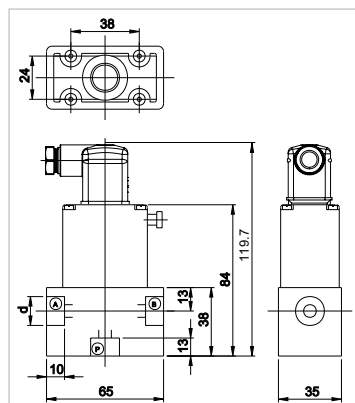
⁵⁾ The Kv value is reduced to 8 l/min with sealing material FKM

Switching time

Frequency: AC		Frequency: UC	
Open (ms)	Close (ms)	Open (ms)	Close (ms)
20	11	11	8

Switching time (ms): Measurement at valve outlet at 6 bar and +20 °C. Open: Pressure build-up 0% to 90%. Close: Pressure build-up 100% to 10%.

1.1.3 Dimensions



Housing material	Inch (inch)	B (mm)	E (mm)	F (mm)
PVC	G 3/8	91	35	65

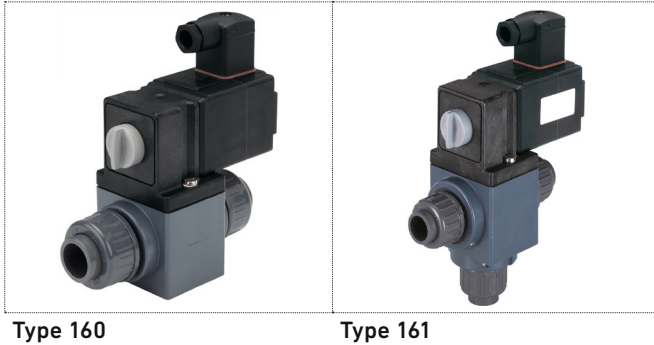
Possible connections

Mode of operation	Port 1	Port 2
A	A	P
B	P	B



For further information on accessories, refer to the online product catalog at www.gfps.com

1.2 Solenoid Valve Type 160/161



Type 160

Type 161

1.2.1 Product description

Type 160/161 works according to the leverage principle and can therefore switch large nominal diameters directly. It is available in both the 2/2-way and the 3/2-way valve designs. It can be used for a wide range of functions, such as opening, locking, dosing, mixing and dispensing. The anchor operates horizontally on a permanently coupled rocker. The sealing cylinder on the lower lever is pressed to the valve seats through the horizontal movement. The plastic-coated metal lever forms one unit with the gas-tight diaphragm bushing. Through this construction, the actuator media is kept separate from the fluid housing.

Function

A solenoid valve is a valve which is actuated by an electromagnet. Their tasks are to shut off, release, dose, distribute or mix gases and fluids. The solenoid valves can switch very fast, they guarantee high reliability and a long lifetime at a low actuator power. Solenoid valves with position measuring can be operated as a servo valve.

Applications

- Water treatment
- Process/chemical engineering
- Plant/mechanical engineering
- Semiconductor industry
- Environmental engineering
- Medical engineering
- Apparatus engineering
- Analytical technology

Benefits/features

- With solvent cement socket, metric
- Circuit functions: A and B (Type 160), E and F (Type 161)
- PN 0 – 3bar
- Handle with ratchet setting
- Electrical connection with cable plug
- Protection rating IP65
- Directly-acting valve up to nominal diameter DN20, separated from media
- Vibration-resistant, block-connected coil system
- Energy-efficient decrease in power in all DC models
- Increased safety through electrical position feedback
- Robust, service-friendly manual override

Flow media

Suited for aggressive, abrasive and slightly contaminated media.

Valve handling

Installation notes

- Turn off pressure and vent pipes before removing pipes and valves.
- Switch off power and secure from reconnection before performing any procedures on the device or system.
- Observe the applicable accident prevention and safety regulations for electrical devices.
- Keep the device away from easily flammable materials and media and do not touch with bare hands.
- Risk of injury due to component failure of valves with AC power.
- Assembly may be performed only by authorized specialists using appropriate tools

Electrical connection

Observe the voltage and Type of current as specified on the Type plate.

Voltage tolerance $\pm 10\%$. Connection via cable plug, protection rating IP65.

Cable $3 \times 0.75 \text{ mm}^2$. Flat pin terminal = ground connection.

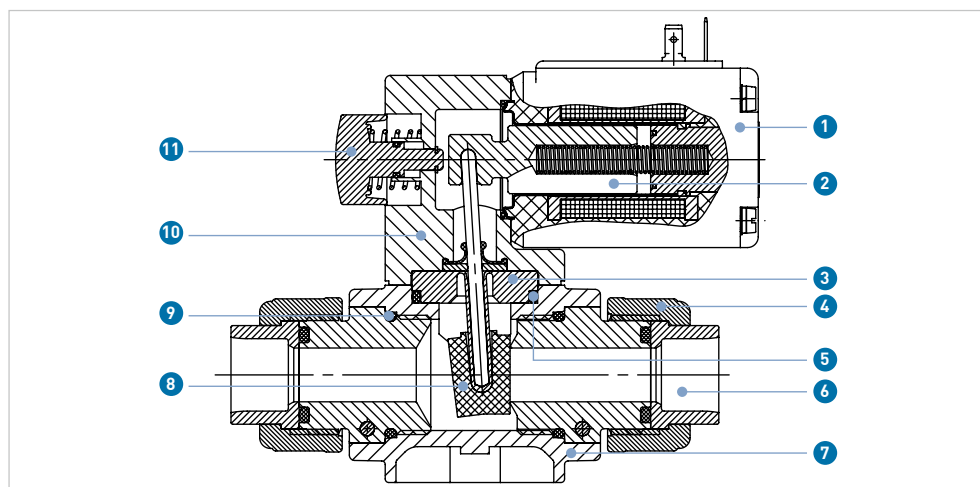
Cable plug insert can be rotated by $4 \times 90^\circ$. Tightening torque for cable plug attachment 1 Nm.



Installation and maintenance must be performed in accordance with the corresponding and current issue installation manual. The installation manual is provided with the product and also available from our document library in the on-line product catalogue at www.gfps.com

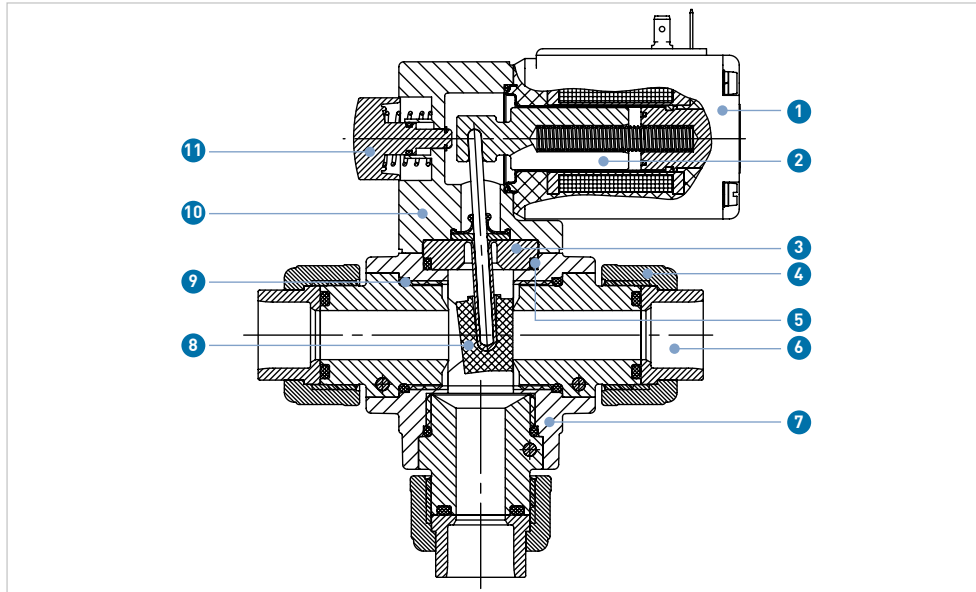
1.2.2 Technical data

2/2-way with union nut and connection fitting



- ① Coil (epoxy)
- ② Core (stainless steel 1.4105)
- ③ Rotating stem (PTFE)
- ④ Union nut (PVC)
- ⑤ O-ring (FKM, EPDM)
- ⑥ Connection fitting (solvent cement socket)
- ⑦ Housing (PVC)
- ⑧ Valve cone (FKM, EPDM)
- ⑨ O-ring (FKM, EPDM)
- ⑩ Angle flange (PC)
- ⑪ With manual override with locking function

3/2-way with union nut and connection fitting



- ① Coil (epoxy)
- ② Core (stainless steel 1.4105)
- ③ Rotating stem (PTFE)
- ④ Union nut (PVC)
- ⑤ O-ring (FKM, EPDM)
- ⑥ Connection fitting (solvent cement socket)
- ⑦ Housing (PVC)
- ⑧ Valve cone (FKM, EPDM)
- ⑨ O-ring (FKM, EPDM)
- ⑩ Angle flange (PC)
- ⑪ With manual override with locking function

Specification

Nominal diameter	DN10-20	
Housing material	PVC	
Sealing material	EPDM, FKM	
Media	Aggressive and non-aggressive liquids, neutral gases, aggressive gases according to their diffusion characteristics	
Media temperature (Housing and gasket)	PVC / EPDM	-10 to +50 °C
	PVC / FKM	-10 to +50 °C
Ambient temperature	Max. +50 °C	
Viscosity	37mm ² /s	
Supply voltage	24 V / UC*, 230 V / 50 Hz	
Voltage tolerance	±10 %	
Switching frequency	AC	60/min
	UC	Max. 6/min
Rated duty	ED 100 %	
Electrical connection	Cable plug, according to DIN EN 175301-803, form A	
Protection rating	IP 65 with cable plug	
Mounting position	As desired, preferably with actuator on top	

*UC = Universal Current = AC/DC

Electrical power consumption

Nominal diameter (mm)	Kv value water ¹⁾ (l/min)	Pressure range ²⁾				Power consumption Inrush (electrical)		Power consumption Operation (electrical)		Weight (kg)
		A (bar)	B (bar)	E (bar)	F (bar)	AC (VA)	UC (W)	AC (VA/W)	UC (W)	
10	33	0-3	0-2	0-0.6	0-1	100 - 120	100	48/16	9	1.2
15	75	0-1	0-1	0-0.3	0-0.5	100 - 120	100	48/16	9	1.2
20	100	0-0.5	0-0.5	0-0.15	0-0.25	100 - 120	100	48/16	9	1.2

¹⁾ Kv value (l/min) at +20 °C, 1 bar pressure at valve inlet and free outlet

²⁾ Pressure data (bar) gauge pressure

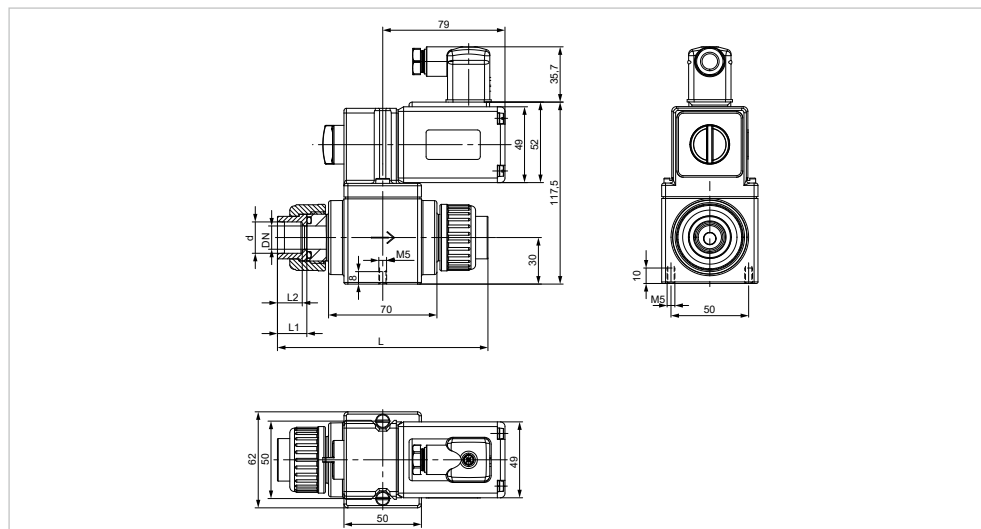
Switching time

Open	Close
(ms)	(ms)
10 - 20	40 - 60

Switching time (ms): Measurement at valve outlet at 6 bar and +20 °C. Open: Pressure build-up 0% to 90%. Close: Pressure build-up 100% to 10%.

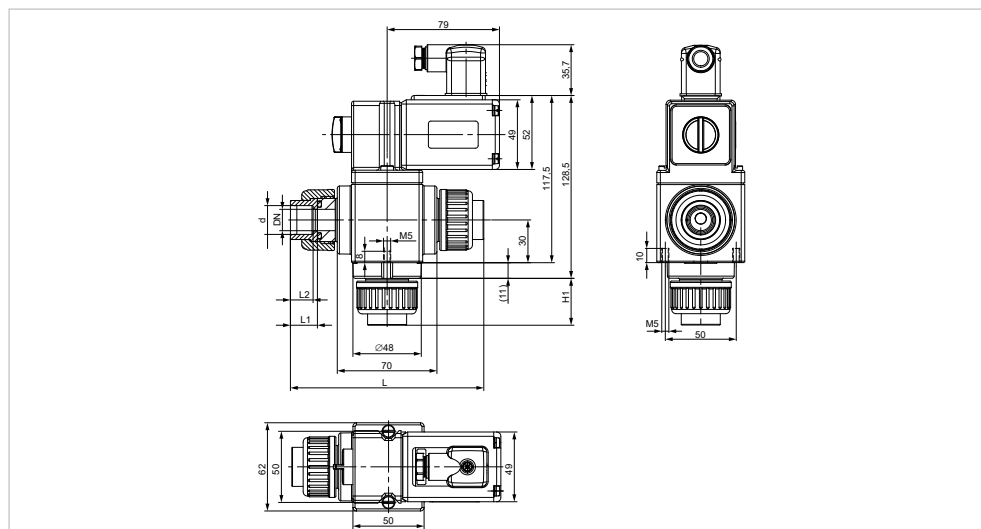
1.2.3 Dimensions

2/2-way with union nut and connection fitting



Material	DN (mm)	Process connection	L1 (mm)	L2 (mm)	d (mm)	L (mm)
PVC	10	Solvent cement socket	17	14	16	130
	10 (with connection for DN15)	Solvent cement socket	19	16	20	134
	15	Solvent cement socket	19	16	20	136
	15 (with connection for DN20)	Solvent cement socket	22	19	25	142
	20	Solvent cement socket	22	19	25	144

3/2-way with union nut and connection fitting



Material	DN (mm)	Process connection	H1 (mm)	L1 (mm)	L2 (mm)	d (mm)	L (mm)
PVC	10	Solvent cement socket	30	17	14	16	130
	10 (with connection for DN15)	Solvent cement socket	32	19	16	20	134
	15	Solvent cement socket	33	19	16	20	136
	15 (with connection for DN20)	Solvent cement socket	36	22	19	25	142
	20	Solvent cement socket	37	22	19	25	144

1.3 Solenoid Valve Type 165



1.3.1 Product description

The pilot-controlled gate Valve Type 165 with servo diaphragm is closed when there is no current. A minimum differential pressure of 0.5 bar is required to fully open and close the valve. Actuator and media chamber are separated by a diaphragm. The solenoid coils are encapsulated with a highly chemically resistant epoxy.

Servo assisted solenoid valves have less power consumption than direct acting solenoid valves in the same dimension.

Function

A solenoid valve is a valve which is actuated by an electromagnet. Their tasks are to shut off, release, dose, distribute or mix gases and fluids. The solenoid valves can switch very fast, and guarantee high reliability and a long lifetime at a low actuator power. Solenoid valves with position measuring can be operated as servo valves.

Applications

- Water treatment
- Process/chemical engineering
- Plant/mechanical engineering
- Semiconductor industry
- Environmental engineering
- Medical engineering
- Apparatus engineering
- Analytical technology

Benefits/features

- Function: A
- PN 0.5 – 6 bar
- Pilot-controlled valve with servo diaphragm
- Separate from media
- No metal internal parts
- Pivoted armature pilot control with lockable emergency manual override
- Simple installation and removal
- Plastic valve for aggressive and contaminated media
- Service-friendly manual operation

Limitations

- Sensitive to solids
- Δp of 0.5 bar absolutely necessary

Flow media

Clean liquids without solid particles (neutral or aggressive)

Valve handling

Installation notes

Electrical connection

Observe the voltage and Type of current as given on the Type plate.

Voltage tolerance $\pm 10\%$. Connection via cable plug, protection rating IP65.

Cable $3 \times 0.75 \text{ mm}^2$. Flat pin terminal = ground connection.

Cable plug insert can be rotated by $4 \times 90^\circ$. Tightening torque for cable plug attachment 1 Nm.

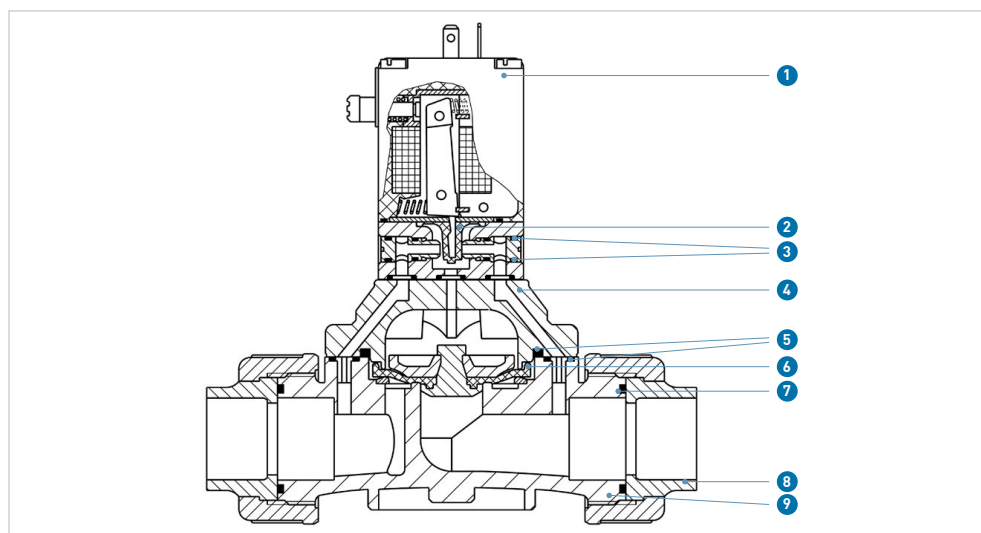
Maintenance notes

- Maintenance may be performed only by authorized specialists using appropriate tools.
- Secure the system against unintentional operation.
- Ensure a controlled restart after maintenance.



Installation and maintenance must be performed in accordance with the corresponding installation manual. The installation manual is provided with the product, see also the online product catalog at www.gfps.com

1.3.2 Technical data



- ① Reel housing (Epoxy)
- ② Diaphragms (EPDM, FKM)
- ③ O-ring (EPDM, FKM)
- ④ Cover (PVC, PVDF)
- ⑤ O-ring (EPDM, FKM)
- ⑥ Diaphragms (EPDM, FKM)
- ⑦ O-ring (EPDM, FKM)
- ⑧ Insert (sleeve) (PVC, PVDF)
- ⑨ Housing (PVC, PVDF)

Specification

Nominal diameter	DN15 – DN50	
Housing material	PVC, PVDF	
Gasket material	EPDM, FKM	
Media	EPDM	Alkalines, detergent and bleach solutions
	FKM	Oxidizing acids and substances
Media temperature	PVC housing	0 to +50 °C
	PVDF housing	0 to +70 °C
Ambient temperature	PVC housing	0 to +40 °C
	PVDF housing	0 to +55 °C
Viscosity	21 mm ² /s	
Supply voltage	24V DC, 230V 50Hz/60Hz, 115V 50Hz/60Hz	
Voltage tolerance	$\pm 10\%$	
Nominal mode of operation	Continuous operation 100 % ED	
Electrical connection	Cable plug for $\varnothing 7 \text{ mm}$ cable in accordance with DIN EN 175301-803 form A (included in scope of delivery)	
Protection rating	IP65 with appliance plug	
Insulation class coil	Class H	
Air connection	Sleeve	
Mounting position	As desired, preferably with actuator on top	

Kv 100 values

Nominal diameter (mm)	Mode of operation	Kv value ¹⁾ water (l/min)	Pressure range ²⁾ (bar)	Power consumption Inrush (electrical)		Power consumption Operation (electrical)	
				AC (VA)	DC (W)	AC (VA/W)	DC (W)
15	A	83	0.5 - 6	20	5	11/5	5
20	A	100	0.5 - 6	20	5	11/5	5
25	A	233	0.5 - 6	20	5	11/5	5
32	A	267	0.5 - 6	20	5	11/5	5
40	A	500	0.5 - 6	20	5	11/5	5
50	A	600	0.5 - 6	20	5	11/5	5

- 1) Kv value (l/min) at +20 °C, 1 bar pressure at valve inlet and free outlet
- 2) Pressure data (bar) gauge pressure

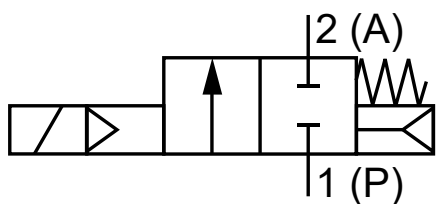
Switching time

Open	Close
(ms)	(ms)
100 - 800	1000 - 4000

Switching time (ms): Measurement at valve outlet at 6 bar and +20 °C. Open: Pressure build-up 0% to 90%. Close: Pressure build-up 100% to 10%.

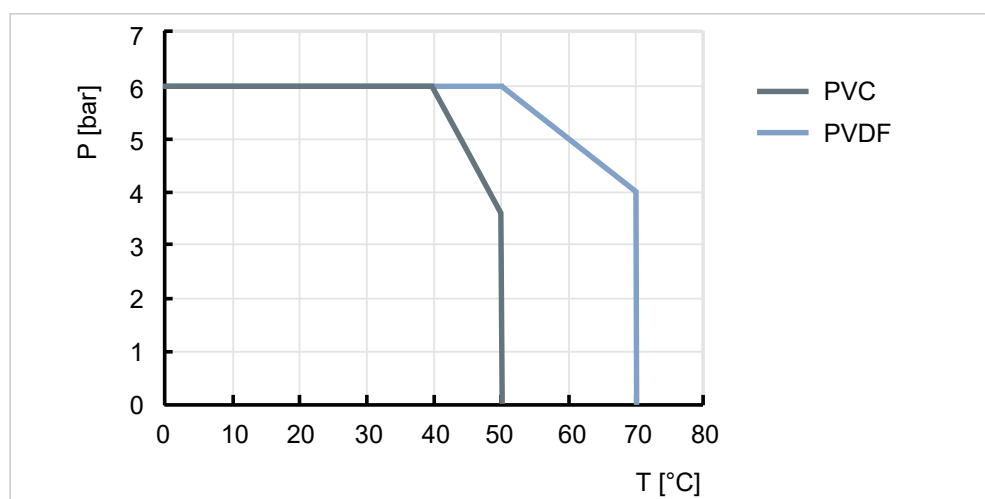
Switching functions

Circuit function A



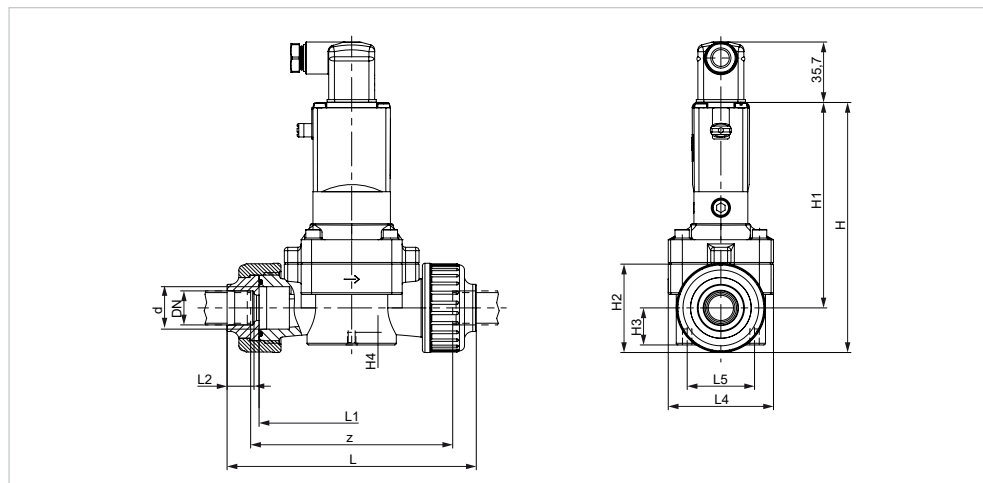
2/2-way valve
(FC, Fail safe to close)

Pressure-temperature diagrams



T Temperature (°C, °F)
P Permissible pressure
(bar, psi)

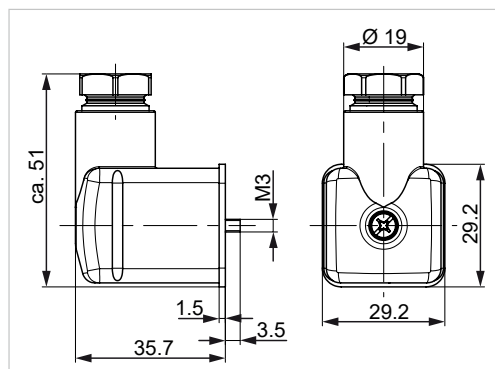
1.3.3 Dimensions



Alle Ausführungen

DN (mm)	d (mm)	H (mm)	H1 (mm)	H2 (mm)	H3 (mm)	H4 (mm)	L1 (mm)	L4 (mm)	L5 (mm)	z (mm)	PVC housing		PVDF housing	
											L (mm)	L2 (mm)	L (mm)	L2 (mm)
15	20	148	122	53	22	8	110	63	40	116	148	16	147	16
20	25	148	122	53	22	8	110	62	40	116	154	19	151	18
25	32	175	137	76	31	15	141	85	45	147	190	22	185	20
32	40	175	137	76	31	15	141	85	45	147	198	26	189	22
40	50	212	160	105	42	15	192	115	45	198	254	31	245	25
50	63	212	160	105	42	15	192	115	45	198	268	38	253	29

Cable plug dimensions



1.4 Solenoid Valve Type 166



1.4.1 Product description

Type 166 is a direct-acting 2/2 or 3/2-way pivoted armature valve. Available with various mechanisms for opening, closing, dosing, mixing and distributing. The solenoid system and medium chamber are separated from one another by means of an isolating diaphragm system. The valve thus has a long service life, even with dry runs. Due to the use of PP and PVDF as housing materials, Type 166 is especially suitable for aggressive media. The solenoid coils are encapsulated with a highly chemically resistant epoxy. The valve is mounted via a G 1/4" union. The valve is available in the nominal diameters DN3, DN4 and DN5.

Function

A solenoid valve is a valve which is actuated by an electromagnet. Their tasks are to shut off, release, dose, distribute or mix gases and fluids. The solenoid valves can switch very fast, and guarantee high reliability and a long lifetime at a low actuator power. Solenoid valves with position measuring can be operated as servo valves.

Applications

- Water treatment
- Process/chemical engineering
- Plant/mechanical engineering
- Semiconductor industry
- Environmental engineering
- Medical engineering
- Apparatus engineering
- Analytical technology

Benefits/features

- Mechanisms: A, E and F
- PN0 – PN 10 bar
- Handle with ratchet setting
- Electrical connection with cable plug
- Protection rating IP65
- Service-friendly, robust emergency manual override
- Direct-acting with isolating membrane
- Maintenance-free pivoted armature technology
- Vibration-resistant, block-bolted coil system

Flow media

Suited for aggressive media

Valve handling

Installation notes

- Turn off pressure and vent pipes before removing pipes and valves.
- Switch off power and secure from reconnection before performing any procedures on the device or system.
- Observe the applicable accident prevention and safety regulations for electrical devices.
- Keep the device away from easily flammable materials and media and do not touch with bare hands.
- Risk of injury due to component failure of valves with AC power.
- Assembly may be performed only by authorized specialists using appropriate tools!

Electrical connection

Observe the voltage and Type of current as specified on the Type plate.

Voltage tolerance $\pm 10\%$. Connection via cable plug, protection rating IP65.

Cable 3 x 0.75 mm². Flat pin terminal = ground connection.

Cable plug insert can be rotated by 4 x 90°. Tightening torque for cable plug attachment 1 Nm.

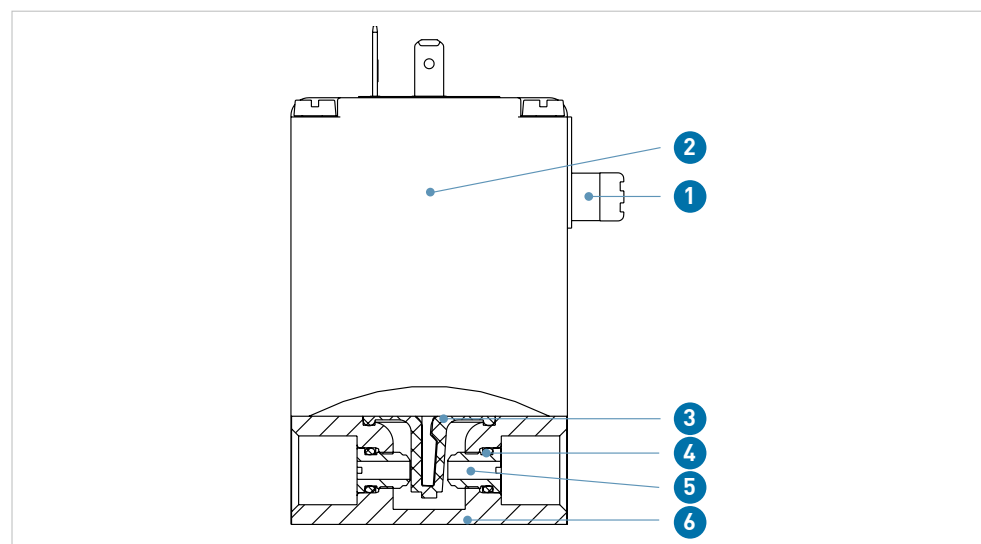
Maintenance notes

- Maintenance may be performed only by authorized specialists using appropriate tools.
- Secure the system against unintentional operation.
- Ensure a controlled restart after maintenance.



Installation and maintenance must be performed in accordance with the corresponding installation manual. The installation manual is provided with the product, see also the online product catalogue at www.gfps.com

1.4.2 Technical data



- ① Manual override
- ② Coil (Epoxy)
- ③ Diaphragm (EPDM, FKM)
- ④ O-ring (EPDM, FKM)
- ⑤ Valve body (PP-H, PVDF)

Specification

Nominal diameter	DN3 - DN5	
Port connection	G 1/4"	
Housing and seat materials	PP-H, PVDF	
Coil material	Epoxy	
Sealing material	EPDM, FKM	
Media	EPDM	Alkalines, acids up to medium concentration, detergent and bleach solutions
	FKM	Oxidizing acids and substances, oils and saline solutions, exhaust gases, oxygen
Medium temperature	EPDM	-30 to +80 °C
	FKM	0 to +80 °C
Viscosity	37 mm ² /s	
Ambient temperature	Max. +55 °C	
Voltages	24V AC/DC, 24V DC, 230V 50 Hz	
Voltage tolerance	±10%	
Rated duty	Intermittent operation	40 % ED (30 min) in 8 W designs
	Continuous duty	100 % ED in 5 W design (upon request)
Electrical connection	Pin terminal according to DIN EN 175301-803 form A for cable plug	
Protection rating	IP65 with cable plug	
Thermal insulation class coil	H	
Mounting position	As desired, preferably with actuator on top	

Electrical power consumption

Nominal diameter (mm)	Mechanism	Kv value ¹⁾ water (l/min)	Pressure range ²⁾		Power consumption Inrush (electrical)		Power consumption Operation(electrical)		Weight (kg)
			AC (bar)	DC (bar)	AC (VA)	DC (W)	AC (VA/W)	DC (W)	
3	A	4.2	0-10	0-8	30	8	15/8	8-11	0.4
	F		0-10	0-8	30	8	15/8	8-11	0.4
	E		0-6	0-4	30	8	15/8	8-11	0.4
4	A	5.0	0-5	0-4	30	8	15/8	8-11	0.4
	F		0-5	0-4	30	8	15/8	8-11	0.4
	E		0-3	0-2	30	8	15/8	8-11	0.4
5	A	6.7	0-4.5	0-3	30	8	15/8	8-11	0.4

¹⁾ Kv value (l/min) at +20 °C, 1 bar pressure at valve inlet and free outlet. At frequency DC the Kv-value is reduced till 10 % to fulfil the function.

²⁾ Pressure data (bar) gauge pressure. Rated power consumption 8 W.

Switching functions

Circuit function A	Circuit function E	Circuit function F
2/2-way valve (FC, Fail safe to close)	3/2 way mixing valve	3/2 way distribution valve

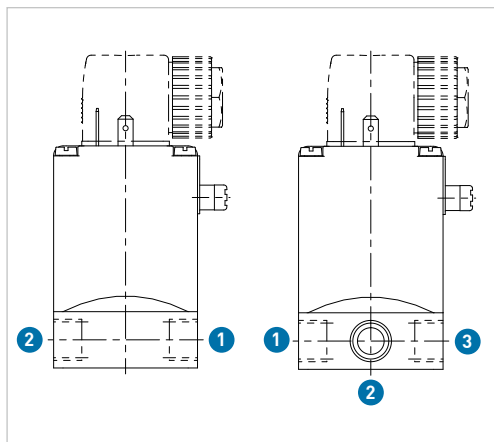
Switching time

Open		Close	
AC (ms)	DC (ms)	AC (ms)	DC (ms)
8 - 12	10 - 20	8 - 15	10 - 20

Switching time (ms): Measurement at valve outlet at 6 bar and +20 °C. Open: Pressure build-up 0% to 90%. Close: Pressure build-up 100% to 10%.

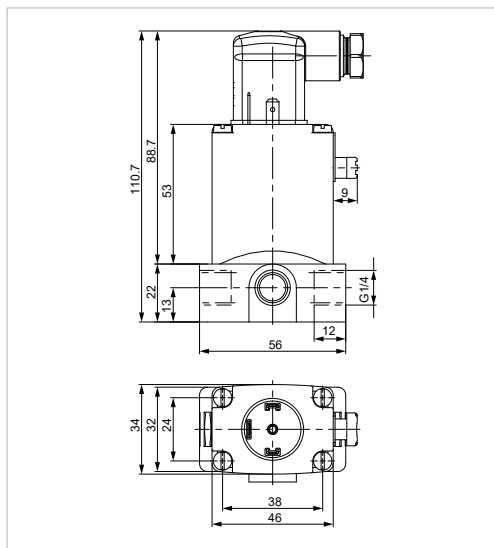
Possible port connections

The ports marked with 1, 2 and 3 are labelled in the drawing according to the circuit function table.



Circuit function	Port 1	Port 2	Port 3
A	P	A	
E	P1	A	P2
F	A	P	B

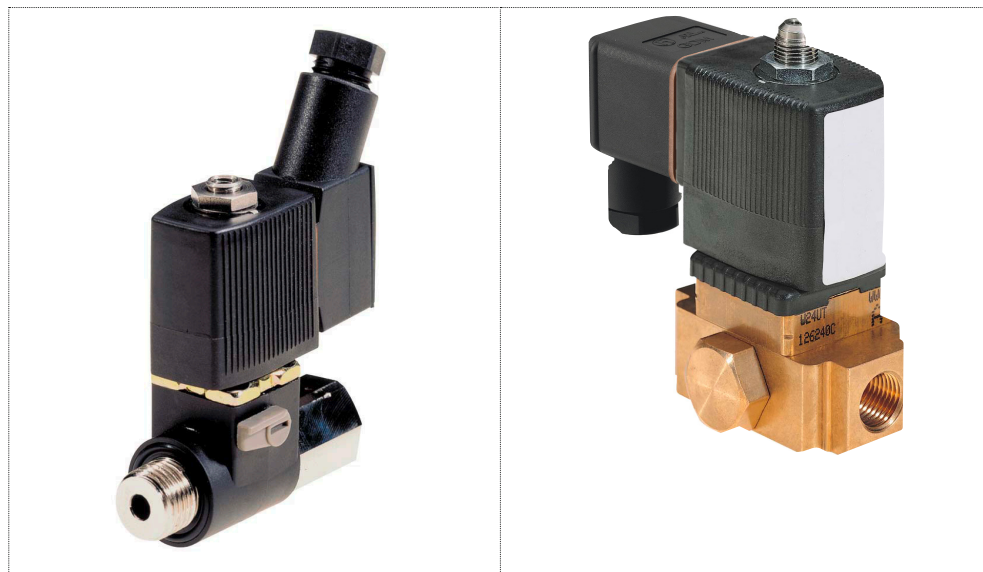
1.4.3 Dimensions



Mounting: By drilling M4 × 8 (metal housing) or self-tapping screws (plastic housing) on underside of the housing on the hole pattern 38 × 24.

2 Pilot valves for pneumatic actuators

2.1 Pilot valve type PV94/95 3/2-ways



Type PV94

Type PV95

Product description

The PV94/PV95 pilot valve is a direct-acting plunger valve. The 3/2-way solenoid valve is used to activate single-acting pneumatic actuators. The PV94 is designed for dimensions up to DN50, the PV95 for DN65-DN150. It is mounted directly on the actuator via a banjo bolt. A G $\frac{1}{8}$ connection is available as an air connection, for the PV94 as well as an additional 6 mm hose connector.

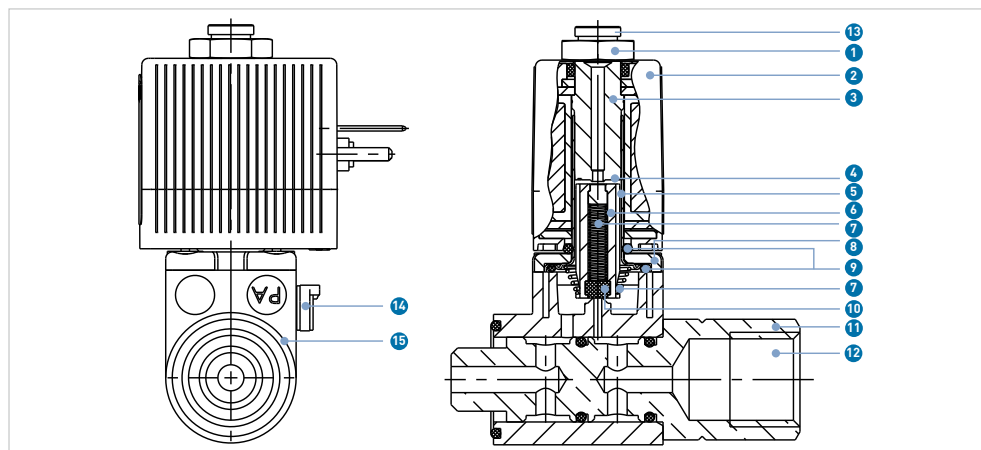
The PV94 is available in nominal size DN1.2, the PV95 in DN2, each with different voltages.

Benefits/features

- Direct acting and compact small valve
- Easy direct attachment to a pneumatic Actuator
- Service-friendly manual operation
- PV94: Push-over coil system
- PV95: Vibration-proof, bolted coil system

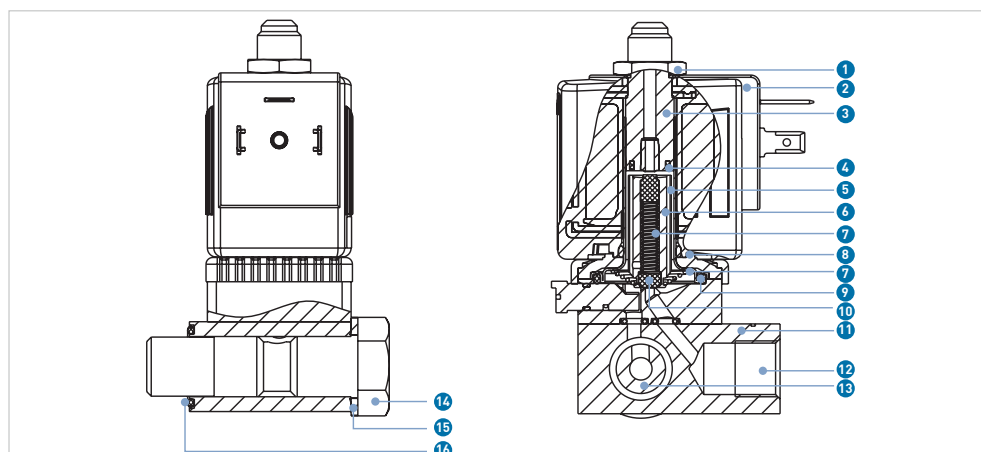
Technical data

PV94



- ① Locknut (Steel)
- ② Coil (PA)
- ③ Stopper (Stainless steel)
- ④ Shading ring (Copper)
- ⑤ Guide tube (Stainless steel)
- ⑥ Magnetic core (Stainless steel)
- ⑦ Spring (Stainless steel)
- ⑧ Sub-base (Stahl)
- ⑨ O-ring (FKM)
- ⑩ Armature seal (FKM)
- ⑪ Banjo bolt (Brass Nickel plated)
- ⑫ Pressure inlet P (Circuit function C)
- ⑬ Pressure inlet P (Circuit function D)
- ⑭ Hand lever (Durethane)
- ⑮ Valve body (PA)

PV95



- ① Locknut (Steel)
- ② Coil (PA)
- ③ Stopper (Stainless steel)
- ④ Shading ring (Copper)
- ⑤ Guide tube (Stainless steel)
- ⑥ Magnetic core (Stainless steel)
- ⑦ Spring (Stainless steel)
- ⑧ Sub-base (Steel)
- ⑨ O-ring (FKM)
- ⑩ Armature seal (FKM)
- ⑪ Valve body (Aluminum)
- ⑫ Pressure inlet P
- ⑬ Pressure inlet A
- ⑭ Screw (Brass Nickel plated)
- ⑮ Seal (Aluminum, NBR)
- ⑯ O-ring (NBR)

Specification	PV94	PV95
Nominal diameter	DN1.2	DN2
Housing material	Polyamide	Brass (flange housing) Aluminum anodized (Connector housing)
Coil material	Polyamide	Polyamide
Hollow screw	Nickel-plated brass	Nickel-plated brass
Sealing material	NBR	FKM
Media	Neutral gases and fluids	
Medium temperature	-10 °C to +60 °C	-10 °C to +100 °C
Ambient temperature	-10 °C to +40 °C	max. + 55 °C
Viscosity	Max. 21 mm²/S	
Port connection	G 1/8"	G 1/8", G 1/4"
Air connection	G 1/8", NPT 1/8", tube fitting Ø6mm	G 1/4", NPT 1/8"
Supply voltage	24 V DC 24 V, 50 – 60 Hz 115 V, 50 – 60 Hz 230 V, 50 – 60 Hz	
Voltage tolerance	+/-10 %	
Rated duty	Continuous duty 100 % ED, intermittent duty 40% ED (30min)	

* QNn value for air [l/min] at +20 °C, 6 bar valve inlet, pressure difference 1 bar

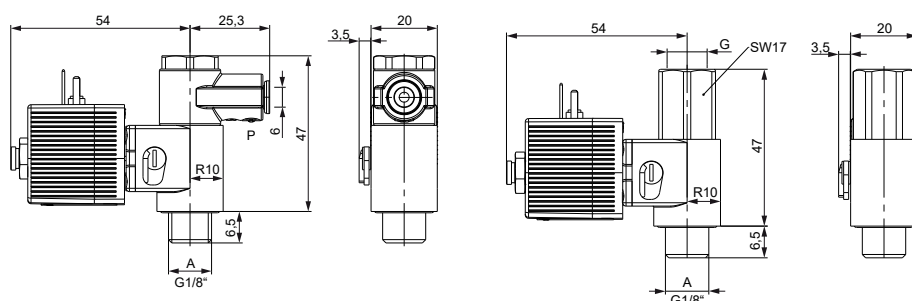
** Pressure data [bar] gauge pressure

*** Response time [ms]: Measured at the valve outlet at 6 bar and +20 °C open: pressure buildup 0 – 90 %, close: pressure release 100 – 0 %

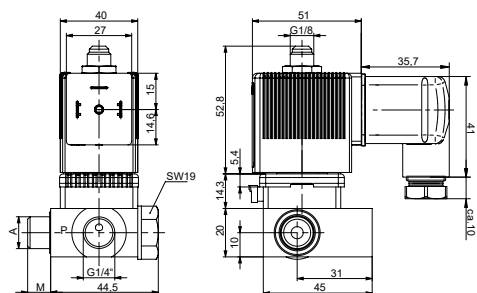
Specification	PV94	PV95
Electrical connections	Per DIN EN 175301-803* Form C	Per DIN EN 175301-803* Form A
Manual override	Standard	
Mounting position	User-defined, preferably actuator on top	
Weight	135 g	420 g
Protection rating	IP 65 with cable plug	
Coil insulation class	B	B
Circuit function	C (normally closed)	C (normally closed)
Q _N value air*	48 l/min	120 l/min
Pressure range**	0-10 bar (AC) / 0-6 bar (DC)	0 – 10 bar
Coil output	4W (AC, DC)	8 W (AC, DC)
Electrical power startup	9 VA (AC); 4 W (DC)	24 VA (AC), 8 W (DC)
Electrical power operation	6 VA (AC), 4 W (DC)	17 VA (AC), 8 W (DC)
Response time open***	7-10 ms (AC) / 7-12 ms (DC)	10-15 ms
Response time close***	9-12 ms (AC)/7-12 ms (DC)	15-20 ms

- * Q_N value for air [l/min] at +20 °C, 6 bar valve inlet, pressure difference 1 bar
- ** Pressure data [bar] gauge pressure
- *** Response time [ms]: Measured at the valve outlet at 6 bar and +20 °C open: pressure buildup 0 – 90 %, close: pressure release 100 – 0 %

Dimensions



Type PV94 with hose coupling

Type PV94 with G $\frac{1}{8}$ ” threaded connection


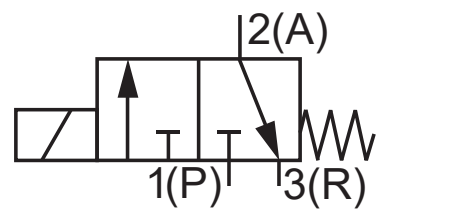
Type PV95

A = G $\frac{1}{8}$ ”; M = 6.5 mm

A = G $\frac{1}{4}$ ”; M = 8.0 mm

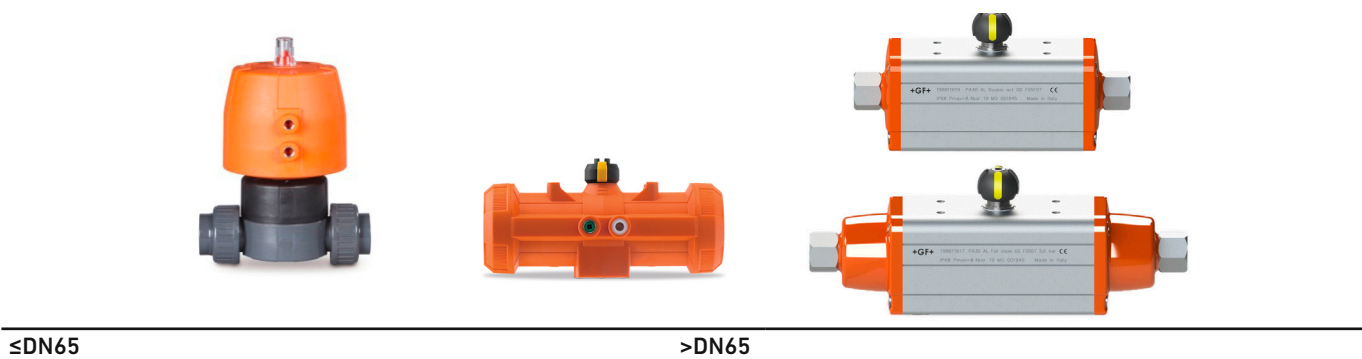
Switching functions

Circuit function C

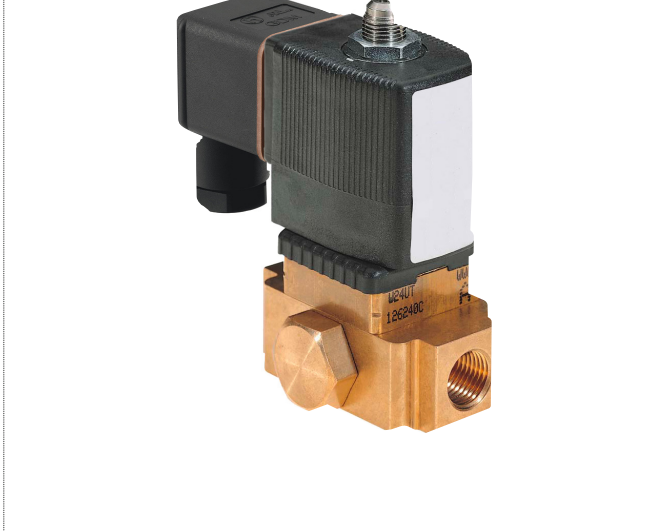


3/2 way direct-acting solenoid valve,
normally closed

Valve selection guide (metric) / NPT



PV94 PV95



Actuator connection			Actuator connection		
G1/8" with adapter union to G1/4"			G1/8" with adapter union to G1/4"		
Compressed air connection			Compressed air connection		
Metric		NPT	Metric		NPT
G1/8"	6 mm hose coupling	NPT1/8"	G1/4"		NPT1/8"
			10 bar max.		10 bar max.
24 V DC	24 V DC	24 V DC	24 V DC		24 V DC
24 V AC	24 V AC	115 V AC	24 V AC		110 V AC
110 V AC	110 V AC		110 V AC		
230 V AC	230 V AC		230 V AC		

2.2 3/2 – 5/2-way solenoid pilot valve MNL532



Product description

3/2 and 5/2-way solenoid valve for activating a double-acting pneumatic actuator. The mounting takes place via a NAMUR connection. For the dimensions of the DIASTAR series DN15 – DN50 and our pneumatic actuators PA11/21 a NAMUR connection plate must be used between the actuator and the solenoid pilot valve.

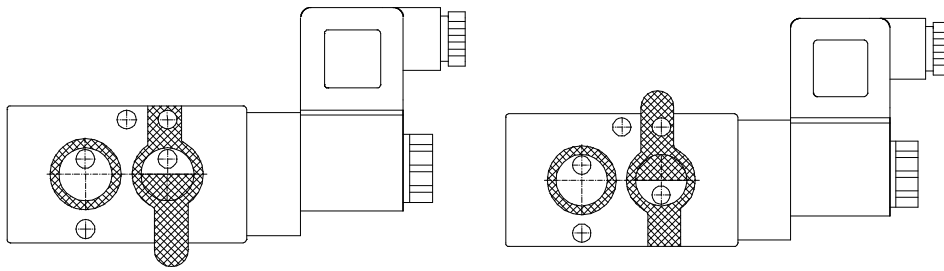
Benefits/features

- Easy change over from 5/2- to 3/2-ways operation by innovative sealing plate
- Single stable version
- Manual override

Technical data

Specification	
Air connection	G1/4"
Dimension	5.5 mm
Air pressure	2 – 10 bar
Temperature	-10 °C – +50 °C
Protection rating	IP65 per DIN40050
Voltage (V AC) / Power consumption	230 V / 5 VA, 115 V / 5 VA, 48 V / 5 VA, 24 V / 5 VA
Voltage (V DC) / Power consumption	24 V / 3 W
Air flow	950 l/min

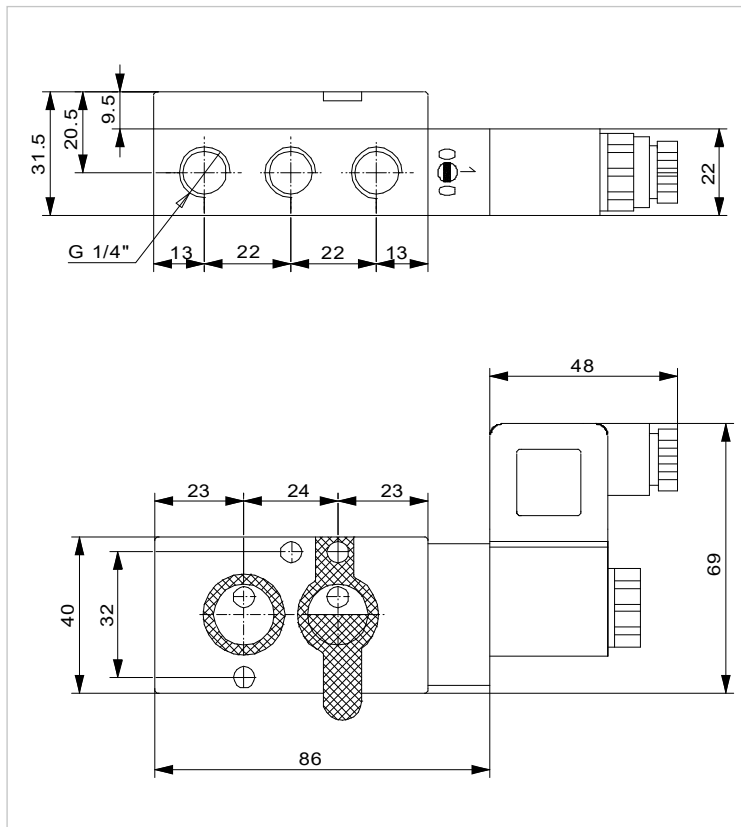
Sealing plate



5/2- ways function

3/2- ways function

Dimensions



2.3 4/2-way solenoid pilot valve Type 5470



2.3.1 Product description

Type 5470 is a 4/2-way solenoid valve for double acting pneumatic actuators. This valve consists of a pilot rocker solenoid valve and a pneumatic valve. A tilting bearing tilts within the housing of the pilot valve, similar to a rocker, and switches the valve. The minimal tilting movement of the rocker is wear-free; basic lubrication is not required. The valves can be mounted together individually using a module flange. They can be snapped together with the connection modules to form valve blocks (on request).

Benefits/features

- Compact design in 4/2-way version
- Extendable valve block
- Reduced power consumption
- Robust construction

Technical data

Technical data		
Product properties		
Materials	Body Inner valve parts Seal material	Polyamide (PA) Ultramid NBR
Weight	approx. 120g	
Nominal diameter	DN4	
Nominal operating mode	Continuous operation	
Electrical data		
Operating voltage	24V AC/DC, 110-120V AC/DC, 220-240V AC/DC	
Voltage tolerance	± 10 %	
Electrical power consumption	24V AC/DC: 2W, 110-120V AC/DC, 220-240V AC/DC: 3 W	
Performance data		
Pressure range	2...10 bar overpressure with respect to atmospheric pressure	
Q _{Nn} value air	300 l/min*	
Electrical nominal power	2...3 W; Solenoids with integrated rectifier, LED and varistor (UC variant) solenoids	
Medium data		
Operating media	Compressed air, neutral gases (5 µm filtration)	
Medium temperature	- 10...+ 50 °C	

Technical data**Approvals and certificates**

Protection class	IP65
Type of protection	Ex Ia IIC T6 on request

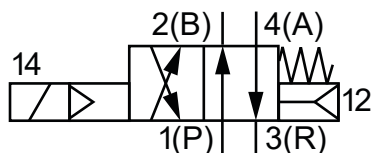
Product connections

Electrical connection	Connector lugs according to DIN EN 175301 – 803, Form C
Port connection	NAMUR
Air connection	Sleeve G 1/8

Environment and installation

Ambient temperature	- 10...+ 55 °C
Installation position	Any, preferably actuator face up

* Flow rate value for air, measurement at + 20 °C, 6 bar pressure at the valve inlet and 1 bar pressure difference

Switching functions**Circuit function G**

Type: G, solenoid valve

4/2 way

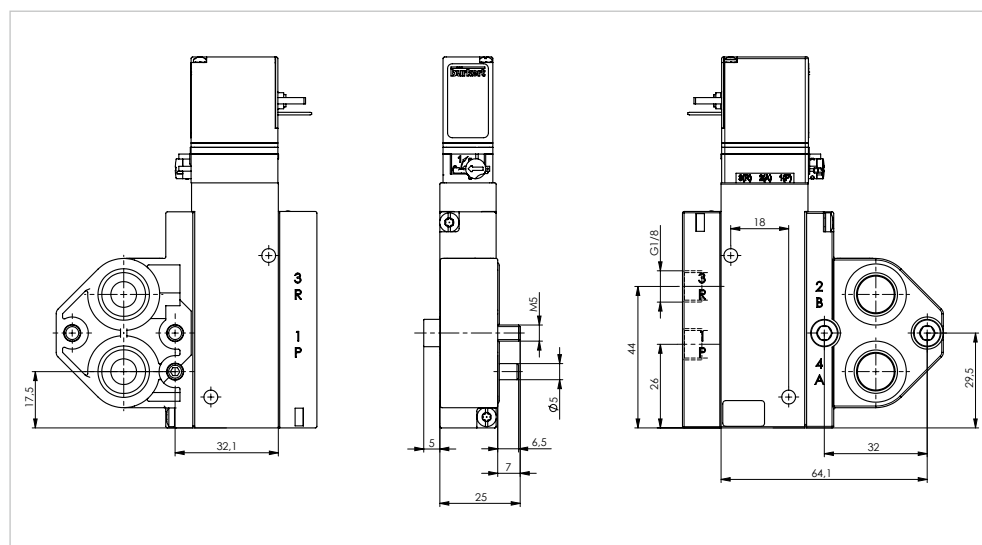
Servo-assisted

Normally open

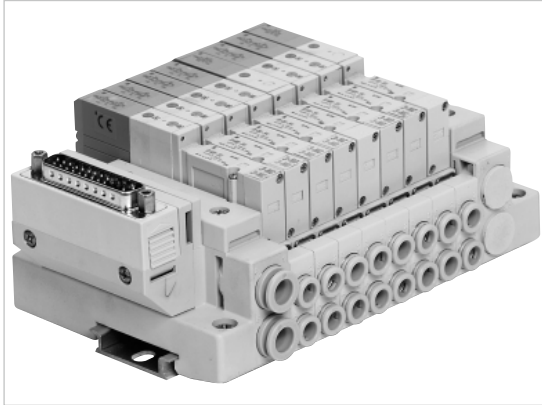
Switching time

Open	Close
15	12

Switching time (ms): Measurement at valve outlet according to ISO 12238 at 6 bar and +20 °C. Open: Pressure build-up 0% to 90%. Close: Pressure build-up 100% to 10%.

Dimensions

2.4 Pilot valve cluster PV2000



Product description

The pilot valve cluster PV 2000 is used for activating several actuators at the same time. It consists of a connecting module, several solenoid pilot valves and an end module. Depending on the application you can choose a connecting module for D-sub connection, AS interface or Profibus. The modular system allows combining 3/2 and 5/2-way valves as required by the application.

Benefits/features

- Compact design
- Fully modular
- Easy subsequent extension
- Connectors for electric as well as pneumatic connections
- 5/2- and 3/2-ways valves
- Bus interfaces available
- Low power consumption
- Optical position indicator
- Manual override

Environmental conditions

! Do not use valves in environments with corrosive gases, chemicals, salt water, water, steam, or where there is direct contact with any of these.

Products with protection class IP65 and IP67 (according to IEC529) are protected against dust and water. However, these products cannot be used in the water.

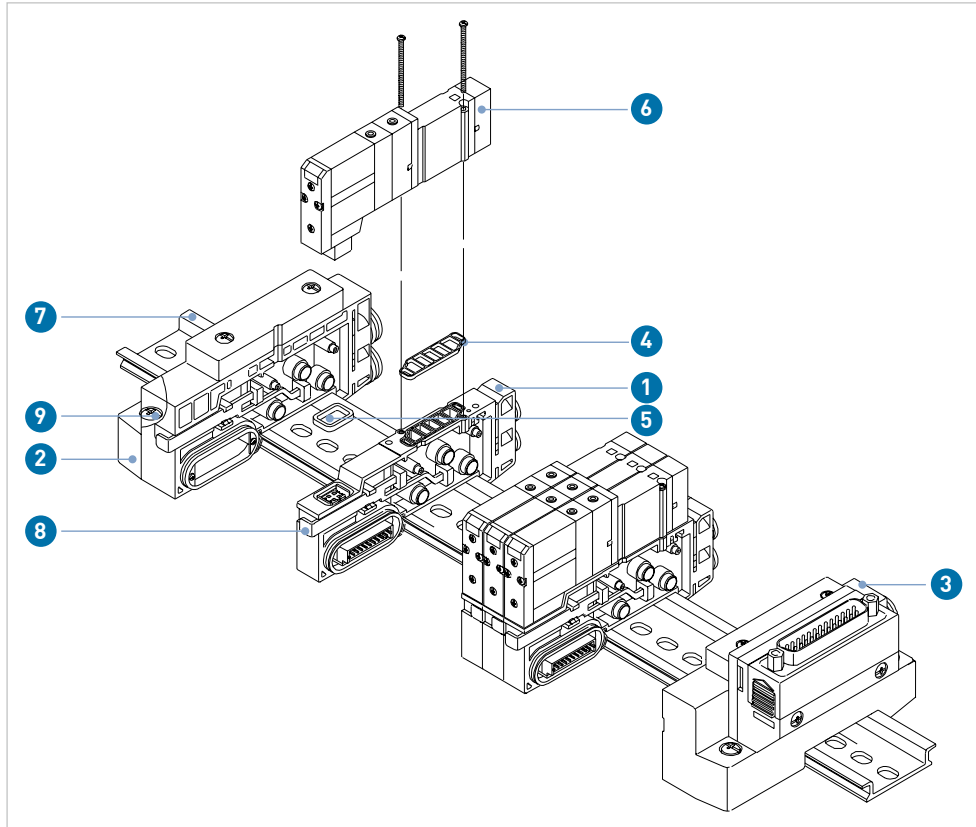
When using the manifold block assembly with integrated sound absorber and protection class IP67, it has to be ensured that the vent connection does not get in direct contact with water or other liquids.

Any liquid entering through the vent connection of the sound absorber can damage the valve. Do not use the valve in an explosive environment.

Do not use in locations subject to vibration or impact. Confirm the specifications in the technical datasheet. Use a protective cover to shield valves from direct sunlight. Shield valves from radiated heat generated by nearby heat sources. Employ suitable protective measures in locations where there is contact with oil or welding, spatter, etc.

If solenoid valves are mounted into a switch panel or if they are energized over a longer period, measures for diverting the excess heat must be taken, in order to comply with the admissible operating temperature.

Technical data



- ① Mounting base
- ② End module
- ③ Connection module with D-sub connector
- ④ Valve seal
- ⑤ Connector seal
- ⑥ Solenoid valve
- ⑦ DIN rail (customer-supplied)
- ⑧ Separation lever
- ⑨ Screw

Specification

Manifold type	Stacking type cassette base manifold	
1/3 (P: supply), 5 (R: exhaust)	Common supply, exhaust	
Valve station	Max. 18 stations	
Max. number of solenoids	18	
Port size	1(P)/3, 5(E) connection	C8 *
	4(A)/2(B) connection	C6 *
Internal pilot operating pressure range	1.5 to 7 bar	
Medium	Compressed air, 5 µm filter or smaller recommended	
Maximum operating frequency (Hz)	5	
Manual override	Non-locking type	
Pilot exhaust method	Main valve / pilot valve common exhaust	
Lubrication	Not required	
Mounting orientation	Unrestricted	
Impact/vibration resistance	150/30 ms (8.3 to 2000 Hz)	
Protection rating valves / D-sub connector	IP67/IP40 (acc. IEC529)	
Supply voltage / duty cycle	24 V DC / 100 %	
Allowable voltage fluctuation	± 10 % of rated voltage	
Power consumption	0.65 W	
Spark suppression	Zener diode	
Indicator light	LED	

* C6: One-touch fitting for
Ø 6 mm

* C8: One-touch fitting for
Ø 8 mm



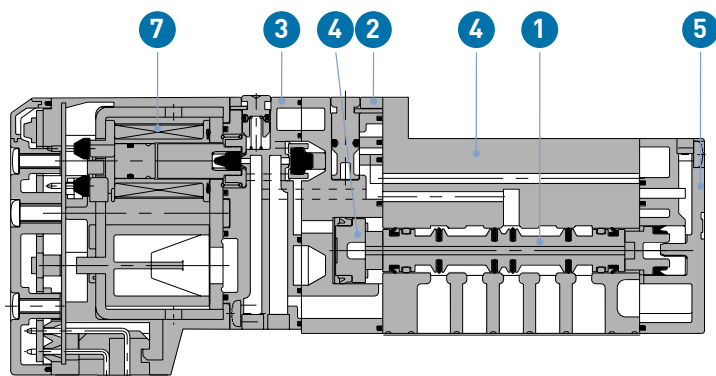
Impact resistance

No malfunction when tested with a drop tester in the axial direction and at a right angle to the main valve and armature, one time each in energized and de-energized states (at initial value).

Vibration resistance

No malfunction when tested with one sweep of 8.3 to 2,000 Hz in the axial direction and at a right angle to the main valve and armature, in both energized and de-energized states (at initial value).

Materials



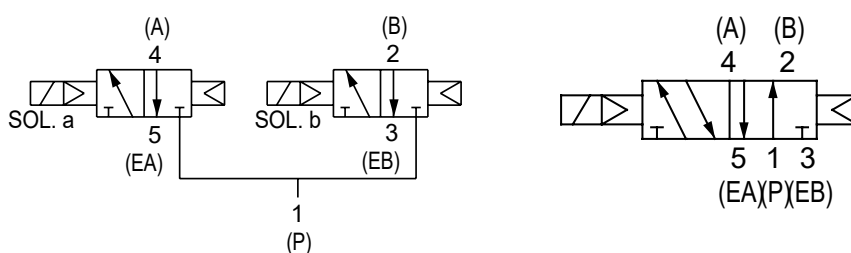
- ① Body (die-cast aluminum zinc)
- ② Adapter plate (Resin)
- ③ Pilot body (Resin)
- ④ Piston (Resin)
- ⑤ End plate (Resin)
- ⑥ Spool valve assembly (Aluminum/H-NBR)
- ⑦ Molded coil (Resin)

5/2-way valve

Flow characteristics

Model	Port size		Flow values	
	1, 5, 3	4, 2	1 → 4, 2 (P → A, B)	4, 2 → 5, 3 (A, B → EA, EB)
	(P/EA/EB)	(A/B)	Flow rate (l/min)	Flow rate (l/min)
SS5 V1-16	C8*	C6*	216	226

Mode of operation of valves



2 x 3/2-way valve

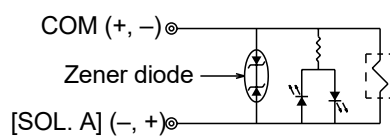
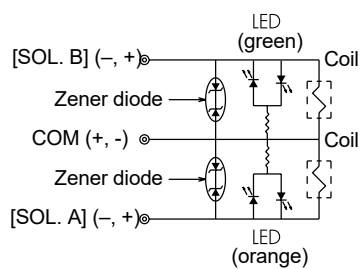
5/2-way valve

Electrical connections



When electric power is connected to the solenoid valve, be careful to apply the proper voltage. Improper voltage may cause malfunction or coil damage.

After completing the wiring, confirm that the connections are correct.



5/2-way valve

2 x 3/2-way valve

Assignment of wire colors as per DIN 4710

Process connection	Wire color	Marking
1	White	
2	Brown	
3	Green	
4	Yellow	
5	Grey	
6	Pink	
7	Blue	
8	Red	
9	Black	
10	Violet	
11	Grey	Pink
12	Red	Blue
13	White	Green
14	Brown	Green
15	White	Yellow
16	Yellow	Brown
17	White	Grey
18	Grey	Brown
19	White	Pink
20	Pink	Brown
21	White	Blue

Pneumatic connections



Use clean compressed air

Do not use compressed air which contains chemicals, synthetic oils containing organic solvents, salts or corrosive gases, etc., as this can cause damage or malfunction.

Install air filters

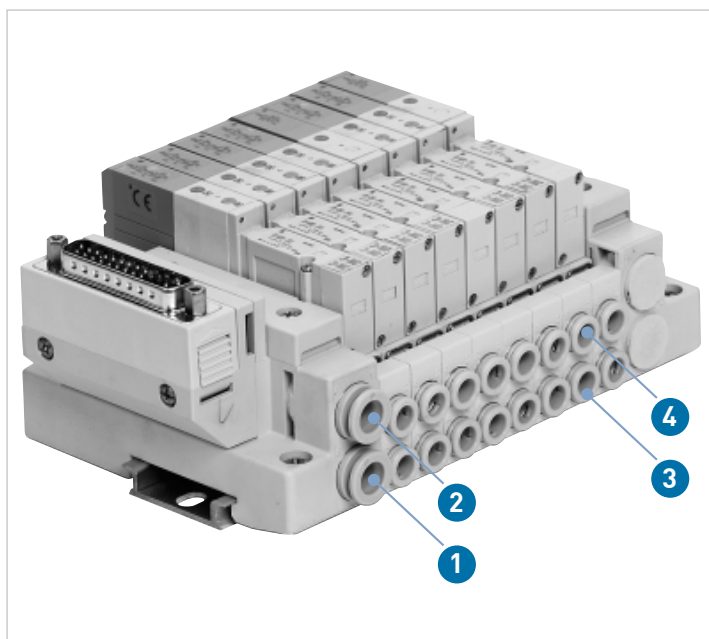
Install air filters close to valves at their upstream side. A filtration degree of 5 µm or less should be selected.

Install an air dryer, after-cooler or water separator

Air that contains excessive condensate may cause malfunction of valves and other pneumatic equipment. Take measures by installing an air dryer, after-cooler or water separator, etc.

Prevent any excessive carbon powder concentration, by installing water separators on the valve inlet side.

If excessive carbon powder is generated by the compressor, it may adhere to the inside of valves and cause malfunction.

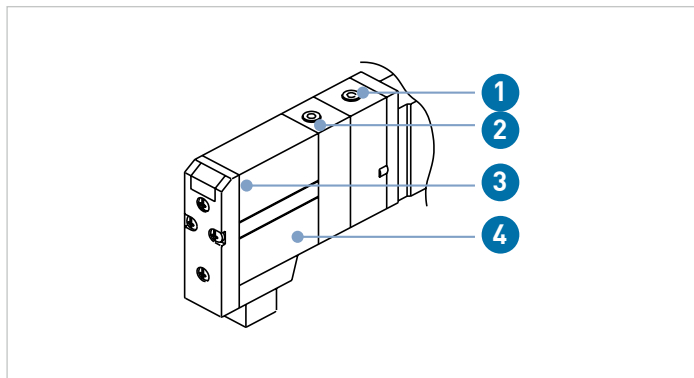


- ① Common exhaust
- ② Compressed air inlet
- ③ Valve outlet A
- ④ Valve outlet B

Manual override

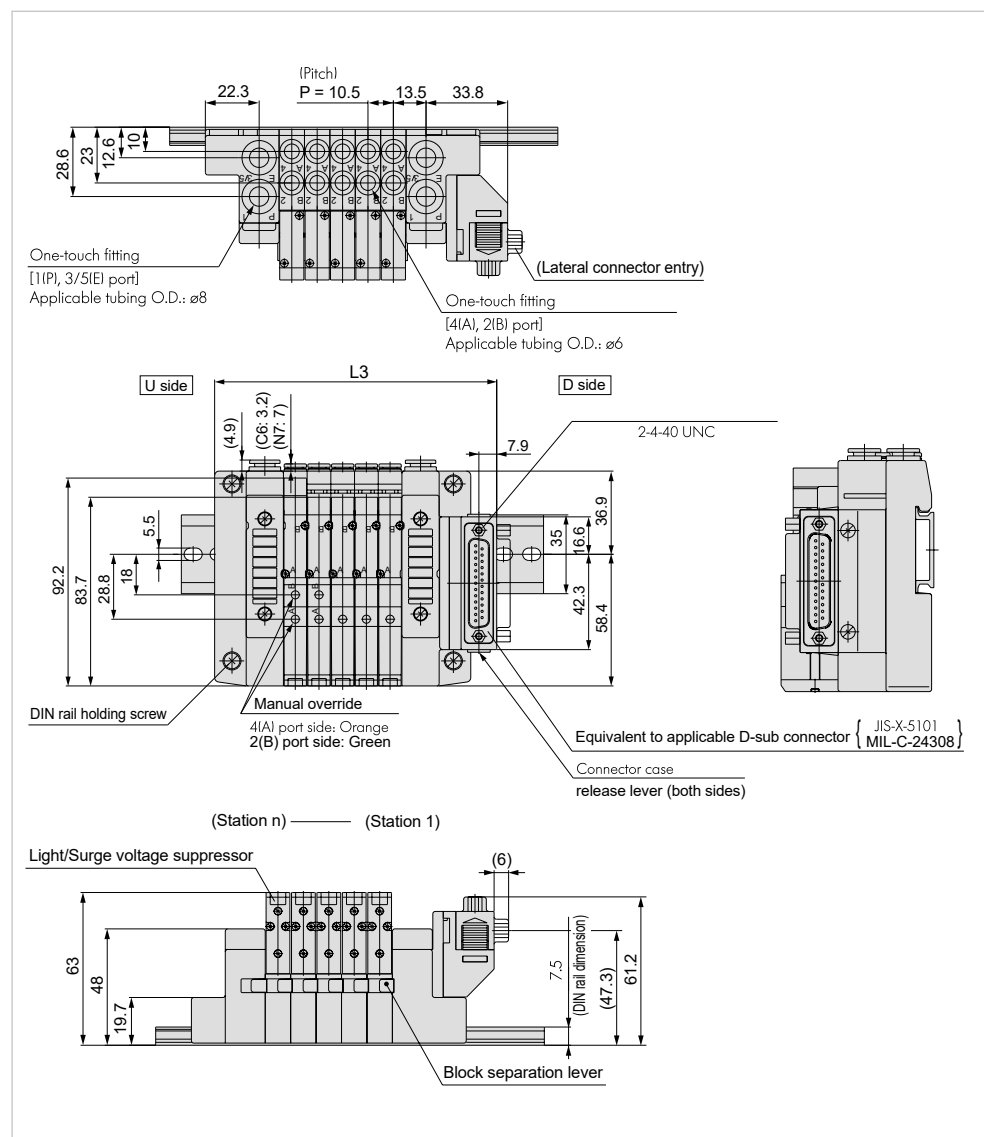


Handle carefully, as connected equipment can be actuated through manual override operation.



- ① Manual override for solenoid B
- ② Manual override for solenoid A
- ③ Solenoid A
- ④ Solenoid B

Dimensions



n	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
L3 (mm)	99.5	110	120.5	131	141.5	162.5	152	173	183.5	194	204.5	215	225.5	236	246.5	257	267.5

n = Number of stations

Planning Fundamentals of Valves and Automation

Valves – Check Valves

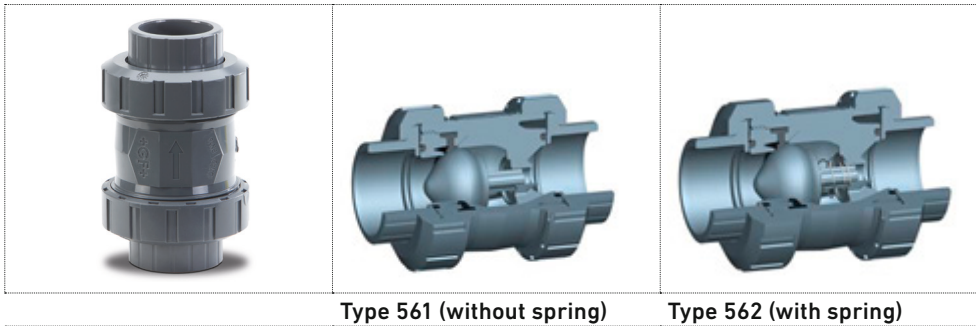
Content

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VI

1 Cone Check Valves

1.1 Check Valve Type 561/562



Type 561 (without spring)

Type 562 (with spring)

1.1.1 Product description

The innovative check valve design combines increased safety and efficiency with easy handling. The two check valves of Type 561 and Type 562 easily fit in all piping systems worldwide thanks to our comprehensive product range. The self-closing function and the silent operation of the valve support safety and comfort.

Function

The check valve is a component that allows the flow of the medium in one direction only.

Applications

- Microelectronics
- Chemical process industry
- Food and beverages
- Ship building
- Water treatment
- Cooling processes

Flow media

Media that are free of foreign particles, viscous, thick and gaseous media.

Benefits/features

Security

- Type 561 (no spring) is already 100 % leak-proof at a water column of 2 m
- The spring within the valve (Type 562) guarantees 100 % leak-tightness when the valve is in idle mode, even without a water column and when installed horizontally
- The gasket is always fixed in the same position. This prevents the gasket from slipping, bending or being washed out
- Corrosion-resistant
- Autonomous self-closing mechanism without an additional energy source
- Self-cleaning design – minimizes cleaning and maintenance
- Optimized flow design
- Corrosion-resistant and high pressure rating
- Wide range of materials for optimum chemical resistance
- High degree of safety and efficiency

Simplicity

The check valves of Type 561 and 562 are self-closing. This means that no other energy source is needed than the pressure in the pipe.

Efficiency

Thanks to the aerodynamic design of the check cone, the valve permits a far higher flow rate than standard check valves with a ball.

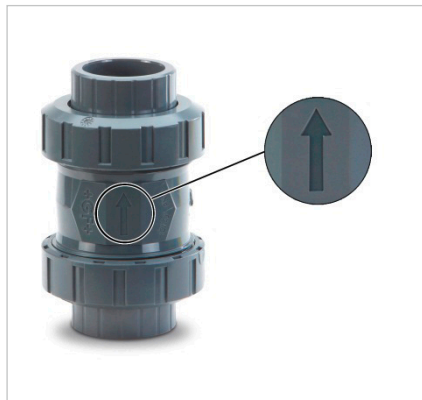
Valve handling

Installation notes

- Before or after pumps, other valves or changes of direction, a turbulence-free section of 10xDN before and 5xDN after the valve must be provided.
- Check valves are not suitable for use with media containing solids. When selecting a check valve, make sure that the density (specific weight) of the cone is greater than that of the medium (exception: bleed valve).
- When used as a bleed valve, the density of the cone must be less than the density of the medium.
- The flow of the fluid must be even across the entire cross-section of the check valve in order for it to work properly. If necessary (after pumps, changes in direction) a damping zone should be allowed for. Cavitation should be avoided.
- Threaded parts have a reverse thread in order to avoid unintended opening when connecting components with threads are removed from the pipe.
- GF Piping Systems recommends that you do not use check valves of Type 561 and 562 as ventilating and bleed valves. Instead, use the ventilating and bleed valves of Type 595 and 591 that were specially developed for this purpose.

Arrows

- The arrow on the valve housing indicates the direction of the flow. For applications with vertical flow, only an upward flow is permitted, i.e. the arrow must point upward. If installed in the opposite direction, the shut-off function is not guaranteed.



Joining technology

Only identical materials may be joined together via fusion or adhesive joints. Sections of pipework with adhesive joints must be rinsed with non-pressurized water as soon as possible after completion of the joints. Hand-tighten the coupling nuts on the valve.

Opening and closing conditions

The values for the opening conditions apply to vertical installation (recommended mounting position). In the case of horizontal installation, the valve opens at much lower differential pressures.

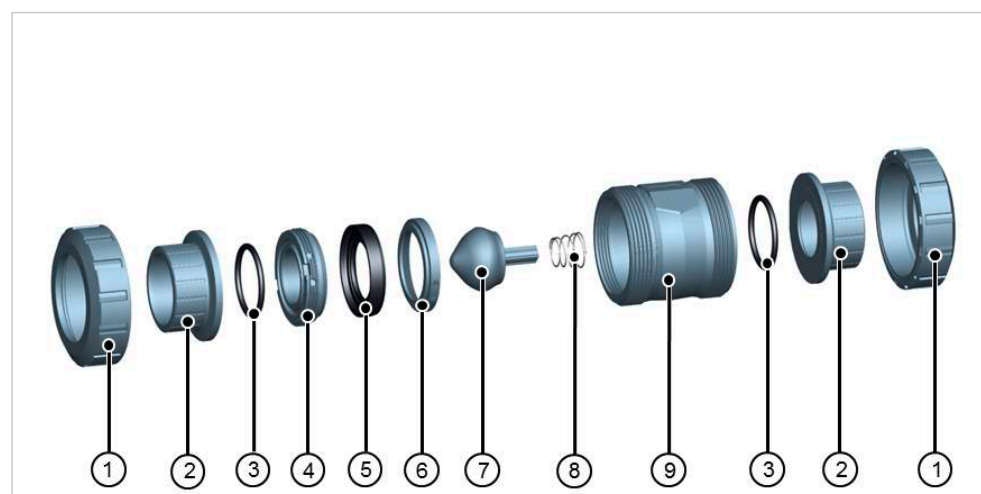
Maintenance notes

Check valves require no maintenance under normal operating conditions. It is sufficient to check periodically that there is no leakage. Should leakage or other malfunctions occur, follow the instructions under "Safety information". We recommend performing a function test for check valves that are kept permanently in the same position 1 or 2 times per year to check their function.



Installation and maintenance must be performed in accordance with the corresponding installation manual. The installation manual is provided with the product, see also the online product catalogue at www.gfps.com

1.1.2 Technical data



- ① Coupling nut
- ② Connecting part
- ③ O-ring
- ④ Screw-in ring
- ⑤ Sealing ring
- ⑥ Back-up ring
- ⑦ Cone
- ⑧ Spring (Type 562)
- ⑨ Housing

Specification

Dimensions	d16/DN10 - d110/DN100, 3/8" - 4"	
Materials	Valve body	PVC-U, PVC-C, ABS, PP-H, PVDF
	Spring Type 562	Standard: V2A Optional: Nimonic 90 Halar (ECTFE) coated
Gasket materials and O-rings	EPDM, FKM, FFKM, FEP coated	
Pressure levels	PVC-U, PVC-C, PVDF	PN16
	PP-H, ABS	PN10
Connections	Solvent cement sockets ISO, BS, ASTM/ANSI, JIS	
	Solvent cement spigots ISO	
	Threaded sockets ISO, BS, ASTM/ANSI	
	Fixed flange ISO, BS	
	Butt fusion spigots, long, PE100 SDR17 ISO	
Approvals	ACS, FDA, DIBt, TA-Luft, NAMSA	

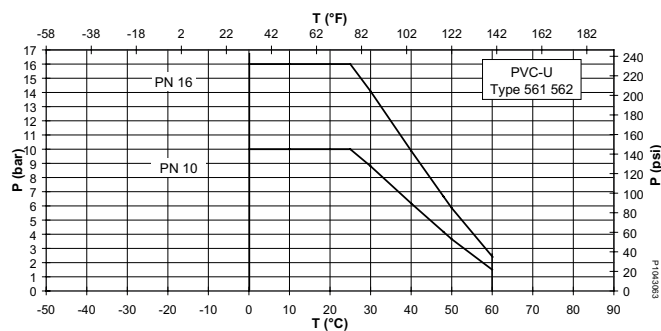
Kv 100 values

DN (mm)	Inch (inch)	d (mm)	Kv 100 (l/min)	Cv 100 (gal/min)	Kv 100 (m³/h)
10	3/8	16	190	13	11
15	1/2	20	190	13	11
20	3/4	25	380	26	23
25	1	32	460	32	28
32	1 1/4	40	850	59	51
40	1 1/2	50	1080	75	65
50	2	63	1670	115	100
65	2 1/2	75	2950	204	177
80	3	90	3600	248	216
100	4	110	4150	286	249

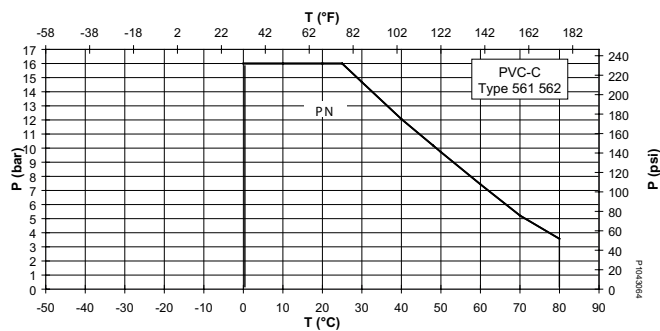
Pressure-temperature diagrams

The following pressure-temperature diagrams are based on a lifetime of 25 years and water or similar media.

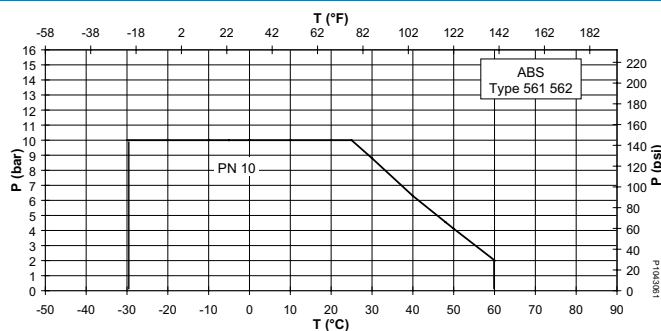
PVC-U



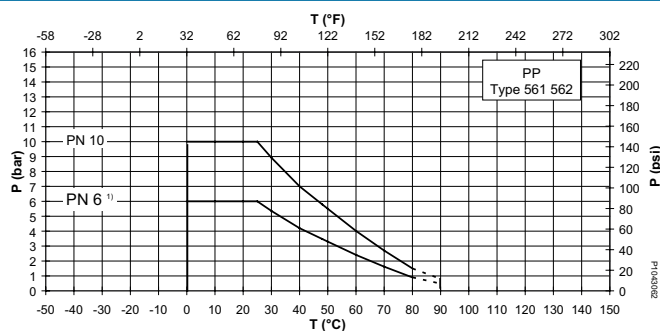
PVC-C



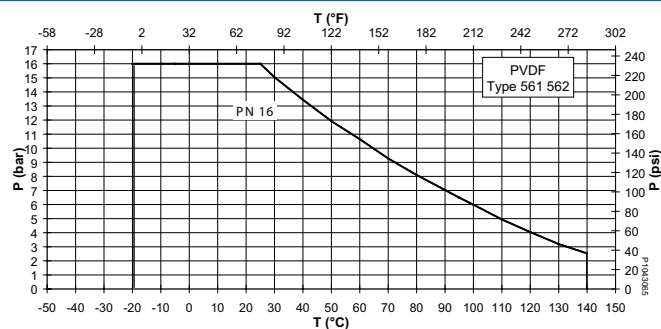
ABS



PP



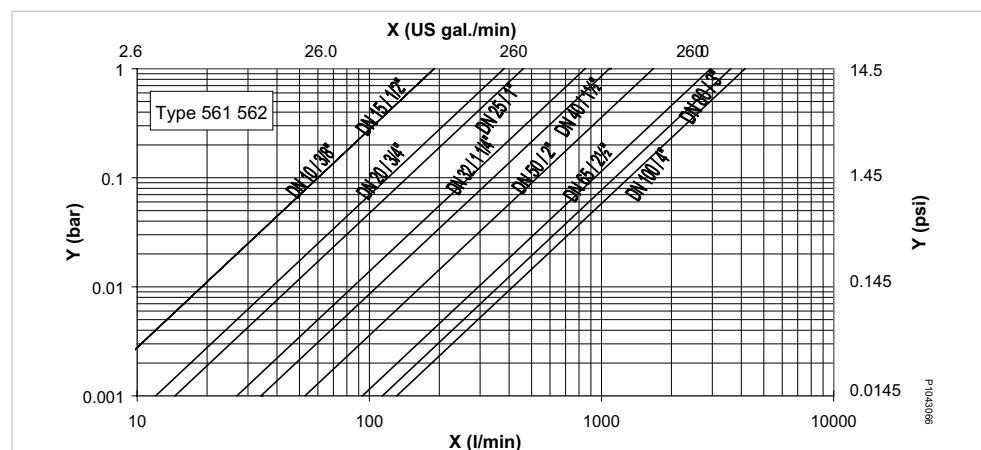
PVDF



T Temperature (°C, °F)

P Permissible pressure (bar, psi)

Pressure losses



X Flow rate
(l/min, US gal/min)
Y Pressure loss Δp (bar, psi)

DN (mm)	Open (vertical installation)		Close ¹⁾			
	Differential pressure for lifting the cone (bar)	Differential pressure for full stroke of the cone (bar)	Flow for full stroke of the cone (l/min)	Min. flow rate for full stroke (m/sec)	Leak-tight starting at (bar)	Type 562 leak-tight starting at (bar)
10	0.003	0.01	8	0.7	0.2	0.1
15	0.003	0.01	9	0.7	0.2	0.1
20	0.003	0.01	13	0.7	0.2	0.1
25	0.005	0.01	18	0.8	0.2	0.1
32	0.005	0.01	35	0.8	0.2	0.1
40	0.01	0.01	70	0.8	0.2	0.1
50	0.02	0.01	100	0.8	0.2	0.1
65	0.025	0.01	120	0.9	0.2	0.1
80	0.03	0.01	170	0.9	0.2	0.1
100	0.03	0.08	250	1.0	0.2	0.1

¹⁾ Vertical and horizontal installation.

The information in the table apply to water or water-like media with a density of approximately 1g/cm³. If media with a higher density are used, please note that, depending on the material used, the cone may float and the closing function of the cone is no longer guaranteed. This is dependent on the material used. The values for the opening conditions apply to vertical installation (recommended installation location). In the case of horizontal installation, the valve opens at much lower differential pressures.

Material	Density (g/cm ³)
ABS	1.03
PP-TV 20 (cone: PP-talk)	1.05
PP-H	0.91
PVC-U	1.38
PVC-C	1.50
PVDF	1.78

Pressure for raising cone Type 562

DN (mm)	Differential pressure for raising the cone (bar)
10	0.028
15	0.028
20	0.030
25	0.030
32	0.035
40	0.040
50	0.050
65	0.060
80	0.060
100	0.060

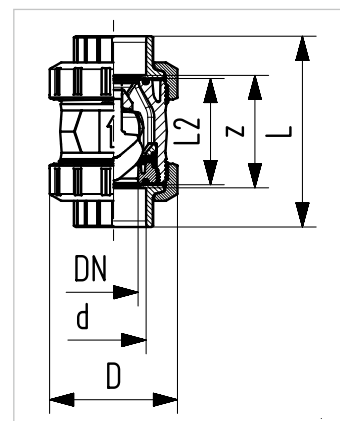
Reference values for tightening torque of screws

d (mm)	DN (mm)	inch (inch)	Total number of screws	Torque flat gasket		Torque profile flat gasket	
				(Nm)	(lb-ft)	(Nm)	(lb-ft)
20	15	½	4 x M12 x 50	10	7.4	10	7.4
25	20	¾	4 x M12 x 55	10	7.4	10	7.4
32	25	1	4 x M12 x 60	15	11	10	7.4
40	32	1¼	4 x M16 x 65	20	15	15	11
50	40	1½	4 x M16 x 70	25	18	15	11
63	50	2	4 x M16 x 75	35	26	20	15
75	65	2½	4 x M16 x 90	50	37	25	18
90	80	3	8 x M16 x 100	30	22	15	11
110	100	4	8 x M16 x 130	35	26	20	15

1.1.3 Dimensions

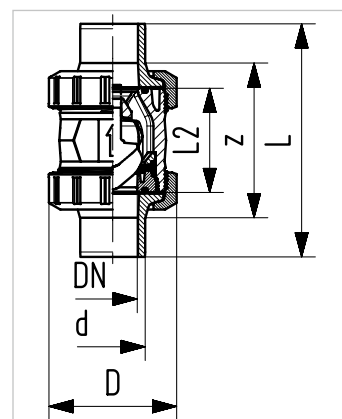
Type 561/562 with solvent cement sockets, metric

d (mm)	DN (mm)	D (mm)	L (mm)	l2 (mm)	z (mm)	closest (inch)
16	10	50	92	56	64	¾
20	15	50	95	56	64	½
25	20	58	110	65	72	¾
32	25	68	123	71	79	1
40	32	84	146	85	94	1 ¼
50	40	97	157	89	95	1 ½
63	50	124	183	101	107	2
75	65	166	233	136	144	2 ½
90	80	200	254	141	151	3
110	100	238	301	164	174	4



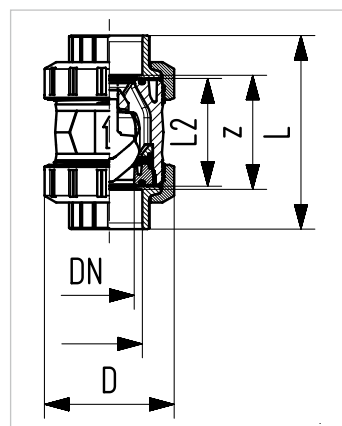
Type 561/562 with solvent cement spigots, metric

d (mm)	DN (mm)	D (mm)	L (mm)	l2 (mm)	z (mm)	closest (inch)
16	10	50	114	56	56	3/8
20	15	50	124	56	56	1/2
25	20	58	144	65	65	3/4
32	25	68	154	71	71	1
40	32	84	174	85	85	1 1/4
50	40	97	194	89	89	1 1/2
63	50	124	224	101	101	2
75	65	166	284	136	136	2 1/2
90	80	200	300	141	141	3
110	100	238	340	164	164	4



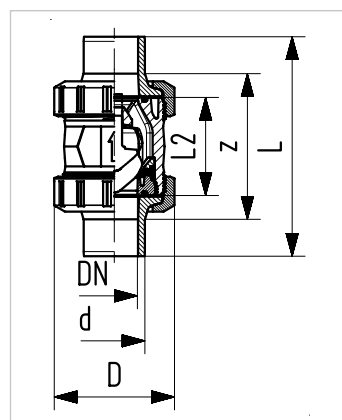
Type 561/562 with threaded socket, Rp

DN (mm)	D (mm)	L (mm)	l2 (mm)	z (mm)	Rp (inch)
10	50	95	56	69	3/8
15	50	100	56	67	1/2
20	58	114	65	78	3/4
25	68	127	71	85	1
32	84	146	85	100	1 1/4
40	97	152	89	106	1 1/2
50	124	177	101	121	2
65	166	233	136	144	2 1/2
80	200	254	141	151	3
100	238	301	164	174	4



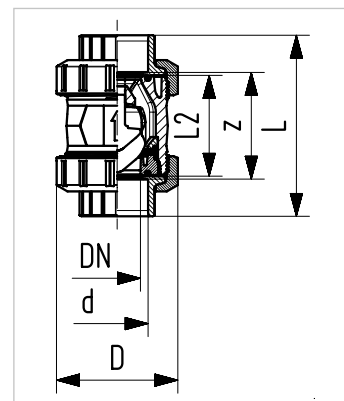
Type 561/562 with socket fusion spigot, metric

d (mm)	DN (mm)	D (mm)	L (mm)	l2 (mm)	closest (inch)
16	10	50	110	56	3/8
20	15	50	120	56	1/2
25	20	58	139	65	3/4
32	25	68	150	71	1
40	32	84	170	85	1 1/4
50	40	97	190	89	1 1/2
63	50	124	220	101	2
75	65	166	280	136	2 1/2
90	80	200	296	141	3
110	100	238	336	164	4



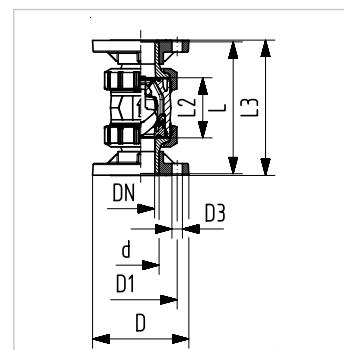
Type 561/562 with solvent cement sockets, metric

d (mm)	DN (mm)	D (mm)	L (mm)	l2 (mm)	z (mm)	closest (inch)
16	10	50	93	56	67	3/8
20	15	50	95	56	66	1/2
25	20	58	109	65	77	3/4
32	25	68	119	71	83	1
40	32	84	135	85	99	1 1/4
50	40	97	147	89	105	1 1/2
63	50	124	168	101	117	2
75	65	166	233	136	167	2 1/2
90	80	200	254	141	180	3
110	100	238	301	164	215	4



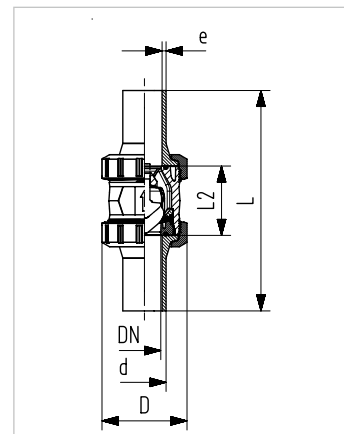
Type 561/562 with fixed flange, metric

d (mm)	DN (mm)	D (mm)	D1 (mm)	D3 (mm)	L (mm)	l2 (mm)	l3 (mm)	closest (inch)
20	15	95	65	14	124	56	130	1/2
25	20	105	75	14	144	65	150	3/4
32	25	115	85	14	154	71	160	1
40	32	140	100	18	174	85	180	1 1/4
50	40	150	110	18	194	89	200	1 1/2
63	50	165	125	18	224	101	230	2



Type 561/562 with butt fusion spigot, long, metric

d (mm)	DN (mm)	D (mm)	L (mm)	l2 (mm)	e (mm)	closest (inch)
20	15	50	193	56	2.3	1/2
25	20	58	216	65	2.3	3/4
32	25	68	223	71	3	1
40	32	84	249	85	3.7	1 1/4
50	40	97	271	89	4.6	1 1/2
63	50	124	321	101	5.8	2



1.1.4 Accessories

- Foot valve with suction basket as protection against contamination



For further information on accessories, refer to the online product catalogue at www.gfps.com

2 Wafer Check Valves

2.1 Check Valve Type 369



2.1.1 Product description

GF Piping Systems flap traps of Type 369 are designed especially for large installations, require little servicing and effort and are extremely compact. The design is optimized for installations between ISO/DIN as well as ANSI/BS connections. The flap traps can be installed either horizontally or vertically. If a medium flows in the flow direction, it opens up the plate of the flap trap, allowing the medium to flow through. If the medium pressure falls below a certain threshold, the flap closes again.

Function

After installation in piping systems, the flap traps of Type 369 are intended exclusively for preventing media from flowing back within the allowable pressure and temperature range.

The flap traps are available with or without a return spring made of V4A or Hastelloy. They are suitable for horizontal or vertical installation.

Applications

- Water treatment
- Chemical process industry

Benefits/features

- Self-closing check valve for horizontal or vertical installation (water column / gravity / optional spring)
- Suitable for installation between both ISO/DIN and ANSI/BS connecting elements
- Simple installation between standard flanges
- Only highly resistant materials
- Robust and maintenance-free design
- All parts that come into contact with media are made in highly resistant plastics and elastomers
- Optimized special flange gasket made of EPDM or FKM already installed in the valve housing are suited for fluted connecting elements
- Disc seals are available in EPDM or FKM and are installed in plates
- For pulsating flow, flap traps with reset spring (made of stainless steel V4A or Hastelloy C) are available. This reduces noise development

Flow media

Media that are free of foreign particles, media containing solids, as well as crystallizing, viscous, thick and gaseous media.

Valve handling

Installation notes

- Install between ISO/DIN (all dimensions) and ANSI/BS valve ends (all except DN32 and DN125)
- Installation with ANSI/BS valve ends: for flap traps in the dimensions DN40 to DN80, ANSI/BS valve ends of the next larger dimension must be used (example DN40 flap trap between DN50 ANSI/BS valve ends).
- Centering through housing diameter (ISO/DIN through D3, ANSI/BS through D)
- Before and after the flap trap, a damping zone of at least 5 times the nominal diameter (DN) should be planned for (we recommend 10 times the nominal diameter).
- Do not install directly on pump flange or subsequent bend.
- PVC-U: The using of PVC-U pipe PN16 is only possible up to d63. Pay attention on installation between ANSI/BS flange adaptors. The WCV DN32 does not fit together with ANSI/BS flange adaptors. For wafer check valve in the dimensions DN40 to DN80 the next larger size of ANSI/BS flange adapter has to be used (example: a DN40 valve has to be mounted between DN 50 ANSI/BS flange adaptors).
- PP and PE: To ensure the proper function of the valve in PP and PE piping systems, a suitable outlet adaptor is required on the outlet side. Please contact your local GF sales representative for further information.
- PVDF: GF recommends for PVDF piping systems the use of a fusion neck one size larger than the pipeline or the use of a wafer check valve one size smaller than the pipe. (example: two d110 fusion necks should be used for the wafer check valve d90).

Selection of lubricant

Using incorrect lubricants can corrode the material of the check valve or the gaskets.

- Mineral oil-based lubricants and Vaseline (petrolatum) are not appropriate.
- All gaskets should be lubricated with silicon- or polyol-based grease.

Maintenance notes

In normal operation, flap traps do not need maintenance. It is sufficient to check periodically that there is no leakage. If media exits at the flange connections, the flange connections must be tightened or replaced in accordance with the tables in "Guidelines for fastening screws".



Installation and maintenance must be performed in accordance with the corresponding installation manual. The installation manual is provided with the product, see also the online product catalogue at www.gfps.com

2.1.2 Technical data



Specification

Dimensions	d40/DN32 – d315/DN300 / 1¼" – 12" to DN600 / 24" available upon request
	PVC-U, PP-H, PVDF
Gasket materials	EPDM, FKM
Pressure level	PN6/PN10
Connections	Flange joints

Kv 100 values

DN (mm)	Inch (inch)	d (mm)	Kv 100 (l/min) ($\Delta p = 1 \text{ bar}$)	Cv 100 (US gal./min) ($\Delta p = 1 \text{ psi}$)	Kv 100 (m³/h) ($\Delta p = 1 \text{ bar}$)
32	1¼	40	270	18.9	16.2
40	1½	50	370	25.9	22.2
50	2	63	900	63	54
65	2½	75	1140	79.8	68
80	3	90	1870	130.9	112
100	4	110	2870	200.9	172
125	5	140	5700	399.0	342
150	6	160	6900	483.0	414
200	8	225	18800	1316.0	1128
250	10	280	25000	1750.0	1500
300	12	315	27600	1932.0	1656

PP with outlet flange adapter PP/PE, SDR11, PN10

DN (mm)	Inch (inch)	d (mm)	Kv 100 (l/min) ($\Delta p = 1 \text{ bar}$)	Cv 100 (US gal./min) ($\Delta p = 1 \text{ psi}$)	Kv 100 (m³/h) ($\Delta p = 1 \text{ bar}$)
32	1¼	40	280	19.6	16.8
40	1½	50	340	23.8	20.4
50	2	63	610	42.7	36.6
65	2½	75	1230	86.1	74
80	3	90	2610	182.7	157
100	4	110	3930	275.1	236
125	5	140	7120	498.4	427
150	6	160	9180	642.6	551
200	8	225	17600	1232.0	1056
250	10	280	24400	1708.0	1464
300	12	315	31900	2233.0	1914

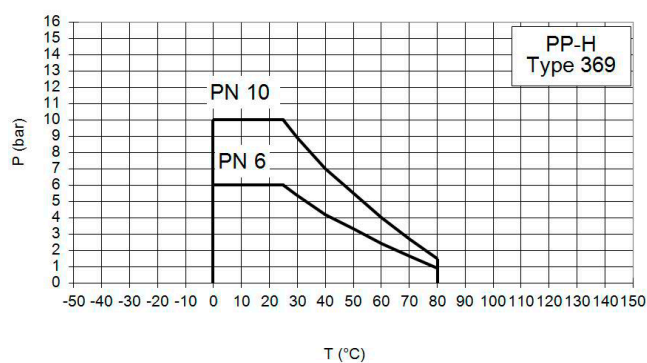
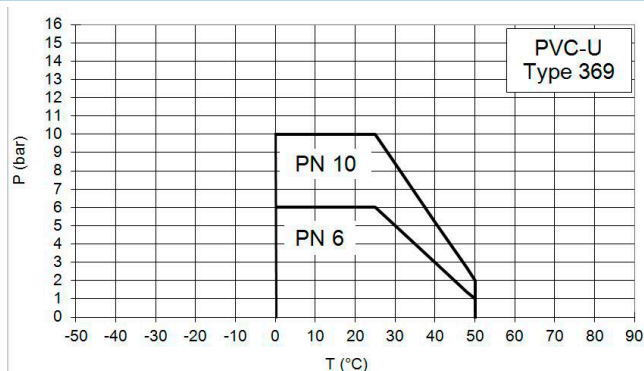
PVDF, pipe PN16 SDR26, PN10 SDR33 from d90

DN (mm)	inch (inch)	d (mm)	Kv 100 (l/min) ($\Delta p = 1$ bar)	Cv 100 (US gal./min) ($\Delta p = 1$ psi)	Kv 100 (m ³ /h) ($\Delta p = 1$ bar)
32	1¼	40	280	19.6	16.8
40	1½	50	340	23.8	20.4
50	2	63	610	42.7	36.6
65	2½	75	1230	86.1	74
80	3	90	2610	182.7	157
100	4	110	3930	275.1	236
125	5	140	7120	498.4	427
150	6	160	9180	642.6	551
200	8	225	17 600	1232.0	1056
250	10	280	24 400	1708.0	1464
300	12	315	31 900	2233.0	1914

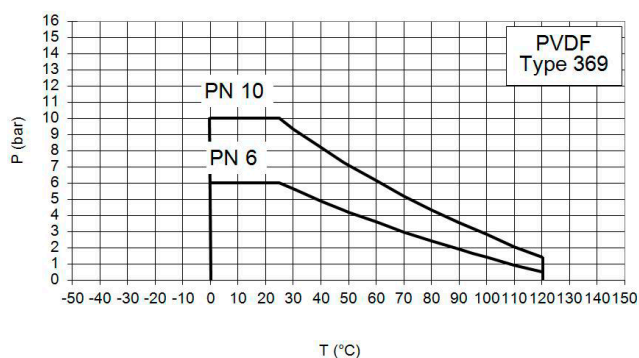
Pressure-temperature diagrams

PVC-U

PP-H



PVDF

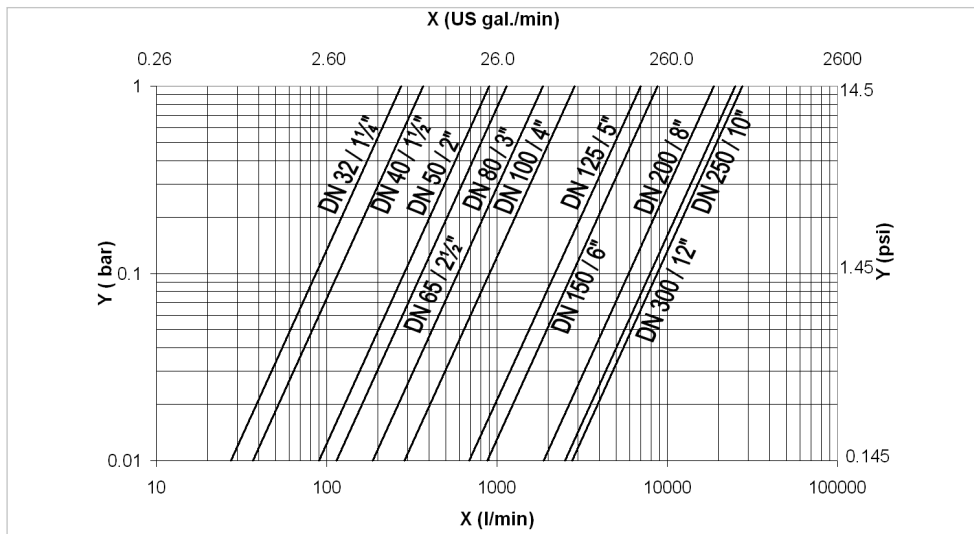


T Temperature (°C, °F)

P Permissible pressure (bar, psi)

Pressure losses

PVC-U, pipe PN10

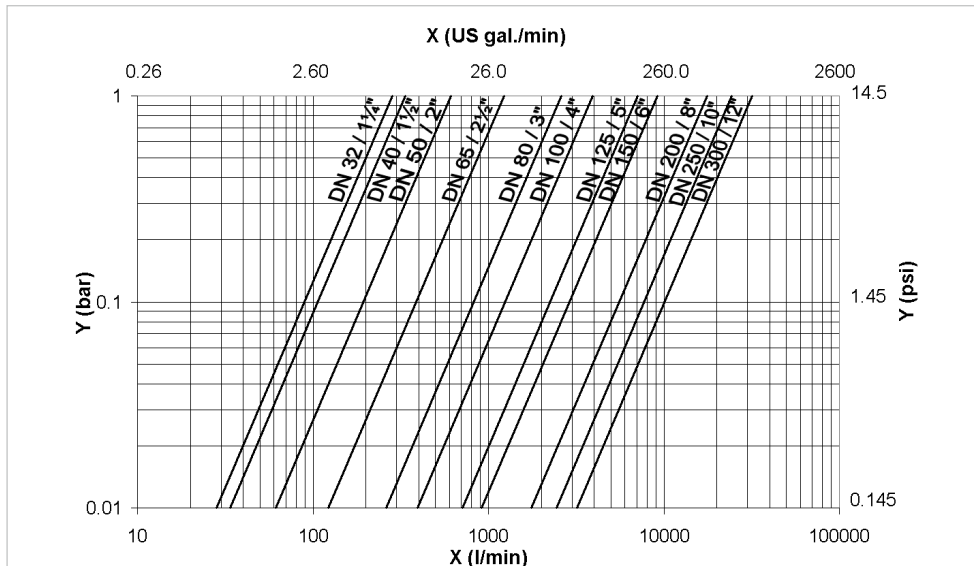


Medium: water 20 °C

X Flow rate
(l/min, US gal/min)

Y Pressure loss Δp (bar, psi)

PP with outlet flange adapter PP/PE, SDR11 (PN10)



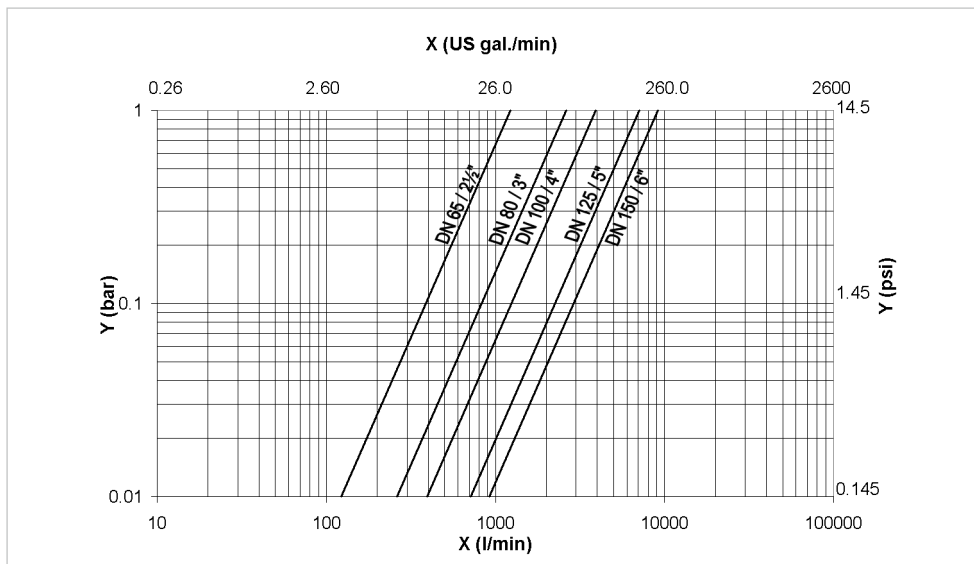
Medium: water 20 °C

X Flow rate
(l/min, US gal/min)

Y Pressure loss Δp (bar, psi)

VI

PVDF, pipe PN10



Medium: water 20 °C

X Flow rate
(l/min, US gal/min)

Y Pressure loss Δp (bar, psi)

Opening pressure / leak-tightness

DN (mm)	Opening pressure (mbar)				Tightness of water column (m)	
	Vertical without spring	Vertical with spring	Horizontal without spring	Horizontal with spring	PVC-U, PVDF PP	
32	10	30	1	20	2	3
40	10	30	1	20	2	3
50	10	30	1	20	2	3
65	10	30	1	20	2	3
80	10	30	1	20	2	3
100	10	30	1	20	2	3
125	10	30	1	20	2	3
150	10	30	1	20	2	3
200	18	38	1	20	2	3
250	18	38	1	20	2	3
300	18	38	1	20	2	3

Reference values for tightening torque of screws

Metric flange adapter

d (mm)	DN (mm)	Inch (inch)	Total number of screws	Max. screw tightening torque	
				(Nm)	(lb-ft)
40	32	1½	4 x M16 x 85	15	11
50	40	1½	4 x M16 x 85	15	11
63	50	2	4 x M16 x 95	20	15
75	65	2½	4 x M16 x 100	25	18
90	80	3	8 x M16 x 110	25	18
110	100	4	8 x M16 x 130	30	22
140	125	5	8 x M16 x 130	35	26
160	150	6	8 x M20 x 180	40	30
225	200	8	8 x M20 x 180	50	37
280	250	10	12 x M20 x 180	55	41
315	300	12	12 x M20 x 180	60	44

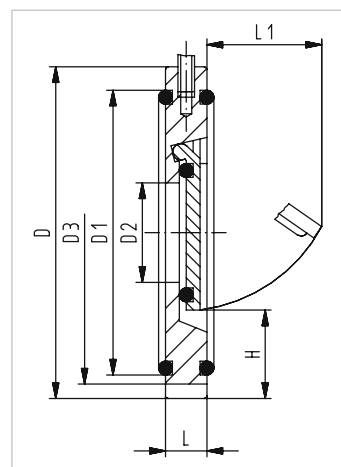
ANSI/BS flange adapters

d (mm)	DN (mm)	Inch (inch)	Total number of screws	Max. closing torque	
				(Nm)	(lb-ft)
50	40	2	4 x UNC5/8" x 3½"	20	15
63	50	2½	4 x UNC5/8" x 4"	25	18
75	65	3	4 x UNC5/8" x 4"	25	18
90	80	4	8 x UNC5/8" x 4½"	30	22
110	100	4	8 x UNC5/8" x 4½"	30	22
160	150	6	8 x UNC3/4" x 5"	40	30
225	200	8	8 x UNC3/4" x 6"	50	37
280	250	10	12 x UNC7/8" x 6½"	55	41
315	300	12	12 x UNC7/8" x 7"	60	44
50	40	2	4 x UNC5/8" x 3½"	20	15
63	50	2½	4 x UNC5/8" x 4"	25	18

2.1.3 Dimensions

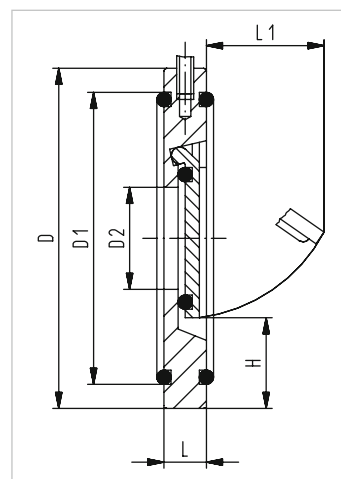
Check Valve Type 369, PVC-U

d (mm)	DN (mm)	inch (inch)	D (mm)	D1 (mm)	D2 (mm)	D3 (mm)	L (mm)	L1 (mm)	H (mm)
40	32	1 ¼	85	59	18	85	15	22	25
50	40	1 ½	105	74	22	95	16	27	27
63	50	2	124	90	32	109	18	40	29
75	65	2 ½	137	110	40	129	20	55	31
90	80	3	175	125	54	144	20	67	32
110	100	4	175	150	70	164	23	67	31
140	125	4	195	178	92	195	23	94	35
160	150	5	222	192	105	220	26	100	41
225	200	6	279	256	154	275	35	152	38
280	250	8	340	306	192	330	40	180	41
315	300	10	410	342	227	380	45	215	41



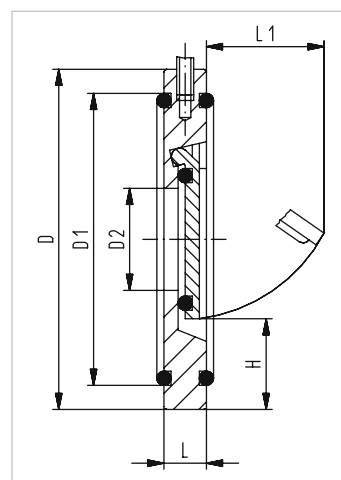
Check Valve Type 369, PP-H

d (mm)	DN (mm)	Inch (inch)	D (mm)	D1 (mm)	D2 (mm)	D3 (mm)	H (mm)	L (mm)	L1 (mm)
40	32	1 ¼	85	59	18	85	25	15	22
50	40	1 ½	105	72	22	95	28	16	27
63	50	2	124	86	32	109	29	18	40
75	65	2 ½	137	105	40	129	31	20	55
90	80	3	175	119	54	144	32	20	67
110	100	4	175	146	70	164	31	23	67
140	125	4	195	173	92	195	35	23	94
160	150	5	222	197	105	220	42	26	100
225	200	6	279	255	154	275	38	35	152
280	250	8	340	312	192	330	41	40	180
315	300	10	410	363	227	380	41	45	215



Check Valve Type 369, PVDF

d (mm)	DN (mm)	Inch (inch)	D (mm)	D1 (mm)	D2 (mm)	D3 (mm)	H (mm)	L (mm)	L1 (mm)
40	32	1 ¼	85	59	18	85	15	22	25
50	40	1 ½	105	74	22	95	16	27	27
63	50	2	124	90	32	109	18	40	29
75	65	2 ½	137	110	40	129	20	55	31
90	80	3	175	125	54	144	20	67	32
110	100	4	175	150	70	164	23	67	31
140	125	4	195	178	92	195	23	94	35
160	150	5	222	192	105	220	26	100	41
225	200	6	279	256	154	275	35	152	38
280	250	8	340	306	192	330	40	180	41
310	300	10	410	342	227	380	45	215	41



2.1.4 Accessories

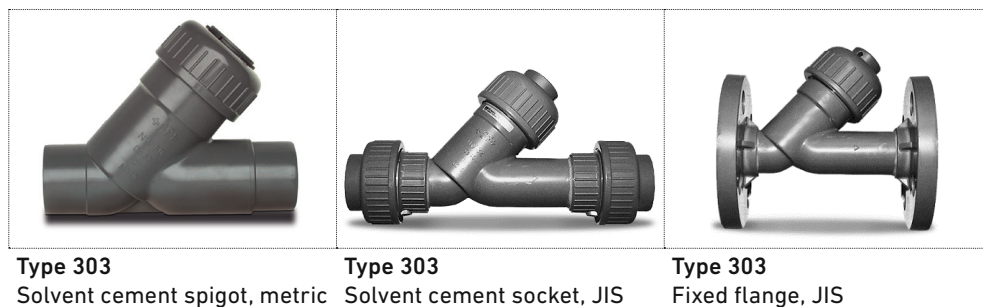
- Spring made of stainless steel V4A (1.4408) or Hastelloy C
- Appropriate outlet flange adapter from GF Piping Systems



For further information on accessories, refer to the online product catalogue at www.gfps.com

3 Angle Seat Check Valves

3.1 Angle Seat Check Valve Type 303/304



3.1.1 Product description

Angle seat check valves of types 303 and 304 are distinguished by their reliability and ability to function regardless of position. The design has evolved its strengths over many years. Because of its ability to function regardless of position and the simple maintenance process, the valve guarantees a high degree of process reliability. The maximum operating time is 25 years.

Function

These GF Piping Systems angle seat check valves of types 303 and 304 are intended exclusively for shutting off and conducting media within the allowable pressure and temperature range following installation in piping systems.

Applications

- Water treatment
- Chemical process industry
- Cooling processes

Benefits/features

- Self-closing piston check valve
- For horizontal and vertical use
- Simple maintenance of the check element without dismantling the valve
- Overall length according to EN 588

Flow media

Media that are free of foreign particles, as well as viscous and thick media.

3.1.2 Technical basics

Use

For the angle seat check valve to function properly, the flow must be evenly distributed over the pipe cross-section. If necessary (after pumps, changes in direction) a damping zone section should be allowed for. Cavitation should be avoided.



Check valves are not suitable for use with media containing solids.

Arrows

The arrow on the valve housing indicates the direction of the flow. For applications with vertical flow, only an upward flow is permitted, i.e. the arrow must point upward. If installed in the opposite direction, the shut-off function is not guaranteed, and serious injuries may result. The 45° angled piston part must always point upwards.

Valve handling

Selection of lubricant

All gaskets should be lubricated with a silicon- or polyol-based grease. Using the wrong lubricants can damage the material of the ball valve or gaskets.

- Mineral oil-based lubricants and Vaseline (petrolatum) are not appropriate.
- For silicon-free ball valves, please consult the special manufacturer's instructions.

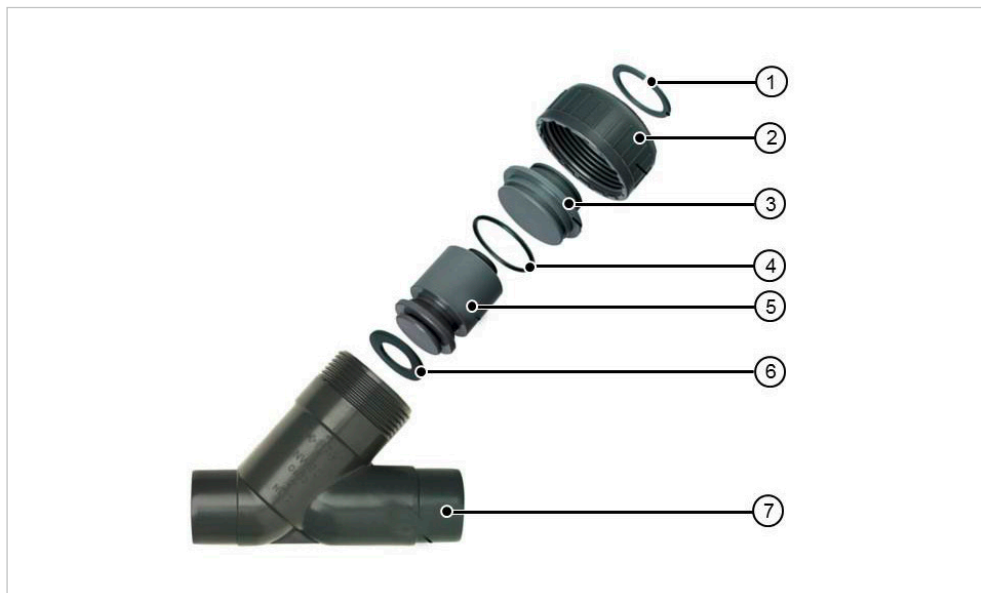
Maintenance notes

Angle seat check valves require no maintenance under normal operating conditions. It is sufficient to check periodically that there is no leakage. Should leakage or other malfunctions occur, follow the instructions under "Safety information". We recommend performing a function test for angle seat check valves that are kept continuously in the same position once or twice a year to check their function.



Installation and maintenance must be performed in accordance with the corresponding installation manual. The installation manual is provided with the product, see also the online product catalogue at www.gfps.com

3.1.3 Technical data



- ① Circlip
- ② Cap nut
- ③ Plug
- ④ O-ring
- ⑤ Piston
- ⑥ Compartment seal
- ⑦ Housing

Specification

Dimensions	d15/DN10 bis d90/DN80, 3/8" - 3"
Valve body materials	PVC-U, ABS, transparent PVC-U
Gasket materials	EPDM, FKM
Pressure level	PN 10
Connections	Solvent cement socket, ISO Solvent cement spigot, JIS Fixed flange, JIS
Actuation variants	Self-closing

Kv 100 values

d (mm)	DN (inch)	inch (inch)	kv 100 (l/min ($\Delta p = 1$ bar))	Cv 100 (US gal./min)	kv 100 (m ³ /h($\Delta p = 1$ bar))
16	10	3/8	45	3.2	2.7
20	15	1/2	95	6.7	5.7
25	20	3/4	170	11.9	10.2
32	25	1	300	21.0	18.0
40	32	1 1/4	440	30.8	26.4
50	40	1 1/2	700	49.0	42.0
63	50	2	1100	77.0	66.0
75	65	2 1/2	1700	119.0	102.0
90	80	3	2400	168.0	144.0

Pressure-temperature diagrams

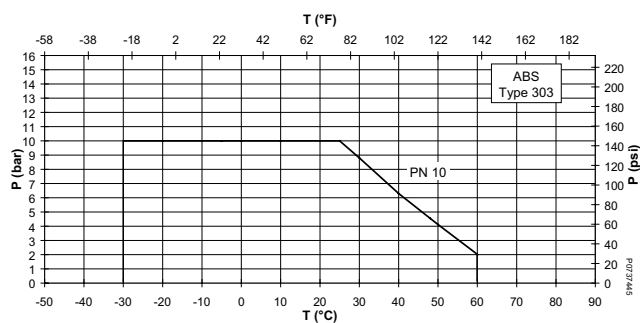
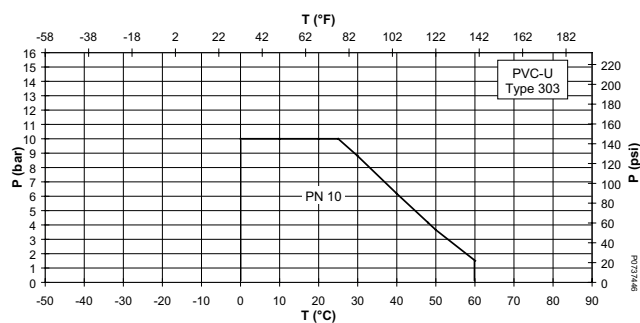
The following pressure-temperature diagrams are based on a lifetime of 25 years and water or similar media.

T Temperature (°C, °F)

P Permissible pressure (bar, psi)

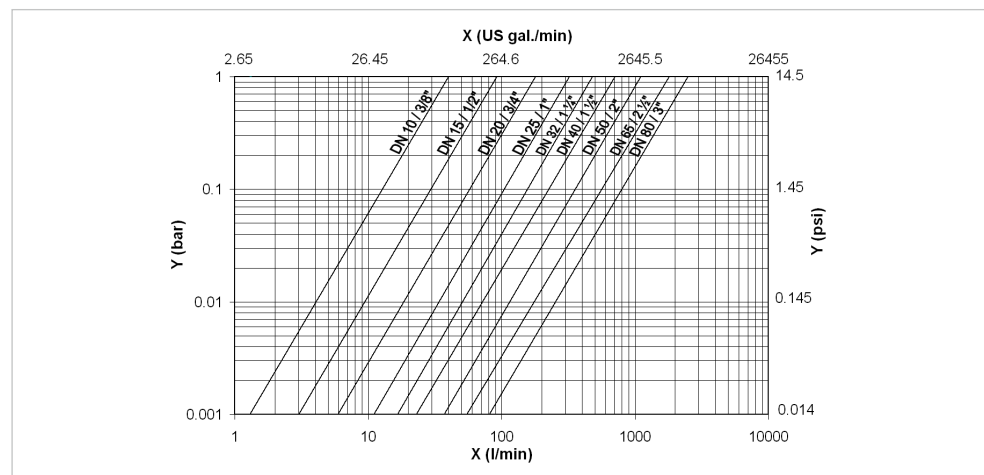
PVC-U

ABS



Pressure losses

Medium: water 20 °C

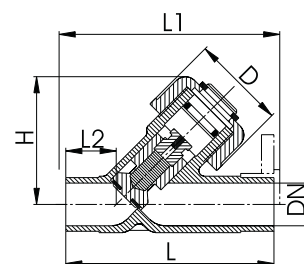
X Flow rate (l/min,
US gal/min)Y Pressure loss Δp (bar, psi)

DN (mm)	Open			Close
	Differential preferential for full stroke (bar)	Minimum flow for full stroke (l/min)	Minimum flow rate for full stroke (m/sec)	Leak-tight starting at (bar)
10	0.02	5	1.1	0.2
15	0.02	10	1.1	0.2
20	0.02	18	1.1	0.2
25	0.02	28	1.1	0.2
32	0.02	50	1.2	0.2
40	0.03	95	1.4	0.2
50	0.03	200	1.5	0.2
65	0.03	280	1.8	0.2
80	0.03	420	1.8	0.2

3.1.4 Dimensions

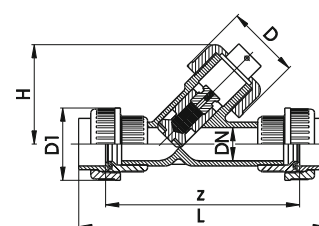
Angle seat check Valve Type 303 with solvent cement spigot, metric

d (mm)	DN (mm)	Inch (inch)	D (mm)	L (mm)	L1 (mm)	L2 (mm)	H (mm)
16	10	3/8	39	114	120	24	58
20	15	1/2	43	124	130	28	65
25	20	3/4	47	144	150	37	75
32	25	1	56	154	160	37	90
40	32	1 1/4	64	174	180	44	102
50	40	1 1/2	82	194	200	48	123
63	50	2	95	224	230	60	144
75	65	2 1/2	92	284	290	74	186
90	80	3	104	300	310	85	204



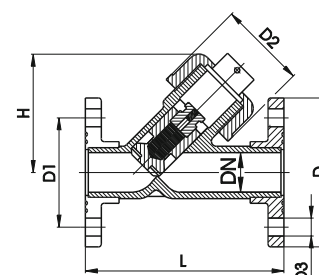
Angle seat check Valve Type 303 with solvent cement socket, JIS

Inch (inch)	DN (mm)	z (inch)	D (mm)	D1 (mm)	L (mm)	H (mm)
1/2	15	162	43	53	194	65
3/4	20	170	47	53	208	75
1	25	180	56	53	224	90
1 1/4	32	204	64	74	256	102
1 1/2	40	228	82	83	290	123
2	50	266	95	103	342	144



Angle seat check Valve Type 303 with fixed flange, JIS

Inch (inch)	DN (mm)	D (mm)	D1 (mm)	D2 (mm)	D3 (mm)	L (mm)	H (mm)
1/2	15	95	70	48	15	130	65
3/4	20	100	75	54	15	150	75
1	25	125	90	62	19	160	90
1 1/4	32	135	100	71	19	180	102
1 1/2	40	140	105	88	19	200	123
2	50	155	120	103	19	230	144
2 1/2	65	185	140	106	19	290	186
3	80	200	150	120	19	310	204



For further information on accessories, refer to the online product catalogue at www.gfps.com

Planning Fundamentals of Valves and Automation

Valves – Others

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1 Ventilating and Bleed Valves

1.1 Ventilating and Bleed Valve Type 591 and Ventilating Valve Type 595



1.1.1 Product description

Ventilating and bleed valves can emit gases from containers and piping systems and vacuums can be avoided by supplying air - automatically and without using external energy. Types 595 and 591 fit all common plastic piping systems thanks to an extensive assortment.

Function

Type 591 function

Bleeding when filling, venting when draining. Depending on the filling rate, the float is raised by the rising fluid level. Simultaneously, the gases are removed from the system through the valve. When the pipe is completely filled, the float is pressed into the profile gasket and closes the valve.

Type 595 function

Ventilating when draining. The ventilating Valve Type 595 was developed especially for the ventilation process and is used when a safe and controlled supply of air must be guaranteed. This prevents gases/liquids from being emitted into the surroundings. The cone is continuously pressed into the profile seal and does not open until a vacuum is created in the pipe or container.

Applications

- Microelectronics
- Chemical process industry
- Food and beverages
- Water treatment
- Cooling processes

Advantages

- Self-acting bleeding and venting
- No auxiliary energy required for operation
- Wide range of materials for optimum chemical resistance
- Complete and reliable bleeding of the piping system
- Controlled supply of air
- High efficiency and precision

Characteristics

Safety

The new valve of types 591 and 595 control the venting and bleeding of piping systems and tanks with high precision and completely reliably. They contribute significantly to the safety and protection of your system, for example by avoiding the unwanted buildup of a vacuum when emptying piping systems and tanks.

Simplicity

The valves are impressive by virtue of their simple installation and are practically maintenance-free. This is a result of their compact construction and innovative details of their construction, which are designed for safety, ergonomics and efficiency.

Flexibility

The many different dimensions and optimal sizes allow the valves to be used under almost all space conditions and in any system design. The valves are positioned at the absolute or temporary high points in the system, after pumps and at turning points.

Flow media

Media that are free of foreign particles, viscous, thick and gaseous media.

1.1.2 Technical basics

Causes of air in the piping system

- During operation, air can be released into the system through pumps, valves, molded parts and other pipe components.
- When filling tanks and pipelines, air inclusions may occur.
- Pressure drops or temperature increases can release air.

Positioning of the valves

- At absolute and temporary high points
- After pumps
- At turning points

Valve handling

Installation notes

Only identical materials may be joined together via fusion or adhesive joints.

- Sections of pipework with adhesive joints must be rinsed with non-pressurized water as soon as possible after completion of the joints.
- Hand-tighten the coupling nuts on the check valve.

Arrows

- The arrow on the valve housing indicates the direction of the flow. For applications with vertical flow, only an upward flow is permitted, i.e. the arrow must point upward. If installed in the opposite direction, the shut-off function is not guaranteed.



Maintenance notes

The automatic operation of the valve requires maintenance to ensure that it functions without problems.



Installation and maintenance must be performed in accordance with the corresponding installation manual. The installation manual is provided with the product, see also the online product catalogue at www.gfps.com

1.1.3 Technical data



- ① Protection cap
- ② Coupling nut
- ③ Spigot
- ④ O-ring
- ⑤ Screw-in ring
- ⑥ Sealing ring
- ⑦ Back-up ring
- ⑧ Float
- ⑨ Spring (Type 595)
- ⑩ Housing
- ⑪ Connecting part

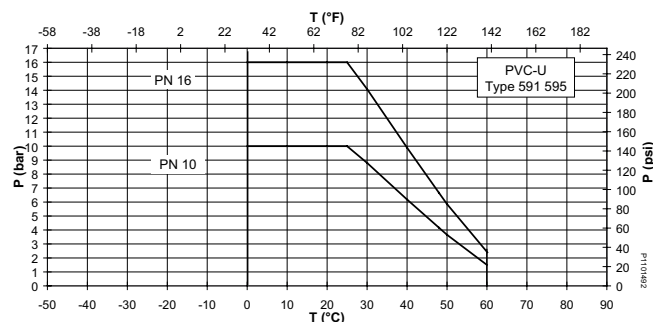
Specification

Dimensions	d16/DN10 – d110/DN100, 3/8" – 4"	
Materials	Valve body	PVC-U, PVC-C, ABS, PP-H, PVDF
	Spring for Type 595	Standard: Nimonic 90 Optional: Nimonic 90 Halar (ECTFE) coated
Gasket materials	EPDM, FKM	
Pressure levels	PVC-U, PVC-C, PVDF	PN16
	PP-H, ABS	PN10
Approvals	ACS, FDA, DIBt, TA Luft, NAMSA	

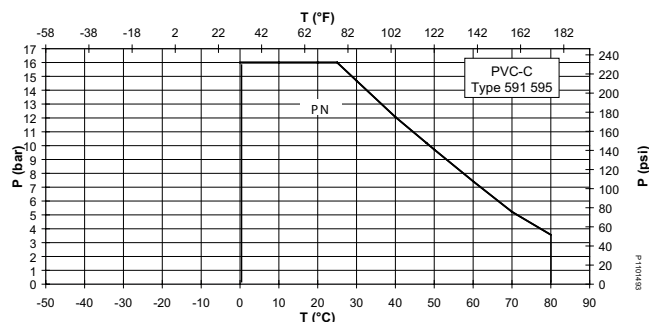
Pressure-temperature diagrams

The following pressure-temperature diagrams are based on a lifetime of 25 years and water or similar media.

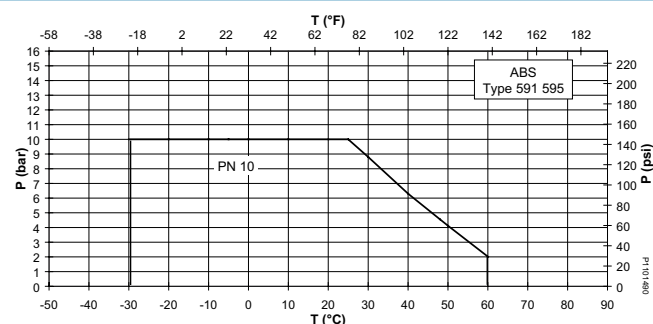
PVC-U



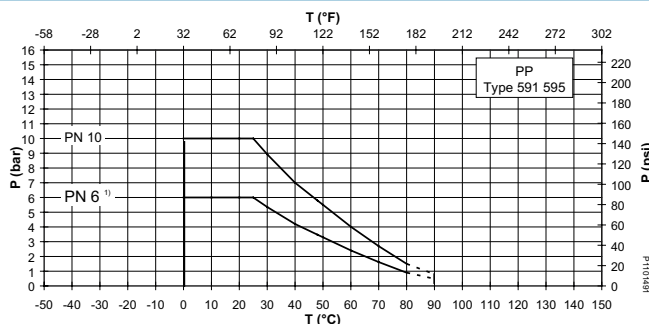
PVC-C



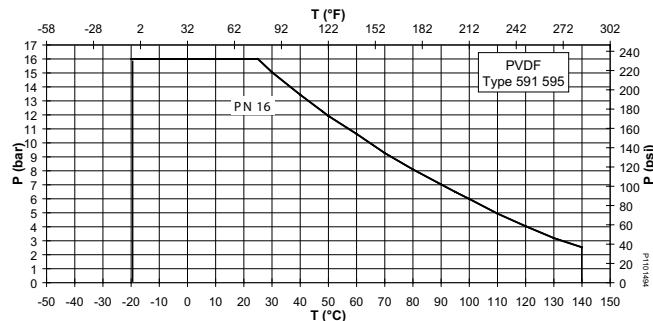
ABS



PP



PVDF



T Temperature (°C, °F)

P Permissible pressure (bar, psi)

¹⁾ E.g. check valves with PP or PE100 SDR17 butt fusion spigots. For applications in the dotted temperature range, please contact the responsible GF representative.

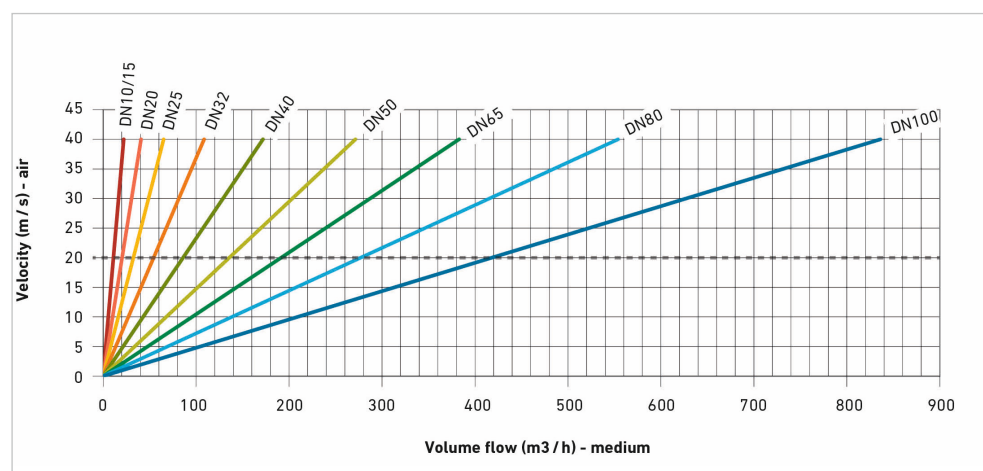
Calculations for valve configuration


To select the correct valve size, the max. flow (Q in m^3/h) is first calculated. To do this, the flow velocity of the medium (V_r in m/s) is required, as is the inner diameter of the medium-conveying pipe (d_i in mm).

$$Q = V_r \cdot \pi \cdot \frac{d_i^2}{4} \cdot 0.001 \cdot 3.6$$

The volume flow of the medium can be equated with the gas volume to be discharged or filled. If several aerating or deaerating valves are used, each valve must be configured for the maximum flow velocity. With the calculated volume flow, the correct valve dimension can be determined from the air volume diagram. The velocity in this diagram corresponds to the discharge velocity of the gases at the valve. It is recommended that, if possible, 20m/s is not exceeded to prevent excessive wear on the valve.

Air volume diagram



 The escape velocity of the air must not exceed 20 m/s.

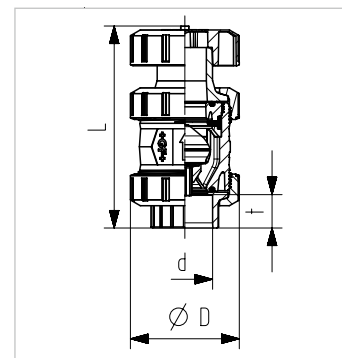
Pressure for raising cone Type 595

DN (mm)	10	15	20	25	32	40	50	65	80	100
Differential pressure for raising cone (bar)	0.028	0.028	0.030	0.030	0.035	0.040	0.050	0.060	0.060	0.060

1.1.4 Dimensions

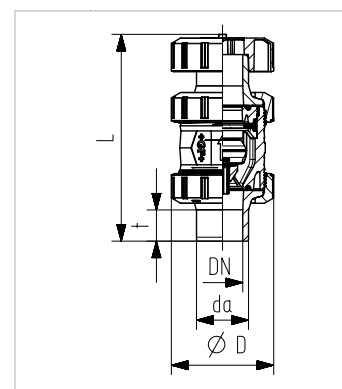
Type 591, Type 595 with solvent cement sockets, metric

d (mm)	DN (mm)	D (mm)	L (mm)	t (mm)	closest (inch)
16	10	50	118	14	$\frac{3}{8}$
20	15	50	124	16	$\frac{1}{2}$
25	20	58	142	19	$\frac{3}{4}$
32	25	68	157	22	1
40	32	84	179	26	1 $\frac{1}{4}$
50	40	97	197	31	1 $\frac{1}{2}$
63	50	124	229	38	2
75	65	166	258	45	2 $\frac{1}{2}$
90	80	200	277	52	3
110	100	238	320	64	4



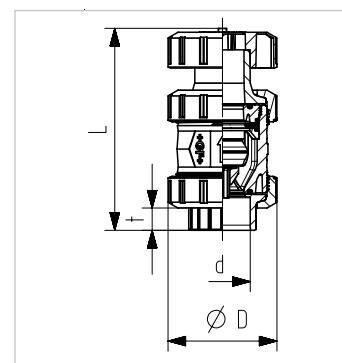
Type 591, Type 595 with solvent cement spigot, metric

d (mm)	DN (mm)	D (mm)	L (mm)	t (mm)	closest (inch)
16	10	50	129	14	$\frac{3}{8}$
20	15	50	139	16	$\frac{1}{2}$
25	20	58	160	19	$\frac{3}{4}$
32	25	68	172	22	1
40	32	84	193	26	1 $\frac{1}{4}$
50	40	97	215	31	1 $\frac{1}{2}$
63	50	124	249	38	2
75	65	166	284	44	2 $\frac{1}{2}$
90	80	200	300	52	3
110	100	238	340	61	4



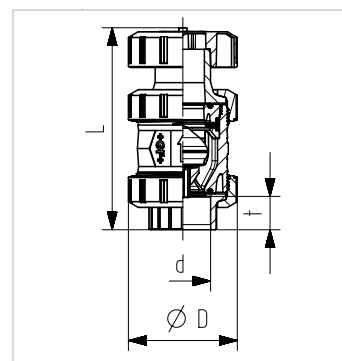
Type 591, Type 595 with solvent cement sockets, inch BS

Inch	DN (mm)	D (mm)	L (mm)	t (mm)
$\frac{3}{8}$	10	50	118	16
$\frac{1}{2}$	15	50	124	18
$\frac{3}{4}$	20	58	142	21
1	25	68	157	24
1 $\frac{1}{4}$	32	84	179	29
1 $\frac{1}{2}$	40	97	197	30
2	50	124	229	36
2 $\frac{1}{2}$	65	166	258	45
3	80	200	277	51
4	100	238	320	64

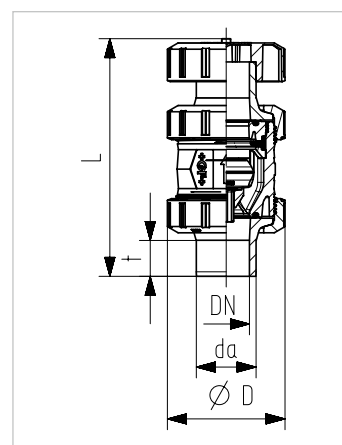


Type 591, Type 595 with solvent cement sockets, inch ASTM incl. 2 threaded sockets, NPT

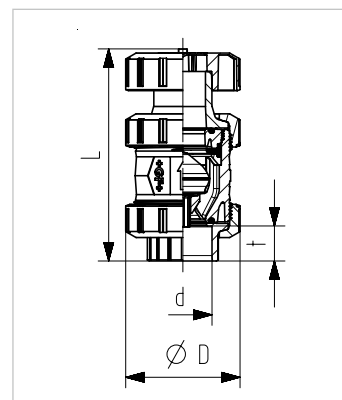
inch	DN (mm)	D (mm)	L (mm)	t (mm)
3/8	10	50	111	19
1/2	15	50	119	23
3/4	20	58	137	25
1	25	68	152	28
1 1/4	32	84	176	31
1 1/2	40	97	193	35
2	50	124	229	38
2 1/2	65	166	258	45
3	80	200	277	48
4	100	238	320	58


Type 591, Type 595 with fusion spigot

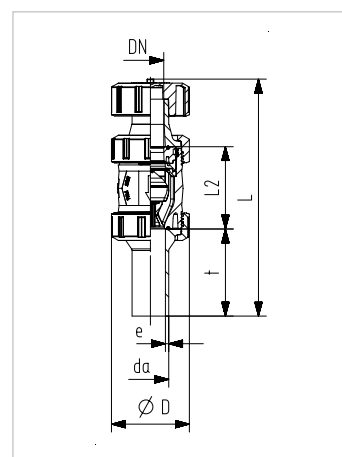
d (mm)	closest (inch)	DN (mm)	PN (bar)	D (mm)	L (mm)	t (mm)
16	3/8	10	10	50	135	13
20	1/2	15	10	50	140	14
25	3/4	20	10	58	157	16
32	1	25	10	68	168	18
40	1 1/4	32	10	84	183	20
50	1 1/2	40	10	97	211	23
63	2	50	10	124	245	27
75	2 1/2	65	10	166	280	48
90	3	80	10	200	296	49
110	4	100	10	238	336	54


Type 591, Type 595 with fusion socket

d (mm)	closest (inch)	DN (mm)	PN (bar)	D (mm)	L (mm)	t (mm)
16	3/8	10	10	50	126	14
20	1/2	15	10	50	127	15
25	3/4	20	10	58	142	16
32	1	25	10	68	153	18
40	1 1/4	32	10	84	171	19
50	1 1/2	40	10	97	190	21
63	2	50	10	124	219	28
75	2 1/2	65	10	166	256	29
90	3	80	10	200	275	33
110	4	100	10	238	318	39


Type 591, Type 595 with butt fusion spigot, SDR11 PE100

d (mm)	closest (inch)	DN (mm)	PN (bar)	D (mm)	L (mm)	l2 (mm)	t (mm)	e (mm)
20	1/2	15	16	50	175	56	69	2.25
25	3/4	20	16	58	195	65	76	2.30
32	1	25	16	68	207	71	76	2.90
40	1 1/4	32	16	84	230	85	82	3.70
50	1 1/2	40	16	97	254	89	91	4.60
63	2	50	16	124	298	101	110	5.80
75	2 1/2	65	16	166	334	136	125	6.80
90	3	80	16	200	360	141	140	8.20
110	4	100	16	238	411	164	160	10.00



2 Throttle Valves

2.1 Throttle Valve Type V251



2.1.1 Product description

Throttle valves are used wherever fluids or gases need to be throttled in pipelines. The compact design, simple and robust construction and good control characteristics ensure high operational safety.

Function

A spindle with cone narrows the cross-section of the opening in the housing, thus restricting the volume flow to the desired value. The setting must be made using a tool (screwdriver or flat material), which has the advantage that the set value cannot be changed unintentionally.

Applications

- Chemical dosing
- Water treatment

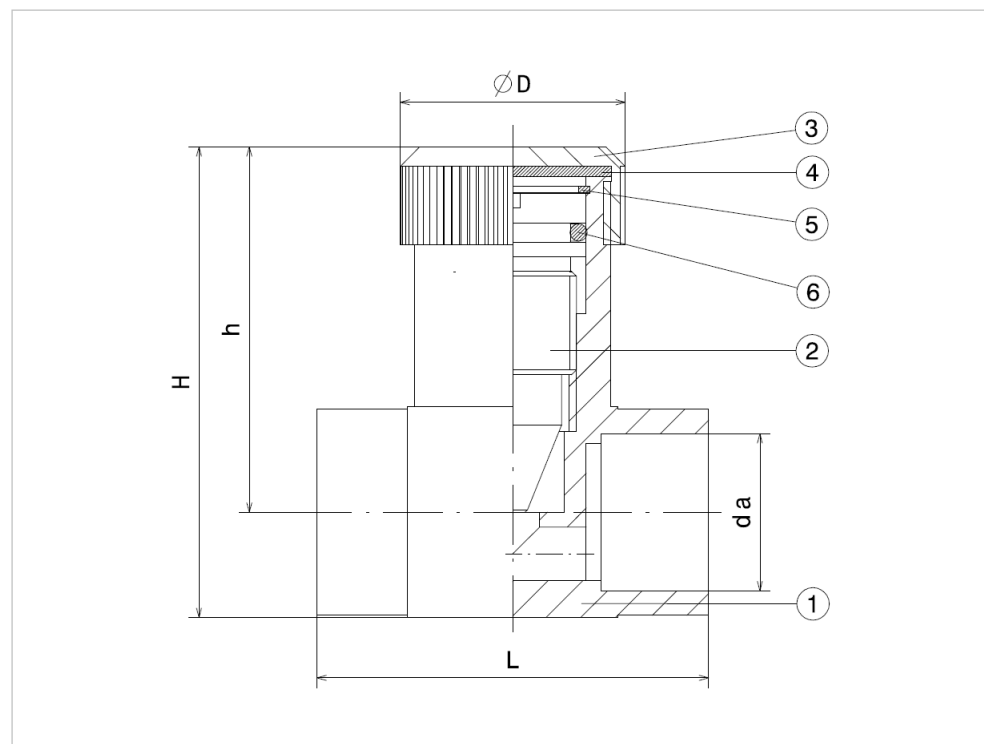
Benefits/features

- Good chemical resistance thanks to highly resistant plastics (PVC, PP, PVDF)
- Requires practically no maintenance and can be installed in any position
- High operational safety thanks to compact and robust construction
- Good control characteristics

Flow media

Neutral and aggressive media with a small quantity of particles/solids. The chemical resistance depends on the selected valve material ([see online tool ChemRes PLUS](#)).

2.1.2 Technical data



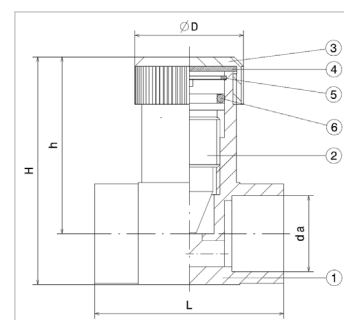
- ① Housing
- ② Spindle
- ③ Cap
- ④ Gasket
- ⑤ Stop ring
- ⑥ O-ring

Specification

Dimensions	d16/DN10 – d63/DN50
Materials	PVC-U
	PP
	PVDF
Gasket materials	EPDM/FKM (PVDF: FKM)
Pressure level	PN10
Setting range	100 - 20 000 l/h
Connections	Cement and fusion spigot
Assembly	Unrestricted
Standards	ISO (metric)

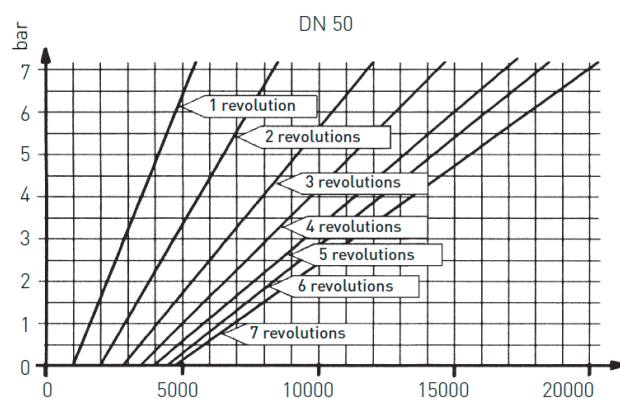
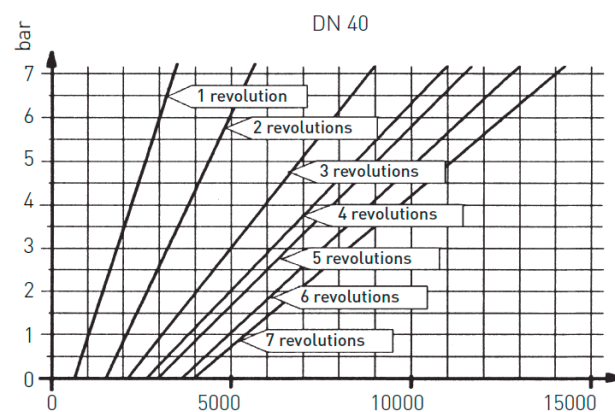
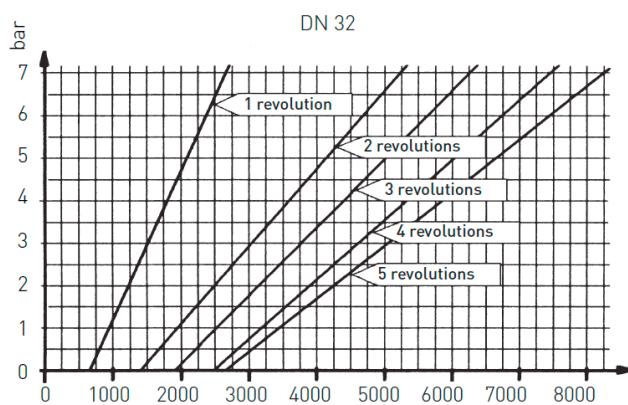
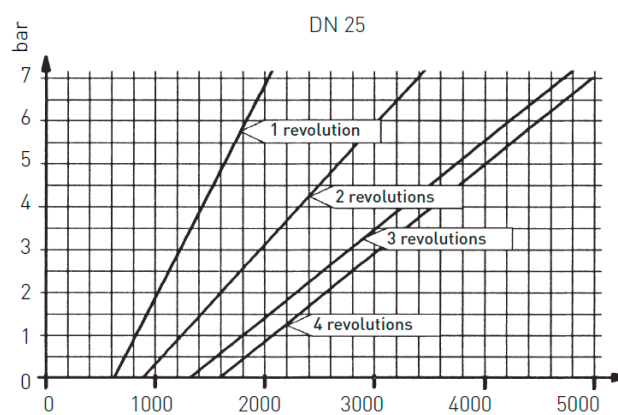
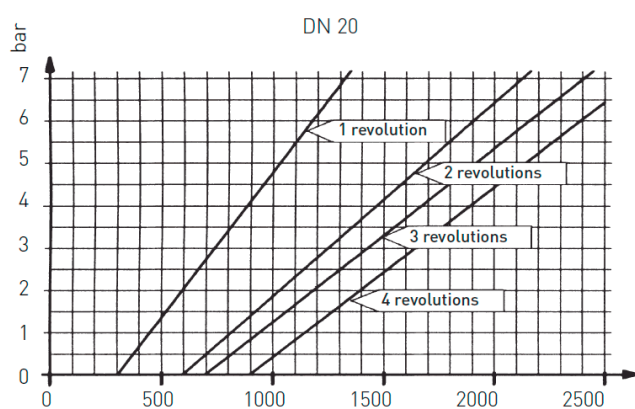
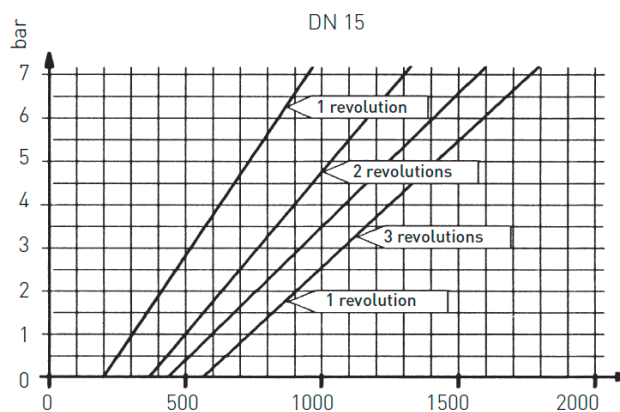
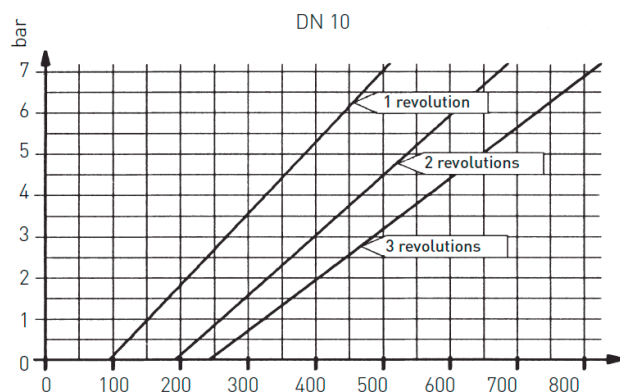
2.1.3 Dimensions

d (mm)	DN (mm)	L (mm)	H (mm)	h (mm)	D (mm)
16	10	47	57	45	29
20	15	55	66	51	35
25	20	66	80	62.5	40
32	25	80	96	74.5	47
40	32	100	111	86	56
50	40	120	133	101	70
63	50	146	158	118	88



Flow characteristics

X Open angle (%)
Y Kv, Cv value (%)



Example

Pressure upstream: 3 bar

Desired flow: 2,000 l/h



- Diagram for DN25, with the set screw opened 2 revolutions and a flow of 2,000 l/h.
- The nominal diameter DN25 is well suited for this purpose.

Tips for installation

To dimension the nominal diameter, we recommend using the given values with a half-opened throttle valve.

3 Diaphragm Gauge Guards

3.1 Diaphragm Gauge Guard Type Z500/Z501

	
Type Z500 With manometer	Type Z501 Without manometer

3.1.1 Product description

The diaphragm-protected gauge guard Z500/Z501 is used when measuring the pressure of neutral and corrosive media.

Function

The manometer is separated from the medium by a TFM-coated EPDM-support diaphragm. The line pressure is transferred to the manometer via a buffer fluid.

The large area of the diaphragm and the low compressibility of the buffer fluid ensure an accurate display. The large number of possible materials makes for a wide range of areas of application.

Applications

- Chemical Process Industry
- Food and beverages
- Water treatment
- Cooling
- Ship building

Benefits/features

- All parts which come into contact with the medium are made of highly resistant plastics
- The manometer does not come into contact with the medium
- The gauge guard is low-maintenance and can be installed in any position
- Large diaphragm surface ensures high accuracy
- The new construction of the diaphragm gauge guard makes turning the diaphragms impossible, which guarantees an extremely precise transfer of pressure
- The new design guarantees an even sealing force on the diaphragms
- Various pipe connections are possible by exchanging the lower part

Handling

Filling with buffer fluid

- Fill the upper part of the diaphragm gauge guard Z500/Z501 up to the lower edge of the thread, preferably with Glysantin or distilled water
- Slightly move the diaphragm from below using a blunt object until no more air bubbles appear.
- Screw in the manometer.
- If the manometer then already displays a low pressure, some buffer fluid must be removed until no pressure display can be seen.

Installation notes

- Install the diaphragm gauge guard vertically with upstream threaded connection and shut-off valve. This guarantees that the manometer can also be moved into the desired reading position at a later stage and be exchanged without any problems (without turning off the system pressure).
- In general, all commercially available manometers can be installed.

Maintenance notes

The diaphragm gauge guards are largely maintenance-free. It may be necessary to check whether a sufficient amount of buffer fluid is present.

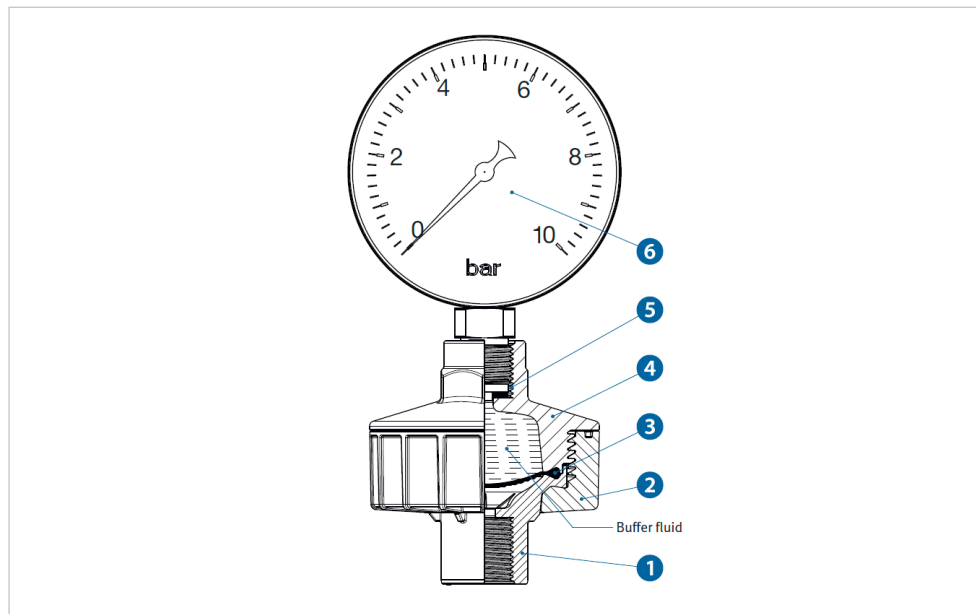


Installation and maintenance must be performed in accordance with the corresponding installation manual. The installation manual is provided with the product, see also the online product catalogue at www.gfps.com.

Tips for installation

Distilled water in particular evaporates very easily at higher temperature, and therefore the buffer fluid may evaporate after years in service. If this happens, top up the buffer fluid.

3.1.2 Technical data



- 1 Lower part (PP, PVC and PVDF)
- 2 Coupling nut
- 3 Diaphragms EPDM/TFM
- 4 Upper part (PP GF)
- 5 Manometer gasket
- 6 Manometer

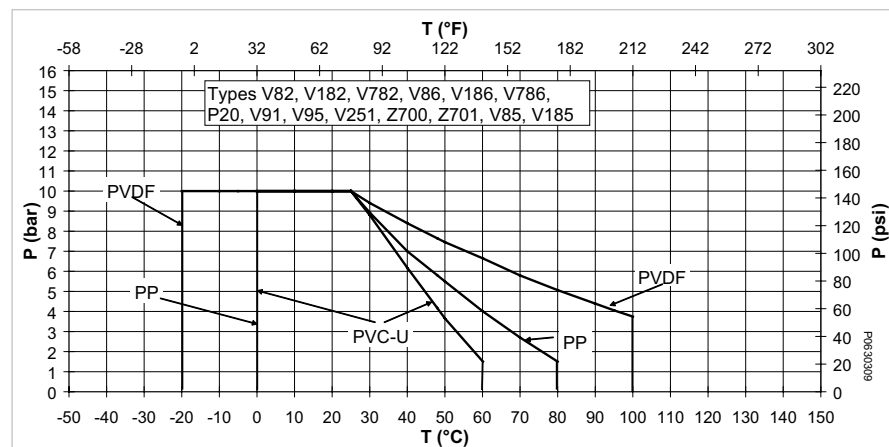
Specification

Dimensions	d25/DN20 – d32/DN25, ¾" – 1 ¼"
Lower part materials	PVC-U, PP-H, PVDF
Upper part material	PP-GF30
Gasket materials	PTFE
Buffer fluid	Glysantin (DI water upon request)
Pressure level	PN10 (10 bar@ 20°C 150 psi@ 68°F)
Manometer ranges	0 – 10 bar with R ¼" and with R ½" 0 – 6 bar with R ¼" and with R ½"
Manometer connections	G ¼" for d25 with 63 mm diameter G ½" for d32 with 100 mm diameter
Connection spigots	d25 with manometer adaptor socket R ¼" with internal thread G ¼" d32 with manometer adaptor socket R ¼" with internal thread G ½" Other connections on request

Pressure-temperature diagrams

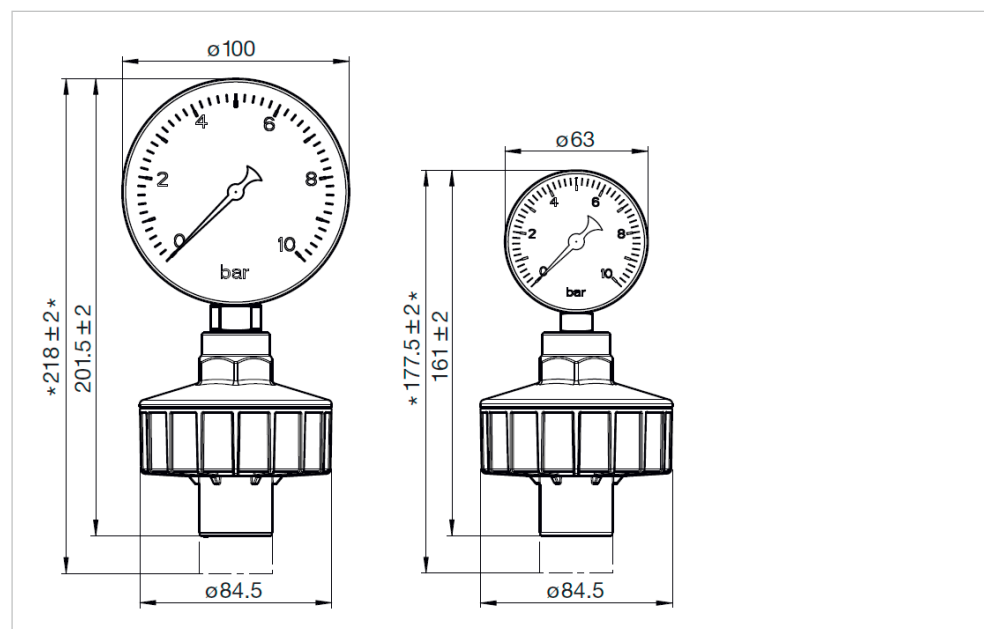
PVC-U, PP-H, PVDF

The pressure-temperature diagrams are based on a lifetime of 25 years and water or similar media.



T Temperature (°C, °F)
P Permissible pressure (bar, psi)

3.1.3 Dimensions



4 Strainers

4.1 Strainer Type 305



4.1.1 Product description

To protect valves, sensors and pumps from pollutants, we recommend the use of strainers of Type 305. This ensures reliable operation and extended service life for your components. The broad product range includes various materials, end connectors and standards, suitable for a wide variety of applications.

Function

The media flow is conducted through the sieve in the strainer from the inside to the outside. This keeps back and collects the dirt particles.

Applications

- Chemical process industry
- Industrial plant engineering
- Cooling processes
- Water treatment

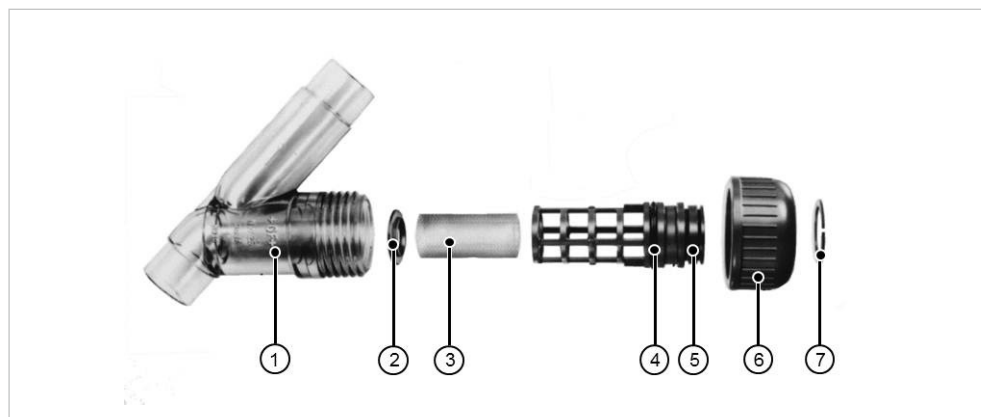
Benefits/features

- Simple and quick installation
- Transparent design (transparent PVC) for checking the amount of contamination visually
- All parts that come into contact with the medium are manufactured using highly resistant thermoplastics
- Radially removable (PP-H)
- Easy dismantling for cleaning or replacing the filter
- Integrated threaded connections
- Guarantees reliable operation of the plant through simple dismantling
- The components used extend service life

Flow media

Neutral and aggressive liquid or gaseous media, as long as the components of the valve that come into contact with the media are resistant at the operating temperature in question according to the resistance table.

4.1.2 Technical data



- ① Housing
- ② Support ring
- ③ Slotted casing
- ④ Body seal
- ⑤ Screen cage
- ⑥ Cap nut
- ⑦ Circlip

Specification

Dimensions	d20/DN15 – d63/DN50, ½" – 2"	
	PVC-U: d20/DN15 – d90/DN80, ½" – 3"	
Valve body materials	PVC-U, PVC-C, ABS, PP-H, transparent PVC-U	
Gasket materials	EPDM, FKM	
Pressure level	PN10	
Hole diameter	PVC-U slotted casing	0.5 mm, 0.8 mm, 1.4 mm, 2.2 mm
	Stainless steel slotted casing	0.5 mm
Connections	Solvent cement sockets	
	Solvent cement spigots	
	Fusion sockets	

Kv 100 values

PVC-U/PP screen hole diameter 0.5 – 2.2 mm

DN (mm)	Inch (inch)	d #(mm)	Kv 100 (l/min) (Δp = 1 bar)	Cv 100 (US gal./min) (Δp = 1 psi)	kv 100 (m³/h) (Δp = 1 bar)
15	½	20	35	2.5	2.1
20	¾	25	65	4.6	3.9
25	1	32	90	6.3	5.4
32	1¼	40	155	10.9	9.3
40	1½	50	225	15.8	13.5
50	2	63	370	25.9	22.2
65	2½	75	575	40.3	34.5
80	3	90	955	66.9	57.5

Stainless steel screen mesh size 0.5 mm

DN (mm)	Inch (inch)	d (mm)	Kv 100 (l/min) (Δp = 1 bar)	Cv 100 (US gal./min) (Δp = 1 psi)	kv 100 (m³/h) (Δp = 1 bar)
15	½	20	35	2.5	2.1
20	¾	25	60	4.2	3.6
25	1	32	85	6.0	5.1
32	1¼	40	130	9.1	7.8
40	1½	50	200	14.0	12.0
50	2	63	330	23.1	19.8
65	2½	75	460	32.2	27.6
80	3	90	665	46.6	40.0

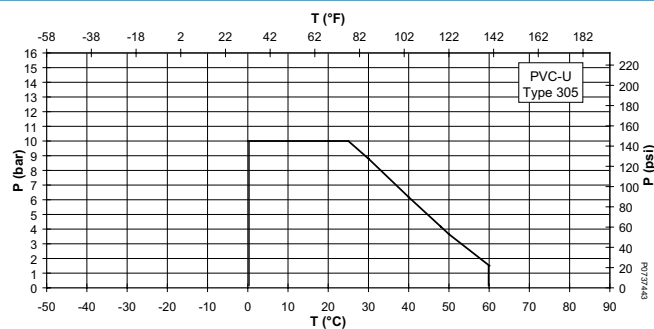
Pressure-temperature diagrams

The following pressure-temperature diagrams are based on a lifetime of 25 years and water or similar media.

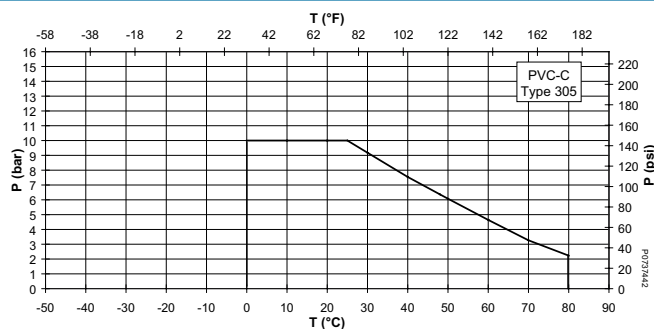
T Temperature (°C, °F)

P Permissible pressure (bar, psi)

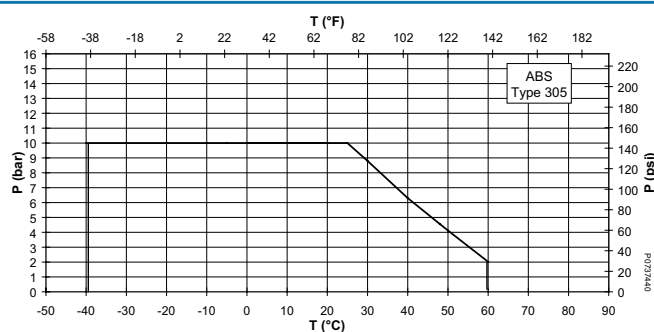
PVC-U



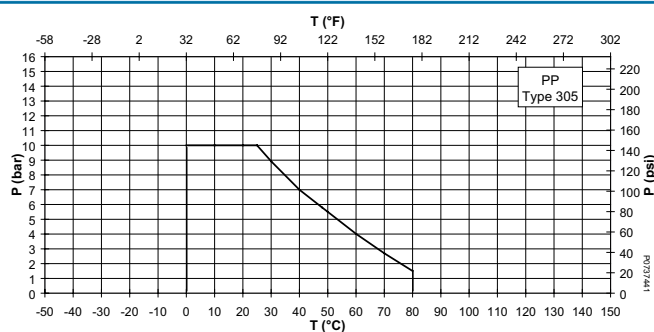
PVC-C



ABS

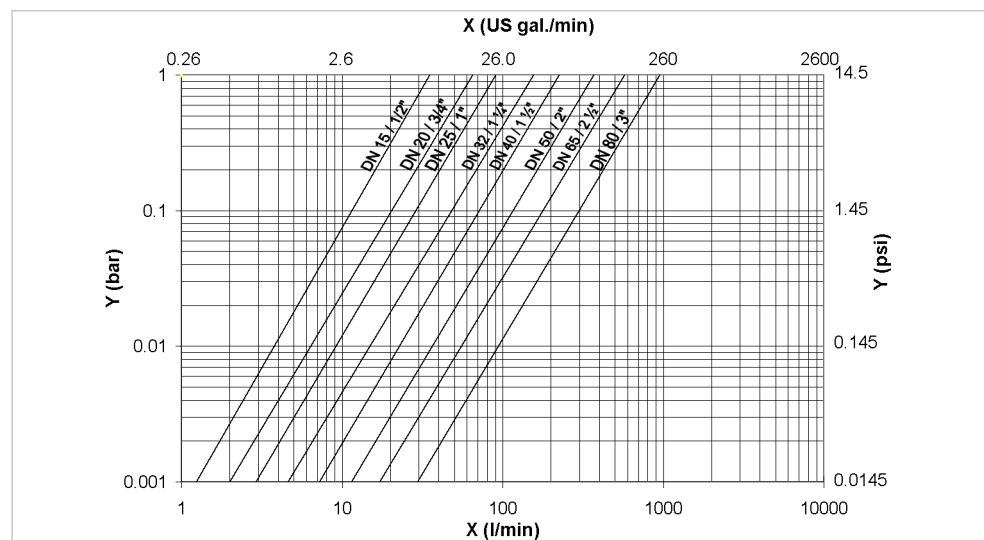


PP



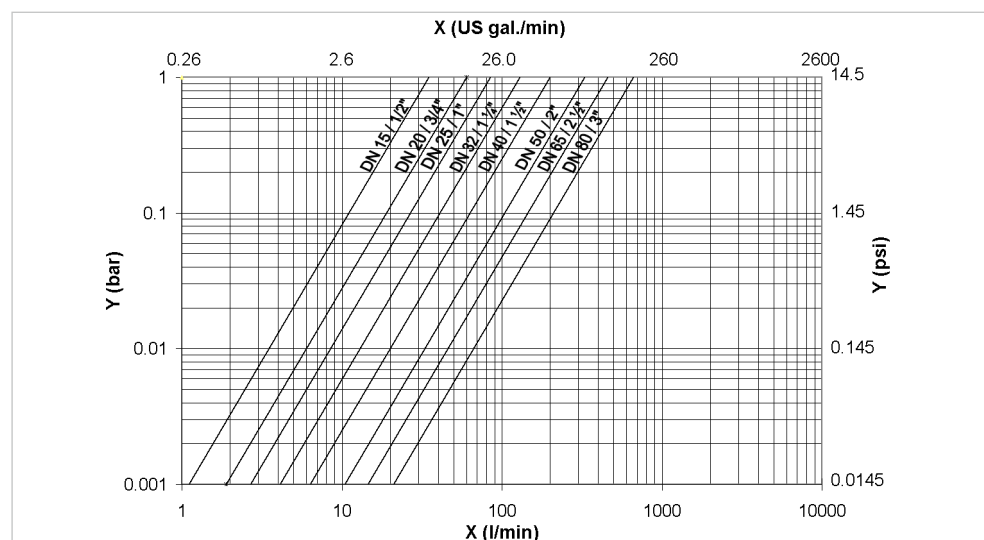
Pressure losses

PVC-U/PP screens (hole diameter 0.5 – 2.2 mm)



X Flow rate
(l/min, US gal/min)
Y Pressure loss Δp (bar, psi)

Stainless steel screens (mesh size: ca. 0.5 mm)

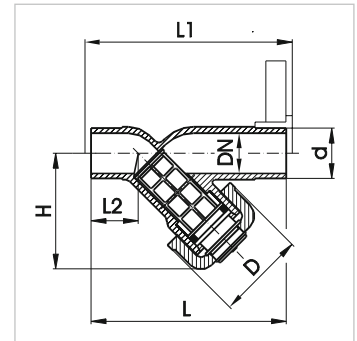


X Flow rate
(l/min, US gal/min)
Y Pressure loss Δp (bar, psi)

4.1.3 Dimensions

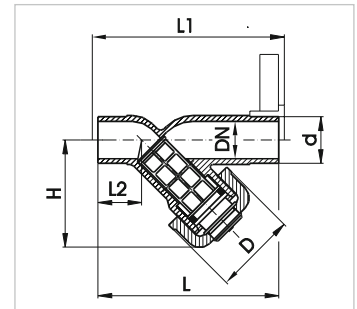
PVC-U solvent cement socket, metric, and transparent PVC-U, metric

DN (mm)	d (mm)	D (mm)	L (mm)	L1 (mm)	L2 (mm)	H (mm)	closest (inch)
20	20	48	124	130	28	65	1/2
25	25	54	144	150	37	76	3/4
32	32	62	154	160	37	90	1
40	40	71	174	180	44	104	1 1/4
50	50	88	194	200	48	124	1 1/2
63	63	103	224	230	0	148	2



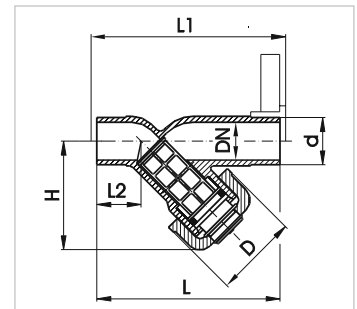
PVC-U cement solvent spigot, metric

DN (mm)	d (mm)	D (mm)	L (mm)	L1 (mm)	L2 (mm)	H (mm)	closest (inch)
20	20	48	124	130	28	65	1/2
25	25	54	144	150	37	76	3/4
32	32	62	154	160	37	90	1
40	40	71	174	180	44	104	1 1/4
50	50	88	194	200	48	124	1 1/2
63	63	103	224	230	60	148	2



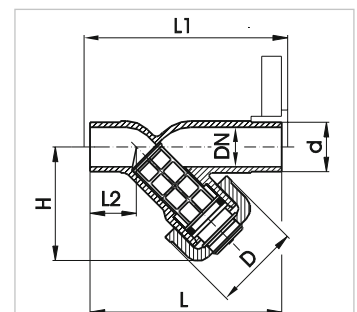
ABS solvent cement spigot, metric

DN (mm)	d (mm)	D (mm)	L (mm)	L1 (mm)	L2 (mm)	H (mm)	closest (inch)
20	20	52	168	130	75	140	1/2
25	25	62	192	150	80	160	3/4
32	32	68	206	160	90	170	1
40	40	85	230	180	110	190	1 1/4
50	50	85	256	200	125	210	1 1/2
63	63	102	294	230	150	240	2



PP solvent cement spigot, metric

DN (mm)	d (mm)	D (mm)	L (mm)	L1 (mm)	L2 (mm)	H (mm)	closest (inch)
20	20	52	168	130	75	140	1/2
25	25	62	192	150	80	160	3/4
32	32	68	206	160	90	170	1
40	40	85	230	180	110	190	1 1/4
50	50	85	256	200	125	210	1 1/2
63	63	102	294	230	150	240	2



Installation and maintenance must be performed in accordance with the corresponding installation manual. The installation manual is provided with the product, see also the online product catalogue at www.gfps.com

5 Water Jet Suction Pumps

5.1 Water Jet Suction Pump Type P20



5.1.1 Product description

The P20 water jet suction pump can be used in cases where liquid that is under pressure is present as a propellant. They are used for transporting and mixing liquids. They are self-priming and have no mechanically moving parts.

Function

The basic principle of the water jet suction pump is that the propellant liquid passes through a nozzle and draws in with it the liquid or gaseous medium from the suction line, increasing its velocity. The result of this is that the propellant and the medium that is sucked in are mixed together. The amount of liquid propelled is a function of the propellant pressure and the size of the nozzle. The amount of medium drawn in can be seen from the diagrams. The results shown are only guidelines and depend on the method of operation.

Applications

- Aquariums
- Chemical process industry
- Industrial water treatment
- Swimming pools

Benefits/features

- No external energy required for operation
- Ideal for mixing, dosing and transporting liquids
- No mechanically moving parts
- Self-priming

Flow media

Neutral and aggressive media free of particles/solids. The chemical resistance depends on the selected material ([see online tool ChemRes PLUS](#)).

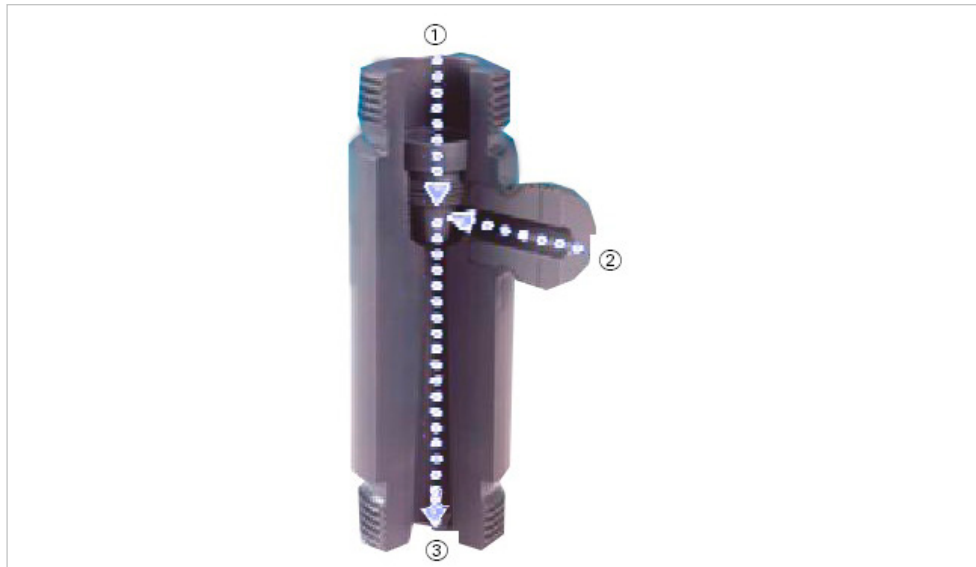
5.1.2 Technical basics

Principle of functionality

The propellant (liquid) flows through a nozzle. Due to this, a negative pressure (vacuum) is created. The liquid or gas suction medium is sucked out through an increase in speed.

The propellant and the suction medium are ideally mixed. The amount of liquid propelled is a function of the propellant pressure and the size of the nozzle. The amount of liquid drawn in can be seen from the diagrams. The results shown are only guidelines and depend on the method of operation.

A throttle is connected to the suction pipe to enable optimal dosing.



- ① Propellant
- ② Suction medium (suction pipe)
- ③ Mixture of propellant and suction medium (outlet)

VI

Valve handling

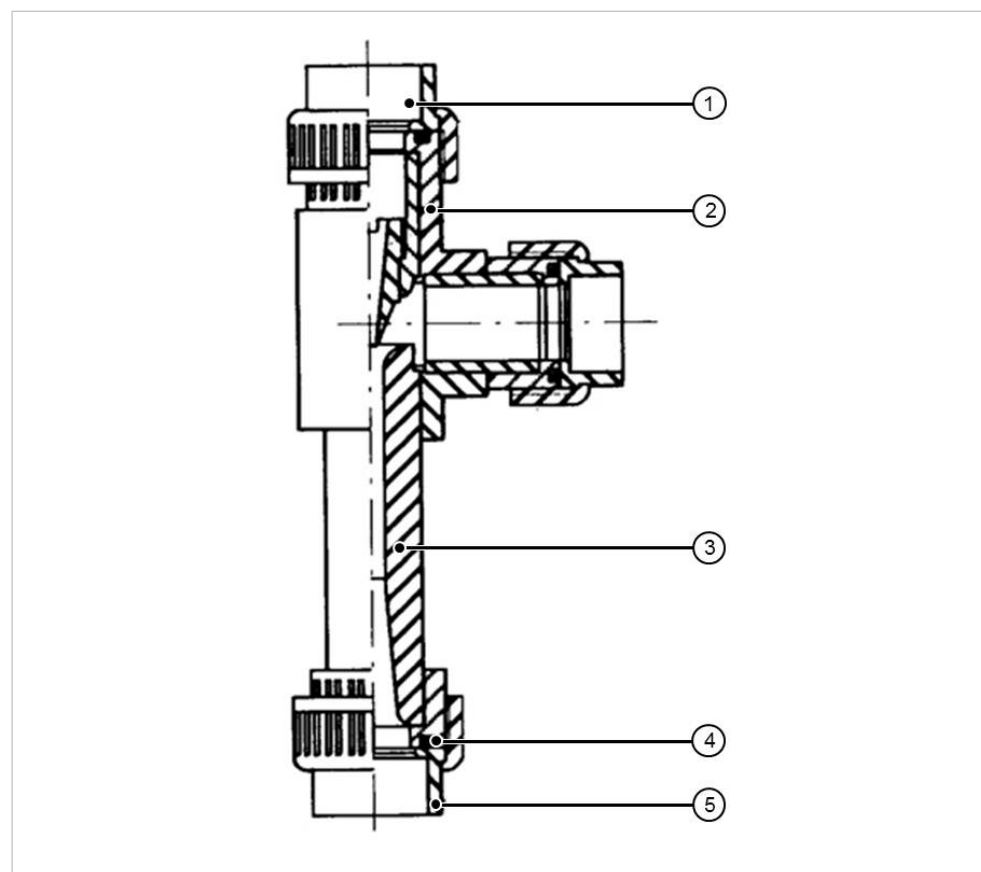
Installation notes

- We recommend installing the water jet pump between two detachable pipe sections. With a view to subsequent dismantling, it is useful to provide shut-off devices.
- Relaxation zones of at least $5 \times DN$ are to be provided upstream and downstream of the pump.
- It is recommended to install a flow meter in the suction pipe to provide information on the suction power of the pump.
- It is useful to install manometers upstream and downstream of the jet pump for reading the inlet pressure and the back pressure.
- The suction time can be significantly reduced by installing a check valve in the suction pipe.
- Inlet and outlet pipes must have at least the nominal diameter of the pump.
- An exact dosing of the propellant and suction flow is guaranteed through the installation of throttle valves.



Installation and maintenance must be performed in accordance with the corresponding installation manual. The installation manual is provided with the product, see also the online product catalogue at www.gfps.com

5.1.3 Technical data



- ① Coupling nut
- ② Nozzle
- ③ Water jet suction pump
- ④ O-ring
- ⑤ Insert

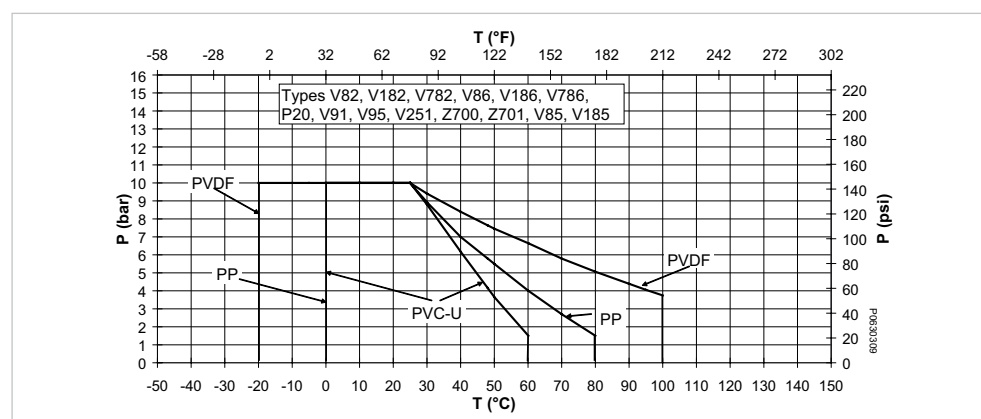
Specification

Dimensions	d16/DN10 – d90/DN80, 3/8" – 3"	
Materials	PVC-U, PP-H, PVDF	
Gasket materials	EPDM, FKM	
Connections	DN10 – DN20	Threads DIN/ISO
	DN20 – DN50	Screws DIN/ISO
	DN65 – DN80	Cement spigots DIN/ISO
Nominal pressure	PN10	

Pressure-temperature diagrams

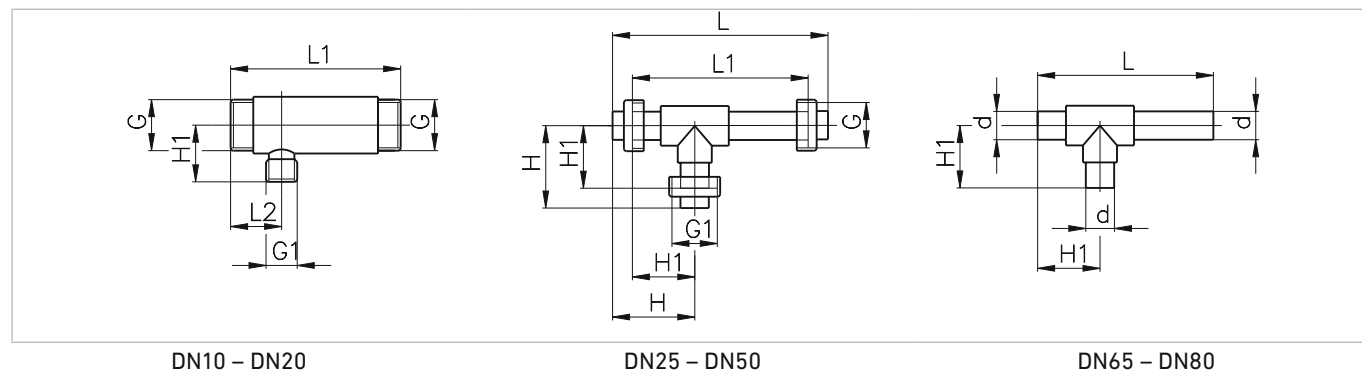
The following pressure-temperature diagrams are based on a lifetime of 25 years and water or similar media.

PVC-U, PP-H, PVDF



- T Temperature (°C, °F)
- P Permissible pressure (bar, psi)

5.1.4 Dimensions

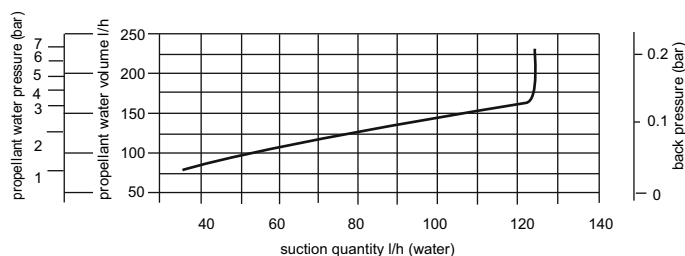


	da (mm)	DN (mm)	G	G1	L (mm)	L1 (mm)	t (mm)	H (mm)	h (mm)
P 20.10 - 1.5	16	10	R ¾"	R ¾"		110	40		35
P 20.10 - 2.0									
P 20.15 - 2.0	20	15	R 1"	R ¾"		125	40		35
P 20.15 - 3.0									
P 20.15 - 4.0									
P 20.20 - 3.0	25	20	R 1 ¼"	R ¾"		145	45		45
P 20.20 - 4.5									
P 20.20 - 6.0									
P 20.25 - 2.5	32	25	R 1 ½"	R 1 ½"	245	195		96	71
P 20.25 - 4.0									
P 20.25 - 5.0									
P 20.32 - 3.0	40	32	R 2"	R 2"	297	239		116	87
P 20.32 - 4.5									
P 20.32 - 6.0									
P 20.40 - 3.5	50	40	R 2 ¼"	R 2 ¼"	369	301		139	105
P 20.40 - 5.5									
P 20.40 - 7.5									
P 20.50 - 5.0	63	50	R 2 ¾"	R 2 ¾"	433	351		169	128
P 20.50 - 7.0									
P 20.50 - 9.0									
P 20.65 - 6.5	75	65			388				115
P 20.65 - 9.0									
P 20.65 - 11.5									
P 20.80 - 8.0	90	80			465				149
P 20.80 - 11.0									
P 20.80 - 14.0									

Characteristic curves

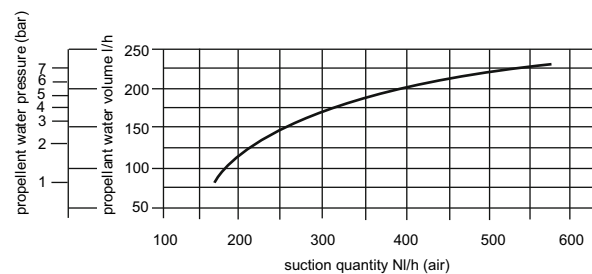
Suction medium: water

DN10, nozzle size 1.5

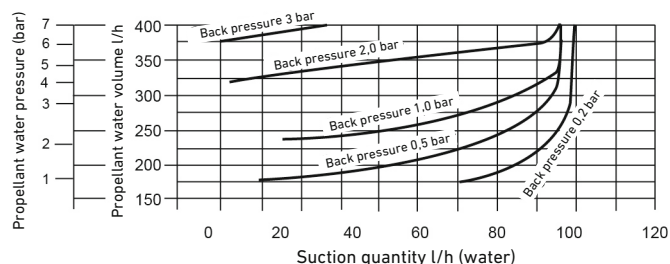


Suction medium: air

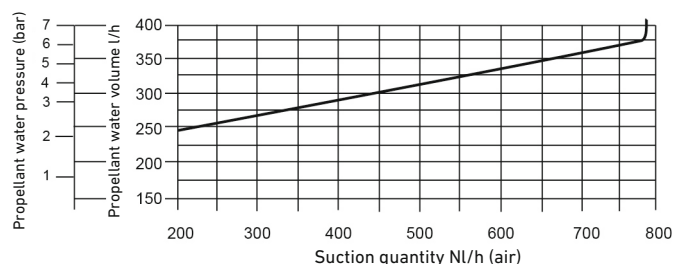
DN10, nozzle size 1.5



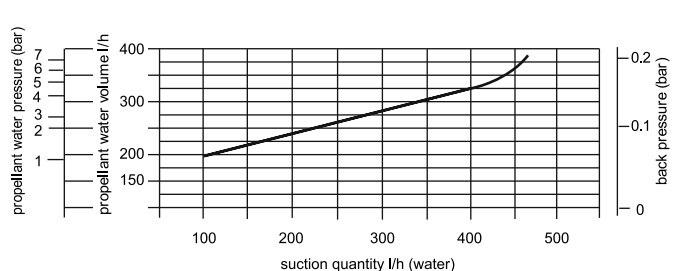
DN10, nozzle size 2.5



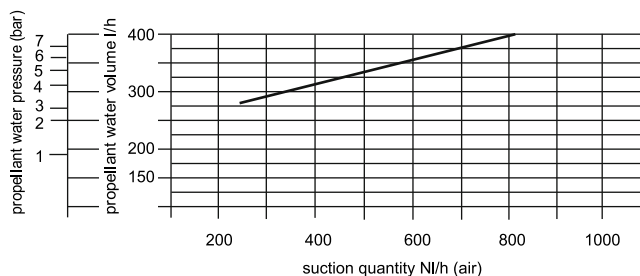
DN10, nozzle size 2.5



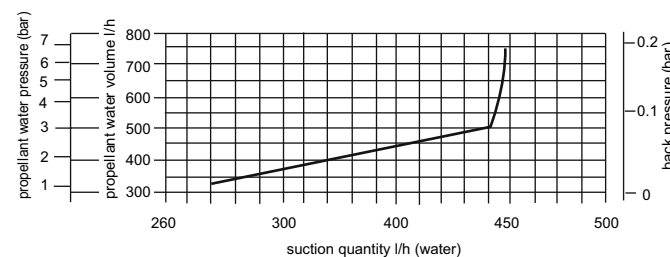
DN15, nozzle size 2.0



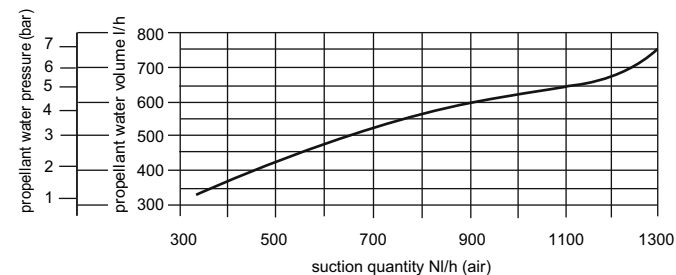
DN15, nozzle size 2.0



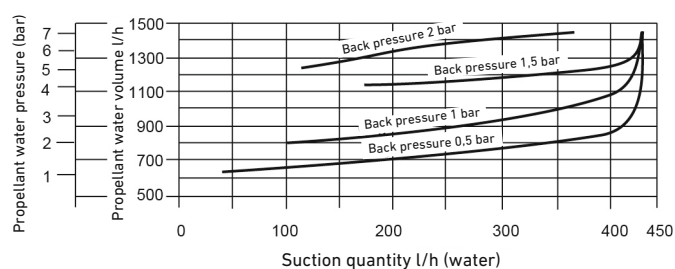
DN15, nozzle size 3.0



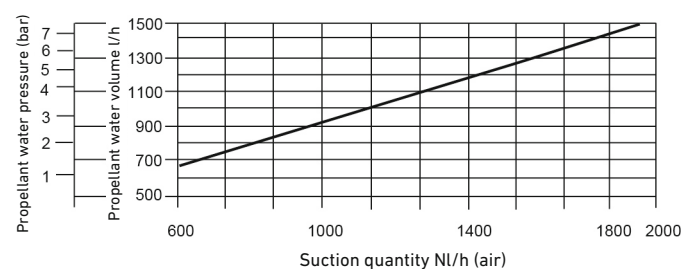
DN15, nozzle size 3.0



DN15, nozzle size 4.0

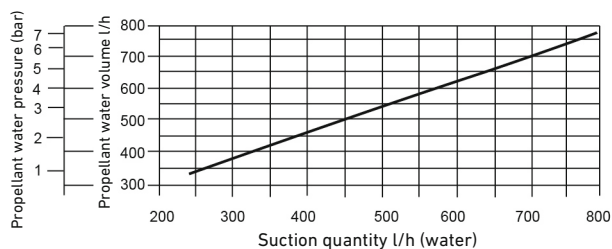


DN15, nozzle size 4.0



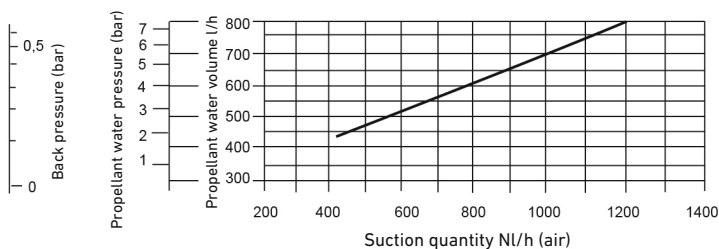
Suction medium: water

DN20, nozzle size 3.0

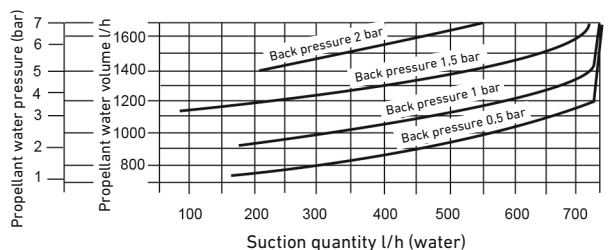


Suction medium: air

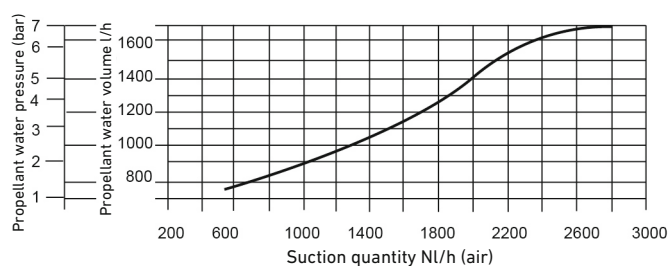
DN20, nozzle size 3.0



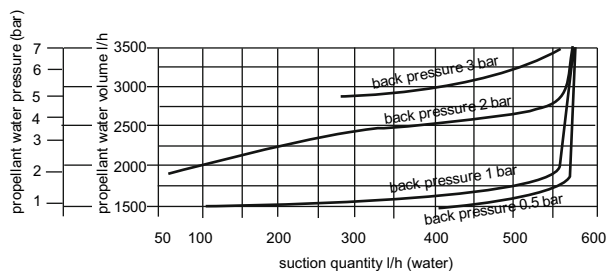
DN20, nozzle size 4.5



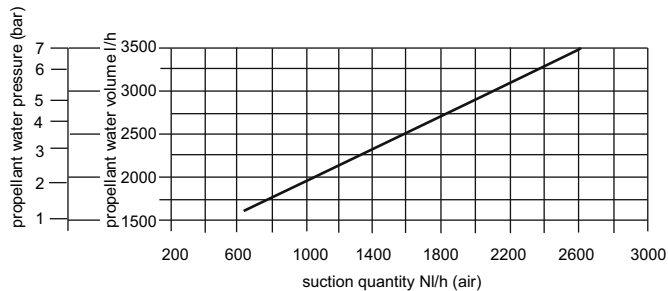
DN20, nozzle size 4.5



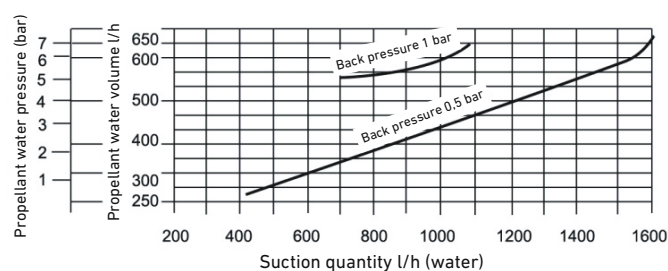
DN20, nozzle size 6.0



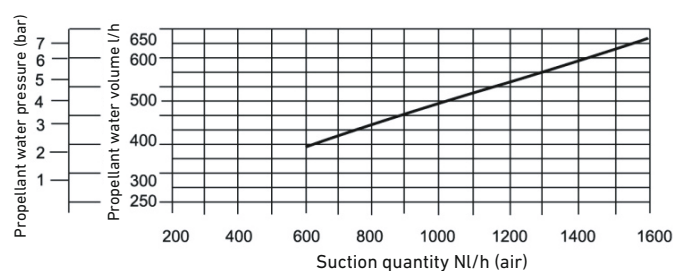
DN20, nozzle size 6.0



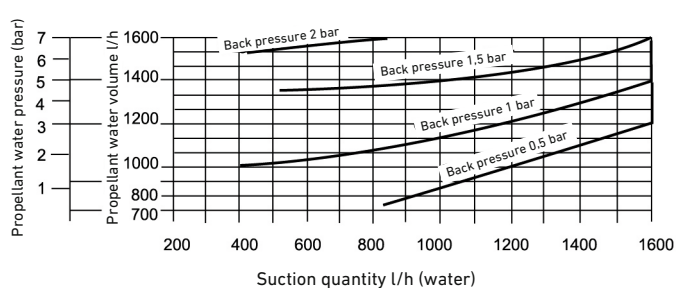
DN25, nozzle size 2.5



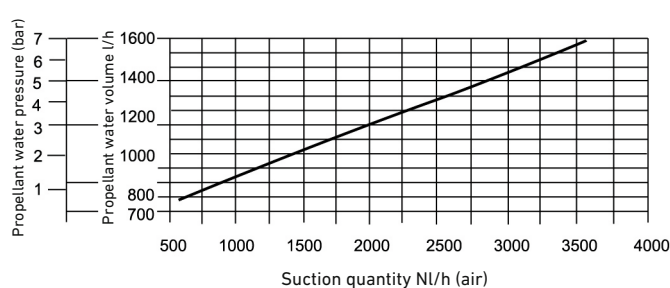
DN25, nozzle size 2.5



DN25, nozzle size 4.0

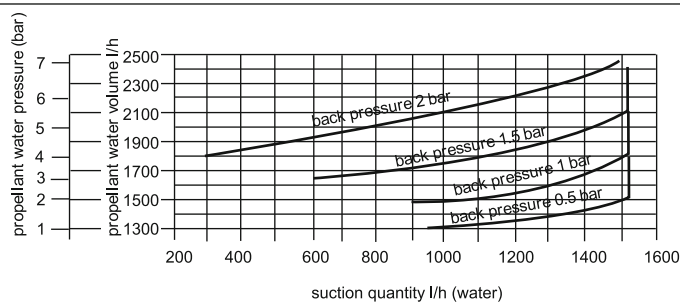


DN25, nozzle size 4.0

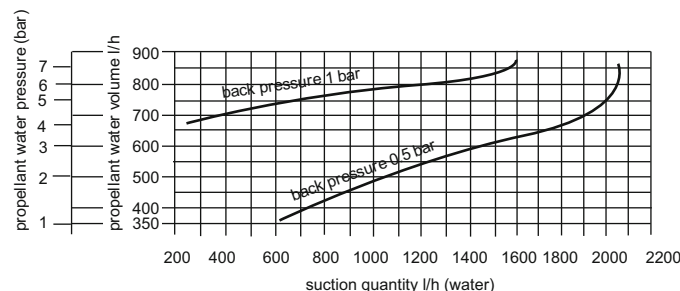


Suction medium: water

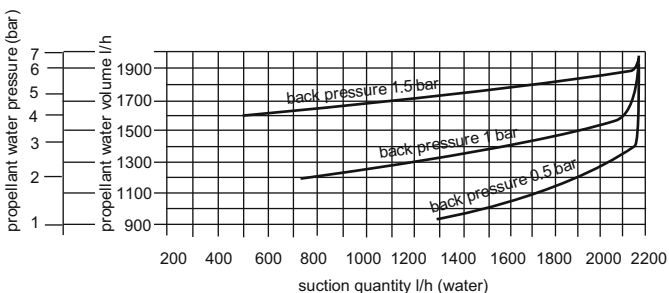
DN25, nozzle size 5.0



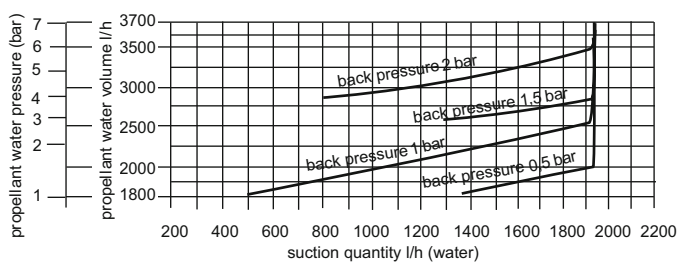
DN32, nozzle size 3.0



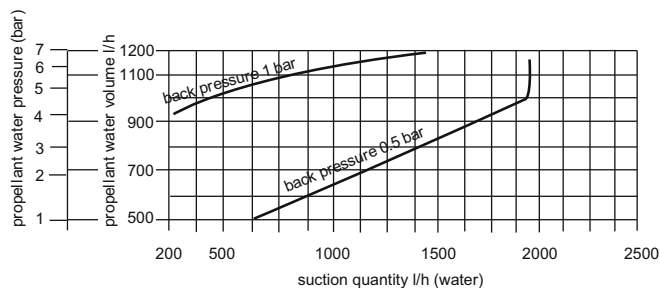
DN32, nozzle size 4.5



DN32, nozzle size 6.0

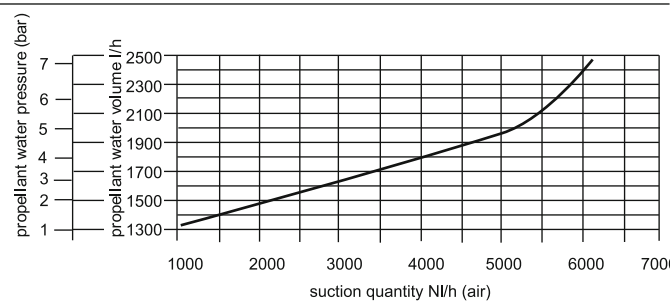


DN40, nozzle size 3.5

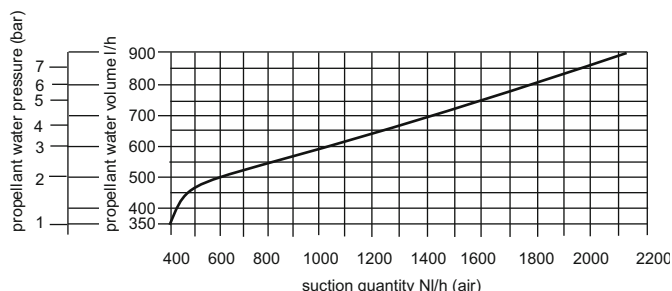


Suction medium: air

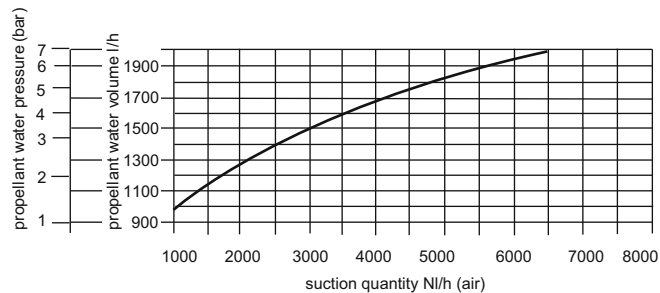
DN25, nozzle size 5.0



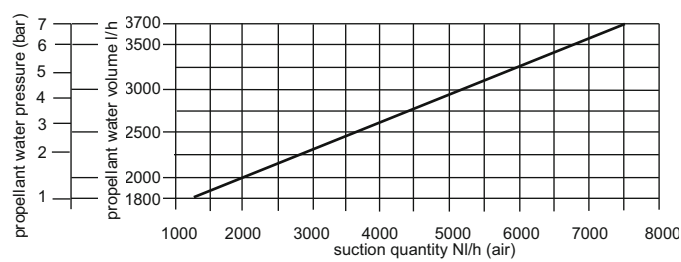
DN32, nozzle size 3.0



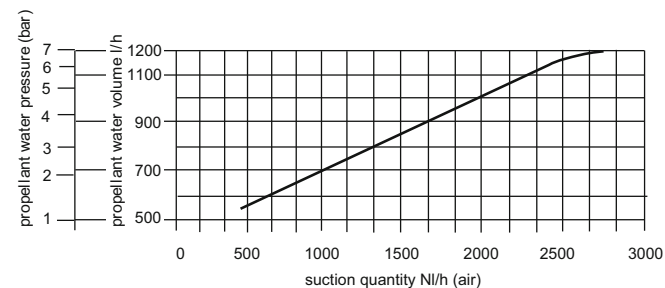
DN32, nozzle size 4.5



DN32, nozzle size 6.0

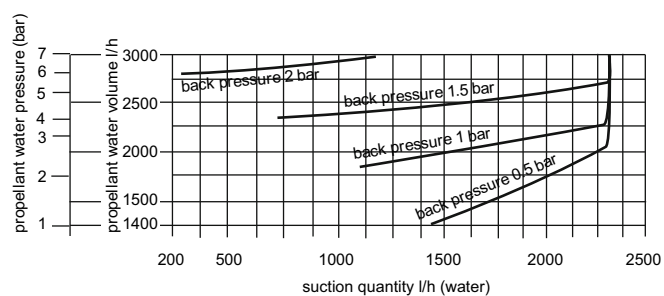


DN40, nozzle size 3.5



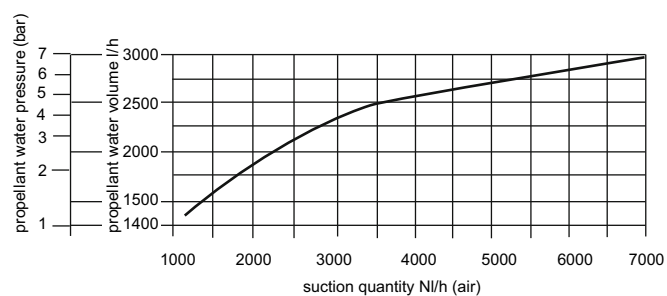
Suction medium: water

DN40, nozzle size 5.5

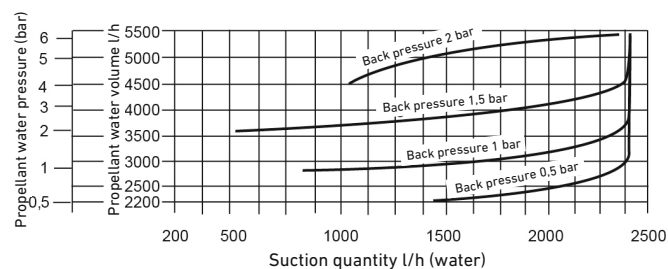


Suction medium: air

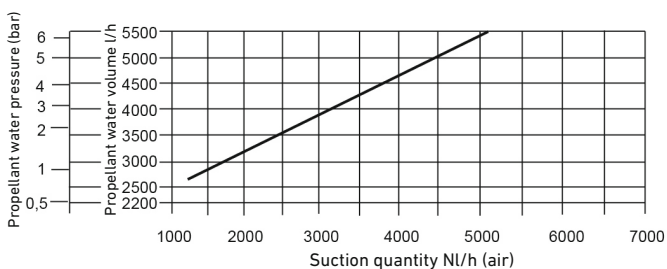
DN40, nozzle size 5.5



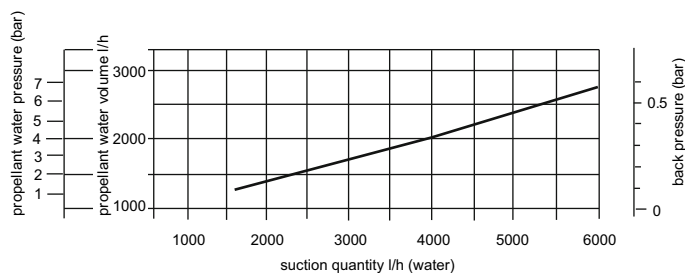
DN40, nozzle size 7.5



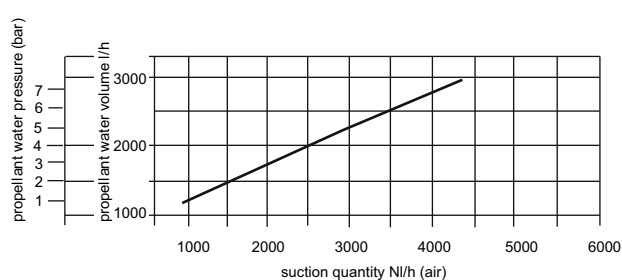
DN40, nozzle size 7.5



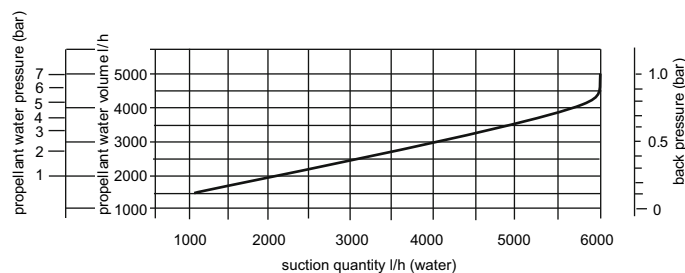
DN50, nozzle size 5.0



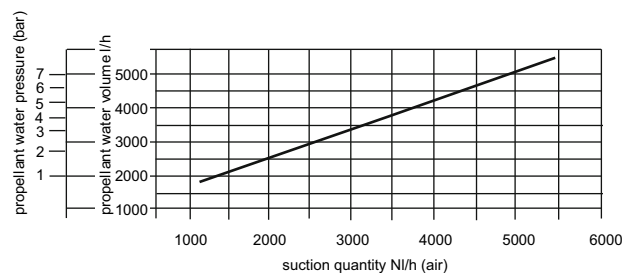
DN50, nozzle size 5.0



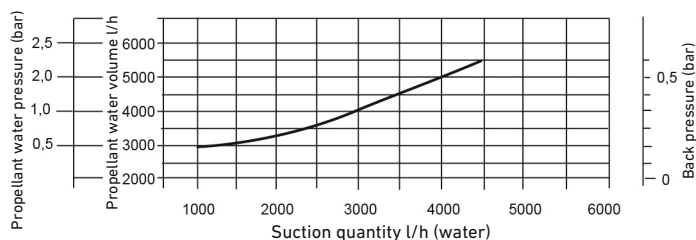
DN50, nozzle size 7.0



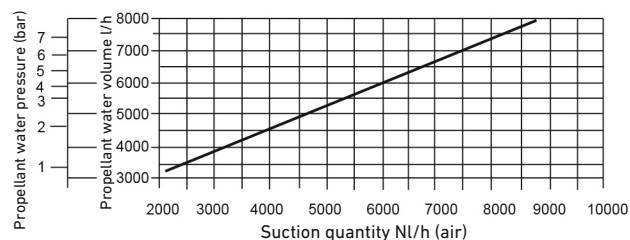
DN50, nozzle size 7.0



DN50, nozzle size 9.0

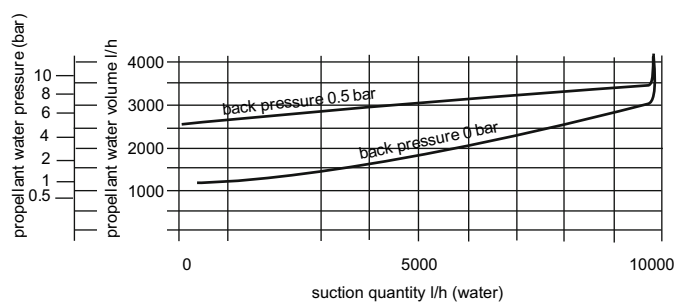


DN50, nozzle size 9.0



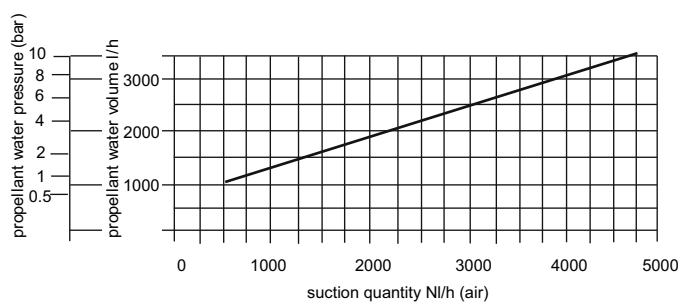
Suction medium: water

DN65, nozzle size 6.5

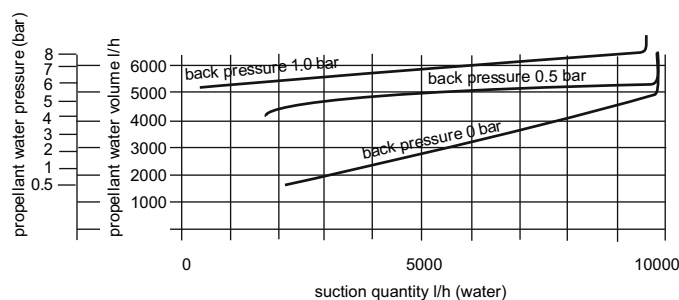


Suction medium: air

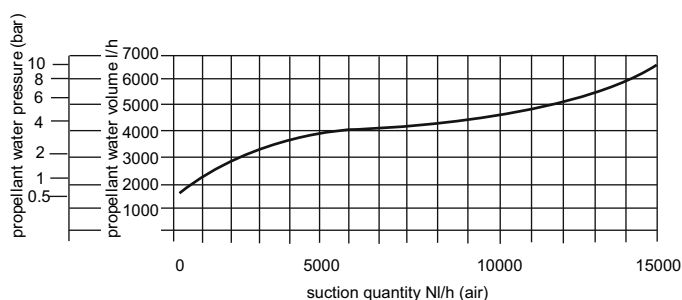
DN65, nozzle size 6.5



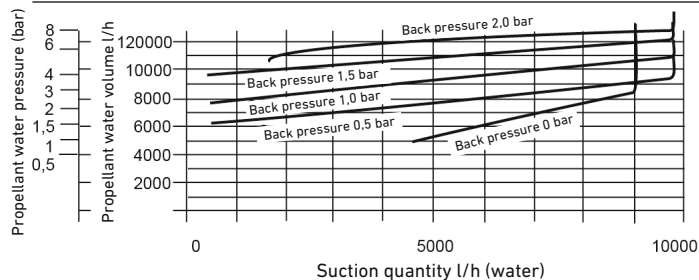
DN65, nozzle size 9.0



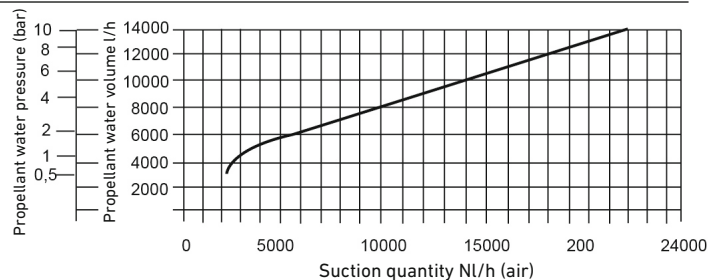
DN65, nozzle size 9.0



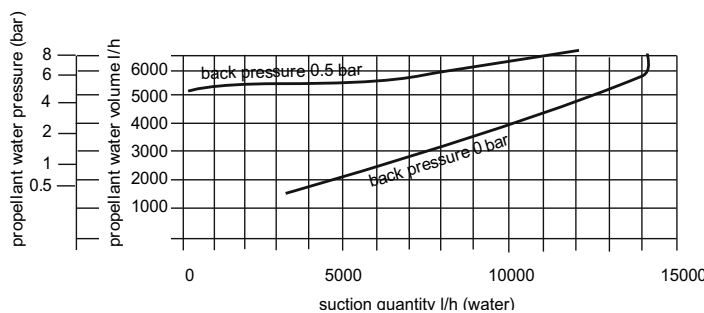
DN65, nozzle size 11.5



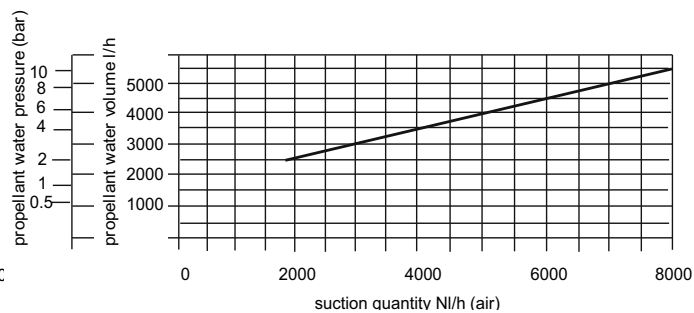
DN65, nozzle size 11.5



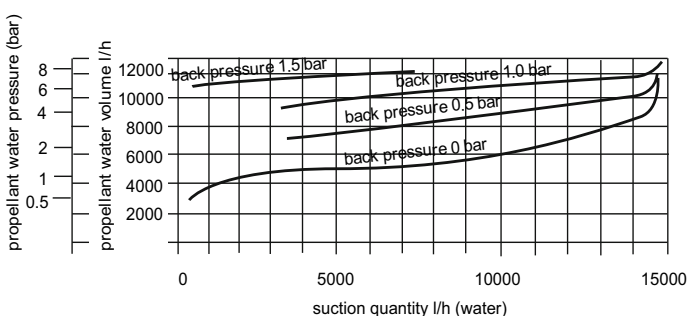
DN80, nozzle size 8.0



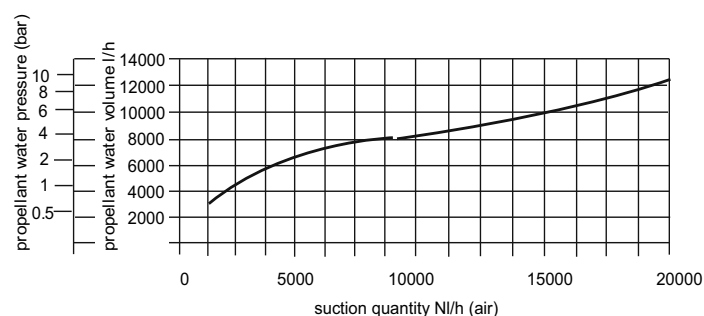
DN80, nozzle size 8.0



DN80, nozzle size 11.0

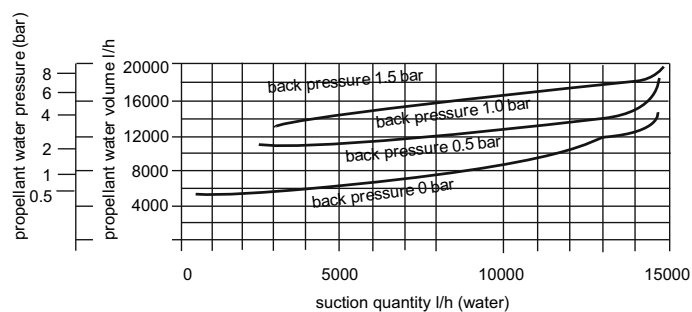


DN80, nozzle size 11.0



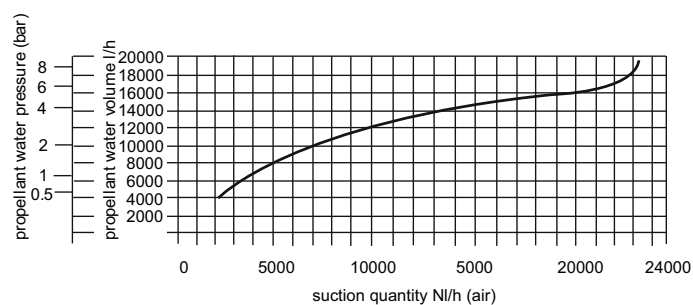
Suction medium: water

DN80, nozzle size 14.0



Suction medium: air

DN80, nozzle size 14.0



Planning Fundamentals of Valves and Automation

Actuators

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1 Electric actuators

1.1 Electric actuators type EA15 – 250



1.1.1 Product description

The electric actuators type EA15, EA25, EA45, EA120 and EA250 are not only excellent equipped, they also feature very high torques ranging from 20 Nm to 250 Nm. This makes it possible to automate a wide range of valves.

Function

Electric actuators are used to operate valves with a swiveling movement from 90° to 180°. The actuator can be installed on any common valves with an ISO 5211 interface.

The addition of accessories allows the actuator to be used not only as an open/close actuator, but also in continuously controlled operation.

Applications

- Chemical process industry
- Water treatment
- Refrigeration

Benefits/features

- Position feedback via relays (open/close/middle)
- Integrated heating element to prevent condensation
- Optical position indicator with LED status monitoring
- Third position between „open“ and „closed“ optional
- Relay output for „ready to operate“ and 7-segment error display
- Integrated emergency manual override with magnetic lock
- Robust PP-GF housing with very good chemical resistance
- Long service life due to robust design and superior electronics
- Flexible configuration thanks to modular concept
- Numerous monitoring and control options
- Simple handling
- Can be used anywhere thanks to universal power supply and standard interfaces

1.1.2 Basic information

Differentiation of actuators

Compared to the basic EA15 model, the actuator type EA25 has a ready-to-operate signal and a duty cycle of 100 %. The standard version of the EA15 is only equipped with the necessary, but can be complemented with a Fail-safe return unit as an accessory. For the EA25, EA45, EA120 and EA250 is also a monitoring board (with cycle time extension, cycle time monitoring, cycle counter, motor current monitoring) and positioner as accessories available. In addition the EA45, EA120 and EA250 electric actuators are not only well equipped with extras, but also feature very high torques. This makes it possible to automate a wide range of valves. While the EA45 features a peak torque of up to 45 Nm, the EA120 goes up to 120 Nm, and the EA250 peaks at 250 Nm. All actuators are ideally equipped for all kinds of control tasks. The EA25, EA45, EA120 and EA250 can also be equipped with a Profibus and thus easily be integrated into an existing Profibus network.

Operation

The electric actuators are available in 24 V AC/DC versions as well as versions equipped with a 100 to 230 V DC universal power supply. Since everything is transformed to 24 V within the device, accessories are equally suited for all actuators. The end positions are defined via digital position monitoring. If the actuator is to be placed at a 180° opening angle instead of a 90° opening angle, this can simply be redefined by the buttons on the base board.

Overload protection

The power supply unit for the EA15, EA25, EA45, EA120 and EA250 is equipped with overload protection to protect the DC motor and the power supply circuit board from overheating. The overload protection is activated as soon as the load exceeds the torque range. As soon as the load returns to the allowable torque range and the temperature has dropped, the actuator returns to operation.

Heating element

The integrated heating element prevents condensation or icing inside the housing. It starts heating from a preset value depends on the ambient temperature, at which the actuator is operated, and can be set manually.

By default the heating element starts heating from a device temperature of 0°C and switches off at 5 °C. The switch-on threshold can be set within steps of 5 °C up to 40 °C. Then the heating switches off again at 45 °C.

Safety position

In the event of power outage, the actuator remains in whatever position it is in at the time. If in this case the actuator is equipped with the „failsafe return unit“ accessory, it automatically returns to a previously defined safe position (OPEN/CLOSE).

Handling

Installation notes

- If the actuator is connected directly to the power supply, an isolating switch must be installed on site (do not disconnect the ground cable). The wire gauge of the supply line must be between 0.75mm² and 1.5 mm². To prevent water from penetrating into the actuator, make sure that the cable entry is not facing upward.
- The EA25/45/120/250 actuators are equipped with healthy monitoring (ready-to-operate signal).
- When the actuator is first switched on, the power supply capacitor charging may cause current surges for a few microseconds.
- Don't switch power off in end positions. Use e.g. changeover contacts.
- For EA25/45/120/250 only: Actuators must be permanently powered to maintain feedback (otherwise feedback relay will be de-energized).

Maintenance notes

- Inspect regularly to ensure all housing screws are properly installed.
- Ensure that the emergency override cover is installed.
- Check whether the control signal and the visual display match, if not, readjust the end positions.



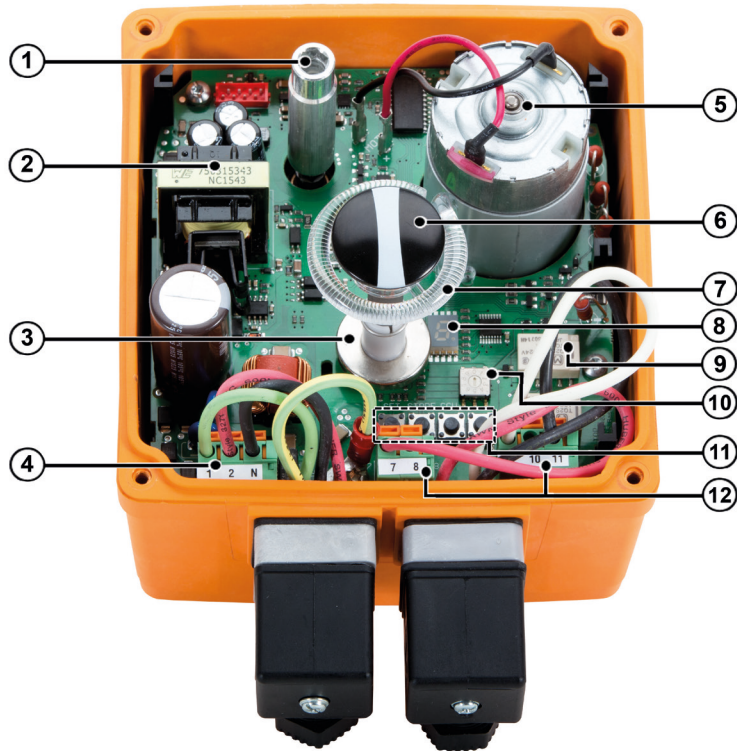
Installation and maintenance must be performed as specified in the installation manual. The document is provided with the product, see also the online catalog at www.gfps.com

Installation tips

- Max. connection wire gauge: 1.5 mm²; Min. connection wire gauge 0.75mm²
- Fuse rating: > 6 A
- Install control and signal lines in separate cable conduits

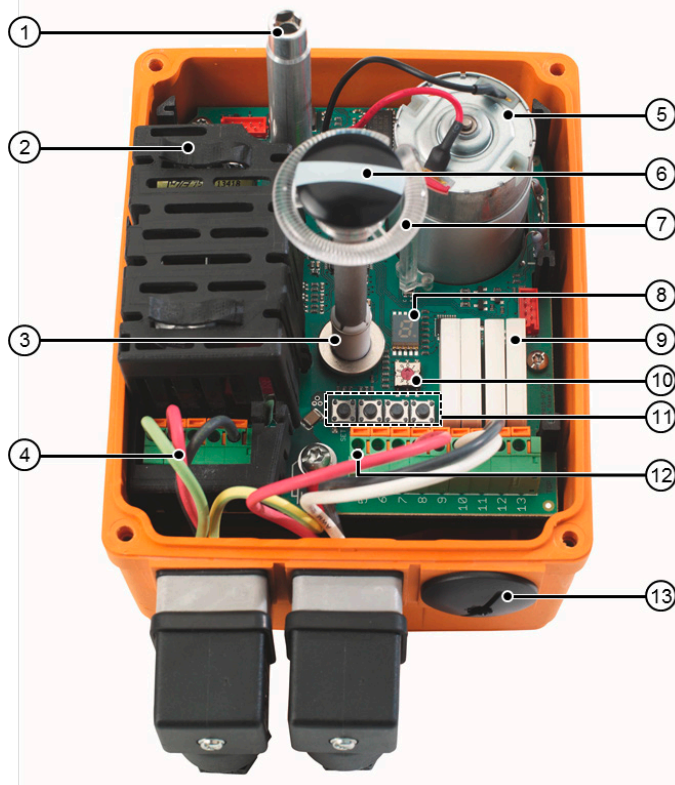
1.1.3 Technical data

The standard version of the EA15 electric actuator consists of the following elements:



- ① Shaft for emergency manual override
- ② Power supply unit with contact-protection installed at 230 V version
- ③ Digital position detection
- ④ Control for OPEN/CLOSED
- ⑤ DC motor
- ⑥ Optical position indicator
- ⑦ Light tube for LED status feedback
- ⑧ 7-segment error display
- ⑨ Feedback via relay for OPEN/CLOSED
- ⑩ Heating element (temperature threshold regulator)
- ⑪ Button for end stop adjustment
- ⑫ Signal output „ready-to-operate“ connection options for DIN plugs (Standard types only) & Cable glands (Standard & cUL types)

The standard version of the EA25/45/120/250 electric actuator consists of the following elements:



- ① Shaft for emergency manual override
- ② Power supply unit with contact-protection installed at 230 V version
- ③ Digital position detection
- ④ Control for OPEN/CLOSED/MIDDLE position
- ⑤ DC motor
- ⑥ Optical position indicator
- ⑦ Light tube for LED status feedback
- ⑧ 7-segment error display
- ⑨ Feedback via relay for OPEN/CLOSED/MIDDLE
- ⑩ Heating element (temperature threshold regulator)
- ⑪ Button for end position adjustment
- ⑫ Terminal block to connect position feedback
- ⑬ Connection options for DIN plugs (standard types only) or cable glands (standard & cUL types)

Specification		
Combinations	EA15	2-way ball valve type 546 Pro to DN50 3-way ball valve type 543 up to DN50
	EA 25	2-way ball valve type 546 Pro to DN50 3-way ball valve type 543 up to DN50
	EA45	2-way ball valve type 546 Pro up to DN65 Butterfly valve types 567 and 578, types 038 and 039
	EA120	2-way ball valve type 546 Pro up to DN100 Butterfly valve types 567 and 578, types 038 and 039
	EA250	Butterfly valve types 567 and 578, types 038 and 039
Rated voltage	AC	100 – 230 V, 50/60 Hz
	AC/DC	24 V, 50/60 Hz
Rated voltage tolerance	± 15%	
Protection class	IP 65 (IP67)1) per EN 60529 Designed for wet & dry locations (NEC), designed for indoor use (UV light may cause discoloration)	
Contamination level	2 according to EN 61010-1	
Overload protection	Current/time-dependent (resetting)	
Overvoltage category	II	
Ambient temperature	-10 °C to +50 °C (14°F to +122°F)	
Max. installation altitude	2000m above sea level (AMSL)	
Allowable humidity	Max. 90 % relative humidity, non-condensing	
Housing material	PP GF for very good chemical resistance	

	EA15	EA25	EA45	EA120	EA250
Rated output	45 VA	45 VA	65 VA	60 VA	70 VA
Rated torque Mdn. (peak)	10 (20)	10 (25)	20 (45)	60 (120)	100 (250)
Duty cycle at 25 °C / 15 min	40%	100 %	50 %	50 %	35 %
Cycle time s/90° at Mdn.	5s	5 s	6 s	15 s	20 s
Connection	F05	F05	F05	F07	F07
Tested cycles (at 20 °C and Mdn.)	150 000	250 000	100 000	100 000	75 000
Weight	1.85 kg	2,193 kg	2,193 kg	3,356 kg	4,995 kg
Actuating angle		Max. 355°, set to 90°			

¹⁾ When used with cable glands and vertical installation.

Options

Electrical ball valves

Type 127

Type 127 ball valves are based on the type 546 Pro ball valve and the EA15 (DN10 – DN50).

Ball valve, electric	Actuator, electric	Ball valve, manually operated	Dimensions	Materials	Standards
Type 127	EA15	Type 546 Pro	DN10 – DN50	PVC-U, PVC-C, PP-h, ABS, PVDF	ISO/DIN, BS ASTM/ANSI, JIS

Type 179 – 184

Type 179 – 184 ball valves are based on the type 546 Pro ball valve and the EA25 (DN10 – DN50), EA45 (DN65 – DN80) or EA120 (DN90 – DN100) electric actuator. The 179 – 184 series is designed for applications with special process requirements.

Ball valve, electric	Actuator, electric	Ball valve, manually operated	Dimensions	Materials	Standards
Type 179	EA25/45/120	Type 546 Pro	DN10 – DN100	PVC-U, PVC-C, ABS	ISO/DIN
Type 180	EA25/45/120	Type 546 Pro	DN10 – DN100	PP	ISO/DIN
Type 181	EA25/45/120	Type 546 Pro	DN10 – DN100	PVDF	ISO/DIN
Type 182	EA25/45/120	Type 546 Pro	DN10 – DN100	PVC-U, PVC-C	ASTM/ANSI
Type 183	EA25/45/120	Type 546 Pro	DN10 – DN100	PVC-U	BS
Type 184	EA25/45/120	Type 546 Pro	DN10 – DN100	PVC-U	JIS

Type 167 – 170

Type 167 – 170 ball valves are based on the type 543 ball valve and the EA25 electric actuator.

Ball valve, electric	Actuator, electric	Ball valve, manually operated	Dimensions	Materials	Standards
Type 167	EA25	Type 543, horizontal	DN10 – DN50	PVC-U, ABS	ISO/DIN, ASTM/ANSI, JIS
Type 168	EA25	Type 543, horizontal	DN10 – DN50	PP	ISO/DIN
Type 170	EA25	Type 543, vertical	DN10 – DN50	PVC-U	ISO/DIN, JIS

Electric butterfly valves

Type 145 – 147

The type 145 electric butterfly valve is intended for wafer style installation and is adaptable to a variety of applications. With the optional positioner, its functional options range from a simple open/close valve to a precise flow control device.

The type 146/147 electric butterfly valve is intended for lug type or wafer style installation and is adaptable to a variety of applications. With the optional positioner, its functional options range from a simple open/close valve to a precise flow control device.

Butterfly valve, electric	Actuator, electric	Butterfly valve, manually operated	Dimensions	Materials	Standards
Type 145	EA45/120/250	Type 567	DN50 – DN300	All	All standards
Type 146	EA45/120/250	Type 578	DN50 – DN300	All	ISO/DIN
Type 147	EA45/120/250	Type 578	DN50 – DN300	All	ASTM/ANSI

Position indicator

The position indicator shows the valve position. The valve positions can be read on the fitted cover. When the cover is fitted, the following image can be seen (Example ball valve):

	2-way	3-way horizontal (L)	3-way vertical (L)
Image of position indicator in valve position 1			
Valve function			
Actuating angle	0° - 90°	0° - 90°	0° - 180°
Valve position 1	A - B (OPEN) See image	A - C (Flow right side, outlet to the front) See image	B - C (Flow left side, bottom outlet) See image
Valve position 2	C - D (CLOSE)	B - C (Flow left side, outlet to the front)	A - C (Flow right side, bottom outlet)

By teaching in a „Middle position“ different possibilities can be achieved depending on the valve and the application. For example:

- 2-way ball valve: Middle position describes a position, permitting no 100% flow but for instance only half as strong.
- 3-way ball valve: Middle position describes a position of the ball in which both passages are slightly opened.
- 3-way ball valve: Middle position describes a position of the ball which closes both passages.

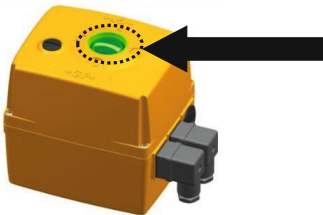
Ball valve and ball-type	3-way horizontal (L-ball)	3-way horizontal (L-ball)	3-way vertikal (L-ball)
Function of the middle position	CLOSE (on both sides no flow)	„Mixing“ (both passages slightly opened)	CLOSE (on both sides no flow)
Actuating angle	0° - 180°	0° - 90°	0° - 180°
Position 1	A - C (OPEN right)	A - C (OPEN right)	B (-C) (OPEN left)
Position 2	B - C (OPEN left) 90°	A/C - B/C (partly opened) 45°	(C-) D (CLOSE) 90°
Position 3	B - D (CLOSE) 180°	B - C (OPEN left) 90°	A (-C) (OPEN right) 180°

(Function of the middle position as „Mixing“ with the 3-way ball valve vertical is only possible with the T-ball)

LED status feedback

The LED status feedback shows the valve positions and the current status of the actuator.

The following table shows the colour assignment of the LED:

	Color	Meaning
	Red	Open
	Green	Closed
	White	Middle
	Flashes white	Actuator moves
	Flashes yellow	Error
	Flashes blue	Adjustment mode
	Green/yellow	Setpoint value reached (at positioner)
	Turquoise	Adjustment run / operation of colour inversion

If the plant standard requires an inversion of the colour assignment, the customer can adjust this afterwards.

1.1.5 Accessories

EA15 / EA25 / EA45 / EA120 / EA250:

- Failsafe return unit
Battery incorporated into the housing for moving to a safe position in case of power outage (open or closed).

EA25 / EA45 / EA120 / EA250:

- Positioner
For continuous valve control with 4 – 20 mA or 0 – 10 V and 4-20mA Feedback
- Monitoring board
 - Cycle time extension
 - Cycle time monitoring
 - Cycle counter
 - Motor current monitoring
- Fieldbus connection
 - Profibus DP auxiliary card
 - AS interface module



For further information on accessories, refer to Planning Fundamentals, chapter on “Accessories for Electrical Actuators”, and the online product catalog at www.gfps.com

1.2 Smart electric Actuators type dEA



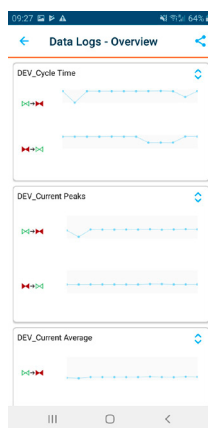
Product description

The smart electric actuator dEA is the first product that can be controlled fully by an app. Furthermore it is not only smart and excellently equipped, it also features very high peak torques ranging from 25 Nm to 250 Nm. Therefore, it is able to automate a wide range of valves.



Function

Electric actuators are used to operate valves with a rotating angle from 90° to 180°. The smart actuators dEA can be installed on any common valves with interface according to ISO 5211. Thanks to the app you can access the actuator via Smartphone - to read data, for control or for system diagnosis. Operating data such as the number of cycles or current drawn is available directly in the app.



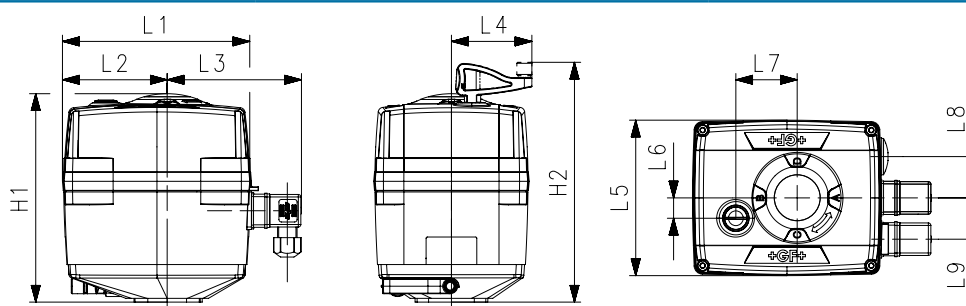
Applications

- Chemical process industry
- Water treatment
- Refrigeration

Benefits/features

- Connectivity via NFC and Wi-Fi Direct ensuring control, identification and visibility without opening the case
- Most relevant asset data visualized in the app
- Connection and control via app possible
- LED stripe for visual open/close 360° feedback
- Heating element
- Position feedback (Open/Close/ Middle)
- Optical position indicator with
- LED status monitoring
- Third position between „OPEN“ and „CLOSE“ optional
- Relay output „ready to operate“
- Integrated emergency manual override with magnetic lock
- Robust PP-GF housing with very good chemical resistance
- Flexible configuration thanks to modular concept

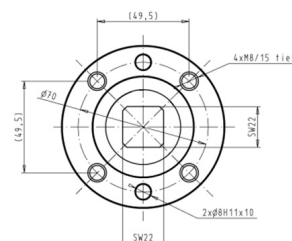
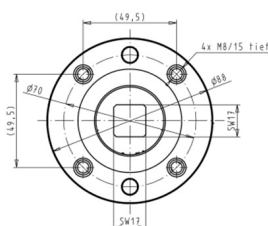
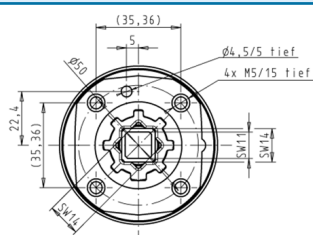
Actuator dimensions



EA	L1 (mm)	L2 (mm)	L3 (mm)	L4 (mm)	L5 (mm)	L6 (mm)	L7 (mm)	L8 (mm)	L9 (mm)	H1 (mm)	H2 (mm)
dEA25	150	82.5	107	64.3	122	16	49	33	33	167	188
dEA45	150	82.5	107	64.3	122	16	49	33	33	167	188
dEA120	150	82.5	107	64.3	122	16	49	33	33	190	212
dEA250	150	82.5	107	64.3	122	16	49	33	33	200	221

dEA120

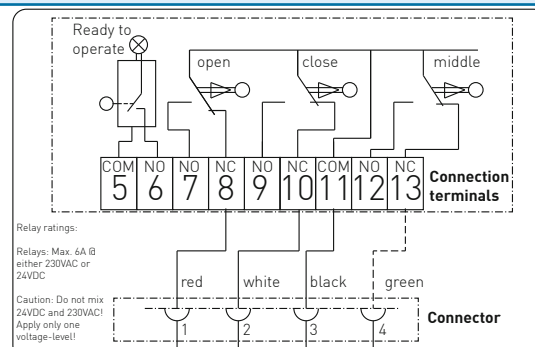
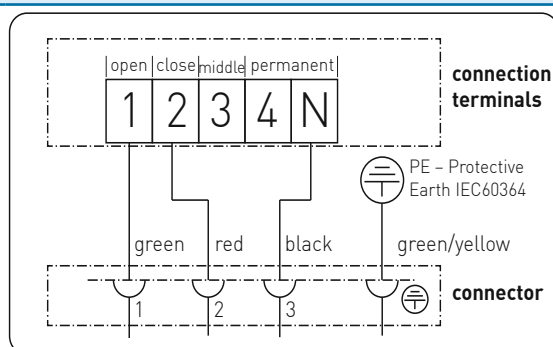
dEA250



For a proper use of the Actuator with standard functions, you can use the following connection diagrams:

Feedback signals

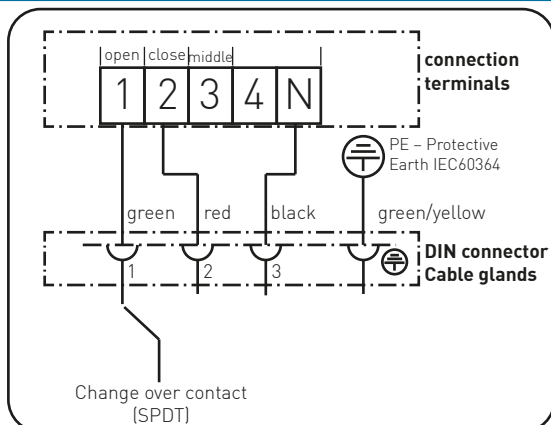
Ready to



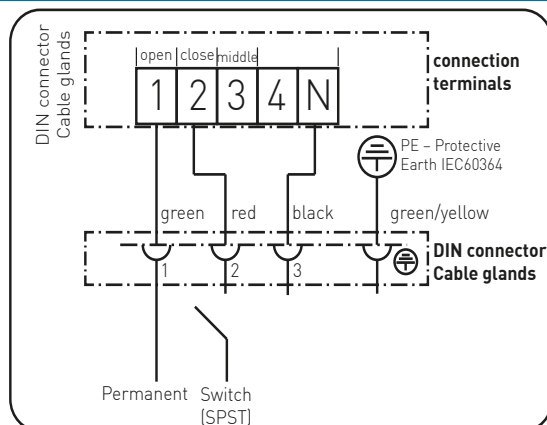
For a proper use of the Actuator with smart functions, you can use the following connection schemes:

Possibility 1

Connection diagram

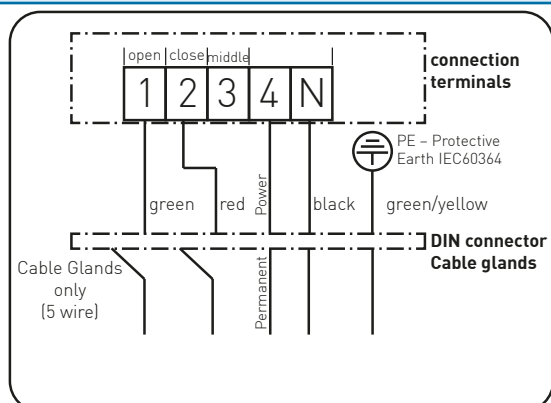


Possibility 2



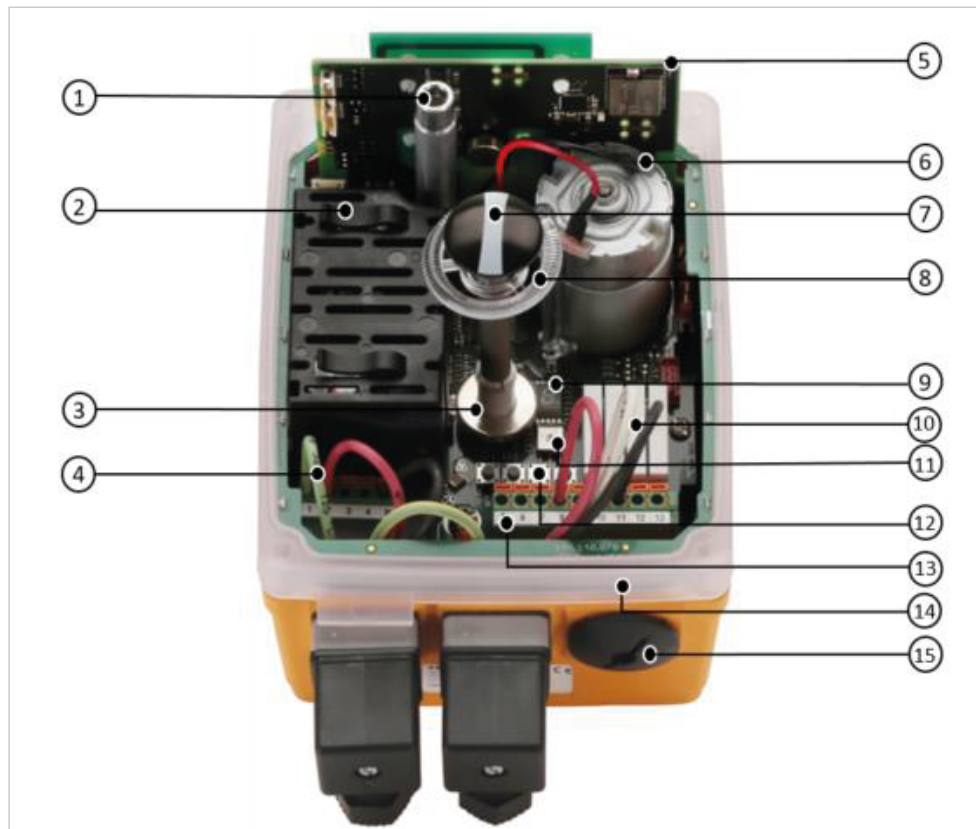
Possibility 3

Connection diagram



1.2.4 Technical data

The standard version of the dEA25/45/120/250 electric smart actuator consists of the following elements:



- ① Shaft for emergency manual override
- ② Power supply unit with contact-protection installed at 230 V version
- ③ Digital position detection
- ④ Control for OPEN/CLOSED/MIDDLE position
- ⑤ Smartboard with NFC and Wi-Fi direct interface
- ⑥ DC motor
- ⑦ Optical position indicator
- ⑧ Light tube for LED status feedback
- ⑨ 7-segment error display
- ⑩ Position feedback via relay for OPEN/CLOSED/MIDDLE
- ⑪ Heating element (temperature threshold regulator)
- ⑫ Button for end position adjustment
- ⑬ Terminal block to connect position feedback"
- ⑭ 360° visible LED
- ⑮ Connection options for DIN plugs or cable glands

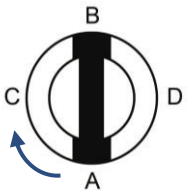
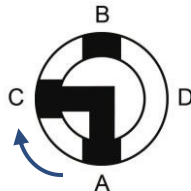
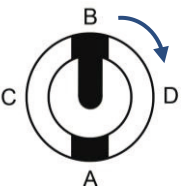
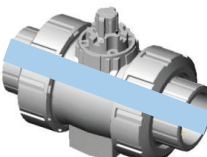
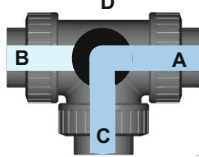
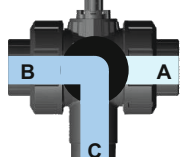
Specification

	dEA25	2-way ball valve type 546 Pro up to DN50 3-way ball valve type 543 up to DN50
	dEA45	2-way ball valve type 546 Pro up to DN65 Butterfly valve types 567 and 578, types 038 and 039 up to DN65
	dEA120	2-way ball valve type 546 Pro up to DN80/DN100 Butterfly valve types 567 and 578, types 038 and 039 up to DN80-DN200
	dEA250	Butterfly valve types 567 and 578, types 038 and 039 up to DN250-DN300
Rated voltage	AC	100 – 230 V, 50/60 Hz
	AC/DC	24 V, 50/60 Hz
Rated voltage tolerance	± 15%	
Protection class	IP 65 (IP67) ¹⁾ per EN 60529 Designed for wet & dry locations (NEC), designed for indoor use (UV light may cause discoloration)	
Contamination level	2 according to EN 61010-1	
Overload protection	Current/time-dependent (resetting)	
Overvoltage category	II	
Ambient temperature	-10 °C to +50 °C (14°F to +122°F)	
Max. installation altitude	2000m above sea level (AMSL)	
Allowable humidity	Max. 90 % relative humidity, non-condensing	
Housing material	PP GF for very good chemical resistance	

	dEA25	dEA45	dEA120	dEA250
Rated output	AC: 35 VA at 100 – 230 V AC/DC: 40 VA at 24 V	AC: 55 VA at 100 – 230 V AC/DC: 60 VA at 24 V	AC: 50 VA at 100 – 230 V AC/DC: 55 VA at 24 V	AC: 60 VA at 100 – 230 V AC/DC: 65 VA at 24 V
Rated torque Mdn. (peak)	10 (25)	20 (45)	60 (120)	100 (250)
Duty cycle at 25 °C / 15 min	100 %	50 %	50 %	35 %
Cycle time s/90° at Mdn.	5 s	6 s	15 s	20 s
Mechanical connection	F05	F05	F07	F07
Tested cycles (at 20 °C and Mdn.)	250 000	100 000	100 000	75 000
Weight	2,1 kg	2,2 kg	3,6 kg	5 kg
Actuating angle	Max. 355°, set to 90°			

Position indicator

The position indicator shows the valve position. The valve positions can be read on the fitted cover. When the cover is fitted, the following image can be seen (Example ball valve):

	2-way	3-way horizontal (L)	3-way vertical (L)
Image of position indicator in valve position 1			
Valve function			
Actuating angle	0° - 90°	0° - 90°	0° - 180°
Valve position 1	A – B (OPEN) See image	A – C (Flow right side, outlet to the front) See image	B – C (Flow left side, bottom outlet) See image
Valve position 2	C – D (CLOSE)	B – C (Flow left side, outlet to the front)	A – C (Flow right side, bottom outlet)

By teaching in a „Middle position“ different possibilities can be achieved depending on the valve and the application. For example:

- 2-way ball valve: Middle position describes a position, permitting no 100% flow but for instance only half as strong.
- 3-way ball valve: Middle position describes a position of the ball in which both passages are slightly opened.
- 3-way ball valve: Middle position describes a position of the ball which closes both passages.

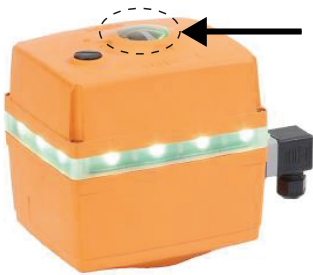
Ball valve and ball-type	3-way horizontal (L-ball)	3-way horizontal (L-ball)	3-way vertikil (L-ball)
Function of the middle position	CLOSE (on both sides no flow)	„Mixing“ (both passages slightly opened)	CLOSE (on both sides no flow)
Actuating angle	0° – 180°	0° - 90°	0° - 180°
Position 1	A – C (OPEN right)	A – C (OPEN right)	B (-C) (OPEN left)
Position 2	B – C (OPEN left) 90°	A/C – B/C (partly opened) 45°	(C-) D (CLOSE) 90°
Position 3	B – D (CLOSE) 180°	B – C (OPEN left) 90°	A (-C) (OPEN right) 180°

(Function of the middle position as „Mixing“ with the 3-way ball valve vertical is only possible with the T-ball)

LED status feedback

The LED status feedback shows the valve positions and the current status of the actuator.

The following table shows the colour assignment of the LED:



Color	Meaning
Red	Open
Green	Closed
White	Middle
Flashes white	Actuator moves
Flashes yellow	Error
Flashes blue	Adjustment mode
Green/yellow	Setpoint value reached (at positioner)
Turquoise	Adjustment run / operation of color inversion

If the plant standard requires an inversion of the colour assignment, the customer can adjust this afterwards.

1.2.5 Accessories

- Failsafe return unit
Battery incorporated into the housing for moving to a safe position in case of power outage (open or closed).



For further information on accessories, refer to Planning Fundamentals, chapter on "Accessories for Electrical Actuators", and the online product catalog at www.gfps.com

1.3 Electric multiturn actuators type EAMT



1.3.1 Product description

The EAMT electric multiturn actuator opens and closes the diaphragm valve fully automatic. Therefore with the EAMT actuator, volume flows are automatically controlled, closed and regulated via a diaphragm valve.

Applications

- Chemical process industry
- Microelectronics
- Water treatment
- Cooling
- Control applications

Benefits/features

- Multiturn actuator
- Adjustable integrated heating
- 7-segment error display
- Position feedback (open/close)
- Fully automatic end position teach-in
- Integrated emergency manual override
- Retrofit set includes: Conversion kit with drive, half shells and screws

Operation

The electric actuators are available in 24 V AC/DC versions as well as versions equipped with a 100 to 230 V DC universal power supply. Since everything is transformed to 24 V within the device, accessories are equally suited for all actuators. The end positions are taught-in fully automatic.

Overload protection

The power supply unit for the EAMT is equipped with overload protection to protect the DC motor and the power supply circuit board from overheating. The overload protection is activated as soon as the load exceeds the torque range. As soon as the load returns to the allowable torque range and the temperature has dropped, the actuator returns to operation.

Heating element

The integrated heating element prevents condensation or icing inside the housing. It starts heating from a preset value depends on the ambient temperature, at which the actuator is operated, and can be set manually.

By default the heating element starts heating from a device temperature of 0 °C and switches off at 5 °C. The switch-on threshold can be set within steps of 5 °C up to 40 °C. Then the heating switches off again at 45 °C.

Safety position

In the event of power outage, the actuator remains in whatever position it is in at the time. If in this case the actuator is equipped with the „failsafe return unit“ accessory, it automatically returns to a previously defined safe position (OPEN/CLOSE).

Handling

Installation notes

- If the actuator is connected directly to the power supply, an isolating switch must be installed on site (do not disconnect the ground cable). The wire gauge of the supply line must be between 0.75mm² and 1.5 mm². To prevent water from penetrating into the actuator, make sure that the cable entry is not facing upward.
- The EAMT actuators are equipped with healthy monitoring (ready-to-operate signal).
- When the actuator is first switched on, the power supply capacitor charging may cause current surges for a few microseconds.
- Don't switch power off in end positions. Use e.g. changeover contacts.
- Actuators must be permanently powered to maintain feedback (otherwise feedback relay will be de-energized).

Maintenance notes

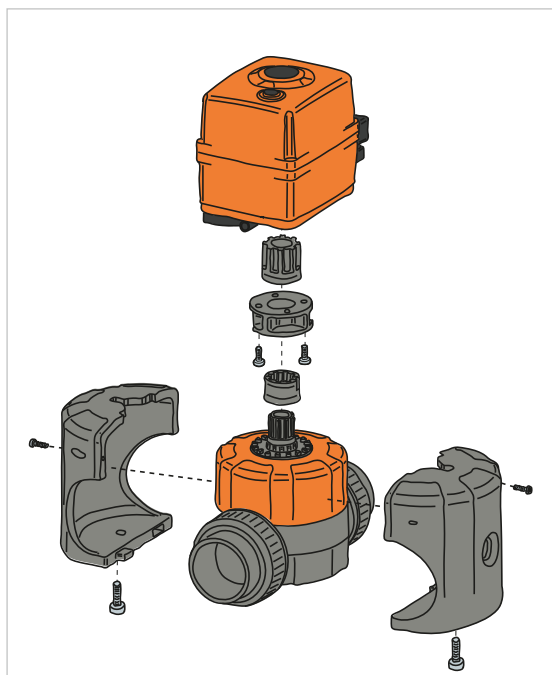
- Inspect regularly to ensure all housing screws are properly installed.
- Ensure that the emergency override cover is installed.
- Check whether the control signal and the visual display match, if not, readjust the end positions.



Installation and maintenance must be performed as specified in the installation manual. The document is provided with the product, see also the online catalog at www.gfps.com

Installation tips

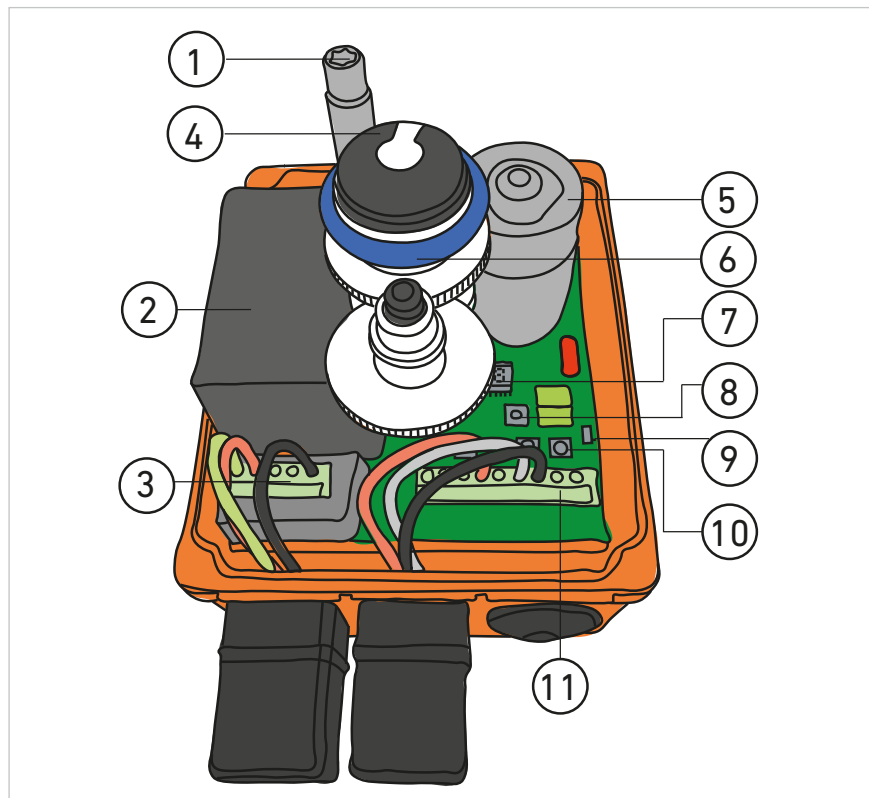
- Max. connection wire gauge: 1.5 mm²; Min. connection wire gauge 0.75mm²
- Fuse rating: > 6 A
- Install control and signal lines in separate cable conduits



Kit with actuator, half shells and screws

1.3.2 Technical data

The standard version of the EAMT electric actuator consists of the following elements:



- ① Shaft for emergency manual override
- ② Power supply with cover
- ③ Control power for OPEN/CLOSED position
- ④ Optical position indicator
- ⑤ DC motor
- ⑥ Light tube for LED status feedback
- ⑦ 7-segment error display
- ⑧ Heating element (temperature threshold regulator)
- ⑨ Switch for diaphragm material
- ⑩ Buttons for end position adjustment
- ⑪ Terminal block to connect position feedback

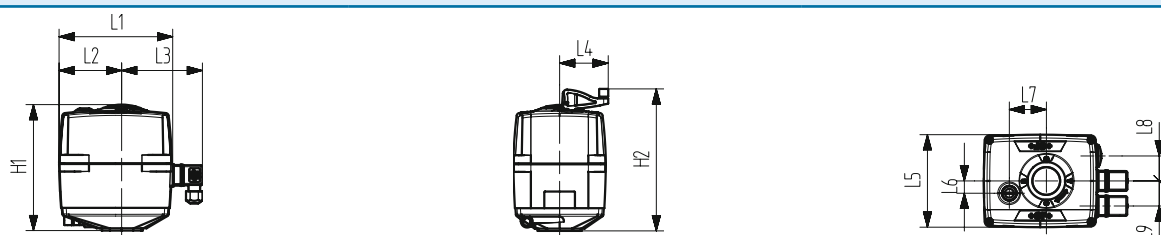
Specification EAMT

Power input max.	65 VA
Current (calculated)	0.55A at 100V 0.24A at 230V 2.5A at 24V
Power Supply	AC: 100 – 230 V, 50/60 Hz AC/DC: 24 V, 50/60 Hz
Supply voltage tolerance	-10%...+15%
Mechanical interface	F05* (WS 11/14)
Duty cycle	50 %
Cycle time open/close	DN25: ≈ 85 sec. DN50: ≈ 130 sec.
Tested cycles (at 20 °C and Mdn)	5000
Weight	2.2 kg / 4.85 lbs
Actuating angle	Multiturn
Protection class	IP 65 (IP67) ¹⁾ per EN 60529 Designed for wet & dry locations (NEC), designed for indoor use (UV light may cause discoloration)
Pollution degree	Operation: Pollution Level 3 Commissioning (open housing cover): Only in controlled environments of pollution level 2
Overload protection	Current/time dependent, resetting
Overvoltage category	II
Fuse	Internal: SMD fuse 2 A, not replaceable. Req. external breakers on all live wires: Rated Current: max. 16A Trip Curve: C, Standards Compliance: UL489, CSA C22.2 No. 5.1, IEC 60947-2
Ambient temp.	-10 °C to +50 °C (14°F to 122°F)
Max. installation altitude	2000m above sea level (AMSL)
Feedback relays	Mono-stable change-over contacts Either max 6A @ 230VAC or 24VDC, no mixed voltage potentials allowed!
Recommended connecting cable	AWG 18-16, UL/cUL AWM 4486 min. 125°C 1000V , outside diameter 8-13mm (cable glands), 4-9mm (DIN-connectors)
Allowable humidity	Max. 90 % relative humidity, non-condensing
Housing material	Housing: PP-GF (POLYFLAM, RPP 4225 CS1) Inspection glass: Udel P-1700 (CL2611) Assembly shells and intermediate elements: PPGF 30

¹⁾ When used with cable glands and vertical installation.

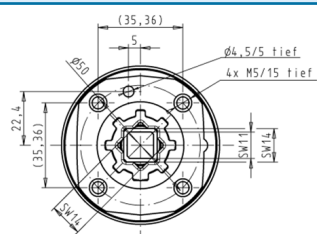
1.3.3 Dimensions

Actuator dimensions



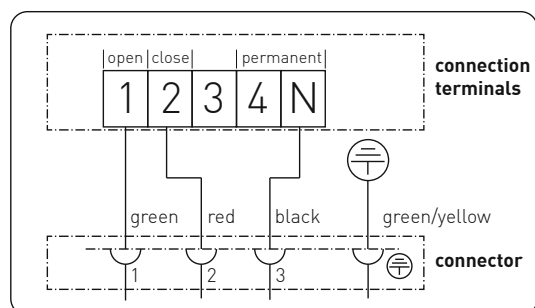
	L1 (mm)	L2 (mm)	L3 (mm)	L4 (mm)	L5 (mm)	L6 (mm)	L7 (mm)	L8 (mm)	L9 (mm)	H1 (mm)	H2 (mm)
EAMT	150	83	108	64	122	16	49	33	33	167	189

Interface dimensions

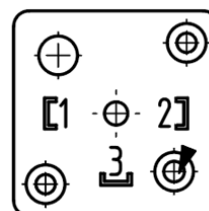
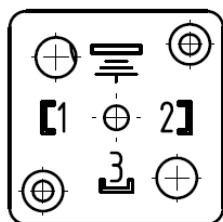
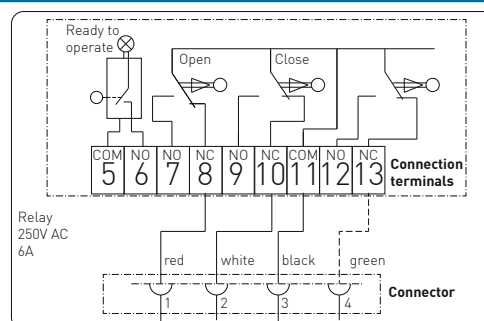


1.3.4 Connection diagram

Connector 1: supply and control

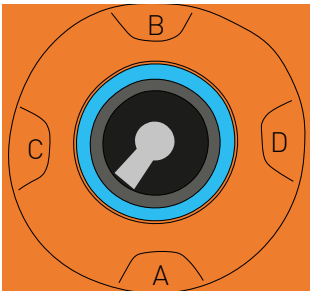


Connector 2: position feedback



1.3.5 LED status feedback

The LED status feedback shows the valve positions and the current status of the actuator.
The following table shows the colour assignment of the LED:

	Color	Meaning
	Red	OPEN position*
	Green	CLOSE position*
	Flashes white	Actuator moves
	Flashes yellow	Fault
	Green/yellow	Setpoint value reached (at positioner)
	Turquoise	Adjustment run / operation of color in-version
	Blue/red	Teach OPEN position
	Blue/green	Teach CLOSE position

*Factory color settings.

1.3.6 Accessories

- Fail-safe return unit with integrated battery pack
- External fail-safe return unit
- Positioner 4-20 mA
- EA Demo Box

i For further information on accessories, refer to the online product catalog at www.gfps.com

1.4 Accessories

1.4.1 General

The accessories for the electric actuators can be retrofitted by the end user at any time. The installation of the accessory boards is easily done via plug-in cards in the housing of the standard actuator. All accessories can be used for the actuator version 24 V DC/AC, as well as the actuator version with 100 to 230V AC.

The following situation has resulted from the new generation of electric actuators from 2016:

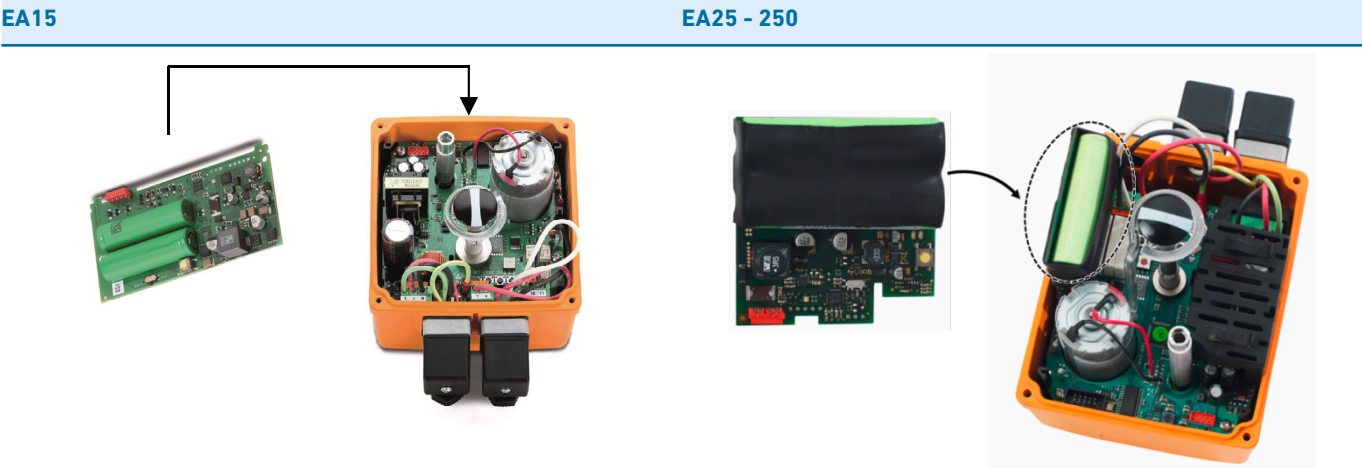
„Old“ actuator	„New“ actuator	Max. torque (Nm)
EA21	EA25	25
NA	EA45	45
EA31	EA120	120
EA42	EA250	250

Compatibility of actuator type with accessories

	OLD	NEW	OLD	NEW
Accessories	EA11	EA15	EA21, EA31, EA42 discontinued	EA25, EA45, EA120, EA250
Heating element	✓	Integrated (standard)	✓	Integrated (standard)
Failsafe return unit external	✓	-	✓	-
New Failsafe return unit integrated or external	-	✓	-	✓
Limit switch AgNi	✓	-	✓	-
Limit switch Au, PNP/NPN	x	-	✓	-
End position feedback (open/closed/middle)	-	Integrated (standard)		Integrated (standard)
Middle position	x	x	✓	Integrated (standard)
Position detection and positioner	x	x	✓	-
New Positioner	x	x	x	✓
Monitoring board with individual modules	x	x	✓	-
New Monitoring board with full set of modules	-	x	-	✓
Test adapter for diagnostic purposes	✓	x	✓	-
AS interface module	✓	✓	✓	✓
New Profibus DP	x	x	x	✓

- ✓ Available
- x Not available
- Not compatible

Failsafe return unit with battery for EA15 and EA25 – 250



General

The failsafe return unit works with the actuator type EA15 and EA15 – 250 and is plugged into the base board and also fixed in place by the cover when installed. The failsafe return unit already includes the required battery; no external wiring is necessary. The failsafe return unit of the type EA15 and EA15 – 250 is a different construction.

In case of a failure of the supply voltage, the battery is electronically switched on automatically after 5 s. With the selector switch on the board, the functions “Move to CLOSED position” or “Move to OPEN position” can be selected.

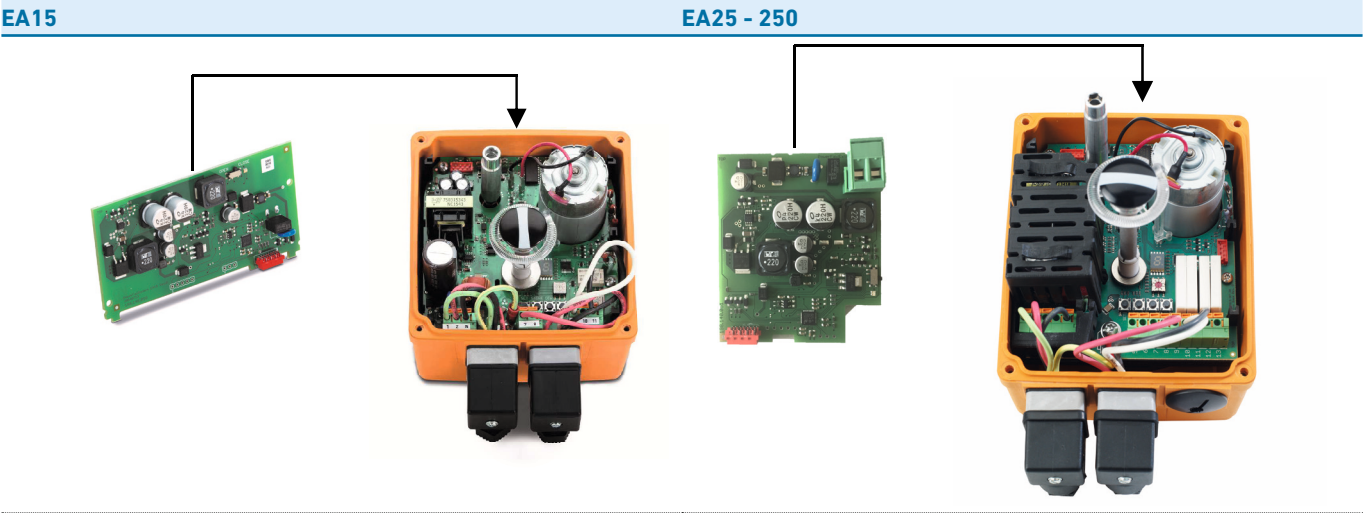
EA15	Switch position	Function
	Switch left	Actuator moves to open (counterclockwise)
	Switch right	Actuator moves to closed (clockwise)

EA25 - 250	Switch position	Function
	Switch left	Actuator moves to open (counterclockwise)
	Switch right	Actuator moves to closed (clockwise)

The batteries are always stored charged. If the battery charge level sinks below 50 %, the actuator flashes yellow and the charge cycle starts. Once UBatt rises above 50 %, the flashing stops.

During the charge cycle, the actuator can be operated normally.

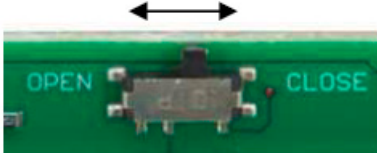
Failsafe return unit for external voltage supply for EA15 and EA25 – 250

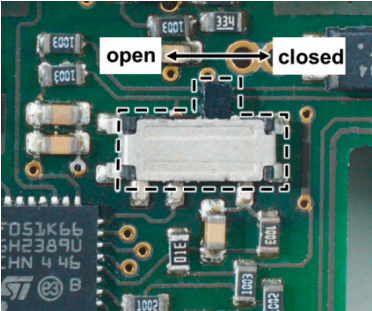


General

The failsafe return unit works with the actuator type EA15 and EA15 – 250. The failsafe return unit is plugged into the base board and also fixed in place by the cover when installed. This reset unit is connected via an external 24 V DC emergency power supply. The failsafe return unit of the type EA15 and EA15 – 250 is a different construction.

In case of a failure of the supply voltage, the battery is electronically switched on automatically after 5 s. With the selector switch on the board, the functions “Move to CLOSED position” or “Move to OPEN position” can be selected.

EA15	Switch position	Function
	Switch left	Actuator moves to open (counterclockwise)
	Switch right	Actuator moves to closed (clockwise)

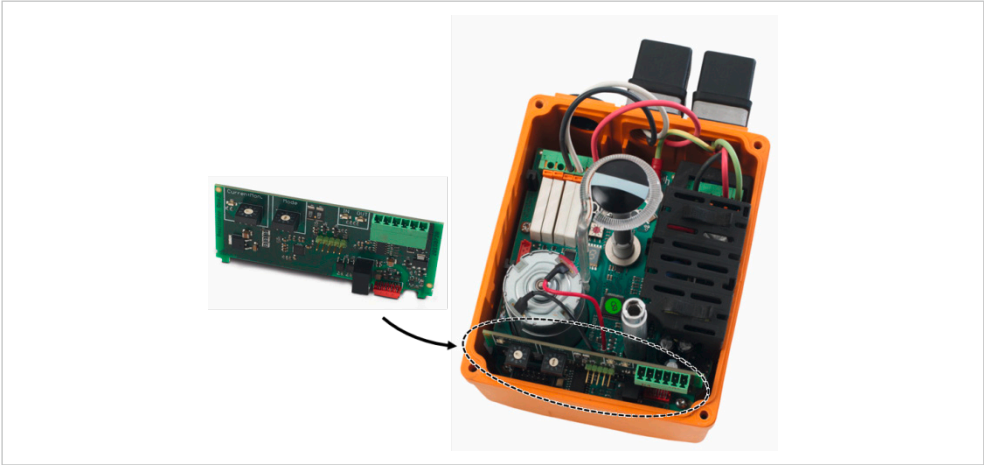
EA25 - 250	Switch position	Function
	Switch left	Actuator moves to open (counterclockwise)
	Switch right	Actuator moves to closed (clockwise)

Use the cable glands provided to insert the cable for the control signal.

Avoid excess length of the battery cable! Excess cable must not be longer than required.

Internal cables must not be longer than 12 cm.

Positioner for EA25 – 250



General

The positioner works with the EA25, EA45, EA120 and EA250 actuators. The positioner controls a user-defined valve position proportional to a given setpoint value. This can be 0–10 V or 4–20 mA. Feedback on the valve position (actual value) is done via the integrated 4–20 mA position detection. All signals can be inverted in any desired combination.

! The inputs are galvanically isolated, so the power supply does not have to be galvanically separated.

i The monitoring card module „Motor current monitoring“ is located on the positioner (left BCD switch). See the chapter „Monitoring / current monitoring“ for further settings.

Signal configuration

Signal configuration is performed via the right BCD switch „Mode“; depending on switch position, the following signal configuration can be achieved:

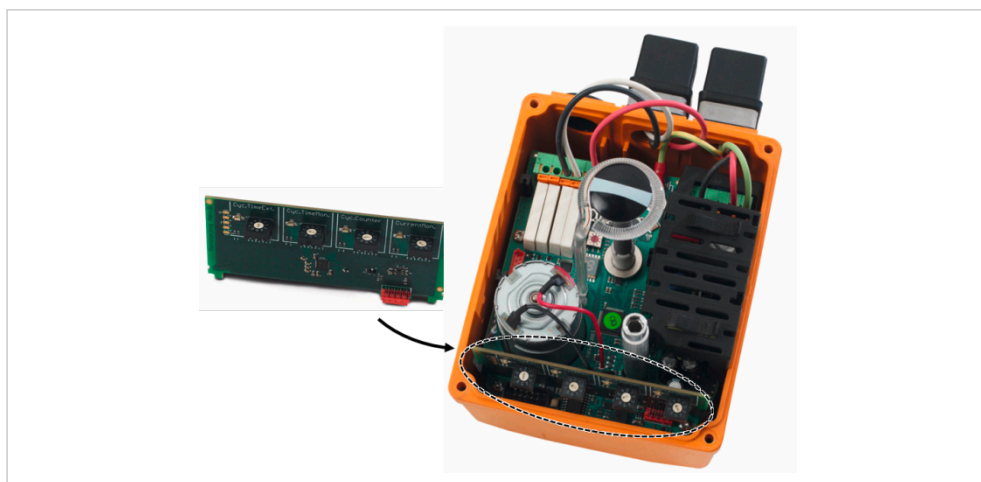
BCD	0 (factory setting)	1	2	3	4	5	6	7 (only as feedback)	8 (only as feedback)	9
Input	4-20 mA	0-10 V	4-20 mA inverted	0-10 V inverted	4-20 mA	0-10 V				
Output	4-20 mA	4-20 mA	4-20 mA	4-20 mA	4-20 mA inverted	4-20 mA inverted		4-20 mA	4-20 mA inverted	

Terminal assignment

The cables are applied as follows via a plug (according to signal configuration):

	1	2	3	4	5	6
	Ground	4-20 mA	Ground	0-10 V	Ground	4-20 mA
	OUT		IN			

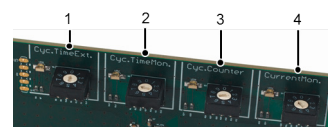
Monitoring card with cycle time extension, cycle time monitoring, cycle counter and motor current monitoring.



General

The monitoring board works with the EA25, EA45, EA120 and EA250 actuator. The monitoring board is plugged onto the base board and is available immediately. The monitoring board enables the following four functions:

No.	Description
1	Cycle time extension
2	Cycle time monitoring
3	Cycle counter Monitoring of a selected number of cycles
4	Motor current monitoring Monitoring a selected maximum motor current



These monitor settings are made via the BCD switches 1 to 4. The functions work independently of one another.

Settings

Cycle time extension

The cycle time extension extends the cycle time of the electric actuator. To do this, the actuator is moved continuously into the end positions (open or closed). For the corresponding value please refer to the table below. These values are valid for 90° actuation. The cycle time is given in seconds.

BCD	EA25	EA45	EA120	EA250
0 (factory setting)	7	7	25	27
1	10	10	28	35
2	13	13	32	40
3	15	15	38	45
4	18	18	42	50
5	20	20	48	55
6	23	23	52	60
7	25	25	58	65
8	28	28	62	70
9	30	30	67	75

Cycle time monitoring

Cycle time monitoring monitors the duration of a preset cycle time of the electric actuator. As soon as the cycle exceeds the preset time, an error is reported. For the corresponding value please refer to the table below. These values are valid for 90° actuation. The cycle time is given in seconds.

BCD	EA25	EA45	EA120	EA250
0	8	7	8	7
1	11	10	11	10
2	14	13	14	13
3	17	16	17	16
4 (factory setting)	20	19	20	19
5	23	22	23	22
6	26	25	26	25
7	29	28	29	28
8	32	31	32	31
9	36	34	36	34

Cycle counter

This function allows setting a desired number of cycles. As soon as the number of cycles exceeds the set value, an error is reported.

BCD	EA25, EA45, EA120, EA250
0	1
1	10'000
2	20'000
3	30'000
4 (factory setting)	40'000
5	50'000
6	75'000
7	100'000
8	150'000
9	200'000

Reset number of cycles

The cycle counter can be reset by the BCD switch and pressing the "SET" button on the main board.

Motor current monitoring

The current monitoring function monitors the motor current. If the motor current is higher than the preset value, an error is reported and the actuator will remain in place.

BCD	EA25	EA45	EA120	EA250
0	25	25	50	50
1	100	300	300	400
2	150	350	400	500
3	200	400	500	600
4	250	450	600	700
5	300	500	700	800
6	400	600	800	1'000
7	500	700	900	1'200
8	600	900	1'000	1'500
9 (factory setting)	700	1'100	1'200	1'800

The motor current monitoring is also located on the positioner card, and thus increasing motor current (and hence torque) can also be monitored here.

! When setting the BCD switches, make sure that the set functions do not block one another.

Example for an EA25:

BCD1 cycle time extension pos 3 = 15 s

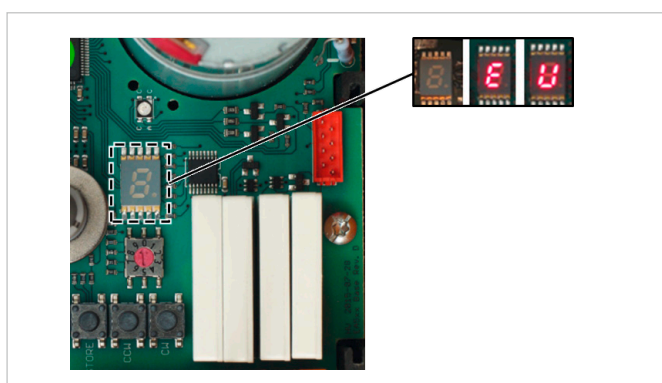
BCD2 cycle time monitoring pos 0 = 8 s

→ Will generate error

Error message

An error message triggers the following:

- The 7-segment display on the base board illuminates; see illustration below. If the monitoring PCB is installed, the respective LED lights up red on the BCD switch, if its set value is exceeded.
- The ready-to-operate signal will be off (terminals 5, 6 / NC contact).
- LED flashes yellow (except for in case of power outage)



Assignment of error codes for error messages

Error code	Description	Signal „Ready for operation“	Response of the actuator
----	No voltage	NO	None
U	Voltage below specification	NO	None
0	Housing temperature too high	> 80° C	Stops
5	Time from end position to end position too long	> 120 s	Stops
b	Voltage over specification	NO	Stops
h	Heater defective (T = < 0 °C)	NO	Runs
e	Error in position detection	NO	None
P	Invalid position	NO	Runs
E	Emergency manual override enabled	NO	None
9	No communication with accessories	NO	None
L	Battery voltage < 50 % (if failsafe return unit is installed)	NO	Runs
R	Defective battery	NO	Runs
I	Actuator has run into engine current limit	NO	

Acknowledge error message

- Check the cause of fault
- If necessary, carry out relevant maintenance
- Error can be acknowledged via the „SET“ button on the main board.

i The message can be eliminated while the supply voltage is still connected or the actuator is briefly disconnected from the mains voltage (does not work with cycle monitoring).

1.4.2 Profibus DP module for EA25 – 250



General

Profibus is realized via an accessory board and M12 plug adapter. The actuator in a Profibus network can be looped through or used as an end position via a termination resistor.

- Profibus DP V0
- Baud rate 9600 – 1.5M
- Connector: M12 (male & female for daisy chain)
- Power supply via standard device plug

Profibus commands

Signal type	Description	Parameter
Digital output (command)	Stop	
	OPEN	
	CLOSED	
	MIDDLE	
	Positioner	
Digital input (feedback)	Desired actuator position	0 – 100 % of the end position
	Actuator moving	
	Position OPEN	
	Position CLOSED	
	Position MIDDLE	
	Measured actuator position	0 – 100 % of the end position
	Remote control selected	
	Monitoring relay	
	Motor current	0-2000 mA
	Internal temperature	0-100° C
Feedback from basic board	Low power voltage	
	Overtemperature active	
	Cycle time expired	
	Motor protection active	
	Thermostat triggered	
	Heater failed	
	Position detection failed	
	Actuator position invalid	
	Teaching mode active	
	Emergency manual active	
	Accessory failure	

Signal type	Description	Parameter
Accessories		
Fail-safe return (Failsafe return unit)	Fail-safe active	
	Battery active	
	Fail-safe time exceeded	
	Battery weak	
	Battery failure	
Monitoring (monitoring card)		
Digital output (command)	Activation of cycle time extension	
	Cycle time extension	0 ... 9
	Activation of cycle time monitoring	
	Limit cycle time monitoring	0 ... 9
	Activation cycle counter	
	Limit cycle counter	0 ... 9
	Activation of motor current monitoring	
	Motor current limit	0 ... 9
Digital input (feedback)	Cycle time extension active	
	Cycle time monitoring active	
	Cycle time monitoring exceeded	
	Cycle counter active	
	Cycle counter exceeded	
	Motor current monitoring active	
	Motor current exceeded	
Profibus		
Digital input (feedback)	Watchdog recovery	
	.	

1.4.3 AS interface



To connect our electric actuators to an AS-i network, GF Piping Systems offers a module which fits exactly to our actuator interface. The ASEV 2400 module offers a compact solution with the feedback already integrated.



To obtain an AS interface-ready actuator, the actuator version with 24 V AC/DC must be ordered. Together with the integrated relays the feedback of the end positions can be obtained in the network.

Technical data

Housing materials	POM (black)
Cover material	Resopal
Gasket	NBR
Power supply	31.6 V DC (ASi voltage)
Connector	M12x1 (4-pin)
AS interface specification	3.0
AS interface profile	S-D/A.0.E
Power consumption	1.3 Watt
Protection class	IP67



For more information on ASi, see Planning Fundamentals, chapter „Actuators for valves“.

2 Pneumatic actuators

2.1 Pneumatic actuator type PA11/PA21



2.1.1 Product description

The pneumatic fully plastic actuators PA11 and PA21 from GF Piping Systems can be connected in various ways. They are available with or without stroke limiters in different designs. A position indicator is incorporated into the NAMUR interface, greatly simplifying the installation of accessories for the pneumatic actuators PA11 and PA21. Naturally, the flange interface also corresponds to the NAMUR standard. Third-party valves can be installed without problems.

Applications

- Chemical process industry
- Water treatment
- Cooling

Benefits/features

- Robust PP-GF housing
- Full plastic actuator
- Position indicator with integrated NAMUR interface
- Multifunction module with different limit switch designs is available as an option

2.1.2 Technical basics

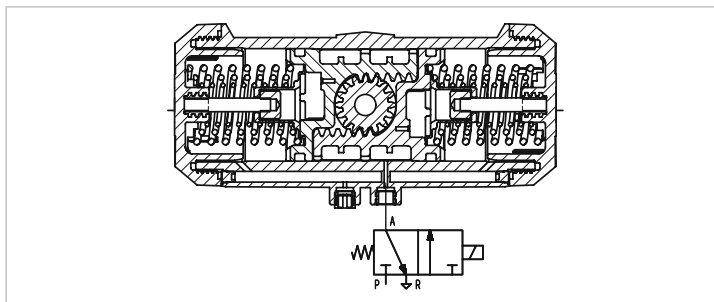
Operating diagram FC, FO, DA

To ensure proper function of the actuator assembly, make sure the position of the actuator matches the valve position.

- Actuator open → Valve open
- Actuator closed → Valve closed

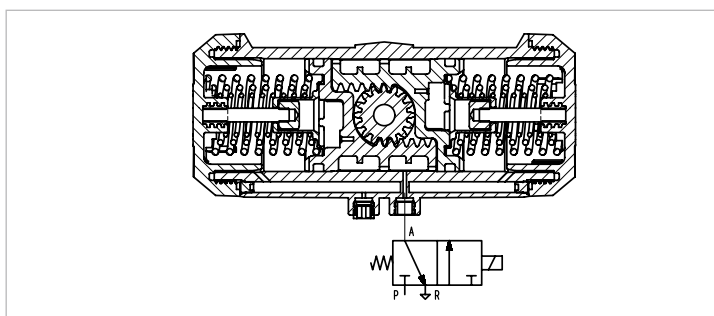
Function FC: fail-safe to close

Control air via 3/2 solenoid pilot valve at connection A turns the actuator 90° to the left.



Function FO: fail-safe to open

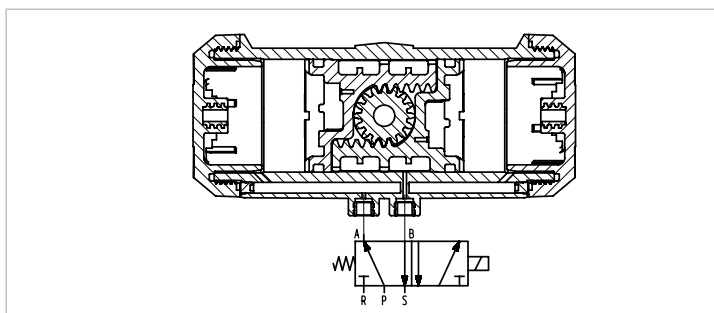
Control air via 3/2 solenoid pilot valve at connection A turns the actuator 90° to the right.



Function DA: double-acting

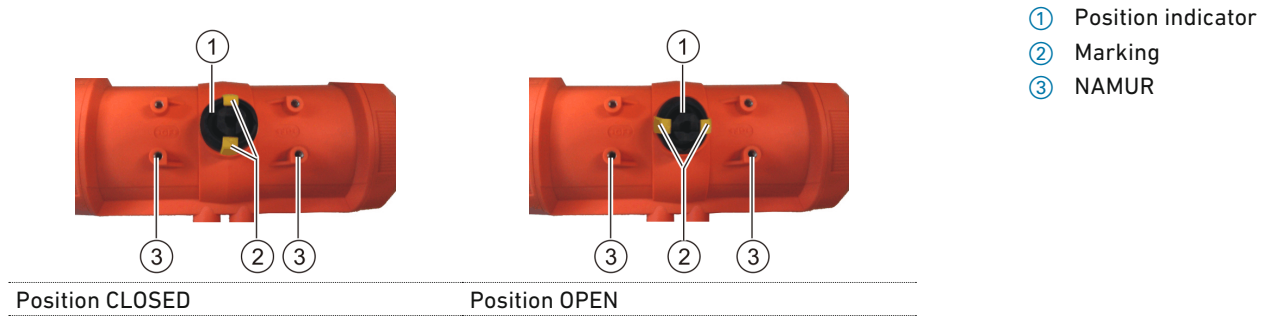
Control air via 5/2 solenoid pilot valve at connection A turns the actuator 90° to the right.

Control air via 5/2 solenoid pilot valve at connection B turns the actuator 90° to the right.



Position indicator

The valve positions can be read on the position indicator marking. The NAMUR accessory interface serves to connect accessories, such as position feedback or positioner.



Control air



In designs with the FC/F0 functions, the bleed hole protected by a green reducing plug may not become damaged or plugged, since the movement of the actuator will otherwise be restricted.

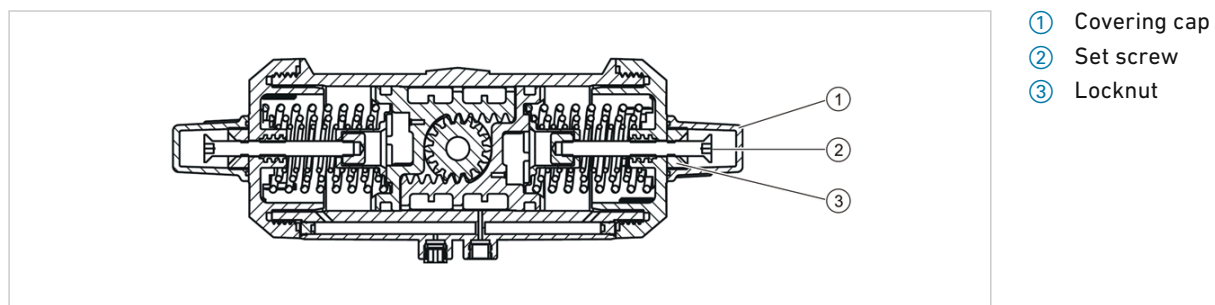
The control air connections are marked with stickers that describe the function of the control air at the respective connection. In the above example, the control air connection A is opening. This is therefore a pneumatic actuator for the function FC (fail-safe to close).

Control air is introduced via the open control connection A (function FC and F0) or via the two control connections A and B (function DA).

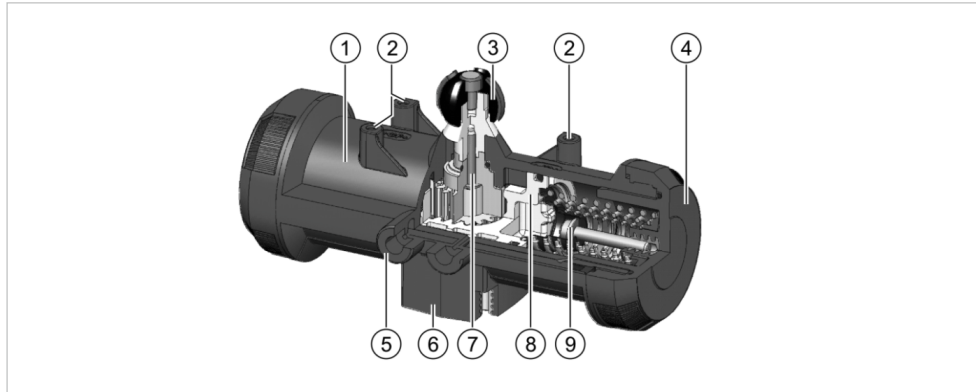
Stroke limiter

In designs with a stroke limiter, the stroke limiter is set at the factory to 90°. This setting can be changed as needed. Limiting the turning movement in the direction of the working position to less than 90°, for example to 45°, is possible in this way.

i For the DA function, limitation is only possible in the open direction.



2.1.3 Technical data



- ① Housing of PP-GF
- ② NAMUR accessory interface
- ③ Position indicator
- ④ Spring cover
- ⑤ Control air connection Rp1/8"
- ⑥ Interface F04/05 according to ISO 5211
- ⑦ Pinion shaft
- ⑧ Piston with rack
- ⑨ Spring assembly, pre-tensioned, not available for function DA

Specification

Combinations	PA11	2-way ball valve types 546 Pro, d16/DN10 – d32/ DN25		
	PA21	2-way ball valve types 546 Pro, d40/DN32 – d63/ DN50		
	PA11	3-way ball valve types 543, d16/DN10 – d32/DN25		
	PA21	3-way ball valve types 543, d40/DN32 – d63/DN50		
Nominal torque Mdn	PA11	5 Nm (3.7 lb. ft.)		
	PA21	10 Nm (7.4 lb. ft.)		
Peak torque	PA11	10 Nm (7.4 lb. ft.)		
	PA21	20 Nm (15 lb. ft.)		
Actuator connection	G1/8"			
Mode of operation	Fail-safe to close (FC)			
	Fail-safe to open (FO)			
	Double-acting (DA)			
Cycle time	1 – 2 s, with throttle valve up to 5 s			
Control medium	Neutral, non-aggressive gases			
	(Control with fluids on request)			
Air pressure according to ISO 8573-1	2 or 3 for -10 °C			
	3 or 4 bar for T > 0 °C			
Actuating principle	Rack and pinion			
Temperature control medium	Max. 40 °C			
Ambient temperature	-10 – +50 °C			
Permissible humidity	0 – 100 %			
Max. allowable control pressure	7 bar			
Position indicator	Optically integrated			
Housing material	PP GF for very good chemical resistance			
Connections	PA11	F04		
	PA21	F05		
Weight	0.75 kg – 1.445 kg			
Control volume in dm ³		DN	Single-acting (FC/FO) dm ³	Double-acting (DA) dm ³
	PA11	10		
		15		0.18 (open)
		20		
		25	0.15	0.15 (closed)
	PA21	32		0.35 (open)
		40	0.28	0.28 (closed)

Options

Pneumatic ball valves

Ball valves of types 230 – 235 are based on ball valve type 546 Pro d16/DN10 – d63/DN50 and pneumatic actuators PA11 (DN10 – DN25) and PA21 (DN32 – DN50).

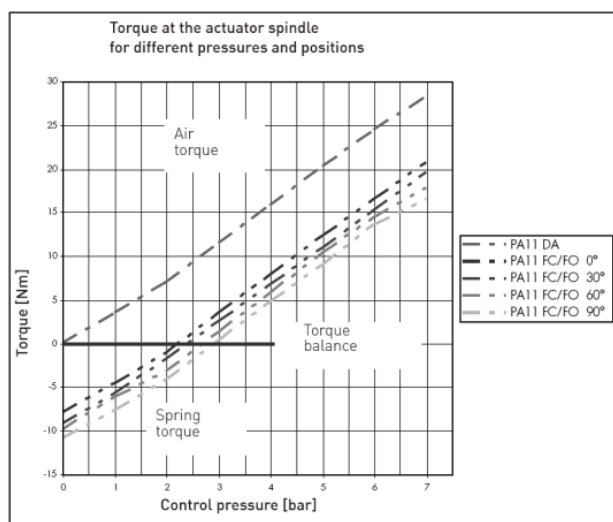
Ball valve, pneumatic	Actuator, pneumatic	Ball valve, manually operated	Dimensions	Materials	Standards
Type 230	PA11/PA21	Type 546 Pro	DN10 – DN50	PVC-U, PVC-C, ABS	ISO/DIN
Type 231	PA11/PA21	Type 546 Pro	DN10 – DN50	PP-H	All standards
Type 232	PA11/PA21	Type 546 Pro	DN10 – DN50	PVDF	All standards
Type 233	PA11/PA21	Type 546 Pro	DN10 – DN50	PVC-U, PVC-C	ASTM/ANSI
Type 234	PA11/PA21	Type 546 Pro	DN10 – DN50	PVC-U, ABS	BS
Type 235	PA11/PA21	Type 546 Pro	DN10 – DN50	PVC-U, PVC-C, PP-H, PVDF	JIS

Ball valves of types 258 – 288 are based on ball valve type 543 d16/DN10 – d63/DN50 and pneumatic actuators PA11 and PA21. Type range 285 – 288 is designed as modular upgradeable 3-way ball valve for mixing and diverting applications which have special process requirements.

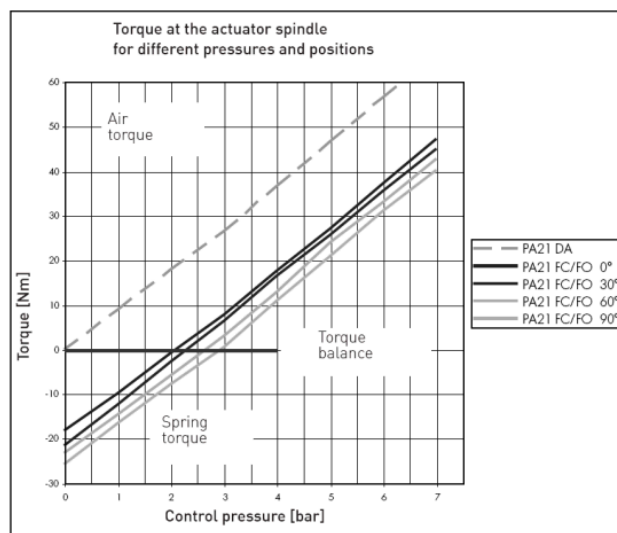
Ball valve, pneumatic	Actuator, pneumatic	Ball valve, manually operated	Dimensions	Materials	Standards
Type 285	PA11/PA21	Type 543, horizontal	DN10 – DN50	PVC-U, PVC-C, ABS	All standards
Type 286	PA11/PA21	Type 543, horizontal	DN10 – DN50	PP-H	DIN/ISO, ASTM
Type 287	PA11/PA21	Type 543, horizontal	DN10 – DN50	PVDF	DIN/ISO, ASTM
Type 288	PA11/PA21	Type 543, vertical	DN10 – DN50	PVC-U, ABS	DIN/ISO, JIS

Torque characteristics

Type PA11



Type PA21

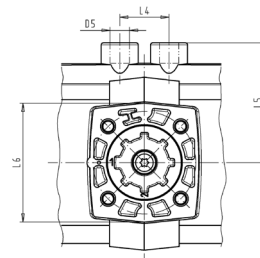
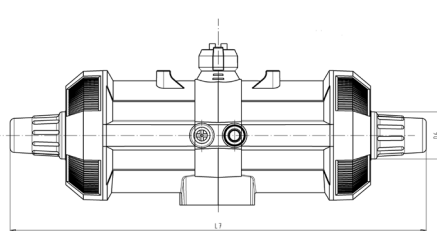
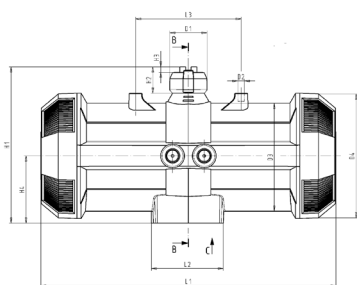


2.1.4 Dimensions

PA11 and PA21 without stroke limiter

PA11/21 with stroke limiter

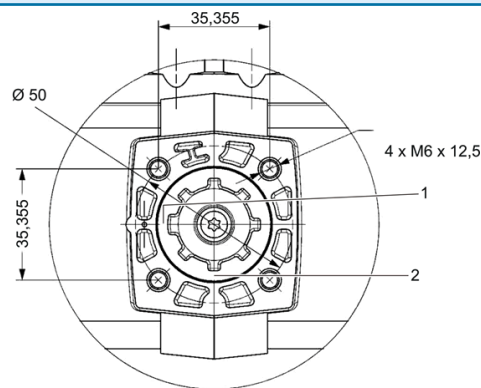
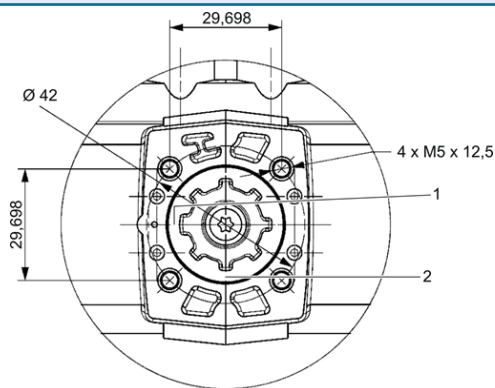
PA11 and PA21 – F image



	L1 (mm)	L2 (mm)	L3 (mm)	L4 (mm)	L5 (mm)	L6 (mm)	L7 (mm)	H1 (mm)	H2 (mm)	H3 (mm)	H4 (mm)	D1 (mm)	D2 (mm)	D3 (mm)	D4 (mm)	D5 (mm)	D6 (mm)
PA11	194	44	80	24	48	54	275	97	20	4	40	29	M5	61	74	G $\frac{1}{8}$ "	35
PA21	224	55	80	24	58.5	58	305	119	20	4	51	29	M5	82	94	G $\frac{1}{8}$ "	35

Type PA11 – interface F04

Type PA21 – interface F05



2.1.5 Accessories

- 3/2-way solenoid valve PV94/95
- 3/2 – 5/2-way solenoid valve MNL532
- 4/2-way solenoid valve 5470
- Pilot valve cluster PV2000
- Electropneumatic positioner type RPC
- Limit switch box for feedback
- AS interface ASVC 2300-11
- Emergency manual override



For further information on accessories, refer to the online product catalog at www.gfps.com



Installation and maintenance must be performed according to the corresponding installation instructions. The installation manual is included with the product, see also the online product catalog at www.gfps.com

2.2 Pneumatic actuators type PPA04 – PPA80



PPA04 – PPA80 Single acting (FC/FO)

PPA04 – PPA80 Double-acting (DA)

2.2.1 Product description

The pneumatic actuators PPA04 – PPA80 are made almost entirely of plastic. Due to the realization of a special spring return unit, these actuators are very compact and light. The actuators can be connected in various ways.

A position indicator is incorporated into the NAMUR interface, greatly simplifying the installation of accessories for the pneumatic actuators PPA04 – PPA80. Furthermore, an additional NAMUR interface allows easy connection to a compressed air system without an adapter plate. The flange pattern also complies with the NAMUR standard. The PPA04 – PPA80 actuators are compatible with products from other manufacturers.

Function

Pneumatic Actuators can be used as open/close or control element for valves. The double-acting (DA) design means that the fitting is opened or closed by the actuator applying compressed air. Depending on the requirement, the springs can open or close. The single-acting actuators (FC/FO) only apply compressed air on one side, while adjustment on the other side is by spring resistance. This means that if there is air failure they return automatically to a safety position. Standard interfaces allow solenoid valves, limit switches or positioners to be connected to the actuator.

Applications

- Chemical process industry
- Water treatment
- Refrigeration
- Process Automation
- Natural resources & surface treatment
- Conventional power generation
- Photovoltaics, semiconductor & TFT/HB LED

Features/Benefits

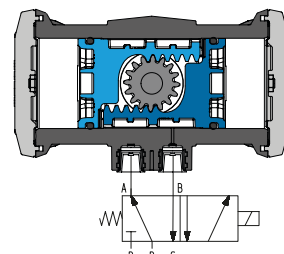
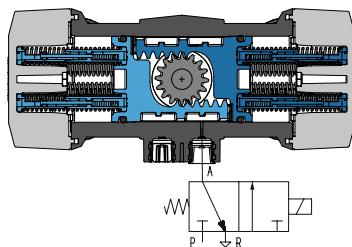
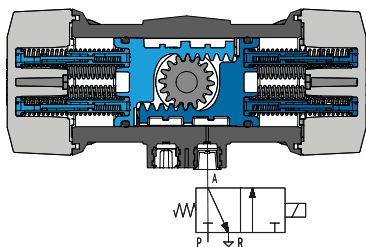
- Robust and compact PP-GF Piping Systems housing
- Full plastic actuator
- Linear torque characteristic curves
- Optimized assignment to ball valve 546 Pro with safe and reliable torque characteristics, tested over service life
- NAMUR accessory interface according to VDE 3845 for integrated mounting of a wide range of accessories
- Flexible spring concept for low pressure operation (4.2 bar) as well as OEM solutions

2.2.2 Technical basis

Operating diagram FC, F0, DA and function FC, F0, DA

For the proper function of the actuator assembly, it is important that the position of the actuator and valve position matches.

- Actuator open – Valve open
- Actuator closed – Valve closed



Function FC: Spring resistance closed

Control air through 3/2 solenoid pilot valve on connection.
A turns the actuator 90° to the left.

Function F0: Spring resistance opened

Control air through 3/2 solenoid pilot valve on connection.
A turns the actuator 90° to the right.

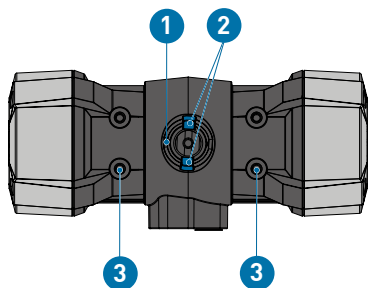
Function DA: Double-acting

Control air through 5/2 solenoid pilot valve on connection.
A turns the actuator 90° to the right.
Control air through 5/2 solenoid pilot valve on connection.
B turns the actuator 90° to the left.

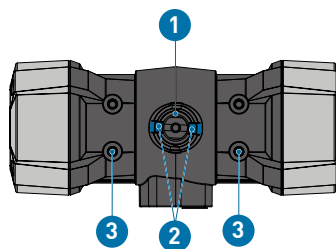
Position indicator

Valve positions can be read off at the mark on the position indicator. The NAMUR standard accessory interface is used for attaching accessories such as a position feedback device or a positioner.

CLOSED position



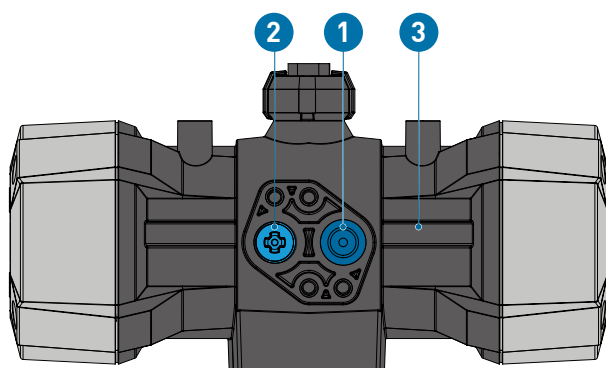
OPEN position



- ① Position indicator
- ② Marking position
- ③ Accessory interface NAMUR as per VDE 3845

Control air

Vent holes



- ① Control connection
- ② Venting connection
- ③ Laser marking mode of operation of the actuator

The control air connection are provided with laser markings indicating the effect of the control air at the respective connection. In the above example, the actuator is closed in the series state and is opened by applying compressed air through the control connection. Consequently, it is a pneumatic actuator of function FC (spring resistance closes).

In versions with the FC/FO function, the vent hole protected with the reducing plug must not be damaged or blocked, as this would obstruct the movements of the actuator.

Handling

Installation note

If the control air connections used are too long, the control air holes in the product can be blocked.

- When installing, make sure that the control air connections do not penetrate into the product housing beyond the available thread in the hole.

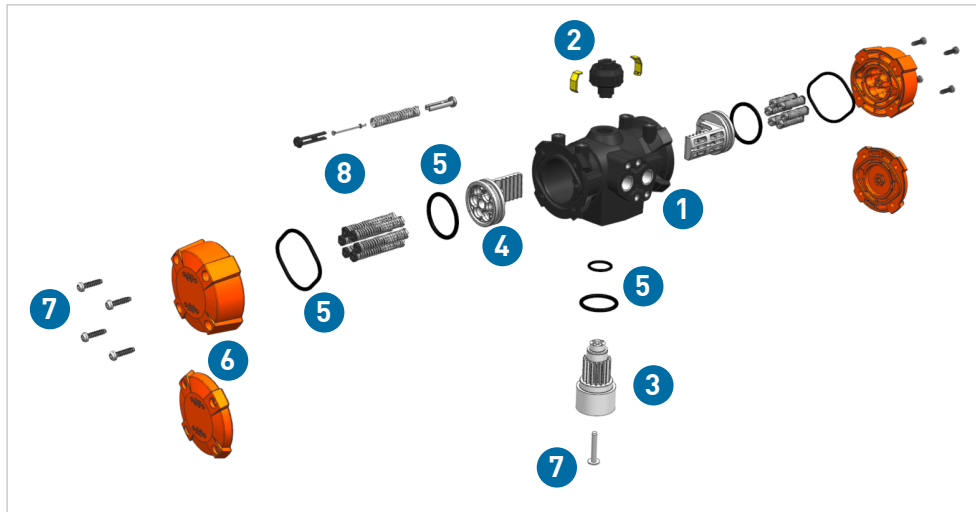
Maintenance notes

Regularly check that the actuator opens and closes correctly.



Installation and service must be carried out as per the relevant installation instructions. Installation instructions are included with the product, see also online product catalog at www.gfps.com

2.2.3 Technical Data



- ① Housing with inserts (PP-HGF30)
- ② Display body (PBTGF30)
- ③ Spindle (PPT20)
- ④ Plunger (POM)
- ⑤ O-rings (NBR)
- ⑥ Cover (PP-HGF30)
- ⑦ Screws (steel A2)
- ⑧ If necessary, loaded spring component (POMGF, steel coated)

Technical Data		PPA04	PPA08	PPA15	PPA40	PPA80
FC/FO Standard	Torque ratings		3 Nm	8 Nm	17 Nm	40 Nm
	Minimum control pressure		5.4 bar	5 bar	4.5 bar	5.1 bar
	Max. permitted control pressure		6 bar	6 bar	6 bar	6 bar
	Number of loaded spring components		12	12	10	12
FC/FO Low pressure	Torque ratings			4.3 Nm	14.7 Nm	32.4 Nm
	Minimum control pressure			3.2 bar	4.2 bar	4.2 bar
	Max. permitted control pressure			6 bar	6 bar	6 bar
	Number of loaded spring components			8	10	10
DA doub- le-acting	Torque ratings	3 Nm	5 Nm	13 Nm	31 Nm	40 Nm
	Minimum control pressure	3.2 bar	2.3 bar	2.5 bar	3.1 bar	1.8 bar
	Max. permitted control pressure	5 bar	5 bar	5 bar	5 bar	5 bar
Control medium		Compressed air, lubricated and unlubricated Fluids on request				
Compressed air class		ISO 8573-1				
Control connection		1/4" (PPA04 DA 1/8")				
Standard connection NAMUR as per VDE 3845		optional	yes	yes	yes	yes
Mechanical interface as per ISO 5211		F03	F05	F05	F05	F07
Control volume per cycle (dm³)	FC/FO		0.1253	0.1429	0.2899	0.6650
	DA	0.0623	0.1253	0.2774	0.5636	1.2551
Cycle time		1 - 2s, with throttle valve up to 5s				
Actuating angle		90°				
Position indicator		Optical				
Enclosure material		PP-GF (glass fiber reinforced polypropylene)				
Ambient temperature		-10 to +50°C				
Permitted air humidity		0 to 100%				
Safety Integrity Level		SIL2-compliant				

Versions

Pneumatic ball valves

The pneumatically operated ball valves are composed of the ball valve type 546 Pro and the pneumatic actuator PPA04 – PPA80.

Pneumatic actuator	Manually operated ball valve	Dimension	Materials	Standards
PPA04 – PPA80	Type 546 Pro	DN10 – DN100	PVC-U, PVC-C, ABS	ISO/DIN
PPA04 – PPA80	Type 546 Pro	DN10 – DN100	PP-H	All standards
PPA04 – PPA80	Type 546 Pro	DN10 – DN100	PVDF	All standards
PPA04 – PPA80	Type 546 Pro	DN10 – DN100	PVC-U, PVC-C	ASTM/ANSI
PPA04 – PPA80	Type 546 Pro	DN10 – DN100	PVC-U, ABS	BS
PPA04 – PPA80	Type 546 Pro	DN10 – DN100	PVC-U, PVC-C, PPH, PVDF	JSI

Control pressure PPA FC/FO

	Number of springs per side	Spring torques [Nm]		Torque with control pressure [Nm]									
				Control pressure [bar]									
				3		4.2		5		5.6		6	
FC		Closed	Open	Closed	Open	Closed	Open	Closed	Open	Closed	Open	Closed	Open
FO		Open	Closed	Open	Closed	Open	Closed	Open	Closed	Open	Closed	Open	Closed
PPA08	6	3.12	6.57					6.20	2.10	7.65	3.70	8.95	4.73
	5	2.53	5.58			5.57	2.07	7.60	4.10	9.27	5.65	10.10	6.55
	4	1.54	4.16			6.30	3.45	8.40	5.50	9.70	6.90	10.70	7.91
PPA15	6	8.23	13.04			10.44	3.90	14.57	8.69	18.33	12.19	20.10	14.46
	5	6.20	10.33			11.96	7.08	16.20	11.74	19.97	15.26	21.91	17.46
	4	4.38	7.10	7.10	3.31	3.31	10.23	18.64	14.73	22.07	18.20	23.84	20.52
PPA40	6	20.16	29.00			18.27	4.57	29.44	16.25	36.35	23.25	40.51	28.41
	5	17.01	24.47			24.49	14.70	33.15	23.74	39.64	30.70	44.39	35.25
	4	12.18	19.03	16.42	6.65	29.03	21.15	37.71	29.28	43.51	36.20	49.02	40.96
PPA80	6	44.53	71.42			48.65	17.43	67.89	37.99	81.83	54.03	91.85	63.80
	5	35.47	59.82			55.10	32.40	77.01	53.53	91.57	69.25	102.42	79.81
	4	27.64	47.42	34.58	15.20	68.44	47.02	91.02	68.24	107.95	84.15	119.23	94.75

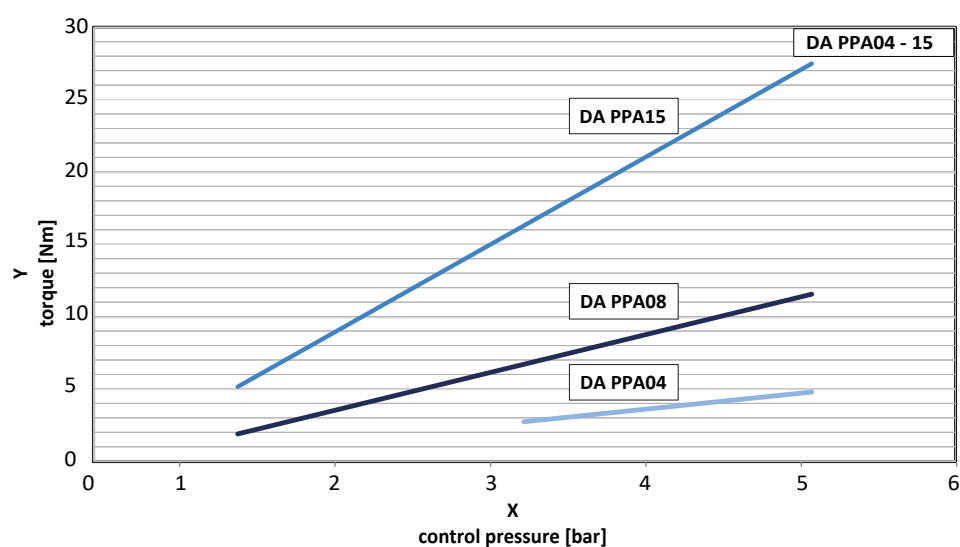
Minimum control pressure

Minimum control pressure for spring combination	Springs	Minimum spring closing torque [Nm]	Minimum control pressure for spring combination [bar]
PPA08	4	1.54	3.5
	5	2.53	4.4
	6	3.12	5.4
PPA15	4	4.38	3.2
	5	6.20	4.1
	6	8.23	5
PPA40	4	12.18	3.5
	5	17.01	4.5
	6	20.16	5.4
PPA80	4	27.64	3.5
	5	35.47	4.4
	6	40.00	5.1

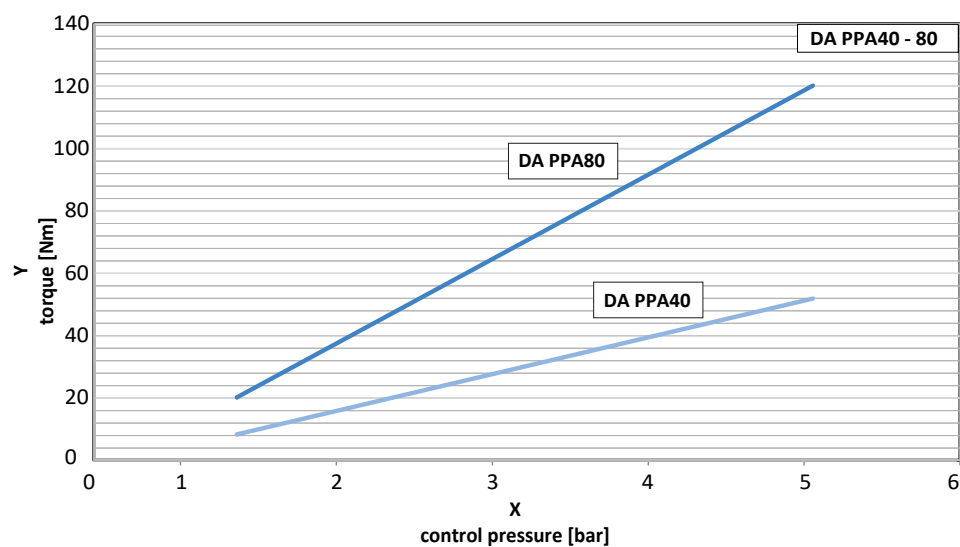
Control pressure DA

	Torque with control pressure [Nm]				
	Air pressure [bar]				
	1	2	3	4.2	5
PPA04		1.98	3.02	4.42	5.31
PPA08		4.20	6.92	9.87	11.92
PPA15		10.96	16.71	23.74	28.49
PPA40	7.88	18.95	30.35	43.16	53.02
PPA80	20.88	45.82	70.70	104.17	121.36

Torque PPA04-15

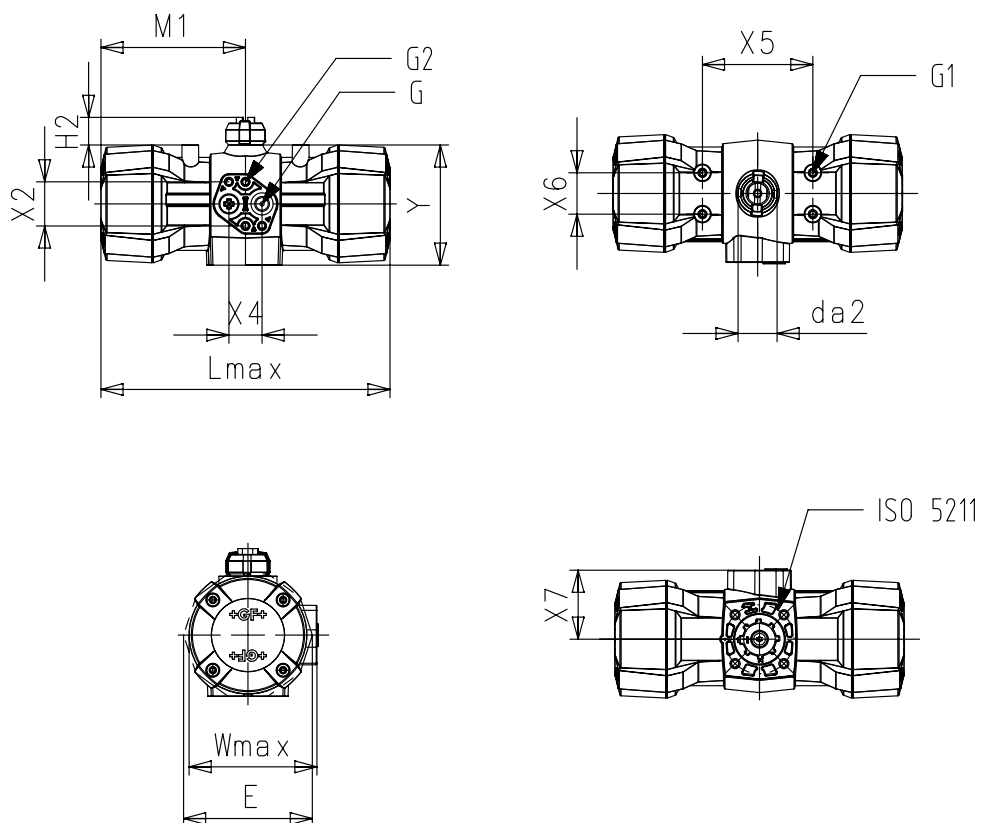


Torque PPA40-80



2.2.4 Dimensions

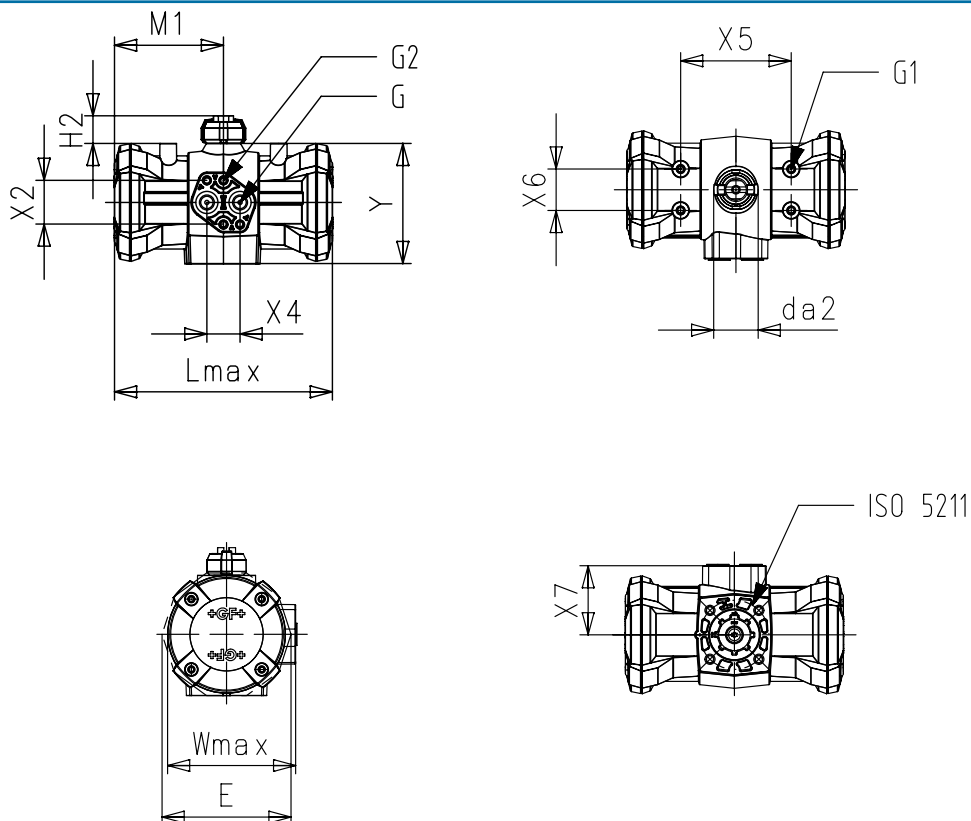
FC/F0
(Single-acting)



	G (inch)	G1 (mm)	H2 (mm)	ISO 5211	M1 (mm)	Wmax (mm)	X4 (mm)	X5 (mm)	X6 (mm)	X7 (mm)	Y (mm)
PPA08	¼	M5	20	F05	79.5	76.5	24	80	30	43.0	75
PPA15	¼	M5	20	F05	105.5	93.0	24	80	30	50.5	88
PPA40	¼	M5	20	F05	122.8	117.0	24	80	30	62.0	111
PPA80	¼	M5	20	F07	171.5	138.5	24	80	30	74.0	131

	da2 (mm)	Lmax (mm)	X2 (mm)	E (mm)	G2 (mm)	Gewicht (kg)
PPA08	32.5	159	32	73.5	M5	0.551
PPA15	32.5	211	32	94.0	M5	1.006
PPA40	32.5	246	32	119.5	M5	1.917
PPA80	32.5	343	32	141.5	M5	3.683

DA (Double-acting)



	G (inch)	G1 (mm)	H2 (mm)	ISO 5211	M1 (mm)	Wmax (mm)	X4 (mm)	X5 (mm)	X6 (mm)	X7 (mm)	Y (mm)
PPA04	1/4	M5	20	F03	51.0	63.0	24	50	25	34.0	66.0
PPA08	1/4	M5	20	F05	63.8	76.5	24	80	30	43.0	75.0
PPA15	1/4	M5	20	F05	82.5	93.0	24	80	30	50.5	87.5
PPA40	1/4	M5	20	F05	91.8	117.0	24	80	30	62.0	111.0
PPA80	1/4	M5	20	F07	130.5	138.5	24	80	30	74.0	131.0

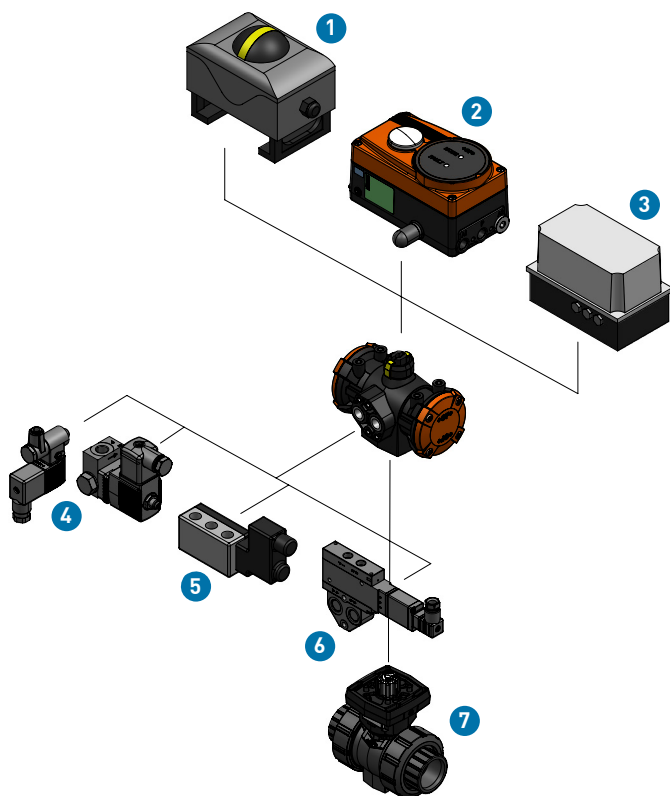
	da2 (mm)	Lmax (mm)	X2 (mm)	E (mm)	G2 (mm)	Gewicht (kg)
PPA04	32.5	102		63.0		0.255
PPA08	32.5	128	32	73.5	M5	0.419
PPA15	32.5	165	32	94.0	M5	0.714
PPA40	32.5	184	32	119.5	M5	1.322
PPA80	32.5	261	32	141.5	M5	2.463

Interfaces F03-F07

F03	F05	F07
PPA04	PPA08/PPA15	PPA80

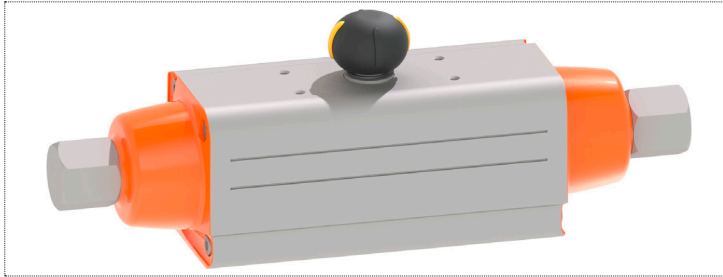
2.2.5 Accessories

Peripheral overview

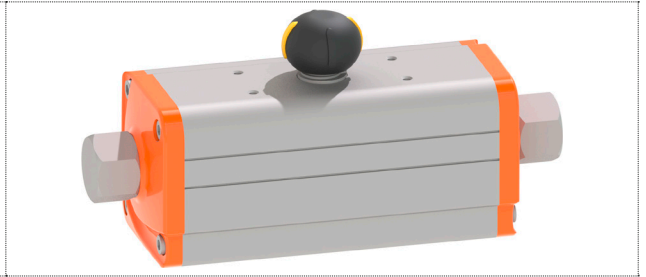


Peripheral overview	Designation
Accessory interface NAMUR top VDE 3845	
① Digital positioner	RPC, RPC D, RPC PID
② Position feedback device	Feedback box
③ AS interface	ASVC 2300
Accessory interface NAMUR side VDE 3845	
④ 3/2-way solenoid valve	PV94/95
⑤ 3/2 - 5/2 way solenoid valve	MNL532
⑥ 4/2-way solenoid valve	5470
Mechanical interface F03/F05/F07 (ISO 5211)	
Connection at the valve	
⑦ Valve	Ball valve type 546 Pro

2.3 Pneumatic actuator type PA30 – PA90



PA30 – PA90 Single-acting (FC/F0)



PA30 – PA90 Double-acting (DA)

2.3.1 Product description

The pneumatic actuator series PA30 – PA90 serves to operate valves with a 90° positioning angle. GF actuators already comply with both the EN standards, as well as several ISO standards: actuator mounting flange according to ISO 5211; actuator square connection according to DIN 3337; connection for solenoid valve, positioner and limit switch according to VDI/VDE 3845 (NAMUR); optical position indicator.

Function

All GF Piping Systems rotary actuators can be used as open/close or control actuators. The double-acting design means that the valve is opened or closed by the actuator applying compressed air. Depending on the requirement, the springs can open or close. The single-acting actuators only apply compressed air on one side, while adjustment on the other side is by spring force. This means that if there is air failure they return automatically to a safety position. Standard interfaces enable easy configuration of: solenoid valve, limit switch and positioner.

Applications

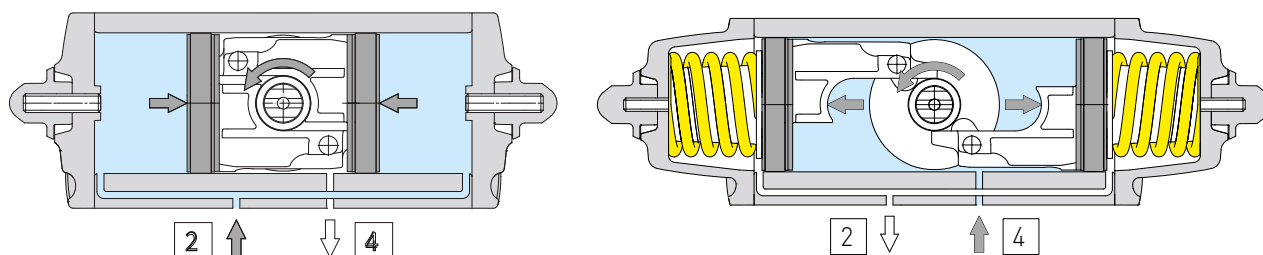
- Chemical process industry
- Water treatment
- Refrigeration

Benefits/features

- Integrated NAMUR interface for accessories and air connections
- Fast cycle times
- Improved stroke limiter
- Wide torque range, from 15 Nm up to 240 Nm
- Attractive price-performance ratio for all variants
- Construction of various limit switch versions without any problems
- Low installation height

2.3.2 Technical basics

Functional principle DA/FC/F0



DA Double-acting

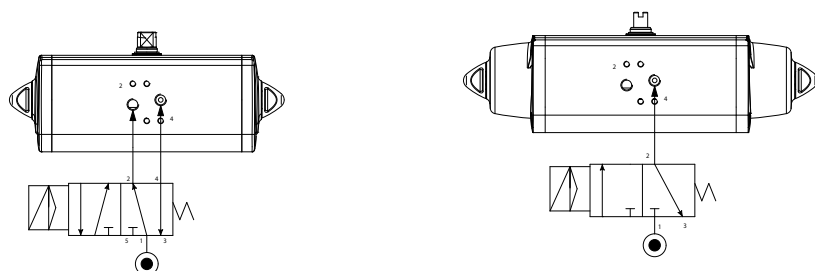
The port 2 is in connection with the cylinder side chambers. Supplying pressurised air in port 2, the actuator drive shaft rotates counter clockwise to open. While the port 4 is in connection with the pressurised intermediate chamber, the drive shaft rotates clockwise to close.

FC/F0 Single-acting

FC: The compressed air supply causes the cylinders to move outwards against the spring tension, until they reach their end position. Without compressed air, the drive is automatically closed by the spring force.

F0: The compressed air supply causes the cylinders to move inwards against the spring tension, until they reach the end position. Without compressed air, the actuator is automatically opened by the spring force.

Operating diagram FC, F0, DA

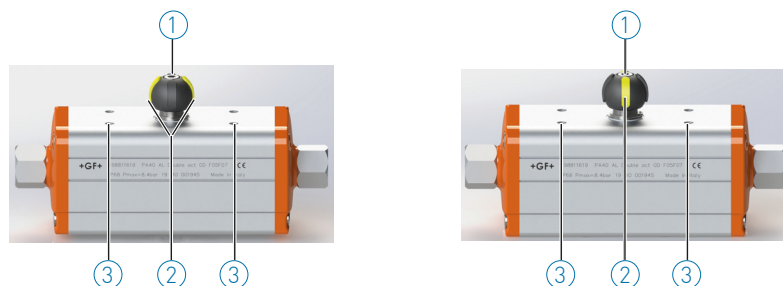


DA Double-acting
with NAMUR 5/2-way valve

FC/F0 Single-acting
with NAMUR 5/2-way valve

Position indicator

The position indicator displays the valve position. The valve positions can be read on the fitted cover.



Position CLOSED

Position OPEN

The valve positions can be read on the position indicator marking. The NAMUR accessory interface serves to connect accessories, such as position feedback or positioner.

Control air

Venting opening

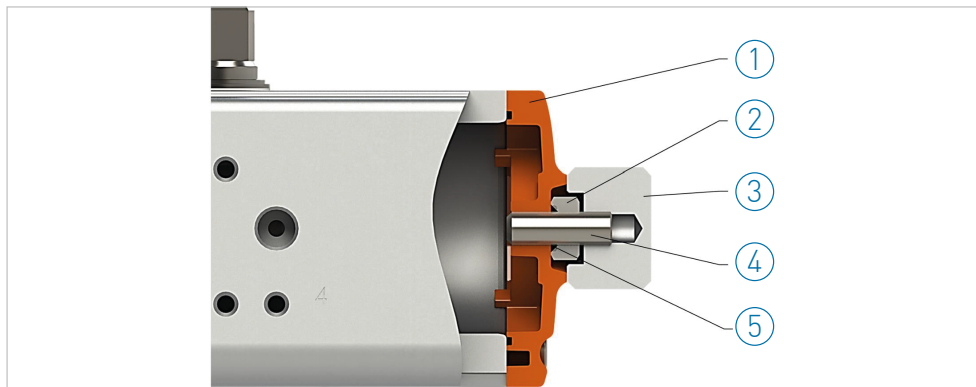
In designs with the FC/FO functions, the bleed hole protected by a green reducing plug may not become damaged or plugged, since the movement of the actuator will otherwise be restricted.

The control air connections are marked with stickers that describe the function of the control air at the respective connection. In the above example, the control air connection A is opening. This is subsequently a pneumatic actuator for the function FC (fail-safe to close).

Control air is introduced via the open control connection A (function FC and FO) or via the two control connections A and B (function DA).

Stroke limiter

In designs with a stroke limiter, the stroke limiter is set at the factory to 90°. This setting can be changed as needed. Limiting the turning movement in the direction of the working position to less than 90°, for example to 45°, is possible in this way.



- ① Cap
- ② Nut
- ③ Protection nut
- ④ Screw
- ⑤ O-Ring

Handling

Installation notes

If the control air connections used are too long, the control air openings of the product may become plugged.

- During installation, ensure that the control air connections do not protrude further into the housing than the existing threaded hole.

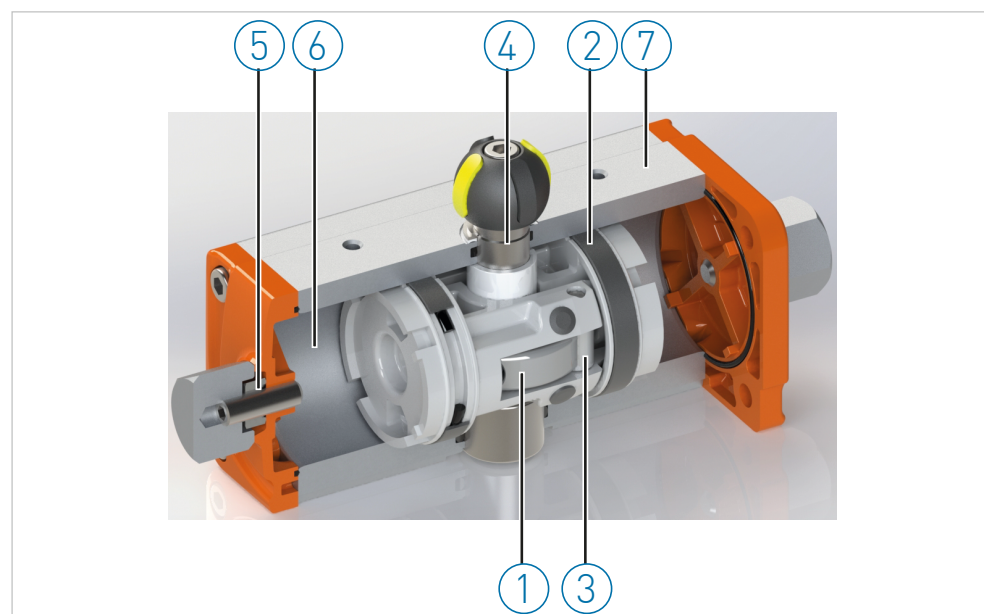
Maintenance notes

Regularly check whether the actuator opens and closes correctly.



Installation and maintenance must be performed according to the corresponding installation instructions. The installation manual is included with the product, see also the online product catalog at www.gfps.com

2.3.3 Technical data



- ① Lift design for high end torques
- ② Seals and piston guide rings
- ③ Automatic bolt lubrication
- ④ ISO/NAMUR connecting shaft of stainless steel
- ⑤ End position damping
- ⑥ The cylinder bore is lapped and hard anodized
- ⑦ Outer surface is hard anodized

Specification			
Combinations	Ball valve	Type 546 Pro	d63/DN50 – d110/DN100
	Butterfly valve	Type 567/578, type 038/039	d63/DN50 – d315/DN300
Rated torque Mdn.	15 – 240 Nm (11.1 – 177.1 lb. ft.)		
Peak torque	30 – 480 Nm (22.2 – 354.1 lb. ft.)		
Actuator connection	R $\frac{1}{8}$ " (PA30 - PA65); R $\frac{1}{4}$ " (PA70+)		
Cycle time	0.5 – 4 s		
Actuating angle	92° (-1°+91°)		
Mode of operation	Fail-safe to close (FC)		
	Fail-safe to open (FO)		
	Double-acting (DA)		
Ambient temperature	-20 – +80 °C		
Control medium	Neutral, non-aggressive gases		
	Preferably slightly oily compressed air		
Permissible humidity	0 – 95 %		
Position indicator	Optically integrated		
Housing material	Aluminum, hard anodized		
Weight	1.95 kg – 22.7 kg		
Control pressures in bar		Single-acting	Double-acting
	Min.	2.8	2.5
	Max.	8.4	8.4

Options

Pneumatic ball valves

Ball valves of types 230 – 235 are based on ball valve type 546 Pro d16/DN10 – d63/DN50 and pneumatic actuators PA11 (DN10 – DN25), PA21 (DN32 – DN50) and PA30 – PA45 (DN65 – DN100).

Ball valve, pneumatic	Actuator, pneumatic	Ball valve, manually operated	Dimensions	Materials	Standards
Type 230	PA11 – P45	Type 546 Pro	DN10 – DN100	PVC-U, PVC-C, ABS	ISO/DIN
Type 231	PA11 – P45	Type 546 Pro	DN10 – DN100	PP-H	All standards
Type 232	PA11 – P45	Type 546 Pro	DN10 – DN100	PVDF	All standards
Type 233	PA11 – P45	Type 546 Pro	DN10 – DN100	PVC-U, PVC-C	ASTM/ANSI
Type 234	PA11 – P45	Type 546 Pro	DN10 – DN100	PVC-U, ABS	BS
Type 235	PA11 – P45	Type 546 Pro	DN10 – DN100	PVC-U, PVC-C, PPH, PVDF	JSI

Butterfly valve, pneumatically operated

The pneumatically actuated butterfly valve type 240 is designed for wafer style installation. The pneumatically actuated butterfly valve types 243/244 are designed for lug style or wafer style installation.

The electro-pneumatic positioner, stroke limiter, and feedback switches give flexibility for integration into a wide variety of applications.

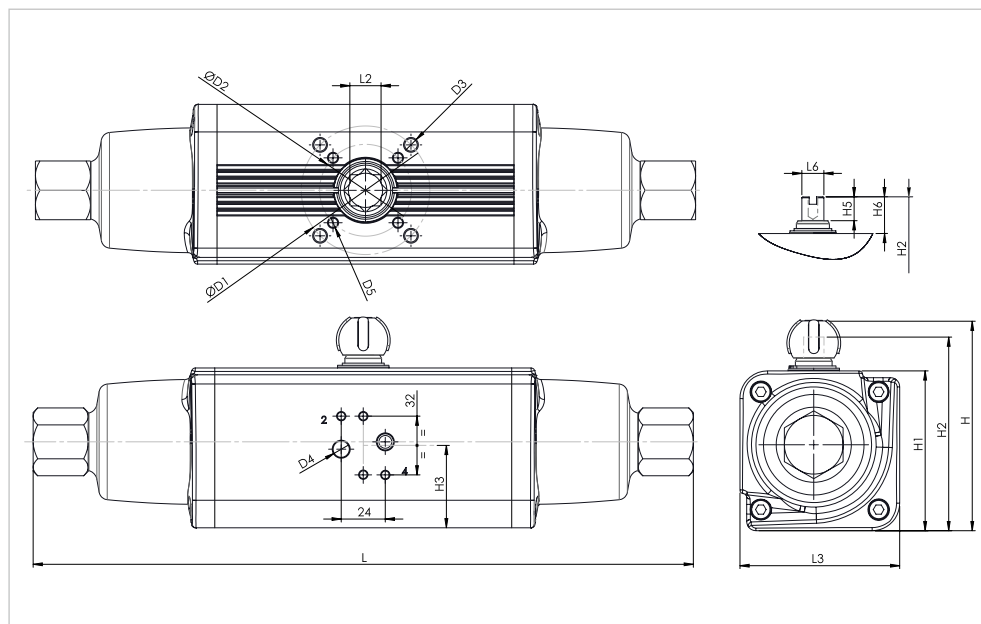
Butterfly valve, pneumatic	Actuator, pneumatic	Butterfly valve, manually operated	Dimensions	Materials	Standards
Type 240	PA30 – P90	Type 567	DN50 – DN300	All	All standards
Type 243	PA30 – P90	Type 578	DN50 – DN300	All	ISO/DIN
Type 244	PA30 – P90	Type 578	DN50 – DN300	All	ANSI

The metal butterfly valves type 038P/039P can be used universally as open/close or control valves. The easy installation of the valve between pipe flanges warrants reliable operation and sealing. The Rilsan-coated valve body and the ductile iron valve disc provide high resistance against corrosion. The butterfly valves are also available in a standard version with stainless steel valve disc.

Butterfly valve, pneumatic	Actuator, pneumatic	Butterfly valve, manually operated	Dimensions	Standards
Type 038P	PA30 – P70	Type 038 lug style	DN50 – DN300	ISO/DIN, ASTM
Type 039P	PA30 – P70	Type 039 wafer style	DN50 – DN300	All standards

2.3.4 Dimensions

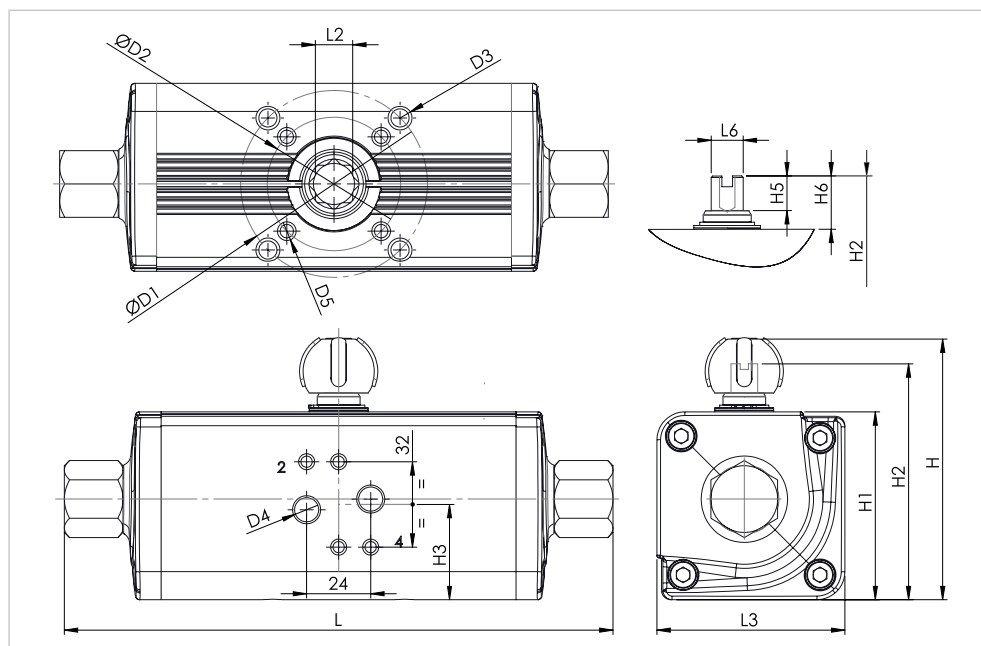
Single-acting (FC/F0)



Type		$\varnothing D1$ (mm)	$\varnothing D2$ (mm)	$D3$ (mm)	$D4$ (mm)	$D5$ (mm)	L (mm)	$L2$ (mm)	$L3$ (mm)	$L6$ (mm)
PA30	F05/07	70	50	M8x12	1/8"	M6x9	274.4	14	70.4	10
PA35	F05/07	70	50	M8x12	1/8"	M6x9	325.2	17	83.3	12
PA40	F05/07	70	50	M8x12	1/8"	M6x9	359.5	17	87	12
PA45	F07/10	102	70	M10x15	1/8"	M8x12	418	22	107.5	15
PA50	F07/10	102	70	M10x15	1/8"	M8x12	433.9	22	111.1	15
PA55	F07/10	102	70	M10x15	1/8"	M8x12	498.3	22	118	19
PA60	F10/12	125	102	M12x18	1/4"	M10x15	547.3	27	134.9	19
PA65	F10/12	125	102	M12x18	1/4"	M10x15	646	27	148	22
PA70	F10/12	125	102	M12x18	1/4"	M10x15	681	36	168	24

Type		H (mm)	$H1$ (mm)	$H2$ (mm)	$H3$ (mm)	$H5$ (mm)	$H6$ (mm)
PA30	F05/07	98.2	70.4	90.4	35.7	13	20
PA35	F05/07	111.1	83.3	103.3	42.8	13	20
PA40	F05/07	114.8	87	107	44.8	13	20
PA45	F07/10	149.5	107.5	137.5	54.5	16	30
PA50	F07/10	153.1	111.1	141.1	58.1	17	30
PA55	F07/10	160	118	148	60	19	30
PA60	F10/12	176.9	134.9	164.9	57.4	19	30
PA65	F10/12	190	148	178	61.5	19.5	30
PA70	F10/12	210.1	168	198	78	19.5	30

Double acting (DA)



Type		ØD1 (mm)	ØD2 (mm)	D3 (mm)	D4 (mm)	D5 (mm)	L (mm)	L2 (mm)	L3 (mm)	L6 (mm)
PA30	F03/05	50	36	M6x9	1/8"	M5x8	181.1	11	59.2	9
PA35	F03/05	50	36	M6x9	1/8"	M5x8	196.1	11	64.5	10
PA40	F05/07	70	50	M8x12	1/8"	M6x9	205.6	14	70.4	10
PA45	F05/07	70	50	M8x12	1/8"	M6x9	242	17	83.3	12
PA50	F05/07	70	50	M8x12	1/8"	M6x9	249.1	17	87	12
PA55	F07/10	102	70	M10x15	1/8"	M8x12	290.2	22	107.5	15
PA60	F07/10	102	70	M10x15	1/8"	M8x12	313.9	22	111.1	15
PA65	F07/10	102	70	M10x15	1/8"	M8x12	339.6	22	118	19
PA70	F10/12	125	102	M12x18	1/4"	M10x15	382.5	27	134.9	19

Type		H (mm)	H1 (mm)	H2 (mm)	H3 (mm)	H5 (mm)	H6 (mm)
PA30	F03/05	87	59.2	79.2	30.3	10	20
PA35	F03/05	92.3	64.5	84.5	32.5	13	20
PA40	F05/07	98.2	70.4	90.4	35.7	13	20
PA45	F05/07	111.1	83.3	103.3	42.8	13	20
PA50	F05/07	114.8	87	107	44.8	13	20
PA55	F07/10	149.5	107.5	137.5	54.5	16	30
PA60	F07/10	153.1	111.1	141.1	58.1	17	30
PA65	F07/10	160	118	148	60	19	30
PA70	F10/12	176.9	134.9	164.9	57.4	19	30

Torque depends on control pressure

Torque (Nm)		Single acting					
Type		2.8 bar		4.2 bar		5.6 bar*	
		air	Spring	air	Spring	air	Spring
PA30 FC/FO	0 °	15.0/14.6	10.0/11.2	22.5/21.9	15.0/16.7	30.0/29.2	20.0/22.3
	45 °	7.5/7.8	7.5/7.8	11.3/11.6	11.3/11.6	15.0/15.5	15.0/15.5
	90 °	10.0/11.2	15.0/14.6	15.0/16.7	22.5/21.9	20.0/22.3	30.0/29.2
PA35 FC/FO	0 °	26.5/26.0	17.5/18.5	40.0/39.0	26.0/27.8	53.0/52.0	35.0/37.0
	45 °	13.0/13.0	13.0/13.0	19.5/19.5	19.5/19.5	26.0/26.0	26.0/26.0
	90 °	17.5/18.5	26.5/26.0	26.0/27.8	40.0/39.0	35.0/37.0	53.0/52.0
PA40 FC/FO	0 °	30.0/28.3	20.0/23.3	45.0/42.4	30.0/34.9	60.0/56.5	40.0/46.5
	45 °	15.0/15.6	15.0/15.6	22.5/23.3	22.5/23.3	30.0/31.1	30.0/31.1
	90 °	20.0/23.3	30.0/28.3	30.0/34.9	45.0/42.4	40.0/46.5	60.0/56.5
PA45 FC/FO	0 °	45.0/41.8	30.0/32.5	67.5/62.7	45.0/48.7	90.0/83.6	60.0/64.9
	45 °	22.5/22.3	22.5/22.3	33.9/33.4	33.9/33.4	45.0/44.5	45.0/44.5
	90 °	30.0/32.5	45.0/41.8	45.0/48.7	67.5/62.7	60.0/64.9	90.0/83.6
PA50 FC/FO	0 °	60.0/56.5	40.0/45.8	90.0/84.7	60.0/68.7	120.0/112.9	80.0/91.6
	45 °	30.0/30.5	30.0/30.5	45.0/45.8	45.0/45.8	60.0/61.0	60.0/61.0
	90 °	40.0/45.8	60.0/56.5	60.0/68.7	90.0/84.7	80.0/91.6	120.0/112.9
PA 55 FC/FO	0 °	90.0/84.8	60.0/66.7	135.0/127.2	90.0/100.1	180.0/169.6	120.0/133.4
	45 °	45.0/45.3	45.0/45.3	67.5/68.0	67.5/68.0	90.0/90.6	90.0/90.6
	90 °	60.0/66.7	90.0/84.8	90.0/100.1	135.0/127.2	120.0/133.4	180.0/169.6
PA60 FC/FO	0 °	120.0/114.5	80.0/91.5	180.0/171.8	120.0/137.2	240.0/229.0	160.0/182.9
	45 °	60.0/61.5	60.0/61.5	90.0/92.3	90.0/92.3	120.0/123.0	120.0/123.0
	90 °	80.0/91.5	120.0/114.5	120.0/137.2	180.0/171.8	160.0/182.9	240.0/229.0
PA65 FC/FO	0 °	180.0/172.0	120.0/137.2	270.0/258.0	180.0/205.7	360.0/344.0	240.0/274.3
	45 °	90.0/92.3	90.0/92.3	135.0/138.4	135.0/138.4	180.0/184.5	180.0/184.5
	90 °	120.0/137.2	180.0/172.0	180.0/205.7	270.0/258.0	240.0/274.3	360.0/344.0
PA70 FC/FO	0 °	240.0/211.8	160.0/196.4	360.0/317.6	240.0/294.6	480.0/423.5	320.0/392.8
	45 °	120.0/120.4	120.0/120.4	180.0/180.5	180.0/180.5	240.0/240.7	240.0/240.7
	90 °	160.0/196.4	240.0/211.8	240.0/294.6	360.0/317.6	320.0/392.8	480.0/423.5

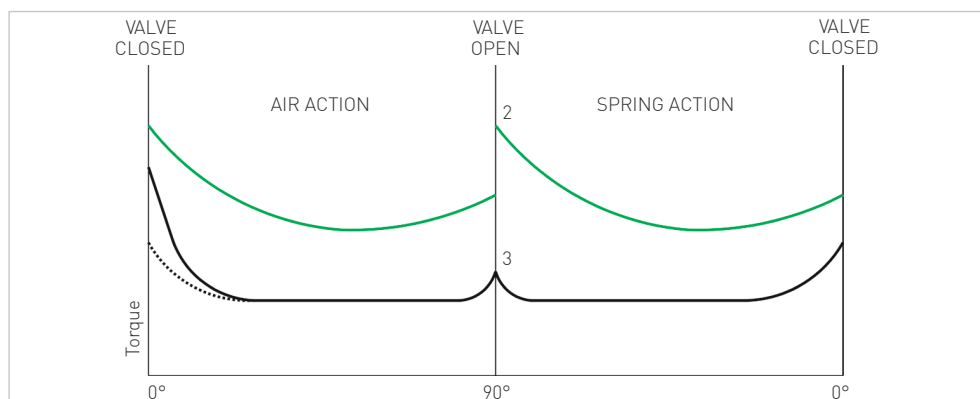
* Standard series; for lower control pressures, special springs are available

Torque (Nm)		Double acting					
Type		3 bar	4 bar	5 bar	5.6 bar*	6 bar	7 bar
PA30 DA	0 °	16.1	21.4	26.8	30.0	32.1	37.5
	45 °	8.0	10.7	13.4	15.0	16.1	18.8
	90 °	12.1	16.1	20.1	22.5	24.1	28.1
PA35 DA	0 °	24.1	32.1	40.2	45.0	48.2	56.3
	45 °	12.1	16.1	20.1	22.5	24.1	28.1
	90 °	18.1	24.1	30.3	33.8	36.2	42.2
PA40 DA	0 °	32.1	42.9	53.6	60.0	64.3	75.0
	45 °	16.1	21.4	26.8	30.0	32.1	37.5
	90 °	24.1	32.1	40.2	45.0	48.2	56.3
PA45 DA	0 °	56.8	75.7	94.6	106.0	113.6	132.5
	45 °	28.4	37.9	47.3	53.0	56.8	66.3
	90 °	42.9	57.1	71.4	80.0	85.7	100.0
PA50 DA	0 °	64.3	85.7	107.1	120.0	128.6	150.0
	45 °	32.1	42.9	53.6	60.0	64.3	75.0
	90 °	48.2	64.3	80.4	90.0	96.4	112.5
PA55 DA	0 °	96.4	128.6	160.7	180.0	192.9	225
	45 °	48.2	64.3	80.4	90.0	96.4	112.5
	90 °	72.3	96.4	120.5	135.0	144.6	168.8
PA60 DA	0 °	128.6	171.4	214.3	240.0	257.1	300.0
	45 °	64.3	85.7	107.1	120.0	128.6	150.0
	90 °	96.4	128.6	160.7	180.0	192.9	225.0
PA65 DA	0 °	192.9	257.1	321.4	360.0	385.7	450.0
	45 °	96.4	128.6	160.7	180.0	192.9	225.0
	90 °	144.6	192.9	241.1	270.0	289.3	337.5
PA70 DA	0 °	257.1	342.9	428.6	480.0	514.3	600.0
	45 °	128.6	171.4	214.3	240.0	257.1	300.0
	90 °	192.9	257.1	321.4	360.0	385.7	450.0

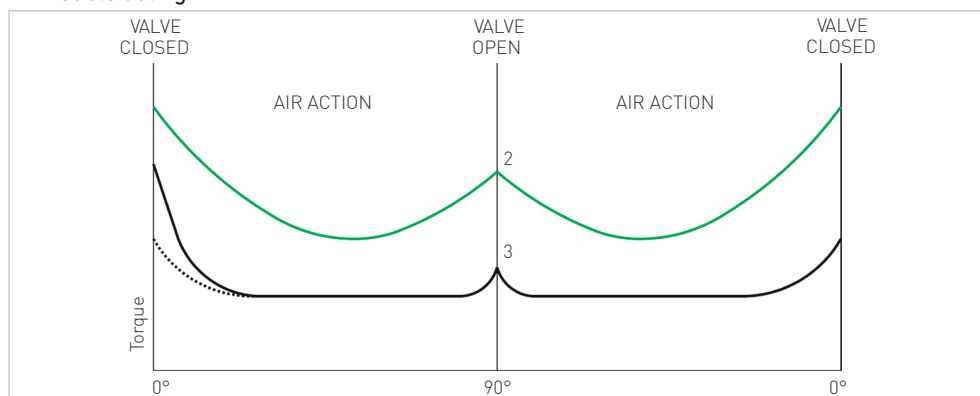
* Standard series; for lower control pressures, special springs are available

Torque characteristics

FC/F0 Single-acting



DA Double acting



2.3.5 Accessories

- 3/2-way solenoid valve PV94/95
- 3/2 – 5/2-way solenoid valve MNL532
- 4/2-way solenoid valve 5470
- Pilot solenoid valve type PV2000 (for valve clusters)
- Electropneumatic positioner type RPC
- Limit switch box for feedback
- AS interface
- Emergency manual override



For further information on accessories, refer to the online product catalog at www.gfps.com

2.4 Pneumatic actuators for diaphragm valves

For further information on pneumatic actuators of diaphragm valves, see planning fundamentals section **diaphragm valves, pneumatic**.

2.5 Accessories

2.5.1 General

The accessories for the electric actuators can be retrofitted by the end user himself at any time. The installation of the accessories is performed via the standardized interfaces of the respective actuator. The pneumatic actuators include rotary actuators (PA11/21 and PA30 – 90) and stroke actuators (DIASTAR). Depending on the function of the accessory, it can be used for both actuator types or for only one. An overview of the possible applications follows below.

Compatibility of actuator type with accessories

Accessories		Rotary actuators PPA04 – PPA80 PA11/21 PA30–90	Stroke actuators DIASTAR
Pilot valves*		✓	✓
<ul style="list-style-type: none"> • Pilot valves PV94/PV95 • MNL532 • Type 5470 • Pilot valve cluster PV2000 			
Digital positioner	SPC		✓
	RPC	✓	
Stroke limiter / emergency manual override			✓
Position feedback sensor	ER52/ER53/ER55		✓
	Limit switch boxes	✓	
AS interface modules	Topmatic		✓
	ASEV2300	✓	

*See chapter „Solenoid valves“

2.5.2 Electropneumatic positioner type SPC/RPC



Type SPC positioner
with diaphragm valve DIASTAR



Type RPC positioner
with pneumatic actuator PPA and ball valve type 546 Pro

Product description

The types SPC (Stroke Process Controller) and RPC (Rotary Process Controller) are digital, electro-pneumatic positioners for integrated mounting on pneumatically operated industrial valves with single-acting stroke actuators e.g. DIASTAR diaphragm valves as well as single- and double-acting rotary actuators e.g. PA and PPA.

Benefits

- Compact and robust design
- Putting into operation by TUNE function of positioner and process controller
- Integrated diagnostic functions for valve monitoring
- Dynamic control system without air consumption in the controlled state
- PID closed loop process controller function (type SPC PID; RPC PID)

Product features

- For pneumatic actuators in double-acting and single-acting function (SPC only single-acting)
- Power supply voltage 24V DC
- Activation 0-10 V, 0-5 V, 4-20 mA, 0-20 mA adjustable
- Multi-pin plug electrical connection
- Operation/configuration via display or internal DIP switch
- Protection rating IP65/IP67
- Binary input (fail-safe position, changeover)
- Operating mode (Automatic/Manual)
- Analog position indicator (0/4 to 20 mA, 0 to 5/10 V) for setpoints and actual values
- Approved and listed according to cULus and cCSAus

Variants

Positioner (SPC, SPC*, SPC D, RPC, RPC D)

The positioner is assembled to a pneumatically driven valve and regulates the position of the valve. The positioner detects the valve position wear-free via a contactless, analog position sensor. The microprocessor electronics in the positioner continuously compares the current position (actual position value) with the position setpoint value specified via the standard signal input (or via fieldbus). If there is a control difference, the electropneumatic control system causes the actuator to correct the actual position value accordingly.

Process controller (SPC PID, RPC PID)

The process controller is integrated in a control loop. The position setpoint value of the valve is calculated from the process setpoint value and the actual process value (sensor signal) via the control parameters (PID controller). The process setpoint value can be specified by an external signal (or via fieldbus). The process controller processes all common current and voltage standard signals and can optionally be equipped with a fieldbus interface. The actual value of the process variable is fed directly to the device as a 4 to 20 mA, Pt 100 or frequency signal. The process controller calculates the internal setpoint value for the subordinate positioner from the setpoint/actual value comparison.

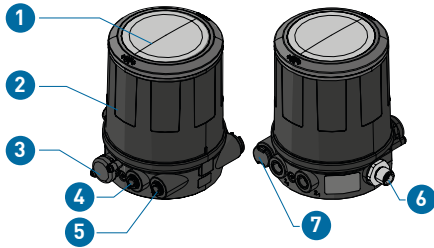
Control head (SPC Lite)

The type SPC Lite positioner is a control head designed for decentralized automation of pneumatic process valves for simple OPEN/CLOSED applications. The valve position is detected via a non-contact, analog sensor element, which automatically detects and stores the valve end positions via a teach function upon putting into operation. The integrated pilot valve controls single-acting actuators.

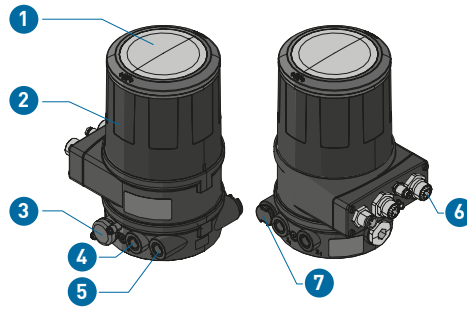
Technical Data

Type SPC Positioner design

TYPE SPC/SPC Lite



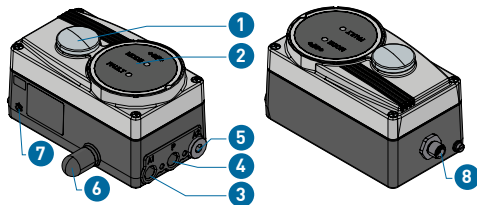
TYPE SPC D/PID



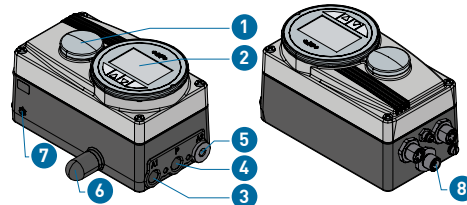
- ① Transparent cover, underneath decoding module
- ② Housing cover
- ③ Pressure limiting valve
- ④ Exhaust air connection
Lettering: 3
- ⑤ Control air connection
Lettering: 1
- ⑥ Electrical connection
- ⑦ Supply air filter

Type RPC Positioner design

TYPE RPC



TYPE RPC D/PID



- ① Mechanical position indication
- ② Display/control module
- ③ Working connection 1 (connection: A1)
- ④ Pressure connection 1.4 - 7 bar (connection: P)
- ⑤ Working connection 2 (connection: A2)
- ⑥ Venting connection/Venting filter
- ⑦ Overpressure valve
- ⑧ Electrical connection

Type	SPC Lite	SPC	SPC D	SPC PID	RPC	RPC D	RPC PID
Pneumatic actuator type	Stroke actuator				Rotary/multiturn actuator		
	SPC*: large air capacity for DIASTAR DN>50						
Function	Control head	Positioner		Process controller	Positioner		Process controller
General data							
Operating Temperature	-10 to +55 °C						
Storage Temp	-20 to +65 °C						
Protection rating	IP65/IP67 as per EN 60529 (evaluated by the manufacturer)						
Deployment height	up to 2000 m above sea level						
	relative humidity max. 95% at 50 °C (non-condensing)						
Housing material	External: PPS, PC, VA, PP-FR Internal: PA 6; ABS				Plastic-coated aluminum stainless steel (V4A), PC, PE, POM, PTFE		
Sealing material	NBR/EPDM				EPDM, NBR, FKM		
Stroke range valve stem (all SPC)	2 - 47 mm	3 - 45 mm					
Integrated displacement transducer	Non-contact (wear-free) analog inductive position sensor				Conductive plastic rotary potentiometer Rotation angle 30° to 180°		
Putting into operation/ Initialization	Automatically through X.TUNE function (automatic adjustment of positioner)						
Pneumatic data							
Control medium	Neutral gases, air Quality class as per ISO 8573-1						
Dust content	Quality class 7, max. particle size 40 µm, max. particle density 10 mg/m³						
Water content	Quality class 3, max. pressure dew point -20 °C or min. 10 °C below the lowest operating temperature						
Oil content	Quality class X, max. 25 mg/m³						

Type	SPC Lite	SPC	SPC D	SPC PID	RPC	RPC D	RPC PID
Temperature range of control medium	-10 to 50 °C						
Pressure range of control medium	3 - 7 bar				1.4 - 7 bar		
Positioning system nominal diameter	DN0.6	DN0.6 SPC*: DN2.5	DN0.6		DN3.0		
Air output control valve for ventilation and vent outlet (QNn value according to definition with pressure drop from 7 to 6 bar absolute)	250 l _N /min	SPC: 7 l _N /min SPC*: 130 l _N /min	7 l _N /min		50 l _N /min (at 1.4 bar2.) 150 l _N /min (at 6 bar2.) QNn=100 l _N /min		
Fluidic connection	Threaded joint G 1/8				Threaded joint G 1/4		
Electrical data							
Protection class	III as per DIN EN 61140 (VDE 0140-1)						
Connections	Round connector (see accessories, not included in delivery)						
M12 8-pin Power supply, input/output signals	x	x	x	x	x	x	x
M12 4-pin Power supply			x	x		x	x
M8 4-pin Process current value from sensor				x			x
M12 D-coded Fieldbus connection	Only with fieldbus device, not available as accessories						
Supply voltage	24 V DC ± 10% - max. residual ripple 10% SPC: 24 V DC ± 25% - max. residual ripple 10%						
Power consumption	< 5 W						
Input data for actual value signal (PID only)	4 ... 20 mA: • Input resistance 70 Ω Resolution 12 bit Frequency: • Measurement range 0 - 1000 Hz • Input resistance 20 kΩ Resolution 1‰ of measured value Input signal > 300 mVss • Signal form: sine, rectangle, triangle PT 100: • Measuring range -20 to +220 °C • Resolution < 0.1 °C • Measuring current < 1 mA						
Input data for setpoint value signal		0/4 - 20 mA: Input resistance 75 Ω Resolution 12 bit 0 - 5/10 V: Input resistance 22 kΩ Resolution 12 bit (at 0 - 5 V only 11 bit)					+Inductive proximity switches 100 mA current limitation
Analog position indicator		Max. current: 10 mA (for voltage output 0 - 5/10 V) Load: 0 - 560 Ω (for current output 0/4 - 20 mA)					
Digital outputs		Galvanically isolated, PNP Current limiting 100 mA, output is clocked on overload					
Digital input		PNP 0 - 5 V = log "0", 10 - 30 V = log "1"					
		Inverted input correspondingly inverted (input current < 6 mA)					
Approvals/Standards	cULus and cCSAus						

Assignments

Assignment of SPC and RPC positioners to pneumatic stroke/rotary actuators:

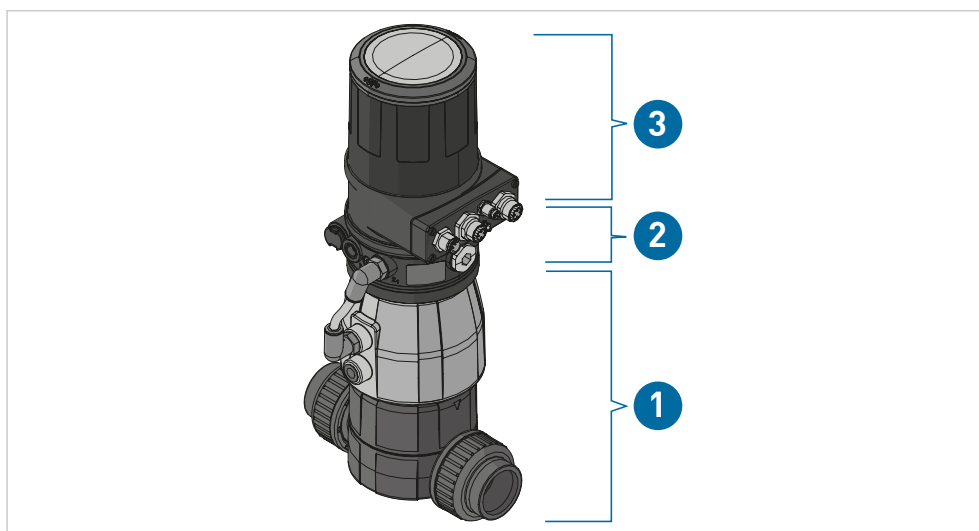
	DIASTAR							PA11/21, PA30 – 90	PPA04 – PPA80
	Six FC	Ten FC/FO	Ten DA	Ten Plus FC	Sixteen FC/FO	Sixteen DA	025	FC/FO/DA	FC/FO/DA
Type SPC		x		x	x		x*		
Type RPC								x	x

only SPC

! Opening times SPC D for DIASTAR FO Sz.5/DN50 up to 30 seconds possible. This should be taken into account when selecting the valve.

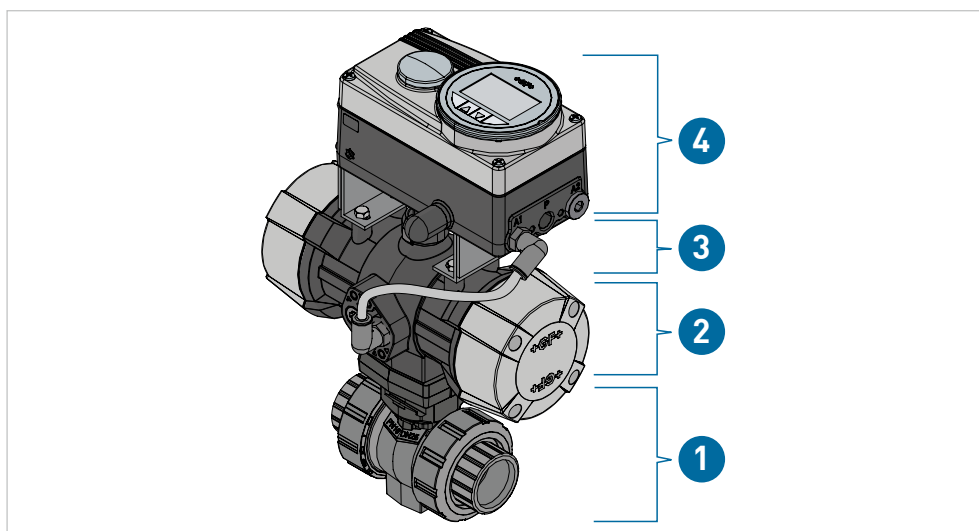
! For diaphragm valves with EPDM diaphragms and 16 bar version, flipping the diaphragm can cause overshooting.

Type SPC



- ① DIASTAR diaphragm valve
- ② Adaption SPC
- ③ Type SPC Positioner

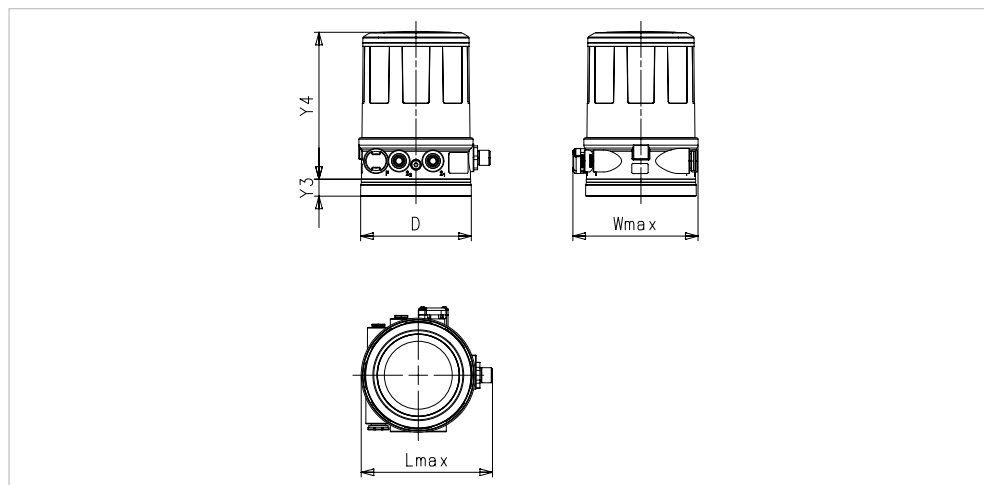
Type RPC



- ① Ball valve type 546 Pro
- ② Pneumatic actuator type PPA04 – PPA80
- ③ Adaption RPC
- ④ Type RPC positioner

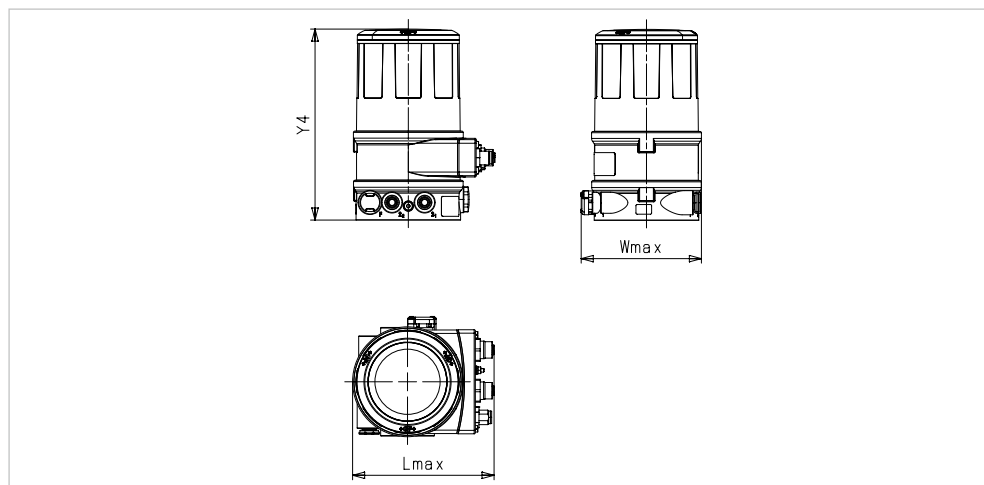
Dimensions

Type SPC / SPC Lite



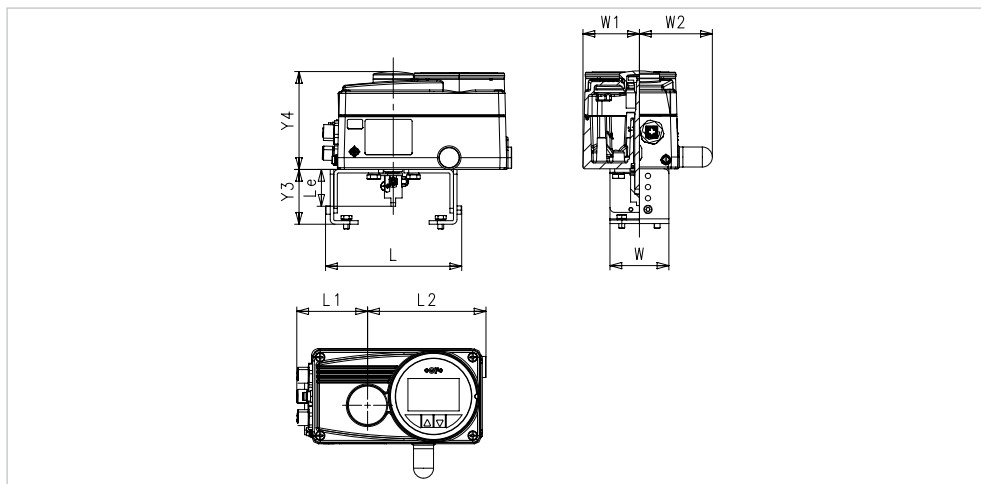
Designation	Order code	Y4	Lmax	Wmax
SPC	199 190 620	117.5	104.5	99.5
SPC*	199 190 621	117.5	104.5	99.5
SPC Lite	199 190 619	117.5	104.5	99.5

Type SPC D/PID



Designation	Order code	Y4	Lmax	Wmax
SPC D	199 190 622	158.5	115.5	99.5
SPC PID	199 190 625	158.5	115.5	99.5

Type RPC / RPC D / RPC PID



Designation	Order code	Y4	W1	W2	L1	L2
RPC	199 190 640	83.5	48	62	60.5	100.5
RPC D	199 190 641	83.5	48	62	60.5	100.5
RPC PID	199 190 644	83.5	48	62	60.5	100.5

Accessories

Adaption for positioner type SPC, SPC Lite, SPC D, SPC PID

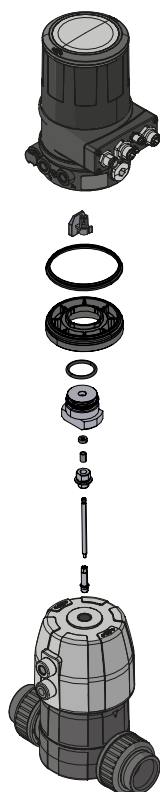
SPC adapter assignment depending on the DIASTAR stroke actuator used:

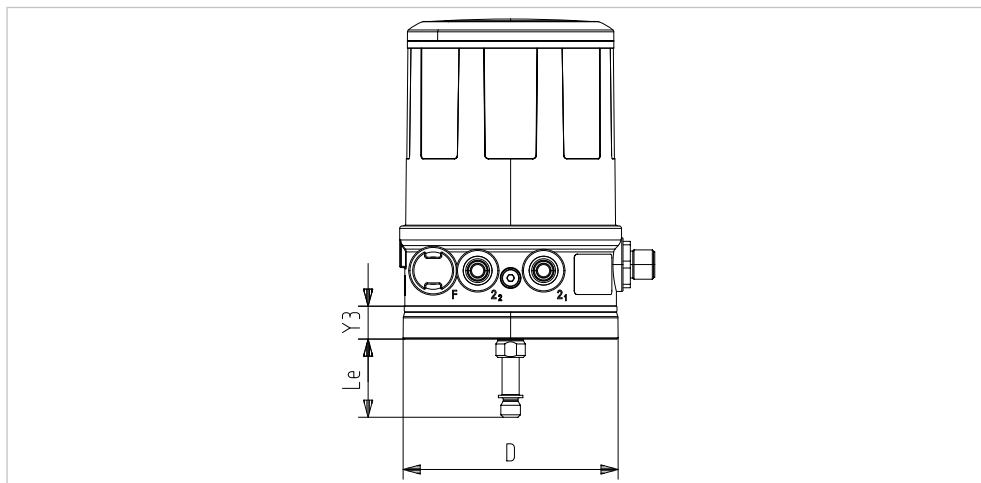
Nominal diameter	Six FC	Ten FC/FO	DIASTAR				025
			Ten DA	Ten Plus FC	Sixteen FC/FO	Sixteen DA	
DN15		1	1	2	2	1	
DN20		2	2	2	2	2	
DN25		2	2	3	3	2	
DN32		3	3	4	4	3	
DN40		4	4	5	5	4	
DN50		4	4	5	5	4	
DN65							6
DN80							6
DN100							6
DN150							6



Example for DN25 Ten DA: A positioner SPC requires the corresponding adaptation for actuator size 2 (item 199 190 628) for a DIASTAR Ten FC with DN25.

For mounting positioner on pneumatic stroke actuator type DIASTAR.



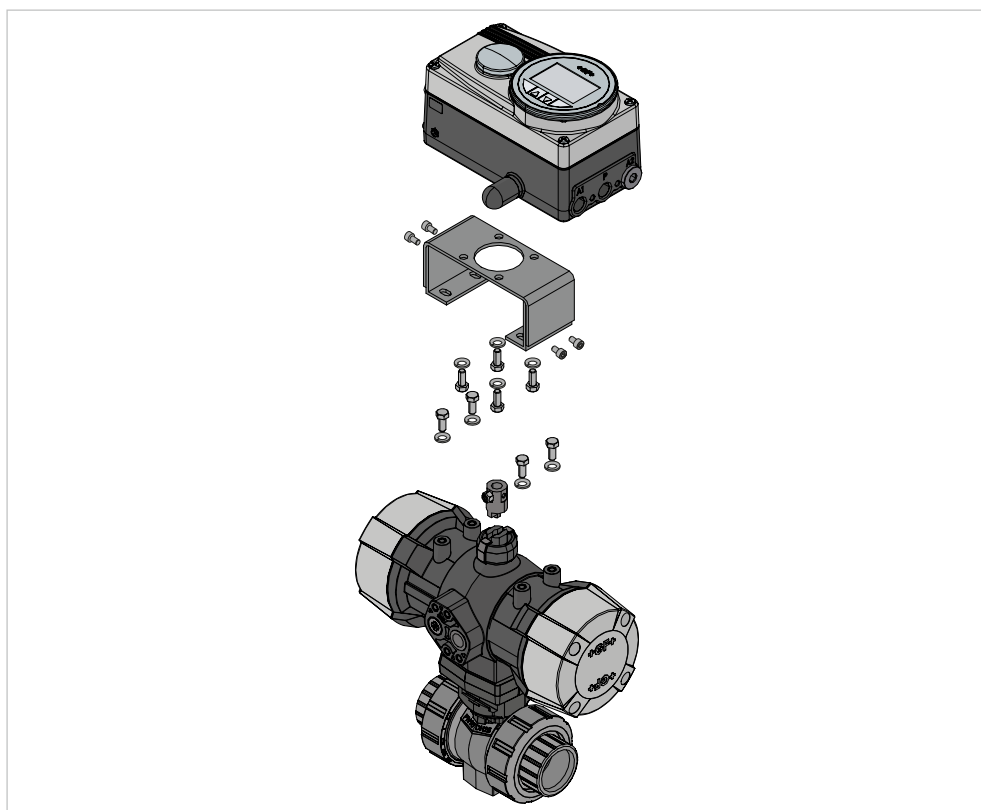


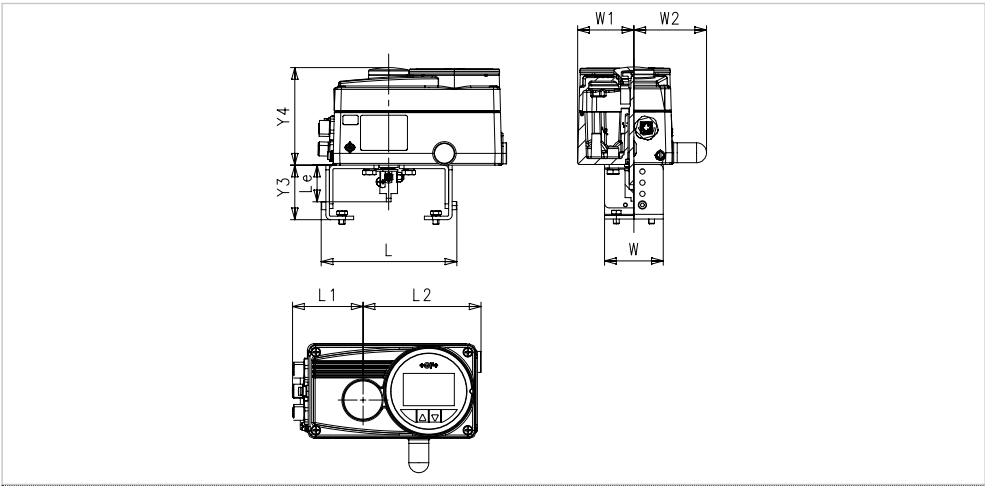
Order code	Designation	Y3	D
199 190 628	Adaption SPC 1 + 2	13.5	88
199 190 629	Adaption SPC 3 + 4	13.5	88
199 190 630	Adaption SPC 5	13.5	88
199 190 631	Adaption SPC 6	13.5	88

! Note: Observe the assignment of adaptation to actuator size.

Adaption for positioner type RPC, RPC D, RPC PID

For mounting positioner on pneumatic rotary actuator type PPA08-80.





Order code	Designation	Y3	L	Le	W
199 190 647	Adaption RPC	46.5	116	31.5	50

Multi-pin connector

For electrical connection of positioner type SPC, type RPC to customer's control system

Order code	Designation	
199 190 649	Round socket M12 8-pin w. cable 5m PUR	Protection rating IP67/IP68/IP69, A-coded, angled plug, free cable end, operating voltage max. 250 V AC/DC, operating current max. 4 A, microbe and hydrolysis resistant, halogen free, ambient temperature: <ul style="list-style-type: none">• Connector: -40 - 90 °C (-40 - 194 °F)• Cable, permanently installed: -40 - 80 °C (-40 - 176 °F)• Cable, movable: -25 - 80 °C (-13 - 176 °F) Contamination level: 3
199 190 650	Round socket M12 4-pin w. cable 5m PUR	
199 190 651	Round socket M8 4-pin w. cable 5m PUR	

! The connections to be used for the respective positioner can be taken from the electrical data above.

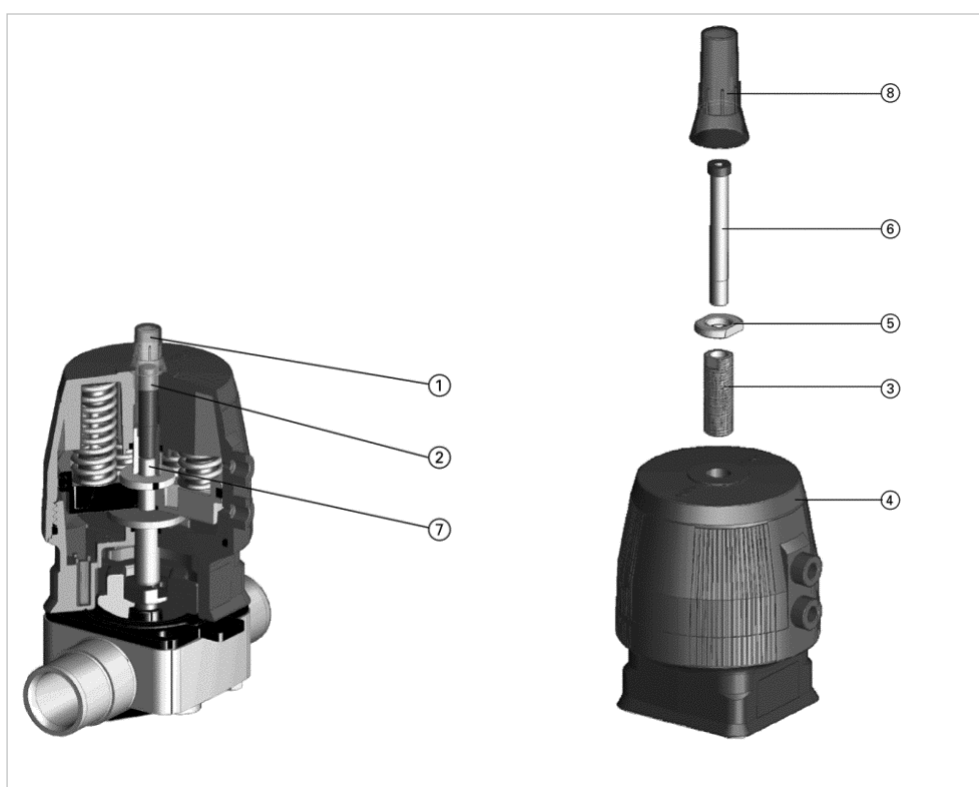
2.5.3 Stroke limiter / emergency manual override for DIASTAR



General

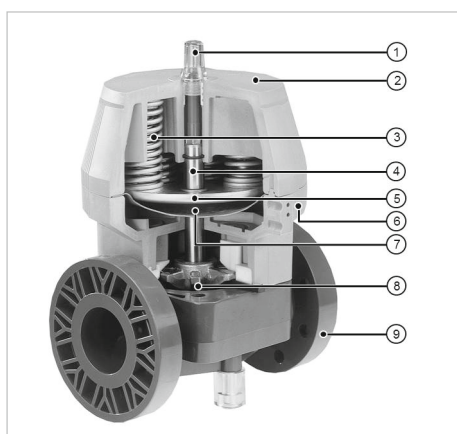
The stroke limiter can be used for limiting the minimum and maximum stroke as well as for the emergency manual override. With the usage of adapters, the stroke limiter can also be combined with our electrical position indicator (ER52/53).

DN15 – DN50



- ① Indicator cap
- ② Position indicator
- ③ Threaded sleeve
- ④ Actuator
- ⑤ Locknut
- ⑥ Position indicator
- ⑦ Threaded sleeve
- ⑧ Indicator cap

DN65 – DN150



- ① Optical position indicator
- ② All-plastic housing, PP-GF
- ③ Pre-tensioned springs
- ④ Lifting spindle group
- ⑤ Diaphragm plate
- ⑥ NAMUR interface for control air
- ⑦ Control diaphragms
- ⑧ Compressor
- ⑨ Valve body

2.5.4 Electric position indicator ER52/53



General

The electrical position indicator is used to indicate the valve position of GF diaphragm valves type DIASTAR. The position indicator can be screwed directly onto the diaphragm valve type DIASTAR.

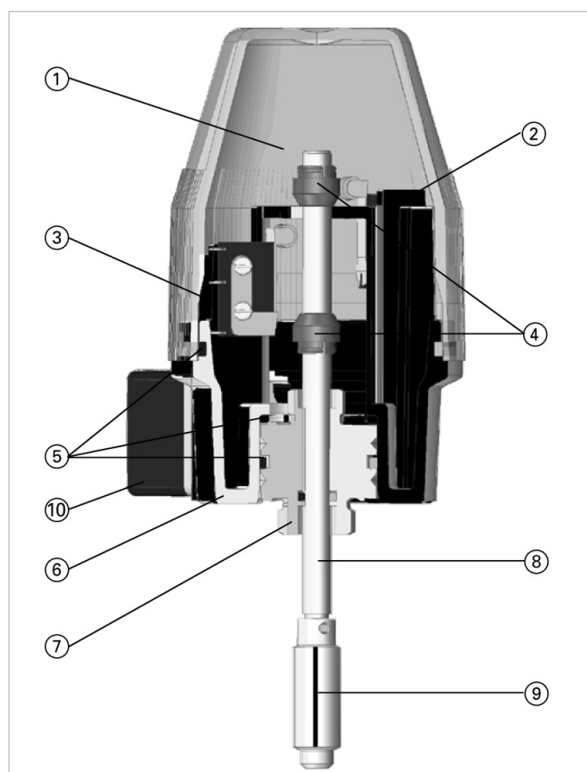
- For pneumatic stroke actuators
- For DIASTAR Ten, Ten Plus, Sixteen, 025
- Mechanical switches (AgNi or Au)
- NPN/PNP, NAMUR
- With optical position indicator

Insert

- Type ER52 d20 – 63 DN15 – DN50
- Type ER53 d75 – 160 DN65 – DN150

Design of the position indicator

Type ER52 (DN15 – 50) type ER53 (DN65 – DN150)



- ① Cover SAN
- ② Microswitch Closed
- ③ Microswitch Open
- ④ Cams PA
- ⑤ O-ring NBR
- ⑥ Housing PP
- ⑦ Brass base
- ⑧ Spindle of stainless steel
- ⑨ Connecting piece stainless steel (differs depending on actuator size)*
- ⑩ Unit plug 3P + E/EN 43650
- * Connecting pieces

	1/2	3	4	5
d	12 mm	16 mm	16 mm	16 mm
⑦				

Electrical connections

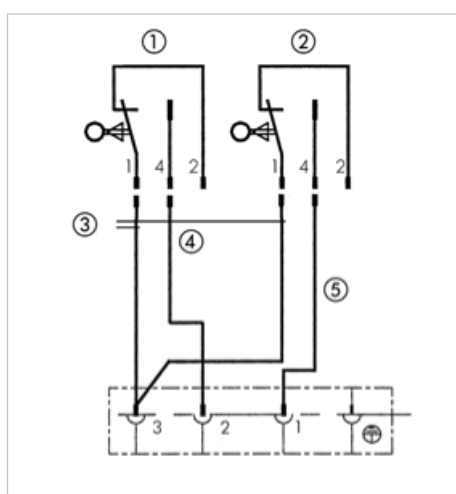
The position indicator is connected in standard version with unit plug.

Electric position indicator type ER52 / ER53

Type	Type of switch	Switching capacity
ER52-1	ER53-1	Microswitch AgNi
ER52-2	ER53-2	Microswitch with gold-plated Au
ER52-3	ER53-3	Inductive switch NPN
ER52-4	ER53-4	Inductive switch PNP
ER52-5	ER53-5	Inductive switch NAMUR
ER52-6	ER53-6	Microswitch Eexd
ER52-7	ER53-7	Analog position sensor

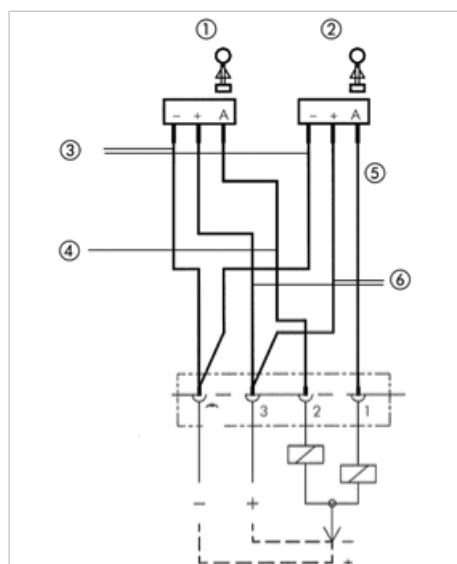
Connection diagrams

ER52-1, ER52-2, ER53-1, ER53-2



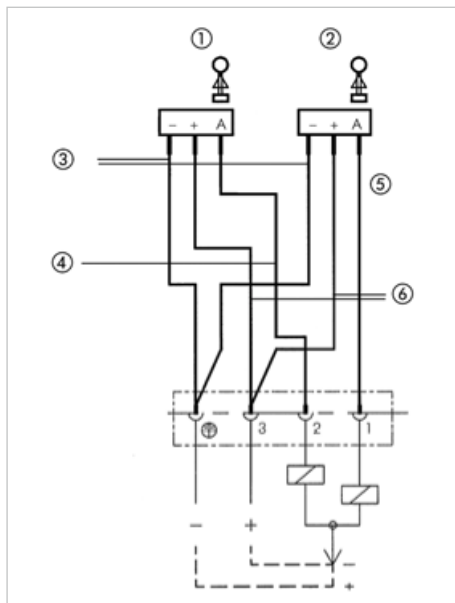
- ① Closed
- ② Opened
- ③ Black
- ④ White
- ⑤ Red

ER52-3, ER52-4



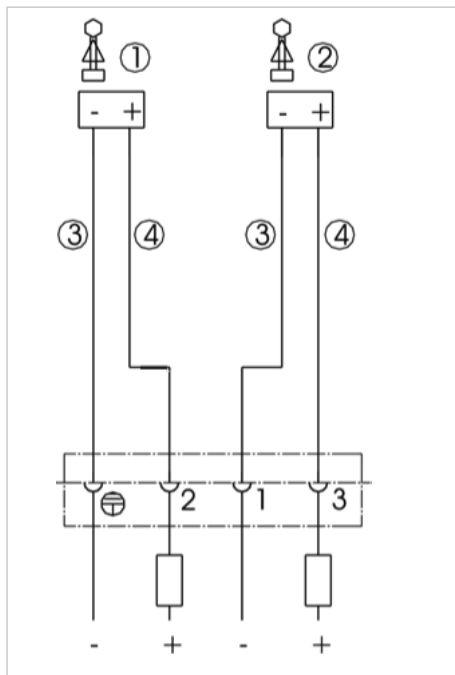
- ① Closed
- ② Opened
- ③ Blue
- ④ Black
- ⑤ Black
- ⑥ Brown

ER53-3, ER53-4



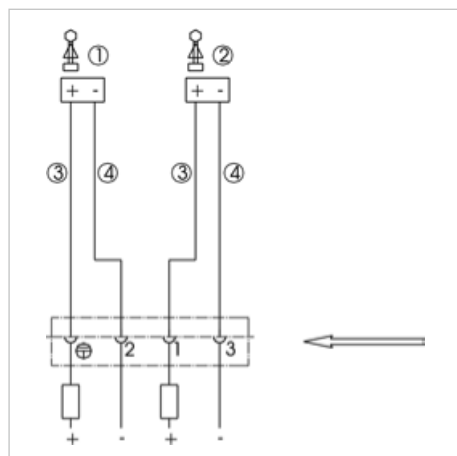
- ① Closed
- ② Opened
- ③ White
- ④ Red
- ⑤ Green
- ⑥ Black

ER52-5



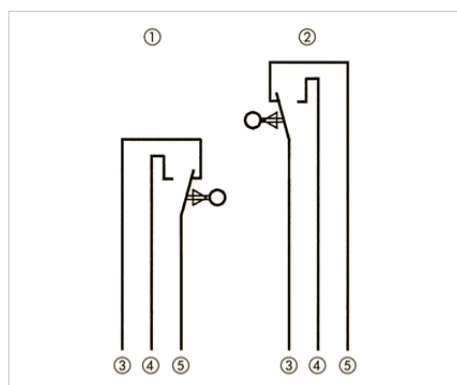
- ① Closed
- ② Opened
- ③ Blue
- ④ Brown

ER53-5



- ① Closed
- ② Opened
- ③ Black
- ④ White

ER52-6, ER53-6



- ① Closed
- ② Opened
- ③ Green
- ④ Brown
- ⑤ White

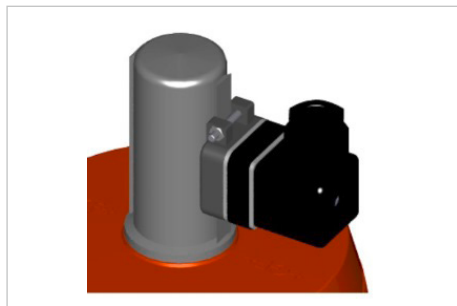
Actuator sizes DIASTAR DN15 – DN50

DN (mm)	Six – FC	Ten – FC	Sixteen – FC	Ten – F0/DA
15	1	1	2	1
20	2	2	2	2
25	2	2	3	2
32	3	3	4	3
40	3	4	5	4
50	3	4	5	4



For more information on pneumatic Stroke actuator DIASTAR, see Planning Fundamentals, chapter „Pneumatic diaphragm valve“.

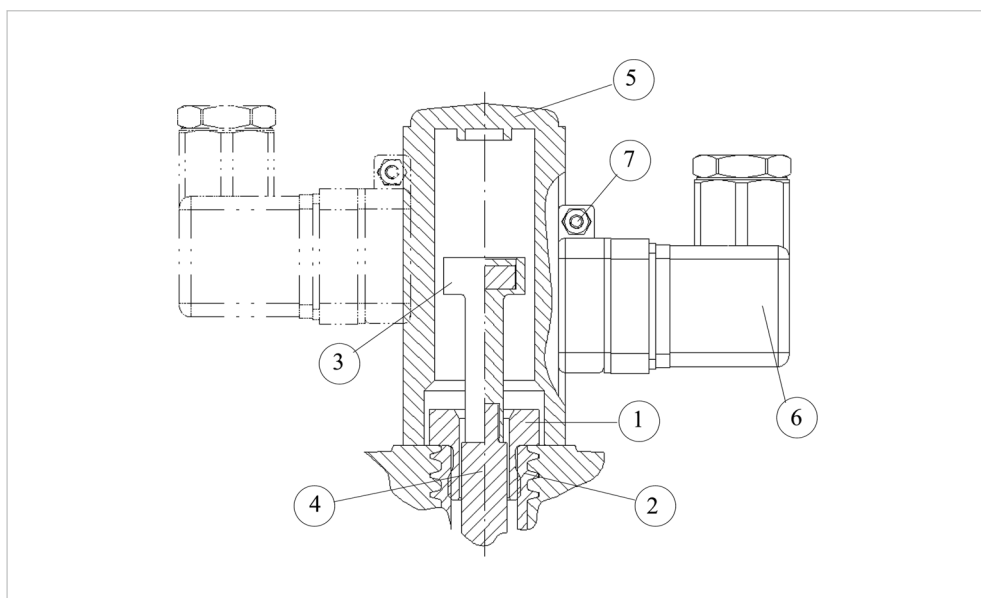
2.5.5 Electric position indicator type ER55



General

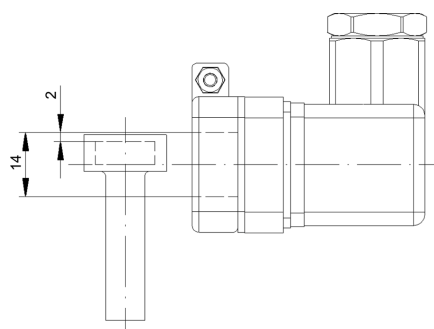
Electric position indicators are used to signal the valve positions. The GF position indicator type ER55 can be screwed directly into the diaphragm valve series DIASTAR type Ten and Sixteen and can indicate a valve position, open or closed. The switching point can be easily set with the adjustable Reed contact.

Design

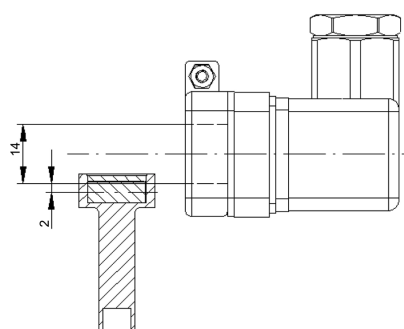


- ① Adaptors
- ② Insert
- ③ Magnetic holder
- ④ Position indicator
- ⑤ Cover
- ⑥ Reed contact
- ⑦ Screw

Valve OPEN contact open
Valve CLOSED contact closed



Valve in OPEN position



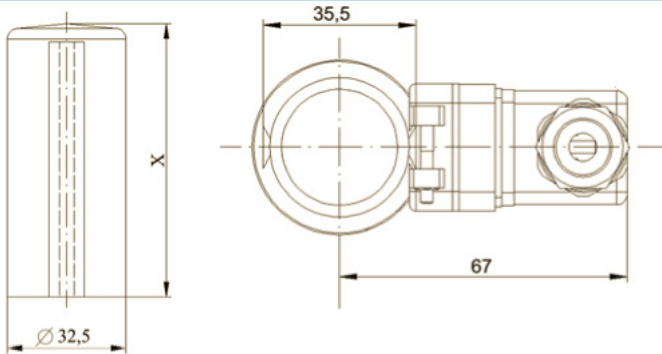
Valve in CLOSED position

Technical data

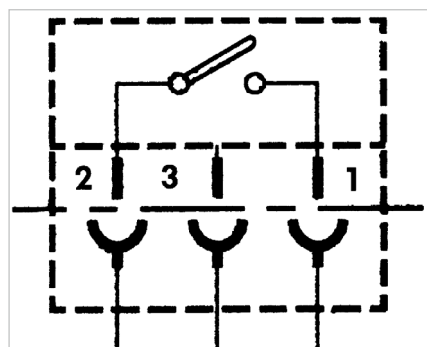
Technical data

Rated voltage	250 V, 50 – 60 Hz max.
Max. continuous current	200 mA
Peak-switch-on current	500 mA (use contact protection relay in case of inductive load)
Contact fitted	Monostable Reed contact
Electrical connection	Standard plug DIN EN 175301-803
Protection class	IP65 as per IEC EN 60529

Dimensions

	Product	Height X (mm)
	199 190 462	75
	199 190 464	48

Connection wiring diagram



2.6 AS Interface

The Topmatic

AS interface type Topomatic for
DIASTAR DN15 – DN150



The As-i controller enables modern and easy bus communication. The controller contains all the necessary electric and pneumatic components. Only the compressed air supply and cabling to the AS interface flat cable must be provided.

Technical data

Housing materials	POM (black)
Cover material	PC (transparent brown)
Gasket	NBR
Power supply	31.6 V DC (ASi voltage)
Connector	M12 x 1 (4-pin)
AS interface specification	3.0
AS interface profile	S-3/ A.0.E
Power consumption	3.5 Watt
Protection class	IP67

ASCV 2300-11

AS interface type ASVC 2300-11
for PA11/21 and PA30 – PA90



Technical data

Housing materials	POM (black)
Cover material	PC (gray)
Gasket	NBR
Power supply	31.6 V DC (ASi voltage)
Connector	M12 x 1 (4-pin)
AS interface specification	3.0
AS interface profile	S-7/ A.0.E
Power consumption	1.9 Watt
Protection class	IP67



For more information on ASi, see Planning Fundamentals, chapter „AS Interface“.

2.6.1 Limit switch boxes



General

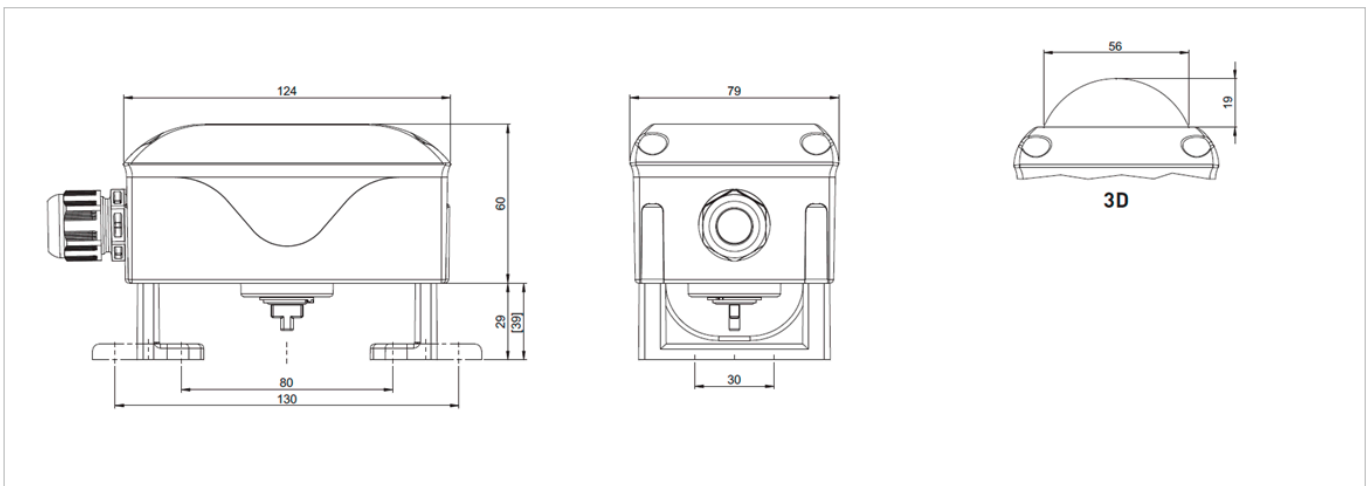
Plastic limit switches boxes for simple position feedback on actuator position (open/closed). The housing can be populated with various types of limit switches.

- Compact and flexible limit switch box made of polyamide (PA6) with a cover made of polycarbonate (PC) and 3D display
- Adjustable polyamide assembly bridge (PA6) 30 % fiberglass-reinforced, for simple installation in normal actuators according to VDI/VDE 3845
- Hole patterns: 80 x 30 mm and 130 x 30 mm (optional: 50 x 25 mm)
- Shaft heights: 20 and 30 mm
- Leak-tightness IP67 according to DIN EN 60529
- Cable threaded connection M20 x 1.5 black (for cable \varnothing 6 – 12 mm)
- Gaskets EPDM and NBR, stainless steel screws 1.4301, shaft polyamide PA6

Application

- Standard applications not in explosive environments
- 1 – 4 mechanical limit switches or inductive sensors in V3 version
- 1 – 3 slot initiators
- 1 – 2 cylindrical sensors \varnothing 8 – 18 mm

Dimensions

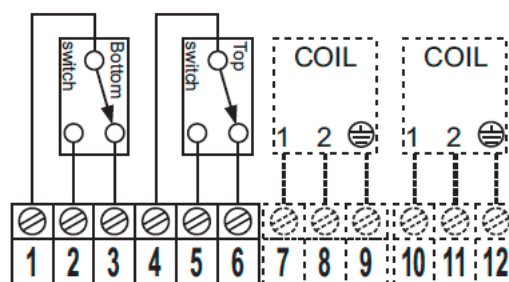


Technical data

Wave box with mechanical toggle switches SPDT

M001

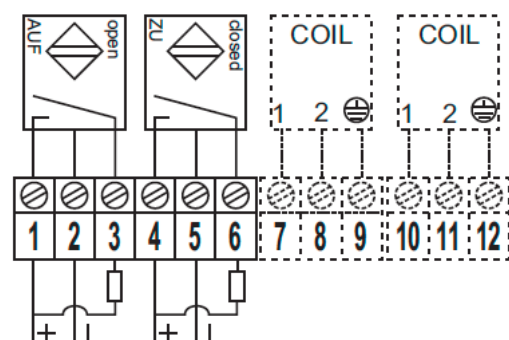
Limit switch make	CHERRY	CHERRY
Limit switch type	D44X	D41X
Voltage	24-250V	24-250V
Maximum current	AC: 250V, 10A DC: 24V, 2,5A	AC: 250V, 0,1A DC: 24V, 0,1A
Contacts	Silver	Gold
SIL level	SIL 1-3 (IEC 61508:2010)	SIL 1-3 (IEC 61508:2010)
Temperature	(-40°C) -25°C ... +80°C	(-40°C) -25°C ... +80°C
Approvals	UL available upon request	UL available upon request



Wave box with inductive proximity switches, 3-wire NPN

I006

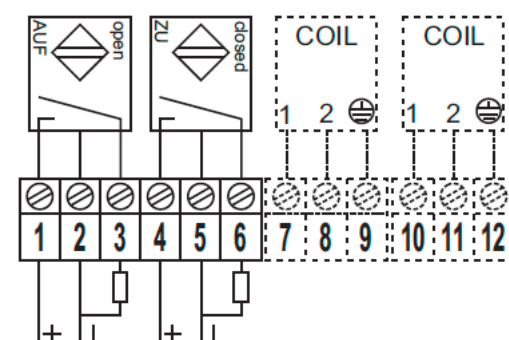
Limit switch make	P+F
Limit switch type	NBB2-V3-E0 (NPN N.O.)
Voltage	10-30V DC
Current consumption	100 mA
Switching frequency	1000 Hz
No-load current	15 mA
Display	LED yellow
Switch protection rating (IP code)	IP67
Temperature	-25°C ... +70°C



Wave box with inductive proximity switches, 3-wire PNP

I001

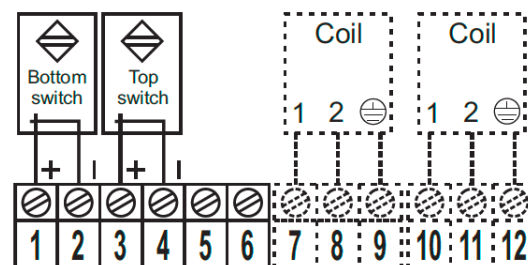
Limit switch make	P+F	IFM
Limit switch type	NBB2-V3-E2 (PNP N.O.)	IS5001 (PNP N. O.)
Voltage	10-30V DC	10-36 V DC
Current consumption	100 mA	0-200 mA
Switching frequency	1000 Hz	800 Hz
No-load current	15 mA	15 mA
Display	LED yellow	LED yellow
Switch protection rating (IP code)	IP67	IP67
Temperature	-25°C ... +70°C	-25°C ... +80°C



Wave box with inherently safe, inductive proximity switches

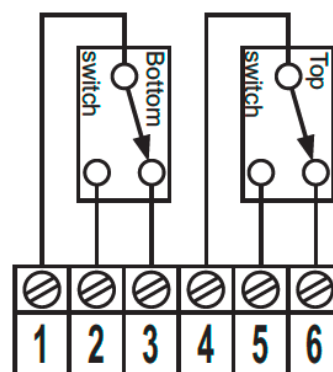
I007, I017

Limit switch make	P+F
Limit switch type	NJ2-V-3-N (open N.C.)
Voltage	8,2V DC
Current consumption	< 1 mA > 3mA
Switching frequency	1000 Hz
SIL Level	SIL 1-3 (IEC 61508:2010)
Ambient temperature	-25°C ... +70°C
ATEX/IECEX	II 2G Ex ia IIC T6 Gb II 2D Ex ia IIIC T80°C Db
EC type examination certificate	IBExU 11 ATEX 1154 IECEX IBE 13.0042
Ex zone	Zone 1, zone 21



Wave box with mechanical toggle switches Ex d**M023, M019**

Limit switch make	Bartec
Limit switch type	07-1511-1530
Function	Changer N.O./N.C.
Contacts	Silver
Voltage, current consumption	DC 24 V, 150 mA AC: 250V, 4A
SIL Level	SIL 1-3 (IEC 61508:2010)
Ambient temperature	Vestamid: -20 °C – +40 °C Aluminum: (-55 °C) -20 °C – +60 °C
ATEX/IECEX	II 2G Ex de IIC T6 Gb II 2D Ex t IIIC T80°C Db
EC type examination certificate	IBExU 12 ATEX 1022 X IECEX IBE 13.0041 X
Ex zone	Zone 1, zone 21



Planning Fundamentals of Valves and Automation

Measurement and Control

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1 System Selection Guide

This section provides tips and suggestions on how to choose just the right measurement system for your specific liquid application needs.

Step 1: Determine Application Requirements

Defining the following variables before building your system will ensure peak performance from your GF Signet sensors and instruments:

- Measurement range
- Installation requirements
- Pipe size and material
- Chemical compatibility of all wetted parts to process chemicals
- System specifications (such as temperature and pressure)
- Performance requirements of sensor
- Particle and fiber load in fluid
- Viscosity of liquids
- Hazardous location requirements

Step 2: Select Sensor Technology

Based on the application requirements determined in Step 1, choose a sensor.

Determine your signal output requirement to allow you to match just the right instrument (see Step 3). If you're not purchasing an instrument, select the sensor electronics package that best suits your needs.

Step 3: Choose Instrument

Choose an instrument. Instruments are available in ¼ DIN size and offered in panel mount configurations. Field mount versions are also offered for certain models. Instruments are available with digital, analog, or analog/digital display. Various retrofit adapters and mounting accessories are also available (see Accessories section). In cases where the sensor feeds directly to a PLC or PC system, GF offers a wide range of instruments and sensors with 4 to 20 mA outputs.

Step 4: Determine Installation Requirements

GF offers a wide selection of installation fittings for flow sensors and in-line pH/ORP electrodes. These fittings are specifically designed to ensure the proper placement of the flow sensor in the piping system to achieve optimum performance. Other pH/ORP electrodes as well as all temperature, pressure and conductivity/ resistivity electrodes use NPT or ISO standard fittings. All submersion electrodes require conduit piping and fixtures not supplied with unit.



Please contact your local GF Piping Systems sales and support office if you need assistance in choosing any one of these products.

2 Submersion Kit

Use this step-by-step ordering guide to assemble your Submersion Kit. The cost effective Submersion Kits are easily built by selecting a GF Signet instrument/junction box, pipe segments, adapter and sensor. Various pipe sizes and materials (PVC-U, PVC-C, PP and PVDF) are also available to suit your needs.

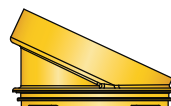
Installation Tips

Use the universal mount junction box to adapt any mounting bracket. Standpipe must be filled with water proof epoxy resin to seal against condensation build-up.

Step 1:

Choose a transmitter

3-9900-1

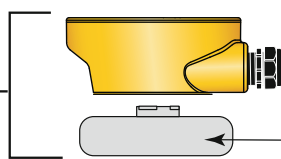


3-9900-396
Angle Adapter kit
required for
Conductivity/Resistivity

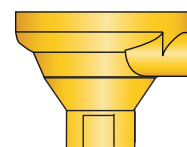
Step 2:

Choose a wiring junction box

3-8050



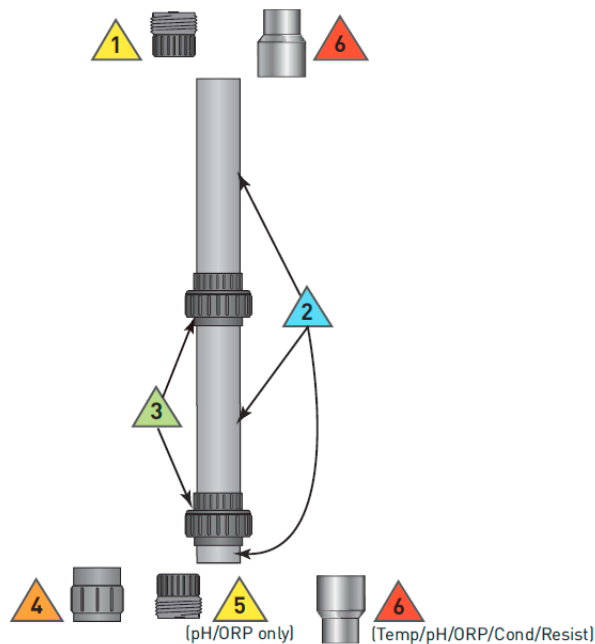
Universal Mount
Junction Box:
Customer required
to drill a 19 mm (¾ in.)
clearance hole
in the base.



3-8052

Step 3:

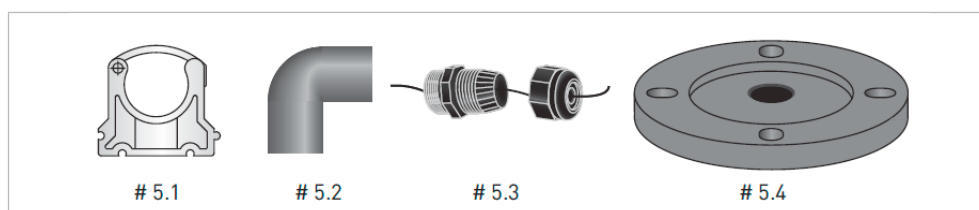
Choose the pipe material



Step 4:

Choose a sensor

Hydrostatic Pressure	Temperature	pH/ORP				Conductivity/Resistivity	
<p>3-2250-XXX</p>	<p>3-2350-X</p>	<p>3-2725-61</p>	<p>3-2766-1</p>	<p>3-2776</p>	<p>3-2751-3</p>	<p>3-2839-1V</p>	<p>3-2819-X</p>
		<p>3-2726-01</p>	<p>3-2766-2</p>	<p>3-2776-1</p>	<p>3-2751-4</p>	<p>3-2840-1V</p>	<p>3-2820-X</p>
		<p>3-2726-11</p>	<p>3-2767-1</p>	<p>3-2777</p>		<p>3-2841-1V</p>	<p>3-2821-X</p>
						<p>3-2842-1V</p>	<p>3-2822-X</p>
							<p>3-2823-X</p>

Step 5:**Optional Accessories****Step 1: Choose a transmitter**

If required

Mfr. Part No.	Code	Component	Description
3-9900-1	159 001 696	Single channel transmitter	<ul style="list-style-type: none"> • 10.8 to 35.2 VDC • 4 to 20 mA output • Open collector output • 9900 Accessories (Optional) <ul style="list-style-type: none"> • HART Module • Conductivity Module with angle adapter • 4 to 20 mA Output Module

If no transmitter required: Go to Step 2

Step 2: Choose a wiring junction box*

*Note: More than one item can be used.

Transmitter

Mfr. Part No.	Code	Component	Description
3-8050	159 000 184	The Universal Mount Kit mounts a 9900 field mount instrument onto a wall, pipe, or tank. Includes: transmitter base, universal mounting plate and bracket.	<ul style="list-style-type: none"> • Use to mount transmitter, 3-9900-1
3-8050-1	159 000 753	The Universal Mount Junction Box contains two terminal blocks that enable cable extensions for pH, ORP, flow, temperature, pressure, and conductivity sensors/electrodes. This kit mounts on a wall, pipe, or tank. Includes: top cover, transmitter base, universal mounting plate and bracket, liquid tight connector kit.	<ul style="list-style-type: none"> • Use if sensor wiring needs to be extended. Cable for sensor should never exceed 30 m (100 ft)
3-8052	159 001 188	3/4 in. Integral mount kit is designed to mount a ProcessPro field mount instrument directly on top of a conductivity/resistivity, temperature, pressure or level sensor. Includes: transmitter base, sensor adapter.	<ul style="list-style-type: none"> • Use to mount transmitter, 3-9900
3-9900.396	159 001 701	Angle Adjustment Adapter Kit	<ul style="list-style-type: none"> • Adjusts the mounting angle of the 3-9900 Transmitter and adds additional wiring clearance

pH/ORP

Mfr. Part No.	Code	Component	Description
3-8052-1	159 000 755	The universal mount junction box contains two terminal blocks that enable cable extensions for pH, ORP electronics or 2751. This kit mounts on a wall, pipe or tank.	<ul style="list-style-type: none"> Use if sensor wiring needs to be extended. Refer to manual for maximum cable lengths.
3-8050-2 (pH/ORP)	159 000 754	The pH/ORP universal mount junction box contains two terminal blocks that enable cable extension of pH or ORP sensors. It features an EasyCal board for simple, push-button pH or ORP calibration. This kit mounts on a wall, pipe, or tank. Includes: top cover, transmitter base, universal mounting plate and bracket, liquid tight connector kit.	<ul style="list-style-type: none"> Built-in EasyCal electronics Digital (S³L) signal output to remote 3-8900 Multi-Parameter Controller or 3-9900 Transmitter 4 to 20 mA signal output to PLC Used with the 3-2751-3 or 3-2751-4 submersible sensor electronics

Conductivity/Resistivity

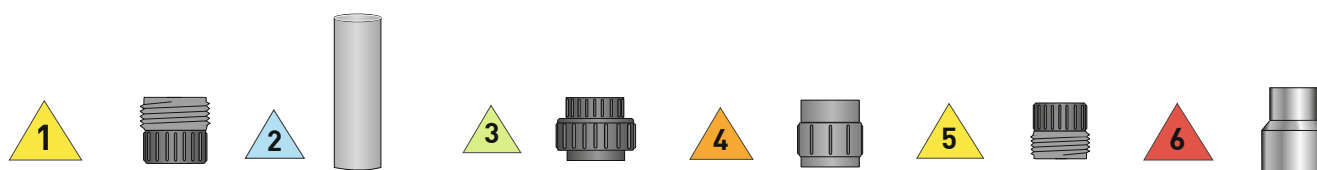
Mfr. Part No.	Code	Component	Description
3-2850-61 (Conductivity/ Resistivity)	159 001 400	Universal mount junction box with sensor electronics, (S ³ L)	<ul style="list-style-type: none"> Digital (S³L) signal output to remote 3-8900 Multi-Parameter Controller or 3-9900 Transmitter Built-in EasyCal electronics
3-2850-62 (Conductivity/ Resistivity)	159 001 401	Universal mount junction box with sensor electronics, 4 to 20 mA	<ul style="list-style-type: none"> 4 to 20 mA signal output to PLC Built-in EasyCal electronics
NONE	Go to Step 5.3 - Cable Gland + Reducer + Elbow		

Step 3: Choose the correct pipe material based on Chemical Compatibility






- Verify the length of the assembly and add a union adapter

() every 2 meters

- Recommended pipe size d25 ≤ 2m/d50 > 2m
- If union/FKM component is not suitable, contact factory









Hydrostatic Level

Pipe Material	Adapter Nipple NPT Male ¾" (+Reductions)		Pipe PN16	Union/ FKM	Reduction to d25
	Item 	 *	Item 	Item 	Item 
PVC-U					
d25/DN20	721 910 557		161 017 107	721 510 132	
d50/DN40	721 910 557 721 900 354	*	161 017 110	721 510 135	721 900 354
PVC-C					
d25/DN20	723 910 557		163 017 132	723 510 132	
d50/DN40	723 910 557 723 900 354	*	163 017 135	723 510 135	723 900 354

Pipe Material	Adapter Nipple NPT Male 3/4" (+Reductions)	Pipe PN16	Union/ FKM	Reduction to d25
PP				
d25/DN20	727 914 557	167 480 712	727 520 157	
d50/DN40	727 914 557 727 910 354 *	167 480 715	727 520 160	727 910 354
PVDF				
d25/DN20	735 914 557	175 480 204	735 528 607	
d50/DN40	735 914 557 735 908 654 *	175 480 207	735 528 610	735 908 654







* Reducer required for d50/DN40 pipes to 3/4 inch nipple

Temperature

Pipe Material	Adapter Nipple NPT Male 3/4" (+Reductions)	Pipe PN16	Union/ FKM	Adapter Nipple NPT Female 3/4" (+Reductions)
	Item   *	Item 	Item 	Item   *
PVC-U				
d25/DN20	721 910 557	161 017 107	721 510 132	721 914 207
d50/DN40	721 910 557 721 900 354 *	161 017 110	721 510 135	721 910 441 721 900 354 *
PVC-C				
d25/DN20	723 910 557	163 017 132	723 510 132	723 910 207
d50/DN40	723 910 557 723 900 354 *	163 017 135	723 510 135	723 910 441 723 900 354 *
PP				
d25/DN20	727 914 557	167 480 712	727 520 157	727 914 267
d50/DN40	727 914 557 727 910 354 *	167 480 715	727 520 160	727 910 354 *
PVDF				
d25/DN20	735 914 557	175 480 204	735 528 607	735 914 267
d50/DN40	735 914 557 735 908 654 *	175 480 207	735 528 610	735 914 267 735 908 654 *







* Reducer required for d50/DN40 pipes to 3/4 inch nipple

pH/ORP

Pipe Material	Adapter Nipple NPT Male 3/4" (+Reductions)	Pipe PN16	Union/ FKM	Adapter Nipple NPT Male 3/4" (+Reductions)
	Item   *	Item 	Item 	Item   *
PVC-U				
d25/DN20	721 910 557	161 017 107	721 510 132	721 910 557
d50/DN40	721 910 557 721 900 354 *	161 017 110	721 510 135	721 910 557 721 900 354 *
PVC-C				
d25/DN20	723 910 557	163 017 132	723 510 132	723 910 557
d50/DN40	723 910 557 723 900 354 *	163 017 135	723 510 135	723 910 557 723 900 354 *
PP				
d25/DN20	727 914 557	167 480 712	727 520 157	727 910 507
d50/DN40	727 914 557 727 910 354 *	167 480 715	727 520 160	727 910 507 737 910 354 *
PVDF				
d25/DN20	735 914 557	175 480 204	735 528 607	735 910 557
d50/DN40	735 914 557 735 908 654 *	175 480 207	735 528 610	735 910 557 735 908 654 *

* Reducer required for d50/DN40 pipes to 3/4 inch nipple

Conductivity/Resistivity

Pipe Material	Adapter Nipple NPT Male 3/4" (+Reductions)		Pipe PN16	Union/ FKM	Adapter Nipple NPT Female 3/4" (+Reductions)	
	Item 	 *	Item 	Item 	Item 	 *
PVC-U						
d25/DN20	721 910 557		161 017 107	721 510 132	721 914 207	
d50/DN40	721 910 557 721 900 354	*	161 017 110	721 510 135	721 910 441 721 900 354	*
PVC-C						
d25/DN20	723 910 557		163 017 132	723 510 132	723 910 207	
d50/DN40	723 910 557 723 900 354	*	163 017 135	723 510 135	723 910 441 723 900 354	*
PP						
d25/DN20	727 914 557		167 480 712	727 520 157	727 914 267	
d50/DN40	727 914 557 727 910 354	*	167 480 715	727 520 160	727 910 354	*
PVDF						
d25/DN20	735 914 557		175 480 204	735 528 607	735 914 267	
d50/DN40	735 914 557 735 908 654	*	175 480 207	735 528 610	735 914 267 735 908 654	*

* Reducer required for d50/DN40 pipes to 3/4 inch nipple

Step 4: Choose the correct sensor or electrode

Hydrostatic Level

Choose the correct sensor by verifying the correct chemical compatibility, temperature, fluid density and requested output sign.

Mfr. Part No.	Code	Component	Description
3-2250-11U-1	159 001 478	Hydrostatic level 0-700 mbar	Digital (S ³ L) output signal. Use with the 3-9900-1 Transmitter or 3-8900 Multi-Parameter Controller
3-2250-21U-1	159 001 482	Hydrostatic level 0-700 mbar	4 to 20 mA output (Blind)

Temperature

Choose the correct sensor by verifying the correct application temperature and requested output signal.

Mfr. Part No.	Code	Component	Description
3-2350-1	159 000 021	Temperature sensor	Digital (S ³ L) output signal. Use with the 3-9900-1 Transmitter or 3-8900 Multi-Parameter Controller
3-2350-3	159 000 920	Temperature sensor	4 to 20 mA output (Blind)

pH/ORP

Choose the correct preamplifier based on sensor selection and the use of a transmitter. Bulb type electrodes are recommended for submersible application.

Mfr. Part No.	Code	Component	Description
3-2751-3	159 001 806	Sensor Electronics for 3-8900 Multi-Parameter Controller, 3-9900 and 3-9950 Transmitter	Sensor Electronics ¾ inch ISO
3-2751-4	159 001 807	Sensor Electronics for 3-8900 Multi-Parameter Controller, 3-9900 and 3-9950 Transmitter	Sensor Electronics ¾ inch ISO

Choose the correct sensor by verifying the correct chemical compatibility, conductivity level, temperature and sensor glass (bulb or flat)

3-2724-01	159 001 546	pH Electrode, flat PT1000	Use with the 3-2751 Smart sensor electronics
3-2725-61	159 000 562	ORP electrode, flat	Use with all preamplifiers and electronics
3-2726-01	159 001 554	pH electrode, bulb, PT1000	Use with the 3-2751 Smart sensor electronics
3-2734-00	159 000 774	pH Electrode, flat, PT1000	Use with the 3-2751 Smart sensor electronics
3-2734-01	159 000 775	pH Electrode, flat, PT1000	Use with the 3-2751 Smart sensor electronics
3-2734-HF-00	159 000 776	pH Electrode, flat, HF resistant	Use with the 3-2751 Smart sensor electronics
3-2734-HF-01	159 000 777	pH Electrode, flat, HF resistant	Use with the 3-2751 Smart sensor electronics
3-2736-00	159 000 778	pH electrode, bulb, PT1000	Use with the 3-2751 Smart sensor electronics
3-2736-01	159 000 779	pH electrode, bulb, PT1000	Use with the 3-2751 Smart sensor electronics
3-2736-HF-00	159 001 780	pH electrode, bulb, HF resistant	Use with the 3-2751 Smart sensor electronics
3-2736-HF-01	159 001 781	pH electrode, bulb, HF resistant	Use with the 3-2751 Smart sensor electronics
3-2735-60	159 001 782	ORP electrode, flat, 10K	Use with all preamplifiers and electronics
3-2735-61	159 001 783	ORP electrode, flat, 10K	Use with all preamplifiers and electronics
3-2766-2	159 000 950	pH electrode, bulb, PT1000	Use with the 3-2751 Smart sensor electronics
3-2767-1	159 000 952	ORP electrode, bulb	Use with all preamplifier and electronics
3-2774-HT-C	159 001 795	pH electrode, flat, 3KΩ	Use with the 3-2751 Smart sensor electronics
3-2776-1	159 000 960	pH electrode, bulb, PT1000	Use with the 3-2751 Smart sensor electronics
3-2777	159 000 961	ORP electrode, bulb	Use with all preamplifiers and electronics

Applications requiring high temperature above 85 °C, please contact factory.

Conductivity/Resistivity

Choose the correct preamplifier based on sensor selection and the use of a transmitter.

Mfr. Part No.	Code	Component	Description
* 3-2850-61	159 001 400	Sensor Electronics	Sends a digital (S ³ L) signal to 3-9900-1 Transmitter or 3-8900 Multi-Parameter Controller
* 3-2850-62	159 001 401	Sensor Electronics	4 to 20 mA output (Blind)

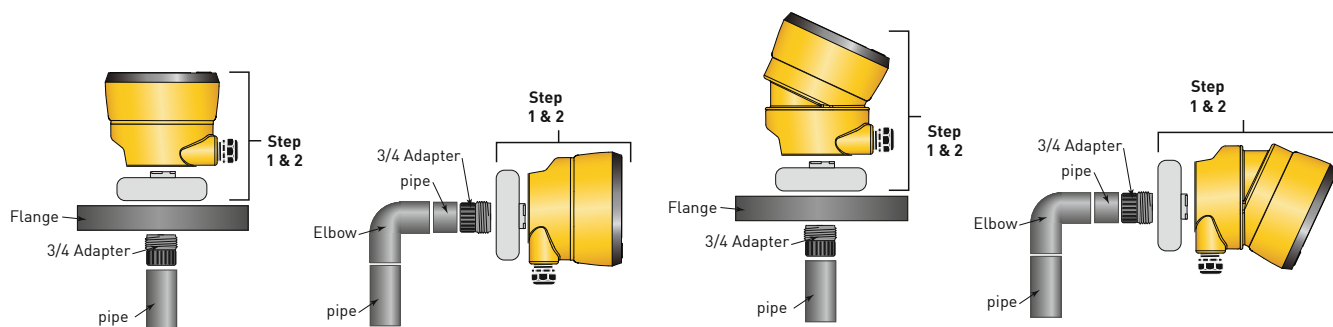
Choose the correct sensor by verifying the correct chemical compatibility (if SS is not suitable, Hastelloy-C, Titanium, Monel - Contact factory or email

GF Signet-specialproducts@georgfischer.com, conductivity level and temperature

3-2839-1V	159 001 810	Conductivity sensor, 0.01 cell	Application with conductivity levels 18.2 MΩ to 100 μS
3-2839-1VD	159 001 811	Conductivity sensor, 0.01 cell	Application with conductivity levels 18.2 MΩ to 100 μS
3-2840-1V	159 001 812	Conductivity sensor, 0.1 cell	Application with conductivity levels 1.0 μS to 1000 μS
3-2840-1VD	159 001 813	Conductivity sensor, 0.1 cell	Application with conductivity levels 1.0 μS to 1000 μS
3-2841-1V	159 001 814	Conductivity sensor, 1.0 cell	Application with conductivity levels 10 μS to 10,000 μS
3-2841-1VD	159 001 815	Conductivity sensor, 1.0 cell	Application with conductivity levels 10 μS to 10,000 μS
3-2842-1V	159 001 816	Conductivity sensor, 10 cell	Application with conductivity levels 100 μS to 200 mS
3-2842-1VD	159 001 817	Conductivity sensor, 10 cell	Application with conductivity levels 100 μS to 200 mS
3-2823-1	198 844 003	Conductivity sensor, 20 cell	Application with conductivity levels 200 μS to 400 mS

* Maximum sensor cable length 4.6 m (15 ft) when using the 3-2850-XX electronics.

Step 5: Optional accessories



Examples of mounting options. Customize to your specific needs.

Item 5.1 - Pipe Clips

Pipe Clips	Code
d25/DN20	167 061 037
d50/DN40	167 061 040

Item 5.2 - Elbow

Elbow	PVC-U	PVC-C	PP	PVDF
d25/DN20	721 100 107	723 100 107	727 100 107	735 018 107
d25/DN40	721 100 110	723 100 110	727 100 110	735 018 110

Item 5.3 - Gland + Elbow (+Reductions)

Cable Gland + Elbow + Reductions	PVC-U	PVC-C	PP	PVDF
d25/DN20	721 914 206 159 000 618 721 100 107 721 910 911	723 910 437 159 000 618 723 100 107 -	727 914 266 159 000 618 727 100 107 727 910 337	735 914 266 159 000 618 735 018 707 735 908 637
d25/DN40	721 914 206 159 000 618 721 910 915 721 900 352 721 100 110	723 910 437 159 000 618 723 900 354 723 100 110 -	727 914 266 159 000 618 727 100 110 727 910 355 727 910 906	735 914 266 159 000 618 735 908 654 735 908 637 735 018 710

Item 5.4 - Flange

Modified Flanges	PVC-U	PVC-C	PP	PVDF
d63/DN50	150 301 700	150 301 704	150 301 708	150 301 712
d65/DN75	150 301 701	150 301 705	150 301 709	150 301 713
d80/DN90	150 301 702	150 301 706	150 301 710	150 301 714
d110/DN100	150 301 703	150 301 707	150 301 711	150 301 715

Modified flanges must be ordered directly from GF-Signet-specialproducts@georgfischer.com

Planning Fundamentals of Valves and Automation

Measurement and Control - Transmitter

Content

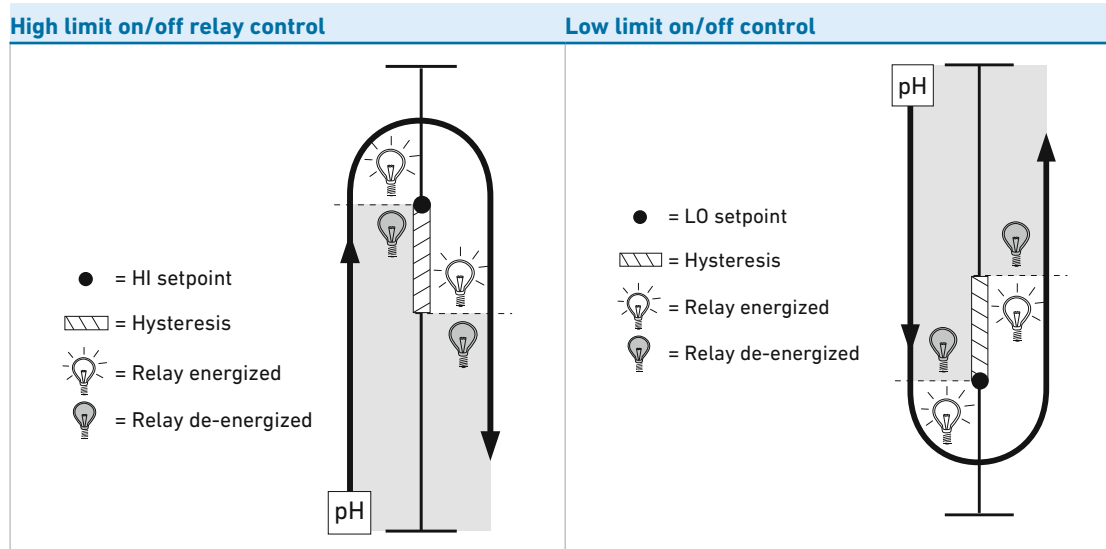
1	Technical Basics	475
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1 Technical Basics

1.1 Relay Information

The two most common methods of controlling a process are “on/off” and “proportional” control. In on/off control, relay setpoints are defined as either high or low limits on the process variable. When the measurement value reaches a limit the relay is energized, typically for the purpose of opening a valve or starting a pump to introduce a chemical reagent to the process. This should cause the measurement value to change in the direction of the setpoint as shown in these on/off control diagrams:



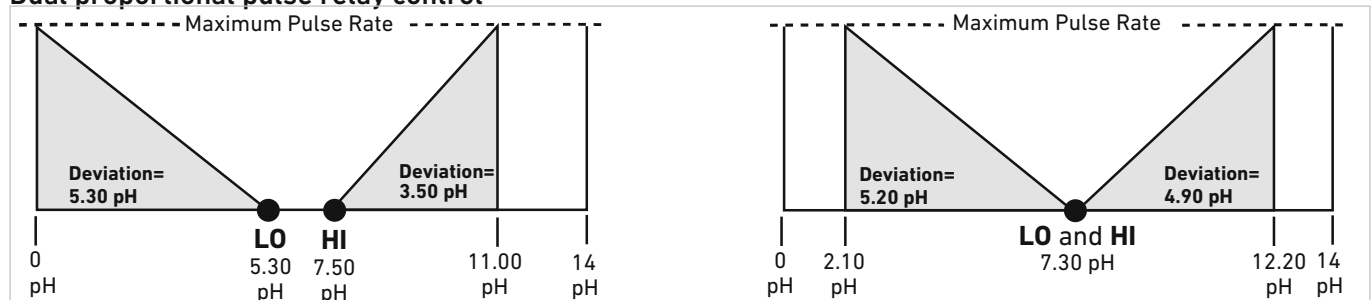
Notice the relay will not de-energize until the setpoint is exceeded by the hysteresis value. This is a programmable value and is primarily used to prevent “relay chatter”, which occurs if a relay is set to energize and de-energize at the same value. Because of hysteresis, and because reagent delivery is fairly constant while the relay is energized, a condition known as “overshoot” is inherent to the on/off control method. Overshoot refers to the introduction of more chemical reagent than is absolutely necessary for achieving a desired adjustment to the process value, and can be expensive over time.

Proportional control is a popular alternative to the on/ off control method. This method typically makes use of variable-rate metering pumps to reduce overshoot and improve precision. Establishing a proportional control scenario requires the selection of setpoint(s), deviation range(s) and maximum pulse rates.

The example shown here illustrates how two relays in “pulse mode” can be used to proportionally control pH within a desired range, or to a single setpoint. This is called “Dual Proportional Control”. Of course, a single relay in proportional pulse mode can be used to establish a high or low limit and will also reduce overshoot.

Metering pumps are idle at and between setpoints. When a setpoint is exceeded, the pump begins delivering reagent at a rate proportional to the difference between the measurement value and the setpoint. The larger the difference, the faster the delivery. The programmed deviation value defines how quickly the maximum pulse rate is reached. Depending on the input requirements of the metering pump, proportional control can also be accomplished with scaleable 4 to 20 mA outputs instead of pulsing relays or open collectors.

Dual proportional pulse relay control



1.2 Open Collector Output

Many GF Signet instruments and sensors feature “Open Collector Outputs” for purposes of signal transmission, alarming, control signal output, etc. Although such outputs allow for a lot of wiring flexibility, care must be taken not to destroy the circuits via incorrect polarity, over-voltage, transients or current overload.

Below is an explanation of proper wiring and dimensioning of related circuit components. Please note that the following recommendations may or may not apply to other manufacturer’s equipment.

Function

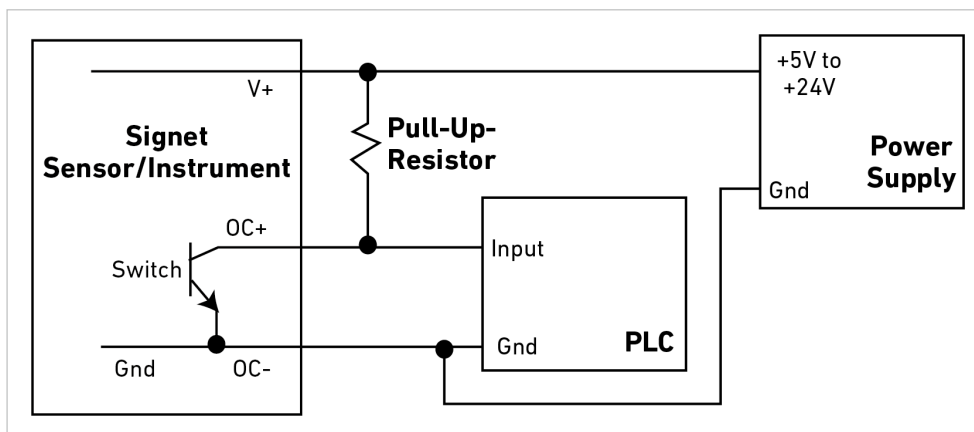
Open Collector (“OC”) outputs are low powered, solid state switches. Although the term “Open Collector” stipulates the use of bipolar transistors (NPN-type or PNP-type) as a switch, nowadays Field Effect Transistors (FET or MOSFET) are used. Unlike electromechanical switches (e.g. push buttons or dry contact relays) these OC switches are very fast, use little power, are inexpensive, do not bounce and do not wear.

However, OCs are also more limited in terms of voltage and current rating as well as being polarized (i.e. they have a “plus” and “minus” terminal and thus DC only switching capability). They are less tolerant to overload abuse than electromechanical devices. Usually these switches have higher resistance and voltage drop.

Sensor Wiring

A typical example of the need for high speed switching capability is the OC frequency output of GF Signet flow sensors like types 2536 or 3-2540. Signal frequencies can reach several hundred pulses per second while voltage and current requirements are small enough, allowing the use of a transistor switch. For each output pulse this switch connects the signal output to the negative supply or ground terminal of the sensor and is therefore an “NPN” style output. GF Signet does not produce sensors with PNP style outputs (which connect the signal output internally to the positive supply terminal).

Most indicating instruments or control system inputs require a signal voltage of 0 to 5 V (TTL or CMOS logic levels) or 0 to 24 V. Therefore, Open Collector output circuits must be complemented with a “Pull-Up-Resistor” to function properly. Please see the following example diagram for wiring with a PLC input:



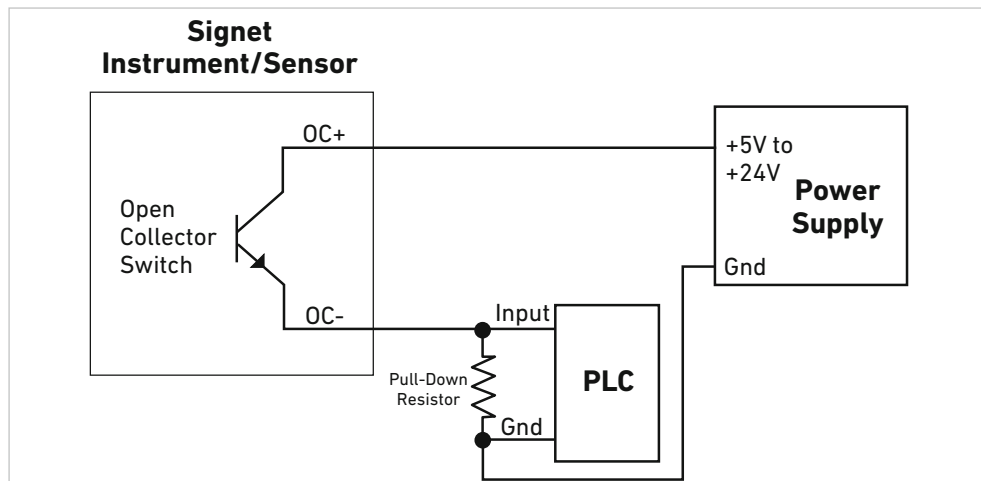
Do not exceed the absolute maximum voltage rating of the OC output as listed in the sensor specifications, normally 27 or 30 Volt, DC only. This includes changes to power line fluctuations, transients or power supply instability, otherwise damage to the OC will occur.

Please note that the voltage connected to the positive sensor supply (V+) must correspond to the required high-level PLC input voltage (i.e. if the high-input voltage of the PLC is 24 V, then the pull-up must be supplied with 24 V). If the input is “TTL-Level” or “CMOS-Level”, that means 5 V for high level, then the pull-up should not be connected with a supply higher than 5 V.

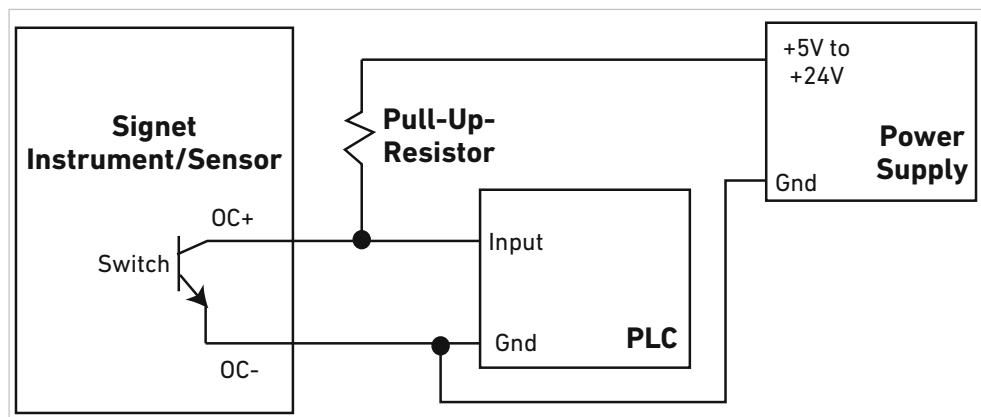
Instrument Output Wiring

Open collector control and alarm outputs on GF Signet instruments (i.e. ProcessPro® or ProPoint® series) are electrically isolated from the instrument's powersupply. That means these can be used in the above mentioned NPN configuration as well as in PNP configuration, if required. Below are a few sample circuits:

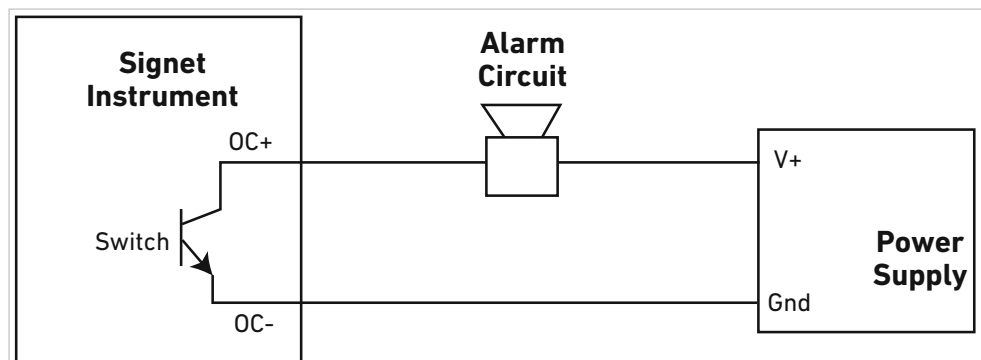
PLC Wiring "PNP" style



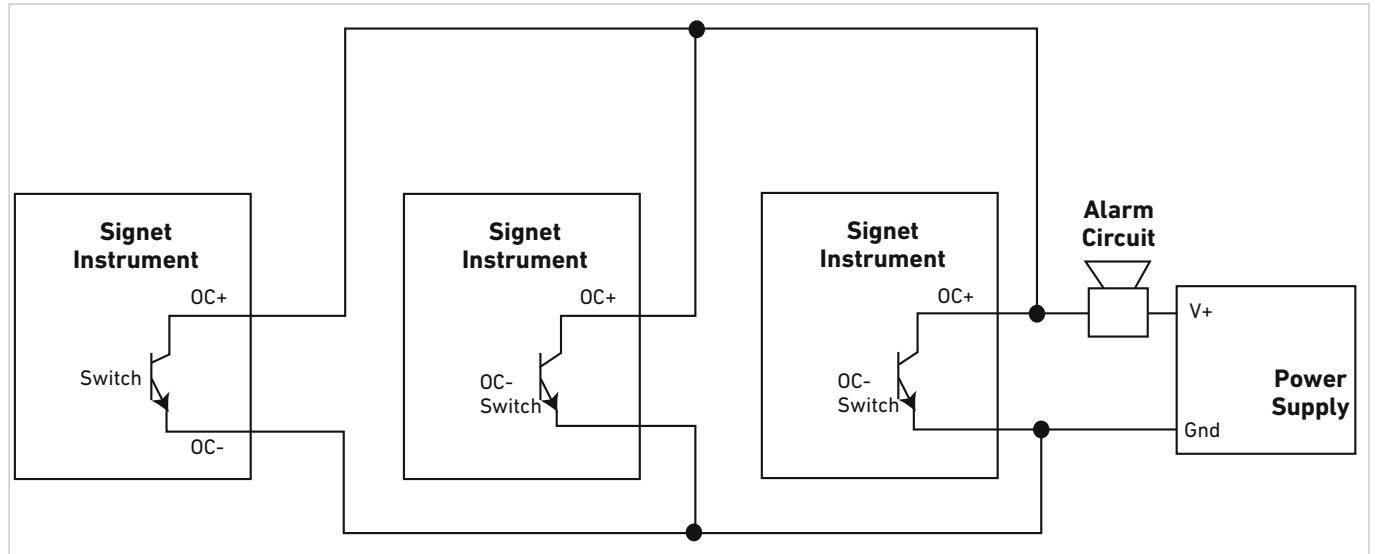
PLC Wiring "NPN" style



Alarm circuit or alarm lamp wiring to a single GF Signet instrument



Alarm circuit or alarm lamp wiring to serve multiple GF Signet instruments - Triggers the alarm if any one of the instruments open collector outputs are on.



Voltage and Current Limitation

As mentioned before, the supply voltage in the OC output circuit MUST be limited to the specified maximum OC voltage (see operating manual for specific instrument). The use of a quality regulated 5 V, 12 V or 24 V (depending on the application) power supply is recommended. The current through the Open Collector switch must be limited. Typical OC outputs allow only for 10 to 50 mA switch current (please consult manual). Exceeding this current limit can burn out the OC output components immediately. Please see the following section on how to dimension the loads.

Load and Pull-Up/Down Resistor Considerations

By utilizing basic arithmetic and Ohm's law, one can determine the safe limits of load resistance. When the OC switch is closed, almost the entire supply voltage is applied to the load, (i.e. the pull-up or pull-down resistor, the alarm horn input, a potential power relay coil or annunciator lamp). The resulting current through the load and through the OC switch, as well, can be calculated as:

$$\text{Current} = \frac{\text{Supply Voltage}}{\text{Load Resistance}}$$



Example 1

The supply voltage is 24 V and a pull-up-resistor of 10 k is used.

Current is $24 \text{ V} / 10,000 \Omega = 2.4 \text{ mA}$

(If the OC current rating is 10 mA, then in this example, it would be considered safe.)

Example 2

The supply voltage is 12 V and a horn with a resistance of 100 is used.

Current is $12 / 100 = 120 \text{ mA}$

(Even if the OC current rating is 50 mA, this load will damage the instrument)

Transient Protection

There are several “difficult” load cases that must be considered:

- **Inductive loads:**

These can be power relay or other solenoids, motors, alarm horn coils, etc. Such loads generate very high voltage spikes every time the load switches. If such a load is unavoidable, the use of transient suppression components, or GF Signet RCfilters (3-8050.396), or snubbers, wired parallel to the load is required. This is critical, as a single transient pulse may destroy the output.

- **Capacitive loads:**

This type of load should be rare but can occur if the load contains an internal power supply/ regulator that is fed from the output circuit. In such a case, it must be assured that the in-rush current does not exceed the OC current rating.

Incandescent lamps:

Such lamps have a very high start-up current until the filament glows and the current settles to the specified value. The use of incandescent lamps on an OC output is not recommended.

An LED type annunciator should be used instead.

“Active High” and “Active Low” Setting

Depending on the desired function of the circuit attached to the OC output, it may be necessary to have the OC output switch turned “on” or “off” when the criteria for the activation of this output are met.

By default, GF Signet instruments are set to operate in “active low” mode. This means when the user-defined condition for the activation is met (e.g. exceeding of an alarm limit) the OC switch is turned “on”.

If wired as standard “NPN-style” output (see previous page) the logic level of the attached control system or PLC input consequently becomes “low” logic level.

If a high input logic level is required for activation, it can be accomplished by changing the OC output function to “active high” in the menu system of the instrument. Most GF Signet instruments allow for this option.

Fail-Safe Behavior

No matter what the setting, most OC outputs of GF Signet instruments turn off when the instrument loses power. This must be taken into account when evaluating system failure consequences. If the system layout requires a “closed” or “on” condition for the output in case of power loss, a mechanical dry contact relay (NC contacts) must be used instead of the OC output.

Control Outputs

Many GF Signet products offer control outputs that can be categorized into three categories: Mechanical Relay, Solid-State Relay and Open Collector. Each control output offers benefits and limitations based on the application requirements. See below for comparisons.

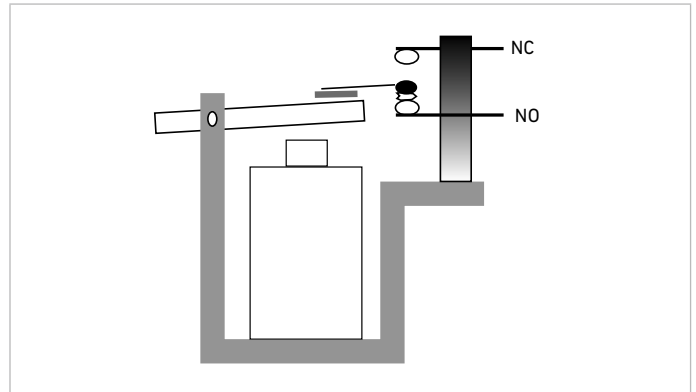
Control Output	Benefits	Considerations
Open collector	<ul style="list-style-type: none"> • Longer life than a Mechanical Relay • No moving parts • Can switch DC voltage only (typically < 30 VDC) • Faster ON/OFF switching capabilities than Mechanical Relays 	<ul style="list-style-type: none"> • Can only be used with DC voltage • Polarity very important when wiring • Not recommended for use with inductive loads • Lower voltage and current ratings than Mechanical Relays • Typically should not apply current > 25 mA
Solid-State Relays	<ul style="list-style-type: none"> • Has isolated outputs (optically) • Can switch DC voltage (typically > 30 VDC) • Can switch AC voltage (typically > 42 VAC) 50 mA DC / 50 mA AC • Longer life than a Mechanical Relay • No moving parts • Faster ON/OFF switching capabilities (Equal rise/fall times) 	<ul style="list-style-type: none"> • Not recommended for use with: inductive loads (ex. Solenoid, Pumps) • If using inductive loads, snubbers(RC Filter) can prevent relay damage • Lower voltage and current ratings than Mechanical Relays
Mechanical Relays	<ul style="list-style-type: none"> • Can switch line voltage (typically > 120 to 240 VAC) • Can switch DC voltage (typically < 30 VDC @ 5A) • Has a large current rating (typically 5 A) • Larger voltage and current ratings than Solid-State Relay and Open Collector Outputs 	<ul style="list-style-type: none"> • Slower ON/OFF switching capabilities than Solid-State Relay and Open Collector Outputs • Mechanical contacts can burn/ wear over time • Snubbers (RC Filter), GF Signet RC Filter Kit 3-8050.396, can prolong contact life

1.3 RC Filter

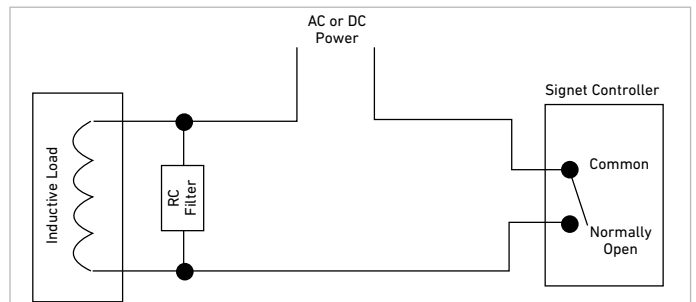
RC Filter kits are recommended when using a GF Signet transmitter or controller with mechanical relays, and/or the external relay module 8059 to switch on and off inductive loads. GF Signet RC filter kits provide protection and extend the life of the relay by preventing premature wearing of the relay contacts, usually caused by voltage/current arcing and line noises generated by the activation and deactivation of mechanical relays.

RC filter kit (3-8050.396) comes with two RC filter assemblies.

During the activation and deactivation of a relay, a spark can be generated on the surface of the relay contacts. This spark, over a period of time, melts the surface of the contacts which will prevent the contacts from making a physical connection.

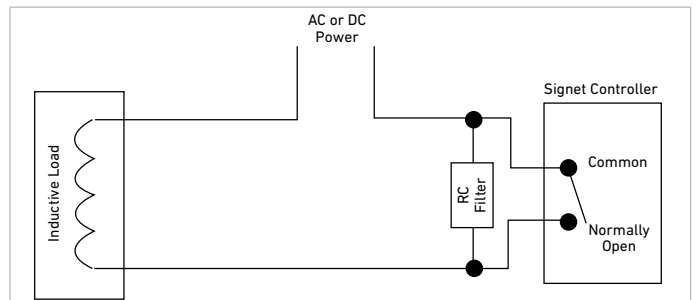


Suitable for AC and DC applications.



Suitable for AC and DC applications. However, if this configuration is used with an AC power source, verify that the impedance of the load is less than the impedance of the RC filter; current leak through the filter may occur and cause the device to be constantly on.

- $R = 47 \, \Omega$
- $C = 0.01 \, \mu F$



2 9950 Dual Channel Transmitter

Member of the SmartPro® Family of Instruments



2.1 Product description

The 9950 Transmitter is a two channel controller that supports two sensors of same or different types in one instrument. The sensor types supported by the 9950 are GF Signet Flow, pH/ORP, Conductivity/Resistivity, Salinity, Temperature, Pressure, Level, Dissolved Oxygen, and devices that transmit a 4 to 20 mA signal with the use of the 8058 iGo® Signal Converter.

The 9950 includes advanced features such as derived functions, advanced multiple relay modes, and timer based relay functions. Derived functions allows for the control of a relay or current loop with the sum, delta (difference), or ratio of two measurements, for example delta pressure and delta temperature. Multiple relay modes allow up to three signals to be used for the control of a single relay. This can be any combination of analog and binary inputs. The timer relay modes allow a relay to be activated on a repeating basis from every minute to once every 30 days. Weekday timer mode allows a relay to be energized on a specific day or days of the week at a specific time.

The 3-9950.393-3 Relay Module includes the ability to interface up to four binary inputs. The binary inputs are compatible with either open collector or mechanical contacts. The binary inputs can supply power to the four inputs or accepts powered outputs from external devices. These inputs can be used with level switches, flow switches, pressure switches or other devices. The inputs can be used to directly control the relays of the 9950 or can be used in combination with the measurement readings for advanced control of your process.

The 9950 supports the following relay modules:

- Four Channel Mechanical Relay Module
- Two Mechanical and Two Solid State Relay Module
- Two Mechanical Relays and Four Binary Inputs Module

The 9950 supports one or two direct conductivity modules for conductivity, resistivity or salinity measurements. A dual channel 4 to 20 mA passive output module is available. This will allow expansion from a base of 2 current loop outputs to a maximum of 6 current loop outputs in a single transmitter.

The 9950 Modbus Module allows for remote access to measurements derived functions, state of current loop outputs and relays over a serial RS485 Modbus automation network.

Features

- One instrument for multiple sensor types
- Multiple language support for Simplified Chinese, English, French, German and Spanish
- Two different sensor types can be combined in one instrument
- Configurable display
- Derived measurements
- Advanced boolean logic
- Single and Dual Channel Direct Conductivity/Resistivity Modules
- Two passive, 4 to 20 mA current loop outputs in base unit, four additional current loops via optional modules
- Optional Dual Channel, passive 4 to 20 mA, Current Loop Module for 2 or 4 additional loop outputs
- USB Port for Field Upgrades using standard USB Flash Drive
- Modbus Module for connections to Serial RS485 automation networks



Applications

- Wastewater Treatment
- Reverse Osmosis
- Deionization
- Chemical Manufacturing / Addition
- Metal and Plastic Finishing
- Fume Scrubber
- Cooling Tower
- Media Filtration
- Chemical Dosing/ Injection
- Aquatic Life Support
- Pools & Fountains
- Rinse Tanks
- Chemical Neutralization

2.2 Specifications

General

Input Channels	Two frequency or S ³ L inputs, or optional direct conductivity modules, maximum of 2 channels
----------------	--

Enclosure and Display

Case Material	PBT
Window	Shatter-resistant glass
Keypad	4 buttons, injection-molded silicone rubber seal
Display	Dot matrix, LCD
Indicators	Two horizontal digital bar graphs, four LED relay status indicators
Update Rate	1 s
LCD Contrast	5 settings
Size	¼ DIN

Mounting

Panel	¼ DIN, ribbed on four sides for panel mounting clip inside panel, silicon gasket included
Wall	Wall Mount enclosure (sold as an accessory)

Terminal Blocks

Pluggable Screw Type	Use minimum 105 °C rated wire
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Torque Ratings

Power/Loop	0.49 Nm (4.4 lb-in.)
Freq/S ³ L	0.49 Nm (4.4 lb-in.)
Relay Module	0.49 Nm (4.4 lb-in.)

Terminal Blocks

Connector Wire Gauge

Power, Loop	12 to 28 AWG; 0.08 mm ² bis 4.0 mm ²
Freq/S ³ L	16 to 28 AWG; 0.08 mm ² bis 1.5 mm ²

Relay Module Connector Wire Gauge

Relay	12 to 28 AWG; 0.08 mm ² bis 4.0 mm ²
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Environmental

Ambient Operating Temperature

DC Power	-10 °C to 70 °C	14 °F to 158 °F
AC Power	-10 °C to 60 °C	14 °F to 140 °F
Storage Temp	-15 °C to 70 °C	5 °F to 158 °F
Relative Humidity	0 to 100% condensing for (front only); 0 to 95% non-condensing (rear panel)	
Maximum Altitude	4,000 m (13,123 ft)	
Enclosure Rating	NEMA 4X/IP65 (front face only)	

Performance Specifications

System Accuracy	Primarily dependent upon the sensor
System Response	Primarily dependent upon the sensor. Controller adds a maximum of 150 ms processing delay to the sensor electronics. Minimum update period is 100 ms System response is tempered by the display rate, output averaging and sensitivity feature
Raw Conductivity/Resistivity input directly from GF Signet Conductivity/Resistivity electrodes via Direct Conductivity/Resistivity Module or via the additionally available sensor electronics type 2850.	

Electrical Requirements

Power to Sensors

Voltage	+4.9 to 5.5 VDC @ 25 °C, regulated
Current	30 mA Maximum
Short Circuit	Protected
Isolation	Low voltage (< 48 V AC/DC)

Power Requirements

DC (9950-1, 9950-2)	24 VDC nominal (12 to 32 VDC, ±10% regulated), UL 60950-1 or UL 61010-1 Power Supply rated for operation at 4000 m altitude
AC (9950-2)	100 to 240 VAC, 50 to 60 Hz, 24 VA
Maximum current	200 mA (without optional relay module)* 500 mA (with optional relay module)*
*The current draw of the other modules and the sensors are minimal	
Current Loop	12 to 32 VDC, ±10% regulated, 4 to 20 mA (30 mA max.)
Overvoltage protection	48 Volt Transient Protection Device (for DC ONLY)
Current limiting for circuit protection	
Reverse-Voltage protection	

Input Types

Digital (S ³ L) or AC frequency	
4 to 20 mA input via the 8058 iGo Signal Converter	
Open collector	
pH/ORP input via the Digital (S ³ L) output from the 2750 pH/ORP Sensor Electronics or 2751 Smart pH/ORP Sensor Electronics	
Conductivity/Resistivity via the Digital (S ³ L) output from the 2850 Conductivity/Resistivity Sensor Electronics	
Sensor Types	Flow, pH/ORP, Conductivity/Resistivity, Pressure, Temperature, Level/Volume, Salinity, Dissolved Oxygen, Other (4 to 20 mA)

Sensor Input Specifications

Digital (S ³ L)	Serial ASCII, TTL level, 9600 bps
Frequency Flow Sensors	0.5 to 1500 Hz

Sensor Input Specifications

Sensitivity (for coil type sensors)	80 mV @ 5 Hz, gradually increasing with frequency to 2.5 V
Freq. Range (for square wave type sensors)	0.5 Hz to 1500 Hz @ TTL level input or open collector
K-Factor Range	0.0001 to 9999999
Accuracy	± 0.5% of reading max error @ 25 °C
Resolution	1 µs
Repeatability	± 0.2% of reading

Power Supply

Rejection	No Effect ± 1 µA per volt
Short Circuit	Protected
Reverse Polarity	Protected
Update Rate	(1/frequency) + 100 ms

Direct Conductivity Module - 3-9950.394-1 and 3-9950.394-2

Accuracy	Conductivity ± 2% of reading Temperature 0.5 °C
Resolution	Conductivity 0.1% of reading Temperature >0.2 °C
Update Rate	2.5 seconds Single Channel, 5 seconds Single Dual Channel
Compatible Electrodes	All GF Signet Sensors

Binary Input (3-9950.393-3)

Input Voltage Range (without damage)	-5 VDC to 30 VDC (No operation below 0 VDC)
Max. Current Rating	6.0 mA
Max. Voltage Rating	30 VDC
Maximum Input Voltage for signal "Off" (low or "0")	1.5 VDC
Minimum Input Voltage for signal "On" (high or "1")	3.0 VDC
Maximum Current Draw for Signal "0" (low)	≤ 500 µA DC
Minimum Current Draw for Signal "1" (high)	500 µA
Typical Current Draw for Signal "1" (high)	6.0 mA at 30 VDC, 4.8 mA at 24 VDC, 2.4 mA at 12 VDC, 1.0 mA at 5 VDC

Current Loop Specifications

Current Loop Out	ANSI-ISA 50.00.01 Class H (Passive, external voltage required)		
Voltage	12 to 32 VDC, ±10% regulated, UL 60950-1 or UL 61010-1 Power Supply rated for operation at 4000 m altitude		
Max. Impedance	250 Ω @ 12 VDC	500 Ω @ 18 VDC	750 Ω @ 24 VDC
Span	3.8 to 21 mA		
Accuracy	± 32 µA max. error @ 25 °C @ 24 VDC		
Resolution	6 µA or better		
Temp. Drift	± 1 µA per °C		
Isolation	Low voltage (< 48 VAC/DC)		
Update Rate	100 mS nominal		
Zero	4.0 mA factory set; user programmable from 3.8 to 5.0 mA		
Full Scale	20.0 mA factory set; user programmable from 19.0 to 21.0 mA		
Power Supply Rejection	± 1 µA per V		
Actual Update Rate Determined by Sensor Type			
Short Circuit and Reverse Polarity Protected			
Adjustable Span, Reversible			
Error Condition	Selectable error condition 3.6 or 22 mA or None		
Test Mode	Increment to desired current (range 3.8 to 21.00 mA)		
Analog Outputs	2 Passive 4 to 20 mA Outputs in Base Unit		

Relay Specifications**Dry-Contact Relays (3-9950.393-1, 3-9950.393-2, and 3-9950.393-3)**

Type	SPDT
Form	C
Max. Voltage Rating	30 VDC or 250 VAC
Max. Current Rating	5 A resistive

Solid-State Relays (3-9950.393-2)

Type	SPDT
Form	C
Max. Voltage Rating	30 VDC or 30 VAC
Max. Current Rating	0.050 A resistive
Hysteresis	Adjustable (absolute in Engineering Units)
On Delay	9999.9 seconds (max)
Cycle Delay	99999 seconds (max)
Test Mode	Set On or Off
Maximum Pulse Rate	0 to 300 pulses/minute
Proportional Pulse	0 to 300 pulses/minute
Volumetric Pulse Width	0.1 to 3200 s
PWM Period	0.1 to 320 s

Display Ranges

pH	-1.00 to 15.00 pH
pH Temp.	-99 °C to 350 °C -146 °F to 662 °F
ORP	-1999 to +1999.9 mV
Flow Rate	-9999 to 99999 units per second, minute, hour or day
Totalizer	0.00 to 99999999 units
Conductivity	0.0000 to 99999 µS, mS, PPM and PPB (TDS), kΩ, MΩ
Cond. Temp.	-99 °C to +350 °C -146 °F to 662 °F
Temperature	-99 °C to +350 °C -146 °F to 662 °F
Pressure	-40 to 1000 psi
Level	-9999 to +99999 m, cm, ft, in, %
Volume	0 to 99999 cm³, m³, in³, ft³, gal, L, lb, kg, %
Salinity	0 to 100 PPT
Dissolved Oxygen	0 to 50 mg/L, 0 to 200%

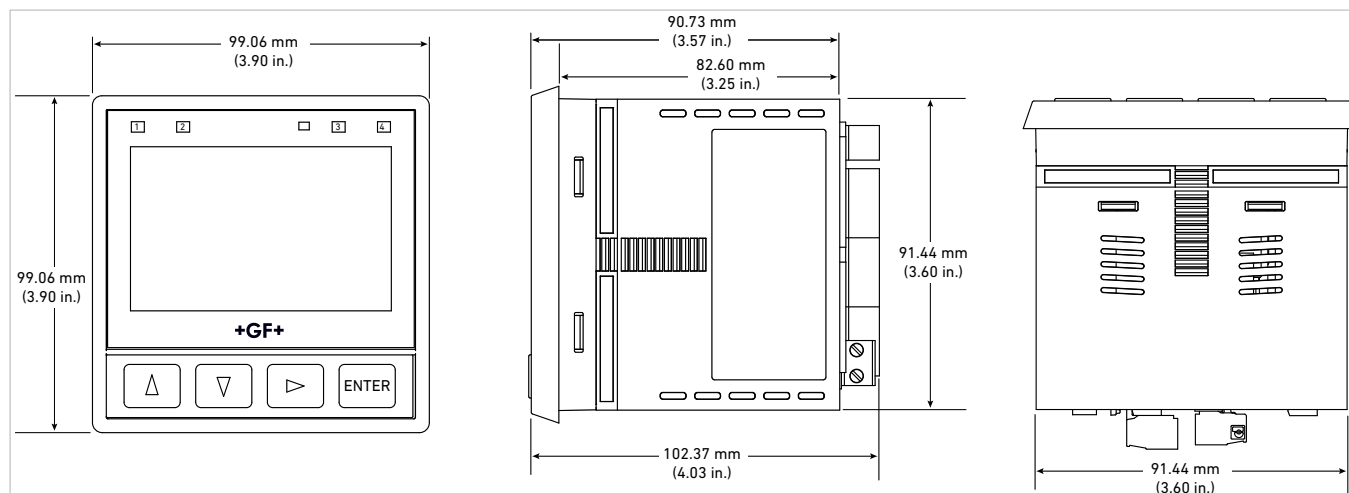
Shipping Weights

Base Unit	0.63 kg	1.38 lb
Relay Module	0.19 kg	0.41 lb
Single Module	0.075 kg	0.16 lb
Dual Channel Module	0.075 kg	0.16 lb
Modbus Module	0.075 kg	0.16 lb

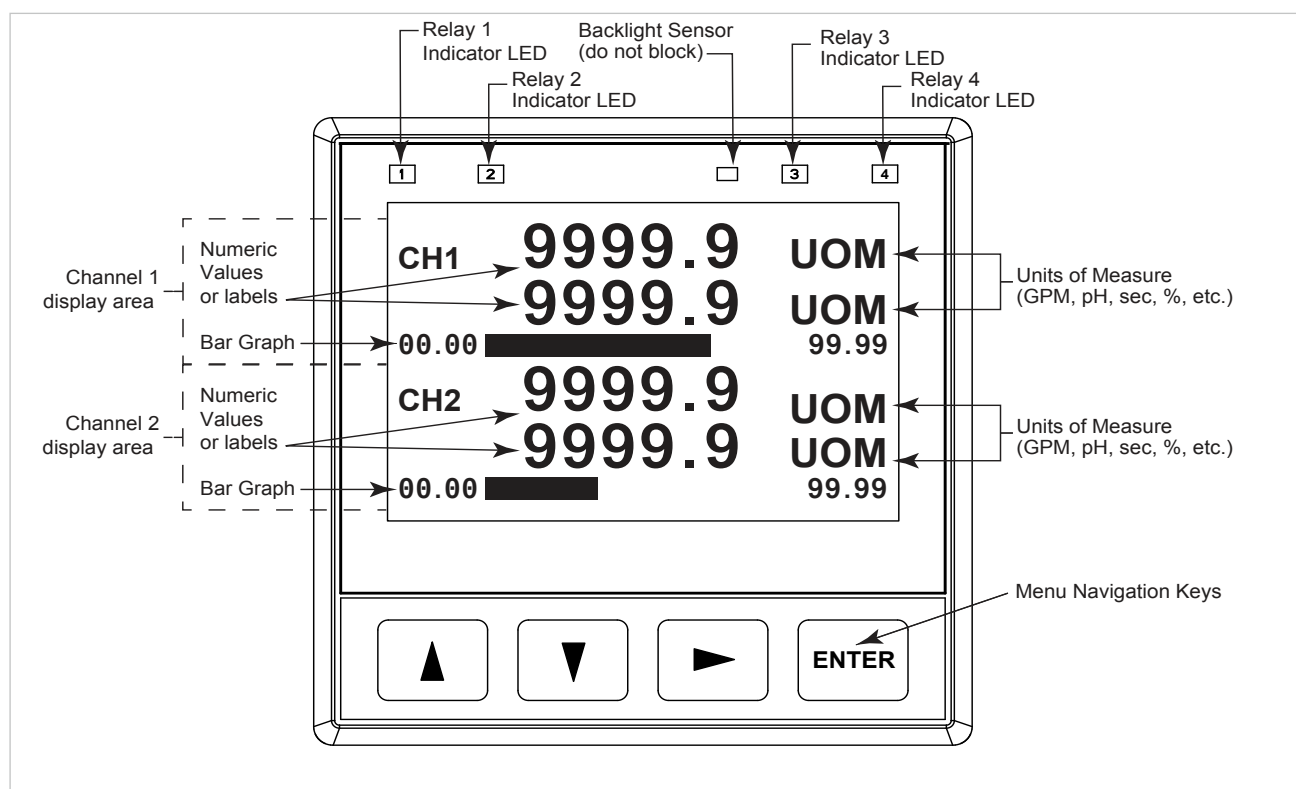
Standards and Approvals

CE, UL, CUL, FCC
RoHS Compliant, China RoHS
Manufactured under ISO 9001 and ISO 14001 for Environmental Management and OHSAS 18001 for Occupational Health and Safety

Dimensions



Graphical User Interface created with emWin licensed by SEGGER



Sensor Model	Freq Output	Digital (S ³ L) Output	Requires 8058
515/8510	X		
525	X		
2000	X		
2100	X		
2250		X	
2350		X	
2450		X	
2507	X		
2536/8512	X		
2537-5		X	
2540	X		
2551	X	X	

The 9950 is compatible with all GF Signet products listed in the column to the right.


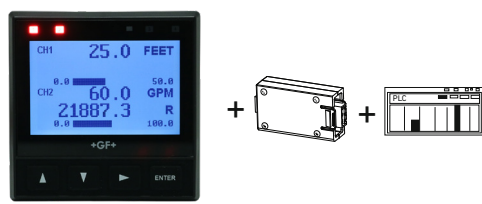
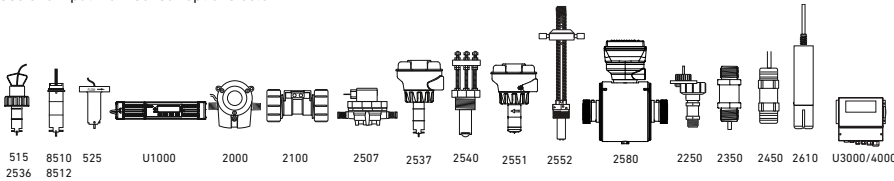
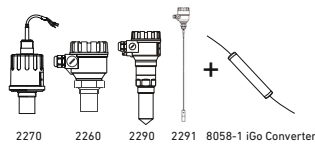
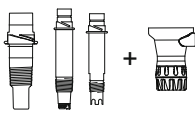
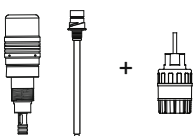

- pH and ORP electrodes require the GF Signet 2750 or 2751 DryLoc® Sensor Electronics (sold separately).
- Conductivity/Resistivity or measurement requires the GF Signet 2850 Conductivity/Resistivity sensor electronics (sold separately).

Sensor Model	Freq Output	Digital (S ³ L) Output	Requires 8058
2580	X	X	
U1000 V2	X		X
U3000	X		X
U4000	X		X
2260			X
2270			X
2290			X
2291			X
2610-51		X	
2724-2726		X	
2734-2736		X	
2750, 2751		X	
2756-2757		X	
2764-2767		X	
2774-2777		X	
2819-2823		X	
2839-2842		X	
2850		X	

Sensor Model	Binary Input
2280	X
2281	X
2282	X
2284	X
2285	X

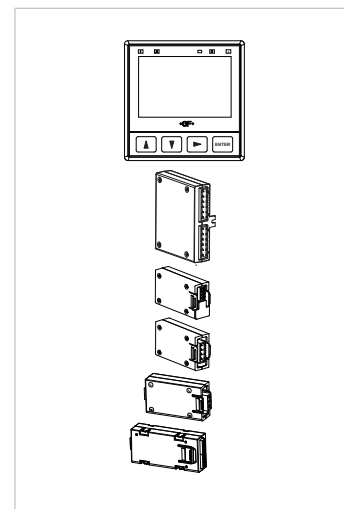
Binary Input compatible sensors. For use with 3-9950.393-3 Relay Module

2.3 System Overview

Panel or Wall Mount	Automation System
<p>GF Signet Model 9950 Transmitter (Includes mounting bracket and panel gasket)</p> 	<p>GF Signet Model 9950 Transmitter with Modbus Module and - PLC (Customer supplied)</p> 
<p>GF Signet Sensors - Flow, Level, Temperature, Pressure, DO Use one input from sensor options below</p> 	<p>Other Level with 8058 iGo Converter plus other 4 to 20 mA</p> 
<p>GF Signet Sensors - pH/ORP Use one input from sensor options below with 2750 or 2751 pH/ORP Smart Sensor Electronics</p> 	<p>GF Signet Wet-Tap Electrode Model 2756, 2757 and 3719 Wet-Tap with 2750 or 2751 pH/ORP Smart Sensor Electronics</p> 
<p>GF Signet Sensors - Conductivity/Resistivity and Salinity Electrodes Use one input from electrode options belowwith Conductivity Module or 2850 Sensor Electronics</p> 	
GF Signet Fittings - See individual sensor data sheets	All Sold Separately

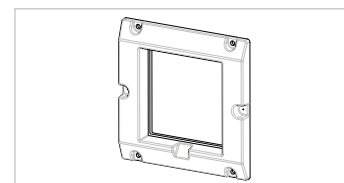
2.4 Ordering Information

Mfr. Part No	Code	Description
9950 Base Unit - Dual Channel, Multi-Parameter, AC Power and DC Power		
3-9950-1	159 001 841	9950 Base Unit – Two Channel Multi-Parameter Inputs, Two 4 to 20 mA Outputs, Panel Mount, DC Power
3-9950-2	159 001 842	9950 Base Unit – Two Channel Multi-Parameter Inputs, Two 4 to 20 mA Outputs, Panel Mount, AC or DC Power
Optional Accessory Modules		
3-9950.393-1	159 310 268	Relay Module with 4 Mechanical Relays
3-9950.393-2	159 310 269	Relay Module with 2 Mechanical and 2 Solid State Relays
3-9950.393-3	159 310 270	Relay Module with 2 Mechanical Relays and 4 Binary Inputs
3-9950.394-1	159 001 846	Single Channel Direct Conductivity/Resistivity Module
3-9950.394-2	159 001 847	Dual Channel Direct Conductivity/Resistivity Module
3-9950.395-M	159 001 905	Modbus Module
3-9950.398-2	159 001 848	Dual Channel 4 to 20 mA Current Loop Output Module

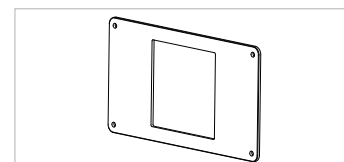


2.5 Accessories and Replacement Parts

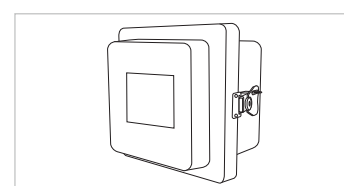
Mfr. Part No	Code	Description
3-5000.399	198 840 224	5 x 5 inch Retrofit Adapter
3-8050.392	159 000 640	CR200 ¼ DIN Retrofit Adapter
3-8050.396	159 000 617	RC Filter Kit (for relay use), 2 per kit
3-8058-1	159 000 966	i-Go® Signal Converter, wire-mount
3-9950.391	159 310 278	Connector Kit, In-Line, 9950 Transmitter
3-9950.392	159 310 279	Relay Module Connector Kit, 9950 Transmitter
3-9900.392	159 001 700	Wall Mount Enclosure Kit
3-9000.392-1	159 000 839	Liquid Tight Connector Kit, NPT (1 pc.)



3-5000.399



3-8050.392



3-9900.392

3 9900 Transmitter

Member of the SmartPro® Family of Instruments



Panel Mount

Field Mount

3.1 Product description

The GF Signet 9900 Transmitter provides a single channel interface for many different parameters including Flow, pH/ORP, Conductivity/Resistivity, Salinity, Pressure, Temperature, Level, Dissolved Oxygen, and other sensors that output a 4 to 20 mA signal. The 9900-1P Transmitter can also be used as a Batch Controller when a Batch Module and Relay Module are installed.

The 9900 is offered in both panel or field mount versions. Both configurations offer an extra large (3.90" x 3.90") auto-sensing backlit display features "at-a-glance" visibility that can be viewed at 4-5 times the distance over traditional transmitters. The highly illuminated display and large characters reduce the risk of misreading or misinterpreting the displayed values. The display shows separate lines for units, main and secondary measurements as well as a "dial-type" digital bar graph.

The 9900 can run on 12 to 32 VDC power (24 VDC nominal), and can also be loop powered with compatible sensors.

Rear Enclosure kits are available for the 9900-1P Panel Mount. Kit options include either a Hinged Cover (3-9900.399-1) for wall or pipe mount installations, or a Flat Cover (3-9900.399-2) designed to fit inside a panel for waterproof protection.

The 9900 offers complete flexibility, plug-in modules allow the unit to easily adapt to meet changing customer needs. Optional modules include the new Modbus as well as the Relay, Direct Conductivity/Resistivity, H COMM, Batch, 4 to 20 mA Output, and a PC COMM Configuration Tool. The unit can be used with default values for quick and easy programming or can be customized with labeling, adjustable minimum and maximum dial settings, and unit of measure and decimal location choices.

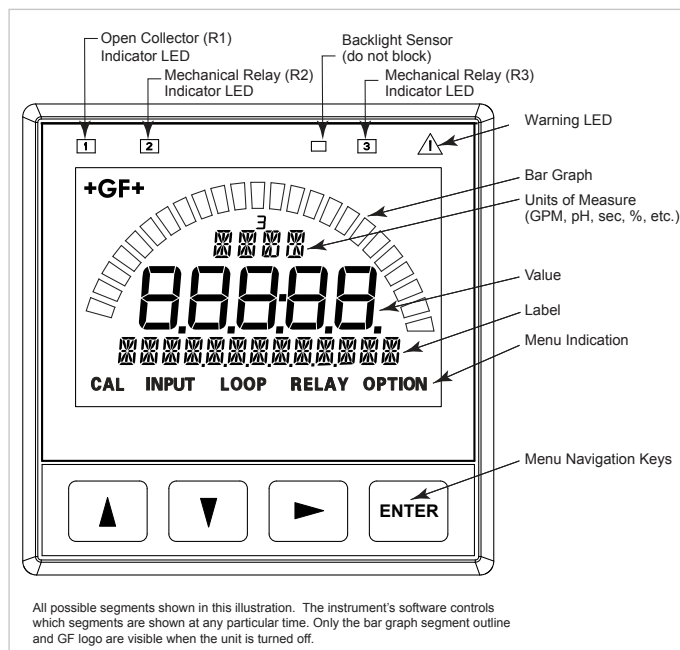
Features

- Multiple sensor types supported with one instrument
- “Dial-type” digital bar graph
- Modules are field installable and replaceable anytime
- Optional Relay Module for addition of two dry contact relays
- Optional H COMM Module for two-way communication
- Optional Batch Module for Batch Control
- Modbus Module for connection to Serial, RS485, Modbus networks
- One 4 to 20 mA output in base unit. One additional 4 to 20 mA available with optional module
- Rear Enclosure kits for panel, wall or pipe mounting
- Warning and Relay LED indicators for “at a glance” visibility
- Customizable features including digital label for custom identification
- Optional PC COMM configuration tool for configuration at a PC



Applications

- Wastewater Treatment
- Reverse Osmosis
- Deionization
 - Ultra Pure Water
 - Two Bed System
 - Mixed Bed System
- Chemical Manufacturing/Addition
- Metal and Plastic Finishing
- Fume Scrubber
- Cooling Towers
- Media Filtration



3.2 Specifications

General

Input Channels		1	
Input Types	Digital (S ³ L)	Serial ASCII, TTL level, 9600 bps	
	Frequency	Range	0.5 to 1500 Hz
		Accuracy	0.5% of reading
Measurement Types		Flow, pH/ORP, Conductivity/Resistivity, Salinity, Pressure, Temperature, Level, Dissolved Oxygen, Batch or user-defined (via 8058)	

Enclosure and Display

Case Material	PBT
Window	Shatter-resistant glass
Keypad	4 buttons, injection-molded silicone rubber seal
Display	Backlit, 7 and 14-segment
Update Rate	1 s
LCD Contrast	5 settings
Indicators	"Dial-type" digital bar graph. LEDs for Open Collector, Relays and Warning Indicator
Enclosure Size	¼ DIN

Mounting 9900-1P

Panel	¼ DIN, ribbed on four sides for panel mounting clip inside panel, silicon gasket included. Optional rear enclosure with flat cover available for waterproof protection when installed inside a panel.
Wall	Options include 9900-1P installed in pre-wired NEMA enclosure, wall mount enclosure or inside of rear enclosure with hinged cover. (USA Only)
Pipe	Optional Rear Enclosure with hinged cover and 9900-1P for pipe mount installation

Mounting 9900-1

Field (Integral)	Options include yellow universal or integral kits for installation with sensor
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Display Ranges

pH	0.00 to 15.00 pH
pH Temperature	-39.99 °C to 149.99 °C -40 °F to 302 °F
ORP	-1999 to +1999 mV
Flow Rate	-9999 to 99999 units per second, minute, hour or day
Totalizer	0.00 to 99999999 units
Conductivity	0.0000 to 99999 µS, mS, PPM and PPB (TDS), kΩ, MΩ
Conductivity Temperature	-100 °C to 250 °C -148 °F to 350 °F (application and sensor dependent)
Temperature	-99 °C to 350 °C -99 °F to 350 °F
Pressure	-40 to 1000 psi
Level	-9999 to 99999 m, cm, ft, in, %
Volume	0 to 99999 cm ³ , m ³ , in ³ , ft ³ , gal, L, lb, kg, %
Salinity	0 to 99.97 PPT
Dissolved Oxygen	PPM 0-50, % SAT 0-200, 0 to 999.9 TORR
Dissolved Oxygen Temperature	-99 °C to 350 °C -99 °F to 350 °F

Environmental

Ambient Operating Temperature

Backlit LCD	-10 °C to 70 °C 14 °F to 158 °F
Storage Temperature	-15 °C to 70 °C 5 °F to 158 °F
Relative Humidity	0 to 100% condensing for field mount; 0 to 95% non-condensing for panel mount
Maximum Altitude	4,000 m (13,123 ft)
Enclosure Rating	NEMA 4X/IP65 (front face only on panel mount); field mount is 100% NEMA 4X/IP65 when used with universal or integral installation kits

Electrical Requirements

Power to Sensors

Voltage	+4.9 to 5.5 VDC @ 25 °C, regulated
Current	1.5 mA max in loop power mode (up to 2.0 mA with 24 V @ 300 Ω max. loop impedance); 20 mA max when using DC power
Short Circuit	Protected
Isolation	Low voltage (< 48V AC/DC) to loop with DC power connected

No isolation when using loop power only

Terminal Blocks	Pluggable screw type	14 AWG or 2.5 mm ² max wire gauge
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Input Power

DC	10.8 to 35.2 VDC, regulated
9900 without Relay Module	200 mA @ 10.8 VDC to 35.2 VDC
9900 with Relay Module	300 mA @ 10.8 VDC to 35.2 VDC
Overvoltage Protection	48 Volt Transient Protection Device
Current limiting for circuit protection	
Reverse-Voltage Protection	

Loop Power

Loop Power Only

Max. Loop Impedance	50 Ω @ 12 V	325 Ω @ 18 V	600 Ω @ 24 V
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With DC Power Input or with 2nd loop, all the time

Max. Loop Impedance	250 Ω @ 12 V	500 Ω @ 18 V	750 Ω @ 24 V
---------------------	--------------	--------------	--------------

Relay Specifications

	Dry-Contact Relays (2)	Open Collector (1)
Type	SPDT	N/A
Form	C	N/A
Max. Current Rating	5 A resistive	50 mA DC
Max. Voltage Rating	30 VDC or 250 VAC	30 VDC
Hysteresis	Adjustable (absolute in engineering units) (EUs)	
Latch	Reset in test screen only	
Delay	9999.9 seconds (max.)	
Test Mode	Set On or Off	
Cycle Time	99999 seconds (max.)	
Maximum Pulse Rate	300 pulses/minute	
Proportional Pulse	400 pulses/minute	
Volumetric Pulse Width	0.1 to 3200 s	
Pulse Width Modulation	0.1 to 320 s	

Input Types

Digital (S ³ L) or AC frequency
4 to 20 mA input via the 8058-1
pH/ORP input via the Digital (S ³ L) output from the 2750/2751 pH/ORP Sensor Electronics
Raw Conductivity/Resistivity input directly from GF Signet Conductivity/Resistivity electrodes via Direct Conductivity/Resistivity Module or via 2850

Input Specifications

Digital (S ³ L)	Serial ACSII, TTL level, 9600 bps
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Frequency Input

Sensitivity	80 mV @ 5 Hz, gradually increasing with frequency
Span	0.5 Hz to 1500 Hz @ TTL level input
Accuracy	± 0.5% or reading max error @ 25 °C
Resolution	1 μS
Repeatability	± 0.2% of reading

Power Supply

Rejection	±1 μA per volt
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Input Specifications

Short Circuit	Protected
Update Rate	(1/frequency) + 150 ms

Output Specifications**Current Output - One (1); Two (2) with 4 to 20 mA Output Module**

Current Loop Output Standard	ANSI-ISA 50.00.01 Class H		
Current Output	4 to 20 mA, isolated, fully adjustable and reversible		
Span	3.8 to 21 mA		
Zero	4.0 mA factory set; user programmable from 3.8 to 5.0 mA		
Full Scale	20.00 mA factory set; user programmable from 19.0 to 21.0 mA		
Accuracy	±32 µA max. error @ 25 °C @ 24 VDC		
Resolution	6 µA or better		
Temperature Drift	±1 µA per °C		
Power Supply Rejection	±1 µA per V		
Isolation	Low voltage (< 48 VAC/DC)		
Voltage	12 to 32 VDC ±10%		
Max. Impedance (with DC power input)	250 Ω @ 12 VDC	500 Ω @ 18 VDC	750 Ω @ 24 VDC
Max. Impedance (no DC power input)	50 Ω @ 12 VDC	325 Ω @ 18 VDC	600 Ω @ 24 VDC
Update Rate	150 mS nominal		
Short circuit and reverse polarity protected			
Adjustable Span	Reversible		
Error Condition	Selectable error condition 3.6 or 22 mA		
Actual update rate determined by sensor type			
Test Mode	Increment to desired current (range 3.8 to 21.00 mA)		

Shipping Weights

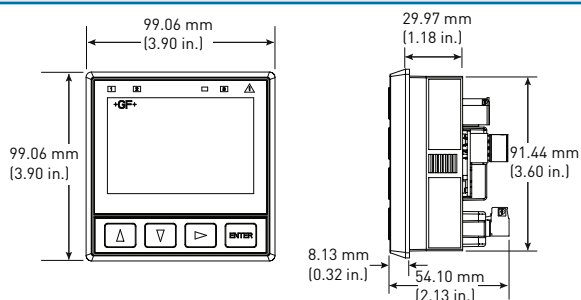
Base Unit	0.63 kg	1.38 lb
Modbus Module	0.16 kg	0.35 lb
H COMM Module	0.16 kg	0.35 lb
Conductivity Module	0.16 kg	0.35 lb
Relay Module	0.19 kg	0.41 lb
Batch Module	0.16 kg	0.35 lb
4 to 20 Output Module	0.16 kg	0.35 lb
Rear Enclosure, Hinged cover	0.30 kg	0.65 lb
Rear Enclosure, Flat cover	0.28 kg	0.60 lb

Standards and Approvals

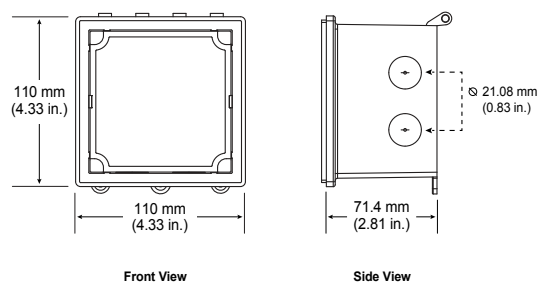
CE, UL, CUL, FCC
RoHS Compliant, China RoHS
Lloyd's Register
Manufactured under ISO 9001 and ISO 14001 for Environmental Management and OHSAS 18001 for Occupational Health and Safety

Dimensions

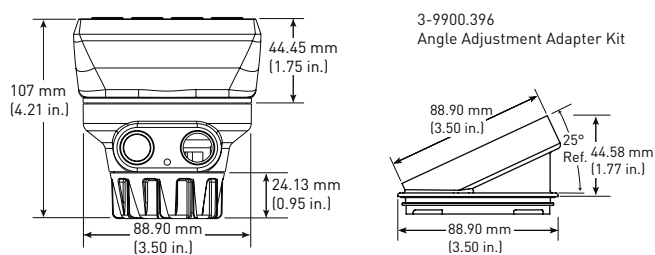
Panel Mount



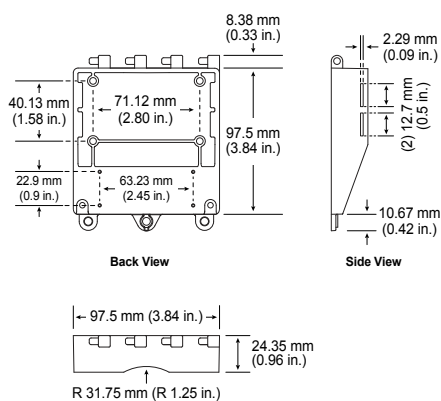
Rear Enclosure



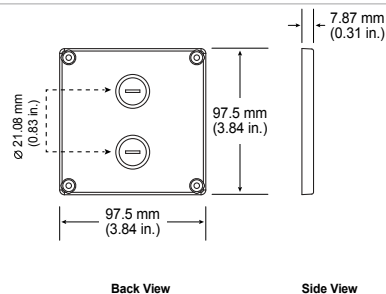
Integral Mount



Hinged Cover



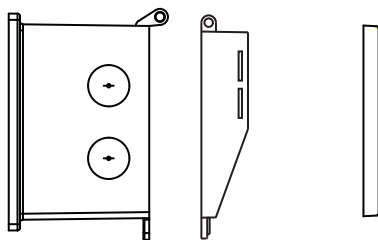
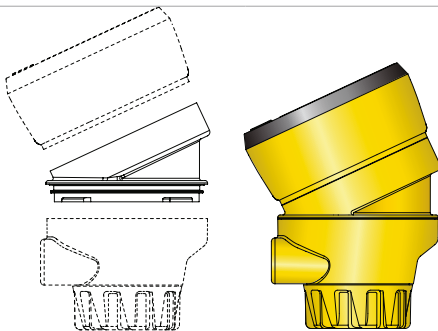
Flat Cover


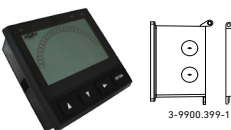





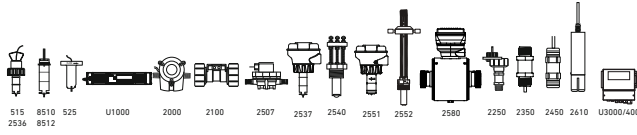
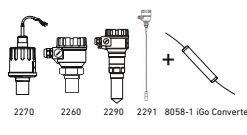








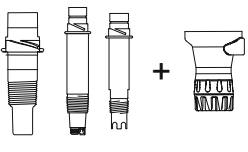
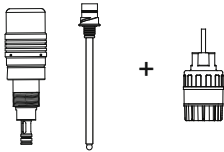
Compatibility


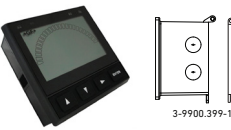




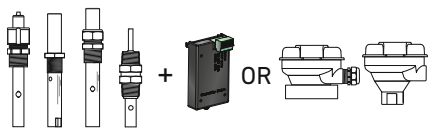
Sensor model	9900 Generation				9900 Module	9900 Generation			
	I	II	III	IV		I	II	III	IV
515/8510	X	X	X	X	H COMM	X	X	X	X
525	X	X	X	X	Relay	X	X	X	X
U1000 V2				X	Conductivity/Resistivity	X	X	X	X
2000	X	X	X	X	Batch		X	X	X
2100	X	X	X	X	4 to 20 mA Output			X	X
2250	X	X	X	X	Modbus	X	X	X	X
2350	X	X	X	X					
2450	X	X	X	X					
2507	X	X	X	X					
2536/8512	X	X	X	X					
2537-5	X	X	X	X					
2540	X	X	X	X					
2551	X	X	X	X					
2552	X	X	X	X					
2580	X	X	X	X					
2610-51	X	X	X	X					
2610 + 8058	X	X	X	X					
2724-2726	X	X	X	X					
2734-2736	X	X	X	X					
2750	X	X	X	X					
2751	X	X	X	X					
2756-2757	X	X	X	X					
2764-2767	X	X	X	X					
2774-2777	X	X	X	X					
2819-2823	X	X	X	X					
2839-2842	X	X	X	X					
2850	X	X	X	X					
U3000/U4000	X	X	X	X					

3.3 System Overview

			
3-9900.399-1 (159 001 834) Rear Enclosure Kit, hinged cover	3-9900.399-2 (159 001 835) Rear Enclosure Kit, flat cover	3-9900-1 (159 001 696) Field Mount	3-8051 (159 000 187) 3-8051-1 (159 001 755) 3-8051-2 (159 001 756) Flow Sensor Integral Mounting Kit
		3-9900-396 (159 001 701) Angle Adjustment Adapter Kit	

Panel Mount	Pipe, Tank, Wall Mount	Field (Integral) Mount
9900 Transmitter (Includes mounting bracket and panel gasket)	9900 Transmitter with Rear Enclosure	9900 Transmitter with Junction Box (varies with sensor and installation)
		    
GF Signet Sensors - Flow, Level, Temperature, Pressure, DO Use one input from sensor options below		Other Level with 8058 iGo Converter plus other 4 to 20 mA
		
Fittings - Customer Supplied		All Sold Separately

Panel Mount	Pipe, Tank, Wall Mount	Field (Integral) Mount
9900 Transmitter (Includes mounting bracket and panel gasket)	9900 Transmitter with Rear Enclosure	9900 Transmitter with Junction Box (varies with sensor and installation)
		   
GF Signet Sensors - pH/ORP Use one input from sensor options below* with 2751 Smart Sensor Electronics		GF Signet Wet-Tap Electrode Model 2756, 2757 and 3719 Wet-Tap with 2751 Smart Sensor Electronics
		
GF Signet Fittings - See individual sensor data sheets		All Sold Separately

Panel Mount	Pipe, Tank, Wall Mount	Field (Integral) Mount
9900 Transmitter (Includes mounting bracket and panel gasket)	9900 Transmitter with Rear Enclosure	9900 Transmitter with 3-9900.396 Angle Adapter and Junction Box (varies with sensor and installation)
		   
GF Signet Sensors - Conductivity/Resistivity and Salinity Electrodes Use one input from electrode options below* with Conductivity Module or 2850 Sensor Electronics		
		
GF Signet Fittings - See individual sensor data sheets		All Sold Separately

* See individual sensor datasheets for additional information

**3-9900.396 is required with the Conductivity Module and either 3-8050 or 3-8052 to provide sufficient clearance

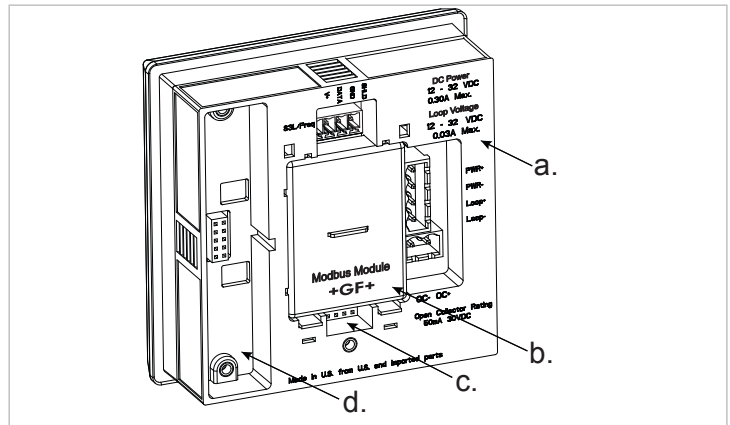
Plug in Modules

Optional modules and accessories are available for the 9900:

- Base Unit (required)
- Slot for optional H COMM or Modbus Modules
- Slot for optional Conductivity/Resistivity, Batch, or 4 to 20 mA Output Module
- Slot for optional Relay Module (not available on field mount)

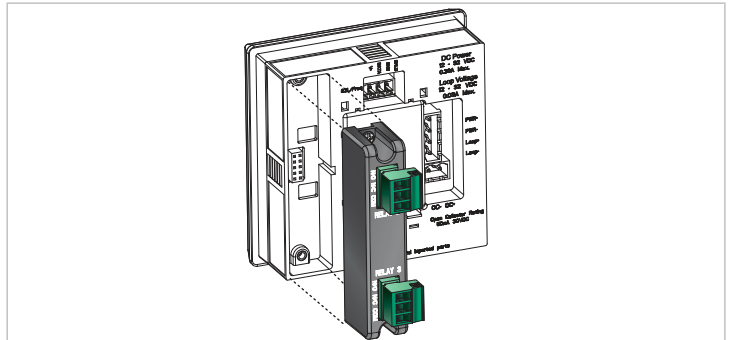
Each item is ordered separately.

Modules are field-replaceable at any time.



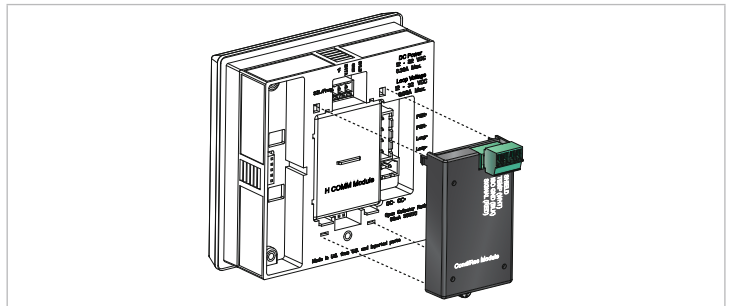
Relay Module (Panel Installations Only) (3-9900.393)

This module adds two programmable dry-contact relays to the standard Open Collector output in the base unit.



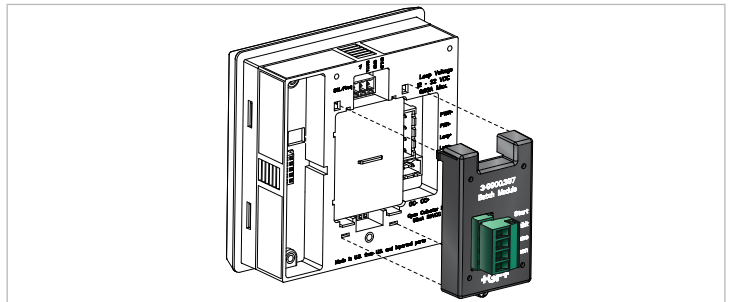
Direct Conductivity/Resistivity Module (3-9900.394)

The Direct Conductivity/Resistivity Module interfaces GF Signet 2819-2823 and 2839-2842 Conductivity electrodes directly to the 9900.



Batch Module (3-9900.397)

The Batch Module adds batch capability to the 9900 Transmitter (Generation II and newer). It is compatible with all GF Signet flow sensors.



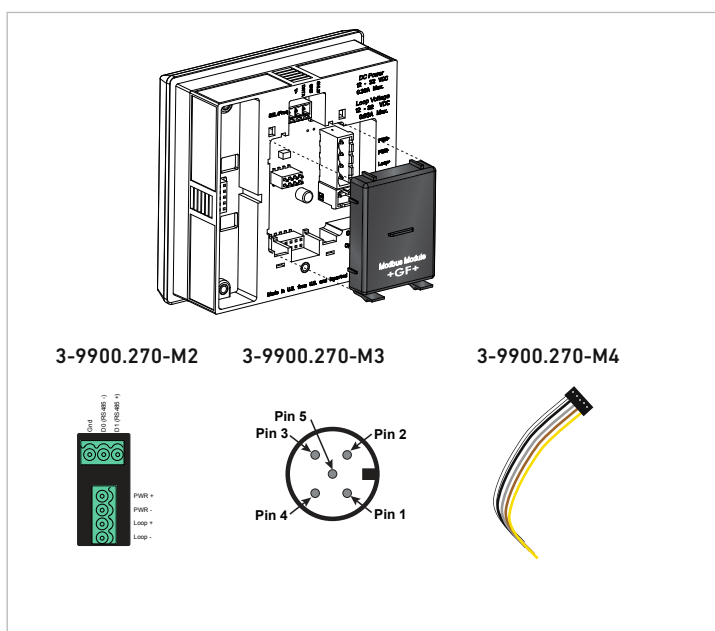
Modbus Modules (3-9900.270-MX)

These Modules allow the 9900 to communicate with Automation systems using the Modbus serial RS485 Protocol.

3-9900.270-M2 - Terminal Block Connections
(Panel Mount Only)

3-9900.270-M3 - M12 Connector (Field Mount Only)

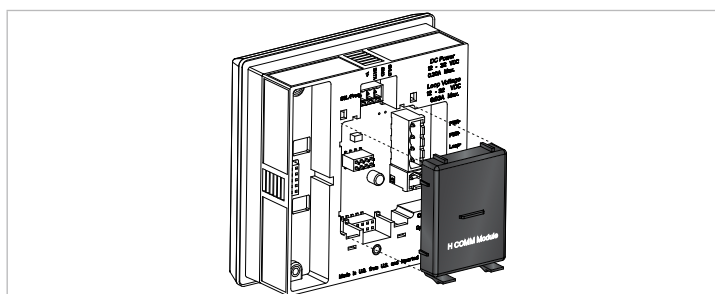
3-9900.270-M4 - Modbus Module with 5 Wire Cable Assembly



H COMM Module (HART®) (3-9900.395)

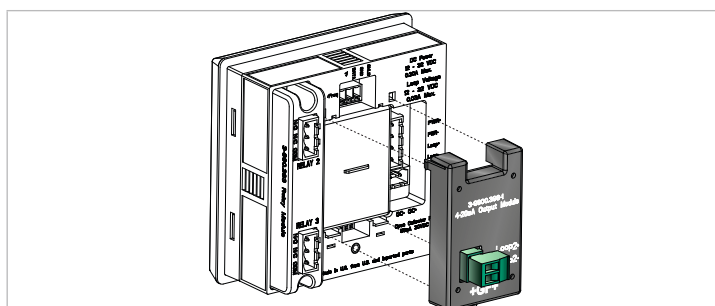
The H COMM Module enables communication between the 9900 and a HART® enabled device.

(Not available for use on 3-9900-1BC Batch Controller)



4 to 20 mA Output Module (3-9900.398-1)

The 4 to 20 mA Output Module adds a second 4 to 20 mA Output to the 9900 Transmitter (Generation III and later). Each of the outputs can be used to output the primary and/or secondary measurement.



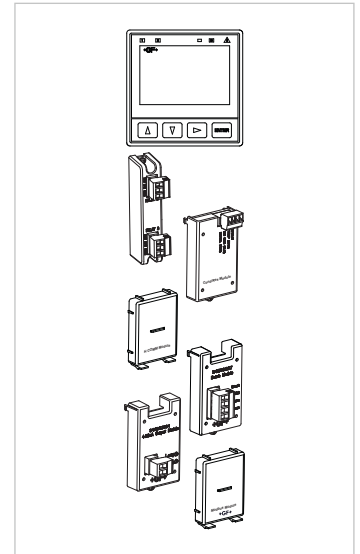
3.4 Ordering Information

Mfr. Part No	Code	Description
9900 Base Unit - Single Channel, Multi-Parameter, 4 to 20 mA, Open Collector, DC power		
3-9900-1P	159 001 695	9900 Panel Mount Transmitter
3-9900-1	159 001 696	9900 Field Mount Transmitter
3-9900-1BC	159 001 770	Batch Controller System
Optional Accessory Modules		
3-9900.270-M2	159 200 121	Modbus Module with Terminal Block Assembly (Panel Mount Only)
3-9900.270-M3	159 200 122	Modbus Module with M12 Connector Assembly (Field Mount Only)
3-9900.270-M4	159 200 128	Modbus Module with 5 Wire Cable Assembly
3-9900.393	159 001 698	Relay Module - 2 DCR (Dry-contact relays)
3-9900.394	159 001 699	Direct Conductivity/Resistivity Module
3-9900.395	159 001 697	H COMM Module
3-9900.397	159 310 163	Batch Module
3-9900.398-1	159 001 784	4 to 20 mA Output Module*

* Module adds a second 4 to 20 mA output. One 4 to 20 mA output is included in the base unit.

3.5 Accessories and Replacement Parts

Mfr. Part No	Code	Description
6682-0204	159 001 709	Conductivity Module Plug, 4 Pos, Right Angle
6682-1102	159 001 710	DC Power Plug, 2 Pos, Right Angle
6682-1103	159 001 711	Relay Module Plug, 3 Pos, Right Angle
6682-1104	159 001 712	Loop Power Plug, 4 Pos, Right Angle
6682-3104	159 001 713	Freq/S ³ L Plug, 4 Pos, Right Angle
6682-3004	159 001 725	Terminal Block Plug
7310-1024	159 873 004	24 VDC Power Supply, 0.42 A, 10W
7310-2024	159 873 005	24 VDC Power Supply, 1.0 A, 24W
7310-4024	159 873 006	24 VDC Power Supply, 1.7 A, 40W
7310-6024	159 873 007	24 VDC Power Supply, 2.5 A, 60W
7310-7024	159 873 008	24 VDC Power Supply, 4.0 A, 96W
3-0252	159 001 808	0252 Configuration Tool
3-8050	159 000 184	Universal Mount Kit
3-8050.396	159 000 617	RC Filter kit (for relay use), 2 per kit
3-8051	159 000 187	Flow Sensor Integral Mounting Kit, NPT, Valox
3-8051-1	159 001 755	Flow Sensor Integral Mounting Kit, NPT, PP
3-8051-2	159 001 756	Flow Sensor Integral Mounting Kit, NPT, PVDF
3-8052	159 000 188	¾ in. Integral Mount Kit
3-8058-1	159 000 966	I-Go® Signal Converter, wire-mount
3-8058-2	159 000 967	I-Go® Signal Converter, DIN rail mount
3-9000.392-1	159 000 839	Liquid Tight Connector Kit, NPT (1 pc.)
3-9900.270-CB1	159 200 123	Replacement Cable Assembly for M1
3-9900.270-CB2	159 200 124	Replacement Terminal Block Assembly for M2
3-9900.270-CB3	159 200 125	Replacement M12 Connector Assembly for M3
3-9900.270-CB4	159 200 129	Replacement Cable Assembly for M4
3-9900.390	159 001 714	Standard Connector Kit, Right Angle, 9900 Transmitter
5541-5005	159 855 021	5 meter (16 ft) M12 cable
5541-5010	159 855 022	10 meter (32 ft) M12 cable
3-9900.391	159 001 715	Optional Connector Kit, In-Line, 9900 Transmitter
3-9900.392	159 001 700	Wall Mount Accessory Kit for 9900
3-9900.396	159 001 701	Angle Adjustment Adapter Kit (for Field Mounting)
3-9900.399-1	159 001 834	Rear enclosure kit, hinged cover
3-9900.399-2	159 001 835	Rear enclosure kit, flat cover



4 9900 Batch Controller System

Member of the SmartPro® Family of Instruments



4.1 Product description

The GF Signet 9900-1BC Batch Controller system provides control capability and process fine-tuning in a familiar package. The programming interface uses a four-button keypad and an intuitive menu for adjusting a batching system to the best performance possible. Choose between simple or advanced modes. In simple mode, relay outputs can be used for batching, external counter, missing signal alarm and 4 to 20 mA output can be used to indicate batch status. In advanced mode relays can also be used for end of batch pulse, two-stage shutdown, overrun alarm, high flow detection, total volume or source volume alarm.

New to Generation IV, Automatic Overrun Compensation feature. The 9900-1BC can measure excess flow after a batch stops and use it to reduce flow to the next batch by de-energizing the batch relay early, thus closing the flow control valve, and eliminating batch overrun.

Designed for a variety of batch applications, the 9900-1BC can save up to 10 batch sizes for batching or blending a variety of liquid volumes. Customize batch names for easy distinction between batches. One K-Factor can be used for all batches, or use a different K-Factor for each batch for when different liquids are batched. User can choose to be prompted prior to starting a batch with a Yes/No or with a password to prevent inadvertently starting a batch.

The 9900-1BC operates on 10.8 to 35.2 VDC, regulated. Connect a remote start or stop switch for remote batch control. Use the end-of-batch pulse to trigger the next step in the process.

Features

- Rear Enclosure option means the 9900-1BC Batch Controller can be installed on a pipe or wall mounted in addition to panel mount installations
- Store up to 10 batch sizes for batching or blending a variety of liquid volumes
- Customize 10 batch names for easy distinction between batches
- Modular Design - Can be purchased as a complete system or add a Batch Module and Relay Module to an existing 9900 Transmitter (Generation II or later)
- New! Automatic Overrun Compensation can eliminate excess flow by automatically reducing the next batch size by the overrun value of previous batch.
- Remote control wiring with start, stop & resume terminals for remote batch control
- 3 programmable relays, one open collector, two dry-contact relays
- Two-stage control to prevent overfilling or to minimize water hammer
- Confirmation START/RESUME – Can prompt user prior to starting each batch with a Yes/No or password to prevent inadvertently starting a batch
- Enter 10 different K-Factors - one per batch for when different liquids are batched

U.S. Patent No.: D662,844 S

Taiwan Patent No.: D147,150



Applications

- Batch Process
- Filter Backwash Initiation
- Chemical Addition
- Canning and Bottling
- Tank Filling
- Bulk Storage Transfer
- Chemical Processing
- Food and Beverage
- Life Sciences
- Water Treatment



The installation must be performed in accordance with the instruction manual.
The instruction manual is included with the product, see also online on www.gfps.com/signet

4.2 Technical Details

General

Input Channels	One	
Accuracy	±0.2%	
Terminal Blocks	Pluggable screw type	16 AWG max wire gauge

Enclosure and Display

Case Material	PBT	
Window	Shatter-Resistant Glass	
Keypad	4 buttons, injection-molded silicone rubber seal	
Display	Backlit, 7- and 14-segment	
Indicators	Dial-type digital bar graph	
Update Rate	1 s	
LCD Contrast	5 settings	
Enclosure size and color	¼ DIN	
Mounting	Panel	¼ DIN, ribbed on four sides for use with mounting bracket for panel mount installations
	Wall	Large enclosure (sold as an accessory) that encases the panel mount transmitter

Environmental Requirements

Ambient Operating Temperature

Backlit LCD	-10 °C to 70 °C	14 °F to 158 °F
Storage Temperature	-15 °C to 70 °C	5 °F to 158 °F
Operating Temperature	-10 °C to 70 °C	14 °F to 158 °F
Relative Humidity	0 to 100% condensing for field and panel mount (front only); 0 to 95% non-condensing for panel mount back side	
Maximum Altitude	4,000 m (13,123 ft)	
Enclosure Rating	Designed to meet NEMA 4X/IP65 (front face only)	

Input Power

DC	24 VDC input; range: 10.8 to 35.2 VDC regulated
Overvoltage Protection	48 Volt transient protection device
Current limiting for circuit protection	
Reverse-Voltage Protection	

Input Specifications

Digital (S ³ L)	Serial ASCII, TTL level, 9600 bps
Accuracy	Determined by sensor

Frequency

Sensitivity	80 mV @ 5 Hz, mV threshold gradually increasing with frequency
Range	0.5 Hz to 1500 Hz @ TTL level input for open collector
Accuracy	± 0.5% of reading max error @ 25 °C
Repeatability	± 0.2% of reading
Resolution	1 µs
Update Rate	150 ms nominal

Power to Sensors

Voltage	+4.9 to 5.5 VDC @ 25 °C, regulated
Current	20 mA max.
Short Circuit	Protected

Power Supply

Reverse Polarity	Protected
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Output Specifications

Relay Specifications

	Dry-Contact Relays (2)	Open Collector (1)
Type	SPDT	NPN
Form	C	N/A
Max. Voltage Rating	30 VDC or 250 VAC	30 VDC
Max. Current Rating	5 A	50 mA
Hysteresis	Adjustable (absolute in Engineering Units)	
Latch	Reset in test screen or view mode	
Delay	9999.9 seconds (maximum)	
Test Mode	Set On or Off	
Maximum Pulse Rate	400 pulses/minute	
Volumetric Pulse Width	0.1 s to 3200 s	
4 to 10 mA	ANSI-ISA 50.00.01 Class H	
Current Loop Output	(passive: external power required)	
Output	1	
Span	3.8 to 21 mA	
Zero	4.0 mA factory set; user programmable from 3.8 to 4.2 mA	
Full Scale	20.00 mA factory set; user programmable 19.0 to 21.0 mA	
Accuracy	± 32 µA max. error @ 25 °C @ 24 VDC	
Resolution	6 µA or better	
Temperature Drift	± 1 µA per °C	
Power Supply Rejection	± 1 µA per V	
Isolation	Low voltage (< 48 VAC/DC)	
Voltage	10.8 to 35.2 VDC	
Max. Impedance	250 Ω @ 12 VDC	500 Ω @ 18 VDC 750 Ω @ 24 VDC
Update Rate	150 ms nominal	
Short circuit and reverse polarity protected		
Adjustable span	Reversible	
Error Condition	Selectable error condition 3.6 or 22 mA or NONE	
Actual update rate determined by sensor type		
Test Mode	Increment to desired current (range 3.6 to 21.00 mA)	

Shipping Weights

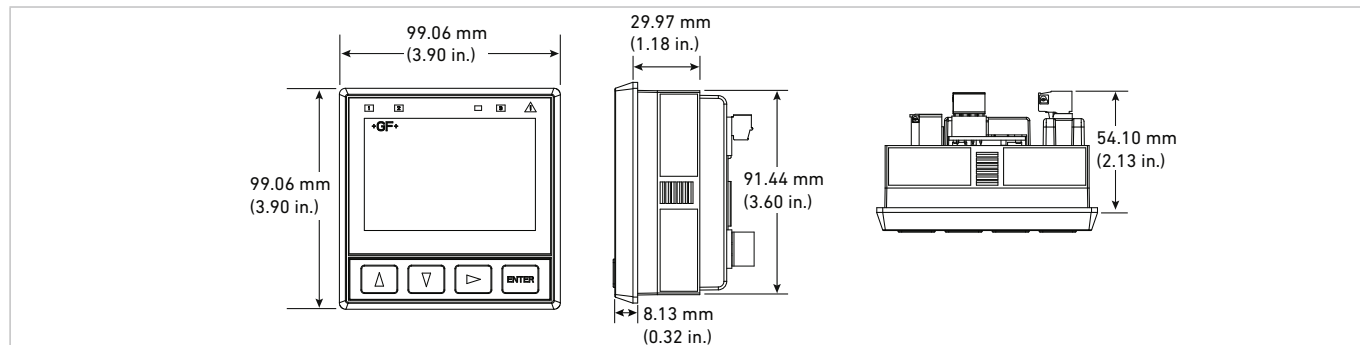
Base Unit	0.63 kg	1.38 lb
Batch Module	0.16 kg	0.35 lb
Relay Module	0.19 kg	0.41 lb

Standard and Approvals

CE, UL, CUL, FCC

RoHS compliant, China RoHS

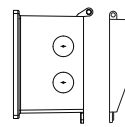
Manufactured under ISO 9001 for Quality, ISO 14001 for Environmental Management and OHSAS 18001 for Occupational Health and Safety

Dimensions**4.3 System Overview****Panel Mount****9900-1BC****Batch Controller System**

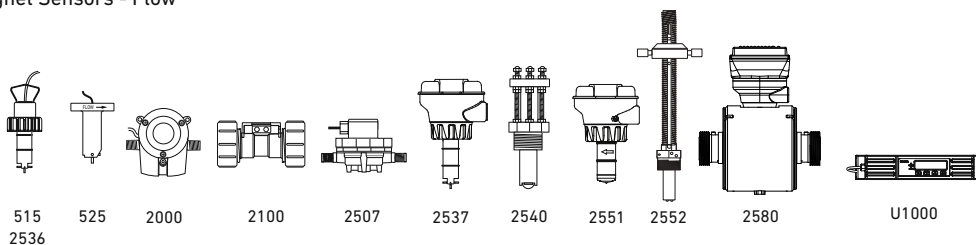
(Includes mounting bracket and panel gasket)

**Pipe, Tank, Wall Mount****9900-1BC Batch Controller System**

with Wall Mount Accessory or Rear Enclosure

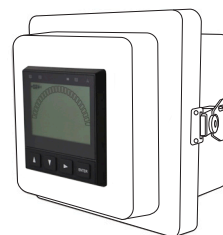
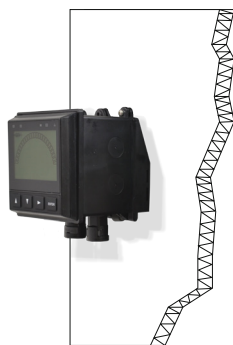
3-9900.392
(power supply sold separately)

3-9900.399-1

GF Signet Sensors - Flow

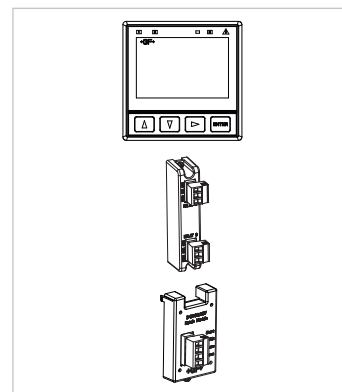
GF Signet Fittings - See individual sensor data sheets

All sold separately

Panel Mount Installation**Pipe, Post, Strut Installation****Panel Mount Installation**

4.4 Ordering information

Mfr. Part	No. Code	Description
3-9900-1BC	159 001 770	Batch Controller System
3-9900-1P	159 001 695	9900 Panel Mount Transmitter
3-9900.393	159 001 698	Relay Module – 2 DCR (dry-contact relays)
3-9900.397	159 310 163	Batch Module



4.5 Accessories

Mfr. Part	Code	Description
6682-1102	159 001 710	DC Power Plug, 2 Pos, Right Angle
6682-1103	159 001 711	Relay Module Plug, 3 Pos, Right Angle
6682-1104	159 001 712	Loop Power Plug, 4 Pos, Right Angle
6682-3004	159 001 725	Freq/(S ³ L) Plug, 4 Pos, In-Line
6682-3104	159 001 713	Freq/(S ³ L) Plug, 4 Pos, Right Angle
7310-1024	159 873 004	24 VDC Power Supply, 10W, 0.42 A
7310-2024	159 873 005	24 VDC Power Supply, 24W, 1.0 A
7310-4024	159 873 006	24 VDC Power Supply, 40W, 1.7 A
7310-6024	159 873 007	24 VDC Power Supply, 60W, 2.5 A
7310-7024	159 873 008	24 VDC Power Supply, 96W, 4.0 A
3-9900.390	159 001 714	Standard Connector Kit, Right Angle
3-9900.391	159 001 715	Connector Kit, In-Line
3-9900.392	159 001 700	Wall Mount Accessory
3-9000.392-1	159 000 839	Liquid Tight Connector Kit, NPT (1 pc.)
3-9900.399-1	159 001 834	Rear Enclosure Hinged Cover
3-9900.399-2	159 001 835	Rear Enclosure Flat Cover
3-0252	159 001 808	Configuration Tool

5 8900 Multi-Parameter Controller

Member of the ProcessPro® Family of Instruments



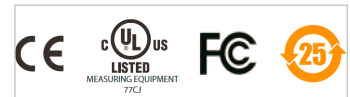
5.1 Product description

The GF Signet 8900 Multi-Parameter Controller takes the concept of modularity to the extreme. Each 8900 is field commissioned with the users specified combination of inputs, outputs, and relays using simple-to-install modular boards into the base unit. Configure the system by selecting either two, four, or six input channels which accepts any of the GF Signet sensors listed below, and/or other manufacturer's sensors via a 4 to 20 mA signal converter (Type 8058). To complete your unit, choose a power module with universal AC line voltage or 12 to 24 VDC $\pm 10\%$, regulated.

If more features are needed, analog output and relay modules are available and easily installed. Plus, the 8900 will support four additional relays via an external relay module. There are other notable features that the 8900 offers. For instance, digital input to the 8900 enables longer cable runs and simplified wiring with minimal noise interference. Advanced relay logic allows users to select up to 3 measurement sources to trigger 1 relay. Derived measurements include difference, sum, ratio, percent recovery, percent rejection, percent passage and BTU. The menu system can be programmed to display in multi-languages including English, German, French, Spanish, Italian, and Portuguese.

Features

- Measures Flow, pH, ORP, Conductivity, Pressure, Level and Temperature
- Multi-language display
- 1/4 DIN enclosure
- Up to 4 analog outputs
- Up to 8 relays
- 12 to 24 VDC or 100 to 240 VAC $\pm 10\%$, regulated power
- Digital communication allows for extended cable lengths and easy wiring
- Accepts 3rd party 4 to 20 mA output devices when used with 8058 signal converter
- Available with 2 to 6 channels
- Simultaneous BTU Calculations with Heating & Cooling Totalizers per calculation



Applications

- RO/DI System Control
- Media Filtration
- Pure Water Production
- Demineralizers
- Chemical Processing
- Metal & Plastics Finishing
- Fume Scrubbers
- Proportional Chemical Addition
- Cooling Tower & Boiler Protection
- Wastewater Treatment
- Aquatic Animal Life Support Systems
- Rinse Tank



The installation must be performed in accordance with the instruction manual.
The instruction manual is included with the product, see also online on www.gfps.com/signet

5.2 Technical Details

General

Compability	Modulator (completely field-commissionable)	
No. of Input Channles	2, 4, or 6	
Compatible Sensors	See System Overview	
Input Signal	Digital (S ³ L)	Serial ASCII, TTL level 9600 bps
Types	Frequency	0.5% of reading
Measurement Types	Flow, pH, ORP, Conductivity/Resistivity, Pressure, Temperature, Level, or 3rd party devices with a 4 to 20 mA output	
Derived Measurements	Sum, difference, ratio, % recovery, % reject, % passage, power (BTU)	
No. of Relays Supported	Available; 2, 4, 6 or 8 (8 dry contact or 4 solid state and 4 dry-contact)	
No. of Analog Outputs	Available in pairs: 2 or 4 (active and/or passive 4 to 20 mA); and/or 2 (0 to 5/10 VDC)	

Enclosure and Display

Enclosure Rating	NEMA 4X/IP65 (front face only)	
Case Material	PBT	
Panel Gasket	Silicone Sponge	
Window	Self-healing polyurethane-coated polycarbonate	
Keypad	4-buttons, highly tactile and audible injection-molded silicone rubber seal	
Display	Alphanumeric 2 x 16 back-lit LCD	
Update Rate	1 second	
Accuracy	Sensor dependent	
LCD Contrast	4 settings	
Languages Available	English, French, Spanish, German, Italian and Portuguese	

Display Ranges (see sensor specifications for actual measurement limits)

pH	-2.00 to 15.00 pH	
pH Temperature	-40 °C to 150 °C	-40 °F to 302 °F
ORP	-9999 to +9999 mV	
Flow Rate	0.0000 to 999999 units per second, minute, hour or day	
Totalizer	0.00 to 99999999 units	
Conductivity	0.0000 to 999999 µS, mS, PPM & PPB (TDS), kΩ, MΩ	
Conductivity Temperature	-99.9 °C to 250 °C	-148 °F to 482 °F

Display Ranges (see sensor specifications for actual measurement limits)

Temperature	-99.9 °C to 999.9 °C	-148 °F to 999.9 °F
Pressure	-99.99 to 9999 psi, kPa, bar	
Level	-99999 to 99999 m, cm, ft, in., %	
Volume	-99999 to 999999 m ³ , ft ³ , in ³ , cm ³ , gal, L, kg, lb, %	
Other (4 to 20 mA)	-99999 to 999999 user selectable units	

Environmental**Ambient Operating Temperature**

Backlit LCD	-10 °C to 55 °C	14 °F to 131 °F
Storage Temperature	-15 °C to 80 °C	5 °F to 176 °F
Relative Humidity	0 to 95% non-condensing	
Maximum Altitude	2,000 m (6,560 ft)	
	4,000 m (13,123 ft); use only DC power supply and, if applicable, solid state relays to maintain UL safety standard up to this altitude	

Electrical**Power Requirements (AC or DC via Power Modules)**

Universal AC	100 to 240 VAC ±10%, regulated 50-60 Hz, 24 VA max.
DC	12 to 24 VDC, ±10%, regulated recommended, 7 Watts max.
Output Power to Sensors	5 VDC up to 40 mA total
Terminal type	Screw-clamp, removable via plug-in modules

Analog Outputs (via I/O Modules and Output Modules) All analog outputs are freely assignable to any channel.

4 to 20 mA Output	Endpoints are adjustable and reversible		
Minimum Default	4.0 mA; user adjustable from 3.8 to 5.0 mA		
Maximum Default	20.00 mA; user adjustable from 19.0 to 21.0 mA		
Test Mode	Produces and adjustable 4 to 20 mA signal for functional verification of each output circuit		
Isolation	Up to 48 VAC/DC		
Error Condition	22.1 mA (default state when output source not configured)		
Update Rate	100 ms		
Accuracy	±32 µA over entire operating temperature range		
Passive 4 to 20 mA			
Voltage	12 to 24 VDC, ±10%, regulated		
Max. Impedance	250 Ω @ 12 VDC	500 Ω @ 18 VDC	750 Ω @ 24 VDC
Active 4 to 20 mA			
Max. Impedance	750 Ω		
0 to 5/10 VDC Output	Endpoints are adjustable and reversible		
Output Range	0 to 5 VDC or 0 to 10 VDC, software selectable		
Minimum Default	0 VDC; user programmable from 0 to 0.5 VDC		
Maximum Default	5 VDC; user programmable from 4.5 to 5.5 VDC, or 9.5 to 10.5 VDC		
Output Load	10 kΩ minimum		
Test Mode	Produces and adjustable signal for functional verification of each output circuit		
Isolation	Up to 48 VAC/DC		
Error Condition	0 VDC (default state when output source not configured)		
Update Rate	100 mS		
Accuracy	±20 mV over entire operating temperature range		
Resolution	5 mV		
Power Supply Rejection	0.5 mV/V		

Relay Modules All relays are free assignable to any channel.

Internal relay modes of operation	Off, Low, High, Window, Proportional Pulse, Pulse Width Modulation, USP, Volumetric, Pulse, Totalizer Volume, Advanced, % Rejection, % Recovery, % Passage
External relay modes of operation	Off, Low, High, Window, USP, Totalizer Volume, Advanced, % Rejection, % Recovery, % Passage
Hysteresis	User adjustable
Time Delay	0 to 6400 seconds
Advanced Relay	Use "AND/OR" logic along with relay sources to trigger a relay. High/Low modes available for each of the 3 sources
Solid State Relays	Non-mechanical switches
Normally Open/Closed Operation	Software selectable
Maximum Voltage Rating	30 VDC or 42 VAC p-p
Current Rating	50 mA DC or 50 mA AC RMS
On-state Impedance	30 Ω or less
Off-state Leakage	400 nA or less, AC or DC
Isolation	Up to 48 VAC/DC
Transient Protection	Embedded, up to 48 V over-voltage
Dry-contact Relays	Mechanical contacts
Type	SPDT
Form	C
Maximum Pulse Rate	600 pulses/min. (volumetric pulse & PWM modes) 400 pulses/min. (prop. Pulse mode)
Maximum Voltage Rating	30 VDC or 250 VAC
Current Rating	5 A

Shipping Weight

Base Unit	1.00 kg	2.25 lb
Power Module	0.12 kg	0.25 lb
I/O Module	0.12 kg	0.25 lb
Output Module	0.12 kg	0.25 lb
Relay Module	0.12 kg	0.25 lb

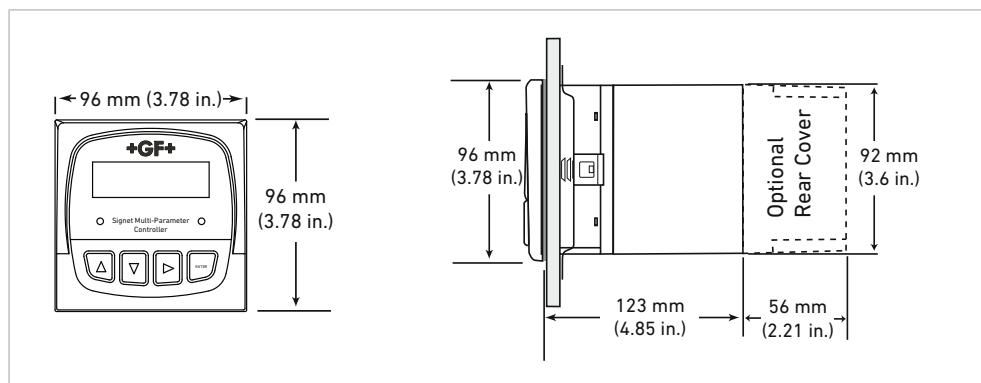
Standards and Approvals

CE, UL, FCC

RoHS compliant, China RoHS

Manufactured under ISO 9001 for Quality, ISO 14001 for Environmental Management and OHSAS 18001 for Occupational Health and Safety.

Dimensions

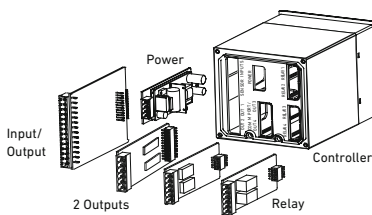


5.3 System Overview

Panel Mount

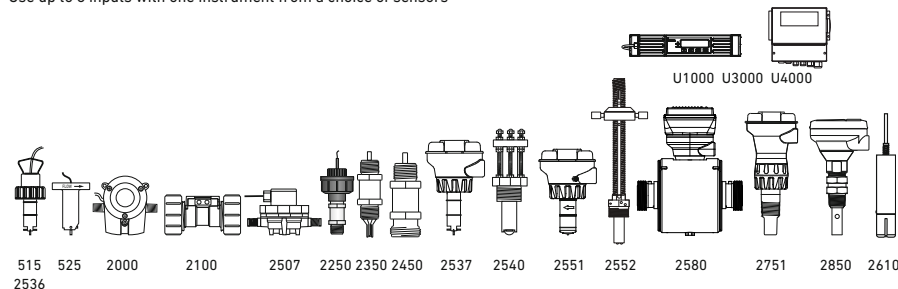
8900 Multi-Parameter Controller

Select from a choice of boards

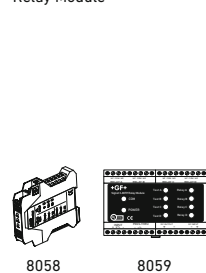


GF Signet Sensors

Use up to 6 inputs with one instrument from a choice of sensors



GF Signet Signal Converter / Relay Module



GF Signet Fittings - See individual sensor data sheets

All sold separately

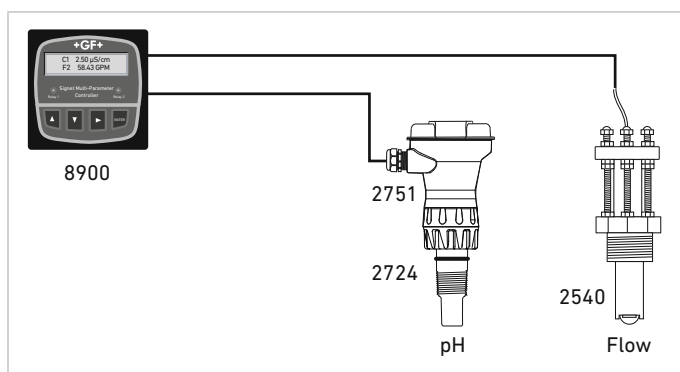
There are hundreds of system types that can be set up with the 8900. The examples below illustrate various sensors in different installation schemes. Wiring topology for point-to-point, daisy-chain, multi-drop, or a combination of these are listed in each example. Digital sensor outputs allow for long cable runs with high noise immunity. See Wiring section for allowable cable lengths.

Example 1

- 8900 input module: Two inputs
- Sensors connected: 2751 with 2724 pH sensors and 2540 flow (frequency)
- Wiring configuration: Point-to-point

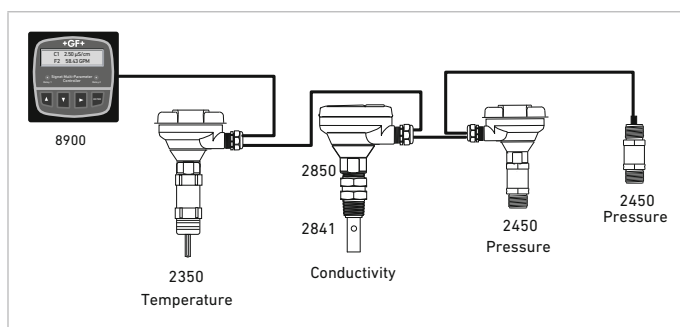
Notes

1. External relays can be used with any input module and does not consume a sensor input channel (Model 8059)
2. 8058 Signal Converter can be used with any input module



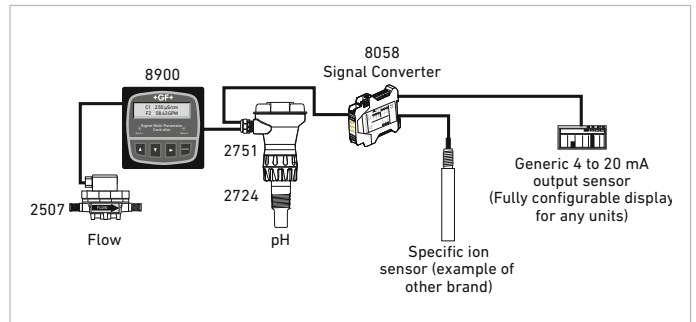
Example 2

- 8900 input module: Four inputs
- Sensors connected: 2350 temperature sensor, 2850 with 2841 conductivity, and two 2450 pressure sensors
- Wiring configuration: Daisy-chain



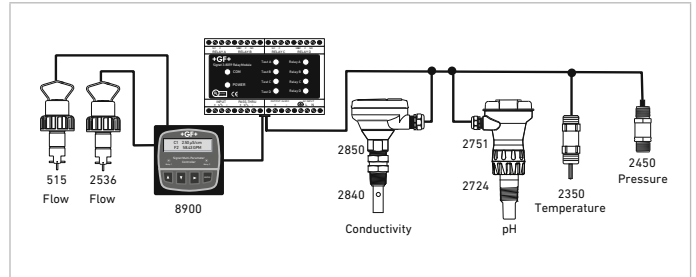
Example 3

- 8900 input module: Four inputs
- Sensors connected: 2507 flow (frequency) and 2751 with 2724 pH sensors; Other manufacturers' dissolved oxygen and level sensors with 4 to 20 mA output
- External Devices: 058 signal converter – 4 to 20 mA to digital (S³L)
- Wiring configuration: Combination of point-to-point and daisy-chain



Example 4

- 8900 input module: Six inputs
- Sensors connected: 2350 temperature sensor, 2850 with 2840 conductivity, 2450 pressure, 2751 with 2742 pH, and 515 and 2536 flow (frequency) sensors
- External Devices: 8059 external relay module
- Wiring configuration: Combination of point-to-point and Multi-drop



Wiring Options

- Point-to-point wiring is direct wiring of individual devices into the controller. This wiring topology is applicable for all inputs.
- Daisy-chain wiring allows sequential connection from one device to the next by using junction boxes. This wiring topology is applicable for digital (S³L) inputs only.
- Multi-drop wiring allows drops from a single bus cable. Junction boxes can be used for the 3-way junctions that are formed with this wiring scheme. This wiring topology is applicable for digital (S³L) inputs only.

5.3.1 Installation of Modules with the Base Unit

One base unit is required to build a functional 8900. It is offered with a backlit LCD display. Programming the unit is done simply via the push-button keypad.

The unit can be tailored to display in English, German, French, Spanish, Italian, and Portuguese. The two line display allows for easy programming, navigation, and viewing of each channel.

1. I/O module

One I/O module is required to build a functional 8900. I/O modules are offered for 2, 4, or 6 sensor inputs with or without two mA or voltage outputs. Users can select two additional outputs via the output module.

2. Power module

One power module is required to build a functional 8900. The power module is offered for universal 100/240 VAC or 12 to 24 VDC (This module can be powered by optional external relays (see ordering information for more details).

3. Output module

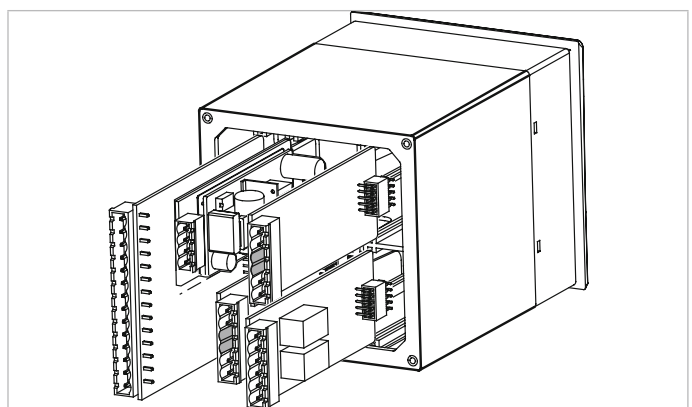
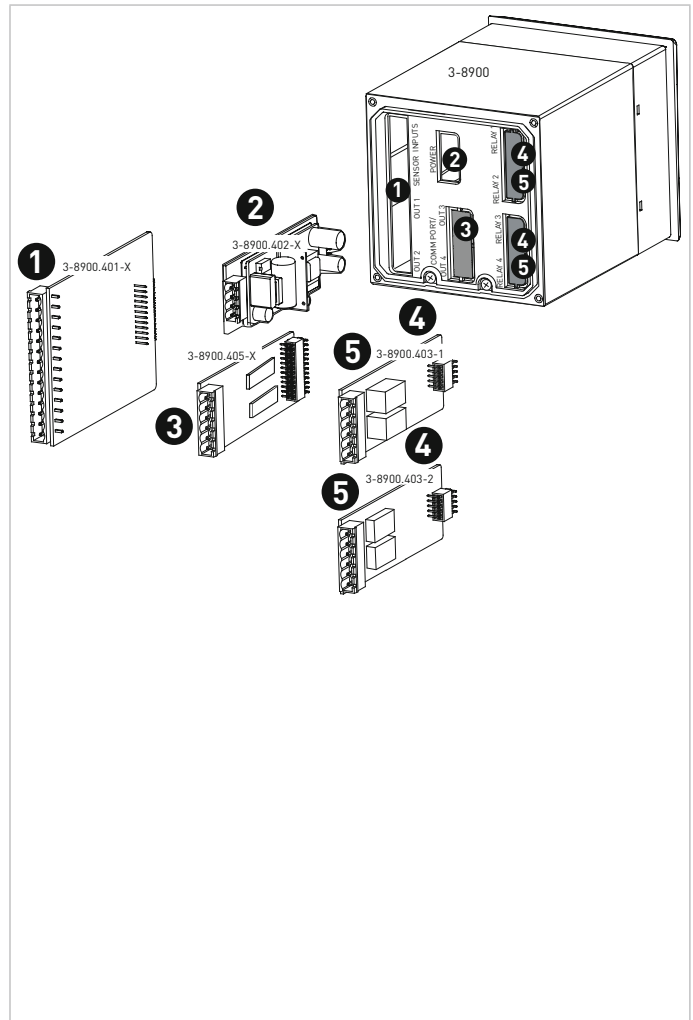
Output modules are optional when building an 8900. This module can be used in addition to other outputs that are available in the I/O modules. Active current is powered by the 8900. Passive outputs require an external 12 to 24 VDC power supply. All outputs are assignable to any input channel.

4. & 5. Relay modules

Relay modules are optional when building an 8900. Relay modes of operation include off, low, high, window, USP, totalizer volume, advanced, proportional pulse, pulse width modulation, volumetric pulse, % reject, % recovery and % passage. The advanced relay option for "AND/OR" logic is used for up to 3 conditions. For instance, a relay will go to high/low if "a" is true and "b" or "c" is false. One or two relay modules can be installed into the 8900. One additional external relay module can also be used at the same time (See optional external relay ordering information). All relays are assignable to any input channel.

Installation of Modules

Modules simply plug in by sliding into the base unit on rails. They are held securely in place by the rear cover. Changes and upgrades can be made in the field at any time.



5.4 Ordering information

Ordering notes

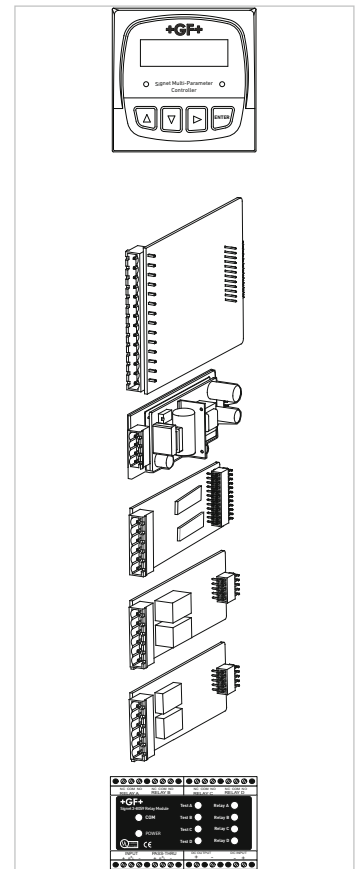
1. Building a functional unit requires a base unit, I/O module, and power module.
2. Output options are available on I/O modules and additional output modules can be used.
The 8900 can support up to four outputs.
3. The 8900 can support up to eight relays.
Up to two internal relay modules can be used simultaneously; additional external relays can also be used.
4. A maximum total of two frequency sensors can be used with any input card.
5. A total of six digit inputs or four digital inputs with two frequency inputs can be used.
6. The 8900 boards are field replaceable.
7. The 8900 can be reconfigured with new sensor types by simple reprogramming.

To build a functional 8900 controller, choose the base unit, power module, and input/output (I/O) module. Additional outputs and relays are available, if needed.

Base Units, Required		
3-8900	159 000 868	Base unit with back-lit LCD
I/O (input/output) Modules, Required; Choose One		
3-8900.401-1	159 000 870	Dual (2) Input (no outputs)
3-8900.401-2	159 000 871	Dual (2) Input with Two Passive* Loop Outputs
3-8900.401-3	159 000 872	Dual (2) Input with Two Active Loop Outputs
3-8900.401-4	159 000 873	Dual (2) Input with Two Voltage Outputs
3-8900.401-5	159 000 874	Quad (4) Input (no outputs)
3-8900.401-6	159 000 875	Quad (4) Input with Two Passive* Loop Outputs
3-8900.401-7	159 000 876	Quad (4) Input with Two Active Loop Outputs
3-8900.401-8	159 000 877	Quad (4) Input with Two Voltage Outputs
3-8900.401-9	159 000 968	Six Inputs (no outputs)
3-8900.401-11	159 000 970	Six Inputs with Two Active Loop Outputs
Power Modules, Required; Choose One		
3-8900.402-1	159 000 878	110/220 VAC Power Module, $\pm 10\%$, regulated
3-8900.402-2	159 000 879	12 to 24 VDC Power Module, $\pm 10\%$, regulated
Optional Output Modules – Choose One		
3-8900.405-1	159 000 883	Two Passive* Current Loop Outputs
3-8900.405-2	159 000 884	Two Active Current Loop Outputs
Optional Relay Modules – Choose One or Two		
3-8900.403-1	159 000 880	Two Dry Contact Relays
3-8900.403-2	159 000 881	Two Solid State Relays
Optional External Relays – Choose One**		
3-8059-4	159 000 772	Four dry-contact relays; requires 12 to 24 VDC $\pm 10\%$, regulated
3-8059-4AC	159 000 773	Four dry-contact relays, requires 100 to 240 VAC $\pm 10\%$, regulated; supplies power to the 12 to 234 VDC $\pm 10\%$, regulated power host device

* Passive outputs require an external power source

** See individual product page for the 8059 External Relay Modules.

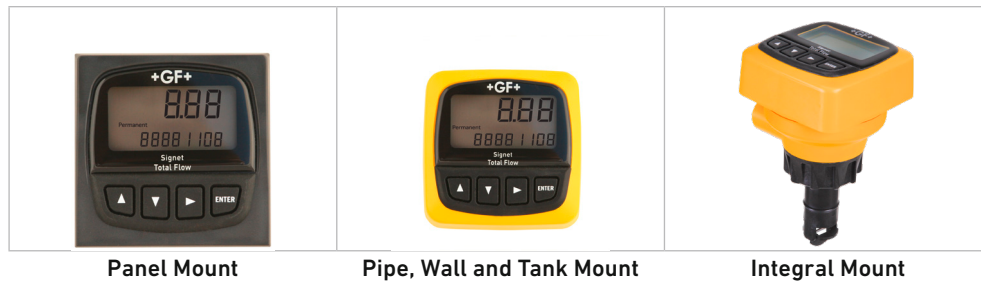


5.5 Accessories

Mfr.-Nr.	Code	Description
Mounting		
3-8050.392	159 000 640	¼ DIN retrofit adapter
3-8050.395	159 000 186	Splashproof rear cover
3-0000.596-1	159 000 892	¼ DIN wall mount bracket 6½ in. (use if no rear cover is installed)
3-0000.596-2	159 000 893	¼ DIN wall mount bracket, 9 in. (use if rear cover is installed)
3-5000.399	198 840 224	Panel adapter, 5 x 5 in. to ¼ DIN
3-5000.598	198 840 225	Surface mount bracket
3-9900.396	159 001 701	Angle adjustment adapter kit
Power Supplies		
7310-1024	159 873 004	24 VDC Power Supply, 10W, 0.42 A
7310-2024	159 873 005	24 VDC Power Supply, 24W, 1.0 A
7310-4024	159 873 006	24 VDC Power Supply, 40W, 1.7 A
7310-6024	159 873 007	24 VDC Power Supply, 60W, 2.5 A
7310-7024	159 873 008	24 VDC Power Supply, 96W, 4.0 A
Miscellaneous		
3-8050.396	159 000 617	RC filter kit (for relay use), 2 per kit

6 8150 Battery Powered Flow Totalizer

Member of the ProcessPro® Family of Instruments



6.1 Product description

The GF Signet 8150 Battery Operated Flow Totalizer is compatible with the GF Signet 515 and 525 flow sensors, and will provide years of dependable operation. The large digital display indicates flow rate and totalized flow volume simultaneously. One of the three totalizers is resettable from the front panel or a remote location, while the second resettable totalizer can only be reset by entering a user-selectable security code. The third is a permanent non-resettable totalizer.

Our intuitive software design and four-button keypad provide for simple operation while setting screen displays and programming the system. Calibration can be easily performed by entering the AutoCal feature and entering a value to match an external reference. Screen displays can be modified to suit the user's needs; along with the flow rate, any of the three totalizers can be selected as the displayed totalizer. Customers can quickly scroll through the totalizers simply by pressing any key on the keypad. A display averaging feature is included for applications where the flow in the pipe fluctuates. For applications where flow stops and starts due to production needs, a no-flow indicator will display the hours of non-flow.

Features

- Three totalizers: 2 resettable and 1 permanent, user-selectable
- Long-lasting lithium batteries
- Mounting versatility
- No-flow indicator
- Large digital display with averaging
- Simple push-button operation
- User-selectable access code prevents unwanted changes
- Auto-calibration



Applications

- Wastewater Flow Accumulation
- Water Treatment Systems
- Remote or Mobile Treatment/ Distribution Systems
- Irrigation Systems
- Filtration Systems
- Commercial Pools & Spas
- Groundwater Remediation
- R.O. Concentrate
- Process Flow Monitoring
- UPW Distribution
- Demineralizer Regeneration
- Process Cooling Water



The installation must be performed in accordance with the instruction manual.
The instruction manual is included with the product, see also online on
www.gfps.com/signet

6.2 Technical Details

General

Compatibility	GF Signet 515 and 525 flow sensors
Input Freq. Range	0 to 400 Hz
Accuracy	±0.5% of reading
Display	LCD type 4-digit upper line – flow rate 8-digit lower line – volume totalizer count, either resettable or permanent
Averaging	0 to 120 secs.
Contrast	Automatic
Low Battery Indication	Battery symbol appears on LCD display
8-digit Resettable Totalizers	Stored until user resets; continues to be stored even after batteries are removed
8-digit Permanent	Kept permanently, even when batteries are removed

Materials

Enclosure	PBT resin
Keypad	Sealed 4-key silicon rubber
Panel and Case Gasket	Neoprene
Window	Polyurethane coated polycarbonate

Electrical

Battery	Two 3.6 V Lithium thionyl chloride, AA-size
Battery Life	4 years nominal @ 50 °C (122 °F)

Environmental

Operating Temperature	-10 °C to 65 °C	14 °F to 149 °F
	-40 °C to 100 °C	-40 °F to 212 °F
Relative Humidity	0 to 95%, non-condensing	
Enclosure	NEMA 4X/IP65 (front face only on panel mount); field mount is 100% NEMA 4X/IP65	

Shipping Weight

	0.5 kg	1.1 lb
--	--------	--------

Standard and Approvals

	CE, FCC, UL, CUL
	RoHS compliant, China RoHS
	Manufactured under ISO 9001 for Quality and ISO 14001 for Environmental Management and OHSAS 18001 for Occupational Health and Safety

Dimensions

3-8150-1P – Panel Mount

3-8150-1 with Universal Mount

Model 515 Integral Mount Sensors - see 515 data sheet for specifications

<p>Panel Mount</p> <p>96 mm (3.8 in.)</p> <p>96 mm (3.8 in.)</p> <p>41 mm (1.6 in.)</p> <p>56 mm (2.2 in.)</p> <p>97 mm (3.8 in.)</p> <p>Optional Splashproof Rear Cover</p> <p>92 mm (3.6 in.)</p>	<p>82 mm (3.23 in.)</p> <p>64 mm (2.5 in.)</p> <p>106 mm (4.2 in.)</p> <p>42 mm (1.7 in.)</p>	<p>102 mm (4.0 in.)</p> <p>-X0 or -X1</p> <p>-X0 = 152 mm (6.0 in.)</p> <p>-X1 = 185 mm (7.3 in.)</p>
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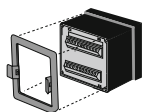
6.3 System Overview

Panel Mount

Pipe, Tank, Wall

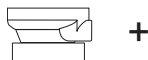
8150 Flow Totalizer

includes mounting bracket and panel gasket



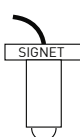
8150 Flow Totalizer

with 3-8050 Universal Mount Kit

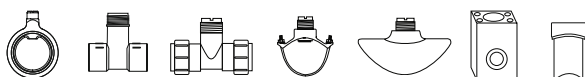


GF Signet Sensors

- 515
- 525



GF Signet Fittings



All sold separately

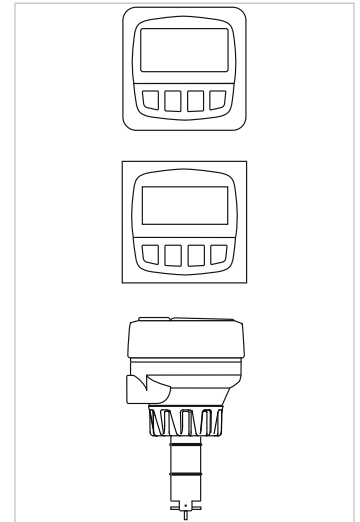
6.4 Ordering information

Ordering Notes

- For panel version, cutout must be 92 x 92 mm (3.62 x 3.62 in.)
- To mount the panel version on a wall, use the heavy duty wall mount bracket.
- Use the Universal mounting kit with the Field mount instrument to mount to a pipe, tank or wall.
- An optional splashproof rear cover can be ordered separately if needed.

Mfr. Part No.	Code	Mounting Notes
Battery Operated Flow Totalizer		
Field Mount (yellow body)		
3-8150-1	159 000 929	Field mount for pipe, tank, and wall mounting
Panel Mount (black body)		
3-8150-1P	159 000 930	Panel mount; includes mounting bracket and panel gasket
Integral Mount		
for ½ to 4 in. pipes		
3-8150-P0*	159 000 931	Mounted on Model 515 Paddlewheel (Part No. 3-8150-P0), w/polypropylene body, black Polypropylene retaining nut, Black PVDF rotor, and Titanium pin
3-8150-T0*	159 001 011	Mounted on Model 515 Paddlewheel (Part No. 3-8150-T0), with a natural PVDF body, natural PVDF retaining nut, rotor and pin
for 5 to 8 in. pipes		
3-8150-P1*	159 000 932	Mounted on Model 515 Paddlewheel (Part No. 3-8150-P1), w/polypropylene body, black Polypropylene retaining nut, Black PVDF rotor, and Titanium pin

* See individual sensor sheets for more sensor information.



6.5 Accessories

Mfr. Part	Code	Description
Mounting		
3-8050	159 000 184	Universal mounting kit
3-8050.390-1	159 001 702	Retaining Nut Replacement Kit, NPT, Valox
3-8050.390-3	159 310 116	Retaining Nut Replacement Kit, NPT, PP
3-8050.390-4	159 310 117	Retaining Nut Replacement Kit, NPT, PVDF
3-0000.596	159 000 641	Heavy duty wall mount bracket (panel mount only)
3-5000.399	198 840 224	Panel adapter, 5 x 5 in. to ¼ DIN
3-5000.598	198 840 225	Surface mount bracket (panel mount only)
3-8050.395	159 000 186	Splashproof rear cover (panel mount only)
3-9900.396	159 001 701	Angle adjustment adapter kit
Liquid Tight Connectors		
3-9000.392	159 000 368	Liquid tight connector kit (include 3 connectors)
3-9000.392-1	159 000 839	Liquid tight connector, NPT (1 connector)
3-9000.392-2	159 000 841	Liquid tight connector, PG 13.5 (1 connector)
Other		
7400-0011	159 000 935	Lithium battery, 3.6 V, size AA (2 required)
5523-0222	159 000 392	Cable (per foot), 2 cond. w/shield, 22 AWG
Replacement Parts for Integral Mount Units – see Model 515 catalog pages for information		
3-8051	159 000 187	Flow Sensor Integral Mounting Kit, NPT, Valox
3-8051-1	159 001 755	Flow Sensor Integral Mounting Kit, NPT, PP
3-8051-2	159 001 756	Flow Sensor Integral Mounting Kit, NPT, PVDF
3-8510-P0	198 864 504	Sensor for ½ to 4 in. pipes, Polypropylene body
3-8510-PI	198 864 505	Sensor for 5 to 8 in. pipes, Polypropylene body
3-8510-T0	159 000 622	Sensor for ½ to 4 in. pipes, all natural PVDF
3-8510-V0	198 864 506	Sensor for ½ to 4 in. pipes, PVDF body

Planning Fundamentals of Valves and Automation

Measurement and Control - Flow Sensors

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1 Technical basics - Flow Sensors

1.1 Flow system compatibility

The chart below outlines the compatibility between GF Signet Flow sensors, instruments and sensor fittings. Refer to individual product pages for more information.

Instruments	Flow Sensors										
	515	2536	2537	525	2000	2507	2100	2540	2551	2552	2581
8150 Battery Powered Flow Totalizer	✓			✓							
8900 Multi-Parameter Controller	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
9900 Transmitter	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
9900-IBC Batch Controller	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
9950 Dual Channel Transmitter	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Fittings - Customer Supplied											
1/4 inch tubing or rigid pipe					✓	✓					
Wide choice of end connectors - see individual data sheet							✓				
1 1/4 inch NPT or ISO 7/1-R 1 1/4								✓		✓	
1 1/2 inch NPT or ISO 7/1-R 1 1/2								✓		✓	
GF Fittings											
Metric PP Wafer EPR (EPDM)	✓	✓	✓						✓		
Metric PP Wafer (FKM)	✓	✓	✓						✓		
Metric PP Union Tee	✓	✓	✓						✓		
Metric PVDF Union Tee	✓	✓	✓						✓		
Metric PVDF Wafer (FKM)	✓	✓	✓						✓		
PVC SCH 80 Tee	✓	✓	✓						✓		
PVC SCH 80 Tee w/pipe	✓	✓	✓						✓		
PVC-C SCH 80 Tee	✓	✓	✓						✓		
PVC-C SCH 80 Tee w/pipe	✓	✓	✓						✓		
PVC Clamp-on Saddle	✓	✓	✓						✓		
Fiberglass Glue-On Tee	✓	✓	✓						✓		
Iron Threaded Tee (NPT)	✓	✓	✓						✓		
Iron Strap-On Saddle	✓	✓	✓						✓		
Copper Sweat-On Tee	✓	✓	✓						✓		
Brass Brazolet	✓	✓	✓						✓		
Carbon Steel Tee (NPT)	✓	✓	✓						✓		
Carbon Steel Weldolet	✓	✓	✓						✓		
316 SS Threaded Tee (NPT)	✓	✓	✓						✓		
316 SS Weldolet	✓	✓	✓						✓		
Metalex Socket Weld				✓							
Metalex Weld-On Mini-Tap				✓							
PVC Glue-On Large Saddle	✓	✓	✓						✓		
Brass Threaded Tee (NPT)	✓	✓	✓						✓		
Metric/BSP PVC Union Tee*	✓	✓	✓						✓		
Metric/BSP PVC Saddle*	✓	✓	✓						✓		
Plastic Weld-On Fittings (PVC)	✓	✓	✓						✓		
Plastic Weld-On Fittings (PP)	✓	✓	✓						✓		
Plastic Weld-On Fittings (PE)	✓	✓	✓						✓		
Steel Weld-On Fittings (SS 1.4435)	✓	✓	✓								
Electrofusion Transition Saddles								✓		✓	
Strap-on Saddles, Threaded								✓		✓	

* Available only through your local Georg Fischer sales office.

1.2 Technical reference - Flow

1.2.1 Velocity-based flow measurement technologies

All of the flow sensors belong to the broad category of velocity-based flow measurement devices. This vast offering includes paddlewheel, electromagnetic, in-line rotor, and turbine flow sensors. Principles of operation vary considerably for each type, but some very important installation considerations are common throughout. The following discussion, plus the general selection guidelines should help the user choose the appropriate sensor type to obtain optimal flow measurement results.

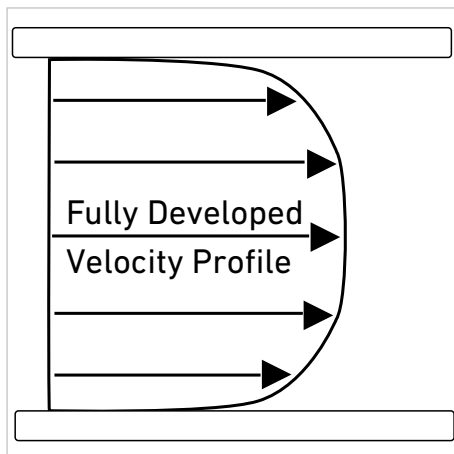


All manuals, data sheets, and additional information are available at www.gfGF-Signet.com

Fully Developed Turbulent Flow

Velocity-based flow sensors depend on fully developed turbulent flow for accurate and repeatable measurements. Fully developed turbulent flow occurs in Newtonian fluids with a Reynolds Number (Re) greater than 4,500. Low flow rates, viscous liquids, and large pipe sizes make fully developed turbulent flow more difficult to achieve. The opposite is also true. That is, for a given set of conditions, simply reducing the pipe size to increase the local flow velocity will produce a higher Reynolds Number.

Re: Reynolds Number



$$Re = 3,162.76 \cdot Q \cdot Sg / (\mu \times ID)$$

Q Flow Rate in GPM

Sg Specific Gravity

μ Dynamic Viscosity in Centipoise (cP)

ID Pipe Inside Diameter in Inches

OR

$$Re = DN \cdot V / \nu$$

DN Pipe Inside Diameter (m)

V Flow Velocity (m/s)

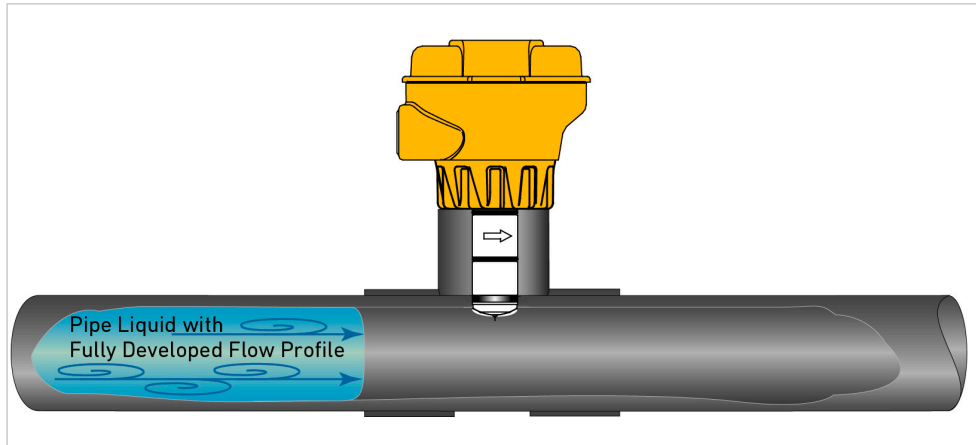
ν Kinematic Viscosity (m²/s)

(ν of water = 1 x 10⁻⁶ m²/s)

1.2.2 Principles of operation

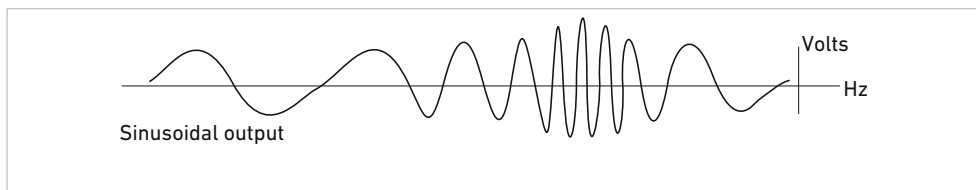
Electromagnetic flow sensors

Electromagnetic flow sensors, like GF Signet Models 2551 and 2552, operate on Faraday's principle of electromagnetic induction, and have no moving parts. As fluid (must be conductive $>20 \mu\text{S}$) moves through the magnetic field produced at the sensor tip, a voltage occurs that is directly proportional to the fluid velocity. Internal electronics then convert this voltage into a frequency and/or a 4 to 20 mA output. GF Signet electromagnetic flow sensors are insertion-style, suitable for use in a wide range of pipe sizes.

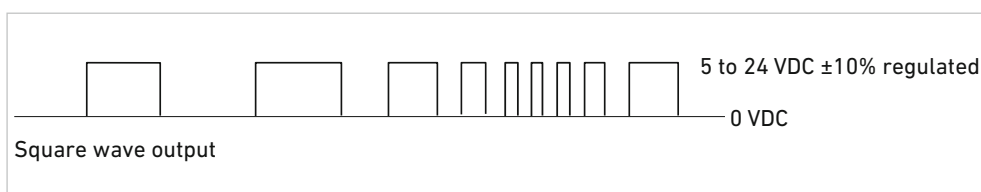
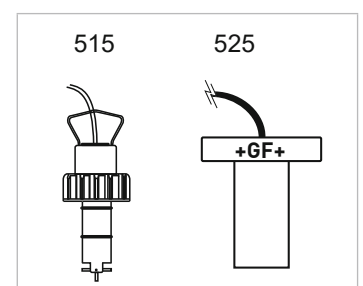


Paddlewheel flow sensors

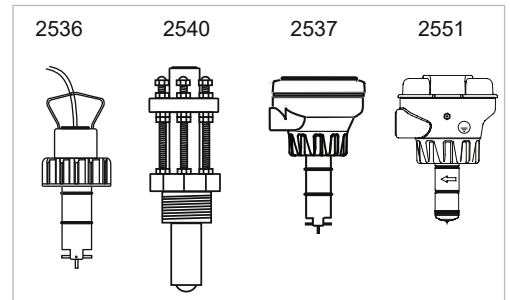
Paddlewheel flow sensors are insertion devices, mounted perpendicular to the piping system, and rely upon the energy in the flow stream to spin a rotor (paddlewheel) around a stationary shaft. Most paddlewheel flow sensors utilize rotors with magnets embedded in each blade. The magnets are typically used either in conjunction with a coil internal to the sensor housing to produce a sinusoidal output (selfgenerating, non-powered sensors), or to trigger an internal electronic switch to produce a square-wave output (transistor-type, powered sensors). Either way, the resulting frequency is directly proportional to the fluid velocity.



- 1 Sinusoidal sensors output a signal typical of selfgenerating, non-powered paddlewheel sensors such as the Model 515 or 525. The frequency and amplitude (voltage) both vary directly with flow rate.

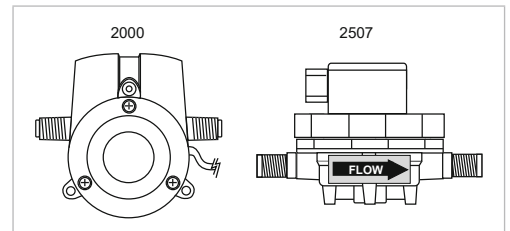


- 2 Transistor-type sensors output a signal typical of powered sensors such as the Model 2536, 2540, and all other GF Signet powered flow sensors with frequency output.



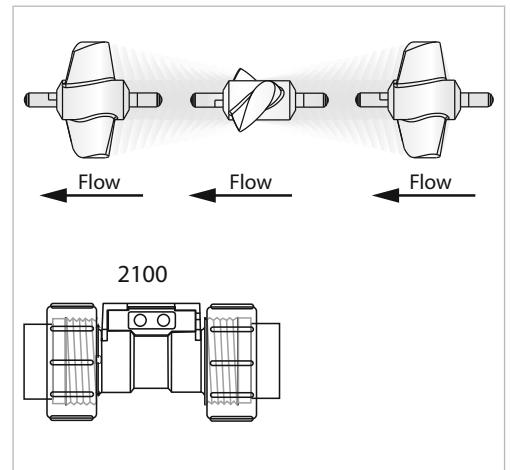
In-Line Rotor flow sensors

In-Line Rotor flow sensors like the GF Signet Models 2000 and 2507 are similar to paddlewheel sensors, except the rotor is positioned in a flow cell. These types of sensors have a transistor-type output signal and are able to measure lower flow rates.



Turbine flow sensors

Turbine flow sensors are full-bore devices designed for low-flow measurements. GF Signet Model 2100 is offered in 6.4 mm and 12.7 mm (¼ in. and ½ in.) line sizes. Many self-aligning end-connector options are available for installation simplicity and application versatility. Similar to paddlewheels, they rely upon the energy in the flow stream to spin a rotor (turbine). The difference is that the shaft is in the centre of, and parallel to, the flow stream. The velocity of the fluid spins the turbine for detection by external electronic circuitry, producing a transistor-type square wave output with a frequency directly proportional to the flow rate.

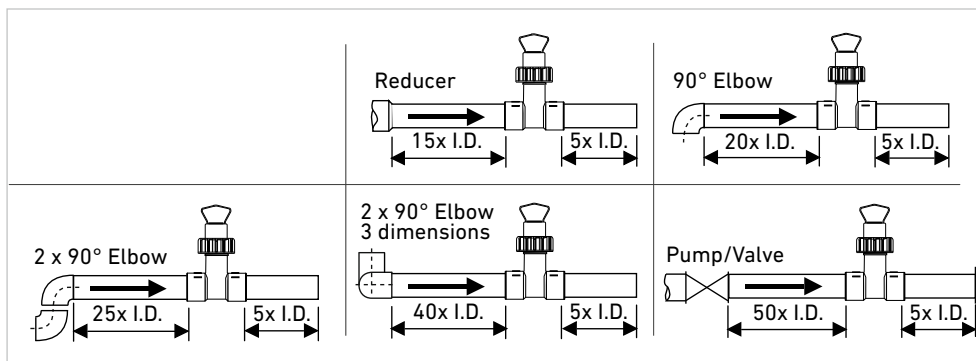


2 Paddlewheel

2.1 Technical basics

Piping location

- The correct location of the sensor in the piping system helps to ensure a proper flow profile in the pipe. It is important to have sufficient straight pipe immediately upstream of the sensor to create “fully developed turbulent flow.” Such a flow profile provides the stability required for the paddlewheel to measure accurately.
- The diagrams below illustrate the minimum distances that are recommended to mount plastic and metal paddlewheel sensors.
- In all scenarios, it is recommended to choose a location with as much straight, uninterrupted pipe length upstream of the sensor as possible. Always use synthetic grease on O-rings.

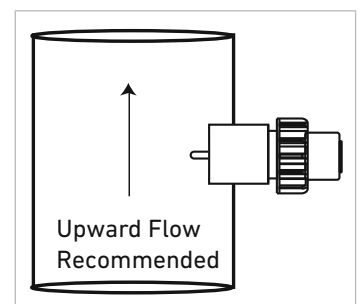


Mounting angle

Paddlewheel sensors are affected by the mounting angle due to the effect of gravity increasing the friction between rotor and bearing surfaces. Air entrapment and sediments within the pipe may also adversely affect sensing accuracy and/or impede operation.

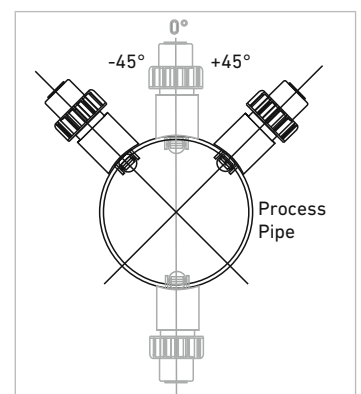
Paddlewheels in Vertical Pipes

- Mount the sensor in a pipe with an upward flow. This position is recommended for all scenarios, as it ensures a full pipe.
- Vertical installations with downward flow are not recommended.



Paddlewheels in Horizontal Pipes

- Recommended sensor mounting angle is $\pm 45^\circ$ from vertical to avoid air bubbles (pipe must be full). With the sensor at greater angles, the drag created by the rotor resting against the sensor body may compromise performance at the lower end of the operating range.
- Straight up installations may experience interference from entrained air at the top of the pipe.
- Inverted installations are often subject to blockage due to sediments in the pipe. Mounting sensors in the bottom of the pipe is NOT recommended if sediments are likely to be in the pipe.



K-Factors

K-Factors are calibration values (pulses per unit of volume) used to convert flow sensor output frequencies to flow rates. GF Signet publishes K-Factors for water only in gallons (pulses per gallon) and liters (pulses per liter) for all sensors, in all applicable pipe sizes and materials, and/or all applicable installation fitting sizes and materials. K-Factors for fluids other than water must be determined empirically, typically on-site using a secondary standard.

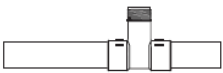





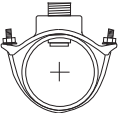
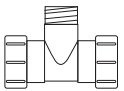


K-Factors are published for pipe sizes of DN15 to DN300 (½ in. to 12 in.). For other pipe sizes, statistical K-Factors may be available. Contact Technical Support for more information.

Installation fittings

515, 2536 and 2537 Rotor-X

This section outlines the installation fittings available from GF Signet for the 515, 2536 and 2537 Rotor-X family of flow sensors. The fitting controls the location of the paddlewheel inside the pipe, which in turn determines the calibration constant (K-Factor).

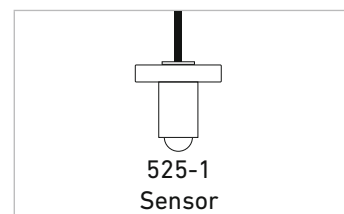
Type	Description	Type	Description
 <p>Plastic Tees</p>	<ul style="list-style-type: none"> 0.5 to 2 inch versions PVC or PVC-C Available with or without pipe extensions 	 <p>Iron, Carbon Steel, 316 SS Threaded Tees</p>	<ul style="list-style-type: none"> 0.5 to 2 in. versions Mounts on threaded pipe ends Wetted PVDF insert
 <p>PVC Glue-on Saddles</p>	<ul style="list-style-type: none"> Available in 10 and 12 inch sizes only Cut 2-1/2 inch hole in pipe Weld in place using solvent cement 	 <p>Carbon Steel & Stainless Steel Weld-on Weldolets</p>	<ul style="list-style-type: none"> 2 to 4 inch, cut 1-7/16 inch hole in pipe Over 4 inch, cut 2-1/8 inch hole in pipe 1.5 in. to 8 in. PVDF insert >8 in. PVC insert
 <p>Clamp-on Saddles</p>	<ul style="list-style-type: none"> 2 to 4 inch, cut 1-7/16 inch hole in pipe 6 to 8 inch, cut 2-1/8 inch hole in pipe 	 <p>Fiberglass Tees</p>	<ul style="list-style-type: none"> 1.5 in. to 2 in. PVDF insert
 <p>Iron Strap-on Saddles</p>	<ul style="list-style-type: none"> 2 to 4 inch, cut 1-7/16 inch hole in pipe Over 4 inch, cut 2-1/8 inch hole in pipe Special order 12 in. to 36 in. 2 inch to 8 in. PVDF insert >8 in. PVC insert 	 <p>Metric Union Fitting</p>	<ul style="list-style-type: none"> For pipes from DN15 to 50 mm PP or PVDF Socket fusion equipment required

525 Metalex

This section outlines the installation fittings available from GF Signet for the 525 Metalex family of flow sensors. The fitting controls the location of the paddlewheel inside the pipe, which in turn determines the calibration constant (K-Factor).

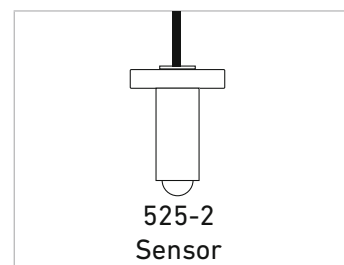
525-1 Metalex Flow Sensor

The smallest Metalex Flow Sensor (525-1) must be installed into a specially constructed tee fitting with socket-weld piping connections.



525-2 Metalex Flow Sensor

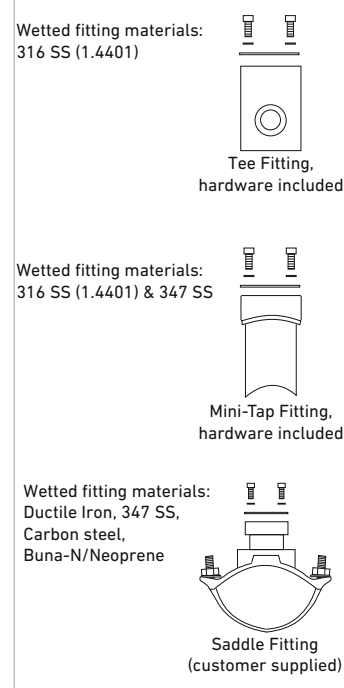
Use the 525-2 and one of these weld-on fittings for stainless steel pipes from DN32 (1¼ inches) up to DN300 (12 inches) in diameter.



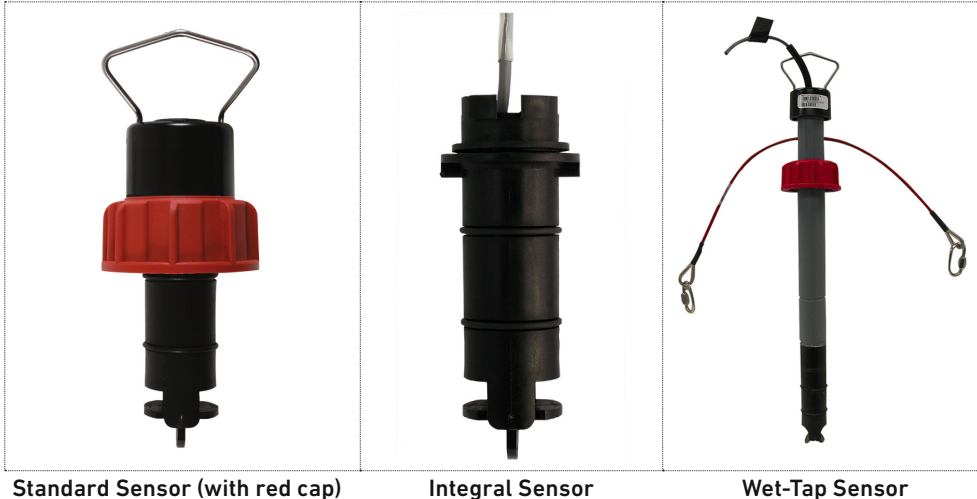
Consult a qualified welder to install Metalex fittings. Use of saddle fittings reduces the pressure rating for the 525 sensor.

Fixed Depth

The insertion depth of a paddlewheel in a flow stream is critical and must be achieved and maintained to ensure accurate flow measurements. GF Signet installation fittings for Rotor-X and Metalex paddlewheel flow sensors set this depth automatically and facilitate the use of convenient K-Factors (calibration values) published in individual sensor instruction manuals. The H-dimension controls the insertion depth and they are critical for proper seating of the flow sensor into the pipe. These dimensions can be found listed in the flow sensor instruction manuals.



2.2 515 Rotor-X Paddlewheel Flow Sensors



2.2.1 Product description

Simple to install with time-honored reliable performance, GF Signet 515 Rotor-X Paddlewheel Flow Sensors are highly repeatable, rugged sensors that offer exceptional value with little or no maintenance. The wide dynamic flow range of 0.3 to 6 m/s (1 to 20 ft/s) allows the sensor to measure liquid flow rates in full pipes and can be used in low pressure systems.

The Model 515 sensors are offered in a variety of materials for a wide range of pipe sizes and insertion configurations. The many material choices including PP and PVDF make this model highly versatile and chemically compatible to many liquid process solutions. Sensors can be installed in up to DN900 (36 in.) pipes using GF Signet's comprehensive line of custom fittings. These custom fittings, which include tees, saddles, and weldolets, seat the sensor to the proper insertion depth into the process flow. The sensors are also offered in configurations for wet-tap installation requirements.

Features

- Operating range 0.3 to 6 m/s (1 to 20 ft/s)
- Wide turndown ratio of 20:1
- Highly repeatable output
- Simple, economical design
- Installs into pipe sizes DN15 to DN900 (½ to 36 in.)
- Self-powered/no external power required
- Test certificate included for -X0, -X1
- Chemically resistant materials



Applications

- Pure Water Production
- Filtration Systems
- Chemical Production
- Liquid Delivery Systems
- Pump Protection
- Scrubber Systems
- Water Monitoring
- Not suitable for gases

2.2.2 Specifications

General

Operating Range	0.3 to 6 m/s	1 to 20 ft/s
Pipe Size Range	DN15 to DN900	½ to 36 in.
Linearity	±1% of max. range @ 25 °C (77 °F)	
Repeatability	±0.5% of max. range @ 25 °C (77 °F)	
Min. Reynolds Number Required	4500	

Wetted Materials

Sensor Body	Glass-filled PP (black) or PVDF (natural)	
O-rings	FKM (std), optional EPDM (EPDM) or FFKM	
Rotor Pin	Titanium, Hastelloy-C or PVDF; optional Ceramic, Tantalum, or Stainless Steel	
Rotor	Black PVDF or Natural PVDF; optional ETFE, with or without carbon fiber reinforced PTFE sleeve	

Electrical

Frequency	19.7 Hz per m/s nominal	6 Hz per ft/s sinusoidal
Amplitude	3.3 V p/p per m/s nominal	1 V p/p per ft/s
Source Impedance	8 KΩ	
Cable Type	2-conductor twisted pair with shield, 22 AWG	
Cable Length	7.6 m (25 ft) can be extended up to 60 m (200 ft) maximum	

Max. Temperature/Pressure Rating - Standard and Integral Sensor

PP	12.5 bar @ 20 °C	181 psi @ 68 °F
	1.7 bar @ 90 °C	25 psi @ 194 °F
PVDF	14 bar @ 20 °C	203 psi @ 68 °F
	1.4 bar @ 100 °C	20 psi @ 212 °F

Operating Temperature

PP	-18 °C to 90 °C	0 °F to 194 °F
PVDF	-18 °C to 100 °C	0 °F to 212 °F

Max. Temperature/Pressure Rating - Wet-Tap Sensor

PP	7 bar @ 20 °C	102 psi @ 68 °F
	1.4 bar @ 66 °C	20 psi @ 150 °F

Operating Temperature

	-18 °C to 66 °C	0 °F to 150 °F
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Max. Wet-Tap Sensor Removal Rating

	1.7 bar @ 22 °C	25 psi @ 72 °F
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Shipping Weight

P51530-X0	0.454 kg	1.00 lb
P51530-X1	0.476 kg	1.05 lb
P51530-X2	0.680 kg	1.50 lb
P51530-X3	0.780 kg	1.72 lb
P51530-X4	0.800 kg	1.76 lb
P51530-X5	0.880 kg	1.94 lb
3-8510-X0	0.23 kg	0.50 lb
3-8510-X1	0.23 kg	0.50 lb

Standards and Approvals

RoHS compliant, China RoHS
Lloyd's Register Type Approval, NSF (P51530-PX version only)
Manufactured under ISO 9001 for Quality and ISO 14001 for Environmental Management and OHSAS 18001 for Occupational Health and Safety

See pressure-temperature diagrams for more information

Dimensions

Standard Mount	Field (Integral) Mount	Wet-Tap Mount Sensor with 3519 Wet-Tap Valve
	(shown with Transmitter, sold separately)	(See 3519 product page for more information).
Pipe range	Pipe range	Pipe range
0.5 to 4 in. -X0 = 104 mm (4.1 in.)	0.5 to 4 in. -Y0 = 152 mm (6.0 in.)	0.5 to 4 in. -P3 = 297 mm (11.7 in.)
5 to 8 in. -X1 = 137 mm (5.4 in.)	5 to 8 in. -Y1 = 185 mm (7.3 in.)	5 to 8 in. -P4 = 333 mm (13.1 in.)
10 in. and up -X2 = 213 mm (8.4 in.)		10 in. and up -P5 = 409 mm (16.1 in.)

2.2.3 System Overview

Panel Mount	Pipe, Tank, Wall Mount	Field (Integral) Mount	Automation System
GF Signet Instruments - 8150 - 8900 - 9900 - 9900-1BC - 9950 	GF Signet Instruments - 9900-1P with Rear Enclosure - 9900-1BC with Rear Enclosure - 9900 with 3-8050-1 Universal Mount Kit or 3-8052-1 Integral Mount Kit - 9950 with 3-8050-1 Universal Mount Kit or 3-8052-1 Integral Mount Kit 	GF Signet Instruments - 8150 - 9900-1 with 3-8051-X Integral Mount Kit 	- 0486 Profibus Concentrator and Customer Supplied Programmable Logic Controller or Programmable Automation Controller
GF Signet 515 Standard, Wet-Tap or 8510 Integral Mount Flow Sensors 			
GF Signet Fittings 			

All sold separately

For overview of Wet-Tap System, see 3519 product page

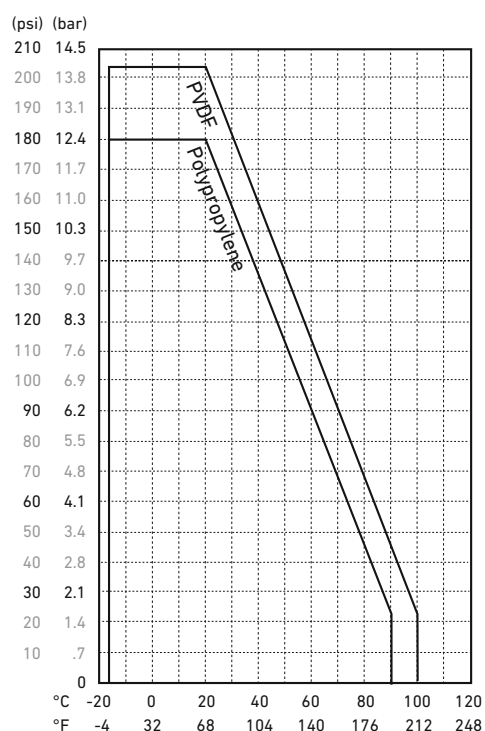
Application Tips

- Use the Conduit Adapter Kit to protect the cable-to-sensor connection when used in outdoor environments. See Accessories section for more information.
- Use a sleeved rotor in abrasive liquids to reduce wear.
- Sensor plug can be used to plug installation fitting after extraction of sensor from pipe.
- For liquids containing ferrous particles, use GF Signet Magmeters.
- For systems with components of more than one material, the maximum temperature/pressure specification must always be referenced to the component with the lowest rating.

Pressure-temperature diagrams

Note

The pressure-temperature diagrams are specifically for the GF Signet sensor. During system design the specifications of all components must be considered. In the case of a metal piping system, a plastic sensor will reduce the system specification. When using a PVDF sensor in a PVC piping system, the fitting will reduce the system specification.



2.2.4 Ordering information

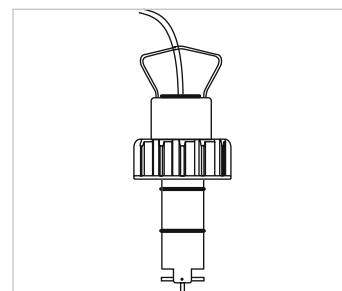
Ordering notes

1. Most common part number combinations shown. For all other combinations contact factory.
2. Other rotor and pin materials are available for purchase from the factory and can be easily replaced in the field. See Accessories section.

Model 515 Standard Mount Paddlewheel

When choosing this style of sensor, the instrument is mounted directly onto the sensor for a local display. See guideline below for instructions.

Mfr. Part No.	Code	Body	Rotor	Pin Material
Paddlewheel Flow Sensor for use with remote mount instrument				
DN15 to DN100 - ½ to 4 in.				
P51530-H0	198 801 659	Polypropylene	Black PVDF	Hastelloy-C
P51530-P0	198 801 620	Polypropylene	Black PVDF	Titanium
P51530-S0	198 801 661	Polypropylene	Black PVDF	Natural PVDF
P51530-T0	198 801 663	Natural PVDF	Natural PVDF	Natural PVDF
P51530-V0	198 801 623	Natural PVDF	Natural PVDF	Hastelloy-C
Pipe size DN125 to DN200 - 5 to 8 in.				
P51530-P1	198 801 621	Polypropylene	Black PVDF	Titanium
P51530-T1	198 801 664	Natural PVDF	Natural PVDF	Natural PVDF
P51530-V1	198 801 624	Natural PVDF	Natural PVDF	Hastelloy-C
Pipe size DN250 - DN900 - 10 to 36 in.				
P51530-P2	198 801 622	Polypropylene	Black PVDF	Titanium
P51530-V2	198 801 625	Natural PVDF	Natural PVDF	Hastelloy-C



Model 515 Integral Mount Paddlewheel

When choosing this style of sensor, the instrument is mounted directly onto the sensor for a local display. See guideline below for instructions.

Mfr. Part No.	Code	Body	Rotor	Pin Material
Flow sensor for integral mounting on the 8150, 8850 or 9900 instrument using the 3-8051-X flow sensor integral mounting kit (sold separately)				
DN15 to DN100 - ½ to 4 in.				
3-8510-P0	198 864 504	Polypropylene	Black PVDF	Titanium
3-8510-T0	159 000 622	Natural PVDF**	Natural PVDF	Natural PVDF**
3-8510-V0	198 864 506	Natural PVDF**	Natural PVDF**	Hastelloy-C**
DN125 to DN200 - 5 to 8 in.				
3-8510-P1	198 864 505	Polypropylene	Black PVDF	Titanium

** PVDF available ½ in. to 4 in. only

Combining a 515 Integral mount flow sensor with an integrally mounted instrument

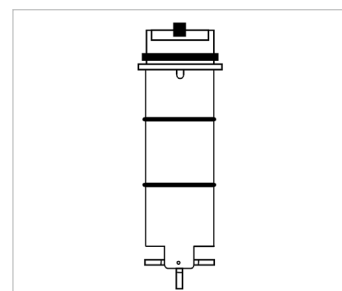
Option 1

Once an integral mount sensor is chosen, it can be mounted directly to a field mount transmitter by following these guidelines:

1. Order the 3-8051-X flow sensor integral mounting kit (sold separately) to connect the sensor to an instrument.
2. Order a field mount transmitter (sold separately). The following part numbers are compatible: 3-8150-1, 3-9900-1.
3. Assembling the sensor with the integral adapter and instrument is quick and simple.

Option 2

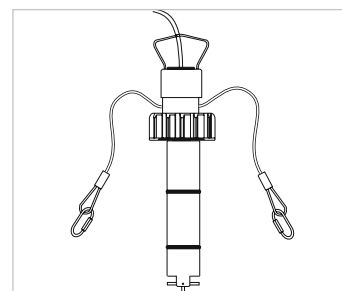
These parts can also be ordered as an assembled part. See "Integral Mount" for more information.



Model 515 Wet-Tap Mount Paddlewheel Flow Sensor

When choosing this style of sensor, the instrument can be mounted nearby on a pipe or wall or in a remote location up to 61 m (200 ft) by connecting the sensor through a standard 3-8050-1 universal junction box. Standard cable length is 7.6 m (25 ft). This style of sensor uses the 3519 Wet-Tap valve only (see individual product page for more information).

Mfr. Part No.	Code	Body	Rotor	Pin Material
Flow Sensor for wet-tap mounting with the 3519 Wet-Tap Valve (sold separately)				
DN15 to DN100 - ½ to 4 in.				
P51530-P3	198 840 310	Polypropylene	Black PVDF	Titanium
DN125 to DN200 - 5 to 8 in.				
P51530-P4	198 840 311	Polypropylene	Black PVDF	Titanium
DN250 to DN900 - 10 to 36 in.				
P51530-P5	198 840 312	Polypropylene	Black PVDF	Titanium



Combining a 515 Wet-Tap Sensor with a 3519 Wet-Tap Valve:

1. Sensor can be mounted in a 3519 Wet-Tap Valve (sold separately)
2. Assembling a sensor with a 3519 Wet-Tap valve is quick and simple. These parts can also be ordered as complete assemblies. See 3519 product page.

Please refer to Wiring, Installation, Accessories and Fitting section for more information.

2.2.5 Accessories and Replacement Parts

Mfr. Part No.	Code	Description
Rotors		
M1538-2	198 801 181	Rotor, PVDF Black
M1538-4	198 820 018	Rotor, ETFE
3-0515.322-1	198 820 059	Sleeved rotor, PVDF Black
3-0515.322-2	198 820 060	Sleeved rotor, PVDF Natural
3-0515.322-3	198 820 017	Sleeved rotor, ETFE
Rotor Pins		
M1546-1	198 801 182	Pin, Titanium
M1546-2	198 801 183	Pin, Hastelloy-C
M1546-3	198 820 014	Pin, Tantalum
M1546-4	198 820 015	Pin, Stainless Steel
P51545	198 820 016	Pin, Ceramic
O-Rings		
1220-0021	198 801 000	O-ring, FKM (2 required per sensor)
1224-0021	198 820 006	O-ring, EPR (EPDM) (2 required per sensor)
1228-0021	198 820 007	O-ring, FFKM (2 required per sensor)
Miscellaneous		
P31536	198 840 201	Sensor plug, Polypropylene
P31542	198 801 630	Sensor cap, Red
P31934	159 000 466	Conduit cap
P51589	159 000 476	Conduit adapter kit
P51550-3	198 820 043	Rotor kit, PVDF natural, (rotor and pin)
5523-0222	159 000 392	Cable (per foot), 2 cond. w/shield, 22 AWG
3-8050	159 000 184	Universal mounting kit
3-8050-1	159 001 753	Universal mount junction box
3-8050.390-1	159 001 702	Retaining nut replacement kit, NPT, Valox (for use with 8510 and 8512)
3-8050.390-3	159 310 116	Retaining nut replacement kit, NPT, PP (for use with 8510 and 8512)
3-8050.390-4	159 310 117	Retaining nut replacement kit, NPT, PVDF (for use with 8510 and 8512)
3-8051	159 000 187	Transmitter integral adapter (for use with 8510 and 8512)
3-8051-1	159 001 755	Transmitter integral mount kit, NPT, PP (for use with 8510 and 8512)
3-8051-2	159 001 756	Transmitter integral mount kit, NPT, PVDF (for use with 8510 and 8512)

2.3 525 Metalex Paddlewheel Flow Sensor



2.3.1 Product description

The GF Signet 525 Metalex Paddlewheel Flow Sensor combines stainless steel construction with insertion paddlewheel technology. The result is a highly reliable sensor suitable for operation at extreme pressures and temperatures. The Tungsten Carbide shaft and carbon fiber reinforced PTFE bearing provides excellent wear resistance for extended service.

A comprehensive fitting program allows installation in steel lines with the mini-block for small diameters, and either the mini-tap or saddle for pipes up to DN300 (12 in.). The self-generating output signal allows use with the battery operated flow totalizer 8150.

Features

- For up to 103 bar (1500 psi @ safety factor 1.5) pressure
- For up to 149 °C (300 °F) temperature
- DN15 to DN300 (½ to 12 in.) pipe range
- Simple installation
- Self-powered/no external power required
- 316 SS body
- Tungsten Carbide or SS shaft
- 7.6 m (25 ft) cable included
- Operating range 0.5 to 6 m/s (1.6 to 20 ft/s)



Applications

- Boiler Feedwater Monitoring
- HVAC
- Chemical Transport
- Heat Exchangers
- Reverse Osmosis
- Cooling Systems
- Not Suitable for Gases



The installation must be performed in accordance with the instruction manual. The instruction manual is included with the product, see also online on www.gfps.com/signet

2.3.2 Technical Details

General

Operating Range	0.5 to 6 m/s	1.6 to 20 ft/s
Pipe Size Range	DN15 to DN300	½ to 12 in.
Linearity	±1% if max. range @ 25 °C (77 °F)	
Repeatability	±0.5% of max. range @ 25 °C (77 °F)	
Min. Reynolds Number Required	4500	

Wetted Materials

Sensor Body	316 SS (ACI type CF-8M per ASTM A351), DIN 17440
Rotor Material	17-4PH-1 Stainless Steel
Rotor Pin	Tungsten Carbide GRP 1 or 316 stainless steel
Retainers (2)	316 stainless steel (1.4401)
Rotor Bearings (2)	Carbon fiber reinforced PTFE
Gasket	KLINGER sil C-4401 (supplied with fitting)

Electrical

Frequency	39 Hz per m/s nominal	12 Hz per ft/s nominal
Amplitude	5 to 8 mV p-p per Hz	
Source Impedance	11.6 KΩ	
Cable Length	7.6 m (25 ft), can be extended up to 61 m (200 ft)	
Cable Type	Cable (per foot) 2 cond. w/shield, 22 AWG	

Max. Temperature/Pressure Rating

Socket Weld or Weld-On	103 bar (1500 psi @ safety factor 1.5) @ 149 °C (300 °F)	
Mini-Tap Fittings		
Strap-on Saddle Fitting	21 bar (305 psi) @ 66 °C (151 °F)	
Operating Temperature	-18 °C to 149 °C	0 °F to 300 °F

Shipping Weight

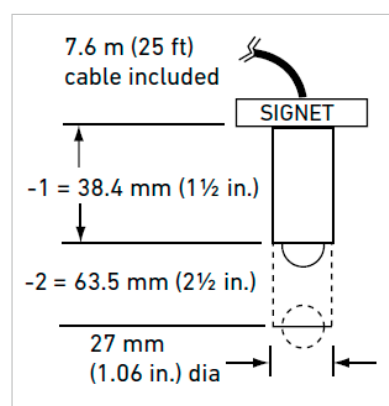
P525-1/ -1S	0.723 kg	1.6 lb
P525-2/ -2S	0.774 kg	1.7 lb

Standards and Approvals

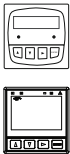
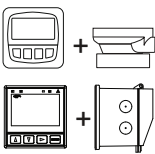



RoHS compliant, China RoHS

Manufactured under ISO 9001 for Quality and ISO 14001 for Environmental Management and OHSAS 18001 for Occupational Health and Safety

Dimensions



2.3.3 System Overview

Panel Mount	Pipe, Tank, Wall Mount	Automation System
<div>GF Signet Instruments</div> <div>- 8150</div> <div>- 8900</div> <div>- 9900</div> <div>- 9900-1BC</div> <div>- 9950</div> <div></div>	<div>GF Signet Instruments</div> <div>- 8150 with 3-8050 Universal Mount Kit</div> <div>- 9900-1</div> <div>- 9900-1BC with Rear Enclosure - 9950</div> <div></div>	<div>- 0486 Profibus Concentrator and Customer Supplied Programmable Logic Controller or</div> <div>- Programmable Automation Controll</div> <div></div>
<div>GF Signet 525 Metalex Flow Sensor</div> <div></div>		
<div>GF Signet Fittings</div> <div></div> <div>All sold separately</div>		

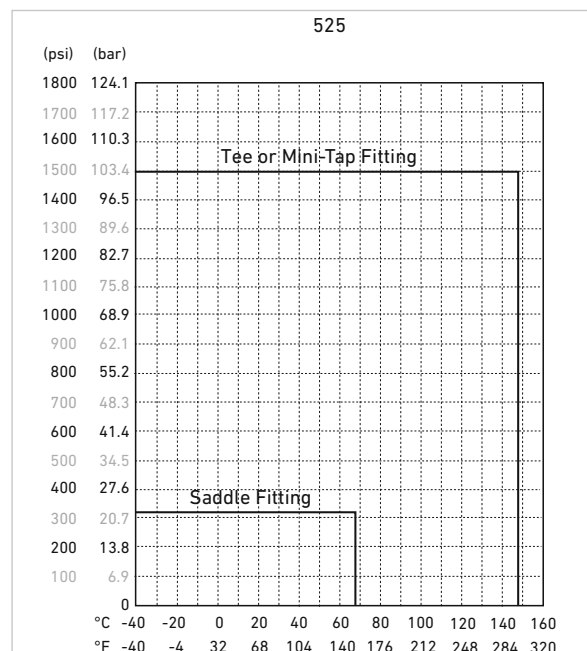
Application Tips

- Use the Conduit Adapter Kit to protect the cable-to-sensor connection when used in outdoor environments. See Accessories section.
- Use the Socket Weld or Weld-on Mini-Tap fittings for sensor installation in pressures up to 1500 psi (103 bar).Sensor plug can be used to plug installation fitting after extraction of sensor from pipe.

Pressure-temperature diagram

Note

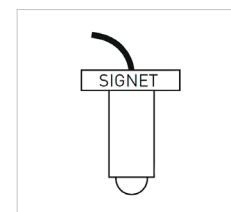
The pressure-temperature diagrams are specifically for the GF Signet sensor. During system design the specifications of all components must be considered. In the case of a metal piping system, a plastic sensor will reduce the system specification. When using a PVDF sensor in a PVC piping system, the fitting will reduce the system specification.



2.3.4 Ordering information

Mfr. Part	No./Code	Sensor Style	Rotor Pin Material
Metalex Flow sensor for high pressures and temperatures			
P525-1	198 801 494	Used with ½ to 1 inch socket-weld mini-tap fittings**	Tungsten Carbide
P525-2	198 801 495	Used with 1¼ to 12 inch weld-on mini-tap fittings**	Tungsten Carbide
P525-1S	159 000 963	Used with ½ to 1 inch socket-weld mini-tap fittings**	316 Stainless Steel
P525-2S	159 000 964	Used with 1¼ to 12 inch weld-on mini-tap fittings**	316 Stainless Steel

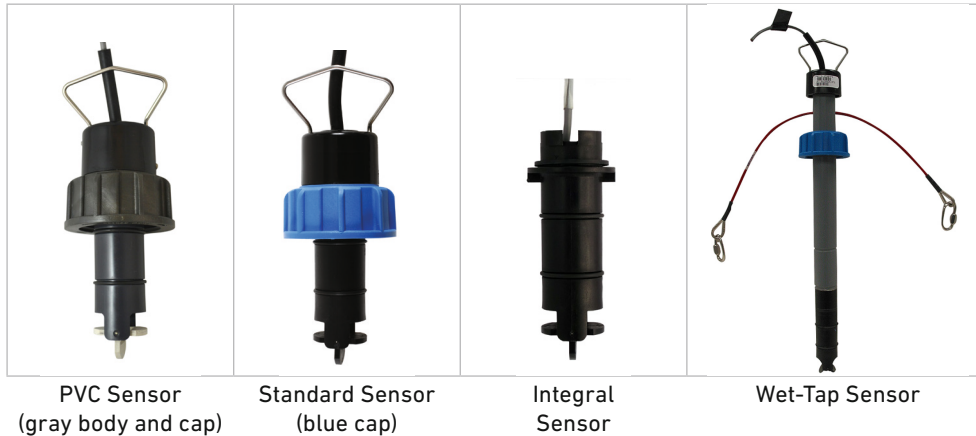
** See Fittings section



2.3.5 Accessoires

Mfr. Part	Code	Description
P52509	198 801 501	Rotor kit (rotors, stainless steel pin, bearings, retainers)
P52509-2	159 000 480	Rotor kit (rotors, tungsten carbide pin, bearings, retainers)
P52504-1	198 801 500	Rotor pin, Stainless Steel (1.4401)
P52504-2	198 820 023	Rotor pin, Tungsten Carbide
P52618	159 000 493	Gasket
P52503	198 820 013	Bearing, carbon fiber reinforced PTFE
P52527	159 000 481	Retainers, Stainless Steel
P52628	159 000 504	Fitting cap kit (cap and gasket)
P51589	159 000 476	Conduit adapter kit
5523-3222	159 000 393	Cable (per foot) 2 cond. w/shield, 22 AWG

2.4 2536 Rotor-X Paddlewheel Flow Sensors



2.4.1 Product description

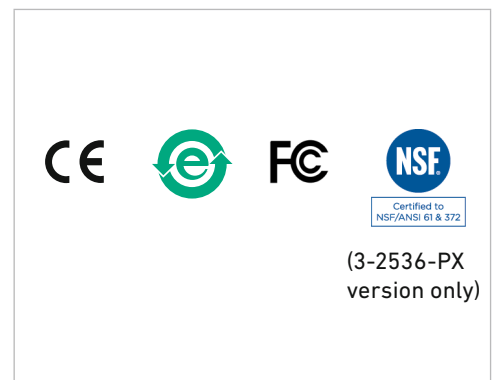
Simple to install with time-honored reliable performance, GF Signet 2536 Rotor-X Paddlewheel Flow Sensors are highly repeatable, rugged sensors that offer exceptional value with little or no maintenance. The Model 2536 has a process-ready open collector signal with a wide dynamic flow range of 0.1 to 6 m/s (0.3 to 20 ft/s). The sensor measures liquid flow rates in full pipes and can be used in low pressure systems.

The GF Signet 2536 sensors are offered in a variety of materials for a wide range of pipe sizes and insertion configurations. The many material choices including PP and PVDF make this model highly versatile and chemically compatible to many liquid process solutions.

Sensors can be installed in DN15 to DN900 (½ to 36 in.) pipes (except the 2536 PVC versions, which can be installed in DN15 to DN100 (½ to 4 in.) pipes), using GF Signet's comprehensive line of custom fittings. These custom fittings, which include tees, saddles, and weldolets, seat the sensor to the proper insertion depth into the process flow. The sensors are also offered in configurations for wet-tap installation requirements.

Features

- Operating range 0.1 to 6 m/s (0.3 to 20 ft/s)
- Wide turndown ratio of 66:1
- Open-collector output
- Highly repeatable output
- Simple, economical design
- Installs into pipe sizes DN15 to DN900 (½ to 36 in.)
- PVC 2536 version DN15 to DN100 (½ to 4 in.) for concentrated Sodium Hypochlorite 12.5% applications
- High resolution and noise immunity
- Test certificate included for -X0, -X1
- Chemically resistant materials



Applications

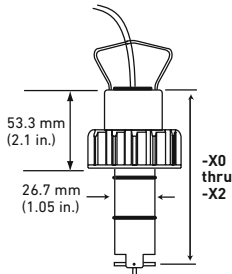
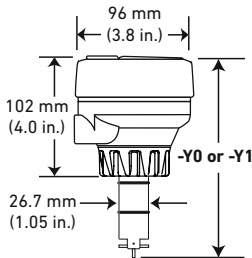
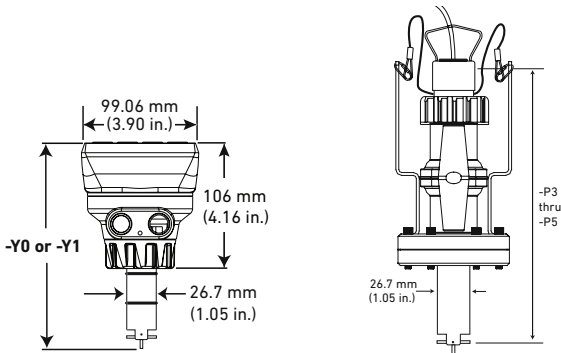
- Pure Water Production
- Filtration Systems
- Chemical Production
- Liquid Delivery Systems
- Pump Protection
- Scrubber/Gas Stacks
- Gravity Feed Lines
- Not suitable for gas
- Sodium Hypochlorite transfer/injection/batching (3-2536-U0)

2.4.2 Specifications





















General		
Operating Range	0.1 to 6 m/s	0.3 to 20 ft/s
Pipe Size Range	DN15 to DN900	½ to 36 in.
PVC	DN15 to DN100	½ to 4 in.
Linearity	±1% of max. range @ 25 °C (77 °F)	
Repeatability	±0.5% of max. range @ 25 °C (77 °F)	
Min. Reynolds Number Required	4500	
Wetted Materials		
Sensor Body	Glass-filled PP (black), PVDF (natural) or PVC (gray)	
O-rings	FKM (std) optional EPR (EPDM) or FFKM	
Rotor Pin	Titanium, Hastelloy-C or PVDF; optional Ceramic, Tantalum or Stainless Steel	
Rotor	Black PVDF or Natural PVDF; optional ETFE, with or w/o carbon fiber reinforced PTFE sleeve for rotor pin	
Electrical		
Frequency	49 Hz per m/s nominal	15 Hz per ft/s nominal
Supply Voltage	5 to 24 VDC ±10%, regulated	
Supply Current	<1.5 mA @ 3.3 to 6 VDC	<20 mA @ 6 to 24 VDC
Output Type	Open collector, sinking 10 mA max.	
Cable Type	2-conductor twisted pair with shield, 22 AWG	
Cable Length	7.6 m (25 ft) can be extended up to 305 m (1000 ft) maximum	
Max. Temperature/Pressure Rating - Standard and Integral Sensor		
PP	12.5 bar @ 20 °C	180 psi @ 68 °F
	1.7 bar @ 85 °C	25 psi @185°F
PVDF	14 bar @ 20 °C	200 psi @ 68 °F
	1.7 bar @ 85 °C	25 psi @ 185 °F
PVC	12.5 bar @ 20 °C	180 psi @ 68 °F
	6.9 bar @ 60 °C	100 psi @ 140 °F
Operating Temperature		
PP	-18 °C to 85 °C	0 °F to 185 °F
PVDF	-18 °C to 85 °C	0 °F to 185 °F
PVC	0 °C to 50 °C	32 °F to 122 °F
Max. Temperature/Pressure Rating - Wet-Tap Sensor		
PP	7 bar @ 20 °C	100 psi @ 68 °F
	1.4 bar @ 60 °C	20 psi @ 140 °F
Operating Temperature	-18 °C to 60 °C	0 °F to 140 °F
Max. Wet-Tap Sensor Removal Rating	1.7 bar @ 22 °C	25 psi @ 72 °F
Shipping Weight		
3-2536-X0	0.454 kg	1.00 lb
3-2536-X1	0.476 kg	1.05 lb
3-2536-X2	0.680 kg	1.50 lb
3-2536-X3	0.780 kg	1.72 lb
3-2536-X4	0.800 kg	1.76 lb
3-2536-X5	0.880 kg	1.94 lb
3-8512-X0	0.35 kg	0.77 lb
3-8512-X1	0.37 kg	0.81 lb
Standards and Approvals		
CE, FCC, NSF (3-2536-PX only)		
RoHS compliant, China RoHS		
Manufactured under ISO 9001 for Quality and ISO 14001 for Environmental Management and OHSAS 18001 for Occupational Health and Safety		

See pressure-temperature diagrams for more information.

Dimensions

Standard Mount	Integral Mount	Wet-Tap Mount Sensor with 3519 Wet-Tap Valve
		
PVC Mount (0.5 to 4 in. pipe range only)	(shown with Transmitter sold separately)	(See 3519 product page for more information)
Pipe range	Pipe range	Pipe range
0.5 to 4 in. -X0 = 104 mm (4.1 in.)	0.5 to 4 in. -Y0 = 152 mm (6.0 in.)	0.5 to 4 in. -P3 = 297 mm (11.7 in.)
5 to 8 in. -X1 = 137 mm (5.4 in.)	5 to 8 in. -Y1 = 185 mm (7.3 in.)	5 to 8 in. -P4 = 333 mm (13.1 in.)
10 in. and up -X2 = 213 mm (8.4 in.)		10 in. and up -P5 = 409 mm (16.1 in.)

2.4.3 System Overview

Panel Mount	Pipe, Tank, Wall Mount	Field (Integral) Mount	Automation System
<p>GF Signet Instruments</p> <ul style="list-style-type: none">- 8900- 9900- 9900-1BC- 9950  	<p>GF Signet Instruments</p> <ul style="list-style-type: none">- 9900-1P with Rear Enclosure- 9900-1BC with Rear Enclosure- 9900 with 3-8050-1 Universal Mount Kit or 3-8052-1 Integral Mount Kit- 9950 with 3-8050-1 Universal Mount Kit or 3-8052-1 Integral Mount Kit      	<p>GF Signet Instruments</p> <ul style="list-style-type: none">- 9900-1 with 3-8051-X Integral Mount Kit  	<ul style="list-style-type: none">- 0486 Profibus Concentrator and Customer Supplied Programmable Logic Controller or- Programmable Automation Controll  
<p>GF Signet 2536 PVC, Standard, Wet-Tap or 8512 Integral Mount Flow Sensors</p>    			
<p>GF Signet Fittings</p>    			

All sold separately

All sold separately

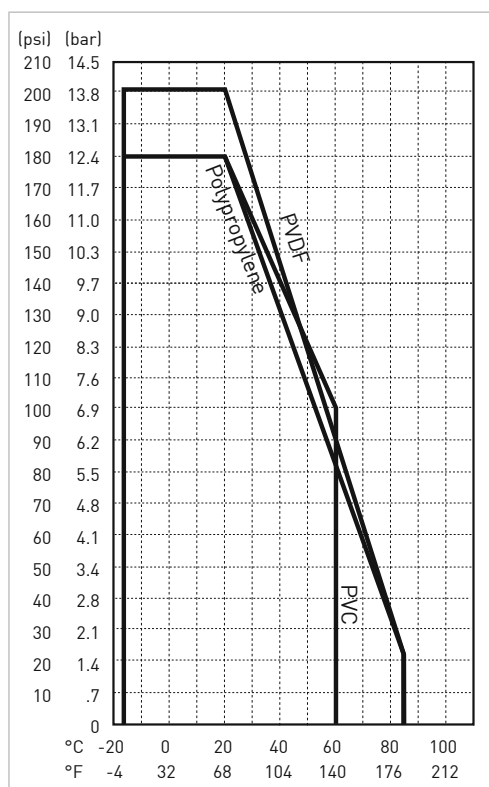
Application Tips

- Use the Conduit Adapter Kit to protect the cable-to-sensor connection when used in outdoor environments. See Accessories section for more information.
- Use a sleeved rotor in abrasive liquids to reduce wear.
- Sensor plug can be used to plug installation fitting after extraction of sensor from pipe.
- For liquids containing ferrous particles, use GF Signet Magmeters.
- For systems with components of more than one material, the maximum temperature/pressure specification must always be referenced to the component with the lowest rating.

Pressure-temperature diagrams

Note

The pressure-temperature diagrams are specifically for the GF Signet sensor. During system design the specifications of all components must be considered. In the case of a metal piping system, a plastic sensor will reduce the system specification. When using a PVDF sensor in a PVC piping system, the fitting will reduce the system specification.



2.4.4 Ordering Information

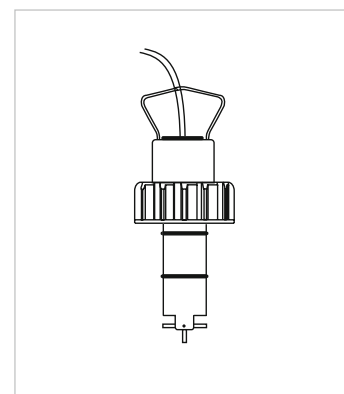
Ordering Notes

1. Most common part number combinations shown. For all other combinations contact factory.
2. Other rotor and pin materials are available for purchase from the factory and can be easily replaced in the field. See Accessories section.

Model 2536 Standard Mount Paddlewheel

When choosing this style of sensor, the instrument can be mounted nearby on a pipe or wall or in a remote location up to 305 m (1000 ft) by connecting the sensor through a standard 3-8050-1 universal junction box. Standard cable length is 7.6 m (25 ft). Use GF Signet fittings for proper seating of the sensor into the process flow.

Mfr. Part No.	Code	Body	Rotor	Pin Material
Flow Sensor for use with remote mount instrument				
DN15 to DN100 - ½ to 4 in.				
3-2536-P0	198 840 143	Polypropylene	Black PVDF	Titanium
3-2536-T0	198 840 149	Natural PVDF	Natural PVDF	Natural PVDF
3-2536-U0	159 001 843	PVC	Sleeved ETFE	Titanium
3-2536-V0	198 840 146	Natural PVDF	Natural PVDF	Hastelloy-C
DN125 to DN 200 - 5 to 8 in				
3-2536-P1	198 840 144	Polypropylene	Black PVDF	Titanium
3-2536-V1	198 840 147	Natural PVDF	Natural PVDF	Hastelloy-C
DN250 - DN900 - 10 to 36 in.				
3-2536-P2	198 840 145	Polypropylene	Black PVDF	Titanium



Model 2536 Integral Mount Paddlewheel

When choosing this style of sensor, the instrument is mounted directly onto the sensor for a local display.

See guidelines below for instructions.

Mfr. Part No.	Code	Body	Rotor	Pin Material
Flow sensor for integral mounting on the 8150 or 8550 instrument using the 3-8051-X Flow Sensor Integral Mount Kit (sold separately)				
DN15 to DN100 - ½ to 4 in.				
3-8512-P0	198 864 513	Polypropylene	Black PVDF	Titanium
3-8512-T0	198 864 518	Natural PVDF**	Natural PVDF	Natural PVDF
3-8512-V0	198 864 516	Natural PVDF**	Natural PVDF	Hastelloy-C
DN125 to DN200 - 5 to 8 in. (PP only)				
3-8512-P1	198 864 514	Polypropylene	Black PVDF	Titanium

**Natural PVDF available ½ in. to 4 in. only

Guidelines: Combining a 2536 integral mount flow sensor with an integrally mounted instrument

Option 1

Once an integral mount sensor is chosen, it can be mounted directly to a field mount transmitter by following these guidelines:

- Order the 3-8051-X flow sensor integral mounting kit (sold separately) to connect the sensor to an instrument.
- Order a field mount transmitter (sold separately). The following part numbers are compatible: 3-9900-1.
- Assembling the sensor with the integral adapter and instrument is quick and simple.

Model 2536 Wet-Tap Mount Paddlewheel Flow Sensor

When choosing this style of sensor, the instrument can be mounted nearby on a pipe or wall or in a remote location up to 305 m (1000 ft) by connecting the sensor through a standard 3-8050-1 universal junction box. Standard cable length is 7.6 m (25 ft). This style of sensor uses the 3519 Wet-Tap valve only (see individual product page for more information).

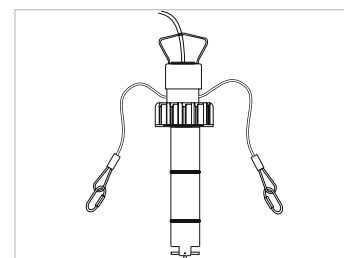
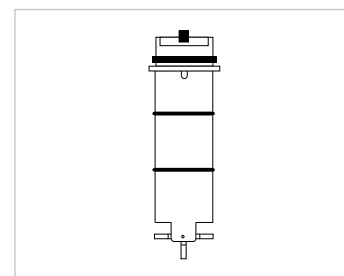
Mfr. Part No.	Code	Body	Rotor	Pin Material
Flow Sensor for wet-tap mounting with the 3519 Wet-Tap Valve (sold separately)				
DN15 to DN100 - ½ to 4 in.				
3-2536-P3	159 000 758	Polypropylene	Black PVDF	Titanium
DN125 to DN200 - 5 to 8 in.				
3-2536-P4	159 000 759	Polypropylene	Black PVDF	Titanium
DN250 to DN900 - 10 to 36 in.				
3-2536-P5	159 000 760	Polypropylene	Black PVDF	Titanium

Guideline: Combining a 2536 Wet-Tap Sensor with a 3519 Wet-Tap Valve

- Once a sensor is chosen, it can be mounted in a 3519 Wet-Tap Valve (sold separately)
- Assembling a sensor with a 3519 Wet-Tap valve is quick and simple. These parts can also be ordered as complete assemblies. See 3519 product page.

Model 2536 Ordering Notes

- Other rotor and pin materials are available for purchase from the factory and can be easily replaced in the field. See Accessories section.



i Please refer to Wiring, Installation, Accessories and Fittings sections for more information.

2.4.5 Accessories and Replacement Parts

Mfr. Part No.	Code	Description
Rotors		
3-2536.320-1	198 820 052	Rotor, PVDF Black
3-2536.320-2	159 000 272	Rotor, PVDF Natural
3-2536.320-3	159 000 273	Rotor, ETFE
3-2536.322-1	198 820 056	Sleeved rotor, PVDF Black
3-2536.322-2	198 820 057	Sleeved rotor, PVDF Natural
3-2536.322-3	198 820 058	Sleeved rotor, ETFE
Rotor Pins		
M1546-1	198 801 182	Pin, Titanium
M1546-2	198 801 183	Pin, Hastelloy-C
M1546-3	198 820 014	Pin, Tantalum
M1546-4	198 820 015	Pin, Stainless Steel
P51545	198 820 016	Pin, Ceramic
O-Rings		
1220-0021	198 801 000	O-ring, FKM (2 required per sensor)
1224-0021	198 820 006	O-ring, EPR (EPDM) (2 required per sensor)
1228-0021	198 820 007	O-ring, FFKM (2 required per sensor)
Miscellaneous		
P31536	198 840 201	Sensor plug, Polypropylene
P31542-3	159 000 464	Sensor cap, Blue
3-2536.555	159 500 532	Sensor cap, Gray
P31934	159 000 466	Conduit cap
P51589	159 000 476	Conduit adapter kit
5523-0222	159 000 392	Cable (per foot), 2 cond. w/shield, 22 AWG
3-2536.321	198 820 054	PVDF Natural, Rotor kit (rotor and pin)
3-8050	159 000 184	Universal mount kit
3-8050-1	159 000 753	Universal junction box
3-8050.390-1	159 001 702	Retaining nut replacement kit, NPT, Valox (for use with 8510 and 8512)
3-8050.390-3	159 310 116	Retaining nut replacement kit, NPT, PP (for use with 8510 and 8512)
3-8050.390-4	159 310 117	Retaining nut replacement kit, NPT, PVDF (for use with 8510 and 8512)
3-8051	159 000 187	Transmitter integral adapter (for use with 8510 and 8512)
3-8051-1	159 001 755	Transmitter integral mounting kit, NPT, PP (for use with 8510 and 8512)
3-8051-2	159 001 756	Transmitter integral mounting kit, NPT, PVDF (for use with 8510 and 8512)

2.5 2537 Paddlewheel Flowmeter



2.5.1 Product description

The GF Signet 2537 Flowmeter is the next generation in fluid measurement technology from the inventor of the original paddlewheel flowmeter. This sensor is an improvement on what's already an industry standard. It has the added functionality of various output options including flow switch, multi-functional pulse, digital (S³L) or 4 to 20 mA. Additionally, it offers low flow, low power and high resolution and can be configured onsite directly through the built-in user interface.

Installation is simple because the GF Signet 2537 utilizes the same fittings as the popular GF Signet 515 and 2536 Paddlewheel Sensors and fits into pipe sizes ranging from DN15 to DN200 (½ to 8 inches). Available in Polypropylene and PVDF, it is ideal for a variety of applications including chemical processing, water and wastewater monitoring and scrubber control.

Features

- Digital (S³L) or 4 to 20 mA outputs or (Multi-function)
- Allows for up to six sensors to GF Signet 8900 Multi-Parameter Controller
- Low flow capabilities down to 0.1 m/s (0.3 ft/s)
- Polypropylene or PVDF sensor bodies
- Polypropylene or PVDF retaining nuts standard, Valox optional
- Installs into pipe sizes DN15 to DN200 (½ to 8 in.)
- Test certificate included for -X0, -X1
- Low power and high resolution



Applications

- Process Flow Monitoring
- Pump Protection
- Pure Water Production
- Filtration Systems
- Chemical Production
- Reverse Osmosis
- Demineralization/Regeneration
- Fume Scrubbers
- Cooling Towers
- Proportional Metering Pump



The installation must be performed in accordance with the instruction manual. The instruction manual is included with the product, see also online on www.gfps.com/signet

2.5.2 Technical Details

General

Operating Range	0.1 to 6 m/s	0.3 to 20 ft/s
Pipe Size Range	DN15 to DN200	½ to 8 in.
Linearity	±1% of max. range @ 25 °C (77 °F)	
Repeatability	±0.5% of max. range @ 25 °C (77 °F)	
System Responses	100 ms update rate nominal	

Wetted Materials

Sensor Body	Glass-filled PP (black) or PVDF (natural)
O-rings	FKM (std) optional EPR (EPDM) or FFKM
Rotor Pin	Titanium, Hastelloy-C or PVDF; optional Ceramic, Tantalum or Stainless Steel
Rotor	Black PVDF or Natural PVDF; optional ETFE, with or w/o carbon fiber reinforced PTFE sleeve for rotor pin

Electrical

Multi	With Dry-Contact Relay	24 VDC nominal, ±10%, regulated, 30 mA max current	
	With Solid State Relay	6 V to 24 VDC, ±10%, regulated, 30 mA max current	
	Digital (S³L)	5.0 VDC min to 6.5 VDC max., 30 mA max current (1.5 mA nominal)	
	4 to 20 mA	400 mV max ripple voltage, 30 mA max current	
	Maximum Pulse Rate	300 Hz	
	Maximum Pulse Width	50 ms	
	Minimum Pulse Rate	0.5 Hz	
	Compatible with PLC, PC or similar equipment		
	Compatible with customer supplied metering pump		
Digital S³L Version	5 VDC nominal, regulated, 3 mA max current		
	Type	Serial ASCII, TTL lever 9600 bps	
	Max. Cable Length	Refer to GF Signet 8900 wiring specifications.	
	Compatible with Model GF Signet 8900, 9900 and 9950 controller		
4 to 20 mA Version	12 to 32 VDC nominal, ±10%, regulated, 21 mA max current		
	Loop Accuracy	±32 µA @ 25 °C @ 24 VDC)	
	Loop Resolution	5 µA	
	Temp. Drift	±1µA per °C max.	
	Power Supply Rejection	±1µA per V	
	Max. Cable	305 m	1000 ft
	Maximum Loop Resistance	600 Ω @ 24 VDC	1 KΩ @ 32 VDC
	Load Impedance	375 Ω	
Reverse Polarity and Short Circuit Protected		Up to 40 V. 1 hour	
Over-voltage Protection		> 40 VDC over 1 hour	
Relay Specifications			
	Mechanical SPDT	5 A @ 30 VDC, 5 A @ 250 VAC	
	Solid-State Relay	100 mA @ 40 VDC, 70 mA @ 33 VAC	
	Relay Modes	Low, High	
	Time Delay	0.0 to 6400.0 seconds	
	Hysteresis	Adjustable for exiting alarm condition	

Max. Temperature/Pressure Rating

Storage Temperature		-10 °C to 75 °F	14 °C to 167 °F
Operating Temperature		0 °C to 65 °C	32 °F to 149 °F
Relative Humidity		0 to 90%, non-condensing	
Flow Sensor/ Retaining Nut	PP	12.5 bar @ 20 °C	181 psi @ 68 °F
		1.7 bar @ 85 °C	25 psi @ 185 °F
	PVDF	14 bar @ 20 °C	203 psi @ 68 °F
		1.7 bar @ 85 °C	25 psi @ 185 °F

Operating Temperature

	PP	-18 °C to 85 °C	0 °F to 185 °F
	PVDF	-18 °C to 85 °C	0 °F to 185 °F

Environmental

Enclosure	NEMA 4X/IP65
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Shipping Weight

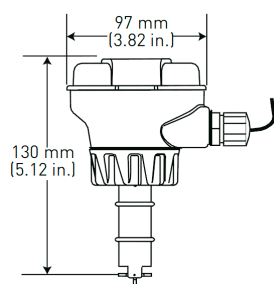
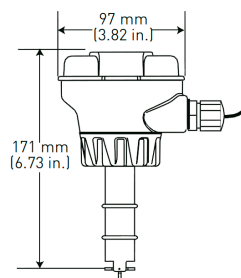
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Standards and Approvals

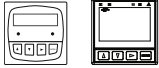
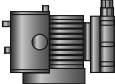



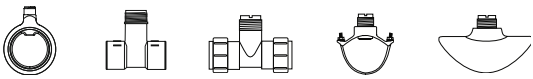
CE, FCC, UL, NSF (3-2537-XC-PX version only)

RoHS compliant, China RoHS

Manufactured under ISO 9001 for Quality and ISO 14001 for Environmental Management and OHSAS 18001 for Occupational Health and Safety.

Dimensions**½ in. to 4 in. pipe****5 to 8 in. pipe**

2.5.3 System Overview

Panel Mount	4 to 20 mA Dry Contact, Solid State	4 to 20 mA Output	Automation System
GF Signet Instruments - 8900 - 9900 - 9950 	- Customer Supplied Metering Pump 	- Customer Supplied Chart Recorder - Programmable Logic Controller or Programmable Automation Controller 	- 0486 Profibus Concentrator and Customer Supplied Programmable Logic Controller or - Programmable Automation Controller 
GF Signet 2537 Paddlewheel Flowmeter 			
GF Signet Fittings 			
All Sold Separately			

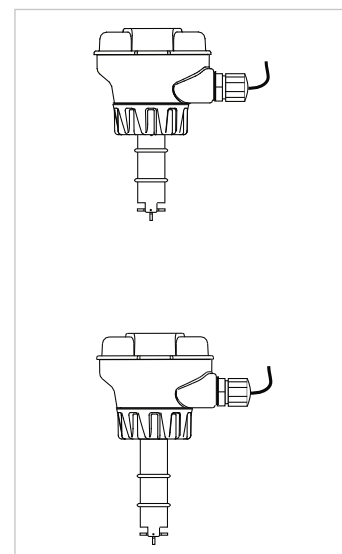
2.5.4 Ordering information

Mfr. Part	Code	Output
Paddlewheel Flowmeter – Integral Mount (8512 sensors)		
DN15 to DN100 – ½ to 4 in.		
Polypropylene body, black Polypropylene retaining nut, black PVDF rotor, Titanium pin, FKM O-rings		
3-2537-1C-P0	159 001 291	Pulse/Flow Switch DCR
3-2537-2C-P0	159 001 292	Pulse/Flow Switch SSR
3-2537-5C-P0	159 001 295	Digital (S ³ L)
3-2537-6C-P0	159 001 296	4 to 20 mA
Natural PVDF body, Natural PVDF retaining nut, rotor and pin, FKM O-rings*		
3-2537-1C-T0	159 001 315	Pulse/Flow Switch DCR
3-2537-2C-T0	159 001 316	Pulse/Flow Switch SSR
3-2537-5C-T0	159 001 319	Digital (S ³ L)
3-2537-6C-T0	159 001 320	4 to 20 mA
DN125 to DN200 – 5 to 8 in.		
Polypropylene body, black Polypropylene retaining nut, black PVDF rotor, Titanium pin, FKM O-rings		
3-2537-1C-P1	159 001 303	Pulse/Flow Switch DCR
3-2537-2C-P1	159 001 304	Pulse/Flow Switch SSR
3-2537-5C-P1	159 001 307	Digital (S ³ L)
3-2537-6C-P1	159 001 308	4 to 20 mA

* PVDF available ½ in. to 4 in. only.

Application Tips

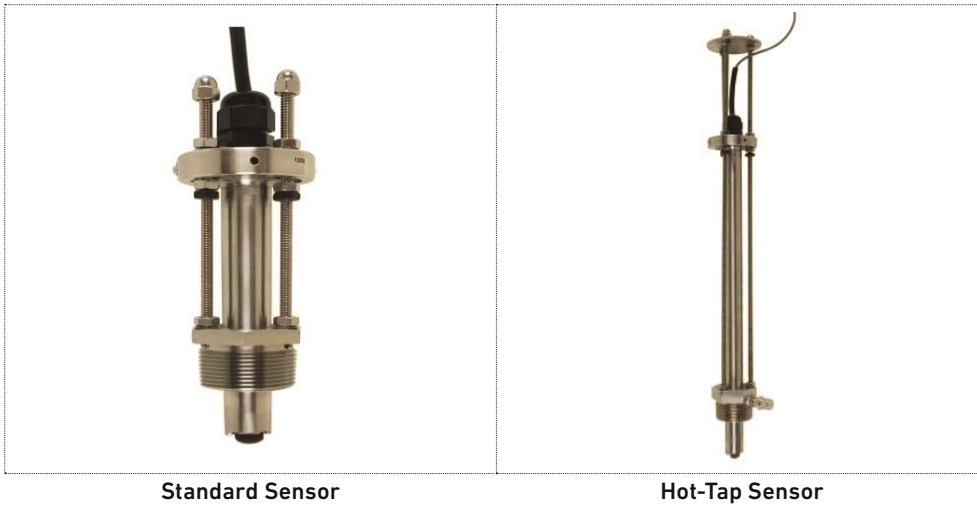
- Select PVDF Rotor Pin for use in Deionized Water.
- Use a sleeved rotor in abrasive liquids to reduce wear.
- Sensor plug is used to plug installation fitting after extraction of sensor from pipe.
- For liquids containing ferrous particles, use GF Signet Magmeters.
- For systems with components of more than one material, the maximum temperature/pressure Specification must always be referenced to the component with the lowest rating.



2.5.5 Accessories

Mfr. Part	Code	Output
Rotors		
3-2536.320-1	198 820 052	Rotor, PVDF Black
3-2536.320-2	159 000 272	Rotor, PVDF Natural
3-2536.320-3	159 000 273	Rotor ETFE
3-2536.322-3	198 820 056	Sleeved rotor, PVDF Black
3-2536.322-2	198 820 057	Sleeved rotor, PVDF Natural
3-2536.322-3	198 820 058	Sleeved rotor, ETFE
Rotor Pins		
M1546-1	198 801 182	Pin, Titanium
M1546-2	198 801 183	Pin, Hastelloy-C
M1546-3	198 820 014	Pin, Tantalum
M1546-4	198 820 015	Pin, Stainless Steel
P51545	198 820 016	Pin, Ceramic
O-Rings		
1220-0021	198 801 000	O-ring, FKM (2 required per sensor)
1224-0021	198 820 006	O-ring, EPR (EPDM) (2 required per sensor)
1228-0021	198 820 007	O-ring, FFKM (2 required per sensor)
Miscellaneous		
P31536	198 840 201	Sensor plug, Polypropylene
3-2536.321	198 820 054	PVDF Natural, Rotor kit
3-8050.391	159 001 703	Retaining Nut Replacement Kit, NPT, Stainless Steel
3-8050.390-1	159 001 702	Retaining Nut Replacement Kit, NPT, Valox
3-8050.390-3	159 310 116	Retaining Nut Replacement Kit, NPT, PP
3-8050.390-4	159 310 117	Retaining Nut replacement Kit, NPT PVDF
3-8050-396	159 000 617	RC Filter kit (for relay use)
3-9000.392-1	159 000 839	Liquid tight connector kit, NPT (1 piece)
3-9000.392-2	159 000 841	Liquid tight connector kit, PG13.5 (1 piece)
7310-1024	159 873 004	24 VDC Power Supply, 10 W, 0.42 A
7310-2024	159 873 005	24 VDC Power Supply, 24 W, 1.0 A
7310-4024	159 873 006	24 VDC Power Supply, 40 W, 1.7 A
7310-6024	159 873 007	24 VDC Power Supply, 60 +, 2.5 A
7310-7024	159 873 008	24 VDC Power Supply, 96 W, 4.0 A

2.6 2540 Stainless Steel High Performance Paddlewheel Flow Sensor



2.6.1 Product description

The GF Signet 2540 Paddlewheel Flow Sensor offers the strength and corrosion resistance of stainless steel for liquid applications with low velocity measurements. Unique internal circuitry eliminates the need for magnets in the process fluid, enabling flow measurement of 0.1 to 6 m/s (0.3 to 20 ft/s) while maintaining the advantages of insertion sensor design. Ultraflon 500C bearings and Tungsten Carbide pin provide exceptional wear resistance.

The GF Signet 2540 offers field replaceable electronics and transient voltage suppression (TVS) to provide greater immunity to large voltage disturbances (i.e. lightning) sometimes encountered in field wiring. Sensors can be installed in DN40 to DN600 (1½ to 24 inch) pipes using the 1½ inch or ISO 7/1-R 1.5 threaded process connection.

The sensors are also offered in a hot-tap configuration with a bleed valve service without process shutdown in pipes up to DN900 (36 in.). Both styles of sensors must be used in full pipes and can be used in low pressure systems.

Features

- Operating range 0.1 to 6 m/s (0.3 to 20 ft/s)
- Field replaceable electronics
- Non-magnetic RF detection
- Standard NPT or ISO process connections
- Hot-tap versions for installation/service without system shutdown
- For pipe sizes up to DN900 (36 in.)
- Adjustable sensor - one size for entire pipe range
- 7.6 m (25 ft) cable



Applications

- HVAC
- Turf Irrigation
- Cooling Systems
- Filtration Systems
- Water Distribution
- Leak Detection
- Pump Protection
- Clarified Effluent Totalization
- Ground Water Remediation
- Gravity Feed Line



The installation must be performed in accordance with the instruction manual.
The instruction manual is included with the product, see also online on
www.gfps.com/signet

2.6.2 Technical Details

General

Operating Range	0.1 to 6 m/s	0.3 to 20 ft/s	
Pipe Size Range	Standard Version	DN40 to DN600	1½ to 24 in.
	Hot-Tap Version	DN40 to DN900	1½ to 36 in.
Sensor Fitting Options	1½ in. NPT threads ISO	7/1-R 1.5 threads	
Linearity	±1% of full range		
Repeatability	±0.5% of full range		
Min. Reynolds Number Required	4500		

Wetted Materials

Body	316 stainless steel (1.4401)
Fitting	318 stainless steel (1.4401)
Fitting O-rings	FKM, optional EPDM (EPDM)
Rotor	17-4PH-1 Stainless Steel
Rotor Pin	Tungsten Carbide GRP 1 (standard) stainless steel (optional)
Retainers (2)	316 stainless steel (1.4401)
Rotor Bearings (2)	Carbon fiber reinforced PTFE

Electrical

Frequency	15 Hz per ft/s nominal	49 Hz per m/s nominal
Power	5 to 24 VDC ±10%, regulated, 1.5 mA max.	
Output Type	Open collector, sinking, max 10.0 mA	
Cable Length	7.6 m (25 ft), can be extended up to 300 m (1,000 ft)	
Cable Type	2-conductor twisted-pair with shield, 22 AWG	

Max. Temperature/Pressure Rating

Sensor with standard FKM sensor fitting O-rings	17 bar @ 82 °C	250 psi @ 180 °F
Sensor with optional EPDM (EPDM) sensor fitting O-rings	17 bar @ 100 °C	250 psi @ 212 °F
Operating Temperature	-18 °C to 100 °C	0 °F to 212 °F

Shipping Weight

3-2540-1/-2/-1S/-2S	1.79 kg	3.9 lb
3-2540-3/-4/-3S/-4S	2.15 kg	4.7 lb

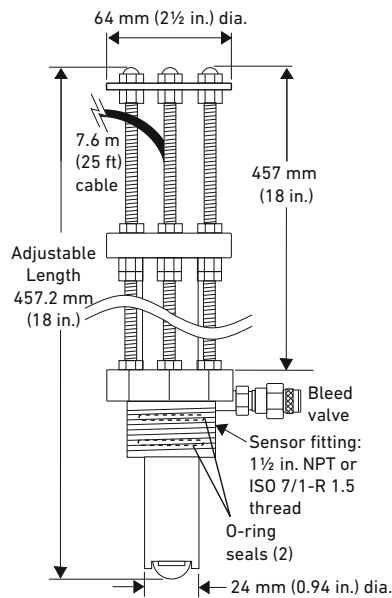
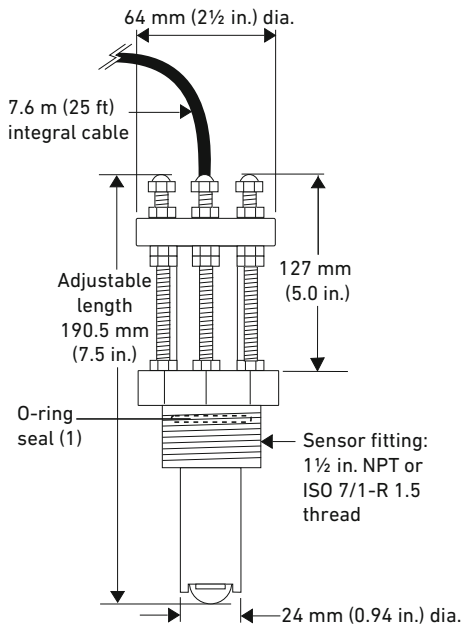
Standards and Approvals

CE, FCC
RoHS compliant, China RoHS
Manufactured under ISO 9001 for Quality and ISO 14001 for Environmental Management and OHSAS 18001 for Occupational Health and Safety














Dimensions

2540 High Performance Flow Sensor for 1½ to 24 in. pipes

2540 Hot-Tap for 1½ to 36 in. pipes



2.6.3 System Overview

Panel Mount	Pipe, Tank, Wall Mount	Field (Integral) Mount	Automation System
GF Signet Instruments - 8900 - 9900 - 9900-1BC - 9950	GF Signet Instruments - 9900-1P with Rear Enclosure - 9900-1BC with Rear Enclosure - 9900 with 3-8050-1 Universal Mount Kit - 9950 with 3-8050-1 Universal Mount Kit	GF Signet Instruments - 9900-1 with 3-8050-1 Universal Mount Kit	- 0486 Profibus Concentrator and Customer Supplied Programmable Logic Controller or - Programmable Automation Control
 	  	 	 
GF Signet 2540 Standard or Hot-tap (not shown) Flow Sensor			
   			
All sold separately			

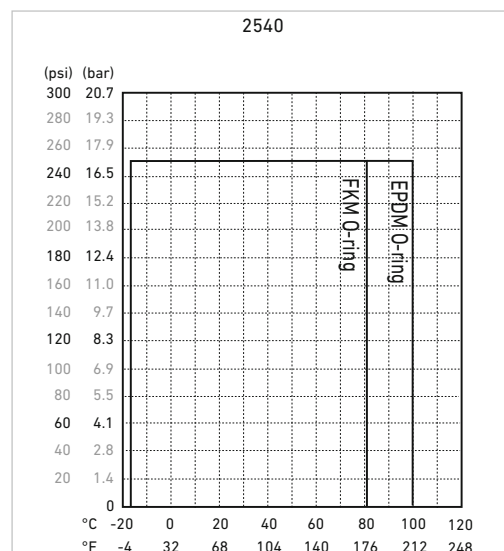
Application Tips

- For systems with components of more than one material, the maximum temperature/pressure specification must always be referenced to the component with the lowest rating.
- Use the Conduit Adapter Kit to protect the cable-to-sensor connection when used in outdoor environments.
- Sensor electronics can be easily replaced by 3-2541.260-1 or 3-2541.260-2.

Pressure-temperature diagram

Note

The pressure-temperature diagrams are specifically for the GF Signet sensor. During system design the specifications of all components must be considered. In the case of a metal piping system, a plastic sensor will reduce the system specification. When using a PVDF sensor in a PVC piping system, the fitting will reduce the system specification.



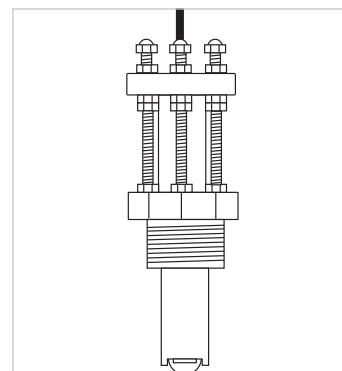
2.6.4 Ordering information

Mfr. Part	Code	Mounting Option	Rotor Pin Material
Stainless Steel High Performance flow sensor with removable electronics			
3-2540-1	198 840 035	1½ inch NPT thread	Tungsten Carbide
3-2540-2	198 840 036	1½ inch ISO thread	Tungsten Carbide
3-2540-3	198 840 037	1½ inch NPT thread, Hot-Tap design*	Tungsten Carbide
3-2540-4	198 840 038	1½ inch ISO thread, Hot-Tap design*	Tungsten Carbide
3-2540-1S	159 001 501	1½ inch NPT thread	316 Stainless Steel
3-2540-2S	159 001 502	1½ inch ISO thread	316 Stainless Steel
3-2540-3S	159 001 503	1½ inch NPT thread, Hot-Tap design*	316 Stainless Steel
3-2540-4S	159 001 504	1½ inch ISO thread, Hot-Tap design*	316 Stainless Steel

* Must use 3-1500.663 Hot-Tap installation tool (ordered separately).

2.6.5 Accessories

Mfr. Part No.	Code	Description
3-1500.663	198 820 008	Hot-Tap Installation Tool (see Installation for more info)
1220-0021	198 801 000	O-ring, FKM (2 required per sensor)
1224-0021	198 820 006	O-ring, EPDM (2 required per sensor)
1228-0021	198 820 007	O-ring, FFKM (2 required per sensor)
3-2540.320	198 820 040	Rotor kit, 2540 PEEK Bearing (old version)
3-2540.321	159 000 623	Rotor kit, 2540 Tungsten Carbide Pin (new version since January 1, 2000)
3-2540.322	159 000 864	Rotor kit, stainless steel pin and rotor
P52504-3	159 000 866	Rotor pin, Tungsten Carbide
P52504-4	159 000 867	Rotor pin, 316 SS
P52503	198 820 013	Bearing, carbon reinforced PTFE
P52527	159 000 481	Retainers, SS (1.44019)
3-2541.260-1	159 000 849	Standard replacement electronics module
3-2541.260-2	159 000 850	Hot-Tap replacement electronics module
5523-0222	159 000 392	Cable (per foot), 2 cond. w/shield, 22 AWG
P51589	159 000 476	Conduit adapter kit
P31934	159 000 466	Conduit cap



2.7 3519 Flow Wet-Tap Valve



Assembly shown with extended length flow sensor installed.

2.7.1 Product description

The GF Signet 3519 Flow Wet-Tap Valve serves as a unique interface between the installation fitting and the wet-tap style GF Signet 515 or 2536 Rotor-X flow sensor. It provides a fast method of removing the sensor from the pipe under specified operating pressures. The PVC and stainless steel design of the Wet-Tap makes it resistant to corrosion and chemical attack by acids, alkalies, salt, and a number of other harsh chemicals.

The GF Signet 3519 Wet-Tap Valve mounts directly onto standard GF Signet installation fittings. The 3519 Wet-Tap consists of a flange and support plate that threads onto the pipe fitting insert, and a PVC ball valve through which an extended length sensor is inserted into the pipe.

Features

- Allows sensor removal without process shutdown
- Pressure release valve for safe sensor removal
- Dual safety lanyards
- Rugged corrosion-resistant PVC construction and stainless steel hardware
- Compatible with GF Signet 515 or 2536 Rotor-X Wet-Tap Flow Sensors
- Eliminates process downtime



Applications

- Filtration Systems
- Chemical Production
- Pump Protection
- Scrubbers
- Water Distribution
- Effluent Totalization
- Process Cooling Loops



The installation must be performed in accordance with the instruction manual. The instruction manual is included with the product, see also online on www.gfps.com/signet

2.7.2 Technical Details

General

Body	PVC
Ball Seal	PTFE
Seats	FKM (std) or EPR (EPDM) also available, contact factory
Hardware	303 SS (brackets), 18/8 SS (nuts & bolts)

Max. Temperature/Pressure Rating

7 bar max. @ 20 °C	100 psi max. @ 68 °F
1.4 bar max @ 66 °C	20 psi max. @ 150 °F

Wet-Tap Maximum Installation/Removal Rating

1.7 bar @ 22 °C	25 psi @ 72 °F
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Shipping Weight

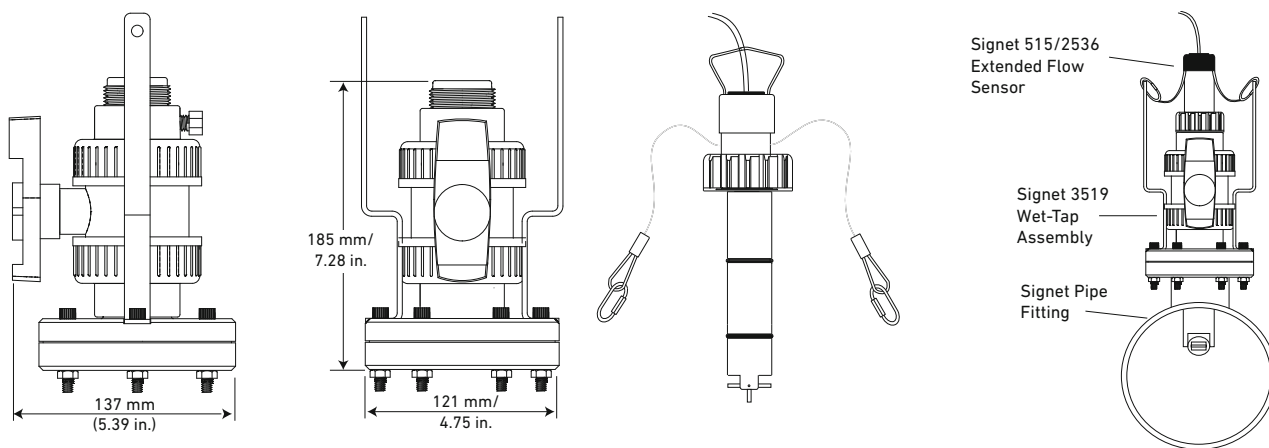
1.3 kg	2.86 lb
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Standards and Approvals

CE, FCC


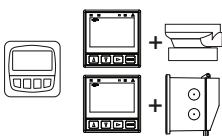
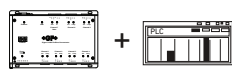
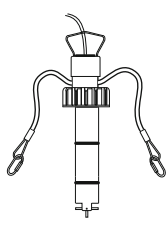

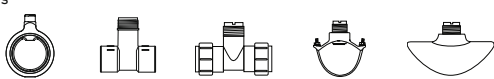
Manufactured under ISO 9001 for Quality and ISO 14001 for Environmental Management and OHSAS 18001 for Occupational Health and Safety

Dimensions



Model 515 or 2536 Wet-Tap Sensor

2.7.3 System Overview

Panel Mount	Pipe, Tank, Wall Mount	Automation System
<p>GF Signet Instruments</p> <ul style="list-style-type: none">- 8150- 8900- 9900-1P- 9900-1BC- 9950 	<p>GF Signet Instruments</p> <ul style="list-style-type: none">- 8150- 9900-1 with 3-8050 Universal Mount Kit- 9900-1BC with Rear Enclosure- 9950 	<ul style="list-style-type: none">- 0486 Profibus Concentrator and Customer Supplied Programmable Logic Controller or Programmable Automation Controll 
<p>GF Signet Wet-Tap Flow Sensor</p> <ul style="list-style-type: none">- 515- 2536 	<p>GF Signet 3519 Wet-Tap Valve</p> 	
<p>GF Signet Fittings</p> 		
<p>All sold separately</p>		

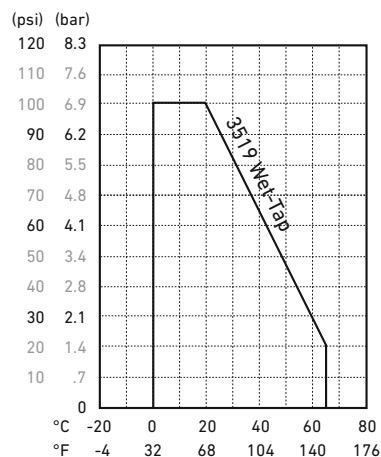
Application Tips

- Once installed, sensor insertion and removal can be performed without process shutdown; see installation/removal pressure specifications page.
- Use the Conduit Adapter Kit when used in outdoor environments.
- For liquids containing ferrous particles, use GF Signet Magmeters.
- Use sensors with sleeved rotors in abrasive liquids to reduce wear.
- For systems with components of more than one material, maximum temperature and pressure specifications must always be referenced to the component with the lowest rating.

Pressure-temperature diagram

Note

The pressure-temperature diagrams are specifically for the GF Signet sensor. During system design the specifications of all components must be considered. In the case of a metal piping system, a plastic sensor will reduce the system specification. When using a PVDF sensor in a PVC piping system, the fitting will reduce the system specification.



2.7.4 Ordering information

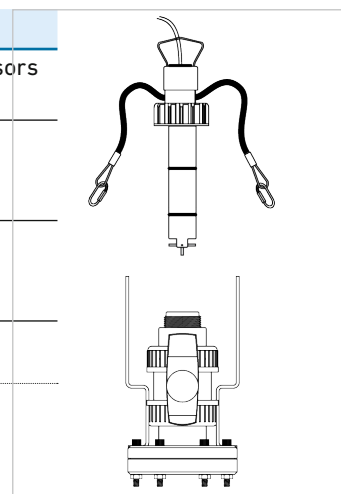
Mfr. Part No.	Code	Flow Range
3-3519	159 000 757	Wet-Tap Valve only for 515 and 2536 Wet-Tap flow sensors
For ½ to 4 inch pipes		
P51530-P3*	198 840 310	Polypro extended length paddlewheel sensor
3-2536-P3**	159 000 758	Polypro extended length low flow paddlewheel sensor
For 5 to 8 inch pipes		
P51530-P4*	198 840 311	Polypro extended length paddlewheel sensor
3-2536-P4**	159 000 759	Polypro extended length low flow paddlewheel sensor
For 10 to 36 inch pipes		
P51530-P5*	198 840 312	Polypro extended length paddlewheel sensor
3-2536-P5**	159 000 760	Polypro extended length low flow paddlewheel sensor

Ordering Notes

* See model 515 data sheet for sensor specifications.

** See model 2536 data sheet for sensor specifications.

Models 515 and 2536 Wet-Tap sensors can be ordered separately.

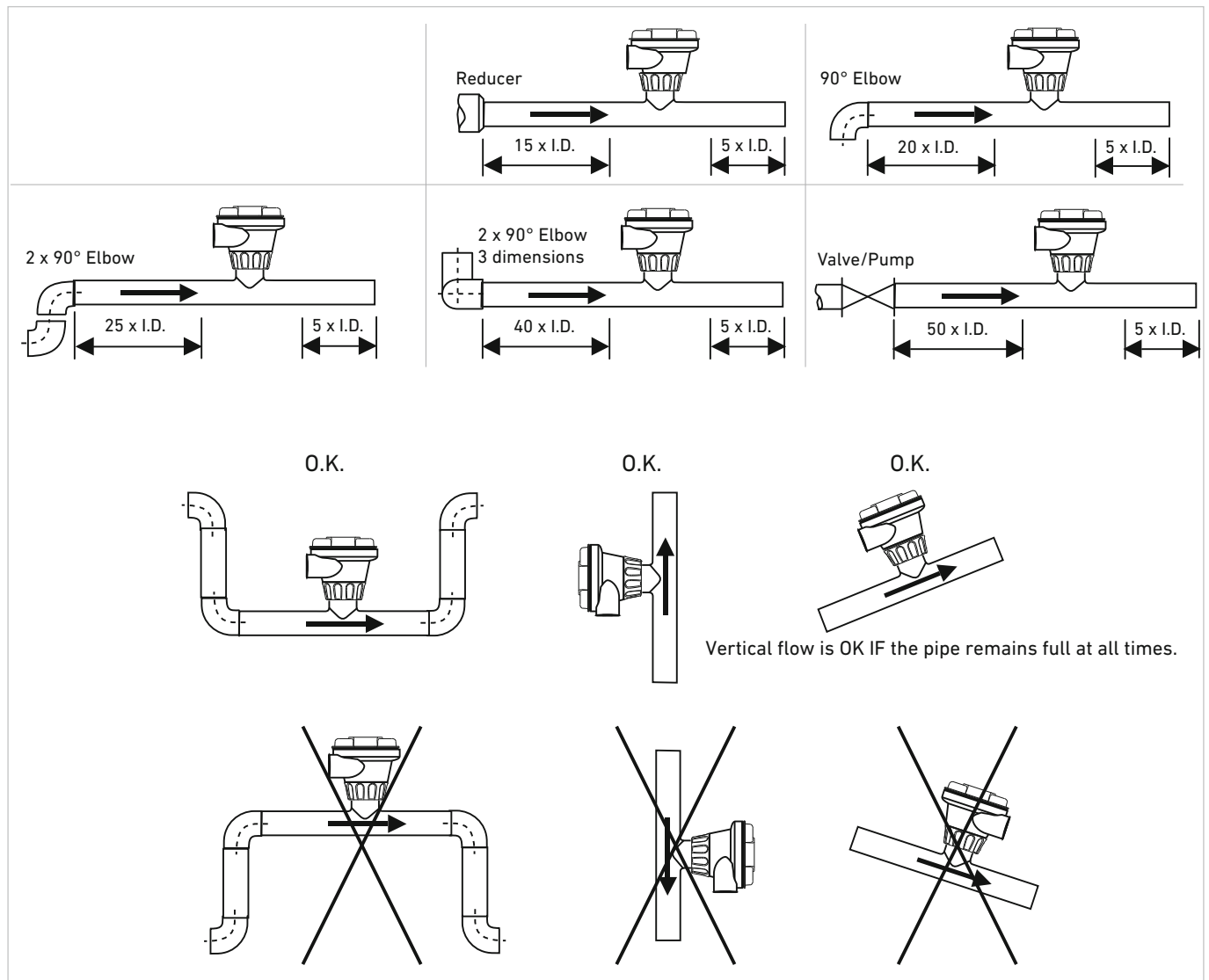
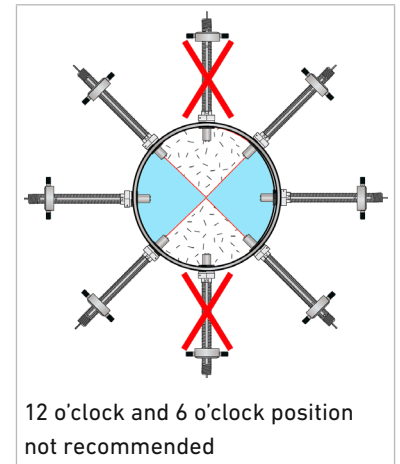


3 Magnetic Flow Sensors

3.1 Technical basics

Magnetic Flow Sensors

- All mounting angles are acceptable for these sensors if the basic parameters are met: the pipe must be full with no entrapped air.
- On horizontal pipe runs, sensor may be mounted in any position around the pipe. If air bubbles or sediments are expected, mount at a slight angle.
- On vertical pipe runs, sensor may be mounted in any orientation with UPWARD flow preferred to ensure a full pipe.



3.2 2551 Magmeter Flow Sensor

Available in a variety of wetted materials and ideal for pipe sizes up to DN900 (36 in.)



3.2.1 Product description

The GF Signet 2551 Magmeter is an insertion style magnetic flow sensor that features no moving parts. The patented* sensor design is available in corrosionresistant materials to provide long-term reliability with minimal maintenance costs. Material options include PP with stainless steel, PVDF with Hastelloy-C, or PVDF with Titanium. Utilizing the comprehensive line of GF Signet installation fittings, sensor alignment and insertion depth is automatic. These versatile, simple-to-install sensors deliver accurate flow measurement over a wide dynamic range in pipe sizes ranging from DN15 to DN900 (½ to 36 inches), satisfying the requirements of many diverse applications.

GF Signet 2551 Magmeters offer many output options of frequency/digital (S³L) or 4 to 20 mA which are available on both the blind and display versions. The frequency or digital (S³L) sensor output can be used with GF Signet's extensive line of flow instruments while the 4 to 20 mA output can be used for a direct input to PLCs, chart recorders, etc. Both the 4 to 20 mA output and digital (S³L) sensor interface is available for long distance signal transmission. An additional benefit is the empty pipe detection which features a zero flow output when the sensors are not completely wetted. Also, the frequency output is bi-directional while the 4 to 20 mA output can be set for uni- or bi-directional flow using the display or the 3-0252 Configuration Tool which connects to PCs for programming capabilities.

In addition the display version of the 2551 Magmeter is available with relays and features permanent and resettable totalizer values which can be stored and seen on the display. Also, the display contains multilanguages with English, Spanish, German, French, Italian and Portuguese menu options.

Features

- Test certificate included for -X0, -X1
- Patented Magmeter technology*
- No moving parts
- Bi-directional flow
- Empty pipe detection
- Installs into pipe sizes DN15 to DN900 (½ to 36 in.)
- Operating range 0.05 to 10 m/s (0.15 to 33 ft/s)
- Accurate measurement even in dirty liquids
- Polypropylene and PVDF retaining nuts standard, Valox optional
- 4 to 20 mA, digital (S³L), frequency, relay output (display only)
- No pressure drop
- Corrosion resistant materials; PP or PVDF with SS, Hastelloy-C, or Titanium
- Multi-language display menu available



Applications

- Chemical Processing
- Water and Wastewater Monitoring
- Metal Recovery and Landfill Leachate
- Commercial Pools, Spas, and Aquariums
- HVAC
- Irrigation
- Scrubber Control
- Neutralization Systems
- Industrial Water Distribution



The installation must be performed in accordance with the instruction manual.
The instruction manual is included with the product, see also online on www.gfps.com/signet

3.2.2 Technical Details

General		
Operating Range	0.05 to 10 m/s	0.15 to 33 ft/s
Pipe Size Range	DN15 to DN900	½ in. to 36 in.
Linearity	± 1% reading plus 0.1% of full scale	
Repeatability	±0.5% of reading @ 25 °C (77 °F)	
Minimum Conductivity	20 µS/cm	

Wetted Materials	
Sensor Body/Electrodes and Grounding Ring	-P0, -P1, -P2: PP/316L SS -T0, -T1, -T2: PVDF/Titanium -V0, -V1, -V2: PVDF/Hastelloy-C
O-rings	FKM (standard) EPR (EPDM), FFKM (optional)
Case	PBT
Display Window	Polyamide (transparent nylon)
Protection Rating	NEMA 4X/IP65

Electrical		
Power Requirements	4 to 20 mA	24 VDC ±10%, regulated, 22.1 mA max.
	Frequency	5 to 24 VDC ±10%, regulated, 15 mA max.
	Digital ("S" ^"3" L)	5 to 6.5 VDC, 15 mA max.
Auxiliary (only required for units with relays)		9 to 24 VDC, 0.4 A max.
Reverse Polarity and Short Circuit Protected		
Current Output 4 to 20 mA	Loop Accuracy	32 µA max. error (25 °C @ 24 VDC)
	Isolation	Low Voltage < 48 VAC/DC from electrodes and auxiliary power
	Maximum Cable	300 m (1000 ft)
	Error Condition	22.1 mA
	Max. Loop Resistance	300 Ω
	Compatible with PLC, PC or similar equipment	
	4 to 20 mA load needed	
Frequency Output	Output Modes	Freq., or Mirror Relay (display version only)
	Max. Pull-up Voltage	30 VDC
	Max. Current Sink	50 mA, current limited
	Maximum Cable	300 m (1000 ft)
	Compatible with GF Signet Model 8900, 9900, 9900-1BC, 9950	
Digital S ³ L Output	Serial ASCII, TTL level 9600 bps	
	Compatible with Model GF Signet 8900, 9900, 9950, 0486 Profibus Concentrator	

Relay Specifications

#1, #2 Type	Mechanical SPDT
Rating	5 A @ 30 VDC max., 5 A @ 250 VDC max.
#3 Type	Solid State
	50 mA @ 30 VDC, 50 mA @ 42 VAC
Hysteresis	User adjustable for exiting alarm condition
Alarm On Trigger Delay	Adjustable (0 to 9999.9 sec)
Relay Modes	Off, Low, High, Window and Proportional Pulse
Relay Source	Flow Rate, Resettable Totalizer
Error Condition	Selectable; Fail Open or Closed

Display

Characters	2 x 16
Contrast	User-set in four levels
Backlighting (only on relay versions)	Requires external 9-24 VDC, 0.4 mA max.

Max. Temperature/Pressure Rating

Storage Temperature	-20 °C to 70 °C	-4 °F to 158 °F
Relative Humidity	0 to 95% (non-condensing)	
Operating Temperature	Ambient	-10 °C to 70 °C 14 °F to 158 °F
	Media	0 °C to 85 °C 32 °F to 185 °F
Maximum Operating Pressure		10.3 bar @ 25 °C 150 psi @ 77 °F
		1.4 bar @ 85 °C 20 psi @ 185 °F

Shipping Weight

	0.680 kg	1.50 lb
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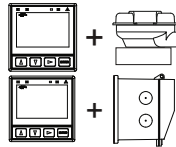




Standards and Approvals

CE, FCC, UL, CUL, NSF (3-2551-PX-XX version only)
RoHS compliant, China RoHS
NEMA 4X / IP65 Enclosure (with cap installed)
Manufactured under ISO 9001 for Quality and ISO 14001 for Environmental Management and OHSAS 18001 for Occupational Health and Safety

Dimensions

Pipe Range		Blind version	Display version
½ to 4 in.	-X0 = 58 mm (2.3 in.)		
5 to 8 in.	-X1 = 91 mm (3.6 in.)		
10 to 36 in.	-X2 = 167 mm (6.6 in.)		

3.2.3 System Overview

Stand-Alone	Panel Mount	Pipe, Tank, Wall	4 to 20 mA Output	Automation System
GF Signet 2551 Magmeter 	GF Signet Instruments - 8900 - 9900-1P - 9900-1BC - 9950 	GF Signet Instruments - 9900-1 with 3-8050-1 Universal Mount Kit - 9900-1BC with Rear Enclosure 	- Customer Supplied Chart Recorder, Programmable Logic Controller or - Programmable Automation Controller 	- 0486 Profibus Concentrator and Customer Supplied - Programmable Logic Controller or Programmable Automation Controller 
	GF Signet 2551 Magmeter 			
GF Signet Fittings				

All Sold Separately

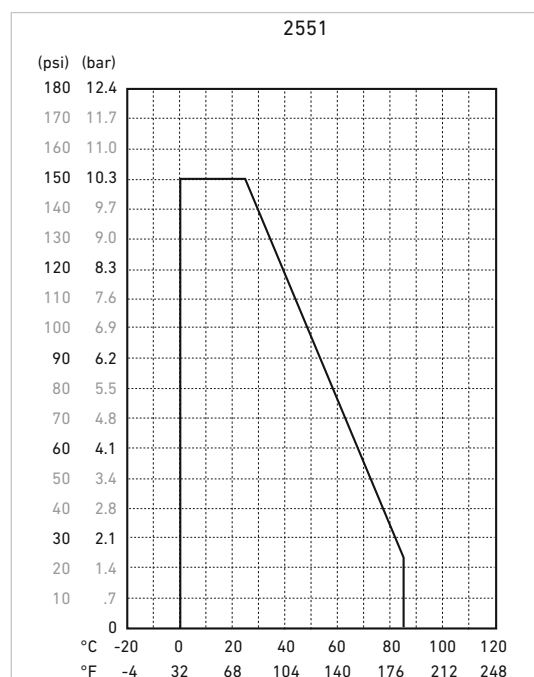
Application Tips

- Note minimum process liquid conductivity requirement is 20 $\mu\text{S}/\text{cm}$.
- Install sensor using standard GF Signet installation fittings for best results.
- Sensor is capable of retrofitting into existing 515 and 2536 fittings

Pressure-temperature diagram

Note

The pressure-temperature diagrams are specifically for the GF Signet sensor. During system design the specifications of all components must be considered. In the case of a metal piping system, a plastic sensor will reduce the system specification. When using a PVDF sensor in a PVC piping system, the fitting will reduce the system specification.



3.2.4 Ordering information

Pipe Size	Mfr. Part No.	Code	Sensor Body
Frequency or Digital (S ³ L) output			
Programmable open collector for use with any GF Signet Flow Instrument or the 8900, 9900 or 9950 Instruments**			

DN15 to DN100 (1/2 to 4 in.)

No Display			
	3-2551-P0-11	159 001 015	Polypropylene and 316L SS
	3-2551-T0-11	159 001 108	PVDF and Titanium
	3-2551-V0-11	159 001 257	PVDF and Hastelloy-C
With Display, two SPDT relays, one solid state relay			
	3-2551-P0-21	159 001 267	Polypropylene and 316L SS
	3-2551-T0-21	159 001 436	PVDF and Titanium
	3-2551-V0-21	159 001 269	PVDF and Hastelloy-C
With Display			
	3-2551-P0-41	159 001 261	Polypropylene and 316 L SS
	3-2551-T0-41	159 001 433	PVDF and Titanium
	3-2551-V0-41	159 001 263	PVDF and Hastelloy-C

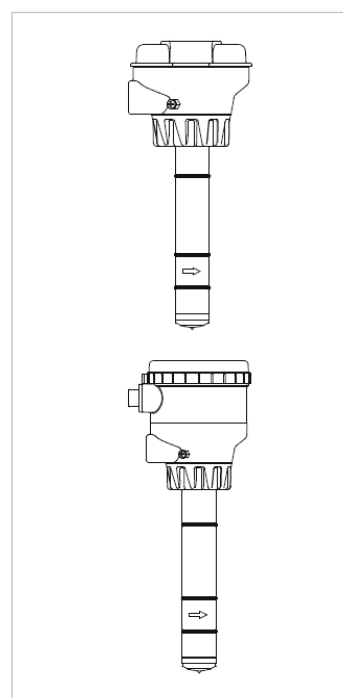
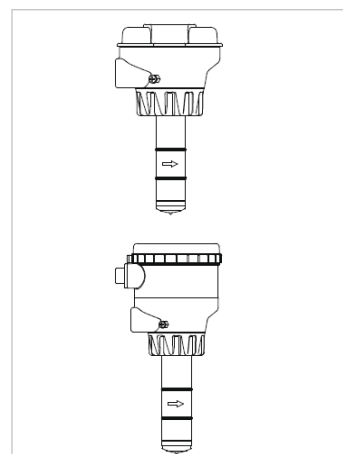
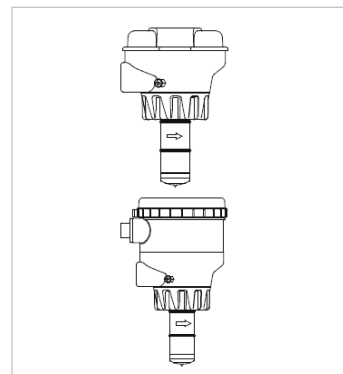
DN125 to DN200 (5 to 8 in.)

No Display			
	3-2551-P1-11	159 001 106	Polypropylene and 316L SS
	3-2551-T1-11	159 001 109	PVDF and Titanium
	3-2551-V1-11	159 001 258	PVDF and Hastelloy-C
With Display, two SPDT relays, one solid state relay			
	3-2251-P1-21	159 001 268	Polypropylene and 316L SS
	3-2551-T1-21	159 001 437	PVDF and Titanium
	3-2551-V1-21	159 001 270	PVDF and Hastelloy-C
With Display			
	3-2551-P1-41	159 001 262	Polypropylene and 316L SS
	3-2551-T1-41	159 001 434	PVDF and Titanium
	3-2551-V1-41	159 001 264	PVDF and Hastelloy-C

DN250 to DN900 (10 to 36 in.)

No Display			
	3-2551-P2-11	159 001 107	Polypropylene and 316L SS
	3-2551-T2-11	159 001 448	PVDF and Titanium
	3-2551-V2-11	159 001 450	PVDF and Hastelloy-C
With Display, two SPDT relays, one solid state relay			
	3-2551-P2-21	159 001 435	Polypropylene and 316L SS
	3-2551-T2-21	159 001 454	PVDF and Titanium
	3-2551-V2-21	159 001 456	PVDF and Hastelloy-C
With Display			
	3-2551-P2-41	159 001 432	Polypropylene and 316L SS
	3-2551-T2-41	159 001 460	PVDF and Titanium
	3-2551-V2-41	159 001 462	PVDF and Hastelloy-C

** This option is a programmable open collector output that is available with display versions only.



Pipe Size	Mfr. Part No.	Code	Sensor Body
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4 to 20 mA output for use with PLC, PC or similar equipment

DN15 to DN100 (1/2 to 4 in.)

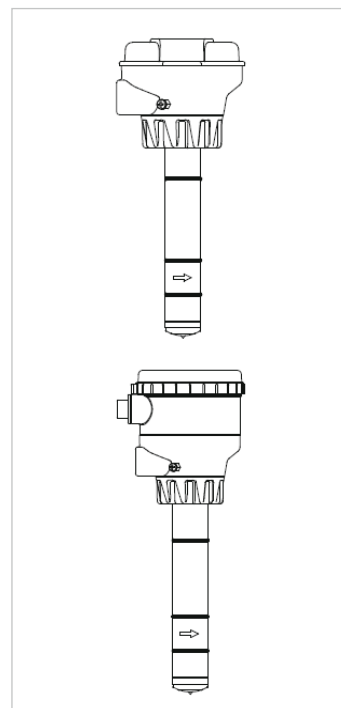
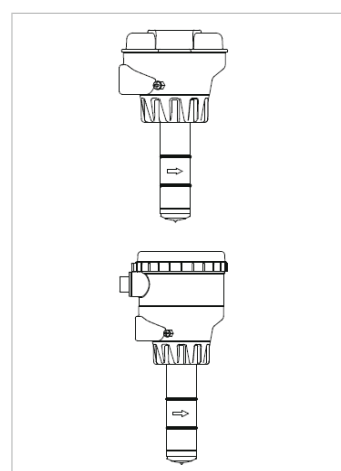
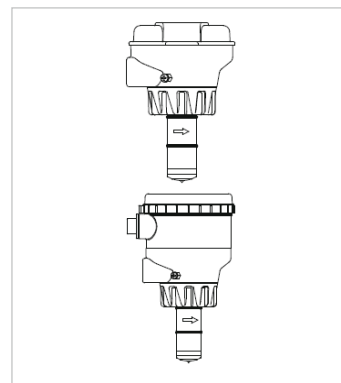
No Display			
	3-2551-P0-12	159 001 110	Polypropylene and 316L SS
	3-2551-T0-12	159 001 113	PVDF and Titanium
	3-2551-V0-12	159 001 259	PVDF and Hastelloy-C
With Display, two SPDT relays, one solid state relay			
	3-2551-P0-22	159 001 273	Polypropylene and 316L SS
	3-2551-T0-22	159 001 439	PVDF and Titanium
	3-2551-V0-22	159 001 275	PVDF and Hastelloy-C
With Display			
	3-2551-P0-42	159 001 279	Polypropylene and 316 L SS
	3-2551-T0-42	159 001 439	PVDF and Titanium
	3-2551-V0-42	159 001 275	PVDF and Hastelloy-C

DN125 to DN200 (5 to 8 in.)

No Display			
	3-2551-P1-12	159 001 111	Polypropylene and 316L SS
	3-2551-T1-12	159 001 114	PVDF and Titanium
	3-2551-V1-12	159 001 260	PVDF and Hastelloy-C
With Display, two SPDT relays, one solid state relay			
	3-2251-P1-22	159 001 274	Polypropylene and 316L SS
	3-2551-T1-22	159 001 440	PVDF and Titanium
	3-2551-V1-22	159 001 276	PVDF and Hastelloy-C
With Display			
	3-2551-P1-42	159 001 280	Polypropylene and 316L SS
	3-2551-T1-42	159 001 443	PVDF and Titanium
	3-2551-V1-42	159 001 282	PVDF and Hastelloy-C

DN250 to DN900 (10 to 36 in.)

No Display			
	3-2551-P2-12	159 001 112	Polypropylene and 316L SS
	3-2551-T2-12	159 001 449	PVDF and Titanium
	3-2551-V2-12	159 001 451	PVDF and Hastelloy-C
With Display, two SPDT relays, one solid state relay			
	3-2551-P2-22	159 001 438	Polypropylene and 316L SS
	3-2551-T2-22	159 001 455	PVDF and Titanium
	3-2551-V2-22	159 001 457	PVDF and Hastelloy-C
With Display			
	3-2551-P2-42	159 001 441	Polypropylene and 316L SS
	3-2551-T2-42	159 001 461	PVDF and Titanium
	3-2551-V2-42	159 001 463	PVDF and Hastelloy-C



3.2.5 Accessories

Mfr. Part	Code	Description
O-Rings		
1220-0021	198 801 000	O-ring, FKM (2 required per sensor)
1224-0221	198 820 006	O-ring, EPDM (EPDM) (2 required per sensor)
1228-0221	198 820 007	O-ring, FFKM (2 required per sensor)
Replacement Transducers		
3-2551-P0	159 001 211	PP/316L SS, DN15 to DN100 (1/2 to 4 in.) pipe
3-2551-P1	159 001 212	PP/316L SS, DN125 to DN200 (5 to 8 in.) pipe
3-2551-P2	159 001 444	PP/316L SS, DN250 to DN900 (10 to 36 in.) pipe
3-2551-T0	159 001 213	PVDF/Titanium, DN15 to DN100 (1/2 to 4 in.) pipe
3-2551-T1	159 001 214	PVDF/Titanium, DN125 to DN200 (5 to 8 in.)
3-2551-T2	159 001 445	PVDF/Titanium, DN250 to DN900 (10 to 36 in.) pipe
3-2551-V0	159 001 376	PVDF/ Hastelloy-C, DN15 to DN100 (1/2 to 4 in.) pipe
3-2551-V1	159 001 377	PVDF/Hastelloy-C, DN125 to DN 200 (5 to 8 in.) pipe
3-2551-V2	159 001 446	PVDF/Hastelloy-C, DN250 to DN900 (10 to 36 in.)
Replacement Electronics Module		
3-2551-11	159 001 215	Magmeter electronics, frequency or digital (S ³ L) output
3-2551-12	159 001 216	Magmeter electronics, 4 to 20 mA output
3-2551-21	159 001 372	Magmeter display electronics, frequency or digital (S ³ L) output, with relays
3-2551-22	159 001 373	Magmeter display electronics, 4 to 20 mA output w/relays
3-2551-41	159 001 374	Magmeter display electronics, frequency or digital (S ³ L) output
3-2551-42	159 001 375	Magmeter display electronics, 4 to 20 mA output
Other		
P31536	198 840 201	Sensor plug, Polypropylene
7310-1024	159 873 004	24 VDC Power Supply, 0.42 A, 10W
7310-2024	159 873 005	24 VDC Power Supply, 1.0 A, 24W
7310-4024	159 873 006	24 VDC Power Supply, 1.7 A, 40W
7310-6024	159 873 007	24 VDC Power Supply, 2.5 A , 60W
7310-7024	159 873 008	24 VDC Power Supply, 4.0 A, 96W
3-8050.390-1	159 001 702	Retaining Nut Replacement Kit, NPT, Valox
3-8050.390-3	159 310 116	Retaining Nut Replacement Kit, NPT, PP
3-8050.390-4	159 310 117	Retaining Nut Replacement Kit, NPT, PVDF
3-8551.521	159 001 378	Clear plastic cap for display
1222-0042	159 001 379	O-ring for clear plastic cap, EPDM (EPDM)
3-0252	159 001 808	Configuration Tool
3-8050.396	159 000 617	RC Filter kit (for relay use), 2 per kit

3.3 2552 Metal Magmeter Flow Sensors



3.3.1 Product description

The GF Signet 2552 Metal Magmeter from Georg Fischer features all-stainless steel construction. The PVDF nosepiece and FKM O-rings are the only other wetted materials. The 2552 installs quickly into standard 1¼ in. or 1½ in. pipe outlets, and is adjustable to fit pipes from DN50 to DN2550 (2 to 102 inches). Two sensor lengths allow maximum flexibility to accommodate a variety of hardware configurations, including ball valves for hot-tap installations.

When equipped with the frequency output, the 2552 is compatible with any externally powered GF Signet flow instrument, while the digital (S³L) output enables multi-channel compatibility with the GF Signet 8900, 9900 or 9950 Multi-Parameter instruments. Select the blind 4 to 20 mA current output to interface directly with data loggers, PLCs or telemetry systems. Key features include Empty Pipe Detection, LED-assisted troubleshooting, and bi-directional span capability (in 4 to 20 mA models).

The GF Signet 3-0252 Configuration Tool is available to customize every performance feature in the 2552 so it can be adapted to the user's application requirements.

Features

- Operating range 0.1 to 6 m/s (0.3 to 20 ft/s)
- Field replaceable electronics
- Non-magnetic RF detection
- Standard NPT or ISO process connections
- Hot-tap versions for installation/service without system shutdown
- For pipe sizes up to DN900 (36 in.)
- Adjustable sensor - one size for entire pipe range
- 7.6 m (25 ft) cable

* U.S. Patent No: 7,055,396 B1



Applications

- Municipal Water Distribution
- Process and Coolant Flow
- Chemical Processing
- Wastewater
- Mining Applications
- Water Process Flow
- HVAC



The installation must be performed in accordance with the instruction manual.
The instruction manual is included with the product, see also online on www.gfps.com/signet

3.3.2 Technical Details

General			
Operating Range	Minimum	0.05 m/s	0.15 ft/s
	Pipes to DN1200 (48 in.)	10 m/s	33 ft/s
	Pipes over DN1200 (48 in.)	3 m/s	10 ft/s
Pipe Size Range	DN50 to DN2550	2 in. to 102 in.	
Linearity	±1% of reading plus 0.1% of full scale		
Repeatability	±0.5% of reading @ 25 °C		
Accuracy	±2% of measured value*		
Minimum Conductivity	20 µs/cm		
Wetted Materials			
Body and Electrodes	316L stainless steel		
Insulator	PVDF		
O-rings	FKM		
Cable	4-cond + shield, PVC jacket (Fixed cable models) or Water-resistant rubber cable assembly with Turck NEMA 6P connector		
Power Requirements			
4 to 20 mA	24 VDC ±10%, regulated, 22.1 mA maximum		
Frequency	5 to 24 VDC ±10%, regulated, 15 mA maximum		
Digital (S³L)	5 to 6.5 VDC 15 mA maximum		
Reverse Polarity and Short Circuit Protected			
Cable Options			
Fixed Cable	7.6 m	25 ft	
Detachable water tight sensor cable with Turck connector (sold separately) two lengths: 4 m (13 ft) or 6 m (19.5 ft)			

* In reference conditions where the fluid is water at ambient temperature, the sensor is inserted at the correct depth and there is a fully developed flow profile which is in compliance with ISO 7145-1982 (BS 1042 section 2.2)

Electrical

Current Output (4 to 20 mA)	Programmable and Reversible		
	Loop Accuracy	32 μ A max. error (@ 25 °C @ 24 VDC)	
	Temperature Drift	± 1 μ A per °C max.	
	Power Supply Rejection	± 1 μ A per V	
	Isolation	Low voltage < 48 VAC/DC from electrodes and auxiliary power	
	Maximum Cable	300 m	1000 ft
	Max. Loop Resistance	300 Ω	
	Error Condition	22.1 mA	
Frequency Output	Compatible with	GF Signet 8900, 9900, 9900-1BC and 9950	
	Max. Pull-up Voltage	30 VDC	
	Short Circuit Protected	≤ 30 V @ 0 Ω pull-up for one hour	
	Reverse Polarity Protected	To -40 V for 1 hour	
	Over-voltage Protected to +40 V for 1 hour		
	Max. Current Sink	50 mA, current limited	
	Maximum Cable	300 m	
Digital (S ³ L)Output	Compatible with	GF Signet 8900, 9900 and 9950	
	Serial ASCII, TTL level 9600 bps		
	Maximum Cable	Application dependent (See 8900 or 9900 manual) in non-icing conditions	
Operating Temp.	Ambient (non-icing conditions)	-15 °C to 70 °C	5 °F to 158 °F
	Media	-15 °C to 85 °C	5 °F to 185 °F
Max. Operating Pressure	20.7 bar @ 25 °C	300 psi @ 77 °F	

Hot-Tap Installation Requirements

Maximum Installation Pressure	20.7 bar	300 psi
Maximum Installation Temp (Insertion/Removal)	40 °C	104 °F
Do not use hot-tap installation where temperatures will exceed 40 °C or if hazardous liquids are present.		

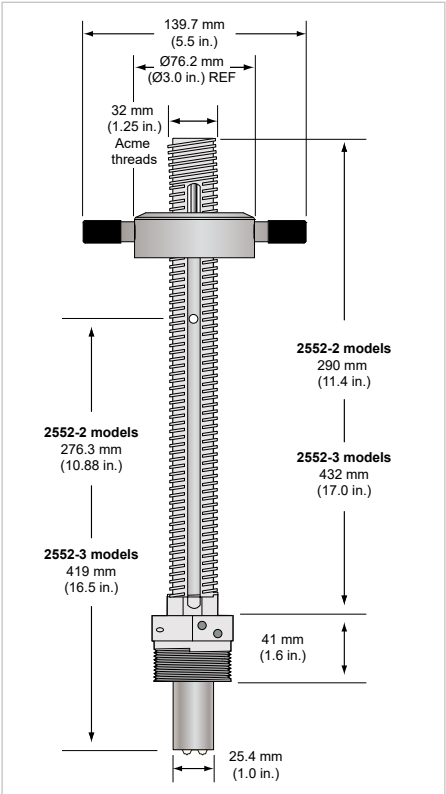
Shipping Weights

3-2552-2X-A-11/A-12	2.50 kg	5.51 lb
3-2552-2X-B-11/B-12	2.30 kg	5.07 lb
3-2552-3X-A-/B-11/A-12/B-12	4.00 kg	8.81 lb

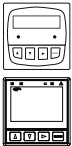
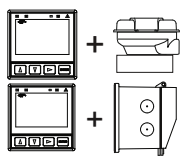

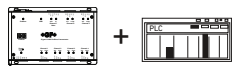

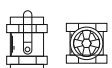



Standards and Approvals

CE, FCC	
RoHS compliant, China RoHS	
NEMA 4 (IP65)	Fixed cable models
NEMA 6P (IP68)	Submersible cable models only. GF Signet recommends maximum 3 m (10 ft) submersion depth for maximum 10 days continuous submersion.
Manufactured under ISO 9001 for Quality and ISO 14001 for Environmental Management and OHSAS 18001 for Occupational Health and Safety	

Dimensions



3.3.3 System Overview

Panel Mount	Pipe, Tank, Wall	4 to 20 mA Output	Automation System
<p>GF Signet Instruments</p> <ul style="list-style-type: none">- 8900- 9900-1P- 9900-1BC- 9950 	<p>GF Signet Instruments</p> <ul style="list-style-type: none">- 9900-1 with 3-8050 Universal Mount Kit- 9900-1BC with Rear Enclosure- 9950 	<ul style="list-style-type: none">- Customer Supplied Chart Recorder, Programmable Logic Controller or- Programmable Automation Controller 	<ul style="list-style-type: none">- 0486 Profibus Concentrator and Customer Supplied Programmable Logic Controller or- Programmable Automation Controller 
<p>GF Signet 2552 Magmeter (Standard or Hot-Tap)</p> 			
<p>ball or gate valve</p> <p>1¼" or 1½"</p> 	<p>nipple</p> <p>1¼" or 1½"</p> 	<p>Weld-on weldolet</p> <p>1¼" or 1½" outlet</p> 	<p>Iron strap-on saddle</p> <p>1¼" or 1½" outlet</p> 
<p>All Sold Separately</p>			

Application Tips

- Minimum process liquid conductivity requirement is 20 µS/cm.
- 1½ x 1¼ inch and 2 x 1¼ inch (2552-2 only) retrofit adapters are available for replacement installations of GF Signet 2550 and 2540 sensors

Sensor Selection Guide

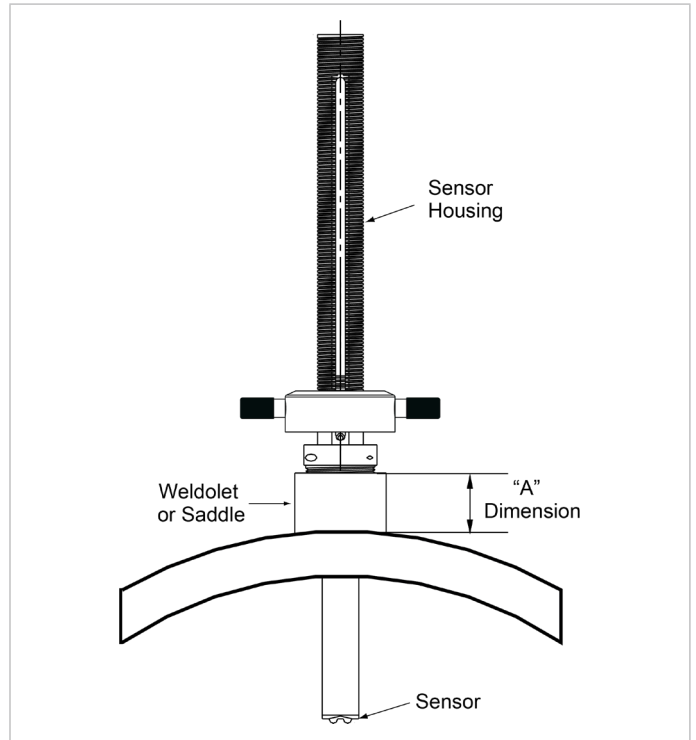
The 2552 Magmeter can be installed into a variety of pipe sizes. Follow the steps below to ensure that you choose the right sensor for your application.

Step 1: Determine how the sensor will be installed

A For standard (non Hot-Tap) installation:

The height of the weldolet (threadolet) and pipe adapter(s) should be determined before the sensor is purchased.

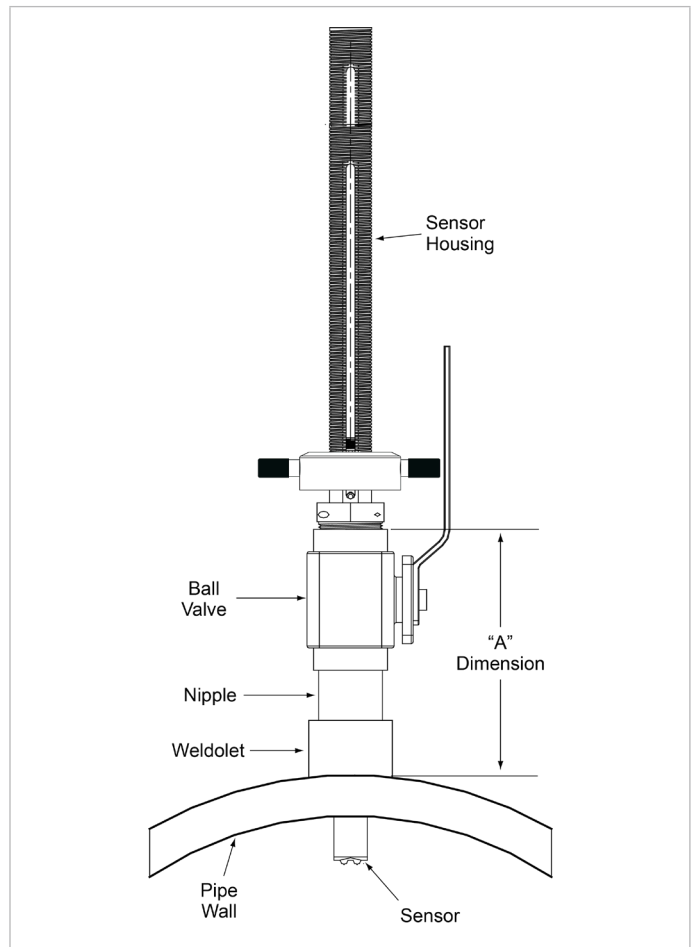
- For retrofit installations, the stack height, or "A" dimension, is the overall height from the top of the pipe to the highest point of the stack.
- Sensor tip must be positioned at 10% of pipe ID
- For new installations, GF Signet recommends a weldolet (threadolet) and an adapter to accommodate the 1¼ in. (or 1½ in. for 2552-3) sensor process threads. The stack height, or "A" dimension, is the overall height from the top of the pipe to the highest point of the stack before the sensor is connected.



B For Hot-Tap installations:

The stack height of the ball valve, nipple weldolet (threadolet) and pipe adapters should be determined before the sensor is purchased.

- For retrofit installations, the ball valve must be at least a 1¼ in. (or 1½ in. for 2552-3) valve. The stack height, or "A" dimension (see Fig. 2), is the overall height from the top of the pipe to the top of the ball valve.
- Sensor tip base must be positioned at 10% of pipe ID
- For new installations, GF Signet recommends a 1¼ in. or 1½ in. full port ball valve, a short nipple and a weldolet (threadolet). The stack height or "A" dimension (see Fig. 2) is the overall height from the top of the pipe to the top of the ball valve before the sensor is connected.



Step 2: Determine how the sensor will be installed

Once the "A" dimension is determined, go to the sensor selection table and find your "A" dimension on the left column. Next, find the appropriate pipe size at the top of the chart. To determine the correct sensor size locate where the pipe size column meets the max "A" dimension row.

			Pipe Size																												
	DN	inches																													
	50	2																													
	65	2.5																													
	80 to 90	3 to 3 ½																													
	100	4																													
	125	5																													
	150 to 200	6 to 8																													
	250	10																													
	300 to 350	12 to 14																													
	400	16																													
	450	18																													
	500	20																													
	550	22																													
	600	24																													
	650 to 700	26 to 28																													
	750 to 800	30 to 32																													
	850	34																													
	900 to 950	36 to 38																													
	1000 to 1100	40 to 42																													
	1200	48																													
	1400	54																													
	1500	60																													
	1700	66																													
	1800	72																													
	2000	78																													
	2100	84																													
	258 m	102																													
Max. "A" Dim	mm	inches	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	3	3	3	3	3	3	
	50.8	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	3	3	3	3	3	3	3	
	63.5	2.5	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	3	3	3	3	3	3	3	
	76.2	3	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	3	3	3	3	3	3	3	
	88.9	3.5	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	3	3	3	3	3	3	3	
	101.6	4	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	3	3	3	3	3	3	3	
	114.3	4.5	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	3	3	3	3	3			
	127	5	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	3	3	3	3	3			
	139.7	5.5	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	3	3	3	3	3			
	152.4	6	2	2	2	2	2	2	2	2	2	2	2	2	2	2	3	3	2	3	3	3	3	3	3	3	3	3	3		
	165.1	6.5	2	2	2	2	2	2	2	2	2	2	2	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3			
	177.8	7	2	2	2	2	2	2	2	2	2	2	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3				
	190.5	7.5	2	2	2	2	2	2	2	2	2	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3					
	228.6	9	2	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3							
	241.3	9.5	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3								
	254	10	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3									
	266.7	10.5	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3											
	279.4	11	3	3	3	3	3	3	3	3	3	3	3	3			3	3	3												
	292.1	11.5	3	3	3	3	3	3	3	3	3	3	3	3			3														
	304.8	12	3	3	3	3	3	3	3	3	3	3	3				3														
317.5	12.5	3	3	3	3	3	3	3	3	3																					
330.2	13	3	3	3	3	3	3	3	3																						
342.9	13.5	3	3	3	3	3	3	3																							
355.6	14	3	3	3	3	3																									
375.9	14.8	3	3																												
381	15																														

2 Use 3-2552-2, max. insertion = 236 mm (9.3 in.)

3 Use 3-2552-3, max. insertion = 368 mm (14.8 in.)

This chart is based on the thickest commonly available pipe.

Step 3: Refer to Ordering Information to select corresponding part numbers**Ordering Notes:**

- Sensor insertion depth is the distance from the bottom of the sensor housing to the tip of the sensor.
- Hot-Tap installations require a 1 1/4 in. or 1 1/2 in. ball valve.
- See Sensor Selection Guide on previous page to determine the sensor length required.

3.3.4 Ordering information

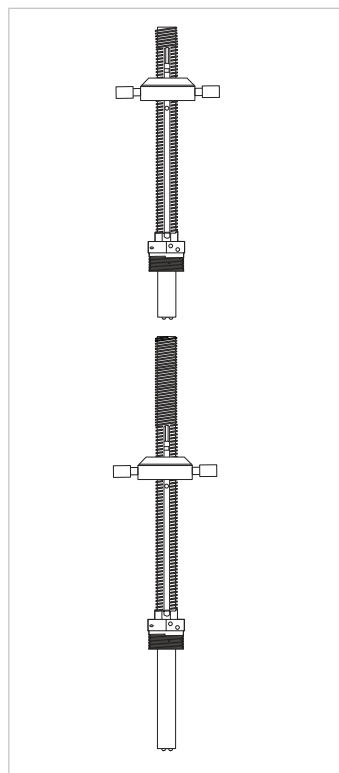
Mfr. Part	Code	Sensor Insertion Depth	Process Connection Thread Options
Frequency or Digital (S ³ L) output For use with any GF Signet Flow or Multi-Parameter Instruments			
Fixed Cable, 7.6 m (25 ft); no connector			
3-2552-21-A-11	159 00 513	9.3 inches*	1¼ inch NPT**
3-2552-22-A-11	159 001 517	9.3 inches*	1¼ inch ISO**
3-2552-33-A-11	159 001 521	14.8 inches*	1½ inch NPT**
3-2552-34-A-11	159 001 522	14.8 inches*	1½ inch ISO**
Watertight sensor connector; cable sold separately			
3-2552-21-B-11	159 001 515	9.3 inches*	1¼ inch NPT**
3-2552-22-B-11	159 001 519	9.3 inches*	1¼ inch ISO**
3-2552-33-B-11	159 001 523	14.8 inches*	1½ inch NPT**
3-2552-34-B-11	159 001 524	14.8 inches*	1½ inch ISO**
4 to 20 mA output			
Fixed Cable, 7.6 m (25 ft); no connector			
3-2552-21-A-12	159 001 514	9.3 inches*	1¼ inch NPT**
3-2552-22-A-12	159 001 518	9.3 inches*	1¼ inch ISO**
3-2552-33-A-12	159 001 525	14.8 inches*	1½ inch NPT**
3-2552-34-A-12	159 001 526	14.8 inches*	1½ inch ISO**
Watertight sensor connector; cable sold separately			
3-2552-21-B-12	159 001 516	9.3 inches*	1¼ inch NPT**
3-2552-22-B-12	159 001 520	9.3 inches*	1¼ inch ISO**
3-2552-33-B-12	159 001 527	14.8 inches*	1½ inch NPT**
3-2552-34-B-12	159 001 528	14.8 inches*	1½ inch ISO**

* Customer must determine stack height (ball valve, nipple, weldolet, etc.). Refer to Sensor Selection on previous page to determine "A" dimension. Sensor tip must be positioned at 10% of pipe ID.

** 1¼ inch process connection is the standard thread size on the 3-2552-2X-X-XX: For the 2552-3 the 1½ inch process connection is standard and the 1¼ inch is available as a special order.

3.3.5 Accessories

Mfr. Part	Code	Description
2120-1512	159 001 425	1½ x 1¼ inch NPT adapter for retrofitting 2540 installation to 2552 - 316 SS
2120-2012	159 001 426	2 x 1¼ inch NPT adapter for retrofitting 2550 installation to 2552 - 316 SS
3-2552.392	159 001 350	1¼ inch NPT full port stainless steel ball valve and nipple kit
3-2552.393	159 001 531	1¼ inch NPT full port brass ball valve & nipple kit
3-2552.394	159 011 532	1½ inch NPT conduit adapter, aluminum for -1 and -2 units
4301-2125	159 001 533	1¼ inch NPT full port ball valve - brass
4301-2125	159 001 387	1¼ inch NPT full port ball valve - stainless steel
5541-4184	159 001 388	4-conductor cable assembly with water-tight connector, 4 m (13 ft)
5541-4186	159 001 389	4-conductor cable assembly with water-tight connector, 6 m (19.5 ft)
Special order	Special order	4-conductor cable assembly with water-tight connector, cable length in 25 ft increments
Special order	Special order	1¼ in. NPT or ISO process connection threads to replace 1½ in. NPT or ISO threads
3-0252	159 001 808	Configuration Tool



3.4 2581 FlowtraMag® Meter



3.4.1 Product description

The GF 2581 FlowtraMag is a full-bore plastic PVC in line style magnetic flowmeter. The PVC body with Titanium or Hastelloy® C electrodes has no moving parts, and is two to three times lighter in weight compared to traditional metal magmeters on the market. It is designed for high accuracy flow measurement in short pipe runs, making it an ideal solution for industrial applications where performance and ease of use are important.

The FlowtraMag design is factory calibrated with certificate at $\pm 1\%$ of reading accuracy. It is offered in corrosion resistant materials to provide long-term reliability with minimal maintenance costs. The LED indicators show at-a-glance system status, including normal operation, zero flow and partially filled pipe detection.

The flow meter provides three different outputs; field selectable frequency or digital (S3L) as well as analog 4 to 20 mA in both passive and active configuration. The GF Config Tool Bluetooth® app supports iOS and Android for simple on-the-fly user configuration with in with instantaneous flow reading.

These versatile, easy-to-install meters deliver accurate flow measurement in pipe sizes of DN25 (1 in.), DN40 (1.5 in.), DN50 (2 in.), DN80 (3 in.) and DN100 (4 in.), optimized for performance in short pipe runs often associated with final effluent lines, well heads and water treatment skids.

Features

- No moving parts
- Lighter in weight compared to traditional metal magmeters
- Reduced straight run requirements, ideal for final effluent lines, wellheads and skids
- Factory calibrated with certificate ($\pm 1\%$ of reading accuracy)
- Partially filled pipe detection status indicator
- Reverse flow direction configurable with 0252 Configuration Tool or GF Config Tool Bluetooth® App
- One device with three different outputs: field selectable Frequency or Digital (S³L), and analog 4 to 20 mA in both passive and active configuration
- On-the-fly configuration with GF Config Tool Bluetooth® App
- Bluetooth® 4.2 capable, support iOS and Android for simple user configuration with instantaneous flow reading

* Patent #: US 10,712,184 B1. Other U.S. and International Patents Pending.
Hastelloy® is a registered trademark of Haynes International.



Applications

- Chemical Processing/Production
- Cooling Tower
- Filtration Systems
- Water and Wastewater Treatment
- Municipal and Industrial Water Distribution
- Pool and Aquatics
- Process Control, Water Process Flow
- Reverse Osmosis
- Scrubber Systems
- Metal Recovery and Landfill Leachate
- Mining

3.4.2 Specifications

General		
Pipe Size Range	DN25, DN40, DN50, DN80, DN100	1 in., 1.5 in., 2 in., 3 in., 4 in.
Flow Range Titanium or Hastelloy C	0.02 to 10 m/s	0.07 to 33 ft/s
DN25 (1")	0.53 LPM to 266.35 LPM	0.14 to 70.36 GPM
DN40 (1.5")	1.36 LPM to 662.34 LPM	0.36 to 174.97 GPM
DN50 (2")	2.23 LPM to 1112.60 LPM	0.59 to 293.92 GPM
DN80 (3 in.)	5.11 LPM to 2493.75 LPM	1.35 to 658.78 GPM
DN100 (4")	8.72 LPM to 4357.83 LPM	2.30 to 1151.22 GPM
Minimum Conductivity	20 μS/cm – water based	
Power Cable Wire	7.6 m (25 ft) 2-conductor shielded	
Output Cable Wire	7.6 m (25 ft) 5-conductor shielded	
Cable wires may be extended up to 305 m (1,000 ft), field splice or special order		
Wetted Materials		
Flow Tube Body	PVC	
Electrode	Titanium, grade 2 or Hastelloy C-276	
O-rings	FKM or EPDM	
Performance		
Accuracy	± 1% of reading plus ± 0.01 m/s (0.033 ft/s), reference condition 50 μS/cm and water based	
Repeatability	± 0.5% of reading @ 25 °C (77 °F)	
Low Flow Cutoff	0.02 m/s (0.07 ft/s) (adjustable via GF Config Tool App or 0252 Configuration Tool)	
Electrical		
DC Power (Functional Rating)	24 VDC, max 24 W (12 to 32 VDC)	
Reverse Polarity Protected	Up to 35 VDC	
Over-Voltage Maximum Rating	35 VDC	
Current Output		
Passive (low power)	4 to 20 mA per ANSI-ISA 50.00.01 Class H	
Active Output	4 to 20 mA	
Passive / Active	User selectable	
Passive Loop Voltage	12 to 32 VDC	
Loop Accuracy	±32 μA (@ 25 °C @ 24 VDC)	
Loop Resolution	5 μA	
Loop Span	3.8 mA to 21 mA	
Error Condition	None, 3.6 mA or 22 mA	
Max. Cable	305 m (1,000 ft)	
Max. Loop Resistance	600 Ω @ 24 VDC	
	Compatible with PLC, PC or similar equipment	
Frequency Output		
Frequency	5 to 24 VDC, 50 mA max.	
Frequency Range	0 to 1500 Hz	

Frequency Output

Max. Cable	305 m (1,000 ft)
Max. Pull-up Voltage	30 VDC, 10k pull-up recommended
	Compatible with GF 8900, 9900, 9950, and 0486 Profibus Concentrator

Digital (S³L) Output

Digital (S ³ L)	4.5 to 5.5 VDC
	Serial ASCII, TTL level 9600 bps Compatible with GF 8900, 9900, 9950 and 0486 Profibus Concentrator
Max. Cable Length	Application dependent

Environmental Requirements

Enclosure	NEMA 4X / IP65		
Relative Humidity	0 to 95% non-condensing		
Storage Temperature	-10 °C to 60 °C (14 °F to 140 °F)		
Operating Temperature			
	Ambient	-10 °C to 60 °C	14 °F to 140 °F
	Media	0 °C to 60 °C	32 °F to 140 °F
UL Environmental Rating	UL 50, Type 6P Storage		
Altitude	4,000 m	13,123 ft	

Pressure/Temperature Ratings

Maximum Operating Pressure	10 bar @ 23 °C (145 psi @ 73 °F)		
DN25 (1"), DN40 (1.5"), DN50 (2")	3.5 bar @ 60 °C (51 psi @ 140 °F)		
DN80 (3"), DN100 (4")	2.27 bar @ 60 °C (33 psi @ 140 °F)		

Shipping Weight -Titanium or Hastelloy C

DN25 (1")	3.4 kg	7.5 lbs
DN40 (1.5")	4.1 kg	9.1 lbs
DN50 (2")	4.5 kg	9.9 lbs
DN80 (3")	7.5 kg	16.5 lbs
DN100 (4")	8.3 kg	18.3 lbs

Standards and Approvals

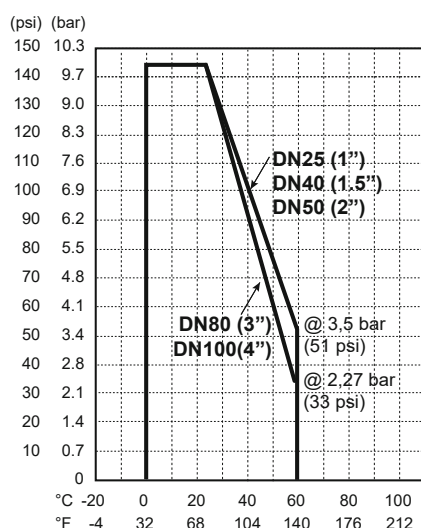
CE, FCC, NSF (Titanium only, does not include flange gaskets)
UL, CUL Recognized Component
RoHS compliant, China RoHS
Manufactured under ISO 9001, ISO 14001 and ISO 45001

Pressure-temperature diagram

Note:

The pressure/temperature graphs are specifically for the GF sensor. During system design the specifications of all components must be considered.

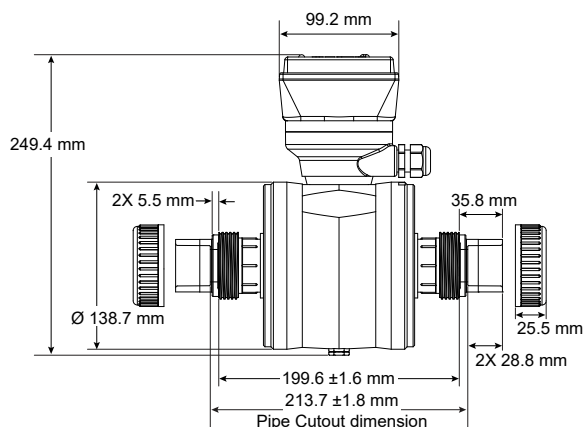
In the case of a metal piping system, a plastic sensor will reduce the system specification.



Dimensions

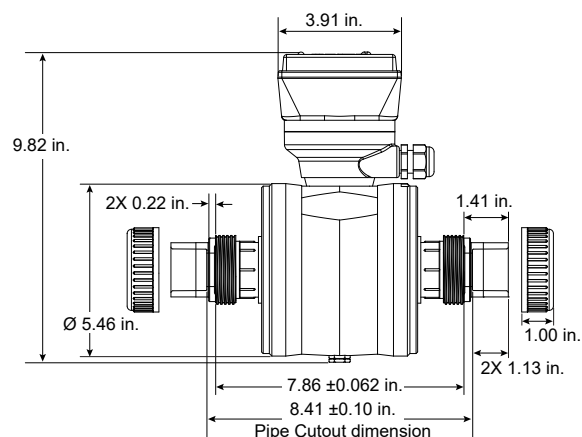
DN25

Metric Union ends and union nuts shown



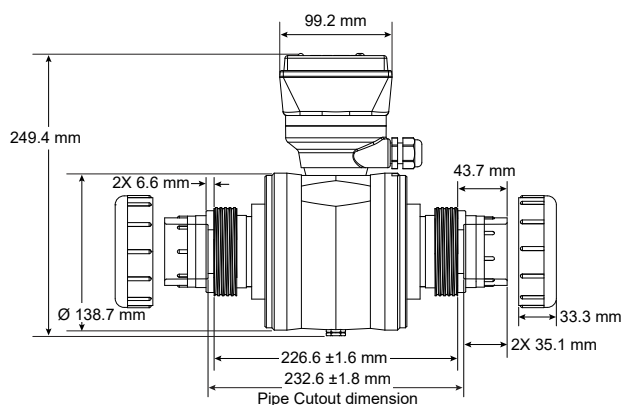
1 in.

ASTM Union ends and union nuts shown



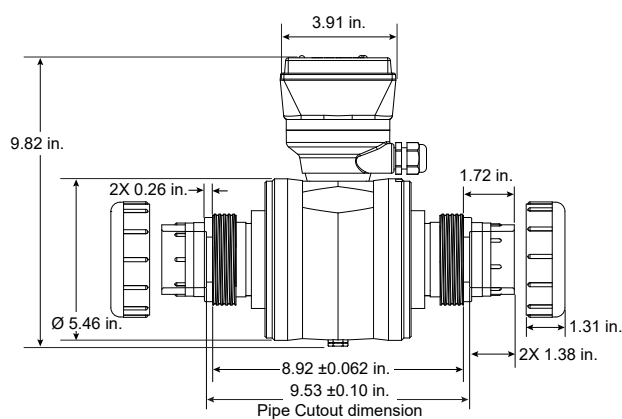
DN40

Metric Union ends and union nuts shown



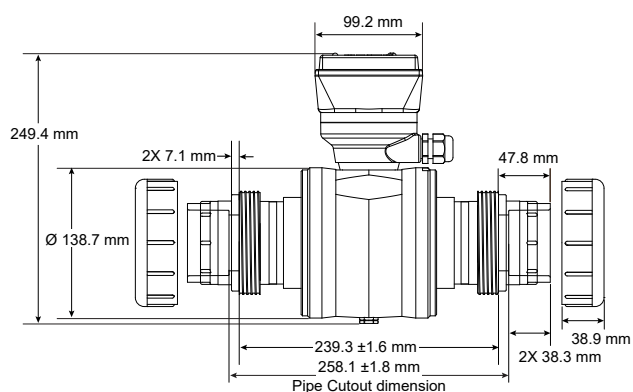
1.5 in.

ASTM Union ends and union nuts shown



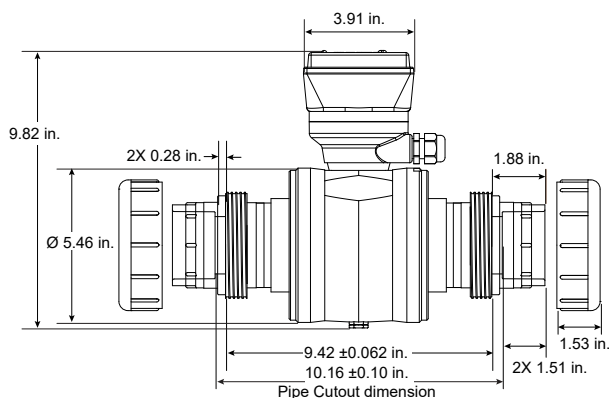
DN50

Metric Union ends and union nuts shown



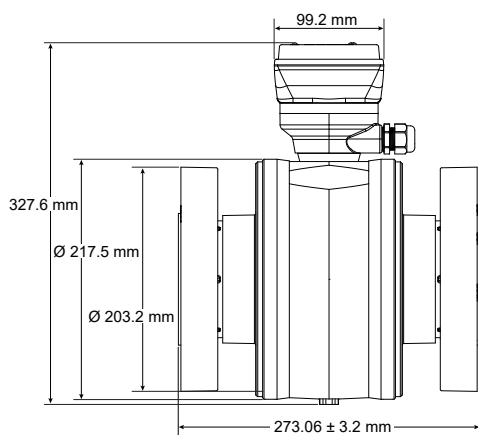
2 in.

ASTM Union ends and union nuts shown

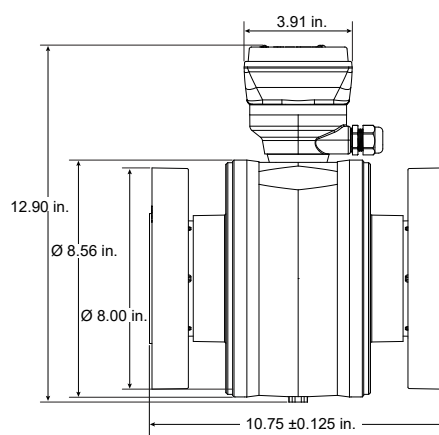


DN80

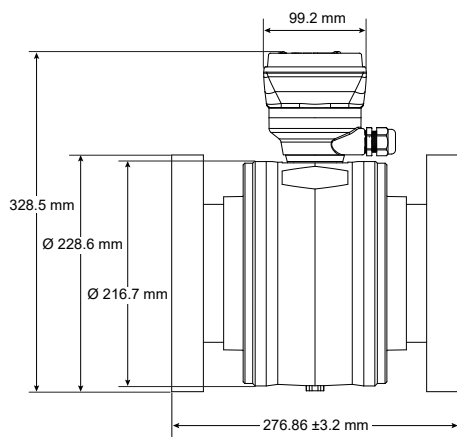
Flange bolt kits and gaskets not shown (Sold separately)

**3 in.**

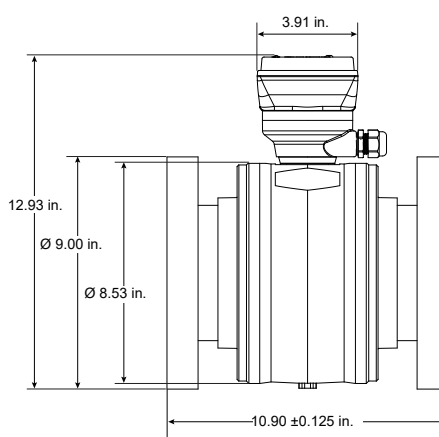
Flange bolt kits and gaskets not shown (Sold separately)

**DN100**

Flange bolt kits and gaskets not shown (Sold separately)

**4 in.**

Flange bolt kits and gaskets not shown (Sold separately)

**3.4.3 System Overview**

Stand-Alone	Panel Mount	Pipe, Tank, Wall	4 to 20 mA Output	Automation System
GF 2581 FlowtraMag 	GF Instruments - 8900 - 9900-1P - 9900-1BC - 9950 	GF Instruments - 9900-1 with 3-8050-1 Universal Mount Kit - 9900-1BC with Rear Enclosure 	- Customer Supplied Chart Recorder, Programmable Logic Controller or - Programmable Automation Controller 	- 0486 Profibus Concentrator and Customer Supplied Programmable Logic Controller or - Programmable Automation Controller
GF 2581 FlowtraMag - 3-2581PTXX-10X - 3-2581PHXX-10X 				

3.4.4 GF Configuration Tool Bluetooth® App



On-the-fly configuration, sensor Information at your fingertips

- **Bluetooth® 4.2 capable, support iOS and Android for simple user configuration**
- **Application setup**
Set Averaging, Sensitivity, Low Flow Cut Off, Direction of Flow, Flow Units and Totalizer Unit
- **Name files**
- **Share and/or Save files**
- **Monitor flow and totalizer**
- **Loop adjustment is a live update**
Set 4 mA, 20 mA, Error condition of the current output alarm (3.6 or 22 mA), adjust your 4 to 20 mA setting and select output mode
- **Calibration**
Custom Calibration of Rate, Volumetric, Zero Flow Calibration

(example shows Menu)

Live Logging while connected
to mobile / tablet device, set
1 sec or more increments.

Sensor Information when you need it

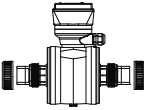
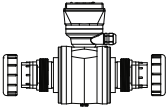
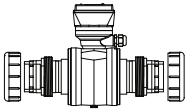
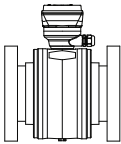
Sensor information, Bluetooth Device Tag, Permanent Totalizer, Resettable Totalizer, Calibration Adjustment Factor, Zero Offset Adjustment.



The screenshot shows the 'Information' screen of the GF+ app. It lists various sensor details: Bluetooth Device Tag (FlowtraMag 209991), Device Passkey (209991), Sensor Serial Number (61903209991), Sensor Part Number (3-2580-P-50), Sensor Order Number (????????), Body Material (PVC), and Body Size (d060_DN050/2in Sch80). At the bottom, there are four buttons: READ, WRITE, SAVE, and LOAD.



3.4.5 Ordering information

	Mfr. Part No.	Code	Description
	3-2581-PT01-101	159 001 970	FlowtraMag, PVC, Titanium, FKM O-Ring, Union, DN25 (1 in.)
	3-2581-PT15-101	159 001 971	FlowtraMag, PVC, Titanium, FKM O-Ring, Union, DN40 (1.5 in.)
	3-2581-PT02-101	159 001 972	FlowtraMag, PVC, Titanium, FKM O-Ring, Union, DN50 (2 in.)
	3-2581-PT03-101	159 001 973	FlowtraMag, PVC, Titanium, FKM O-Ring, Flange, DN80 (3 in.)
	3-2581-PT04-101	159 001 974	FlowtraMag, PVC, Titanium, FKM O-Ring, Flange, DN100 (4 in.)
	3-2581-PH01-101	159 001 975	FlowtraMag, PVC, <i>Hastelloy C</i> , FKM O-Ring, Union, DN25 (1 in.)
	3-2581-PH15-101	159 001 976	FlowtraMag, PVC, <i>Hastelloy C</i> , FKM O-Ring, Union, DN40 (1.5 in.)
	3-2581-PH02-101	159 001 977	FlowtraMag, PVC, <i>Hastelloy C</i> , FKM O-Ring, Union, DN50 (2 in.)
	3-2581-PH03-101	159 001 978	FlowtraMag, PVC, <i>Hastelloy C</i> , FKM O-Ring, Flange, DN80 (3 in.)
	3-2581-PH04-101	159 001 979	FlowtraMag, PVC, <i>Hastelloy C</i> , FKM O-Ring, Flange, DN100 (4 in.)
	3-2581-PT01-102	159 001 980	FlowtraMag, PVC, Titanium, EPDM O-Ring, Union, DN25 (1 in.)
	3-2581-PT15-102	159 001 981	FlowtraMag, PVC, Titanium, EPDM O-Ring, Union, DN40 (1.5 in.)
	3-2581-PT02-102	159 001 982	FlowtraMag, PVC, Titanium, EPDM O-Ring, Union, DN50 (2 in.)
	3-2581-PT03-102	159 001 983	FlowtraMag, PVC, Titanium, EPDM O-Ring, Flange, DN80 (3 in.)
	3-2581-PT04-102	159 001 984	FlowtraMag, PVC, Titanium, EPDM O-Ring, Flange, DN100 (4 in.)
	3-2581-PH01-102	159 001 985	FlowtraMag, PVC, <i>Hastelloy C</i> , EPDM O-Ring, Union, DN25 (1 in.)
	3-2581-PH15-102	159 001 986	FlowtraMag, PVC, <i>Hastelloy C</i> , EPDM O-Ring, Union, DN40 (1.5 in.)
	3-2581-PH02-102	159 001 987	FlowtraMag, PVC, <i>Hastelloy C</i> , EPDM O-Ring, Union, DN50 (2 in.)
	3-2581-PH03-102	159 001 988	FlowtraMag, PVC, <i>Hastelloy C</i> , EPDM O-Ring, Flange, DN80 (3 in.)
	3-2581-PH04-102	159 001 989	FlowtraMag, PVC, <i>Hastelloy C</i> , EPDM O-Ring, Flange, DN100 (4 in.)

3.4.6 Accessories

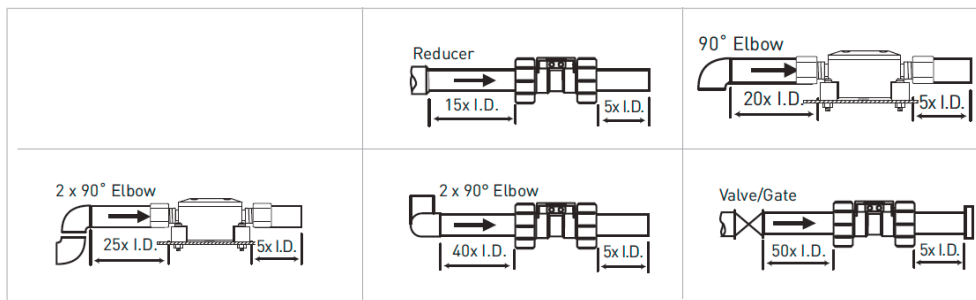
Mfr. Part No.	Code	Description
3-0252	159 001 808	0252 Configuration Tool (optional for configuring with PC)
5523-0222	159 000 392	Cable (per foot), 2 cond. w/shield, 22 AWG
5523-0224	159 855 034	Cable (per foot), 6 cond. w/shield, 22 AWG
3-2581-PX01-10X Accessories		
857 375 010	857 375 010	PVC 80 Type 375 Union FKM (SxS) 1 in. (ASTM)
1220-0218	159 812 039	1.234IDX.139 FKM O-ring RMS 1071 (1 in.) (2 required per unit)
897 375 010	897 375 010	PVC 80 Type 375 Union EPDM (SxS) 1 in. (ASTM)
1224-0218	159 812 044	NSF 1.234IDX.139 EPDM O-ring (1 in.) (2 required per unit)
161 375 904C	161 375 904C	Union End, PVC, PN16, d32DN25 (Metric)
3-2581-PX15-10X Accessories		
857 375 015	857 375 015	PVC 80 Type 375 Union FKM (SxS) 1.5 in. (ASTM)
1220-0327	159 812 040	1.725IDX.210 FKM O-ring RMS1071 (1.5 in.) (2 required per unit)
897 375 015	897 375 015	PVC 80 Type 375 Union EPDM (SxS) 1.5 in. (ASTM)
1224-0327	159 812 045	NSF 1.725IDX.210 EPDM O-RING (1.5 in.) (2 required per unit)
161 375 906C	161 375 906C	Union End, PVC, PN16, d50DN40 (Metric)
3-2581-PX02-10X Accessories		
857 375 020	857 375 020	PVC 80 Type 375 Union FKM (SxS) 2 in. (ASTM)
1220-0331	159 812 041	2.225X.210 FKM O-RING RMS1071 (2 in.) (2 required per unit)
897 375 020	897 375 020	PVC 80 Type 375 Union EPDM (SxS) 2 in. (ASTM)
1224-0331	159 812 046	NSF 2.225X.210 EPDM O-RING (2 in.) (2 required per unit)
161 375 907C	161 375 907C	Union End, PVC, PN16, d63DN50 (Metric)
3-2581-PX03-10X Accessories		
854-030	854-030	3 in. PVC80 Van-Stone Flange (S)
37X 002 117	37X 002 117	FKM Full Face Flange Gasket - 150# ANSI Bolt Pattern - 3 in.
37X 002 008	37X 002 008	EPDM Full Face Flange Gasket - 150# ANSI Bolt Pattern - 3 in.
37Z 000 068	37Z 000 068	Van Stone Flange 316SS Bolt Kit, 4-hole, 3 in. ASTM
721 790 113	721 790 113	DN80 Flange Adapter, PVC-U, Metric (Use with backing flange 721 700 013)
721 700 013	721 700 013	DN80 Backing Flange, PVC-U, Metric
749 440 713	749 440 713	DN80 FKM Profile Flange Gasket, Metric
748 440 713	748 440 713	DN80 EPDM Profile Flange Gasket, Metric
3-2581-PX04-10X Accessories		
854-040	854-040	4 in. PVC80 Van-Stone Flange (S)
37X 002 118	37X 002 118	FKM Full Face Flange Gasket - 150# ANSI Bolt Pattern - 4 in.
37X 002 009	37X 002 009	EPDM Full Face Flange Gasket - 150# ANSI Bolt Pattern - 4 in.
37Z 000 069	37Z 000 069	Van Stone Flange 316SS Bolt Kit, 8-hole, 4 in. ASTM
721 790 114	721 790 114	DN100 Flange Adapter, PVC-U, Metric (Use with backing flange 721 700 014)
721 700 014	721 700 014	DN100 V-Flange Ring PVC-U, Metric
749 440 714	749 440 714	DN100 FKM Profile Flange Gasket, Metric
748 440 714	748 440 714	DN100 EPDM Profile Flange Gasket, Metric

4 In-Line Rotors and Turbines

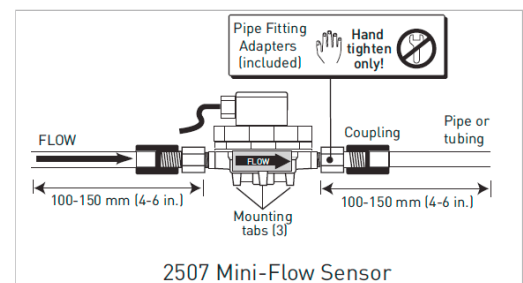
4.1 Technical basics

Piping Location

- The location of the sensor in the piping system determines the flow profile that the sensor is monitoring. The ideal location is to have sufficient straight pipe immediately upstream of the sensor to create “fully developed turbulent flow.” Such a flow profile provides the stability required for the paddlewheel to measure accurately.
- The diagrams below illustrate the minimum distances recommended from various obstructions.
- In all scenarios, it is recommended to choose a location with the maximum length of straight, uninterrupted pipe.
- Six common installation configurations are shown below as guidelines to help you select the best location in your piping system for the flow sensor. Always maximize distance between sensors and pump sources.
- Never install immediately downstream of valves, fittings, etc.
- Observe minimum Reynolds Number
- The flow sensors are not for bi-directional operation.



For optimal performance of the 2507, a straight flow run of at least 100 to 150 mm (4 to 6 in.) should be allowed before and after the sensor.

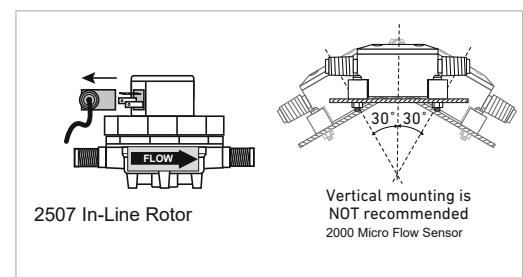


Mounting Angle

The mounting angle of the sensor may affect the performance of the system.

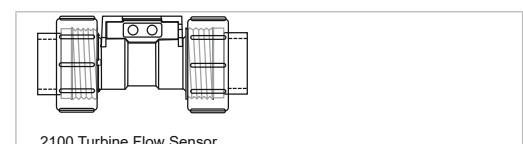
In-line Rotors

- GF Signet Models 2507 and 2000 flow sensors are designed to be mounted on a flat surface, although the sensors may be tilted up to $\pm 30^\circ$ if necessary.
- Installation in excess of 30° will affect the accuracy of the sensor.
- For Model 2507, two pipe fitting adapters (included) convert the straight threads G- $\frac{1}{4}$ in. to $\frac{1}{4}$ in. NPT.
- These sensors should be installed securely to their supporting surface to prevent vibrations from affecting the performance.



Turbine Flow Sensors

- All mounting angles are acceptable for these sensors if the basic parameters are met: the pipe must be full with no entrapped air.
- Install the sensor with the arrow pointing in the direction of the flow of liquid.



4.2 2000 Micro Flow Rotor Sensor



4.2.1 Product description

The GF Signet 2000 Micro Flow Rotor Sensor is constructed of Polyphenylene Sulfide (PPS) which provides high material strength. The 2000 offers two flow ranges starting at 0.11 or 1.13 lpm (0.03 or 0.3 gpm), for clean process liquids, regardless of fluid color or opacity.

This sensor can be connected to flexible tubing or rigid pipe, and uses standard hardware for mounting. Only one moving part and a low pressure drop across the sensor reduces operating costs and maintenance requirements.

Features

- Operating range 0.11 to 12.11 lpm (0.03 to 3.2 U.S. gpm)
- Simple mounting
- ¼ in. NPT or ISO threads for simple pipe or tubing connection
- Measures opaque and transparent liquids
- Low pressure drop
- Standard cable 7.6 m (25 ft)

Applications

- Coolant Flow
- Dosing
- Batch Dispensing
- Not recommended for Strong Oxidizers



The installation must be performed in accordance with the instruction manual. The instruction manual is included with the product, see also online on www.gfps.com/signet

4.2.2 Technical Details

General

Operating Range	-11 & -12 version	0.11 to 2.6 lpm	0.03 to 0.7 U.S. gpm
	-21 & -22 version	1.13 to 12.11 lpm	0.3 to 3.2 U.S. gpm
Linearity	±1.2% of full range		
Repeatability	±0.5% of full range		
Connections	¼ in. NPT (male) or ISO 7/1 - R¼ (male)		

Wetted Materials

Sensor Body and Cover	40% glass filled Polyphenylene Sulfide (PPS)
Rotor	PEEK®, natural, unfilled
Cover O-ring	FKM

Electrical

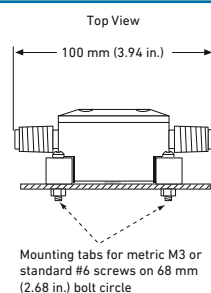
Power	5 to 24 VDC ±10%, regulated, 10 mA max.
Output Type	Open-collector, sinking, 20 mA max.
Cable Length	7.6 m (25 ft), can be extended up to 300 m (1000 ft)
Cable Type	2-conductor twisted pair w/shield, 22 AWG

Max. Temperature/Pressure Rating

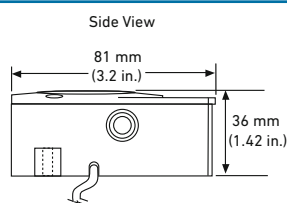
0 °C to 80 °C @ 5.5 bar max. 32 °F to 176 °F @ 80 psi max

Dimensions

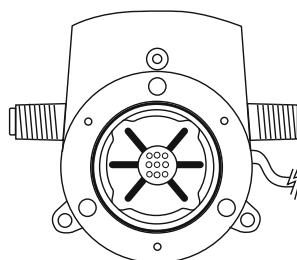
Top View



Side View



Cover Removed

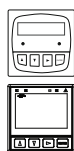


Mounting tabs for metric M3
standard #6 screws on
68 mm (2.68 in.) bolt circle

4.2.3 System Overview

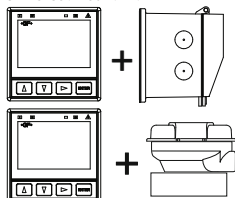
Panel Mount

GF Signet Instruments
- 8900
- 9900-1P
- 9900-1BC
- 9950



Pipe, Tank, Wall

GF Signet Instruments
- 9900-1P with Rear Enclosure
- 9900-1 with 3-8050
Universal Mount Kit

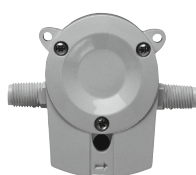


Automation System

- 0486 Profibus Concentrator and Customer
Supplied Programmable Logic Controller
or
- Programmable Automation Controller



GF Signet
Model 2000 Sensor



All sold separately

Flexible tubing or rigid pipe
(customer supplied)



Pressure-temperature diagram

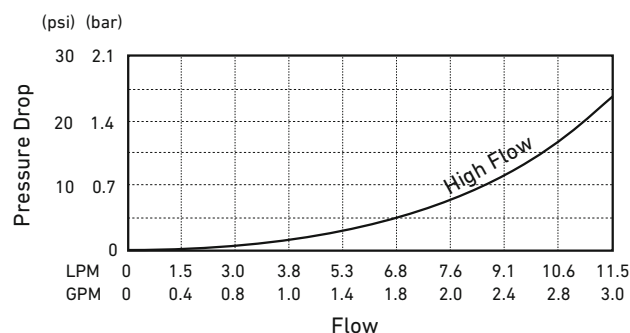
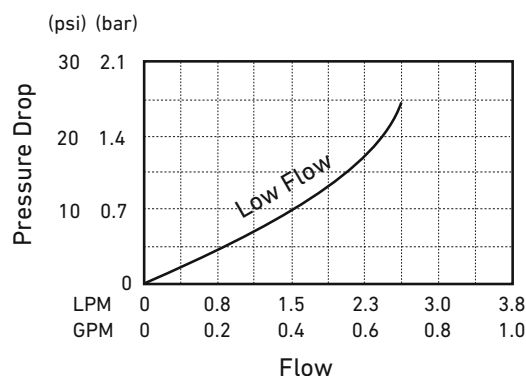
Note

The pressure-temperature diagrams are specifically for the GF Signet sensor. During system designs the specifications of all components must be considered. In the case of a metal piping system, a plastic sensor will reduce the system specification

Low Flow

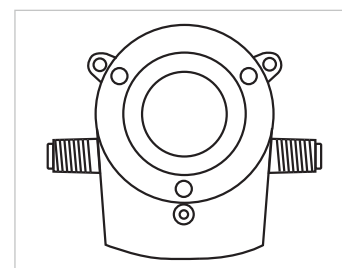
High Flow

2000 - Pressure Drop-High Flow



4.2.4 Ordering information

Mfr. Part No.	Code	Flow Range	End Fittings
3-2000-11	198 822 000	Low flow, 0.11 to 2.61 lpm (0.03 to 0.7 gpm)	¼ NPT threads
3-2000-12	198 822 001	Low flow, 0.11 to 2.61 lpm (0.03 to 0.7 gpm)	ISO 7/1-R1/4 threads
3-2000-21	198 822 002	High flow, 1.13 to 12.11 lpm (0.3 to 3.2 gpm)	¼ NPT threads
3-2000-22	198 822 003	High flow, 1.13 to 12.11 lpm (0.3 to 3.2 gpm)	ISO 7/1-R1/4 threads



4.2.5 Accessories

Mfr. Part	Code	Description
3-2000.390	159 000 248	Replacement rotor kit
1220-0029	198 820 049	Cover O-ring
2450-0620	198 820 051	Cover screw, each
5523-0222	159 000 392	Cable (per foot), 2 cond. w/shield, 22 AWG
3-8050-1	159 000 753	Universal junction box

4.3 2507 Mini Flow Rotor Sensor



4.3.1 Product description

The GF Signet 2507 Mini Flow Rotor Sensor contains a free-running rotor that is driven by the fluid flow. Within the given measurement range, the rotational speed of the rotor is proportional to the fluid flow rate.

Magnets built into the rotor trigger an electronic switch in the top of the sensor creating a square-wave output. Both opaque and transparent fluids can be measured with kinematic viscosities between 0.2 to 20.0 centistokes.

Features

- Operating range 400 to 12,000 mL/m (0.1 to 3.2 U.S. gpm)
- Detachable signal connector for easy servicing
- Simple installation with a G 1/4 in. (1/4 in. NPT) threaded connection
- Standard 7.6 m (25 ft) cable
- PVDF construction
- Compact assembly



Applications

- Fluid Dispensing
- Laboratory and Clinical Wet Benches
- Chemical Dosing
- Batch Processes



The installation must be performed in accordance with the instruction manual. The instruction manual is included with the product, see also online on www.gfps.com/signet

4.3.2 Technical Details

General			
Operating Range	-2V sensor	400 to 2800 mL/m	(0.105 to 0.740 U.S. gpm)
	-3V sensor	700 to 4200 mL/m	(0.185 to 1.123 U.S. gpm)
	-4V sensor	1300 to 6000 mL/m	(0.343 to 1.585 U.S. gpm)
	-6V sensor	3200 to 12000 mL/m	(0.845 to 3.170 U.S. gpm)
Accuracy	±2% of reading		
Repeatability	±0.25% of full range		
Viscosity range	0.2 to 20.0 centistokes		
Connections	G 1/4 in. ports, 1/4 in. NPT pipe adapters (2 included)		

Wetted Materials

Housing	PVDF
Flow insert	PTFE
Quad ring seal	FKM
Rotor	PVDF
Pipe thread adapters	PVDF

Electrical

Power	5 to 24 VDC $\pm 10\%$, regulated, 10 mA max.
Output Type	Open-collector, sinking, 10 mA max.
Cable Length	7.6 m (25 ft), can be extended up to 300 m (1000 ft)
Cable Type	2-conductor shielded twisted-pair, 22 AWG

Max. Temperature/Pressure Rating

5.5 bar @ -18 °C	80 psi @ 0 °F
5.5 bar @ 24 °C	80 psi @ 75 °F
3 bar @ 120 °C	45 psi @ 248 °F

Shipping Weight

0.115 kg	0.25 lb
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Standard and Approvals

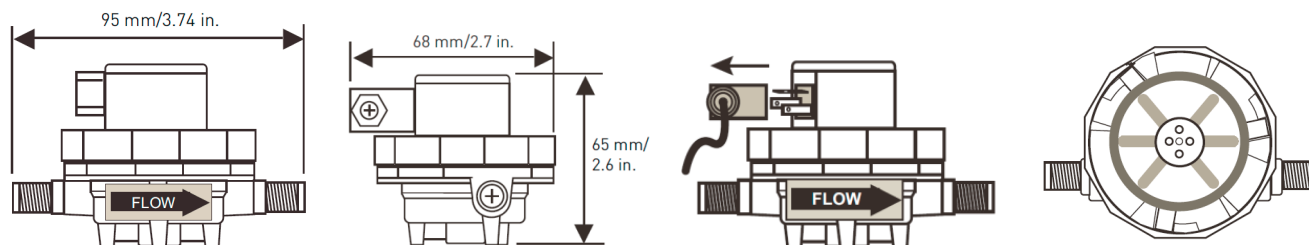
CE, FCC

RoHS compliant, China RoHS

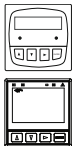
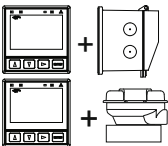
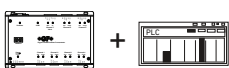
Manufactured under ISO 9001 for Quality and ISO 14001 for Environmental Management and OHSAS 18001 for Occupational Health and Safety

4.3.3 Dimensions

Detachable Signal Connector Top View(cover removed)




4.3.4 System Overview

Panel Mount	Pipe, Tank, Wall	Automation System
<p>GF Signet Instruments</p> <ul style="list-style-type: none"> - 8900 - 9900-1P - 9900-1BC - 9950 	<p>GF Signet Instruments</p> <ul style="list-style-type: none"> - 9900-1P with Rear Enclosure - 9900-1 with 3-8050 Universal Mount Kit 	<ul style="list-style-type: none"> - 0486 Profibus Concentrator and Customer Supplied Programmable Logic Controller or - Programmable Automation Controller 

**GF Signet
Model 2507 Sensor**



All sold separately

Panel Mount	Pipe, Tank, Wall	Automation System
GF Signet Pipe Fitting Adapters (two included) Used to convert the sensor's G1/4 in. straight threads into 1/4 in. NPT threads		
		

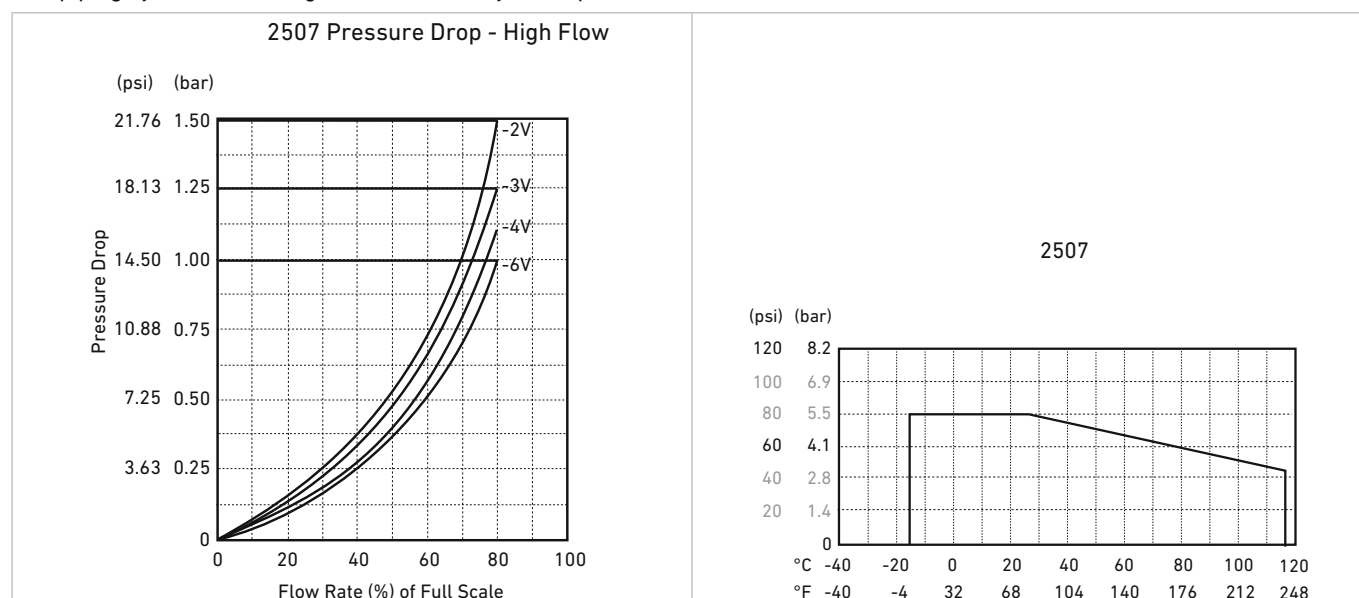
Application Tips

- Use the threaded ports on bottom of sensor to secure the sensor to any flat surface.
- The range of any sensor can be changed by replacing the flow insert.
- Suitable only for clean fluids without particles.

Pressure-temperature diagram

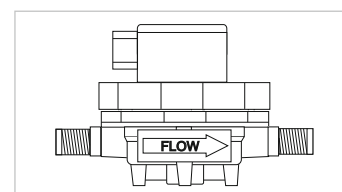
Note

The pressure-temperature diagrams are specifically for the GF Signet sensor. During system design the specifications of all components must be considered. In the case of a metal piping system, a plastic sensor will reduce the system specification. When using a PVDF sensor in a PVC piping system, the fitting will reduce the system specification.



4.3.5 Ordering information

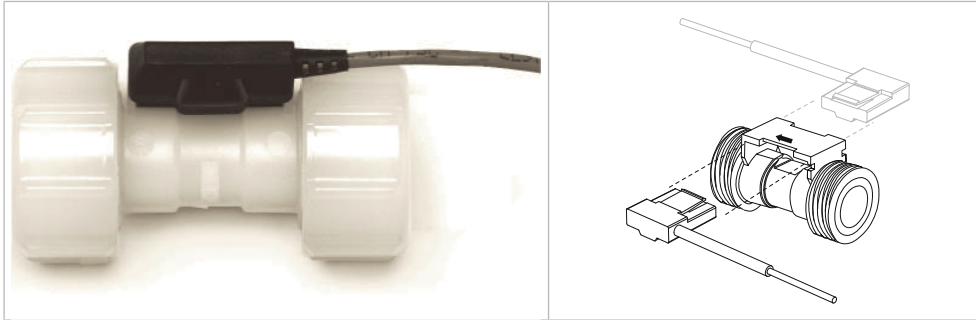
Mfr. Part No	Code	Insert Option
Mini Flow low flow sensor with free-running rotor		
3-2507.100-2V	198 801 732	With 2 mm insert; for 0.15 to 0.740 gpm (400 to 2800 mL/m)
3-2507.100-3V	198 801 733	With 3 mm insert, for 0.185 to 1.123 gpm (700 to 4200 mL/m)
3-2507.100-4V	198 801 734	With 4 mm insert, for 0.343 to 1.585 gpm (1300 to 6000 mL/m)
3-2507.100-6V	198 801 736	With 6 mm inlet, no insert, for 0.845 to 3.170 gpm (3200 to 12000 mL/m)



4.3.6 Accessories

Mfr. Part	Code	Description
3-2507.080-2	198 801 550	Rotor, 2507
3-2507.080-3	198 801 547	Quad ring, 2507
3-2507.080-5	198 801 508	DIN connector, 2507
3-2507.081-2	198 801 502	2 mm insert
3-2507.081-3	198 801 503	3 mm insert
3-2507.081-4	198 801 558	4 mm insert
5523-0222	198 000 392	Cable (per foot), 2 cond. w/shield, 22 AWG

4.4 2100 Turbine Flow Sensor



4.4.1 Product description

Engineered specifically for small pipe diameter applications, the GF Signet 2100 Turbine Flow Sensor provides accurate readings in two flow ranges: 0.3 to 3.8 lpm and 3 to 38 lpm (0.1 to 1 gpm and 0.8 to 10 gpm).

The injection-molded PVDF body and ceramic bearings provide excellent chemical compatibility and long service in dosing and batching applications. Union piping and tubing connections along with removable NEMA 4X electronics allow for easy assembly and field replaceability. The 2100 can be used with DN8 (¼ in.), DN10 (3/8 in.), DN15 (½ in.) tubing, or DN15 (½ in.) piping for simple installation. End connections are available in PVDF for hose barbs, fusion socket or IR/ butt fusion, and in PVC for socket or NPT thread.

Features

- Operating range of 0.38 to 38 lpm (0.10 to 10 U.S. gpm)
- Non-magnetic turbine
- Union ends for various connector types
- End connector kits for rigid or flexible tubing or DN15 (½ in.) pipe
- PVDF & ceramic wetted parts provide superior chemical compatibility
- For use with both clear and opaque fluids
- Small and compact design
- 4.6 m (15 ft) cable
- Features removable electronics that installs from either side of the sensor



Applications

- Chemical Addition
- Textile Dyeing
- High-purity Chemical Dispensing
- Water Addition
- Fertigation
- Dosing
- Pump Protection
- Not suitable for gases



The installation must be performed in accordance with the instruction manual.
The instruction manual is included with the product, see also online on
www.gfps.com/signet

4.4.2 Technical Details

General

Flow Range	-L = 0.38 to 3.8 lpm	(0.10 to 1 U.S gpm)
	-H = 3 to 38 lpm	(0.8 to 10 U.S gpm)
Accuracy	±3% of reading	
Repeatability	±0.5% of reading	
Pipe Size Range	DN15 (½ in.)	
Tubing Size	DN8 (¼ in.), DN10 (3/8 in.), DN15 (½ in.)	

Wetted Materials

Sensor Body/Rotor	PVDF
Shaft/Bearings	Ceramic
O-rings	-1 = FKM, -2 = EPR (EPDM)
Electronics Housing	PBT (polybutylene terephthalate)
	EVA (ethylene vinyl acetate)

Electrical

Power	5 to 24 VDC ±10%, regulated, 1.5 mA max.
	Reverse polarity protected
Output	Open collector, sinkin, max 30 mA
Cable Length	4.6 m (15 ft) can be extended up to 300 m (1000 ft)
Cable Type	PVC jacketed, 2 conductor twisted pair with shield (22 AWG)

Max. Temperature/Pressure Rating

	16 bar @ 20 °C	232 psi @ 68 °F
	9.3 bar @ 70 °C	130 psi @ 158 °F
Operating Temperature	-20 °C to 70 °C	-4 °F to 158 °F
Storage Temperature	-15 °C to 80 °C	5 °F to 176 °F

Shipping Weight

	0.15 kg	0.33 lb
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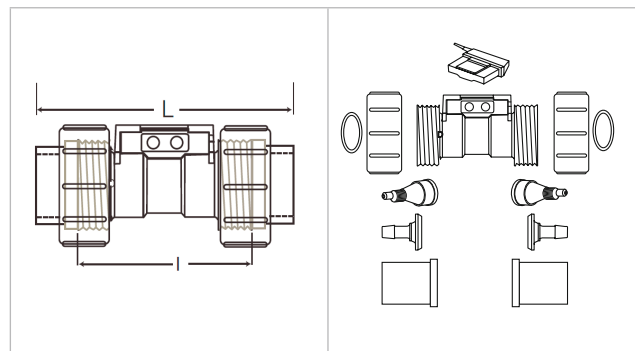
Standards and Approvals

CE, FCC
RoHS compliant, China RoHS
Manufactured under ISO 9001 for Quality and ISO 14001 for Environmental Management

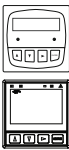
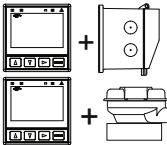
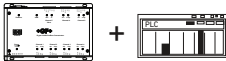

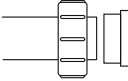
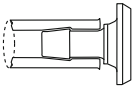
4.4.3 Dimensions

L = overall length

All sockets	102 mm	4 in.
Butt fusion/IR	170 mm	6.7 in.
¼ in. Barb	124 mm	4.9 in.
¾ in. Barb	127 mm	5 in.
½ in. Barb	132 mm	5.2 in.



4.4.4 System Overview

Panel Mount	Pipe, Tank, Wall	Automation System
<p>GF Signet Instruments</p> <ul style="list-style-type: none">- 8900- 9900-1P- 9900-1BC- 9950 	<p>GF Signet Instruments</p> <ul style="list-style-type: none">- 9900-1P with Rear Enclosure- 9900-1 with 3-8050 Universal Mount Kit* 	<ul style="list-style-type: none">- 0486 Profibus Concentrator and Customer Supplied Programmable Logic Controller or- Programmable Automation Controller 
<p>GF Signet Model 2100 Sensor</p> 		
<p>All sold separately</p>		
<p>End Connector options</p>	<p>Fusion, threaded or solvent socket connectors for DN15 (1/2 in.) pipe</p> 	<p>Hose barb connectors for DN8, DN10, or DN15 (1/4 in., 3/8 in. or 1/2 in.) flexible tubing</p> 

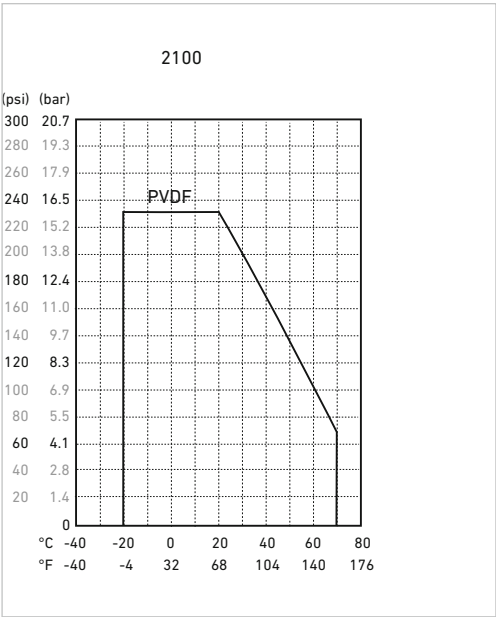
Application Tips

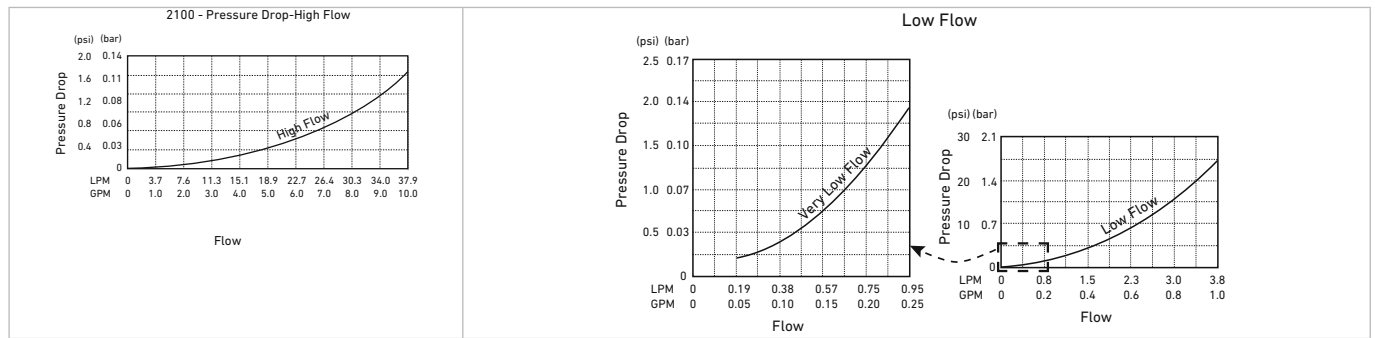
- All socket and hose barb connector kits are sold individually. Two kits are required for each sensor.
- Junction block, 3-8050-1 recommended if standard cable is extended to maximum 300 m (1000 ft)

Pressure-temperature diagram

Note

The pressure-temperature diagrams are specifically for the GF Signet sensor. During system design the specifications of all components must be considered. In the case of a metal piping system, a plastic sensor will reduce the system specification. When using a PVDF sensor in a PVC piping system, the fitting will reduce the system specification.

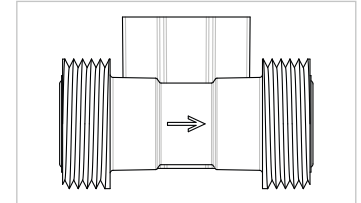




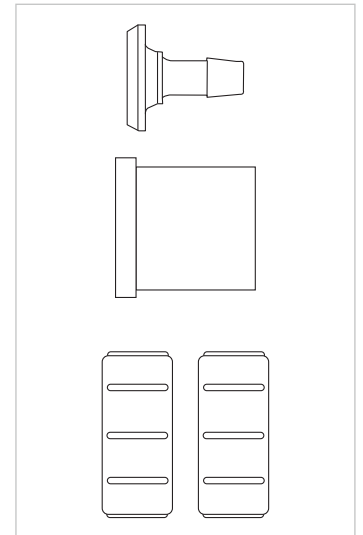
4.4.5 Ordering information

Mfr. Part No.	Code	O-ring Material	Flow Range
Turbine flow sensor, PVDF body and rotor, for use with various end-connectors			
3-2100-1L	159 000 001	FKM	Low, 0.38 to 3.8 lpm (0.10 to 1 gpm)
3-2100-2L	159 000 003	EPR (EPDM)	Low, 0.38 to 3.8 lpm (0.10 to 1 gpm)
3-2100-1H	159 000 002	FKM	High, 3 to 38 lpm (0.8 to 10 gpm)
3-2100-2H	159 000 004	EPR (EPDM)	High, 3 to 38 lpm (0.8 to 10 gpm)

* Note: To install this flow sensor, end fittings must be installed on both ends of the sensor



Mfr. Part No.	Code	Type of End Fitting
End fitting for Model 2100 sensor		
3-2100-31	159 000 005	Hose barb connector kit, PVDF, ½ inch (1-hose barb and 1-ring nut)
3-2100-32	159 000 006	Hose barb connector kit, PVDF, 3/8 inch (1-hose barb and 1-ring nut)
3-2100-33	159 000 007	Hose barb connector kit, PVDF, ¼ inch (1-hose barb and 1-ring nut)
3-2100-34	159 000 008	Fusion socket connector, PVDF, DN15 ½ inch (1-fusion socket and 1 ring nut)
3-2100-35	159 000 009	Butt Fusion/IR connector kit, PVDF, DN15 ½ inch (1-IR socket and 1 ring nut)
3-2100-36	159 000 010	Metric socket connector kit, PVC, ½ inch (1-solvent socket and 1 ring nut)
3-2100-37	159 000 011	SCH 80 socket connector kit, PVC, ½ inch (1-solvent socket and 1 ring nut)
3-2100-38	159 000 012	NPT thread socket connector kit, PVC, ½ inch (1-threaded socket and 1 ring nut)







4.4.6 Accessoires

Mfr. Part	Code	Description
1220-0018	159 000 019	O-rings FKM (2 required per sensor)
1224-0018	159 000 020	O-rings EPR (EPDM) (2 required per sensor)
3-8050-1	159 000 753	Universal junction box

5 Variable area flow meter

5.1 335/350/123 Variable area flow meter

			
Variable area flow meter type 335	Variable area flow meter type 350	Variable area flow meter type 123 (short version)	Variable area flow meter type 335 PVDF-HP

5.1.1 Product description

Variable area flow meters from GF Piping Systems are radially installed, dismountable meters for measuring the flow rate in industrial piping system constructions. The measuring principle is advanced and efficient. The measurement ranges, which are tailored to our customers' needs, and the range of materials available for the tubes and screwed fittings, allow the flow meters to be used for a wide range of applications and a great variety of media.

Function

If a medium flows upwards through the vertically mounted measuring tube at a sufficient flow velocity, the float is raised to the point at which a state of equilibrium sets in between the lifting force of the medium and the weight of the float. As the mean flow velocity is proportional to the quantity flowing through per unit of time, this state of equilibrium corresponds to the measurement of the current flow volume.

Applications

- Water treatment
- Chemical process industry
- Microelectronics
- Food industry
- Ship building
- Building services engineering

Benefits/features

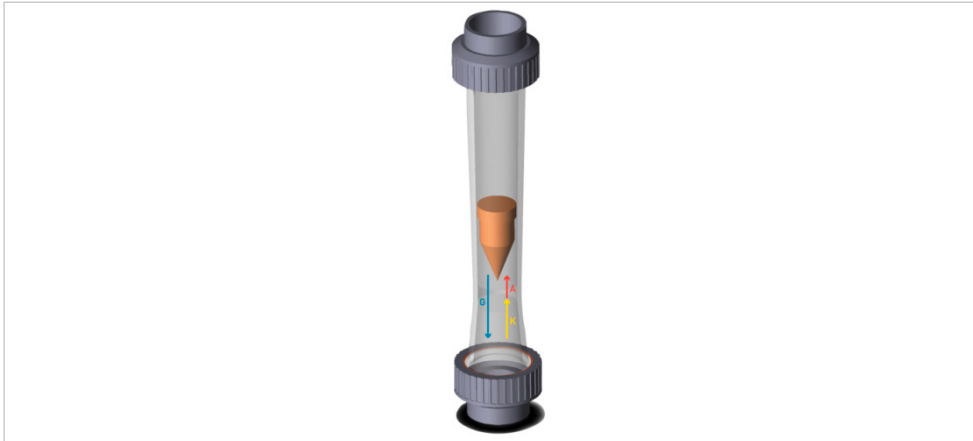
- Easy and cost effective measurement principle
- No additional energy required for operation
- Easy reading of the measured value
- Available scale range from 50 l/h up to 60'000 l/h
- Printed double scale for water in percent and l/h
- Special scales for liquid and gaseous media can be attached
- Wide range of materials
- Break-proof and corrosion resistant
- Large dimensions with guiding rod (PVDF-coated)

Flow media

For liquid and gaseous media, [see online tool ChemRes PLUS](#).

5.1.2 Handling

Measurement principle



G Weight force
A Buoyant force
K Flow force

All flow meters are equipped with a double scale: a percent scale as well as a scale for the flow rate in l/h for water (H₂O). In addition, special scales in m³/h, GPM and special scales for HCL, NaOH and air are available and can be subsequently attached to the measuring tubes without a scale. More scales are available on request.

Accurate reading

The top edge of the float with the largest diameter indicates the flow volume. If special scales are applied subsequently, it is important to ensure that the scale marking >< is affixed so that it aligns precisely with the one on the measuring tube.

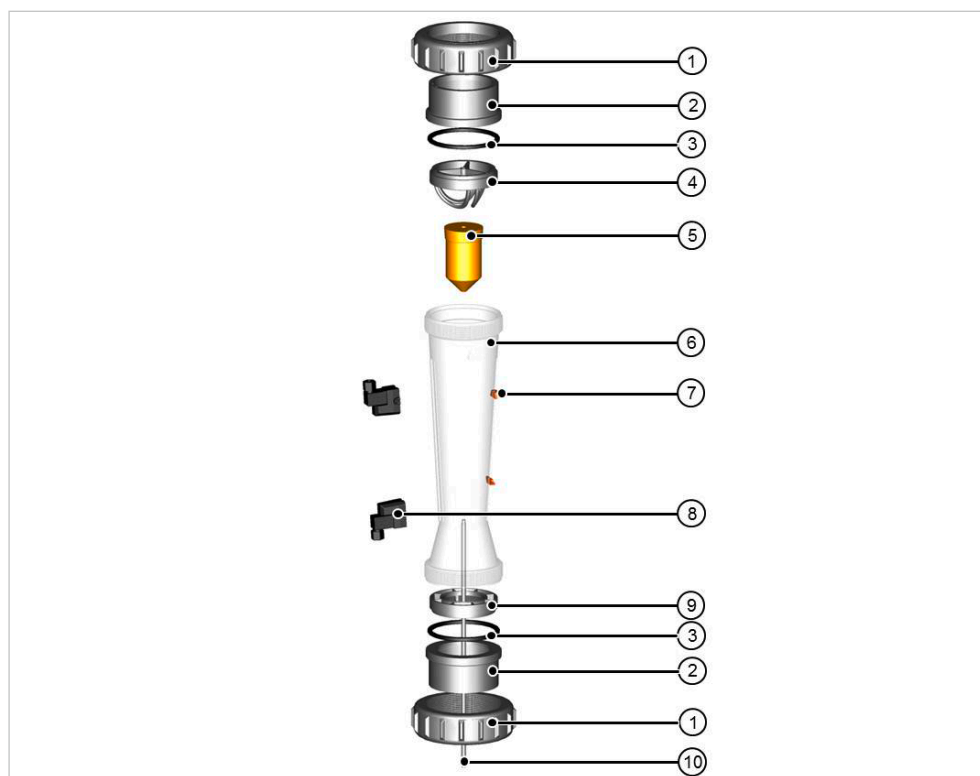
Installation notes

- Variable area flow meters are not recommended for media containing solids.
- To avoid unstable flow conditions, a damping zone must be considered before and after the variable area flow meter.
- The maximum permitted pressure for gases is 0.5 bar.



Installation and maintenance must be performed in accordance with the corresponding installation manual. The installation manual is provided with the product, see also the online product catalogue at www.gfps.com

5.1.3 Technical data



- ① Coupling nut
 - ② Threaded bush
 - ③ O-ring
 - ④ Top insert
 - ⑤ Float
 - ⑥ Measuring tube
 - ⑦ Flow value indicator
 - ⑧ Limit contact¹
 - ⑨ Bottom insert
 - ⑩ Guiding rod²
- ¹ Optional
- ² Only for DN50 and DN65

Specification

Dimensions	Type 335	d32/DN25 - d75/DN65, 1" - 2 ½"
	Type 350	d32/DN25 - d75/DN65, 1" - 2 ½"
	Type 123 (short version)	d16/DN10 - d32/DN25, 3/8" - 1"
	Special version	d32/DN25 - d75/DN65, 1" - 2 ½"
Measuring tube materials	Type 335	PA, PSU, PVC-U transparent
	Type 350	PA, PSU, PVC-U transparent
	Type 123 (short version)	PVC-U transparent, PSU
	Special version	PSU-HP
Float materials	PVDF, PTFE*	
Gasket material	O-rings	EPDM, FKM
Pressure rating	PN10	
Scale ranges	Type 335	50 - 60'000 l/h
	Type 350	50 - 60'000 l/h
	Short version	2.5 - 1'000 l/h
	Special version	50 - 30'000 l/h
Connections	Type 335, 350, SK	PVC-U solvent cement sockets
	Special version	PVDF-HP fusion spigots
	Additional designs and materials (e.g. stainless steel) upon request	

*special version type 123

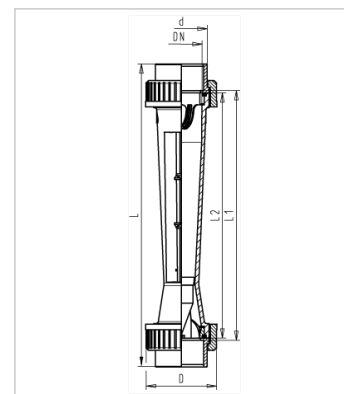
5.1.4 Pressure losses

Pressure loss of type 335/350			Pressure loss of type 123 (short version)		
Scale range (l/h)	Type	Pressure loss (mbar)	Scale range (l/h)	Type	Pressure loss (mbar)
50 - 500	335 / 350	22.84	2.5 - 25	SK 50/500	4.31
100 - 1000	335 / 350	22.84	5 - 50	SK 51/510	4.31
150 - 1500	335 / 350	22.84	10 - 100	SK 52/520	4.31
250 - 2500	335 / 350	22.84	8 - 80	SK 60/600	8.14
200 - 2000	335 / 350	24.99	15 - 150	SK 61/610	8.14
300 - 3000	335 / 350	24.99	20 - 200	SK 62/620	8.14
600 - 6000	335 / 350	24.99	15 - 150	SK 70/700	4.51
1000 - 10000	335 / 350	24.99	30 - 300	SK 71/710	4.51
1500 - 15000	335 / 350	28.23	50 - 500	SK 72/720	4.51
2000 - 20000	335 / 350	45.67	100 - 1000	SK 73/730	4.51
3000 - 30000	335 / 350	45.67			
8000 - 60000	335 / 350	47.24			

5.1.5 Dimensions

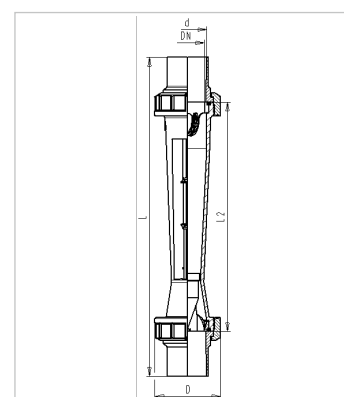
Type 335

Scale range (l/h)	Type	D (mm)	DN (mm)	L (mm)	L1 (mm)	L2 (mm)	G (Inch)
50 - 500	335	58	25	385	341	335	1 ½
100 - 1000	335	58	25	385	341	335	1 ½
150 - 1500	335	72	32	393	341	335	2
250 - 2500	335	72	32	393	341	335	2
200 - 2000	335	83	40	403	341	335	2 ¼
300 - 3000	335	83	40	403	341	335	2 ¼
600 - 6000	335	83	40	403	341	335	2 ¼
600 - 6000	335	101	50	417	341	335	2 ¾
1000 - 10000	335	101	50	417	341	335	2 ¾
1500 - 15000	335	101	50	417	341	335	2 ¾
2000 - 20000	335	135	65	429	341	335	3 ½
3000 - 30000	335	135	65	429	341	335	3 ½
8000 - 60000	335	135	65	429	341	335	3 ½



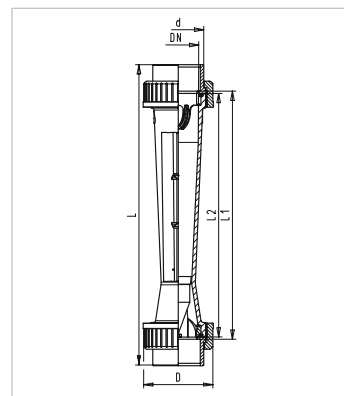
Special version Type 335 PVDF-HP

Scale range (l/h)	Type	D (mm)	DN (mm)	L (mm)	L2 (mm)	G (Zoll)
100 - 1000	335	60	25	453	335	1 ½
300 - 3000	335	83	40	466	335	2 ¼
600 - 6000	335	83	40	466	335	2 ¼
1000 - 10000	335	101	50	472	335	2 ¾
1500 - 15000	335	101	50	472	335	2 ¾
2000 - 20000	335	122	65	495	335	3 ½
3000 - 30000	335	122	65	495	335	3 ½



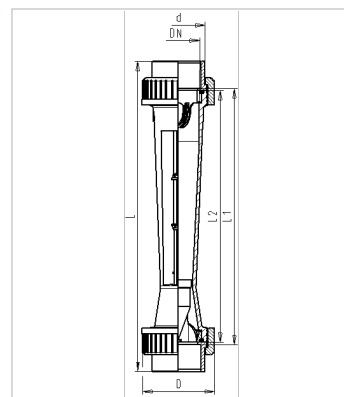
Type 350

Scale range (l/h)	Type	D (mm)	DN (mm)	L (mm)	L1 (mm)	L2 (mm)	G (Inch)
50 - 500	350	58	25	400	356	350	1 ½
100 - 1000	350	58	25	400	356	350	1 ½
150 - 1500	350	72	32	408	356	350	2
250 - 2500	350	72	32	408	356	350	2
200 - 2000	350	83	40	418	356	350	2 ¼
300 - 3000	350	83	40	418	356	350	2 ¼
600 - 6000	350	83	40	418	356	350	2 ¼
600 - 6000	350	101	50	432	356	350	2 ¾
1000 - 10000	350	101	50	432	356	350	2 ¾
1500 - 15000	350	101	50	432	356	350	2 ¾
2000 - 20000	350	135	65	444	356	350	3 ½
3000 - 30000	350	135	65	444	356	350	3 ½
8000 - 60000	350	135	65	444	356	350	3 ½



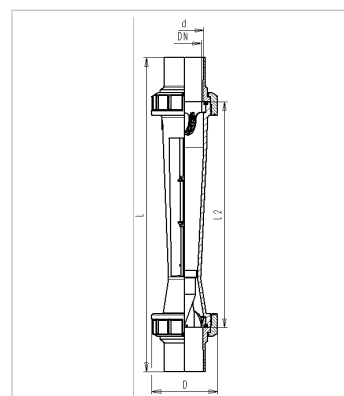
Type 123 (short version)

Scale range (l/h)	Type	D (mm)	DN (mm)	L (mm)	L1 (mm)	L2 (mm)	G (Inch)
2.5 - 25	SK 50/500	35	10	199	171	165	¾
5 - 50	SK 51/510	35	10	199	171	165	¾
10 - 100	SK 52/520	35	10	199	171	165	¾
8 - 80	SK 60/600	43	15	223	191	185	1
15 - 150	SK 61/610	43	15	223	191	185	1
20 - 200	SK 62/620	43	15	223	191	185	1
15 - 150	SK 70/700	60	25	250	206	200	1 ½
30 - 300	SK 71/710	60	25	250	206	200	1 ½
50 - 500	SK 72/720	60	25	250	206	200	1 ½
100 - 1000	SK 73/730	60	25	250	206	200	1 ½



Special version Type 123 PVDF-HP

Scale range (l/h)	Type	D (mm)	DN (mm)	L (mm)	L2 (mm)	G (Inch)
68 - 204	SK 70	60	25	318	200	1 ½
90 - 295	SK 71	60	25	318	200	1 ½
136 - 795	SK 73	60	25	318	200	1 ½



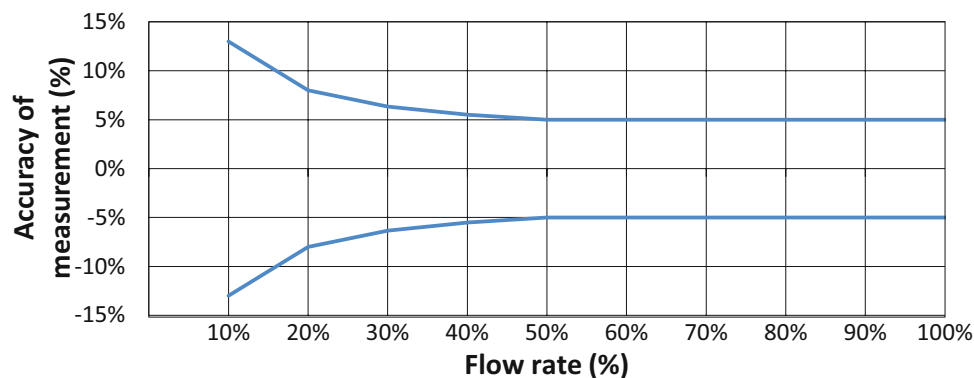
5.1.6 Measuring accuracy

Type 335/350

Measuring accuracy according to VDI/VDE 3513, error limit value $G = 5\%$, range of linearity $q_6 = 50\%$, this means up to max. $\pm 5\%$ of the final value.

Flow rate in %	10	20	30	40	50	60	70	80	90	100
Total measurement error % of measured value	13.0	8.0	6.3	5.5	5.0	5.0	5.0	5.0	5.0	5.0
Total measurement error % of full scale value	1.3	1.6	1.9	2.2	2.5	3.0	3.5	4.0	4.5	5.0

Measuring accuracy

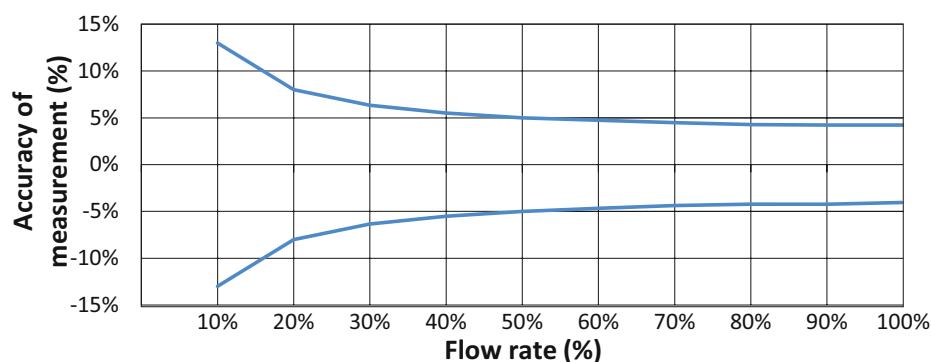


VAFM Type 123 (short version)

Accuracy class 4 according to VDE/DIN 3513 page 2.

Flow rate in %	10	20	30	40	50	60	70	80	90	100
Total measurement error % of measured value	13.0	8.0	6.3	5.5	5.0	4.7	4.4	4.3	4.1	4.0
Total measurement error % of full scale value	1.3	1.6	1.9	2.2	2.5	2.9	3.1	3.4	3.7	4.0

Measuring accuracy

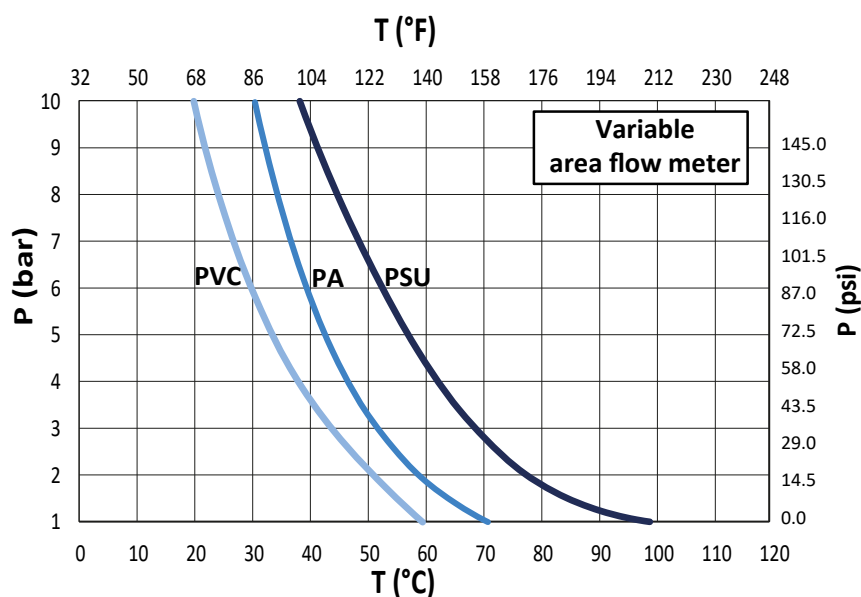


5.1.7 Temperature range

To determine the maximum internal pressure at high temperatures, we refer you to our material-related pressure-temperature diagrams for reference values.

Measuring tube	Union	Max. temperature at 1 bar
PVC-U	PVC-U	0 – 60°C
PA	PVC-U	0 – 60°C
PSU	PVC-U	0 – 60°C
PSU	PVDF	0 – 90°C

Pressure-Temperature diagram



5.1.8 Adjustment factors

Temperature correction table for gases

		Calibrating temperature (°C)								
		0	10	20	30	40	50	60	70	80
Operating temperature (°C)	0	1	1,018	1,035	1,052	1,07	1,088	1,103	1,12	1,135
	10	0.983	1	1,018	1,035	1,051	1,068	1,084	1.1	1,116
	20	0.965	0.983	1	1,015	1,032	1,05	1,065	1.08	1,096
	30	0.948	0.966	0.983	1	1,015	1,031	1,047	1,062	1.08
	40	0.933	0.95	0.967	0.984	1	1,015	1,031	1,046	1,061
	50	0.92	0.936	0.953	0.968	0.984	1	1,015	1.03	1,045
	60	0.905	0.922	0.938	0.955	0.968	0.985	1	1,015	1.03
	70	0.892	0.907	0.924	0.94	0.955	0.97	0.985	1	1,014
	80	0.88	0.895	0.912	0.927	0.943	0.965	0.971	0.987	1



Example

Calibrating temperature is 20 °C and operating temperature is 70 °C. Take the factor 0.924 from the calibrating temperature column for 20 °C and the operating temperature row for 70 °C. The values shown by the flow meter have to be multiplied by this factor in order to calculate the actual flow volume at an operating temperature of 70 °C. Use the following formula to get the factor:

$$\sqrt{\frac{T_c + 273}{T_o + 273}} = \sqrt{\frac{20 + 273}{70 + 273}} = 0.924$$

T_c Calibrating temperature

T_o Operating temperature



Note

Operating temperature > calibrating temperature: factor < 1

Operating temperature < calibrating temperature: factor > 1

Density correction table for gases

Gases for calibration							
Operating gases	P(kg/Nm ³)	Air	Oxygen	Nitrogen	Ammonia	Acetylene	Chlorine
Air	1,293	1,000	1,050	0.983	0.772	0.953	1,580
Oxygen	1,429	0.953	1,000	0.935	0.735	0.906	1,500
Nitrogen	1,251	1,017	1,069	1,000	0.786	0.968	1,604
Ammonia	0.771	1,295	1,360	1,272	1,000	1,232	2,040
Acetylene	1,171	1,050	1,105	1,033	0.812	1,000	1,660
Chlorine	3,220	0.633	0.665	0.623	0.490	0.603	1,000
Hydrogen	0.089	3,810	4,010	3,750	2,940	0.630	6,020
Carbon dioxide	1,977	0.080	0.850	0.796	0.625	0.770	1,275
Sulphur dioxide	2,926	0.668	0.698	0.654	0.514	0.633	1,050
Coal gas	0.550	1,532	1,610	1,506	1,185	1,460	2,420
Propane	2,020	0.800	0.841	0.786	0.618	0.762	1,262

The data in the table serve to correct the values displayed by the flow meter for gaseous media when the operating temperature deviates from the weight of 1.293 kg/Nm³ (air) used for the calibration.



Example

Specific weight at the time of calibration is 1.293 kg/Nm³ (air). The medium hydrogen with its specific weight of 0.089 kg/Nm³ is to be measured. From the calibrating gases/air column, in row seven for operating gases/hydrogen, you obtain the factor 3.81. The values shown by the flow meter have to be multiplied by this factor in order to determine actual flow volume at a specific weight of 0.089 kg/Nm³.



Note

Operating gas density > calibration gas density factor < 1

Operating gas density < calibration gas density factory > 1

Density correction table for liquids

Density of liquid (kg/l) float material PVDF									
Density of operating liquid (kg/l)		0.5	0.6	0.7	0.8	0.9	1	1.1	1.2
	0.5	1	1,105	1.2	1.29	1.38	1,464	1,545	1.63
	0.6	0.903	1	1,084	1,168	1,248	1.32	1,397	1,475
	0.7	0.834	0.923	1	1,078	1.15	1.22	1.29	1.36
	0.8	0.775	0.856	0.928	1	1,066	1,133	1,196	1,262
	0.9	0.724	0.802	0.87	0.937	1	1.06	1.12	1.18
	1.0	0.683	0.755	0.818	0.883	0.94	1	1,055	1,114
	1.1	0.645	0.715	0.771	0.836	0.892	0.946	1	1,055
	1.2	0.613	0.678	0.735	0.793	0.845	0.896	0.947	1
	1.3	0.585	0.648	0.7	0.755	0.807	0.857	0.903	0.955
	1.4	0.56	0.62	0.671	0.723	0.773	0.82	0.865	0.913
	1.5	0.537	0.595	0.645	0.695	0.743	0.787	0.832	0.877
	1.6	0.515	0.57	0.618	0.665	0.712	0.755	0.798	0.84
	1.7	0.496	0.548	0.595	0.641	0.685	0.726	0.767	0.81
	1.8	0.478	0.538	0.574	0.617	0.66	0.7	0.74	0.78
	1.9	0.462	0.511	0.555	0.597	0.638	0.676	0.715	0.755
	2.0	0.446	0.495	0.536	0.578	0.617	0.654	0.691	0.73
Density of liquid (kg/l) float material PVDF									
Density of operating liquid (kg/l)		1.3	1.4	1.5	1.6	1.7	1.8	1.9	2
	0.5	1.71	1,785	1.86	0.94	2.02	2.09	2.16	2.24
	0.6	1,545	1,615	1.68	0.754	1.82	1.89	1.95	2.02
	0.7	1,425	1.49	1.55	1,615	1.68	1,745	18	1,865
	0.8	1,325	1.38	1.43	1.5	1.56	1.62	1.67	1.73
	0.9	1.24	1,295	1.35	1,405	1.46	1,515	1.57	1.62
	1.0	1.17	1.22	1.27	1,325	1,375	1.43	1.48	1.53
	1.1	1,106	1,155	1.2	1,255	1.3	1.35	1.4	1.45
	1.2	1.05	1,095	1.14	1.19	1,235	1.28	1.33	1.37
	1.3	1	1,044	1,088	1,134	1,176	1.22	1,264	1,305
	1.4	0.958	1	1,042	1,085	1.13	1.17	1.21	1.25
	1.5	0.92	0.96	1	1,042	1,084	1,125	1.16	1,205
	1.6	0.882	0.92	0.958	1	1.04	1.08	1.11	1.15
	1.7	0.848	0.886	0.923	0.961	1	1,038	1,072	1.11
	1.8	0.817	0.853	0.888	0.926	0.962	1	1,032	1.07
	1.9	0.79	0.826	0.858	0.897	0.93	0.968	1	1,034
	2.0	0.798	0.798	0.83	0.867	0.9	0.935	0.965	1

The data in the table serve to correct the values displayed by the flow meter for gaseous media when the operating temperature deviates from the specific weight of 1.0 kg/l (water) used for the calibration.

Example

Specific weight at calibration 1.0 kg/l (water). The liquid media with a specific weight of 0.9 kg/l is to be measured. If you have a calibrating solution of 1.0 kg/l, you can find the factor 1.06 in column 5 under operating liquid density 0.9 kg/l. The values shown by the flow meter have to be multiplied by this factor in order to calculate the actual flow volume at a specific weight of 0.9 kg/l.

Note

New density is larger: factor < 1
New density is lower: factor > 1

5.1.9 Accessories

Limit contacts Type GK10/11

Variable area flow meters from GF Piping Systems are equipped with two dovetail guides. For external electrical monitoring, these can be used for fitting magnetically actuated limit contacts.

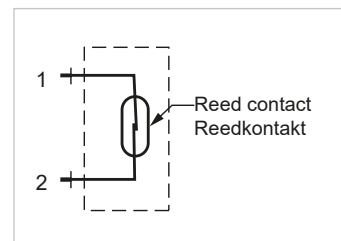
Function of the limit contact (GK)

The limit contact serves to monitor externally the limited flow values and can be adjusted to any flow value on the corresponding scale. The magnet built into the float closes or opens a reed contact in the limit contact. This is a bistable switching function, the switching status remains when the float is taken from the contact.

Note: When subsequently mounting limit contacts, mind that you have to replace the standard float with a magnetic float.

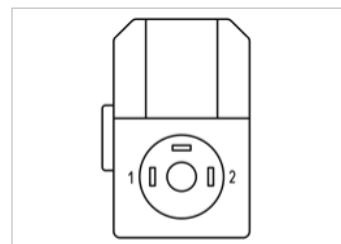
The limit contacts GK10/GK11 are only suitable for the VAFM Type 335/350 as well as the short version of the existing range. The same contact type can not be used for monitoring both the min. and max. levels (GK10 min./GK11 max.).

Even a brief overshoot is not permitted. This is uncontrollable with inductive or capacitive peaks, e.g. with solenoid valves. Therefore it is recommended to use a limit valve switch or a contact protection relay.



Technical data

Connection	Standard connector DIN 40050
Contact fitted	Dry reed contact
Protection rating	IP 65
Max. nominal voltage	250 V
Max. switching rating	10W / 10VA
Max. Peak-switching current	0.5 A
Continuous rating	0.2A
Contact resistance	<150 mOhm
Leakage resistance	>10 ¹¹ Ohm
Ambient temperature	0°C to +55°C
Protection rating	IP65



Contact function

Position of float in relation to limit contacts

	Top	Bottom
Max. contact (GK11)	Closed	Open
Min. contact (GK10)	Open	Closed

The contacts remain in these positions, even if the float leaves the corresponding contact. When the float moves back to the desired position, the corresponding contact is deactivated.

Assembly

1. Replace the float with a magnetic float
2. Position the limit contact on the dovetail guide of the FAVM
3. Tighten fastening screw

4-20mA measured value sensor type GK15

The measured value sensor type GK15 uses a special, newly developed electronic system with a microprocessor and sensors. The GK15 provides an output signal of 4-20mA, according to the level setting of the magnetic float in the flow meter. This signal could be used by a PLC, for example, to control processes or to show the precise flow rate on an external display. For use with inductive loads, use a relay to protect the contacts.

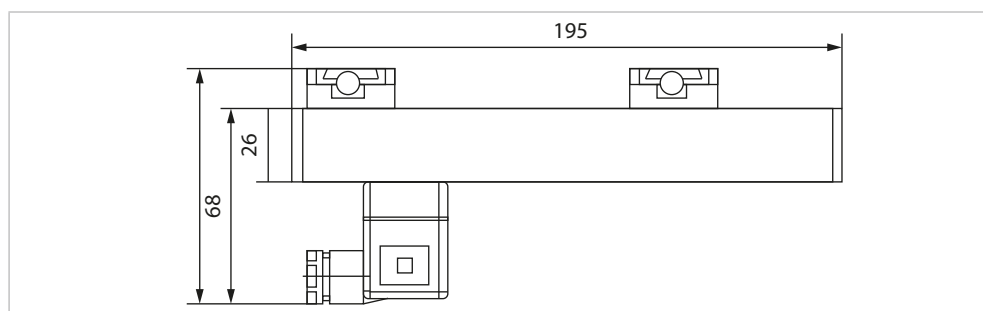


As the resolution of the various scales differs, the sensor is programmed individually at the factory for each measurement range. Therefore, please identify your required measurement range when you place the order.

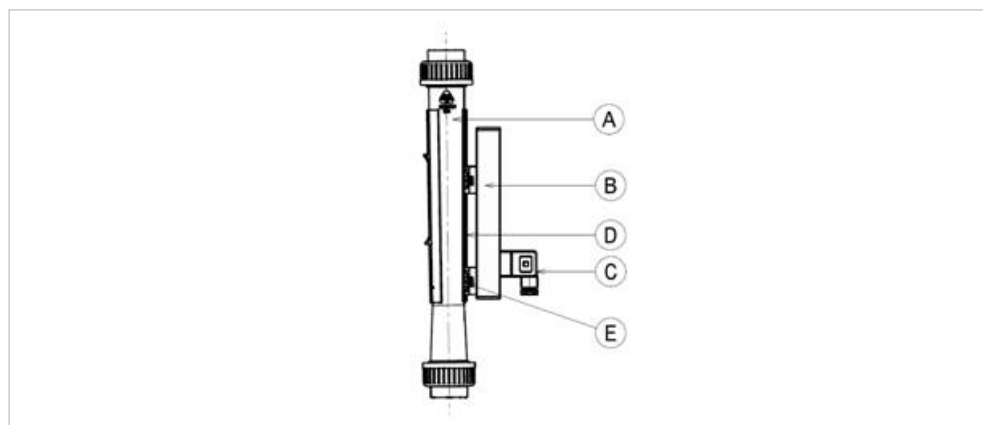
Technical data

Supply voltage	12-24 VDC (+ - 10%)
Current consumption	<50 mA
Load resistance	Min. 0 max. 500 Ω
Current output	4-20mA (3 wire)
Protection rating	IP65
Ambient temperature	0 °C to 50 °C
Process Connection	Plug DIN 43650
Measuring accuracy	<1%

Dimensions



GK15 function elements



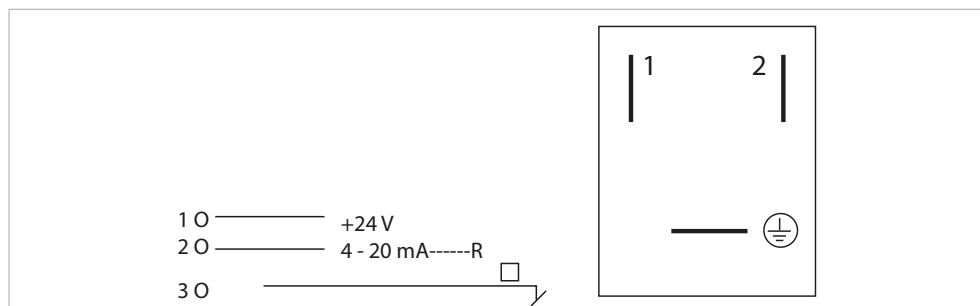
- A Flow Meter Type 335/350 with magnetic float
- B Sensor GK15
- C Cable plug
- D Dovetail guide
- E Clamping screws, for fastening and adjusting sensor

Assembly

1. Position the sensor on the dovetail guide of the area flow meter
2. Adjust the notch on the GK15 sensor to the 50% mark on the scale
3. Tighten the clamping screws
4. Take off the plug and wire it according to the displayed electrical connection

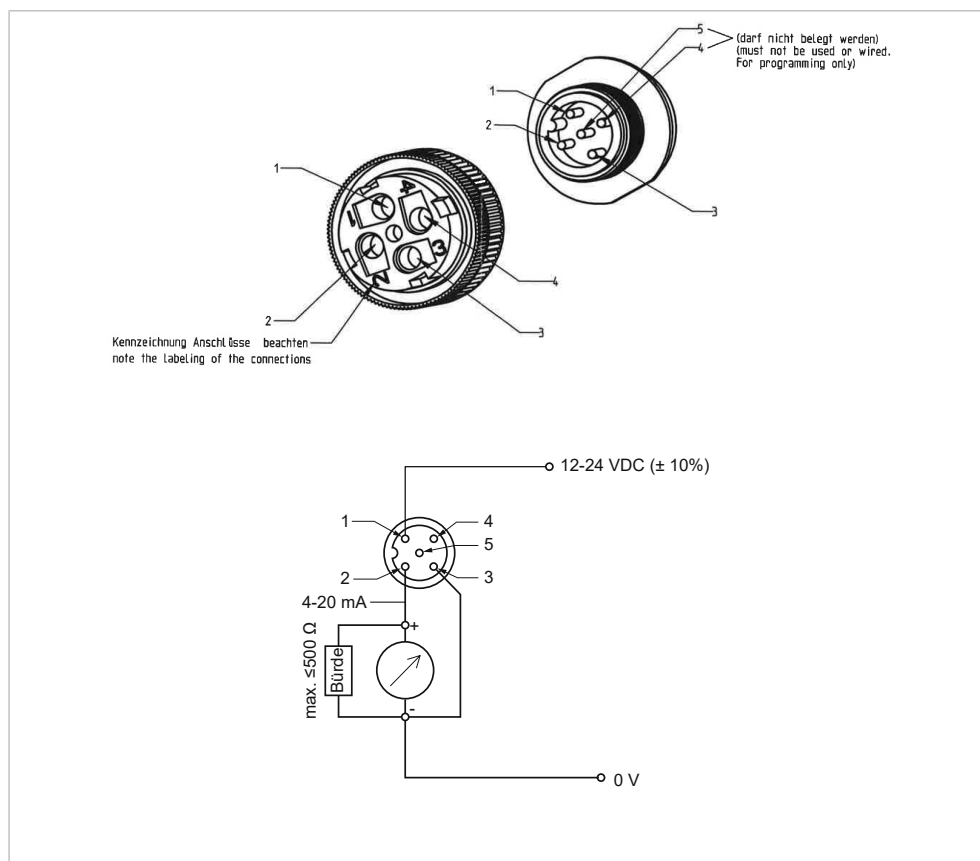
Electrical connection

Wiring diagram measured value sensor



- Pin1 Operating voltage
12 – 24 V
- Pin2 Output signal 4-20mA
- Pin3 0 V
- Pin4 Must not be used or
wired. For programming
only.
- Pin5 Must not be used or wired.
For programming only.

Wiring diagram measured value sensor plug



For further information on accessories, refer to the online product catalogue at www.gfps.com

6 Ultrasonic Flow Sensors

6.1 Technical basics



6.1.1 Product description

GF ultrasonic flow sensors perform highly accurate flow rate measurements of liquid media without coming into contact with the actual medium. As they use ultrasonic technology, no invasive intervention is required. This advantage comes into play especially in areas in which one would like to avoid contamination, such as with ultrapure water. This also applies for applications in which all direct contact must be avoided due to strong chemical reactions (chemical industry). Their installation also requires no interruption of processes.

The U series was developed especially for long-term measurements, while products of the PF series were conceived especially as mobile measuring units.

Advantages/features

- Large, easy to read graphic display with backlighting
- Easy to install without special tools
- "Clamp-on" design for fixed or temporary installations.
- Simple and user-friendly menu structure
- Simple quick-start setup procedure
- Especially configured for GF Piping Systems

CE RoHS

Applications

- Ultrapure water measurement
- Heatingsystems
- Chilled water metering
- Flow measurement for energy metering
- Monitoring of manufacturing processes

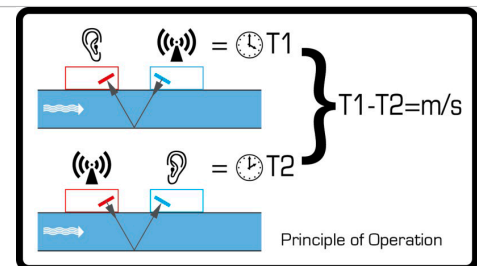
Function

GF ultrasonic flow sensors determine accurate flow readings based on detecting a time difference of two ultrasonic sound pulses which are emitted and reflected off the pipewall.

Transducers are mounted onto the outer pipe. A periodically voltage pulse causes piezo crystals inside of the measuring transducers to swing which generates a sound at ultrasonic frequency.

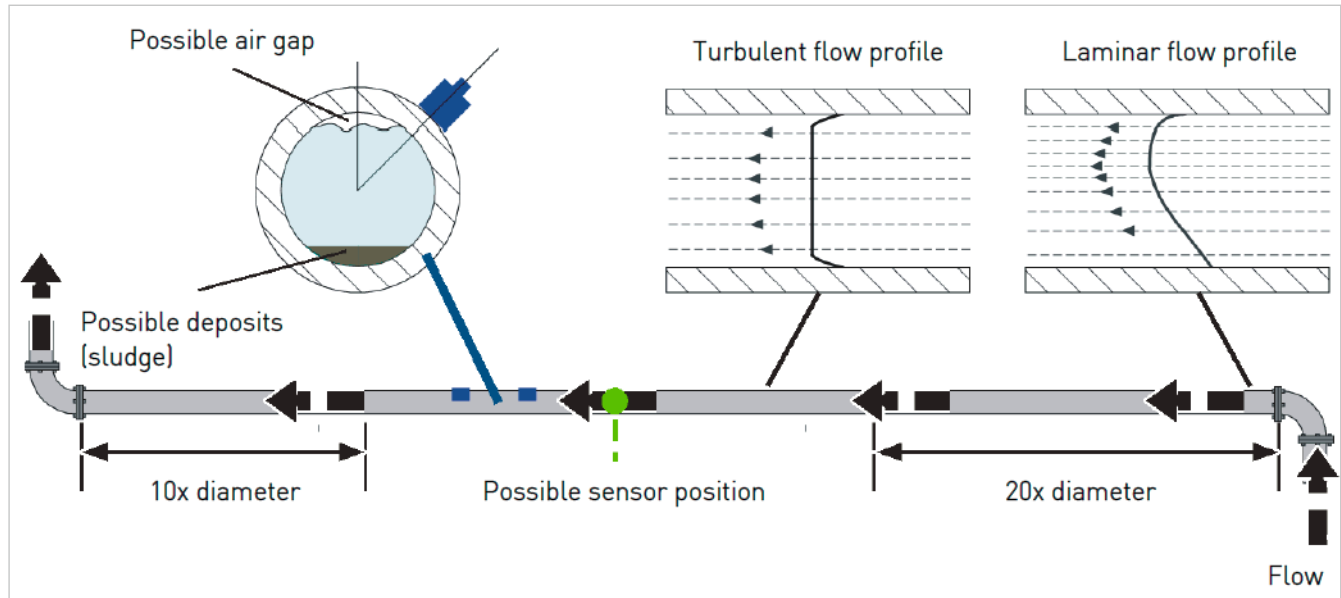
First the ultrasonic sound is transmitted downstream where is received by the second transducer. Then the same process takes place in the opposite direction.

The resulting time difference $T1-T2$ is directly proportional to the speed at which the liquid is flowing through the pipe.



6.1.2 Technical basics

GF ultrasonic flow sensors require a uniform and even flow profile, since a flow which is distorted can lead to unpredictable measurement errors. In many applications it is not possible, however, to attain a flow profile with even speed all around. Reasons for this can be, for example, air bubbles on the upper inner wall of the pipe, turbulence in the pipe or sludge on the bottom of the pipe.



The most accurate results are attained in our experience when the guide rail of the measuring transducer is not installed on top of the pipe, but is rather turned 45° to the right or the left of the pipe.

Incorrect measurements

The measurement can be distorted when the measuring transducer is positioned in the vicinity of upstream pipe segments such as bends, tees, valves, pumps and other similar hindrances.

In order to ensure that the ultrasonic flow sensors are positioned such that an undistorted flow profile is possible, the measuring transducers must be installed far enough away from possible sources of disruption that they have no influence on the measurement.

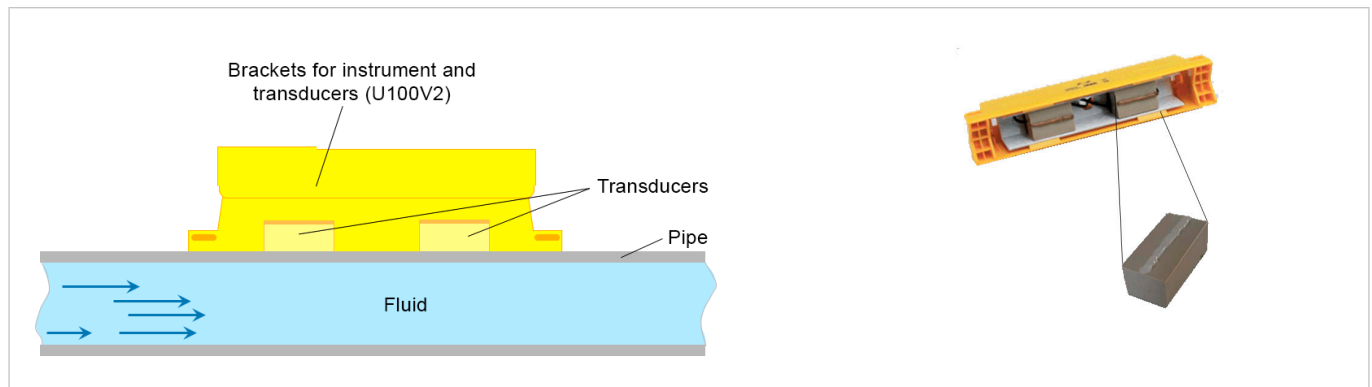
6.1.3 Handling

Installation notes

Maximum accuracy through optimal contact surfaces

In order to attain the most precise measurements, the following points must be observed at the installation site:

- A smooth and even contact between the pipe surface and the measuring transducer is an important factor in attaining a sufficiently strong ultrasonic signal.
- The pipe surface must be free of any residual grease.
- Contamination and peeling paint must be removed in order to guarantee an even contact surface.
- Rust preventer must be removed from the contact surfaces. Thick layers of paint can unintentionally reflect ultrasonic signals. No measurement is thereby possible.
- Ultrasonic conductive paste must be applied sufficiently in the middle of the sound transducers.
- The sensor distance must be chosen properly. The correct numbers for the U1000 V2 are summarized in a table. All other devices display the distance in the setup during installation.



⚠ The quality of the contact surface and the software settings each influence the measurement decisively. Ultrasonic conductive paste must be used for every installation and must be applied on the center of the sound transducers.

Tips for installation

Measuring point diagnosis

The quality of an installed measuring point can be subjected to a diagnosis in all devices. In case problems occur, one can discover whether there is a fundamental technical problem, whether settings can be optimized or whether the physical installation itself should be rechecked. The diagnosis is a variance analysis of the initial situation for which the device was configured and the actual situation at the measuring point. The following information can support troubleshooting, see Diagnosis menu:

Estimated/actual transmission time (Est. TA / Act. TA)

The two values Est. TA and Act. TA should be close to one another in a good installation.

Est. TA 85.64
Act. TA 86.77

Gain

This factor refers to the signal quality. The switch position is stated in parentheses. For a good setup, values between 600 and 970 can be expected, as well as a switch position of (x1).

Gain 845 (x1)
DT 125 ns

In the case that one of the mentioned data points does not meet expectations, one should analyze the following points more closely.

Possible causes for faulty measurements

Faulty installation/settings

If the signal quality is bad (PF220 and PF330, U3000/4000 less than two bars, U1000 V2 under 60 %), there may be problems with the installation. The following points are to be checked:

- Check input data for the measurement point
- Check whether the correct sound transducers are being used – A or B
- Sufficient ultrasonic conductive paste must be applied in the middle of the sound transducers
- The correct sensor distance was set according to specifications
- The cables connecting the measuring device and the sensors are correctly plugged in

Application-specific causes

Surface quality	Unfavorable consistency of the raw surface	Uneven surfaces do not ensure good contact to the sound transducers
	Paint/rust	Should be removed at the measuring point to the extent possible
	Entrapped air	Between the materials, lead to measuring problems especially with networked pipes
Inner surface of pipe	Roughness	The roughness factor may have to be adjusted for in the settings
	Fusion seams	The sensors should not be positioned on fusion seams.
Wrong sensor position	Run-in distances	Are the sound transducers too close to a bend?
	Other sensors	There is an invasive sensor upstream of the measuring point
State of the medium	Air bubbles	The medium should be as free of bubbles as possible.
	Air in the pipe	The sensors should be installed on the sides in horizontal stretches of pipe.
Flow is too low	Blocked pipe	Check pipe for blockages
	Valve position	Check whether upstream valves are open.

Sound speeds in different materials

Ultrasonic penetrates different material and liquids at different speeds. Therefore, the entry of the material and liquid type of fundamental importance when using GF ultrasonic flow sensors. The pipe material must be defined, as well as the medium itself. Some specifications are already included in the software menu, others can be found under the following link.

These can then be entered manually (not in the U1000 V2).



For a list with numbers on the speed of sound in a wide variety of materials, see http://www.gfps.com/appgate/ecat/common_flow/100021/DE/en/252706/download/document.html

6.2 Speed of sound in various liquids and solids

6.2.1 Speed of sound in liquids at 25°C and atmospheric pressure

Substance	Chem. Formula	Specific Gravity	Speed of Sound (m/s)	$\Delta v / ^\circ\text{C}$ (m/s/°C)
Acetic anhydride (22)	$(\text{CH}_3\text{CO})_2\text{O}$	1.082 (20°C)	1180	2.5
Acetic acid, anhydride (22)	$(\text{CH}_3\text{CO})_2\text{O}$	1.082 (20°C)	1180	2.5
Acetic acid, nitrile	$\text{C}_2\text{H}_3\text{N}$	0.783	1290	4.1
Acetic acid, ethyl ester (33)	$\text{C}_4\text{H}_8\text{O}_2$	0.901	1085	4.4
Acetic acid, methyl ester	$\text{C}_3\text{H}_6\text{O}_2$	0.934	1211	
Acetone	$\text{C}_3\text{H}_6\text{O}$	0.791	1174	4.5
Acetonitrile	$\text{C}_2\text{H}_3\text{N}$	0.783	1290	4.1
Acetylacetone	$\text{C}_6\text{H}_{10}\text{O}_2$	0.729	1399	3.6
Acetylene dichloride	$\text{C}_2\text{H}_2\text{Cl}_2$	1.26	1015	6.8
Acetylene tetrabromide (47)	$\text{C}_2\text{H}_2\text{Br}_4$	2.966	1027	
Acetylene tetrachloride (47)	$\text{C}_2\text{H}_2\text{Cl}_4$	1.595	1147	
Alcohol	$\text{C}_2\text{H}_6\text{O}$	0.789	1207	4
Alkazene-13	$\text{C}_{15}\text{H}_{24}$	0.86	1317	3.9
Alkazene-25	$\text{C}_{10}\text{H}_{12}\text{Cl}_2$	1.2	1307	3.4
2-Amino-ethanol	$\text{C}_2\text{H}_7\text{NO}$	1.018	1724	3.4
2-Aminotolidine (46)	$\text{C}_7\text{H}_9\text{N}$	0.999 (20°C)	1618	
4-Aminotolidine (46)	$\text{C}_7\text{H}_9\text{N}$	0.966 (45°C)	1480	
Ammonia (35)	NH_3	0.771	1729	6.68
Amorphous Polyolefin		0.98	962.6	
t-Amyl alcohol	$\text{C}_5\text{H}_{12}\text{O}$	0.81	1204	
Aminobenzene (41)	$\text{C}_6\text{H}_5\text{NO}_2$	1.022	1639	4
Aniline (41)	$\text{C}_6\text{H}_5\text{NO}_2$	1.022	1639	4
Argon (45)	Ar	1.400 (-188°C)	853	
Azine	$\text{C}_6\text{H}_5\text{N}$	0.982	1415	4.1
Benzene (29,40,41)	C_6H_6	0.879	1306	4.65
Benzol (29,40,41)	C_6H_6	0.879	1306	4.65
Bromine (21)	Br_2	2.928	889	3
Bromo-benzene (46)	$\text{C}_6\text{H}_5\text{Br}$	1.522	1170	
1-Bromo-butane (46)	$\text{C}_4\text{H}_9\text{Br}$	1.276 (20°C)	1019	
Bromo-ethane (46)	$\text{C}_2\text{H}_5\text{Br}$	1.460 (20°C)	900	
Bromoform (46,47)	CHBr_3	2.89 (20°C)	918	3.1
n-Butane (2)	C_4H_{10}	0.601 (0°C)	1085	5.8
2-Butanol	$\text{C}_4\text{H}_{10}\text{O}$	0.81	1240	3.3
sec-Butylalcohol	$\text{C}_4\text{H}_{10}\text{O}$	0.81	1240	3.3
n-Butyl bromide (46)	$\text{C}_4\text{H}_9\text{Br}$	1.276 (20°C)	1019	
n-Butyl chloride (22,46)	$\text{C}_4\text{H}_9\text{Cl}$	0.887	1140	4.57
tert Butyl chloride	$\text{C}_4\text{H}_9\text{Cl}$	0.84	984	4.2
Butyl oleate	$\text{C}_{22}\text{H}_{42}\text{O}_2$		404	3
2,3 Butylene glycol (7)	$\text{C}_4\text{H}_{10}\text{O}_2$	1.019	1484	1.51
Cadmium	Cd		2237.7	
Carbinol (40,41)	CH_4O	0.791 (20°C)	1076	2.92
Carbitol	$\text{C}_6\text{H}_{14}\text{O}_3$	0.988	1458	
Carbon dioxide (26)	CO_2	1.101 (-37°C)	839	7.71
Carbon disulphide	CS_2	1.261 (22°C)	1149	
Carbon tetrachloride (33,35,47)	CCl_4	1.595 (20°C)	926	2.48
Carbon tetrafluoride (14)	CF_4	1.75 (-150°C)	875.2	6.61
Cetane (23)	$\text{C}_{16}\text{H}_{34}$	0.773 (20°C)	1338	3.71
Chloro-benzene	$\text{C}_6\text{H}_5\text{Cl}$	1.106	1273	3.6
1-Chloro-butane (22,46)	$\text{C}_4\text{H}_9\text{Cl}$	0.887	1140	4.57
Chloro-di Fluoromethane (3) (Freon 22)	CHClF_2	1.491 (-69°C)	893.9	7.79
Chloroform (47)	CHCl_3	1.489	979	3.4
1-Chloro-propane (47)	$\text{C}_3\text{H}_7\text{Cl}$	0.892	1058	

Substance	Chem. Formula	Specific Gravity	Speed of Sound (m/s)	$\Delta v / ^\circ\text{C}$ (m/s/°C)
Chlorotrifluoromethane (5)	CClF_3		724	5.26
Cinnamaldehyde	$\text{C}_9\text{H}_8\text{O}$	1.112	1554	3.2
Cinnamic aldehyde	$\text{C}_9\text{H}_8\text{O}$	1.112	1554	3.2
Colamine	$\text{C}_2\text{H}_7\text{NO}$	1.018	1724	3.4
o-Cresol (46) m-	$\text{C}_7\text{H}_8\text{O}$	1.047 (20°C)	1541	
Cresol (46)	$\text{C}_7\text{H}_8\text{O}$	1.034 (20°C)	1500	
Cyanomethane	$\text{C}_2\text{H}_3\text{N}$	0.783	1290	4.1
Cyclohexane (15)	C_6H_{12}	0.779 (20°C)	1248	5.41
Cyclohexanol	$\text{C}_6\text{H}_{12}\text{O}$	0.962	1454	3.6
Cyclohexanone	$\text{C}_6\text{H}_{10}\text{O}$	0.948	1423	4
Decane (46)	$\text{C}_{10}\text{H}_{22}$	0.73	1252	
1-Decene (27)	$\text{C}_{10}\text{H}_{20}$	0.746	1235	4
n-Decylene (27)	$\text{C}_{10}\text{H}_{20}$	0.746	1235	4
Diacetyl	$\text{C}_4\text{H}_6\text{O}_2$	0.99	1236	4.6
Diamylamine	$\text{C}_{10}\text{H}_{23}\text{N}$		1256	3.9
1,2 Dibromo-ethane (47)	$\text{C}_2\text{H}_4\text{Br}_2$	2.18	995	
trans-1,2-Dibromoethene(47)	$\text{C}_2\text{H}_2\text{Br}_2$	2.231	935	
Dibutyl phthalate	$\text{C}_8\text{H}_{22}\text{O}_4$		1408	
Dichloro-t-butyl alcohol	$\text{C}_4\text{H}_8\text{Cl}_2\text{O}$		1304	3.8
2,3 Dichlorodioxane	$\text{C}_2\text{H}_6\text{Cl}_2\text{O}_2$		1391	3.7
Dichlorodifluoromethane (3) (Freon 12)	CCl_2F_2	1.516 (-40°C)	774.1	4.24
1,2 Dichloro ethane (47)	$\text{C}_2\text{H}_4\text{Cl}_2$	1.253	1193	
cis 1,2-Dichloro-Ethene (3,47)	$\text{C}_2\text{H}_2\text{Cl}_2$	1.284	1061	
trans 1,2-Dichloro-ethene(3,47)	$\text{C}_2\text{H}_2\text{Cl}_2$	1.257	1010	
Dichloro-fluoromethane (3) (Freon 21)	CHCl_2F	1.426 (0°C)	891	3.97
1-2-Dichlorohexafluoro cyclobutane (47)	$\text{C}_4\text{Cl}_2\text{F}_6$	1.654	669	
1-3-Dichloro-isobutane	$\text{C}_4\text{H}_8\text{Cl}_2$	1.14	1220	3.4
Dichloro methane (3)	CH_2Cl_2	1.327	1070	3.94
1,1-Dichloro-1,2,2,2 tetra fluoroethane	$\text{CClF}_2\text{-CClF}_2$	1.455	665.3	3.73
Diethyl ether	$\text{C}_4\text{H}_{10}\text{O}$	0.713	985	4.87
Diethylene glycol, monoethyl ether	$\text{C}_6\text{H}_{14}\text{O}_3$	0.988	1458	
Diethylenimine oxide	$\text{C}_4\text{H}_9\text{NO}$	1	1442	3.8
1,2-bis(DiFluoramino) butane (43)	$\text{C}_4\text{H}_8(\text{NF}_2)_2$	1.216	1000	
1,2bis(DiFluoramino)- 2-methylpropane (43)	$\text{C}_4\text{H}_9(\text{NF}_2)_2$	1.213	900	
1,2bis(DiFluoramino) propane (43)	$\text{C}_3\text{H}_6(\text{NF}_2)_2$	1.265	960	
2,2bis(DiFluoramino) propane (43)	$\text{C}_3\text{H}_6(\text{NF}_2)_2$	1.254	890	
2,2-Dihydroxydiethyl ether	$\text{C}_4\text{H}_{10}\text{O}_3$	1.116	1586	2.4
Dihydroxyethane	$\text{C}_2\text{H}_6\text{O}_2$	1.113	1658	2.1
1,3-Dimethyl-benzene (46)	C_8H_{10}	0.868 (15°C)	1343	
1,2-Dimethyl-benzene(29,46)	C_8H_{10}	0.897 (20°C)	1331.5	4.1
1,4-Dimethyl-benzene (46)	C_8H_{10}		1334	
2,2-Dimethyl-butane (29,33)	C_6H_{14}	0.649 (20°C)	1079	
Dimethyl ketone	$\text{C}_3\text{H}_6\text{O}$	0.791	1174	4.5
Dimethyl pentane (47)	C_7H_{16}	0.674	1063	
Dimethyl phthalate	$\text{C}_8\text{H}_{10}\text{O}_4$	1.2	1463	
Diiodo-methane	CH_2I_2	3.235	980	
Dioxane	$\text{C}_4\text{H}_8\text{O}_2$	1.033	1376	
Dodecane (23)	$\text{C}_{12}\text{H}_{26}$	0.749	1279	3.85
1,2-Ethandiol	$\text{C}_2\text{H}_6\text{O}_2$	1.113	1658	2.1
Ethanenitrile	$\text{C}_2\text{H}_3\text{N}$	0.783	1290	
Ethanoic anhydride (22)	$(\text{CH}_3\text{CO})_2\text{O}$	1.082	1180	
Ethanol	$\text{C}_2\text{H}_6\text{O}$	0.789	1207	4
Ethanol amide	$\text{C}_2\text{H}_7\text{NO}$	1.018	1724	3.4
Ethoxyethane	$\text{C}_4\text{H}_{10}\text{O}$	0.713	985	4.87
Ethyl acetate (33)	$\text{C}_4\text{H}_8\text{O}_2$	0.901	1085	4.4
Ethyl alcohol	$\text{C}_2\text{H}_6\text{O}$	0.789	1207	4

Substance	Chem. Formula	Specific Gravity	Speed of Sound (m/s)	$\Delta v / ^\circ\text{C}$ (m/s/°C)
Ethyl benzene (46)	C ₈ H ₁₀	0.867(20°C)	1338	
Ethyl bromide (46)	C ₂ H ₅ Br	1.461 (20°C)	900	
Ethyl iodide (46)	C ₂ H ₅ I	1.950 (20°C)	876	
Ether	C ₄ H ₁₀ O	0.713	985	4.87
Ethyl ether	C ₄ H ₁₀ O	0.713	985	4.87
Ethylene bromide (47)	C ₂ H ₄ Br ₂	2.18	995	
Ethylene chloride (47)	C ₂ H ₄ Cl ₂	1.253	1193	
Ethylene glycol	C ₂ H ₆ O ₂	1.113	1658	2.1
50% Glycol/ 50% H ₂ O			1578	
d-Fenochone	C ₁₀ H ₁₆ O	0.947	1320	
d-2-Fenochone	C ₁₀ H ₁₆ O	0.947	1320	
Fluorine	F	0.545 (-143°C)	403	11.31
Fluoro-benzene (46)	C ₆ H ₅ F	1.024 (20°C)	1189	
Formaldehyde, methyl ester	C ₂ H ₄ O ₂	0.974	1127	4.02
Formamide	CH ₃ NO	1.134 (20°C)	1622	2.2
Formic acid, amide	CH ₃ NO	1.134 (20°C)	1622	
Freon R12			774	
Furfural	C ₅ H ₄ O ₂	1.157	1444	
Furfuryl alcohol	C ₅ H ₆ O ₂	1.135	1450	3.4
Fural	C ₅ H ₄ O ₂	1.157	1444	3.7
2-Furaldehyde	C ₅ H ₄ O ₂	1.157	1444	3.7
2-Furancarboxaldehyde	C ₅ H ₄ O ₂	1.157	1444	3.7
2-Furyl-Methanol	C ₅ H ₆ O ₂	1.135	1450	3.4
Gallium	Ga	6.095	2870 (@30°C)	
Glycerin	C ₃ H ₈ O ₃	1.26	1904	2.2
Glycerol	C ₃ H ₈ O ₃	1.26	1904	2.2
Glycol	C ₂ H ₆ O ₂	1.113	1658	2.1
Helium (45)	He ₄	0.125(-268.8°C)	183	
Heptane (22,23)	C ₇ H ₁₆	0.684 (20°C)	1131	4.25
n-Heptane (29,33)	C ₇ H ₁₆	0.684 (20°C)	1180	4
Hexachloro-Cyclopentadiene (47)	C ₅ Cl ₆	1.718	1150	
Hexadecane (23)	C ₁₆ H ₃₄	0.773 (20°C)	1338	3.71
Hexalin	C ₆ H ₁₂ O	0.962	1454	3.6
Hexane (16,22,23)	C ₆ H ₁₄	0.659	1112	2.71
n-Hexane (29,33)	C ₆ H ₁₄	0.649 (20°C)	1079	4.53
2,5-Hexanedione	C ₆ H ₁₀ O ₂	0.729	1399	3.6
n-Hexanol	C ₆ H ₁₄ O	0.819	1300	3.8
Hexahydrobenzene (15)	C ₆ H ₁₂	0.779	1248	5.41
Hexahydrophenol	C ₆ H ₁₂ O	0.962	1454	3.6
Hexamethylene (15)	C ₆ H ₁₂	0.779	1248	5.41
Hydrogen (45)	H ₂	0.071 (-256°C)	1187	
2-Hydroxy-toluene (46)	C ₇ H ₈ O	1.047 (20°C)	1541	
3-Hydroxy-toluene (46)	C ₇ H ₈ O	1.034 (20°C)	1500	
Iodo-benzene (46)	C ₆ H ₅ I	1.823	1114	
Iodo-ethane (46)	C ₂ H ₅ I	1.950 (20°C)	876	
Iodo-methane	CH ₃ I	2.28 (20°C)	978	
Isobutyl acetate (22)	C ₆ H ₁₂ O		1180	4.85
Isobutanol	C ₄ H ₁₀ O	0.81 (20°C)	1212	
Iso-Butane			1219.8	
Isopentane (36)	C ₅ H ₁₂	0.62 (20°C)	980	4.8
Isopropanol (46)	C ₃ H ₈ O	0.785 (20°C)	1170	
Isopropyl alcohol (46)	C ₃ H ₈ O	0.785 (20°C)	1170	
Kerosene		0.81	1324	3.6
Ketohexamethylene	C ₆ H ₁₀ O	0.948	1423	4
Lithium fluoride (42)	LiF		2485	1.29
Mercury (45)	Hg	13.594	1449	

Substance	Chem. Formula	Specific Gravity	Speed of Sound (m/s)	$\Delta v / ^\circ\text{C}$ (m/s/°C)
Mesityloxide	$\text{C}_6\text{H}_6\text{O CH}_4$	0.85	1310	
Methane (25,28,38,39)		0.162	405(-89.15°C)	17.5
Methanol (40,41)	CH_4O	0.791 (20°C)	1076	2.92
Methyl acetate	$\text{C}_3\text{H}_6\text{O}_2$	0.934	1211	
o-Methylaniline (46)	$\text{C}_7\text{H}_9\text{N}$	0.999 (20°C)	1618	
4-Methylaniline (46)	$\text{C}_7\text{H}_9\text{N}$	0.966 (45°C)	1480	
Methyl alcohol (40,44)	CH_4O	0.791 (20°C)	1076	2.92
Methyl benzene (16,52)	C_7H_8	0.867	1328	4.27
2-Methyl-butane (36)	C_5H_{12}	0.62 (20°C)	980	
Methyl carbinol	$\text{C}_2\text{H}_6\text{O}$	0.789	1207	4
Methyl-chloroform (47)	$\text{C}_2\text{H}_3\text{Cl}_3$	1.33	985	
Methyl-cyanide	$\text{C}_2\text{H}_3\text{N}$	0.783	1290	
3-Methyl cyclohexanol	$\text{C}_7\text{H}_{14}\text{O}$	0.92	1400	
Methylene chloride (3)	CH_2Cl_2	1.327	1070	3.94
Methylene iodide	CH_2I_2	3.235	980	
Methyl formate (22)	$\text{C}_2\text{H}_4\text{O}_2$	0.974 (20°C)	1127	4.02
Methyl iodide	CH_3I	2.28 (20°C)	978	
α -Methyl naphthalene	$\text{C}_{11}\text{H}_{10}$	1.09	1510	3.7
2-Methylphenol (46)	$\text{C}_7\text{H}_8\text{O}$	1.047 (20°C)	1541	
3-Methylphenol (46)	$\text{C}_7\text{H}_8\text{O}$	1.034 (20°C)	1500	
Milk, homogenized			1548	
Morpholine	$\text{C}_4\text{H}_9\text{NO}$	1	1442	3.8
Naphtha		0.76	1225	
Natural Gas (37)		0.316 (-103°C)	753	
Neon (45)	Ne	1.207 (-246°C)	595	
Nitrobenzene (46)	$\text{C}_6\text{H}_5\text{NO}_2$	1.204 (20°C)	1415	
Nitrogen (45)	N_2	0.808 (-199°C)	962	
Nitromethane (43)	CH_3NO_2	1.135	1300	4
Nonane (23)	C_9H_{20}	0.718 (20°C)	1207	4.04
1-Nonene (27)	C_9H_{18}	0.736 (20°C)	1207	4
Octane (23)	C_8H_{18}	0.703	1172	4.14
n-Octane (29)	C_8H_{18}	0.704 (20°C)	1212.5	3.5
1-Octene (27)	C_8H_{16}	0.723 (20°C)	1175.5	4.1
Oil of Camphor Sassafrassy			1390	3.8
Oil, Car (SAE 20a.30)	1.74		870	
Oil, Castor	$\text{C}_{11}\text{H}_{10}\text{O}_{10}$	0.969	1477	3.6
Oil, Diesel		0.8	1250	
Oil, Fuel AA gravity		0.99	1485	3.7
Oil (Lubricating X200)			1530	5091.9
Oil (Olive)		0.912	1431	2.75
Oil (Peanut)		0.936	1458	
Oil (Sperm)		0.88	1440	
Oil, 6			1509	
2,2-Oxydiethanol	$\text{C}_4\text{H}_{10}\text{O}_3$	1.116	1586	2.4
Oxygen (45)	O_2	1.155 (-186°C)	952	
Pentachloro-ethane (47)	C_2HCl_5	1.687	1082	
Pentalin (47)	C_2HCl_5	1.687	1082	
Pentane (36)	C_5H_{12}	0.626 (20°C)	1020	
n-Pentane (47)	C_5H_{12}	0.557	1006	
Perchlorocyclopentadiene(47)	C_5Cl_6	1.718	1150	
Perchloro-ethylene (47)	C_2Cl_4	1.632	1036	
Perfluoro-1-Hepten (47)	C_7F_{14}	1.67	583	
Perfluoro-n-Hexane (47)	C_6F_{14}	1.672	508	
Phene (29,40,41)	C_6H_6	0.879	1306	4.65
β -Phenyl acrolein	$\text{C}_9\text{H}_8\text{O}$	1.112	1554	3.2
Phenylamine (41)	$\text{C}_6\text{H}_5\text{NO}_2$	1.022	1639	4

Substance	Chem. Formula	Specific Gravity	Speed of Sound (m/s)	$\Delta v / ^\circ\text{C}$ (m/s/°C)
Phenyl bromide (46)	C ₆ H ₅ Br	1.522	1170	
Phenyl chloride	C ₆ H ₅ Cl	1.106	1273	3.6
Phenyl iodide (46)	C ₆ H ₅ I	1.823	1114	
Phenyl methane (16,52)	C ₇ H ₈	0.867 (20°C)	1328	4.27
3-Phenyl propenal	C ₉ H ₈ O	1.112	1554	3.2
Phthalardione	C ₈ H ₄ O ₃		1125	
Phthalic acid, anhydride	C ₈ H ₄ O ₃		1125	
Phthalic anhydride	C ₈ H ₄ O ₃		1125	
Pimelic ketone	C ₆ H ₁₀ O	0.948	1423	4
Plexiglas, Lucite, Acrylic			2651	
Polyterpene Resin		0.77	1099.8	
Potassium bromide (42)	KBr		1169	0.71
Potassium fluoride (42)	KF		1792	1.03
Potassium iodide (42)	KI		985	0.64
Potassium nitrate (48)	KNO ₃	1.859 (352°C)	1740.1	1.1
Propane (2,13)(-45 to -130°C)	C ₃ H ₈	0.585 (-45°C)	1003	5.7
1,2,3-Propanetriol	C ₃ H ₈ O ₃	1.26	1904	2.2
1-Propanol (46)	C ₃ H ₈ O	0.78 (20°C)	1222	
2-Propanol (46)	C ₃ H ₈ O	0.785 (20°C)	1170	
2-Propanone	C ₃ H ₆ O	0.791	1174	4.5
Propene (17,18,35)	C ₃ H ₆	0.563 (-13°C)	963	6.32
n-Propyl acetate (22)	C ₅ H ₁₀ O ₂	1.280 (2°C)	4.63	
n-Propyl alcohol	C ₃ H ₈ O	0.78 (20°C)	1222	
Propylchloride (47)	C ₃ H ₇ Cl	0.892	1058	
Propylene (17,18,35)	C ₃ H ₆	0.563 (-13°C)	963	6.32
Pyridine	C ₆ H ₅ N	0.982	1415	4.1
Refrigerant 11 (3,4)	CCl ₃ F	1.49	828.3	3.56
Refrigerant 12 (3)	CCl ₂ F ₂	1.516 (-40°C)	774.1	4.24
Refrigerant 14 (14)	CF ₄	1.75 (-150°C)	875.24	6.61
Refrigerant 21 (3)	CHCl ₂ F	1.426 (0°C)	891	3.97
Refrigerant 22 (3)	CHClF ₂	1.491 (-69°C)	893.9	4.79
Refrigerant 113 (3)	CCl ₂ F-CClF ₂	1.563	783.7	3.44
Refrigerant 114 (3)	CClF ₂ -CClF ₂	1.455	665.3	3.73
Refrigerant 115 (3)	C ₂ ClF ₅		656.4	4.42
Refrigerant C318 (3)	C ₄ F ₈	1.62 (-20°C)	574	3.88
Selenium (8)	Se		1072	0.68
Silicone (30 cp)		0.993	990	
Sodium fluoride (42)	NaF NaNO ₃	0.877	2082	1.32
Sodium nitrate (48)	NaNO ₃	1.884 (336°C)	1763.3	0.74
Sodium nitrite (48)	NaNO ₂	1.805 (292°C)	1876.8	
Solvesso 3		0.877	1370	3.7
Spirit of wine	C ₂ H ₆ O	0.789	1207	4
Sulphur (7,8,10)	S		1177	-1.13
Sulphuric acid (1)	H ₂ SO ₄	1.841	1257.6	1.43
Tellurium (7)	Te		991	0.73
1,1,2,2-Tetrabromo-ethane(47)	C ₂ H ₂ Br ₄	2.96612	1027	
1,1,2,2-Tetrachloro-ethane(67)	C ₂ H ₂ Cl ₄	1.595	1147	
Tetrachloroethane (46)	C ₂ H ₂ Cl ₄	1.553 (20°C)	1170	
Tetrachloro-ethene (47)	C ₂ Cl ₄	1.632	1036	
Tetrachloro-methane (33,47)	CCl ₄	1.595 (20°C)	926	
Tetradecane (46)	C ₁₄ H ₃₀	0.763 (20°C)	1331	
Tetraethylene glycol	C ₈ H ₁₈ O ₅	1.123	1586/5203.4	3
Tetrafluoro-methane (14) (Freon 14)	CF ₄	1.75 (-150°C)	875.24	6.61
Tetrahydro-1,4-isoxazine	C ₄ H ₉ NO		1442	3.8
Toluene (16,52)	C ₇ H ₈	0.867 (20°C)	1328	4.27
o-Toluidine (46)	C ₇ H ₉ N	0.999 (20°C)	1618	

Substance	Chem. Formula	Specific Gravity	Speed of Sound (m/s)	$\Delta v / ^\circ\text{C}$ (m/s/°C)
p-Toluidine (46)	$\text{C}_7\text{H}_9\text{N}$	0.966 (45°C)	1480	
Toluol	C_7H_8	0.866	1308	4.2
Tribromo-methane (46,47)	CHBr_3	2.89 (20°C)	918	
1,1,1-Trichloro-ethane (47)	$\text{C}_2\text{H}_3\text{Cl}_3$	1.33	985	
Trichloro-ethene (47)	C_2HCl_3	1.464	1028	
Trichloro-fluoromethane (3) (Freon 11)	CCl_3F	1.49	828.3	3.56
Trichloro-methane (47)	CHCl_3	1.489	979	3.4
1,1,2-Trichloro-1,2,2-Trifluoro-Ethane	$\text{CCl}_2\text{F}-\text{CClF}_2$	1.563	783.7	
Triethyl-amine (33)	$\text{C}_6\text{H}_{15}\text{N}$	0.726	1123	4.47
Triethylene glycol	$\text{C}_6\text{H}_{14}\text{O}_4$	1.123	1608	3.8
1,1,1-Trifluoro-2-Chloro-2-Bromo-Ethane	$\text{C}_2\text{HClBrF}_3$	1.869	693	
1,2,2-Trifluorotrichloro- ethane (Freon 113)	$\text{CCl}_2\text{F}-\text{CClF}_2$	1.563	783.7	3.44
d-1,3,3-Trimethylnor- camphor	$\text{C}_{10}\text{H}_{16}\text{O}$	0.947	1320	
Trinitrotoluene (43)	$\text{C}_7\text{H}_5(\text{NO}_2)_3$	1.64	1610	
Turpentine		0.88	1255	
Unisis 800		0.87	1346	
Water, distilled (49,50)	H_2O	0.996	1498	-2.4
Water, heavy	D^2O		1400	
Water, sea		1.025	1531	-2.4
Wood Alcohol (40,41)	CH_4O	0.791 (20°C)	1076	2.92
Xenon (45)	Xe		630	
m-Xylene (46)	C_8H_{10}	0.868 (15°C)	1343	
o-Xylene (29,46)	C_8H_{10}	0.897 (20°C)	1331.5	4.1
p-Xylene (46)	C_8H_{10}		1334	
Xylene hexafluoride	$\text{C}_8\text{H}_4\text{F}_6$	1.37	879	
Zinc (7)	Zn		3298	

6.2.2 Speed of sound in solids at 25°C and atmospheric pressure

Material	Shear Wave Velocity (m/s)	Long Wave Velocity (m/s)
Steel 1% Carbon (hardened)	3150	5880
Carbon Steel	3230	5890
Mild Steel	3235	5890
Steel 1% Carbon	3220	
302 - Stainless Steel	3120	5660
303 - Stainless Steel	3120	5660
304 - Stainless Steel	3075	
316 - Stainless Steel	3175	5310
347 - Stainless Steel	3100	5470
410 - Stainless Steel	2990	5390
430 - Stainless Steel	3360	
Aluminium	3100	6320
Aluminium (rolled)	3040	
Copper	2260	4660
Copper (annealed)	2325	
Copper (rolled)	2270	
CuNi (70%Cu, 30%Ni)	2540	5030
CuNi (90%Cu, 10%Ni)	2060	4010
Brass (Naval)	2120	4430
Gold (hard-drawn)	1200	3240
Inconel	3020	5820
Iron (electrolytic)	3240	5900
Iron (Armco)	3240	5900
Ductile Iron	3000	4550
Cast Iron	2500	
Monel	2720	5350
Nickel	2960	5630
Tin (rolled)	1670	3320
Titanium	3125	6100
Tungsten (annealed)	2890	5180
Tungsten (drawn)	2640	
Tungsten (carbide)	3980	
Zinc (rolled)	2440	4170
Glass (Pyrex)	3280	5610
Glass (heavy silicate flint)	2380	
Glass (light borate crown)	2840	5260
Nylon	1150	2400
Nylon (6-6)	1070	
Polyethylene (HD)		2310
Polyethylene (LD)	540	1940
PVC, PVC-C		2400
Acrylic	1430	2730
Asbestos Cement		2200
Tar Epoxy		2000
Rubber		1900

6.3 220/330 Portaflow – portable ultrasonic flow meter



6.3.1 Product description

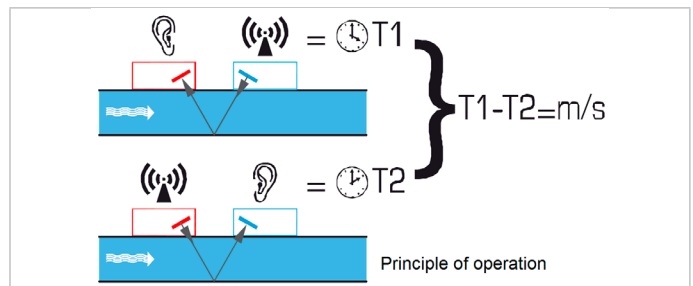
The Portaflow series makes possible a simple measurement of the flow of liquid without contacting the medium. Thanks to its user-friendly operating menu and simple configuration, the sensor can quickly be put into operation and guarantees precise measurement results. Due to its compact form and low weight, it is very well suited for mobile measurements. The integrated battery pack enables it to autonomously measure and record flow without a stationary power supply over a long time.

Function

Setup of the measuring site takes only a few minutes and the flow does not have to be interrupted, and the pipe does not have to be emptied.

Just as do all current GF ultrasonic flow sensors, the PF220 and PF330 also function according to the path-time principle of sound waves.

These mobile measuring devices can easily be adapted to the measurement environment and cover a broad range of raw materials and liquids. Both variants also offer 4 – 20 mA pulse or frequency outputs, in order to be able to observe flow rates on external devices.



Benefits/features

- Large, easy to read graphic display
- Easy to install, thanks to flexible guide rail
- Battery for up to 20 hours of mobile use
- Comfortable keyboard with dual function
- Simple quick-start commissioning
- Data storage for 198 K data points (type PF330)
- Analog and pulse outputs



Applications

- Drinking water
- River water
- Cooling water
- Fully desalinated water
- Water-glycol mixtures
- Chemicals
- Leak detection
- Boiler testing

6.3.2 Technical data

Portaflow PF220 ultrasonic flow sensor



- ① Test block
- ② Measured value sensor cable (2 x) 2 m long
- ③ Chains (2 x) 0.5 m long (1.65 ft) for A-ST, or 3.3 m long (10.8 ft) for B-ST type measured value sensor
- ④ Ultrasonic coupling paste
- ⑤ Output cable
- ⑥ Power supply
- ⑦ Guide rail
- ⑧ Measure value sensor A-ST (2 x) for use with pipes in the range d13 – 114 mm, or B-ST (2 x) for use with pipes in the range d115 – 1,000 mm
- ⑨ Scaled mounting rail
- ⑩ Portaflow PF220 measuring unit

The Portaflow 220 equipment is delivered in a polypropylene carrying case which is cushioned on the inside with foam in order to provide additional protection during transport.

Portaflow PF330 ultrasonic flow sensor



- ① Test block
- ② RS-232 cable
- ③ Measured value sensor cable (2 x) 2 m long
- ④ USB cable
- ⑤ Output cable
- ⑥ Ultrasonic coupling paste
- ⑦ Chains (2 x) 3.3 m long (10.8 ft)
- ⑧ Power supply
- ⑨ Guide rail
- ⑩ Measured value sensor „A-ST“ (2 x) for use with pipes in the range d13 – 114 mm
- ⑪ Measured value sensor „B-ST“ (2 x) for use with pipes in the range d115 – 2000 mm
- ⑫ Scaled mounting rail
- ⑬ Portaflow PF330 measuring unit with backlit graphic display

The Portaflow 330 equipment is delivered in a rugged IP67 carrying case which is cushioned on the inside with foam in order to provide additional protection during transport.

Specification

General

Measuring method	Ultrasonic runtime measurement	
Flow range	0.1 m/s – 20 m/s bidirectional	
Accuracy	Pipes > DN75	± 0.5 % – ± 2 % measured value for flow throughput rates
	Pipes DN13 – DN75	± 3 % of the measured value for flow throughput rates > 0.2 m/s
	All pipes ID's	± 6 % of the measured value for flow throughput rates < 0.2 m/s
Repetition accuracy	± 0.5 % of the measured value for flow or ± 0.02 m/s depending on which value is larger	
Response time	< 500 ms, depending on pipe diameter	
	Velocity	m/s, ft/s
	Volume	l/s, l/min, l/h, gal/min, gal/h, USgals/min, USgals/h, Barrel/h, Barrel/day, m³/s, m³/min, m³/h
Selectable totalizer units	Liters, m³, gallons, US gallons, barrels	
Totalizer	12 digits	
Menu languages	EN, DE, FR, RU, SE, IT, SP, P, NO, DEN	

Environment

Operating temperature	-20 °C – +50 °C	-4 °F – +122 °F
Storage temperature	-25 °C – +65 °C	-13 °F – +149 °F
Pipe wall temperature	-20 °C – +135 °C	-4 °F – +275 °F
Humidity during operation	Max. 90 % relative humidity at +50 °C (122 °F)	

Suitable pipe types

Pipe material	PVDF-SYGEF, PP-PROGEF, PE-ELGEF, PB-INSTAFLEX, ABS, PVC-U/PVC-C, construction steel, cast iron, stainless steel 316, copper		
Pipe dimensions (d)	Type PF220	d13 - d1000 mm	0.5 - 39 inch
	Type PF330	d13 - d2000 mm	0.5 - 78 inch
Pipe wall strength	d1 - d75 mm		0.04 - 3 inch
Pipe coating	Possible materials: rubber, glass, concrete, epoxy, steel		
Pipe coating thickness	0 - 10 mm		0 - 0.4 inch

Electronics

Power supply	9 - 24 V DC
Power consumption	Max. 10,5 W

Rechargeable battery

Technology	5-cell NiMH
Capacity	3,8 Ah
Operating time (typical)	20 hours of continuous operation with deactivated backlighting and 4 – 20 mA output
Battery charge time	6.5 hours
Service life	> 500 charge/discharge cycles

Power supply

Input voltage	90 - 264 V AC (47 - 63 Hz)
Output voltage	12 V DC
Output voltage max.	1,5 A
Approvals	UL, CUL, TUV, CB, CE

Outputs

Analog output	Range	4 - 20 mA, 0 - 20 mA, 0 - 16 mA
	Resolution	0.1 % to scale
	Load max.	620 Ω
	Insulation	1,500 V optoisolated
	Alarm current	Adjustable between 0 – 26 mA
Pulse output	Type	Digital MOSFET relay
	Pulse sequence	Max. 500 pps, user-programmable
	Pulse width	5 – 500 ms, user-programmable
	Max. voltage	48 V
	Max. current	500 mA
	Insulation	1,500 V optoisolated
USB interface (only PF330)	Protocol	Supports full speed (12 Mbits/s) data transmission rate
	Software	USB driver software included in delivery
	Push-fit	Protected industry push-fit
RS-232 interface (only PF330)	Protocol	Serial communication interface RS-232 including handshake
	Push-fit	Protected industry push-fit (GND, RxD, TxD, DTR, DSR)

Data logger (only PF330)

Saved data	Log book application details, throughput, total throughput, unit, time
Number of data points	198 k
Number of data sets	20
Number of data points per set	No limit (max. 198 k)
Programmable capture rate	5 s – 1 hour
Start/stop	Manual or time-controlled
Data download	Via RS-232/USB interface

Measured value sensor pairs

Type A	Type PF220 & PF300	Pipes d13 – d115 mm (2 MHz)
Type B	Type PF220	Pipes d115 – d1,000 mm (1MHz)
	Type PF330	Pipes d115 – d2,000 mm (1Mhz)

Housing and display

Material	ABS		
Dimensions	264 x 168 x 50 mm	10.4 x 6.6 x 2.0 inch	
Weight	1.1 kg (incl. battery)	2.45 lb	
Keyboard	16 membrane keys with tactile feedback		
Display	Type	240 x 64 pixel graphic display, high contrast, backlit	
	Viewing angle	Min. 30°, typically 40°	
	Active area	127 x 34 mm	5 x 1.3 inch
Protection class	IP 54		

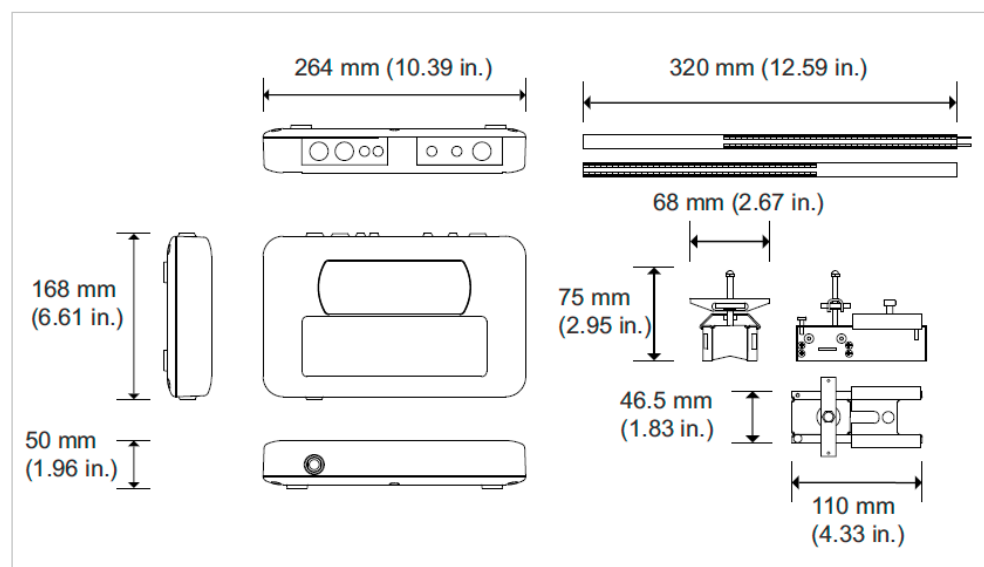
Shipping information

	PF330		PF220	
Package dimensions	420 x 390 x 220 mm	16.5 x 15.4 x 8.7 inch	510 x 140 x 440 mm	20 x 5.5 x 17.3 inch
Weight	7.5 kg	16.5 lb	6 kg	13.2 lb
Volume weight	5.7 kg	12.5 lb	5.2 kg	11.5 lb

Standards/approvals


CE, conforms to RoHS		
Security	BS EN 61010	
EMC	BS EN 61326 - 1:2006	BS EN 61326-2-3:2006
Power supply	EN61204 - 3	UL, CUL, TUV, CB, CE

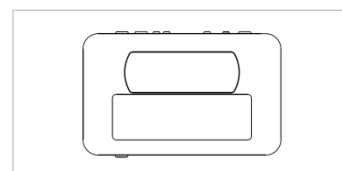
6.3.3 Dimensions



6.3.4 Order overview

Manufacturer's part no.	Part no.	Description
Standard		
PF 220 A	159 300 002	Portaflow PF220, for d13 – d114 mm
PF 220 B	159 300 003	Portaflow PF220, type B measured value sensor for d115 – d1,000 mm
PF 330 A+B	159 300 001	Portaflow PF330, types A and B measured value sensor for d13 – d2000 mm, data logger

 Installation and maintenance must be performed according to the corresponding installation instructions. The installation manual is included with the product, see also the online product catalogue at www.gfps.com



6.4 U1000 V2 Ultrasonic flow meter



6.4.1 Product description

The U1000 V2 is an ultrasonic permanent clamp-on flow metering solution for measuring flow rate. This cost effective device can either be used as a stand-alone meter or as an integral part of a control loop.

The U1000 V2 is very simple to install – clamp it on to the pipe, connect it to power and enter the pipe diameter. No expertise or special tools are required. The „clamp-on“ concept makes the installation of the sensors in running systems possible. The pipe does not have to be opened. Compact, robust and reliable – the U1000 V2 was designed for long-term use in industrial applications.

The U1000 V2 is especially configured for pure water and can be used on PVDF-ABS, PVC, PP, PE, PB-Instaflex, iron and steel pipes. Processes can be monitored directly by a higher-level system via 4 to 20 mA, Modbus, pulse or frequency output.

Benefits/features

- Large, easy to read graphic display with backlighting
- Easy to install without special tools
- „Clamp-on“ design
- Expanded size range (¾ inch to 6 inch pipes)
- Simple to follow programming menu
- Simple quick-start set up procedure
- Compact integral design

CE RoHS

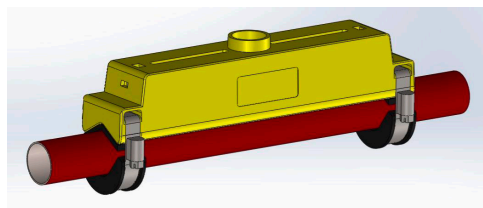
Applications

- Ultrapure water measurement
- Flow measurement for heat metering
- Chilled water metering
- Flow measurement for energy metering
- Monitoring of manufacturing processes

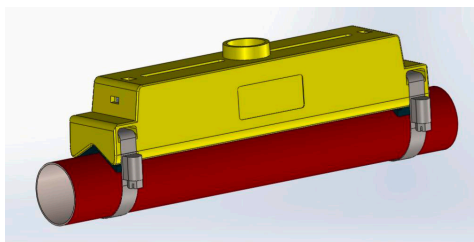
6.4.2 Handling

Selection of pipe adapter

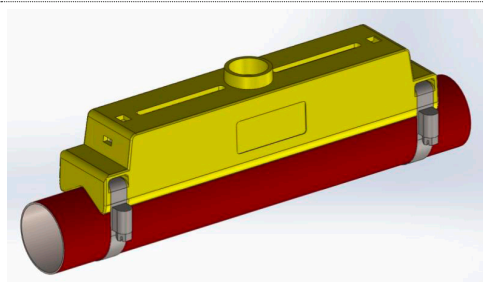
To guarantee a secure fit on the pipe, the proper pipe adapters must be selected, depending on the outside diameter (included in scope of delivery).



OD smaller than 40 mm:
upper and lower pipe adapter



OD 40 – 60 mm:
upper pipe adapter



OD 60 mm and larger:
no pipe adapter necessary

Maintenance notes

If the device was installed in accordance with the Operating Manual, no extensive maintenance intervals are to be observed.

Depending on the application, however, you may have to check whether a sufficient quantity of ultrasonic conductive paste has been applied between the pipe surface and the sensor. High relative humidity or sprayed water can wear away at the ultrasonic conductive paste, which leads to a worsening of signal quality and ultimately to a complete interruption of the measurement. Such a test must be performed every 6 – 12 months. If necessary, new ultrasonic conductive paste must be applied.

Electrical connection



No.	Description
①	Input 12 V / 24 V (brown)
②	Return conductor 12 V – 24 V (blue)

No.	Description	
③	Pulse + (white)	The SPNO MOSFET relay of the electronics module provides an isolated switching pulse for a maximum switching current of 500 mA and a maximum voltage of 48 V AC. The relay ensures 2500 V isolation. Galvanically, this is a zero potential output.
④	Pulse – (green)	
⑤	Output (+), 4 – 20 mA (red)	The 4 – 20 mA current output is an isolated current source and designed for a load of < 620 Ω. The alarm current that is triggered by a flow outside of the stated range or due to a signal loss, is set to 3.5 mA.
⑥	Return conductor (-), 4 – 20 mA (black)	
⑦	Non-isolated shielding	

Electrical connection Modbus



No.	Description
①	Modbus –ve (brown)
②	Modbus ground (white)
③	Modbus +ve (black)
④	Modbus ground (white)
⑤	Modbus optional ground (uninsulated screen)



Note: Ensure the white wires are correctly associated with the black & brown wires. The black/white twisted pair is fitted with a black sleeve to distinguish between the black/white and brown/white pairs.



Installation and maintenance must be performed according to the corresponding installation instructions. The installation manual is included with the product, see also the online product catalogue at www.gfps.com

6.4.3 Technical data



- ① Power supply (AC/DC)
- ② Pipe bracket
- ③ Electronics module
- ④ Guide rail
- ⑤ User interface
- ⑥ Pipe

Technical specifications

General

Measuring method	Ultrasonic runtime measurement	
Flow range	0.1 m/s – 10 m/s (0.3 ft/s - 32 ft/s), bi-directional	
Accuracy	± 3 % of the flow value with a flow rate > 0.3 m/s	
Repeatability	± 0.5 % of the measured value	
Response time	< 500 ms	
Selectable flow units	Velocity	m/sec, ft/sec.
	Volume	l/s, l/min, gal/s, gal/min, USgal/s, USgal/min, m3/min, m3/hr
Selectable totalizer units	Liter, m3, gals, USgals	
Menu languages	EN	

Environment

Operating temperature	0 °C to +50 °C	32 °F to 122 °F
Storage temperature	-10 °C to +60 °C	14 °F to 140 °F
Temperature of pipe wall	0 °C to +85 °C	32 °F to 185 °F
Humidity during operation	Max. 90 % relative humidity at +50 °C (122 °F)	

Suitable pipe types

Pipe materials	PVDF, PP-H, PE, PB, ABS, UPVC, CPVC, construction steel, iron, stainless steel 316	
Pipe diameter (d)	d25 - d180 mm*	0.86 - 7 inch* (¾ inch to 6 inch)

Electronics

Power supply	12 - 24 V AC/DC
Power consumption	Max. 7 VA

Outputs

Analog output

Range	4 - 20mA
Resolution	0.1 % of measurement range
Load max.	620 Ω
Insulation	1MΩ at 100 V
Alarm current	3.5 mA

Outputs**Pulse output**

Type	Opto-Isolated MOSFET volt free contact (NO/NC)
Pulse sequence	1 – 166 pps user-programmable frequency mode max. 200 Hz
Pulse width	50 ms standard value, 3 – 99 ms user-programmable
Max. voltage	24V DC or 24V AC
Max. current	500 mA
Insulation	1MΩ at 100V

Modbus

Format	RTU
Baud Rate	1200, 2400, 4800, 9600, 19200, 38400
Data-Parity-StopBits	8-None-2, 8-None-1, 8-Odd-2, 8-Even-1
Standards	PI-MBUS-300 Rev. J
Physical connection	RS485

Housing and display

Material	Polycarbonate	
Dimensions	250 x 48 x 90 mm	9.85 x 1.9 x 3.55 Inch
Weight	0.5 kg	1.1 lb
Keyboard	Keypad with 4 buttons	

Display

Type	LCD, 2 lines x 16 characters	
Viewing angle	Min. 30°, max. 40°	
Active area	83 x 18.6 mm	3.3 x 0.73 Inch
Protection class	IP 54	

Shipping information

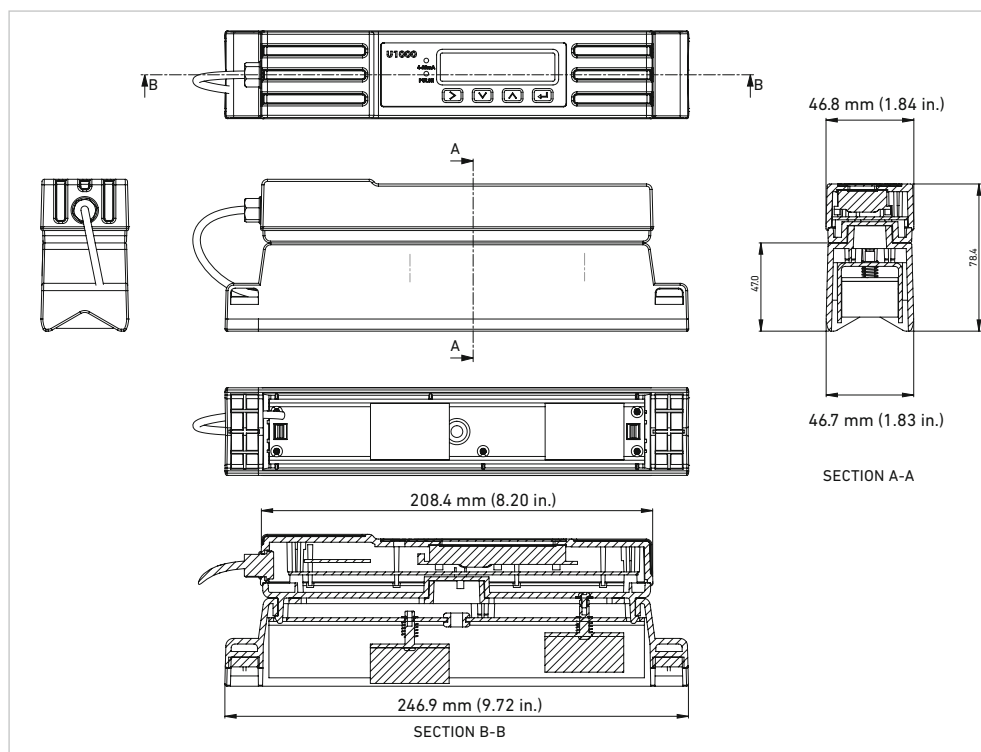
Packet dimensions	290 x 280 x 100 mm	11.4 x 11 x 4 Inch
Weight	1.4 kg	0.05 lb
Volume weight	1.4 kg	0.05 lb

Standards/approvals

CE, conforms to RoHS		
UL listed		
Security	BS EN 61010-1:2001	
EMV	BS EN 61326-1:2006	BS EN 61326-2-3:2006
Environment	BS EN 60068-1:1995	
	BS EN 60068-2-1:2007	BS EN 60068-2-2:2007

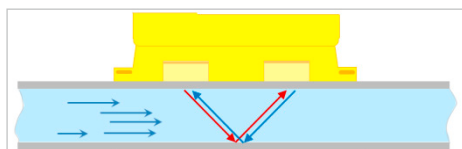
* Note: Pipe size is dependant on pipe material and inner pipe diameter

Dimensions



6.4.4 Function

The U1000 V2 functions, as do all GF current ultrasonic flow meters, according to the path-time principle of ultrasonic waves.



The device is installed directly on the pipe surface and transmits ultrasonic waves back and forth between the two sound transducers. Depending on the flow, a small time difference arises between the two ultrasonic signals – this is proportional to the flow speed.

The U1000 V2 is especially configured for pure water and can be used on PVDF-ABS, PVC, PP, PE, PB-Instaflex and steel pipes. Processes can be monitored directly by a higher-level system via 4 to 20 mA, Modbus, pulse or frequency output.

6.4.5 Order overview

Code	Type	Description
159 300 300	U1000 V2	U1000 V2 4-20 mA & pulse d22 – d115 (¾ in. – 4 in.)
159 300 301	U1000 V2	U1000 V2 4-20 mA & pulse d125 – d180 (5 in. – 6 in.)
159 300 302	U1000 V2	U1000 V2 Modbus & pulse d22 – d115 (¾ in. – 4 in.)
159 300 303	U1000 V2	U1000 V2 Modbus & pulse d125 – d180 (5 in. – 6 in.)

6.5 UD2100 Ultrasonic Doppler Flow Meter



6.5.1 Product description

The UD2100 ultrasonic doppler flow meter is a permanent clamp-on flow meter for non-invasive flow measurement. It is specifically designed for challenging flow applications with dirty, aerated, abrasive, corrosive and/or caustic media – applications where the most regular flow meters would be defeated.

Typical media in applications of the UD2100 contains: Wastewater, slurries, vicious liquids, sewage, abrasives, sediments and others. This flow meter is recommend for use in fully filled pipes and virtually any media that contains solids or bubbles. The UD2100 can be used on UPVC, CPVC, PE, PVDF, PP-H, ABS, PB, HDPE, steel and iron pipes. Processes can be monitored directly by a higherlevel system via 4-20 mA, HART or Modbus output.

Benefits/features

- Large, easy to read graphic display with backlighting
- Easy to install without special tools
- "Clamp-on" design
- Made for difficult applications and dirty media
- Compatible with almost all pipe types and diameters
- Simple quick-start set up procedure
- Compact integral design
- Various options for process communication
- Integrated datalogger



Applications

- Wastewater Treatment
- Mining
- Paper Mills
- Monitoring of manufacturing processes with dirty liquids

Recommended for use with liquids containing suspended solids or bubbles with minimum size of 100 microns and minimum concentration of 75 ppm.

6.5.2 Specifications

General

Measuring method	Ultrasonic doppler measurement
Flow range	± 0.03 m/s - 12.2 m/s (± 0.1 ft/s - 40 ft/s), bi-directional
Accuracy	± 2 % of the flow reading at a flow rate > ± 0.3 m/s Requires solids or bubbles with minimum size of 100 microns and minimum concentration of 75 ppm
Repeatability	± 0.1 % of measured value
Linearity	± 0.5 %
Response time	1 s
Selectable flow units	Velocity m/sec, ft/sec. Volume Liter (L) per sec/min/hour/day US gallons (USG) per sec/min/hour/day Imperial gallons (ISG) per sec/min/hour/day Barrels (bbl) per sec/min/hour/day Cubic meter (m3) per sec/min/hour/day Cubic feet (m3) per sec/min/hour/day
Selectable totalizer units	Liters, m3, US gallons, imperial gallons, barrels, cubic feet
Menu languages	English, Spanish, French

Environment

Operating temperature	-20 °C to +60 °C (head unit) -4 °F to +140 °F -40 °C to +150 °C (sensor) -40 °F to +300 °F
Storage temperature	-10 °C to +60 °C 14 °F to 140 °F
Temperature of pipe wall	0 °C to 85 °C 32 °F to 185 °F
Humidity during operation	Max. 90 % relative humidity at +50 °C (122 °F)

Suitable pipe types

Pipe materials	UPVC, CPVC, PE, PVDF, PP-H, ABS, PB, HDPE, steel, stainless steel, iron, cast iron, ductile iron, metal, line pipes. Pipes with loose insertion liners and pipes with walls containing air are not supported.
Pipe diameter (d)	16 - 4500 mm* ½ - 180 inch*

Electronics

Power supply	100 - 240 V AC 50-60 Hz 9-32 V DC
Power consumption	AC: Max. 10 VA DC: Max 10 Watt

Outputs

Analog output

Range	4 – 20 mA or 0-5 VDC
Resolution	0.1 % of measurement range
Load max.	1000 Ω
Insulation	1500 V optically isolated
Alarm current	3.5 mA

Pulse output

Pulse sequence	2.25 s minimum time between pulses
Pulse Duration	350 ms
Max. voltage	250 VAC
Max. current	12 A
Insulation	1000 V

Modbus

Type	Modbus RTU via RS485 or HART
Relays	1200, 2400, 4800, 9600, 19200, 38400
Type	2x SPDT 5 amp

Outputs

Programming	Programmable flow alarm and/or proportional pulse
-------------	---

Data logger

Interface	USB
Data points	26 million data points
Format	CSV

Housing and display**Enclosure**

Material	Polycarbonate	
Dimensions	278 x 188 x 130 mm	10.95 x 7.4 x 5.12 inch
Weight	5 kg	11 lbs
Keyboard	Keypad with 5 buttons	
Protection class	IP 66 / NEMA4X (water and dust tight)	

Display

Type	White, backlit matrix
Supported languages	English, Spanish, French

Sensor

Material	316SS	
Dimensions	85 x35 x 38 mm	3.375 x 1.375 x 1.5 inch

Shipping information

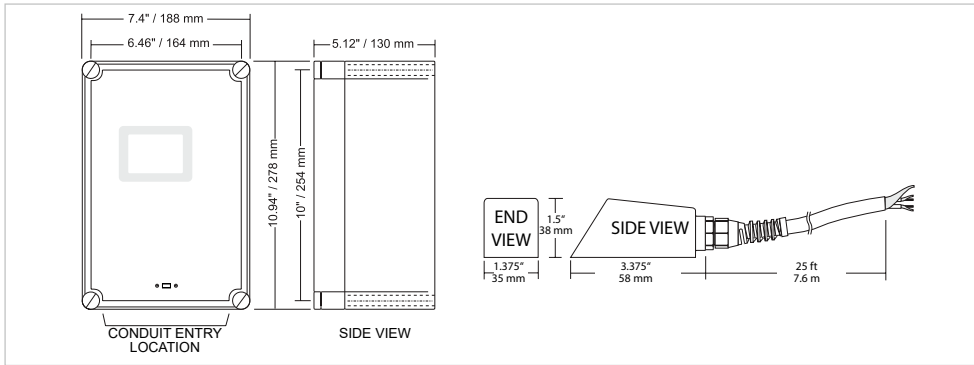
Package dimensions	380 x 290 x 230 mm	15 x 12 x 10 inch
Weight	5,4 kg	12 lbs
Volume weight	5,4 kg	12 lbs

Standards/approvals

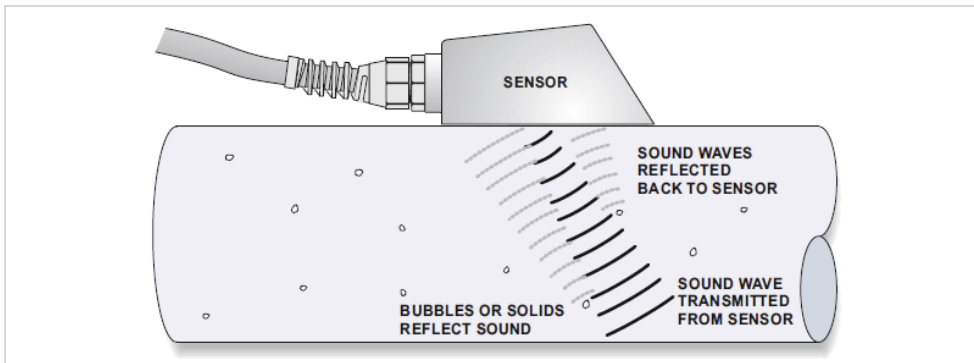
CE, conforms to RoHS		
Security	BS EN 61010-1:2001	
EMV	BS EN 61326-1:2006	BS EN 61326-2-3:2006
Environment	BS EN 60068-1:1995	
	BS EN 60068-2-1:2007	BS EN 60068-2-2:2007

* Note: Pipe size is dependant on pipe material and inner pipe diameter

Dimensions



6.5.3 Function



The UD2100 ultrasonic doppler sensor continuously emits high frequency (ultrasonic) sound pulses through the pipe wall into the flowing liquid.

The ultrasonic sound pulses get reflected back from the particles or gas bubbles in the media. At zero flow the reflected frequency is the same as the emitted frequency. If the liquid is flowing the reflected frequency is different from the emitted (through the doppler effect).

This frequency shift is measured continuously by the UD2100 and used to precisely measure the velocity of the media.

6.5.4 Configuration options

Type	Configuration mode	Configuration option
UD2100	-□□-□□-□□-□□-□	Standard Model (A1-A1-A1-A1-A)
Power input	-A□-□□-□□-□□-□	Standard – 100-240VAC 50/60Hz
	-B□-□□-□□-□□-□	9-32VDC, 10W Maximum
Enclosure & Electronics Protection	-□1-□□-□□-□□-□	Standard – NEMA4X (IP66) polycarbonate
Enclosure Temperature Rating	-□□-A□-□□-□□-□	Standard – (-5° to 140°F / -20° to 60°C)
Intrinsic Safety	-□□-□1-□□-□□-□	Standard – SE4 Transducer, Non-Incendive for Class 1 Div 2, Groups A,B,C,D
Transducers	-□□-□□-□□-□□-□	Standard – SE4-A Clamp-on Sensor (for 0.5" / 12.5 mm to 180" (4.5 m) ID pipes)
Transducers Mounting Hardware	-□□-□□-□1-□□-□	Standard – PC4; Includes stainless bracket, mounting clamps, and silicone coupling compound
Transducer Cable Length	-□□-□□-□□-□□-□	Standard – 25 ft. (7.6 m) shielded coaxial pair
	-□□-□□-□□-□□-□	50 ft / 15 m continuous shielded coaxial pair
	-□□-□□-□□-□□-□	100 ft / 30 m continuous shielded coaxial pair
Serial Communication	-□□-□□-□□-□1-□	Standard – None
	-□□-□□-□□-□2-□	Modbus® RTU via RS-485 or HART (field selectable)
Control Relays Config Code & Standard	-□□-□□-□□-□□-□	Standard – 2 relays, rated 5 amp SPDT, programmable

6.5.5 Order overview



Config. Code	Code	Description
UD2100-A1-A1-A1-A1-A	159 300 320	UD2100 100-240 VAC 4-20 mA, Pulse 7.6 m cable NEMA4X/IP66 -20-60 °C
UD2100-A1-A1-A1-B1-A	159 300 321	UD2100 100-240 VAC 4-20 mA, Pulse 15 m cable NEMA4X/IP66 -20-60 °C
UD2100-A1-A1-A1-C1-A	159 300 322	UD2100 100-240 VAC 4-20 mA, Pulse 30 m cable NEMA4X/IP66 -20-60 °C
UD2100-A1-A1-A1-A2-A	159 300 323	UD2100 100-240 VAC Modbus, 4-20 mA, Pulse 7.6 m cable NEMA4X/IP66 -20-60 °C
UD2100-A1-A1-A1-B2-A	159 300 324	UD2100 100-240 VAC Modbus, 4-20 mA, Pulse 15 m cable NEMA4X/IP66 -20-60 °C
UD2100-A1-A1-A1-C2-A	159 300 325	UD2100 100-240 VAC Modbus, 4-20 mA, Pulse 30 m cable NEMA4X/IP66 -20-60 °C
UD2100-B1-A1-A1-A1-A	159 300 326	UD2100 9-32 VDC 4-20 mA, Pulse 7.6 m cable NEMA4X/IP66 -20-60 °C
UD2100-B1-A1-A1-B1-A	159 300 327	UD2100 9-32 VDC 4-20 mA, Pulse 15 m cable NEMA4X/IP66 -20-60 °C
UD2100-B1-A1-A1-C1-A	159 300 328	UD2100 9-32 VDC 4-20 mA, Pulse 30 m cable NEMA4X/IP66 -20-60 °C
UD2100-B1-A1-A1-A2-A	159 300 329	UD2100 9-32 VDC Modbus, 4-20 mA, Pulse 7.6 m cable NEMA4X/IP66 -20-60 °C
UD2100-B1-A1-A1-B2-A	159 300 330	UD2100 9-32 VDC Modbus, 4-20 mA, Pulse 15 m cable NEMA4X/IP66 -20-60 °C
UD2100-B1-A1-A1-C2-A	159 300 331	UD2100 9-32 VDC Modbus, 4-20 mA, Pulse 30 m cable NEMA4X/IP66 -20-60 °C

6.5.6 Accessories

Code	Description
159 300 340	Standard clamp-on Sensor with 25 ft / 7.6 m shielded coaxial pair
159 300 341	Standard clamp-on Sensor with 50 ft / 15 m length cable
159 300 342	Standard clamp-on Sensor with 100 ft / 30 m length cable
159 300 343	Sensor cable Junction Box
159 300 344	Sensor Mounting Kit with Couplant and SS clamps for pipes up to 32" (80 cm)
159 300 345	Enclosure Sunscreen (iridite aluminum)
159 300 038	Superlube Grease 85mg
159 300 346	Extra sensor cable 20 ft / 6 m length
159 300 347	Extra sensor cable 35 ft / 10 m length
159 300 348	Extra sensor cable 175 ft / 50 m length
	Extra sensor cable custom length (up to 500 ft / 152 m, RG174U shielded coaxial pair)

6.6 U3000 and U4000 Ultrasonic flow sensors



6.6.1 Product description

The Ultraflow brings simplicity to the non-invasive measurement of liquid flow, offering the user quick and accurate flow measurement with its easy to follow menu and simple set up. Dry servicing, providing minimum downtime and maximum availability, even in a continuously running system. A cost-effective alternative to conventional measuring systems in piping systems: operation and maintenance without contact of media guarantees that a system has minimal downtime and maximum operational readiness.

Function

Just as do all current GF ultrasonic flow sensors, the U3000 and U4000 also function according to the path-time principle of sound waves, which is described in detail in the fundamentals of ultrasonic measuring technology.

The U3000 and U4000 flow sensors were developed for permanent installations for continuous monitoring and control of processes.

Current, frequency or pulse signals make possible multiple connections to higher-level control systems.

Benefits/features

- Large, easy to read graphic display
- Easy to install
- „Clamp-on“ sensors that do not come into contact with media
- Easily comprehensible programming menu
- Simple quick-start commissioning
- Data storage for 198 K data points (type U4000)
- Analog, pulse and alarm outputs
- Reynolds number correction



Applications

- HV AC and energy system audits
- Pump verification
- Process monitoring/control
- Chemical dosing
- Hydraulic systems
- Sprinkler systems
- Leak monitoring
- Boiler testing

6.6.2 Handling

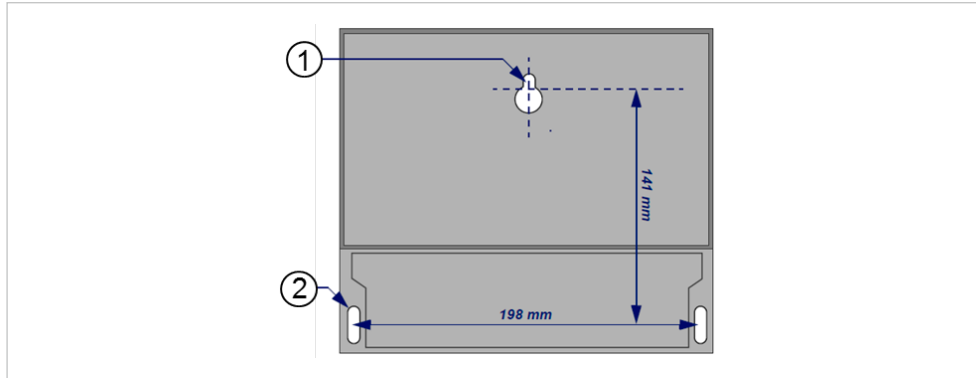
Installation notes

Basic functions and notes on correct installation of the GF ultrasonic flow sensors can be found in the previous introductory chapter. In the following, specific notes on the U3000 and U4000 are given.

Installation assistance and cable connections

Information on installation

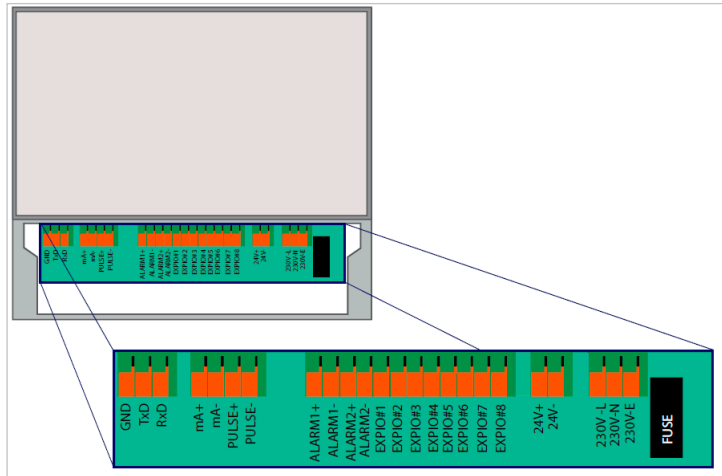
The measuring unit should be securely attached to the wall via the two illustrated attachment points.



- ① M4 keyhole
- ② Slot for M4 screw

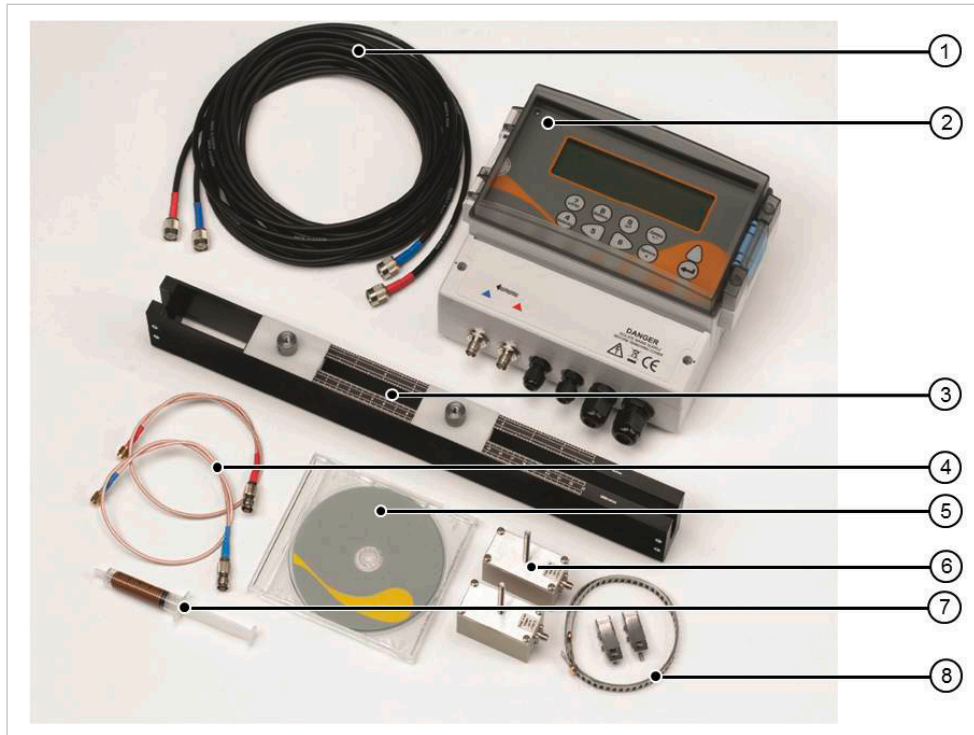
Cable connections

All power and control cables are routed via cable connections to the underside of the measuring unit and attached to the terminal strip according to the illustration.



Installation and maintenance must be performed according to the corresponding installation instructions. The installation manual is included with the product, see also the online product catalog at www.gfps.com

6.6.3 Technical data



- ① Measured value sensor cable (2 x) 10 m long
- ② Measuring unit with backlit graphic display
- ③ Mounting rail for the use of measured value sensor pair "A" or "B"
- ④ USB cable and RS-232-C cable (U4000)
- ⑤ User manual
- ⑥ Measured value sensor "A-ST" 2 x (U3000/U4000A) for use with pipes in the range d13 – d114 mm
Measured value sensor "B-ST" 2 x (U3000/U4000A) for use with pipes in the range d115 – d2,000 mm
- ⑦ Ultrasonic coupling paste
- ⑧ Steel bands for fastening the measured value sensor mounting rails on the pipe

Specification

General

Measuring method	Ultrasonic runtime measurement	
Flow range	0,1 m/s - 20 m/s	
Accuracy	Pipes > DN75	± 0.5 % – 3 % of the measured value for flow throughput rates > 0.2 m/s
	Pipes DN13 – DN75	± 0.3 % of the measured value for flow throughput rates > 0.2 m/s
Repetition accuracy	± 0.5 % of the measured value for flow or ± 0.02 m/s depending on which value is larger	
Response time	< 500 ms, depending on pipe diameter	
Selectable flow units	Velocity	m/s, ft/s
	Volume	l/s, l/min, l/h, gal/min, gal/h, USgals/min, USgals/h, Barrel/h, Barrel/day, m³/s, m³/min, m³/h
Selectable totalizer units	Liters, m³, gallons, US gallons, barrels	
Totalizer	12 digits	
Menu languages	EN, DE, FR, RU, SE, IT, SP, P, NO, DEN	

Environment

Operating temperature	-20 °C – +50 °C	-4 °F – +122 °F
Storage temperature	-25 °C – +75 °C	-13 °F – +167 °F
Pipe wall temperature	-20 °C – +135 °C	-4 °F – +275 °F
Humidity during operation	Max. 90 % relative humidity at +50 °C (122 °F)	

Suitable pipe types

Pipe material	PVDF-SYGEF, PP-PROGEF, PE-ELGEF, PB-INSTAFLEX, ABS, PVC-U/PVC-C, construction steel, cast iron, stainless steel	
Pipe dimensions [d]	13 - 2000 mm	0.5 - 78 inch
Pipe wall thickness	1 - 75 mm	0.04 - 3 inch
Pipe coating	Possible materials: rubber, glass, concrete, epoxy, steel	
Pipe coating thickness	0 - 25 mm	0 - 1 inch

Electronics

Power supply	12 – 24 V AC or DC, 86 – 264 V AC (47Hz – 63 Hz)
Power consumption	max. 10,5 W

Outputs

Analog output	Range	4 – 20 mA, 0 – 20 mA, 0 – 16 mA
	Resolution	0.1 % of final value
	Load max.	620 Ω
	Insulation	1,500 V optoisolated
	Alarm current	Adjustable between 0 – 26 mA
Impulse output	Type	Digital MOSFET relay
	Pulse sequence	1 – 250 pps, user-programmable
	Pulse width	2 – 500 ms, user-programmable
	Max. voltage	48 V
	Max. current	500 mA
Alarm outputs	Insulation	1,500 V optoisolated
	Type	2 x MOSFET relay
	Max. voltage	48 V
	Max. current	500 mA
	Insulation	1,500 V optoisolated
USB interface (only U4000)	Protocol	Supports full speed (12 Mbits/s) data transmission rate
	Software	USB driver software included in delivery
	Push-fit	Mini USB
RS-232 interface (only U4000)	Protocol	Serial communication interface RS-232 including XON-XOFF handshake
	Terminals	GND, Rx/D, Tx/D

Data logger (only U4000)

Saved data	Log book application details, throughput, total throughput, unit, time
Number of data points	198 k
Number of data sets	20
Number of data points per set	No limit (max. 198 k)
Programmable capture rate	5 s – 1 hour
Start/stop	Manual or time-controlled
Data download	Via RS-232/USB interface

Measured value sensor pairs

Type A	Pipes d13 – d114 mm (2 MHz)
Type B	Pipes d115 – d2,000 mm (1 MHz)

Housing and display

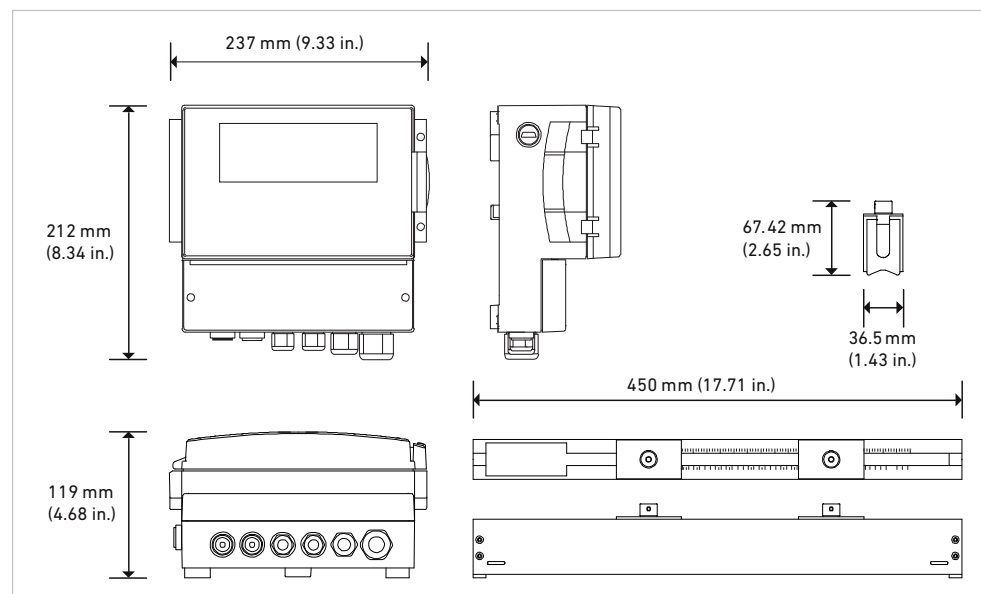
Material		ABS and aluminum	
Dimensions		230 x 180 x 120 mm	9.0 x 7.1 x 4.7 inch
Weight		1.2 kg	2.65 lb
Keyboard		15 membrane keys with tactile feedback	
Display	Type	240 x 64 pixel graphic display, high contrast, backlit	
	Viewing angle	Min. 30°, typically 40°	
	Active surface	127 x 34 mm	5 x 1.3 inch
Protection class		IP 65	

Shipping information

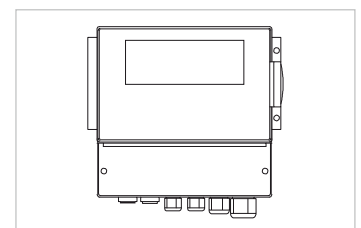
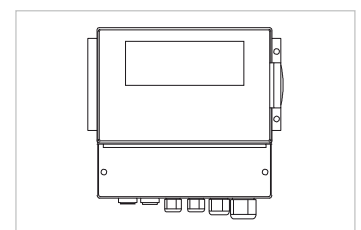
Package dimensions	480 x 320 x 230 mm	19 x 12.5 x 9 inch
Weight	4.8 kg	10.6 lb
Volume weight	5.8 kg	12.8 lb

Standards/approvals

CE, conforms to RoHS		
EMV	BS EN 61326-1:2006	BS EN 61326-2-3:2006
Security	BS EN 61010-1:2001	
Environmental benefit	BS EN 60068-1:1995	
	BS EN 60068-2-1:2007	
	BS EN 60068-2-2:2007	

Dimensions**6.6.4 Order overview**

Manufacturer's part no.	Part no.	Description
Voltage supply 230 V AC		
U3000A d13 - d114 mm	159 300 004	Ultraflow U3000, for pipes d13 – d114 mm
U3000B d115 - d299 mm	159 300 006	Ultraflow U3000, for pipes d115 – d299 mm
U3000B d300 - d2000 mm	159 300 075	Ultraflow U3000, for pipes d300 – d2,000 mm
U4000A d13 - d114 mm	159 300 008	Ultraflow U4000, for pipes d13 – d114 mm, data logger
U4000B d115 - d299 mm	159 300 010	Ultraflow U4000, for pipes d115 – d299 mm, data logger
U4000B d300 - d2000 mm	159 300 076	Ultraflow U4000, for pipes d300 – d2,000 mm, data logger
Power supply 24 V DC		
U3000A d13 - d114 mm	159 300 005	Ultraflow U3000, for pipes d13 – d114 mm
U3000B d115 - d299 mm	159 300 007	Ultraflow U3000, for pipes d115 – d299 mm
U3000B d300 - d2000 mm	159 300 077	Ultraflow U3000, for pipes d300 – d2,000 mm
U4000A d13 - d114 mm	159 300 009	Ultraflow U4000, for pipes d13 – d114 mm, data logger
U4000B d115 - d299 mm	159 300 011	Ultraflow U4000, for pipes d115 – d299 mm, data logger
U4000B d300 - d2000 mm	159 300 079	Ultraflow U4,000, for pipes d300 – d2,000 mm, data logger



6.7 Flow Integral Systems with 9900 Transmitter

Member of the SmartPro® Family of Instruments



6.7.1 Product description

GF Signet has combined the 9900 SmartPro Transmitter with the 515 and 2536 Paddlewheel Flow sensors to create integral systems that are easy to order and simple to install. Also available in conductivity, level, temperature, and pressure configurations, each integral system features a 9900 Transmitter which provides a local and easy to read LCD display. The push button keypad makes it easy to navigate through the transmitter's menu. The DC-powered 9900 features a scalable 4 to 20 mA output and open collector for process control.

The integral 9900 system is combined with GF Signet's field-proven Models 8510 and 8512. These sensors reliably perform in flow ranges from 0.3 to 6 m/s (1 to 20 ft/s) and 0.1 to 6 m/s (0.3 to 20 ft/s) respectively for pipe sizes from ½ to 8 inches. They are available in a variety of materials including polypropylene and PVDF and are easily mounted in the pipe using GF Signet's comprehensive line of standard fittings.

Features

- Local display for sensor mounted instruments
- Provides 4 to 20 mA output
- "At a glance" visibility
- "Dial-type" digital bar graph
- NEMA 4X/IP65



Applications

- RO/DI System Control
- Cooling Tower Control
- Water Quality Monitoring
- Filtration Systems
- Chemical Production
- Liquid Delivery Systems
- Pump Protection
- Scrubber Systems
- Semiconductor Water Production

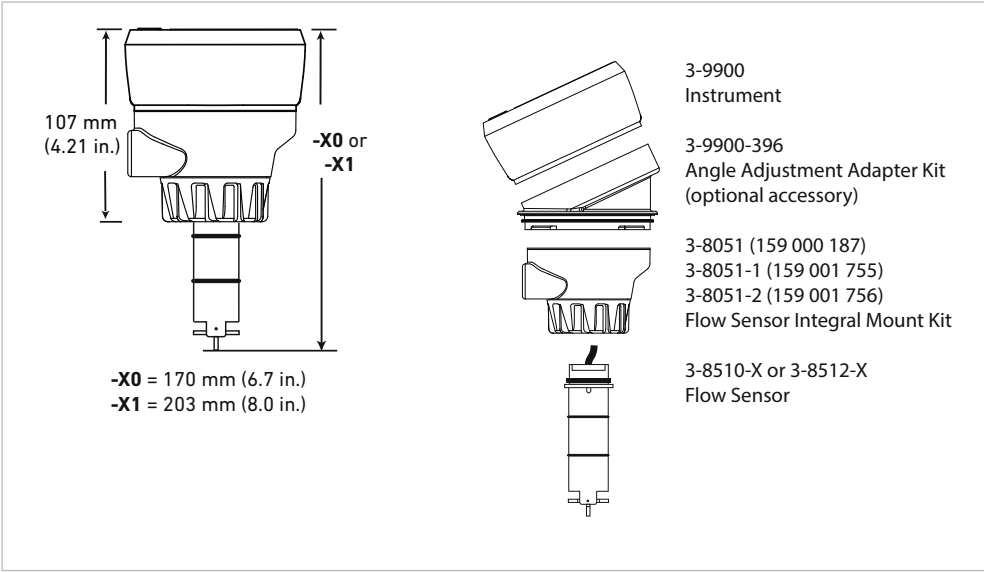


The installation must be performed in accordance with the instruction manual. The instruction manual is included with the product, see also online on www.gfps.com/signet

6.7.2 Technical Details

i See individual product pages for more information.

Dimensions



6.7.3 System Overview

Integral Installation

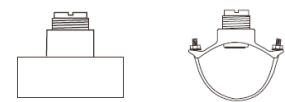
GF Signet Model 9900 Transmitter
With 3-8051-X Integral Mount Kit



GF Signet Sensor
8510
8512



GF Signet Fittings



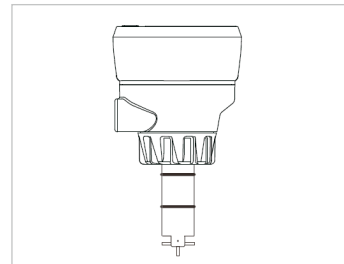
All sold separately

6.7.4 Ordering information

Ordering Notes

Integral Mounts are available with all parts conveniently assembled (transmitter, sensor, and mounting kit). Alternatively, all three parts can be purchased separately. See individual transmitter and sensor pages for more information. Only available in Europe.

Mfr. Part No./ Code	Instrument + Sensor	Pipe Size	Sensor Body Material	Sensor Rotor/Pin Material
159 001 733	3-9900-1 w/3-8510-P0	½ to 4 in.	Polypropylene	Black PVDF/Titanium
159 001 734	3-9900-1 w/3-8510-H0	½ to 4 in.	Polypropylene	Black PVDF/Hastelloy-C
159 001 735	3-9900-1 w/3-8510-S0	½ to 4 in.	Polypropylene	Black PVDF/Natural PVDF
Special order via DZS	3-9900-1 w/3-8510-V0	½ to 4 in.	Natural PVDF	Natural PVDF/Hastelloy-C
159 001 736	3-9900-1 w/3-8510-T0	½ to 4 in.	Natural PVDF	Natural PVDF/Natural PVDF
159 001 737	3-9900-1 w/3-8510-P1	5 to 8 in.	Polypropylene	Black PVDF/Titanium
159 001 738	3-9900-1 w/3-8512-P0	½ to 4 in.	Polypropylene	Black PVDF/Titanium
159 001 739	3-9900-1 w/3-8512-H0	½ to 4 in.	Polypropylene	Black PVDF/Hastelloy-C
159 001 740	3-9900-1 w/3-8512-S0	½ to 4 in.	Polypropylene	Black PVDF/Natural PVDF
159 001 741	3-9900-1 w/3-8512-V0	½ to 4 in.	Natural PVDF	Natural PVDF/Hastelloy-C
159 001 742	3-9900-1 w/3-8512-T0	½ to 4 in.	Natural PVDF	Natural PVDF/Natural PVDF
159 001 743	3-9900-1 w/3-8512-P1	5 to 8 in.	Polypropylene	Black PVDF/Titanium



6.7.5 Accessoires

Mfr. Part	Code	Description
3-9900.396	159 001 701	Angle adjustment adapter kit
3-0252	159 001 808	Configuration Tool

7 GF Signet Single and Multi-Parameter Specification Matrix

	9950	9900	9900-1BC	8900	8150
					
Description	Multi-Channel (2 channel) Multi-Parameter Controller	Single-Channel 9900: Multi-Parameter Transmitter 9900-1BC: Single Parameter Controller		Multi-Channel, Multi-Parameter Controller	Battery Powered Flow Totalizer
Modular Components	Yes	Yes		Yes	No
Number of Flow Totalizers	2 Permanent 2 Resettable	1 Permanent 1 Resettable		6 Permanent 6 Resettable	1 Permanent 2 Resettable
Max. Sensor Inputs	2 frequency or S ³ L inputs	1		(up to 2 frequency and 4 (S ³ L) or 6 (S ³ L) 6 total sensor inputs	1
Mounting Options	Panel	Panel, Wall, Pipe, Tank		Panel	Panel, Wall, Pipe, Tank, Integral
Display	LCD, Dot matrix	LCD with digital bar graph		LCD	LCD
Analog Output Types	2 Standard Passive, 4 to 20 mA outputs 2 or 4 optional passive, 4 to 20 mA Outputs via Channel Dual Modules 2 Passive 4 to 20 mA	9900: 2 Passive 4 to 20 mA 1 Standard, 1 Optional with 4 to 20 mA Output module HART optional with H COMM module 9900-1BC: 1 Passive 4 to 20 mA		4 Passive/Active 4 to 20 mA or (4) 0 to 5/10 VDC	None
Max. Relays / O.C.	4 dry contact relays or 2 mechanical and 2 solid state relays (optional relay module)	1 open collector (standard) 2 relays (optional relay module)		up to 8 relays (via 8059)	None
Derived Measurements	6 derived measurements sum, delta (difference), ratio, % passage % reject, % recovery	N/A		Sum, Difference, % Recovery, % Reject, % Passage, Ratio, Power (BTU)	None
Languages	English, French, German, Spanish and Simplified Chinese	English		English, French, German, Spanish, Italian, and Portuguese	English
Ambient Temperature	DC: -10°C to 70°C (14 to 158 °F) AC: -10°C to 60°C (14 °F to 140 °F) -15 °C to 70°C (5 °F to 158 °F)	-10 °C to 70 °C (14 °F to 158 °F)		-10 °C to 55 °C (14 °F to 131 °F)	-10 °C to 65 °C (14 °F to 149 °F)
Storage Temperature	-15 °C to 70°C (5 °F to 158 °F)	-15 °C to 70 °C (5 °F to 158 °F)		-15 °C to 80 °C (5 °F to 176 °F)	
Relative Humidity	0 to 95%, non-condensing	0 to 95%, non-condensing		0 to 95%, non-condensing	0 to 95%, non-condensing
Power Requirements	DC – 24 VDC nominal (12 to 32 VDC, ± 10% regulated) AC – 100 to 240 VAC, 50 to 60 Hz, 24V	24 VDC input; range: 10.8 to 35.2 VDC regulated		12 to 24 VDC ±10%, regulated or 100 to 240 VAC ±10%, regulated, 50/60 Hz	(2) 3.6 V Lithium Batteries

	9950	9900	9900-1BC	8900	8150
Standards and Approvals	CE, UL, CUL, FCC, RoHS compliant, China RoHS , NEMA TYPE 4X/IP65 (front face only on panel mount)	9900: CE, FCC, UL, CUL, RoHS compliant, Lloyd's Register, China RoHS, NEMA TYPE 4X/IP65 (front face only on panel mount); field mount is 100% NEMA TYPE 4X/IP65 9900-1BC: CE, UL, CUL, FCC, RoHS compliant, China RoHS, NEMA TYPE 4X/IP65 (front face only)		CE, FCC, UL, CUL, RoHS compliant, China RoHS NEMA 4X/IP65 (front face only)	CE, FCC, UL, CUL, RoHS compliant, China RoHS, NEMA 4X/IP65 (front face only on panel mount); field mount is 100% NEMA 4X/IP65

Planning Fundamentals of Valves and Automation

Measurement and Control - pH/ORP Sensors

Content

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1 Technical basics - pH/ORP Sensors

1.1 GF Signet pH/ORP, Conductivity/Resistivity System Compatibility

The chart below outlines the compatibility between GF Signet pH/ORP and conductivity/resistivity electrodes, instruments and sensor fittings.

Instruments, Sensor Electronics, and Preamplifiers	Electrodes						
	pH/ORP				Conductivity		
	2724 2726	2734- 2736	2764- 2767	2774- 2777	2818- 2821	2822- 2823	2839- 2842
2751 pH/ORP Smart Sensor Electronics	✓	✓	✓	✓			
2760 pH/ORP Preamplifier	✓		✓	✓			
2850 Conductivity Sensor Electronics					✓	✓	✓
8860 ProcessPro® Dual Channel Conductivity Controller					✓	✓	✓
8900 Multi-Parameter Controller with Sensor Electronics	✓	✓	✓	✓	✓	✓	✓
9900 Transmitter with Sensor Electronics	✓	✓	✓	✓	✓	✓	✓
9950 Dual Channel Transmitter with Sensor Electronics or Module(s)	✓	✓	✓	✓	✓	✓	✓
Fittings - Customer Supplied	✓	✓		✓	✓	✓	✓
¾ in. process connections	✓	✓					✓
ISO 7/1-R3/4 process connections					✓		
Tri-clamp fittings			✓				
1 in. process connections							
GF Fittings For use with fittings up to DN100 (4 in.) only	✓	✓					
Fiberglass Glue-On Saddle	✓	✓					
Metric PP Union Tee	✓	✓					
Metric PVDF Union Tee	✓	✓					
PVC SCH 80 Tee	✓	✓					
PVC SCH 80 Tee w/pipe	✓	✓					
PVC-C SCH 80 Tee	✓	✓					
PVC-C SCH 80 Tee w/pipe	✓	✓					
PVC Clamp-on Saddle	✓	✓					
Fiberglass Glue-On Tee	✓	✓					
Iron Threaded Tee (NPT)	✓	✓					
Iron Strap-On Saddle	✓	✓					
Copper Sweat-On Tee	✓	✓					
Brass Brazolet	✓	✓					
Carbon Steel Tee (NPT)	✓	✓					
Carbon Steel Weldolet	✓	✓					
316 SS Threaded Tee (NPT)	✓	✓					
316 SS Weldolet	✓	✓					
Brass Threaded Tee (NPT)	✓	✓					
Metric/BSP PVC Union Tee*	✓	✓					
Metric/BSP PVC Saddle*	✓	✓					

* Available only through your local GF Piping Systems sales office.

1.2 Choosing the Correct pH/ORP Electrode

Choosing the right GF Signet pH/ORP electrode is important and unique for each application.

Electrode	Application
Series 2724	For all general purpose, mild applications
Series 2774	For more aggressive applications with ions such as mercury, copper, lead and perchlorate.
Series 2764	For more aggressive applications with ions such as mercury, copper, lead and perchlorate, bromides, iodides, cyanides, and sulfides

Refer to the application matrix for assistance in your selection:

Application	2724-2726 DryLoc® Electrodes	2774-2777 Electrodes	2764-2767 Differential Electrodes	Application	2724-2726 DryLoc® Electrodes	2774-2777 Electrodes	2764-2767 Differential Electrodes
Aquatic Animal Life Support Systems	✓	X	X	Fruit and Vegetable Rinsing	✓	?	?
Boiler Make-Up Water (20 µS)	✓	X	X	Greenhouses	✓	X	X
Brackish Water Influent	✓	X	?	Heavy Metal Recovery	X	✓	?
Chemical Injection, Mixing Tank	✓	X	?	Influent Monitoring (to neutralization processes)	✓	X	?
Chemical Processing	✓	?	?	Neutralization Systems	✓	?	?
Chlorine Dioxide Control Effluent	✓	X	?	Ozone Injection Effluent	✓	X	X
Chrome Reduction	X	✓	?	Plating Baths	✓	?	?
Circuit Board Etching	X	✓	?	Process Control (verify chemical compatibility)	✓	X	?
Circuit Board Film Processing	X	✓	?	Pulp and Paper	X	X	✓
Coagulation and Flocculation	✓	X	?	Reverse Osmosis	✓	X	X
Commercial Aquariums	✓	X	?	Rinse Water	✓	X	?
Commercial Swimming Pools	✓	X	X	Scrubbers	✓	X	?
Cooling Towers	✓	X	X	Sulfur Recovery	✓	X	?
Cyanide Destruction	X	X	✓	Surface Finishing	X	✓	?
Dechlorination Monitoring	✓	X	X	Textile Dye Process	X	✓	?
Desalination Plantseffluent	✓	X	X	Toxics Destruction	X	✓	?
Desalination Plantsinfluent	✓	X	X	Wastewater Neutralization Tanks	✓	X	?
Dialysis	✓	X	X	Wastewater Treatment	✓	X	?
Drinking Water Quality	✓	X	X	Water Parks	✓	X	?
Effluent Monitoring (discharge to local water sources)	✓	X	X	Water Treatment (boilers, cooling towers, pH neutralization, make-up water)	✓	X	X
Fish Farming	✓	X	?	Wholesale Nurseries	✓	X	X
Food and Beverage Manufacturing	✓	X	?	Zoo Exhibit Water Treatment	✓	X	?

✓ Best choice for this application

X DO NOT use this electrode; it is not required or it is an incorrect choice

? In certain applications, this is a good alternative to the "best choice" option

1.3 Technical Reference Section: pH/ORP

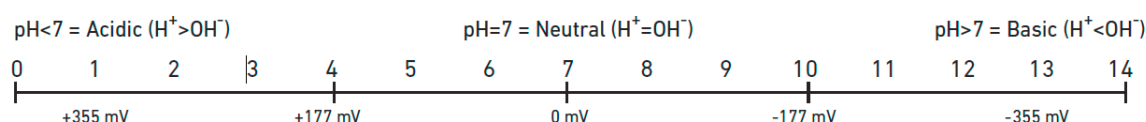
Information in this section addresses frequently asked questions regarding pH and ORP and is provided as REFERENCE ONLY to supplement procedures and recommendations specifically outlined in individual product instruction manuals. All manuals, data sheets, and additional helpful information are available at www.gfGF.Signet.com

1.3.1 Definition of pH

pH is defined as the negative logarithm of the Hydrogen ion concentration in aqueous solutions. The common pH scale ranges from 0 to 14, with 7 being neutral water (H₂O). At pH 7, Hydrogen ions (H⁺) exist in equal concentration to Hydroxyl ions (OH⁻). A solution is considered to be acidic if the concentration of H⁺ exceeds that of OH⁻, and is indicated by pH values below 7. Conversely, a solution is considered to be basic if the concentration of H⁺ is less than that of OH⁻, and is indicated by pH values above 7.

Common Acids		Common Bases	
1M HCl	0.0 pH	Egg Whites	7.5 pH
Sulfuric Acid	0.3 pH	Seawater	8.0 pH
Lemon Juice	2.0 pH	Sodium Bicarbonate	8.4 pH
Vinegar	3.0 pH	Ammonia	11.6 pH
Wine	3.5 pH	Photo Developer	12.0 pH
Beer	4.5 pH	0.1M NaOH	13.0 pH
Milk	6.0 pH	Lye	14.0 pH

pH Scale



(Theoretical: 59.16 mV/pH @ 25 °C)

1.3.2 Definition of ORP

ORP is an abbreviation for Oxidation-Reduction Potential. Oxidation is a term used to denote the occurrence of a molecule losing an electron. Reduction occurs as a molecule gains an electron. The "potential" is simply an indication of a solution's propensity to contribute or accept electrons. ORP reactions (sometimes referred to as REDOX) always take place simultaneously. There is never oxidation without reduction, and ORP electrodes are used to detect electrons exchanged by molecules as these reactions occur.

Both pH and ORP electrodes produce voltages that depend on the solutions in contact with their sensing ends. Most pH electrodes, including the GF Signet brand, are designed to produce 0 mV at pH 7, positive mV below pH 7 (associated with the charge of the Hydrogen ion, H⁺) and negative mV above pH 7 (associated with the charge of the Hydroxyl ion, OH⁻). According to the Nernst Equation, the interval between each pH unit is approximately 59.16 mV at 25 °C. This "raw" output is converted to a pH value by the display instrument.

The ORP scale is typically -1000 mV to +1000 mV, and the electrodes produce these values directly.

Whereas pH is a specific measure of the Hydrogen ion concentration in solution, ORP only provides relative measures of chemicals and cannot discriminate one from another. Although non-specific, it is a very useful and inexpensive method of monitoring and controlling the activity of such compounds as chlorine, ozone, bromine, cyanide, chromate, and many other chemical reactions.

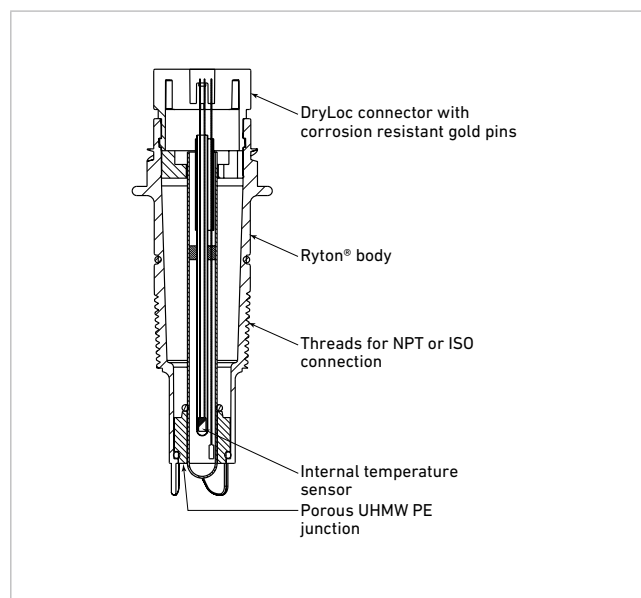
It is worth noting that Temperature Compensation, very important for accurate pH measurement, is NOT used in ORP measurements. Temperature does indeed affect the reactionary potential of all chemicals, some to a greater extent than others. But even if the effects of temperature could be precisely known in all of the many different REDOX reactions, it would not be desirable to remove them from the measurement. True ORP is the direct measurement of electrons in transit during Oxidation-Reduction reactions, regardless of temperature.

1.3.3 Principle of Operation

Cutaway of 2724 pH electrode

Standard pH/ORP electrodes are also commonly called combination electrodes; a pH/ORP measuring electrode and a reference measuring electrode are combined in a single body. The pH/ORP sensor measures the amount of hydrogen ions in the liquid. The pH signal is measured against the steady reference signal. Various chemical elements leaching through the porous reference junction can react with the reference electrolyte, dilute the electrolyte solution, or attack the silver chloride element; in either case, it will disturb the steady reference signal. Stray electrical currents will also affect the steady reference signal. A temperature element is also built into the pH combination electrode. Instruments interpret the temperature compensated pH signal into a pH reading at 25 °C (77 °F). ORP values are not temperature dependent; GF Signet ORP sensors do not have temperature compensation.

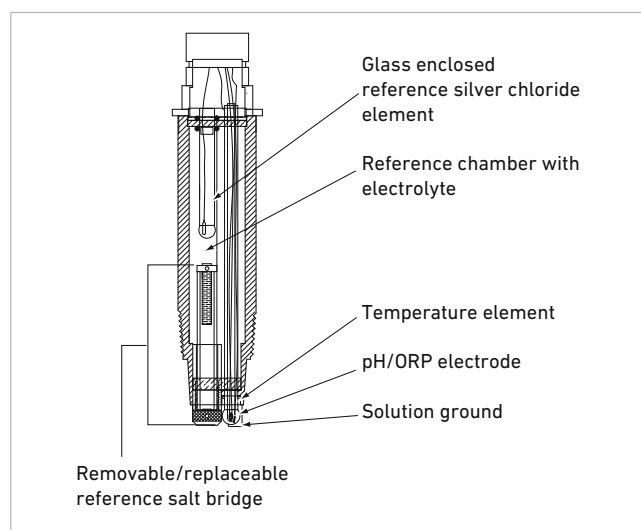
GF Signet offers two different groups of Standard pH/ORP Electrode Models: Models 2724-2726 and 2774-2777



Cutaway of 2766 pH electrode

Differential pH/ORP electrodes function similar to the standard (combination) electrodes, but the reference design is modified and there is a third electrode, the solution ground. The pH and reference electrodes are measured against the solution ground. The solution ground drains stray currents away from the reference element, hence maintaining a steady signal at all times. The reference salt bridge slows or stops various chemical elements from leaching into the reference chamber. Chemicals that leach in may dilute the electrolyte but will not react with the glass-encased reference silver chloride element. The reference electrolyte can be refreshed if it is diluted or depleted. The temperature element is embedded in the pH/ORP electrode for an extremely quick response.

GF Signet offers one group of Differential pH/ORP Electrodes: Models 2764-2767



1.3.4 Standard Versus Differential pH/ORP Electrodes

GF Signet offers what is called combination pH/ORP electrodes; a combination of three or four electrodes built into one common body that measures the pH or ORP of the solutions. These electrodes are the pH/ORP sensing element, temperature sensing element (pH only), the reference, and sometimes a solution ground. An electrical path between the process solution, reference electrode, and the pH/ORP sensing electrode must always be present to complete the measuring circuit. When the circuit is broken or interrupted, the result is a faulty reading. There are only a few things in a chemical process that would affect the glass-sensing element. These include concentrations of HF, constant high temperatures, and particles that can break the glass. On the other hand, there are many problems that can occur with the reference electrode. The reference silver chloride sensing element (wire) is exposed to the process liquid via the primary porous reference junction, which is in constant contact with the process and allows liquid to pass through to the reference electrolyte. Because of the direct contact with the process liquid, the reference electrolyte and reference silver chloride sensing element can react with chemicals in the process. Many application liquids do not chemically react with the reference and therefore a standard electrode will perform well in this scenario. However, there are other process chemicals that will easily attack the reference and therefore, a differential style electrode should be used. There are three advantages of the differential electrode:

1. If the process chemicals attack the KCl electrolyte, the reference electrolyte chamber is refillable.
2. If the reference junction becomes clogged by chemical reactions between the KCl and the process chemicals, the reference salt bridge is replaceable.
3. If there are stray currents or if there are process chemicals that attack the silver chloride wire in the standard electrodes, it will not attack it in the differential electrode because the wire is encased in a glass electrode.

A general rule of thumb is to use a differential electrode if you have mercury, copper, lead, chlorate, bromine, iodine, cyanide, or sulfide compounds in the process liquid. Differential electrodes may also be useful in processes where oil, grease, and dirt build up on the reference junction because it is easily replaced.

1.3.5 Important Application Tips

- It is important that the sensing end of pH and ORP electrodes remain wet, for it may be permanently damaged if allowed to dehydrate. This is true for both in-line and submersible installation configurations. However, be careful to keep the electrical interconnection between electrode and preamplifier dry and clean at all times. Moisture in this area can also cause permanent damage.
- pH control is best when performed in a tank. This is especially true in neutralization applications since it is very important for reagents to mix thoroughly with waste fluids, and to be allowed adequate time for the reactions to occur. Limiting adjustments to fewer than 3 pH units per stage, and sizing tanks to provide at least 10 minutes retention time, will increase the probability of producing safe effluents.
- For bulb-style pH and ORP electrodes, significant natural self-cleaning by turbulent eddies is achieved at velocities of 1.5 m/s or more (5 ft/s). Flat surface electrodes get adequate self-cleaning at velocities of 0.3 to 0.6 m/s (1 to 2 ft/s). In all cases, exposure to velocities greater than 3 m/s (10 ft/s) can cause excessive measurement noise and electrode wear and should be avoided.
- The aging of pH and ORP electrodes (i.e., reference depletion and decreased glass sensitivity) results from a series of chemical reactions. And as a general rule, the rates of chemical reactions double with every increase of 10 °C or 18 °F. This means shorter life expectancy for all pH and ORP electrodes as application temperatures increase.

- HF acid and strong caustics etch pH glass. High concentrations, especially at high temperatures, destroy electrodes quickly. For applications containing trace quantities of HF (< 2%), use the GF Signet 2726-HF electrode. This electrode has a polymeric constituent in the pH glass that resists attack by HF and extends the service life considerably over "normal" electrodes.
- In applications where process temperatures will drop below 10 °C (50 °F), use the bulb-style electrodes in place of the flat style electrode. This is a function of the electrical impedance of the glass that increases dramatically as temperature decreases.
- Proper electrode placement within a tank is also very important. Electrodes should be mounted in well-mixed areas, away from reagent and waste introduction. It is usually advisable to position the electrode near the discharge outlet of the tank.
- In-line pH control is not recommended because it is very difficult to determine the amounts of reagent necessary to achieve a desired reaction if both pH and flow are variables. However, in-line pH monitoring is very common and useful.

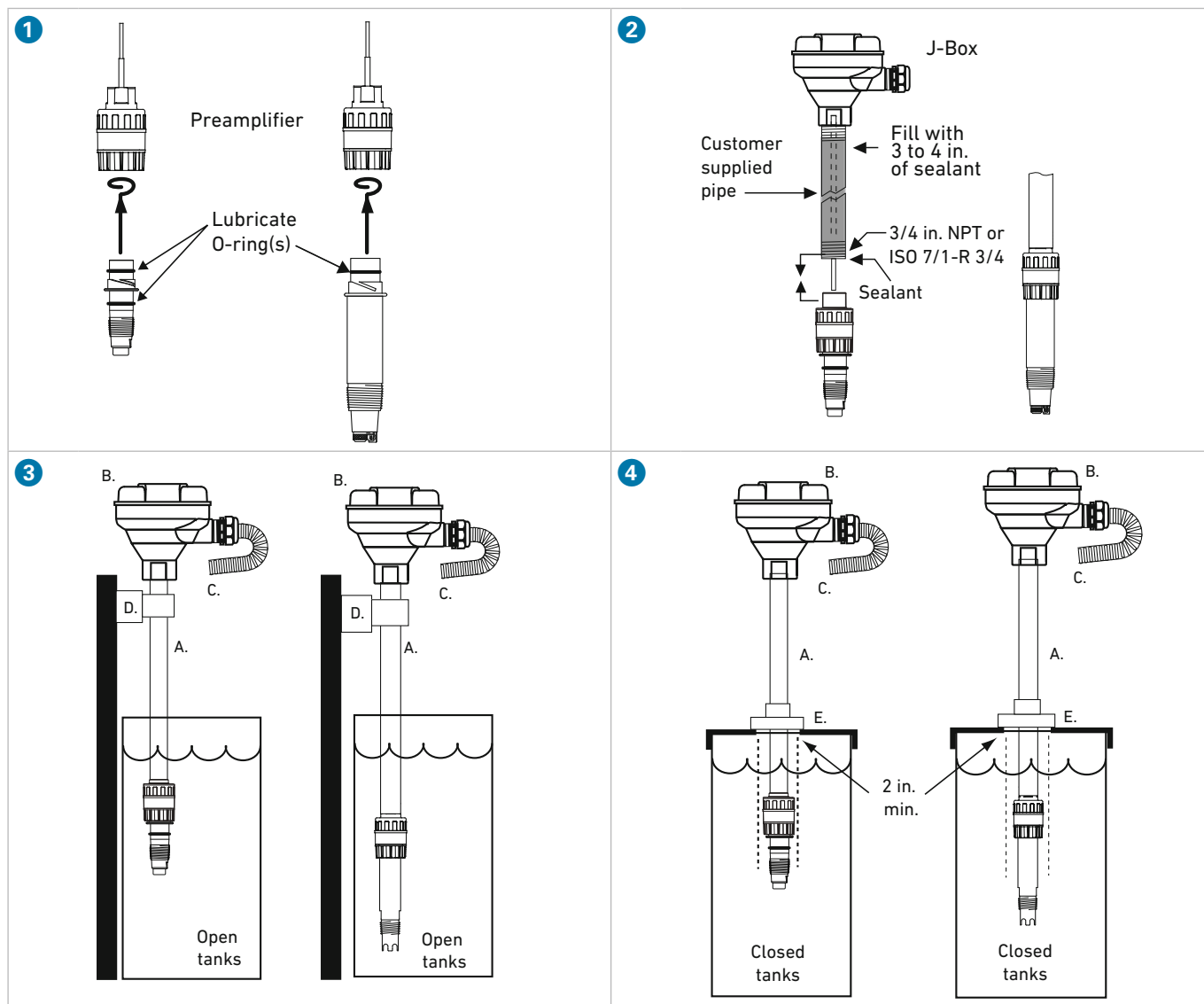
1.3.6 Installation of pH/ORP Electrodes

Submersible Installation

2724-2726/2734-2736/2764-2767/2774-2777 with 2751/2760 preamplifier

Sensors are designed to install in tanks by attaching conduit to the $\frac{3}{4}$ inch threads at the top of the accompanying preamplifier or sensor electrodes. Installing a sensor can simply be done by following these steps:

1. The O-ring at the top of the electrode fits very tightly into the preamplifier. Use a small amount of lubricant (non-petroleum based) to assist the assembly.
2. To prevent moisture from migrating into the preamplifier, backfill the conduit with 3 to 4 inches of sealant.
3. Mount electrodes in a location with ample clearance to remove them for periodic cleaning and recalibration.
4. Choose a location that keeps the electrode glass completely submerged at all times.



Customer supplied:

- A) 3/4 in. NPT threaded pipe
- B) GF Signet threaded J-box
- C) Flex conduit
- D) Quick release pipe clamp
- E) Tank flange

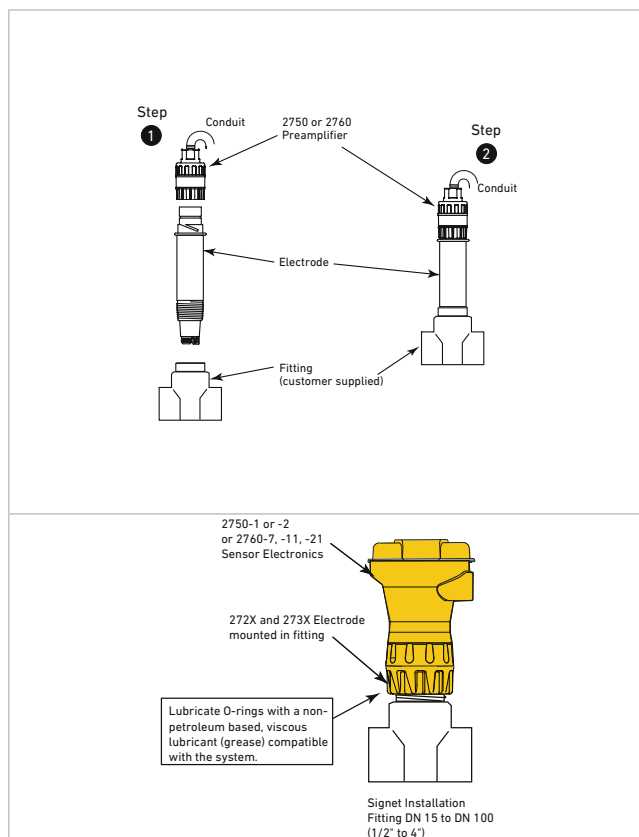
Installation Tips

- Mount the electrode near tank outlet away from reagent addition areas.
- Place the electrode tip in pH 4 buffer during system maintenance or storage to avoid dehydration
- Sensor should be below the drain level to prevent the sensor from drying out.

! If liquid level is not constant, always ensure liquid contact with electrode tip.

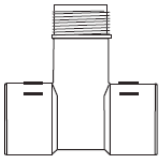
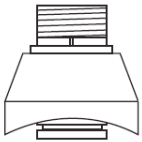
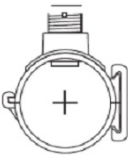
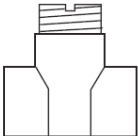
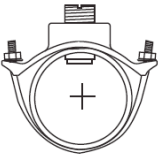
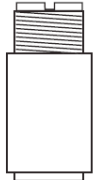
2724-2726/2734-2736/2764-2767/2774-2777 pH/ORP Electrodes with 2751 or 2760 preamplifier

- These sensors feature a thread close to the sensor end which allows the sensor to thread directly into a standard NPT pipe tee.
- Electrodes must be immersed in liquid. Keep pipe full at all times to avoid dehydration.
- Observe mounting angle requirements for models 2764-2767.
- Any mounting angle is acceptable for Models 2724-2726, 2734-2736 and 2774-2777.
- Models 2724-2726, 2734-2736 can utilize cap from sensor electronics to mount into GF Signet installation fittings for pipes from DN15 to DN100 (½ in. to 4 in.).



In-line installation

Installation Fittings Compatible with Models 2724-2726, 2734-2736 pH/ORP Electrodes

Type	Description	Type	Description
	<ul style="list-style-type: none"> • Available in ½ in. to 4 in. sizes • PVC, PVC-C w/solvent cement socket • PVDF and PP w/union end fittings 		<ul style="list-style-type: none"> • Available in 2 in. to 4 in. sizes • Requires 1-7/16 in. hole in pipe • Install by certified welder only
	<ul style="list-style-type: none"> • Available in 2 in. to 4 in. sizes • Requires 1-7/16 in. hole in pipe 		<ul style="list-style-type: none"> • Available in ½ in. to 2 in. sizes • Female NPT ends
	<ul style="list-style-type: none"> • Available in 2 in. to 4 in. sizes • Requires 1-7/16 in. hole in pipe 		<ul style="list-style-type: none"> • Use for installation in pipes > 4 in. (1-¼ in. NPT) • PVC, PVC-C, or PVDF versions • Specify socket or 1-¼ inch NPT male threads (socket version shown here)

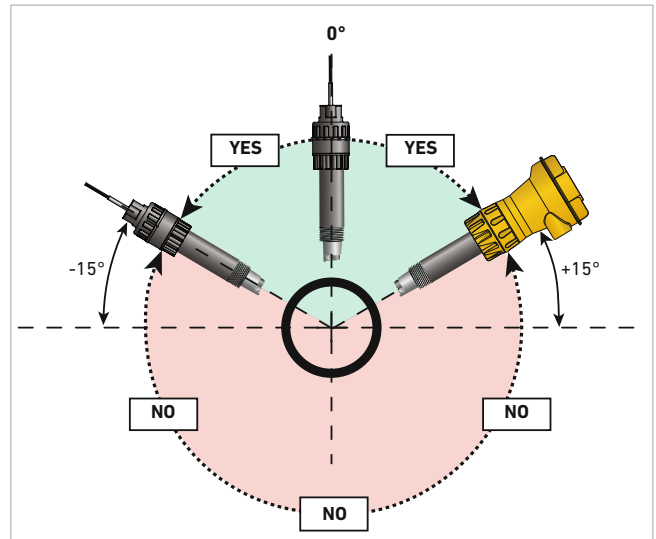
Installation Tips

- Use pipe adapters to install electrodes into pipe sizes larger than DN100 (4 inches)
- Adapters are designed to either glue into a plain socket tee (specify socket) or thread into a 1¼ inch threaded tee (specify threaded).

Mounting Angle

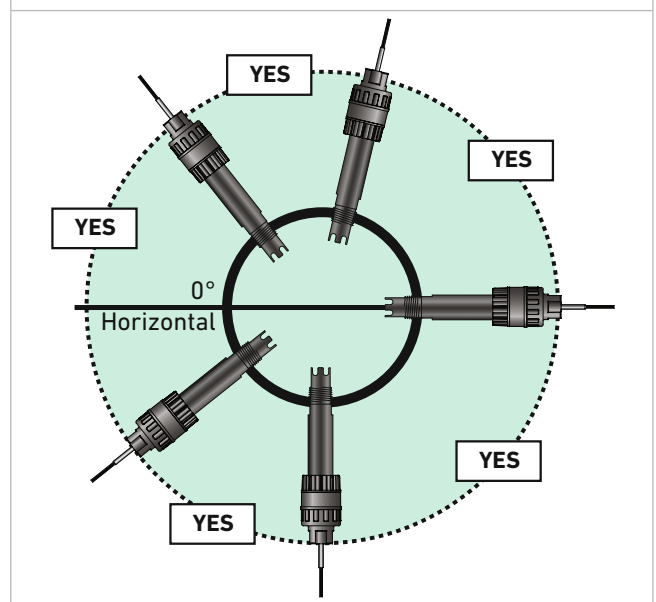
Sensor Mounting - Models 2764-2767

- pH electrodes must be mounted at least 15° from the horizontal to ensure proper sensing. Sensors mounted at less than 15° will impede performance.
- ORP electrodes may be mounted at any angle without affecting the performance.



Sensor Mounting - Models 2724-2726, 2734-2736, 2774-2777

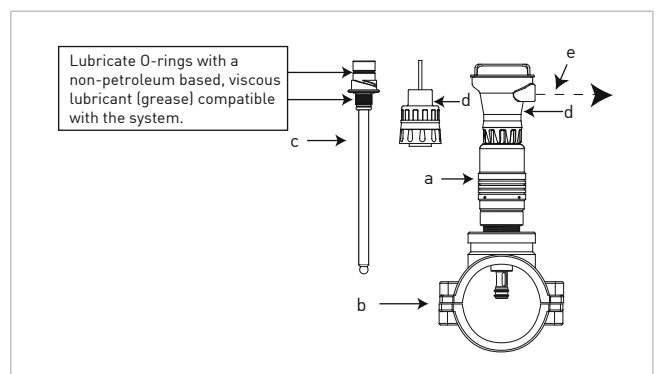
- Models 2724-2726, 2734-2736 and 2774-2777 may be mounted at any angle without affecting the performance.
- Avoid the 12 o'clock position.
- In the presence of sediment, avoid the 6 o'clock position.



3719 Wet-Tap Overview

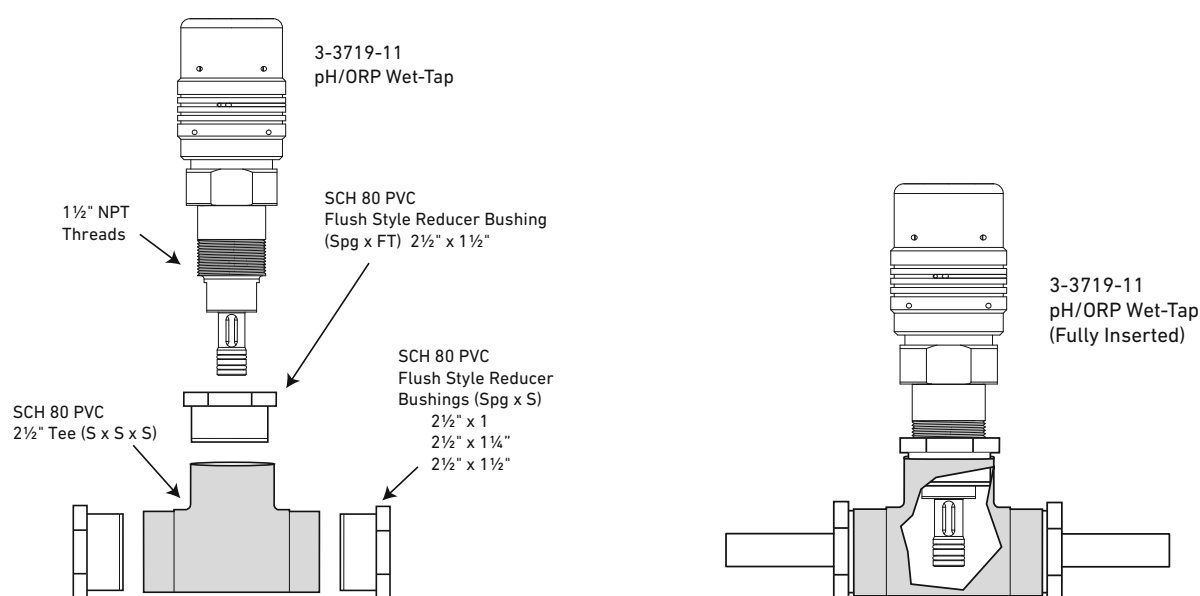
- 3719 pH/ORP Wet-Tap
- Low Profile PP Clamp-on Saddle Fitting (customer supplied)
- 275X-WT and 275X-WTP DryLoc® pH or ORP Electrode ("DryLoc" refers to the electrode connector style)
- 2751/2760-11 DryLoc® pH/ORP Sensor with J-Box
- Output signal options:
 - digital (S³L)
 - 4 to 20 mA

All of these components are sold separately.



3719 pH/ORP Wet-Tap Installation

- Initial installation must be performed under nonpressurized conditions.
- The 3719-11 has a 1½ in. NPT process connection for use with accessory saddle fittings from 2½ to 4 in.
- The 3719-21 has a 2 in. NPT process connection for use with accessory saddle fittings from 6 to 12 in.
- It is possible to install the 3719 into pipe sizes below 2½ inches by creating a “flow cell” with standard piping components.
- One simple solution, using a GF SCH 80 PVC tee and reducer bushings, is illustrated below.
- Avoid the entrapment of air inside the flow cell.
- Model 3719-12 has an ISO 7/1-R1.5 process connection to fit pipe sizes DN65 to DN100. Installation fittings are customer supplied.
- Model 3719-22 has an ISO 7/1-R2 process connection to fit pipe sizes DN150 to DN300. Installation fittings are customer supplied.



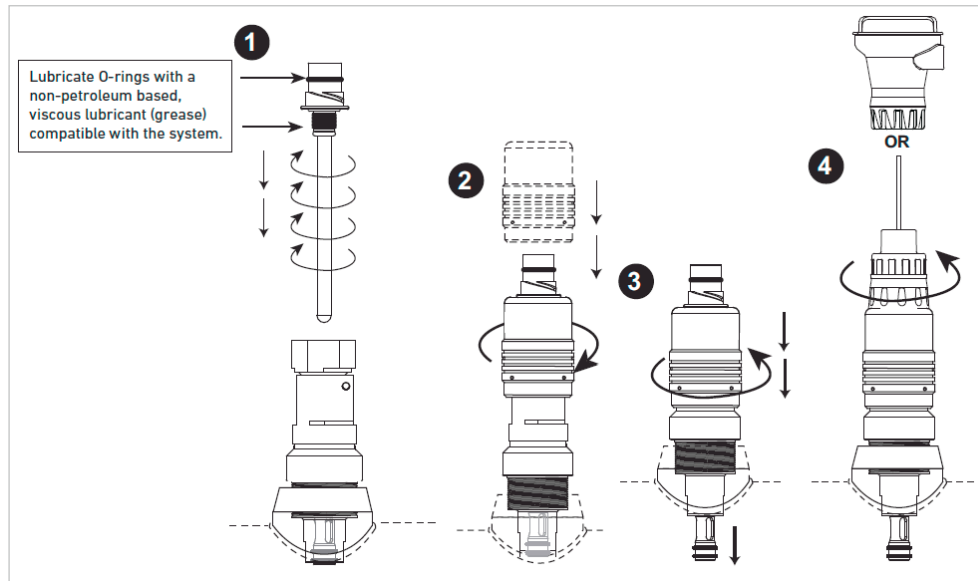
For installation into pipe sizes below 2½ inch, insertion depth of electrode requires use of 2½ inch fitting with reducers.

Installation Tips

- Provide 0.5 m (20 in.) minimum clearance from the top of the pipe for electrode removal.
- The 3719 can be mounted in any orientation, including horizontal and inverted.
- Use caution when removing inverted sensors. Residual fluid may be present in the retraction housing.
- Keep electrode connector clean and dry at all times.
- For reliable in-line measurements of pH and ORP, it is imperative to position the electrode tip into the process stream.
- Because of its compact “short stroke” design, the 3719 requires low-profile fittings to assure proper positioning in pipe sizes DN65 to DN300 (2½ to 12 in.)
- It is strongly recommended to use the low profile PP clamp-on saddle fittings.

3719 pH Wet-Tap Electrode Installation

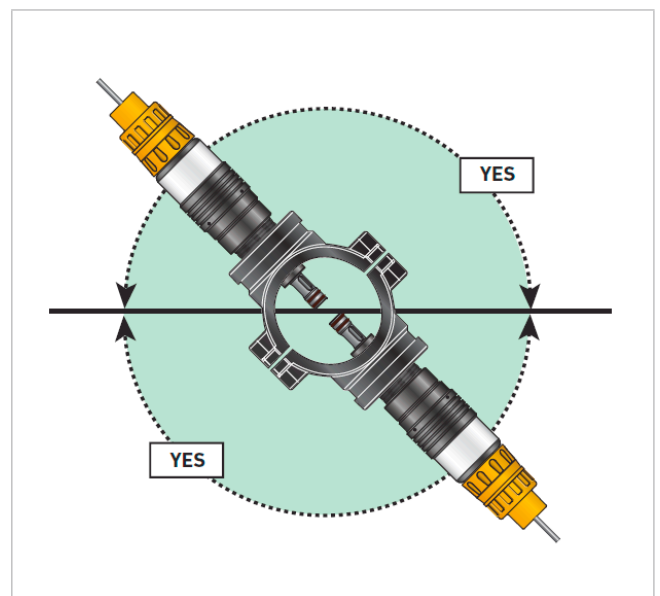
The 3719 can be mounted in any orientation, including horizontal and inverted (shown here with both 2760-11 preamplifier and 2751-1 or -2 Sensor Electronics).



- 1 Slide electrode (DryLoc®) straight down into electrode piston. Thread electrode into place until connector shoulder is flush with top of electrode piston. Hand tighten only.
- 2 Place the Locking Shroud over electrode; turn 1/4-turn clockwise to unlock the piston, then press down firmly on the Locking Shroud to lower the electrode piston into the pipe.
- 3 Turn the Locking Shroud 1/4-turn counterclockwise to lock the piston.
- 4 Install the 2750 or 2760 DryLoc® pH/ORP Sensor electronics onto the electrode connector (see individual operation manuals for more detail).

3719 Wet-Tap Mounting Angle

- The 3719 can be mounted in any orientation, including horizontal and inverted.
- Avoid the 12 o'clock position.
- In the presence of sediment, avoid the 6 o'clock position.



2 Electrodes

2.1 GF Signet 2724-2726 pH/ORP Electrodes

General Purpose

Compatible with ALL GF Signet pH/ORP instruments and SmartPro transmitters



2.1.1 Product description

The GF Signet 2724-2726 pH and ORP electrodes are general purpose sensors ideal for a wide range of applications. These feature a patented reference design and uses the unique foul-proof patented DryLoc® connector. The large area PE reference junction and pathway is constructed to increase the total reference effectiveness and ensures long service life.

The DryLoc® connector with corrosion resistant gold plated contacts readily connects the sensor to the mating 2751 pH/ORP Smart Sensor Electronics or the 2760 Preamplifier. The robust PPS threaded sensor body and choice of flat pH, bulb pH, or flat ORP sensing elements allows a broad range of chemical and mechanical compatibility for a wide variety of applications.

There are two optional pH sensing versions available, HF and LC. The HF version is for applications where traces of hydrofluoric acid (2% or less) will attack standard pH glass. The LC version can be used for low conductivity fluids 20 - 100 $\mu\text{S}/\text{cm}$ nominal and below 20 μS when mounted under controlled conditions.

The quick temperature response is available in either a Pt1000 or 3 K Ω temperature sensor and allows compatibility with all GF Signet pH/ORP instruments. The 2724-2726 electrodes incorporate $\frac{3}{4}$ inch NPT or ISO 7/1-R 3/4 threads for installing into standard pipe-tees. They can also be mounted directly into GF Signet standard fittings, DN15 to DN100 ($\frac{1}{2}$ to 4 inch).

Features

- Patented reference design for exceptional performance and prolonged life in harsh environments*
- Memory chip enabled for access to a wide range of unique features when connected to the GF Signet 2751 pH/ORP Smart Sensor Electronics
- PPS body for broad range of chemical compatibility
- Patented DryLoc® connector with gold plated contacts
- Special design allows for installation at any angle, even inverted or horizontal
- ¾" NPT or ISO 7/1-R 3/4 threaded sensors for use with reducing tees DN15 to DN100 (½ to 4 in.)
- Mounts in GF Signet standard fittings from DN15 to DN100 (½ to 4 in.)
- Quick temperature response
- Bulb and flat HF resistant glass available for trace HF, in less than 2% concentration applications
- Low conductivity sensor available for liquids down to 20 µS/cm



* U.S. Patent Nos.: 6,666,701, 7,799,193 B2, 7,867,371 B2 and 8,211,282 B2

Applications

- Water & Wastewater Treatment
- Neutralization Systems
- Effluent Monitoring
- Sanitization Systems
- Pool & Spa Control
- Aquatic Animal Life Support Systems
- Process Control
- Cooling Towers

2.1.2 Specifications

General

Performance	Efficiency	>97% @ 25 °C (77 ° F)
Operating Range	pH	0 to 14 pH
	ORP	±2000 mV
	3-2726-LC	Low conductivity fluids; 20 - 100 µS/cm nominal < 20 µS; flow must be less than 150 ml/min in a properly grounded system
	3-2724-HF, 3-2726-HF	Hydrofluoric acid resistant glass, pH 6 or below; trace HF <2%

Compatibility

2751 Smart Sensor Electronics (for 8900, 9900, 9950, 4 to 20 mA or Profibus Concentrator),
2760 Preamplifier

Temperature Sensor

Pt1000 versions	Compatible with GF Signet 2751 pH/ORP Smart Sensor Electronics for connection to a PLC or to the GF Signet 8900, 9900 or 9950 instruments
3 KΩ Balco versions	Compatible with GF Signet 2751 pH/ORP Smart Sensor Electronics or with GF Signet 2760 pH/ORP Preamplifier for connection to the GF Signet 8750 pH/ORP Transmitter

Process Connection

¾ in. NPT	ISO 7/1-R 3/4	Mounts into GF Signet fittings
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Wetted Materials

pH	PPS, glass, UHMW PE, FKM
ORP	PPS, glass, UHMW PE, FKM, Platinum

Max. Temperature/Pressure Rating

Operating Temperature Range*	bulb tip design	0 °C to 85 °C	32 °F to 185 °F
	flat tip design	10 °C to 85 °C	50 °F to 185 °F
Operating Pressure Range		6.8 bar @ -10 to 65 °C (100 psi @ 14 to 150 °F)	
		4 bar @ 65 to 85 °C (58 psi @ 150 to 185 °F)	

*Best performance for 2724-HF, 2726-HF sensors is above 10 °C (50 °F)

Recommended Storage Temperature

0 °C to 50 °C	32 °F to 122 °F
---------------	-----------------

The electrode glass will shatter if shipped or stored at temperature below 0 °C (32 °F)

The performance life of the electrode will shorten if stored at temperatures above 50 °C (122 °F)

Mounting

In-line Mounting	Use the sensor threads
	Use a GF Signet standard fitting up to 4 in.
	Sensor can be mounted at any angle
Submersible Mounting	Use threads on models 2751 or 2760
	Requires ¾ inch NPT or ISO 7/1-R 3/4 male threaded liquid tight extension conduit.

Shipping Weight

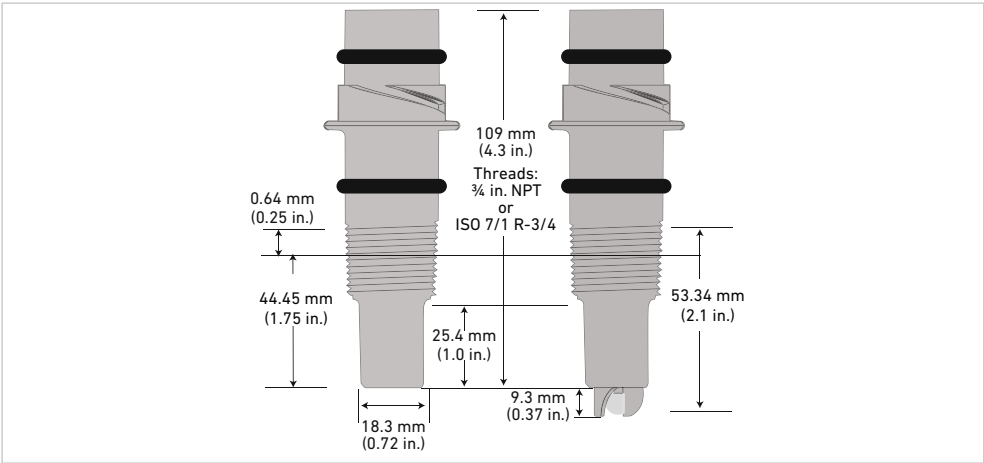
0.25 kg	0.55 lb
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Standards and Approvals

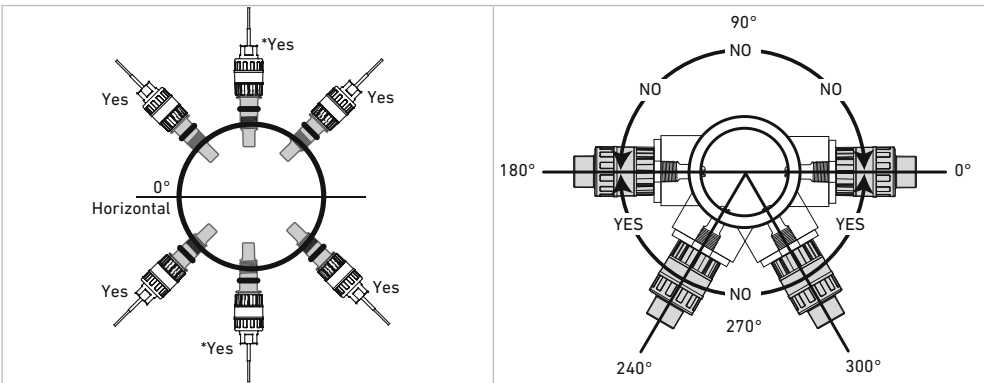
RoHS compliant, China RoHS
Manufactured under ISO 9001, ISO 14001 and ISO 45001

See pressure-temperature diagrams for more information.

Dimensions



Mounting Angle

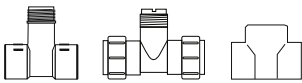
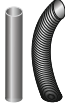


Models 2724-2726 may be mounted at any angle without affecting the performance.
*Avoid locations with air pockets and sediment.

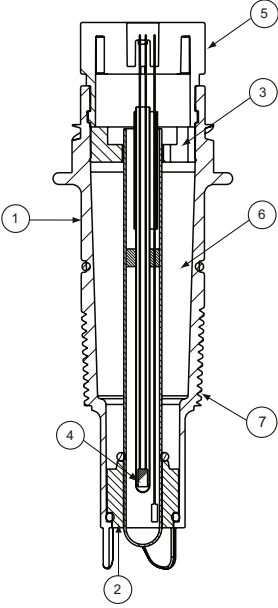


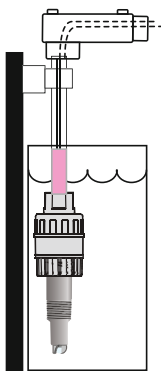
When mounting in standard threaded fittings the electrode must be mounted horizontally to 60 degrees below horizontal position only.

2.1.3 System Overview

Panel Mount	Pipe, Tank, Wall	4 to 20 mA Output	Automation System
GF Signet Instruments with 2751 Smart Sensor Electronics - 8900 - 9900 - 9950	GF Signet Instruments with 2751 Smart Sensor Electronics - 9900 and Rear Enclosure	2751 Smart Sensor Electronics with - Customer Supplied Chart Recorder or Programmable Logic Controller or - Programmable Automation Controller	2751 Smart Sensor Electronics with - 0486 Profibus Concentrator and Customer Supplied Programmable Logic Controller or - Programmable Automation Controller
GF Signet 2724-2726 DryLoc® pH/ORP Electrodes			
All sold separately			

Panel Mount	Pipe, Tank, Wall	4 to 20 mA Output	Automation System
In-Line Installation - GF Signet and threaded 1/2 in to 4 in fittings only		Submersible Installation - Customer supplied pipe extension or conduit with 3/4 in. NPT or ISO 7/1-R 3/4 threads	
			

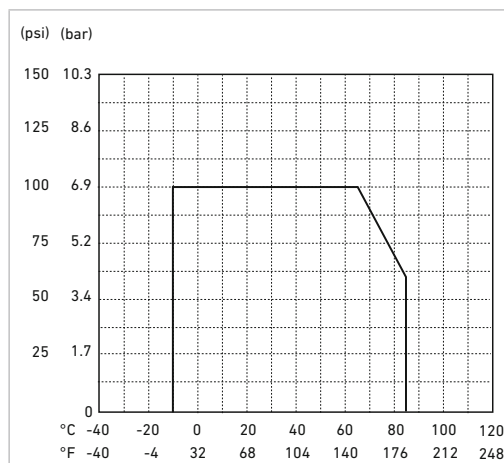
Electrode Key Features and Benefits:

			
Dual-patented reference design for long life in conductivity or chemicals.	⑦ Sensor in threaded reducing tee	⑧ Sensor in GF Signet fitting	⑨ Sensor submersible installation

1. PPS body for chemical compatibility with most harsh chemicals.
2. Porous UHMW PE (ultra high molecular weight polyethylene) junction resists fouling and build-up.
3. Memory chip enabled for convenient data storage and access (calibration data, operational data, and manufacturing data), electrode health monitoring via glass impedance measurement when used in connection with the 2751 pH/ORP Smart Sensor Electronics.
4. Internal temperature sensor located in the glass stem for a quick temperature response.
5. DryLoc® connector with corrosion resistant gold plated pins for quick and easy sensor removal. Resists moisture and dirt intrusion.
6. Dual-patented reference design with a 406 mm (16 in.) reference pathway for prolonged life in harsh environments. This enables the sensor to last significantly longer than other standard pH/ORP electrodes in most applications.
- 6a. With the patented reference design, the GF Signet 2726-LC version performs better in low conductivity water between 20 - 100 μ S and lasts longer than previous "DI" electrodes.
- 6b. The 2726-LC sensor also performs in applications with extremely low (less than 20 μ S) conductivity. Special precautions must be taken to avoid measurement complications.
Please note the following.
 - Electrostatic charges (streaming potentials) can cause dramatic offsets in a system with very low conductivity water. To minimize this, sensors should be placed in a well grounded system.
 - To enhance performance, a low flow cell is recommended to provide a steady flow rate (150 ml/minute). Sensors placed in high flow applications will experience noisier readings due to streaming potential.
7. Threads for NPT or ISO process connection into reducing tees
 - Use off-the-shelf GF reducing tees DN20 to DN100 (¾ to 4 in.).
8. Mounts directly into GF Signet fittings (½ to 4 in.) for easy sensor retrofitting.
9. Mount submersed into a tank via the 2751 or 2760 back threads.

Pressure-temperature diagram

i The pressure-temperature diagram are specifically for the GF Signet sensor. During system design the specifications of all components must be considered. In the case of a metal piping system, a plastic sensor will reduce the system specification.



Application Tips

- Use the flat glass electrodes when a self-cleaning feature is desired; especially useful in applications with abrasive chemicals for in-line installations.
- Use bulb protected electrodes for low temperature applications or where fast response is required.
- ORP electrodes are generally used for chemical reaction monitoring, not control.
- Ensure that sensor materials are chemically compatible with the process liquid.
- Keep electrode tip wet, avoid air pockets and sediment.

Buffer Solution

3822-7004
3822-7007
3822-7010

Quinhydrone

3822-7115



The GF Signet pH buffers are ideal for calibration. The liquid solutions are conveniently packaged in one pint (473 ml) bottles. pH buffer kits in powder pillows are available for mixing fresh solutions with water at the time of use.

All pH buffers are color coded for easy identification; 4.01 pH is red, 7.00 pH is yellow, and 10.00 pH is blue.

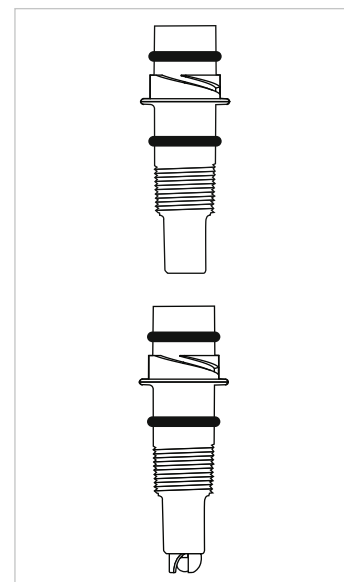
All pH buffers are traceable to NIST standards. The 4.01 and 7.00 buffer solutions can be used to calibrate ORP sensors when saturated with quinhydrone

2.1.4 Ordering Information

Model 2724-2726 Ordering Notes

- 1) pH and ORP electrodes require connection to model 2751 pH/ORP Smart Sensor Electronics or 2760 Preamplifier.
- 2) The 2751 "EasyCal" feature recognizes common pH and ORP buffer values of 4, 7 and 10 pH and +87, +264 and +469 mV for ORP.

Mfr. Part No.	Code	Tip Design	Process Connection Thread Options
pH Electrodes			
Temperature element Pt1000; use with 2751 pH/ORP Smart Sensor Electronics* and Profibus Concentrator			
3-2724-00	159 001 545	Flat	¾ in. MNPT, Thread
3-2724-01	159 001 546	Flat	ISO 7/1-R 3/4 Thread
3-2726-00	159 001 553	Bulb	¾ in. MNPT, Thread
3-2726-01	159 001 554	Bulb	ISO 7/1-R 3/4 Thread
3-2726-HF-00	159 001 549	Bulb, HF Resistant ¹	¾ in. MNPT, Thread
3-2726-HF-01	159 001 550	Bulb, HF Resistant ¹	ISO 7/1-R 3/4 Thread
3-2726-LC-00	159 001 557	Bulb, Low Conductivity ²	¾ in. MNPT, Thread
3-2726-LC-01	159 001 558	Bulb, Low Conductivity ²	ISO 7/1-R 3/4 Thread
Temperature element 3 KΩ Balco; Compatible with both the 2751 pH/ORP Smart Sensor Electronics* and the 2760 Preamplifier**			
3-2724-10	159 001 547	Flat	¾ in. MNPT, Thread
3-2724-11	159 001 548	Flat	ISO 7/1-R 3/4 Thread
3-2724-HF-10	159 001 771	Flat, HF Resistant ¹	3/4 in. NPT, Thread
3-2724-HF-11	159 001 772	Flat, pH Resistant ¹	ISO 7/1-R 3/4 Thread
3-2726-10	159 001 555	Bulb	¾ in. MNPT, Thread
3-2726-11	159 001 556	Bulb	ISO 7/1-R 3/4 Thread
3-2726-HF-10	159 001 551	Bulb HF Resistant ¹	¾ in. MNPT, Thread
3-2726-HF-11	159 001 552	Bulb HF Resistant ¹	ISO 7/1-R 3/4 Thread
3-2726-LC-10	159 001 559	Bulb, Low Conductivity ²	¾ in. MNPT, Thread
3-2726-LC-11	159 001 560	Bulb, Low Conductivity ²	ISO 7/1-R 3/4 Thread
ORP Electrodes; Compatible with both the 2751 pH/ORP Smart Sensor Electronics* and the 2760 Preamplifier**			
3-2725-60	159 001 561	Flat	¾ in. MNPT, Thread
3-2725-61	159 001 562	Flat	ISO 7/1-R 3/4 Thread



i The 3 KΩ Balco temperature element electrodes are compatible with the 2751 pH/ORP Smart Sensor Electronics, 8900, 9900 and 9950 instruments.

* The 2751 pH/ORP Smart Sensor Electronics has a digital (S³L) output which is used with 8900, 9900 or 9950 instruments, and the Profibus Concentrator. It also has a 4 to 20 mA output for connections to PLC's, data recorders, etc.

** The 2760 Preamplifier is used for connection directly to 8750 transmitter or other analog transmitters.

¹ HF resistant ≤2%HF

² Low conductivity applications, 20 - 100 μS/cm recommended

2.1.5 Accessories and Replacement Parts

Mfr. Part No.	Code	Description
1220-0021	198 801 000	O-ring, FKM (2 required per sensor)
3-2700.395	159 001 605	Calibration kit: includes 3 polypropylene cups, box used as cup stand, 1 pint pH 4.01, 1 pint pH 7.00
3822-7115	159 001 606	20 gm bottle quinhydrone for ORP calibration (must use pH 4.01 and/or pH 7.00 buffer solutions)
3-2759	159 000 762	pH/ORP System Tester (adapter cable sold separately)
3-2759.391	159 000 764	2759 DryLoc adapter cable (for use with 2750 and 2760)
3-0700.390	198 864 403	pH Buffer Kit (1 each 4, 7, 10 pH buffer in powder form, makes 50 ml of each)
3822-7004	159 001 581	pH 4.01 buffer solution, 1 pint (473 ml) bottle
3822-7007	159 001 582	pH 7.00 buffer solution, 1 pint (473 ml) bottle
3822-7010	159 001 583	pH 10.00 buffer solution, 1 pint (473 ml) bottle
3800-5000	159 838 107	3.0M KCl storage solution for pH and ORP, 1 pint (473 ml) bottle
3-2700.397	159 001 870	Protective cap for pH/ORP electrodes, 5 pieces
3-2700.398	159 001 886	O-ring lubricant Kit (5 packs of Super Lube, 1cc each)

2.2 2734-2736 pH/ORP Electrodes

High Performance sensors

Compatible with GF Signet 8900/9900/9950 instruments



Flat Glass

Protected Bulb

2.2.1 Product description

The GF Signet 2734-2736 pH and ORP electrodes are ideal for a wide range of harsh applications with low concentrations of poisoning ions, and chemicals that react with silver ion, Ag⁺. The superior glass formulation provides excellent chemical resistance in acidic and alkaline/caustic environments. The large area PTFE reference junction, salt bridge and reference electrode are constructed to increase the total reference effectiveness, resist chemical attack, help resist coating, and ensure long service life in harsh applications.

The DryLoc® connector with corrosion resistant gold plated contacts readily connects the sensor to the mating 2751 pH/ORP Smart Sensor Electronics. The robust PPS threaded sensor body and choice of flat, bulb pH, or flat ORP sensing elements provide a broad range of chemical compatibility for a wide variety of applications.

There is an optional pH sensing version available for applications with HF. The HF version is for applications where traces of hydrofluoric acid (2% or less) will attack standard pH glass.

The quick temperature response is available in a Pt1000 temperature sensor and allows compatibility with the GF Signet 8900, 9900 and 9950 instruments.

The sensors incorporate ¾ inch NPT or ISO 7/1-R 3/4 threads for installing into standard pipe-tees. They can also be mounted directly into GF Signet standard fittings, DN15 to DN100 (½ to 4 inch).

Features

- Enhanced reference chemistry to resist chemical poisoning and prolong the life of the electrodes in harsh environments
- PTFE reference junction resists fouling and chemical attack
- Superior pH glass formulation for excellent chemical resistance in acidic and alkaline/caustic environments
- PPS body for broad range of chemical compatibility
- Memory chip enabled for access to a range of unique features when connected to the GF Signet 2751 pH/ORP Smart Sensor Electronics
- Patented reference design for exceptional performance*
- Patented DryLoc® connector with gold plated contacts
- Mounts in GF Signet standard fittings from DN15 to DN100 (½ to 4 in.) or standard pipe fitting, 3/4" NPT or ISO 7/1-R 3/4
- Special design allows for installation at any angle, even inverted or horizontal
- Quick temperature response
- Bulb and flat HF resistant glass available for trace HF, in less than 2% concentration applications

* U.S. Patent Nos.: 6,666,701, 7,799,193 B2, 7,867,371 B2 and 8,211,282 B2

Applications

- Water & Wastewater Treatment
- Neutralization Systems
- Plating Baths
- Air Scrubbers
- Metal Removal
- Process Control
- Cooling Towers



The installation must be performed in accordance with the instruction manual. The instruction manual is included with the product, see also online on www.gfps.com/signet



2.2.2 Technical Data

General

General			
Performance	Efficiency	>95% @ 25 °C (77 ° F)	
Operating Range	pH	0 to 14 pH	
	ORP	±2000 mV	
	3-2734-HF, 3-2736-HF	Hydrofluoric acid resistant glass, pH 6 or below; trace HF ≤2%	
Compatibility	2751 pH/ORP Smart Sensor Electronics (for 8900, 9900, 9950, Profibus Concentrator, 4 to 20 mA)		
Temperature Sensor	Pt1000	Compatible with GF Signet 2751 pH/ORP Smart Sensor Electronics for connection to a PLC or to the GF Signet 8900, 9900 or 9950 instruments and Profibus Concentrator	
Process Connection	¾ in. NPT	ISO 7/1-R ¾	Mounts into GF Signet fittings

Wetted Materials

pH	PPS, glass, PTFE, FKM
ORP	PPS, glass, PTFE, FKM, Platinum

Max. Temperature/Pressure Rating

Operating Temperature Range	10 °C to 100 °C	50 °F to 212 °F
Operating Pressure Range	0 to 6.9 bar (0 to 100 psi) @ 10 °C to 65 °C (50 °F to 149 °F)	
	Linearity Derated 6.9 to 4.0 bar (100 to 58 psi) @ 65 °C to 100 °C (149 °F to 212 °F)	

Recommended Storage Temperature

	0 °C to 50 °C	32 °F to 122 °F
The electrode glass will shatter if shipped or stored at temperature below 0 °C (32 °F)		
The performance life of the electrode will shorten if stored at temperatures above 50 °C (122 °F).		

Mounting

In-line/Vertical Mounting	Use the sensor threads
	Use a GF Signet standard fitting ½ to 4 in.
	Sensor can be mounted at any angle
Submersible Mounting	Use threads on model 2751
	Requires ¾ in. NPT or ISO 7/1-R ¾ male threaded liquid tight extension conduit.

Shipping Weight

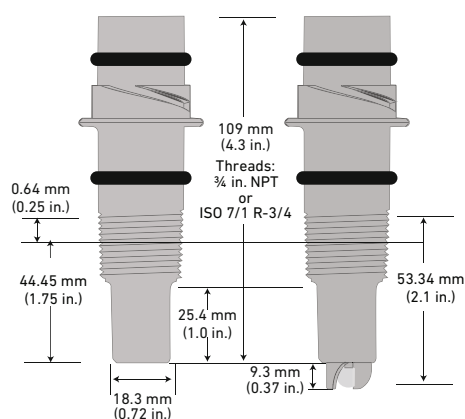
	0.25 kg	0.55 lb
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Standards & Approvals

	CE, FCC, RoHS compliant, China RoHS
	Manufactured under ISO 9001, ISO 14001 and ISO 45001

See pressure-temperature diagrams for more information.

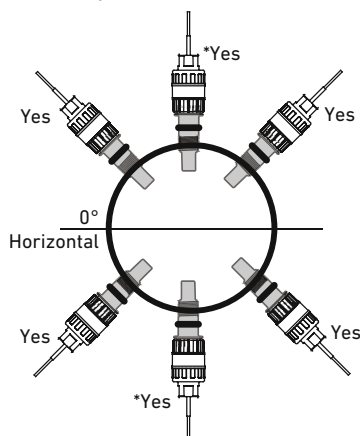
Dimensions



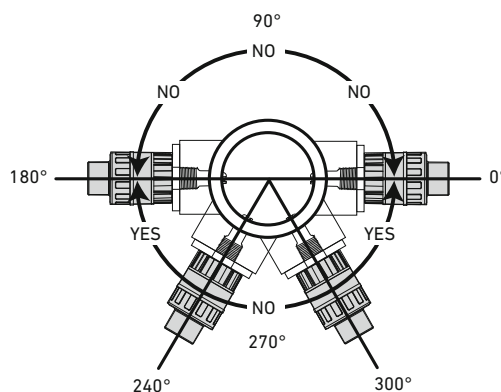
Mounting angle using GF Signet Fittings

Models 2734-2736 may be mounted at any angle without affecting the performance

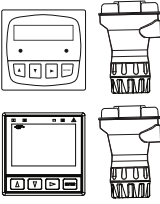
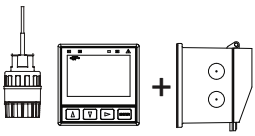
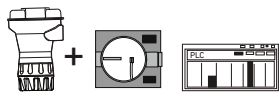
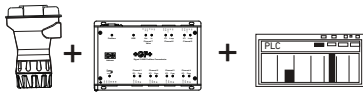

Avoid locations with air pockets and sediment



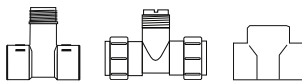

When mounting in standard threaded fittings the electrode must be mounted horizontally to 60 degrees below horizontal position only.



2.2.3 System Overview

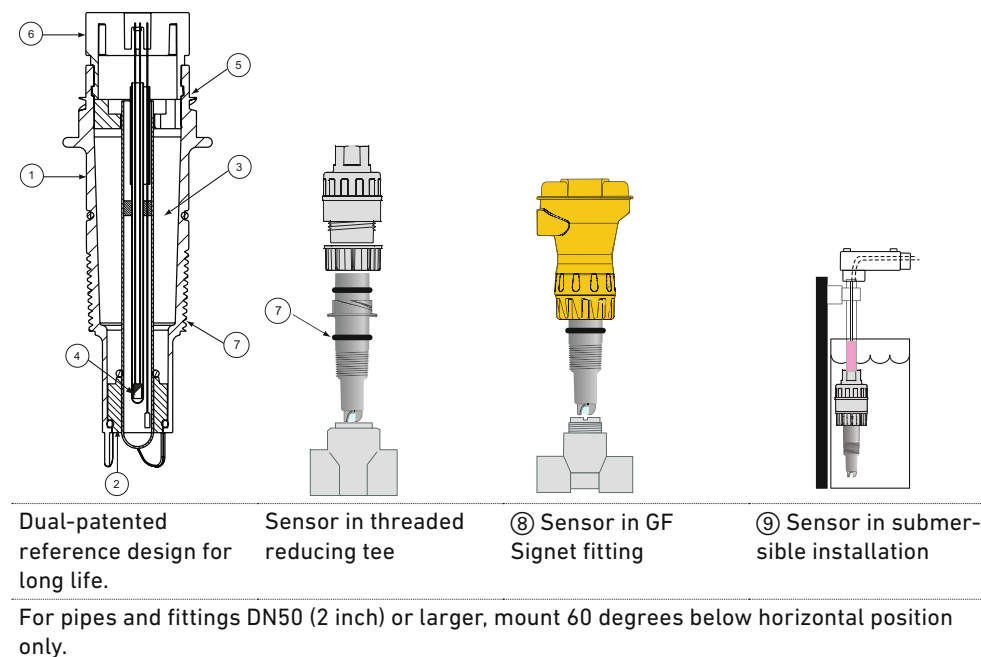
Panel Mount	Pipe, Tank, Wall	4 to 20 mA Output	Automation System
GF Signet Instruments with 2751 Smart Sensor Electronics - 8900 - 9900 - 9950 	GF Signet Instruments with 2751 Smart Sensor Electronics - 9900 and Rear Enclosure 	2751 Smart Sensor Electronics with - Customer Supplied Chart Recorder - Programmable Logic Controller, or - Programmable Automation Controller 	2751 Smart Sensor Electronics with - 0486 Profibus Concentrator and - Customer Supplied Programmable Logic Controller or - Programmable Automation Controller 
GF Signet 2734-2736 DryLoc® pH/ORP Electrodes 			

All sold separately

Panel Mount	Pipe, Tank, Wall	4 to 20 mA Output	Automation System
In-Line Installation - GF Signet and threaded 1/2 in to 4 in fittings only		Submersible Installation - Customer supplied pipe extension or conduit with 3/4 in. NPT or ISO 7/1-R 3/4 threads	
			

Electrode Key Features and Benefits:

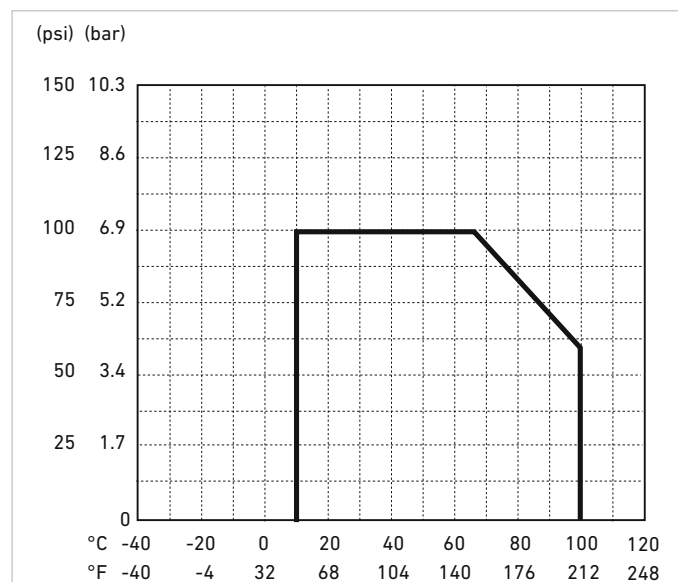
1. PPS body for chemical compatibility with most harsh chemicals.
2. Porous PTFE junction resists fouling, chemicals, and build-up.
3. Enhanced reference chemistry to resist poisoning and to prolong the life of the electrodes in harsh media applications.
4. Internal temperature sensor located in the glass stem for a quick temperature response.
5. Memory chip enabled for convenient data storage and access (calibration data, operational data, and manufacturing data), electrode health monitoring via glass impedance measurement when used in connection with the 2751 pH/ORP Smart Sensor Electronics.
6. DryLoc® connector with corrosion resistant gold plated pins for quick and easy sensor removal. Resists moisture and dirt intrusion.
7. Threads for NPT or ISO process connection into reducing tees. Use off-the-shelf GF reducing tees DN20 to DN100 (3/4 to 4 in.).
8. Mounts directly into GF Signet fittings (1/2 in. to 4 in.) for easy sensor retrofitting.
9. Mount submersed into a tank via the 2751 pH/ORP Smart Sensor Electronics.



Pressure-temperature diagram

Note

The pressure-temperature diagram is specifically for the GF Signet sensor. During system design the specifications of all components must be considered. In the case of a metal piping system, a plastic sensor will reduce the system design the specifications of all components must be considered. In the case of a metal piping system, a plastic sensor will reduce the system specification.



Application Tips

- Use the flat glass electrodes when a self-cleaning feature is desired; especially useful in applications with abrasive chemicals, in-line installations.
- Use the 2736-0X bulb protected electrodes in high pH alkaline/caustic applications (10 to 14 pH) or in applications of low pH range (0 to 3 pH).
- ORP electrodes are generally used for chemical reaction monitoring, not control.
- Ensure that sensor materials are chemically compatible with the process liquid.
- Keep electrode tip wet, avoid air pockets and sediment.

Buffer Solution

3822-7004
3822-7007
3822-7010

Quinhydrone

3822-7115



The GF Signet pH buffers are ideal for calibration. The liquid solutions are conveniently packaged in one pint (473 ml) bottles. pH buffer kits in powder pillows are available for mixing fresh solutions with water at the time of use.

All pH buffers are color coded for easy identification; 4.01 pH is red, 7.00 pH is yellow, and 10.00 pH is blue.

All pH buffers are traceable to NIST standards. The 4.01 and 7.00 buffer solutions can be used to calibrate ORP sensors when saturated with quinhydrone

2.2.4 Ordering information

Model 2734-2736 Ordering Notes

1. pH and ORP Sensor Electrodes require connection to model 2751 pH/ORP Smart Sensor Electronics.
2. The 2751 "EasyCal" feature recognizes common pH and ORP buffer values of 4, 7 and 10 pH and +87, +264 and +469 mV for ORP.

Mfr. Part No.	Code	Tip Design	Temperature Element
pH Electrodes - Temperature element Pt1000; use with 2751 pH/ORP Smart Sensor Electronics*			
3-2734-00	159 001 774	Flat	3/4 in. NPT, Thread
3-2734-01	159 001 775	Flat	ISO 7/1-R 3/4 Thread
3-2734-HF-00	159 001 776	Flat, HF Resistant ¹	3/4 in. NPT, Thread
3-2734-HF-01	159 001 777	Flat, HF Resistant ¹	ISO 7/1-R 3/4 Thread
3-2736-00	159 001 778	Bulb	3/4 in. NPT, Thread
3-2736-01	159 001 779	Bulb	ISO 7/1-R 3/4 Thread
3-2736-HF-00	159 001 780	Bulb, HF resistant ¹	3/4 in. NPT, Thread
3-2736-HF-01	159 001 781	Bulb, HF resistant ¹	ISO 7/1-R 3/4 Thread
ORP Electrodes - Compatible with 2751 pH/ORP Smart Sensor Electronics			
3-2735-60	159 001 782	Flat, 10K	3/4 in. NPT, Thread
3-2735-61	159 001 783	Flat, 10K	ISO 7/1-R 3/4 Thread

* The 2751 Sensor Electronics has a digital (S³L) output which is used with 8900, 9900 or 9950 instruments, and Profibus Concentrator.

It also has a 4 to 20 mA output for connections to PLCs, data recorders, etc.

¹ HF resistant <2% HF



! The 2734 and 2736 pH electrodes are not compatible with the GF Signet 2760 Preamplifier.

2.2.5 Accessories and Replacement Parts

Mfr. Part	Code	Description
1220-0021	198 801 000	O-ring, FKM (2 required per sensor)
3-2700.395	159 001 605	Calibration kit: includes 3 polypropylene cups, box used as cup stand, 1 pint pH 4.01, 1 pint pH 7.00
3822-7115	159 001 606	20 gm bottle quinhydrone for ORP calibration (must use pH 4.01 and/or pH 7.00 buffer solutions)
3-2759	159 000 762	pH/ORP System Tester (adapter cable sold separately)
3-2759.391	159 000 764	2759 DryLoc adapter cable (for use with 2750 and 2760)
3-0700.390	198 864 403	pH Buffer Kit (1 each 4, 7, 10 pH buffer in powder form, makes 50 ml of each)
3822-7004	159 001 581	pH 4.01 buffer solution, 1 pint (473 ml) bottle
3822-7007	159 001 582	pH 7.00 buffer solution, 1 pint (473 ml) bottle
3822-7010	159 001 583	pH 10.00 buffer solution, 1 pint (473 ml) bottle
3800-5000	159 838 107	3.0M KCl storage solution for pH and ORP, 1 pint (473 ml) bottle
3-2700.397	159 001 870	Protective cap for pH/ORP electrodes, 5 pieces
3-2700.398	159 001 886	O-ring lubricant Kit (5 packs of Super Lube, 1cc each)

2.3 2744-2747 Differential DryLoc® pH/ORP Electrodes

High Performance



Protected Bulb Flat Glass

2.3.1 Product description

The Signet 2744-2747 Differential pH and ORP electrodes are high performance sensors built with the DryLoc® connector, a PPS body, and PTFE reference junction to handle the most extreme and harshest of chemical applications.

These differential electrodes use a field-proven 3-electrode differential technique: the pH and reference electrodes are measured against a ground electrode, ensuring a steady and stable signal.

A key feature is the reference electrode, which is housed in a glass half-cell embedded in the reference chamber and is protected from compounds that may contain sulfides (S^{2-}) and metals. To ensure long service life, the reference features a refillable electrolyte chamber and a replaceable equitransferant salt bridge, both easily serviced in the field. The patented porous PTFE reference junction resists fouling, clogging and chemical attack.

Other elements of the design are the solution ground, the pH/ORP electrodes, and the temperature element. The solution ground eliminates noisy measurements by draining electrical current away from the reference electrode. The pH/ORP electrodes are designed with a flat or bulb surface, and a temperature device positioned at the tip of the measurement surface for a quick temperature response. Various temperature devices offered include 3 K Ω or Pt1000 RTD.

The electrodes are used with the GF Signet 2751 Smart Sensor Electronics, which provide a blind 4 to 20 mA output or use the digital (S^3L) output to connect the GF Signet 8900, 9900 or 9950 instruments, and the 0486 Profibus Concentrator. The electrodes can also be used with the 2760 Preamplifier to connect to ProPoint® and ProcessPro® series of pH/ORP instrumentation.

Features

- Differential design for stable measurements in the most aggressive applications
- Long service life even in severe or difficult chemical applications
- Memory chip enabled for access to a wide range of unique features when connected to the GF Signet 2751 pH/ORP Smart Sensor Electronics
- High performance glass that can withstand high pH caustic media as well as elevated temperature applications
- PPS body for broad range of chemical compatibility
- Watertight DryLoc® connector with foul-proof gold plated contacts*
- Porous PTFE reference junction resists fouling and chemical attack
- Rebuildable reference electrode
- Solution ground
- Temperature sensor (pH)
- Easy sensor replacement using DryLoc electrode connector
- Quick temperature response
- Compatible with all GF Signet instruments

*U.S. Patent No.: 6.666.701

Applications

- Plating Baths
- Surface Finishing
- Plant Effluent
- Water and Wastewater Treatment
- Scrubbers
- Textile Dye Process
- Harsh Chemical Applications
- Heavy Metal Removal and Recovery
- Toxics Destruction
- Coagulation and Flocculation



See Technical Reference section for assistance in choosing the correct sensor.

2.3.2 Specifications

General

Compatibility	GF Signet 2751 and 2760	
Operating Range	2744/2746	0 to 14 pH
	2745/2747	±1500 mV (ORP)
Process Connection	1 in., for use in reducing tees up to 4 in.	

Wetted Materials

Body	PPS	
Reference Junctions	PTFE	
Sensing Surface	pH	Glass membrane
	ORP	Platinum
O-rings	EPDM	
Solution Ground	Carbon graphite	

Max. Temperature/Pressure Rating

Operating Temperature	10 °C to 100 °C	50 °F to 212 °F
Operating Pressure Range	0 to 6.9 bar (0 to 100 psi) @ 10 °C to 65 °C (50 °F to 149 °F)	
	Linearity Derated 6.9 to 4.0 bar (100 to 58 psi) @ 65 °C to 100 °C (149 °F to 212 °F)	

Recommended Storage Temp.

	0 °C to 50 °C	32 °F to 122 °F
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Recommended Storage Temp.

The electrode glass will shatter if shipped or stored at temperature below 0 °C (32 °F).

The performance life of the electrode will shorten if stored at temperatures above 50 °C (122 °F).

Mounting

In-line/Vertical Mounting	Use sensor 1 in. threads. Sensor must be mounted at least 15 degrees above the horizontal axis.	
Submersible Mounting	Use threads on Model 2751 or 2760; requires ¾ in. NPT or ISO 7/1-R 3/4 in. male threaded extension.	
Reference	Electrolyte	Buffered equi-transferant salt solution gel
	Element	pH half-cell
Temperature Sensor	pH	3 KΩ, PT1000 RTD
	ORP	10K ID Resistor

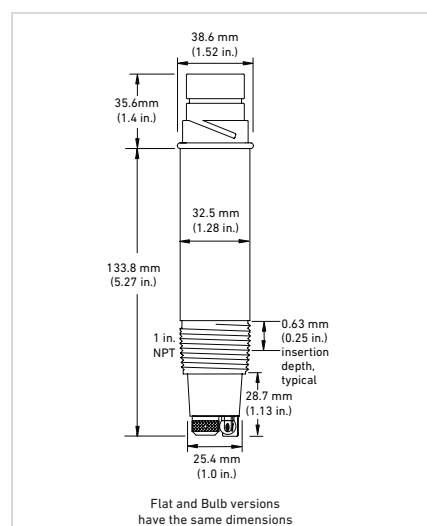
Shipping Weight

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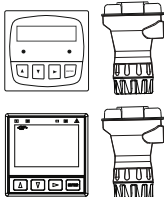
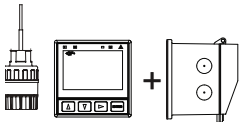
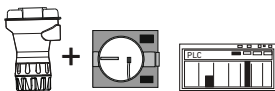
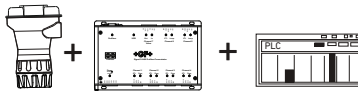


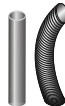
Standards & Approvals

	Manufactured under ISO 9001, 14001 and OHSAS 18001 for Quality
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Dimensions



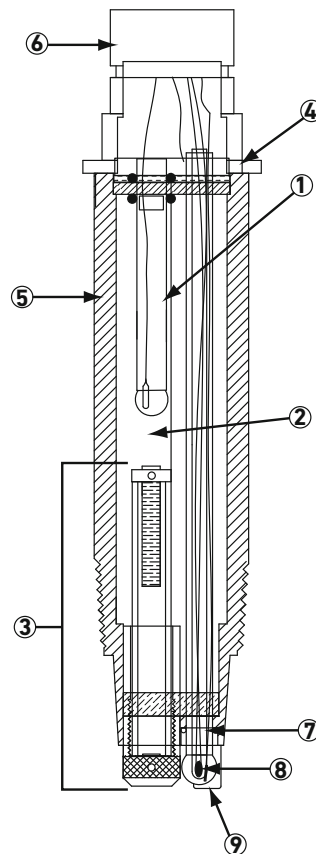
2.3.3 System Overview

Panel Mount	Pipe, Tank, Wall	4 to 20 mA Output	Automation System
GF Signet Instruments with 2751 Smart Sensor Electronics - 8900 - 9900 - 9950 	GF Signet Instruments with 2751 Smart Sensor Electronics - 9900 and Rear Enclosure 	2751 Smart Sensor Electronics with - Customer Supplied Chart Recorder - Programmable Logic Controller, or - Programmable Automation Controller 	2751 Smart Sensor Electronics with - 0486 Profibus Concentrator and - Customer Supplied Programmable Logic Controller or - Programmable Automation Controller 
GF Signet 2744-2747 DryLoc® pH/ORP Electrodes 			
All sold separately			
In-Line Installation - threaded fittings only 	Submersible Installation - Customer supplied pipe extension or conduit with 3/4 in. NPT or ISO 7/1-R 3/4 threads* 		

* Refer to the GF Signet Submersion Kit brochure (3-0000.707) located on our website for installation suggestions and options.

Electrode Key Features and Benefits

1. Glass encased reference electrode protects the Ag/AgCl (silver/silver chloride) element from reacting with certain chemical compounds that typically leach into the reference chambers. Keeps the pH/ORP reading stable.
2. Large volume reference electrolyte chamber resists dilution over time for a long service life. Chamber is refillable. Holds approximately 30 ml of electrolyte.
3. Salt Bridge serves as a double reference junction and is the first line of defense to keep out process chemicals from the reference electrolyte chamber. It is built with a double porous PTFE reference junction which is highly compatible to chemicals, resists fouling and build-up of dirt.
4. Memory chip enabled for convenient data storage and access (calibration data, operational data, and manufacturing data), electrode health monitoring via glass impedance measurement when used in connection with the 2751 pH/ORP Smart Sensor Electronics.
5. PPS body for chemical compatibility to most harsh chemicals. Also able to withstand high temperatures.
6. DryLoc connector with corrosion resistant gold plated pins for quick and easy sensor removal.
7. Capillary TC (temperature sensor) embedded in tip of pH/ORP electrode for quick temperature response.
8. Measuring pH/ORP electrode.
9. Solution Ground electrode eliminates noisy measurements by draining electrical current away from the reference electrode.



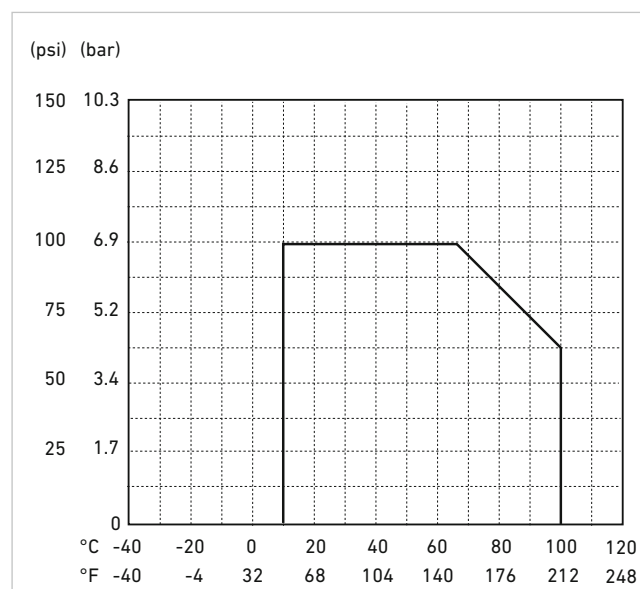
A Differential Electrode solves many common problems typically experienced by standard pH/ORP electrodes at troublesome measuring points. See the table below to find the common problem, cause and effect, and the Differential pH/ORP Electrode solution.

If the (GF Signet Models 272X, 273X or 277X) pH/ORP electrode experiences the following:	The cause and effect of the problem may be:	Use a Differential Electrode to solve the problem because:
<ul style="list-style-type: none"> Reading slowly drifts over time Sensor responds slowly 	<p>Chemical attack from Hg^{2+}, Cu^+, Pb^{2+}, ClO_4^- or other compounds which react with or dilute the KCl reference electrolyte.</p> <p>Reference junction gets clogged from oils, grease, or dirt from the process.</p>	<p>Salt bridge will slow or stop attack. If attacking ions penetrate the salt bridge and affect the reference, simply refill reference solution.</p> <p>Readings do not drift due to stable differential reference design, however may require cleaning or replacement of the salt bridge if electrode gets too dirty.</p>
<ul style="list-style-type: none"> Reading slowly drifts over time Sensor reading becomes erratic 	<p>Chemical attack of the Ag^+ reference billet from Br^-, I^-, CN^-, and S_2^- compounds</p> <p>Clogged reference and slowed reading from silver compounds forming on the inside of the reference electrode from Ag^+ of reference element reacting and precipitating Ag_2S, $AgBr$, AgI, $AgCN$, or other silver compounds.</p>	<p>Will not affect electrode due to Ag^+ element protected in glass encased reference electrode.</p> <p>Will not affect electrode due to Ag^+ element protected in glass encased reference electrode.</p>
<ul style="list-style-type: none"> Reading suddenly jumps to a new value Reading unexpectedly changes 	<p>Stray electrical currents in the process liquid; Ag^+ reference element picks up current and shifts reference reading, resulting in shifted pH reading. The Ag^+ element will eventually become totally stripped. Process must be properly grounded or place metal rod close to electrode.</p>	<p>Will not affect electrode due to Ag^+ element protected in glass encased reference electrode; also, electrode has a built in solution ground, so if there is a stray current, it will not be seen by the electrode.</p>

Pressure-temperature diagram

Note

The pressure-temperature diagram are specifically for the GF Signet sensor. During system design the specifications of all components must be considered. In the case of a metal piping system, a plastic sensor will reduce the system specification.



Ion	Ion name	Ion	Ion name	Compound	Compound name
Br^-	Bromide	Hg^{2+}	Mercury	KCL	Potassium chloride
Cu^+	Copper ion	ClO_4^-	Perchlorate	Ag_2S	Silver sulfide
CN^-	Cyanide	Ag^+	Silver	$AgBr$	Silver bromide
I^-	Iodide	S_2^-	Sulfide	AgI	Silver iodide
Pb^{2+}	Lead			$AgCN$	Silver cyanide

Application Tips

- Use the flat glass electrodes when a self-cleaning feature is desired; especially useful in applications with abrasive chemicals for in-line installations.
- Use bulb protected electrodes for low temperature applications where a fast response is required.
- ORP electrodes are generally used for chemical reaction monitoring, not control.
- Ensure sensor materials are chemically compatible with the process liquid.
- Keep electrode tip wet, avoid air pockets and sediment.

Buffer Solution	Quinhydrone
3822-7004	3822-7115
3822-7007	
3822-7010	



The GF Signet pH buffers are ideal for calibration. The liquid solutions are conveniently packaged in one pint (473 ml) bottles. pH buffer kits in powder pillows are available for mixing fresh solutions with water at the time of use.

All pH buffers are color coded for easy identification; 4.01 pH is red, 7.00 pH is yellow, and 10.00 pH is blue.

All pH buffers are traceable to NIST standards. The 4.01 and 7.00 buffer solutions can be used to calibrate ORP sensors when saturated with quinhydrone

Please refer to Wiring, Installation, and Accessories section for more information.

2.3.4 Ordering information

Model 2744-2747 - Ordering Notes

1. pH and ORP electrodes require connection to model 2751 or 2760.
2. Conduit and mounting brackets for submersible installations must always be used (customer supplied).
3. Adapters from 1 - 1½ in. are available.
4. Use sensor threads for in-line mounting; Model 2751 or 2760 threads for submersible mounting.
5. Reference electrode can be rebuilt with replacement electrolyte and salt bridge.

Mfr. Part No.	Code	Tip Design	Temperature Element
pH Differential Electrode			
3-2744-1	159 001 944	Flat	3 KΩ Balco ^{1,2}
3-2744-2	159 001 910	Flat	Pt1000 ¹
3-2746-1	159 001 911	Bulb with protection	3 KΩ Balco ^{1,2}
3-2746-2	159 001 912	Bulb with protection	Pt1000 RTD ¹
ORP Differential Electrode			
3-2745-1	159 001 913	Flat	10 KΩ Balco ^{1,2}
3-2747-1	159 001 914	Bulb with protection	10 KΩ Balco ^{1,2}

¹ For use with the Multi-Parameter instruments, and Profibus Concentrator when used with the 2751 Smart Sensor Electronics. The 2751 Smart Sensor Electronics has a digital (S³L) output which is used with the Multi-Parameter instruments. It also has a 4 to 20 mA output for connections to PLCs, data recorders, etc.



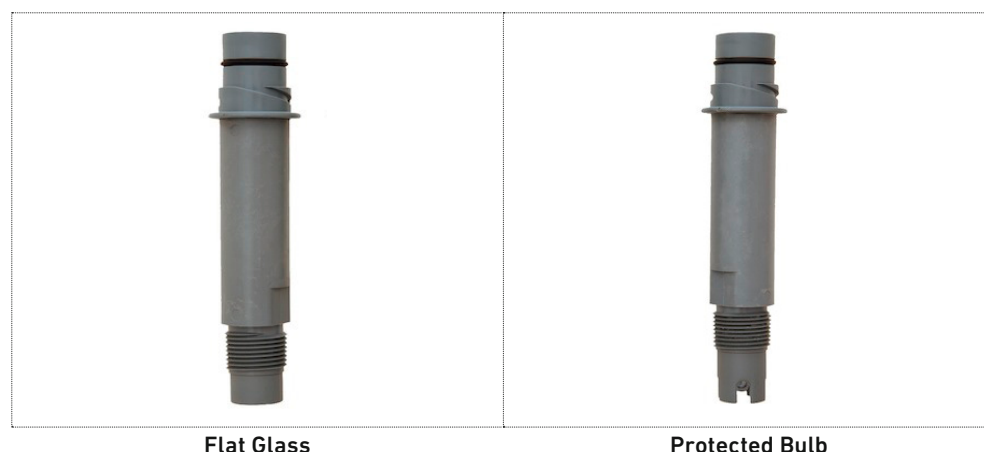
² The 2760 preamplifier is used for connection directly to ProPoint® and ProcessPro® series pH/ORP instrumentation.

Accessories and Replacement Parts

Mfr. Part	Code	Description
1224-0205	159 000 836	O-ring, EPDM
3-2700.395	159 001 605	Calibration kit: includes 3 polypropylene cups, box used as cup stand, 1 pint pH 4.01, 1 pint pH 7.00
3822-7115	159 001 606	20 gm bottle quinhydrone for ORP calibration (must use pH 4.01 and/or pH 7.00 buffer solutions)
3800-4340	159 001 948	Replacement salt bridge in black
3864-0001	159 001 007	Replacement salt bridge in gray
3864-0002	159 001 008	Replacement reference electrolyte solution, 500 mls
2120-0015	159 001 009	PVC-C adapter: 1.5 in. MNPT to 1 in. FNPT
2122-0015	159 001 010	PVDF adapter: 1.5 in. MNPT to 1 in. FNPT
3-0700.390	198 864 403	pH Buffer Kit (1 each 4, 7, 10 pH buffer in powder form, makes 50 ml of each)
3822-7004	159 001 581	pH 4.01 buffer solution, 1 pint (473 ml) bottle
3822-7007	159 001 582	pH 7.00 buffer solution, 1 pint (473 ml) bottle
3822-7010	159 001 583	pH 10.00 buffer solution, 1 pint (473 ml) bottle
3-2759	159 000 762	pH/ORP System Tester (adapter cable sold separately)
3-2759.391	159 000 764	Adapter cable (for use with 2751 and 2760)
3800-5000	159 838 107	3.0M KCl storage solution for pH and ORP, 1 pint (473 ml) bottle
3-2700.398	159 001 886	O-ring lubricant kit (5 packs of Super Lube, 1cc each)

2.4 2774-2777 DryLoc pH/ORP Electrodes

General Purpose / Industrial



Flat Glass

Protected Bulb

2.4.1 Product description

The GF Signet 2774-2777 pH and ORP electrodes are high performance sensors ideal for a wide range of applications. The unique foul-proof DryLoc® connector with gold-plated contacts is designed specifically for use with the GF Signet 2751 pH/ORP Smart Sensor Electronics or the 2760 Preamplifier. These dependable and highly responsive electrodes feature a PTFE double reference junction with potassium nitrate (KNO_3) in the front chamber to block various poisoning ions such as Copper (Cu^{2+}), Lead (Pb^{2+}), Mercury (Hg^{2+}), and a large reference chamber that combine to extend the service-life.

The positioning of the temperature element embedded in the pH sensing tip allows the temperature response to be quick and accurate. The electrodes are offered with either flat or bulb style sensing elements. The flat versions allow sediment and particles to sweep past the measurement surface, minimizing risks of abrasion, breakage and coating. The bulb versions can be used for low temperature applications or where fast response is required. Due to the specially designed chambers which keep electrolyte in place, all sensor models can be installed at any angle, even inverted.

The quick temperature response is available in either a Pt1000 or 3K Ω temperature sensor and allows compatibility with all GF Signet pH/ORP instruments.

Features

- Double reference PTFE junction to block various poisoning ions and resist fouling and dirt buildup
- PPS body for broad range of chemical compatibility
- Memory chip enabled for access to a wide range of unique features when connected to the GF Signet 2751 pH/ORP Smart Sensor Electronics
- Patented DryLoc® connector with gold plated contacts*
- Special design allows for installation at any angle, even inverted or horizontal
- Temperature sensor (pH)
- Quick temperature response
- Easy sensor replacement using DryLoc electrode connector
- High temperature versions available
- Mounts into standard $\frac{3}{4}$ inch threads
- Compatible with all GF Signet instruments

* U.S. Patent No.: 6,666,701

Applications

- Water Treatment & Water Quality Monitoring
- Cooling Tower and Boiler Protection
- Aquatic Animal Life Support System
- Pool and Spa Control
- Neutralization Systems
- Process Control

! The installation must be performed in accordance with the instruction manual. The instruction manual is included with the product, see also online on www.gfps.com/signet

2.4.2 Specifications

General

Compatibility	GF Signet Models 2751 and 2760	
Operating Range	2774/2776	0 to 14 pH
	2775/2777	±2000 mV (ORP)
Process Connection	¾ in., for use in reducing tees up to 4 in.	
Reference	Electrolyte	KNO ₃ /KCl polyacrylamide gel
	Element	Ag/AgCl

Wetted Materials

	Body	PPS	
	Reference junctions	PTFE	
	Sensing surface	pH	Glass membrane
		ORP	Platinum
	O-rings	FKM	

Max. Temperature/Pressure Rating

Operating Temperature	0 °C to 85 °C	32 °F to 285 °F
Max. Operating Pressure	6.9 bar	100 psi
Higher temperature and pressure sensors are available upon request		

Recommended Storage Temperature

	0 °C to 50 °C	32 °F to 122 °F
The electrode glass will shatter if shipped or stored at temperature below 0 °C (32 °F)		
The performance life of the electrode will shorten if stored at temperatures above 50 °C (122 °F)		

Mounting

In-line/Vertical Mounting	Use the electrodes ¾ inch threads to install into pipe fitting. Electrode can be mounted at any angle.	
Submersible Mounting	Use threads on Model 2751 or 2760; requires ¾ inch NPT or ISO 7/1-R 3/4 male threaded extension.	
Temperature Sensor	pH	3 KΩ or PT1000 RTD
	ORP	none

Shipping Weight

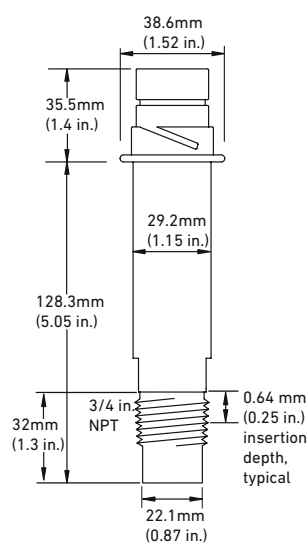
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Standards and Approvals

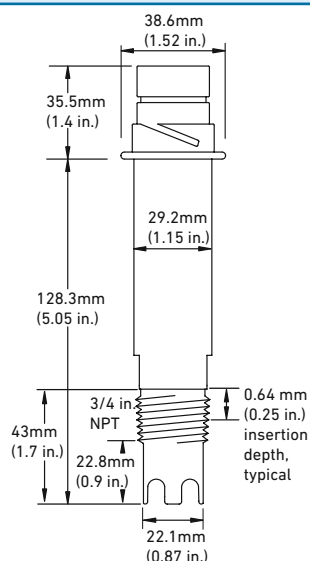
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Dimensions

Flat Electrode



Bulb Electrode



2.4.3 System Overview

Panel Mount	Pipe, Tank, Wall	4 to 20 mA Output	Automation System
GF Signet Instruments with 2751 Smart Sensor Electronics - 8900 - 9900 - 9950	GF Signet Instruments with 2751 Smart Sensor Electronics - 9900 and Rear Enclosure	2751 Smart Sensor Electronics with - Customer Supplied Chart Recorder Programmable Logic Controller, or - Programmable Automation Controller	2751 Smart Sensor Electronics with - 0486 Profibus Concentrator and Customer Supplied Programmable Logic Controller or - Programmable Automation Controller

GF Signet 2774-2777 DryLoc® pH/ORP Electrodes

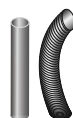


All sold separately

In-Line Installation - threaded fittings only



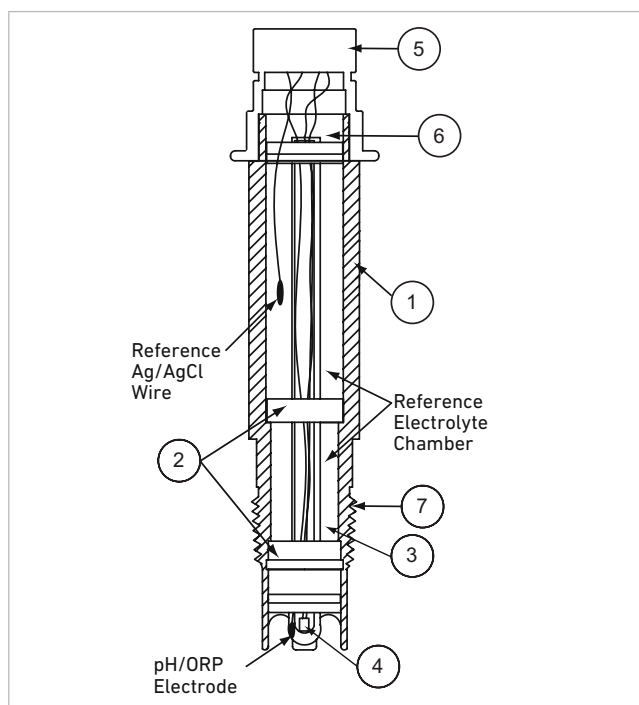
Submersible Installation - Customer supplied pipe extension or conduit with 3/4 in. NPT or ISO 7/1-R 3/4 threads and pipe assembly*



* Refer to the GF Signet Submersion Kit brochure (3-0000.707) located on our website for installation suggestions and options.

Electrode Key Features and Benefits

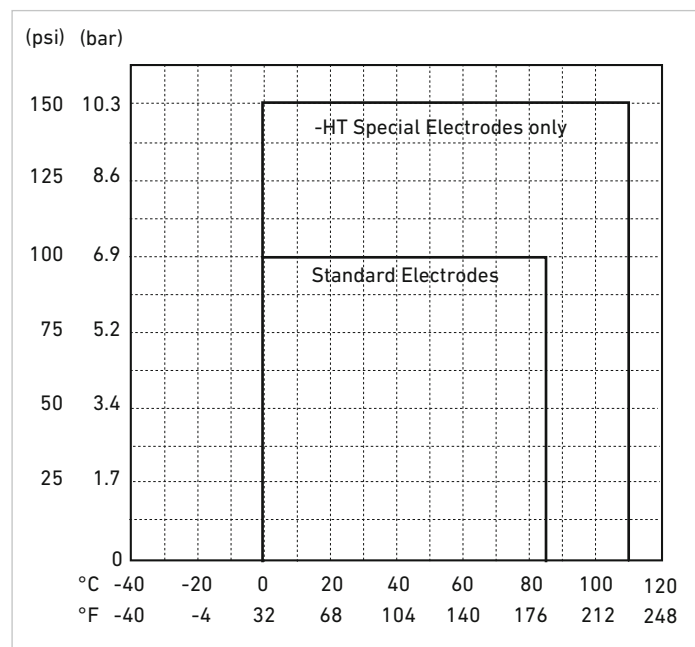
- PPS body for chemical compatibility to resist most harsh chemicals. Also able to withstand high temperatures.
- Porous PTFE junction resists fouling, chemicals, and build-up.
- First reference chamber with KNO₃ protects Ag/AgCl wire for a prolonged sensor life.
- Capillary TC (temperature sensor) embedded in tip of pH/ORP electrode for quicker temperature response.
- DryLoc connector with corrosion resistant gold plated pins for quick and easy sensor removal.
- Memory chip enabled for convenient data storage and access (calibration data, operational data, and manufacturing data), electrode health monitoring via glass impedance measurement when used in connection with the 2751 pH/ORP Smart Sensor Electronics.
- Threads for NPT process connection into reducing tees. Use off the shelf GF reducing tees DN20 to DN100 (3/4 to 4 in.).



Pressure-temperature diagram

Note

The pressure-temperature diagram are specifically for the GF Signet sensor. During system design the specifications of all components must be considered. In the case of a metal piping system, a plastic sensor will reduce the system specification.



Application Tips

- Use the flat glass electrodes for in-line pH sensor applications when a self-cleaning feature is desired; especially useful in applications with abrasive chemicals in in-line applications.
- Use bulb protected electrodes for low temperature applications or where fast response is required.
- ORP electrodes are generally used for chemical reaction monitoring, not control.
- Ensure that sensor materials are chemically compatible with the process liquid.
- Keep electrode tip wet, avoid air pockets and sediment.

Buffer solutions

Buffer Solution	Quinhydrone
3822-7004	3822-7115
3822-7007	
3822-7010	



The GF Signet pH buffers are ideal for calibration. The liquid solutions are conveniently packaged in one pint (473 ml) bottles. pH buffer kits in powder pillows are available for mixing fresh solutions with water at the time of use.

All pH buffers are color coded for easy identification; 4.01 pH is red, 7.00 pH is yellow, and 10.00 pH is blue.

All pH buffers are traceable to NIST standards. The 4.01 and 7.00 buffer solutions can be used to calibrate ORP sensors when saturated with quinhydrone

Please refer to Wiring, Installation, and Accessories sections for more information.

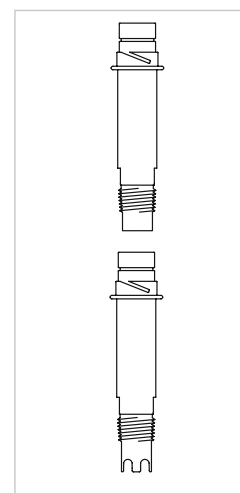
2.4.4 Ordering information

Model 2774-2777 Ordering Notes

- pH and ORP sensors require connection to model 2751 or 2760.
- Conduit and mounting brackets for submersible installation must always be used (customer supplied).
- All of these sensors can be installed upside-down.
- Special order options may have longer delivery time. Consult your local Georg Fischer sales representative for lead times.

Mfr. Part No.	Code	Tip Design	Temperature Element
pH Electrodes			
3-2774	159 000 955	Flat	3 KΩ RTD ¹
3-2776	159 000 959	Bulb with Protection	3 KΩ RTD ¹
3-2774-1	159 000 956	Flat	PT1000 RTD ²
3-2776-1	159 000 960	Bulb with Protection	PT1000 RTD ²
3-2774-HT	159 001 796	Flat	3 KΩ Balco RTD, High Temperature ⁴⁾
3-2774-HT-C	159 001 795	Flat	BNC connector, 3 KΩ Balco RTD, NPT, High Temperature ^{4) 5)}
3-2774-HT-ISO	159 001 794	Flat	3 KΩ Balco, High Temperature ⁴⁾
ORP Electrodes			
3-2775	159 000 957	Flat	10 K ID resistor ³
3-2777	159 000 961	Bulb with Protection	10 K ID resistor ³

- ¹ 3 KΩ Balco RTD for connection to ProPoint and ProcessPro pH/ORP instrument series when used with the 2760 preamplifier.
- ² Pt1000 RTD for connection to the 8900, 9900, 9950 or Profibus Concentrator when used with the 2751 Smart Sensor Electronics. The 2751 has a digital (S³L) output which is used with the 8900, 9900, or 9950 transmitter, and the Profibus Concentrator. It also has a 4 to 20 mA output for connection to PLC's, data recorders, etc.
- ³ 10 KΩ ID resistor for connection to the 8900, 9900 or 9950 when used with the 2751 pH/ORP Smart Sensor Electronics
- ⁴
 - HT pH electrode, flat glass, high temperature (110 °C, 230 °F), 3/4" NPT, 3KΩ TC, in-line install only.
 - HT-C pH electrode, flat glass, high temperature (110 °C, 230 °F), 3KΩ TC, BNC connector, NPT, 15 ft cable, no memory chip.
 - HT-ISO pH electrode, flat glass, high temperature (110 °C, 230 °F), 3/4" ISO, 3KΩ TC, in-line install only.
- ⁵ Option -HT-C can only be connected to the 2751 or 2760 sensor electronics if used with the 3-2722 BNC adapter.



i Special Order Options - Please consult the factory.

2.4.5 Accessories and Replacement Parts

Mfr. Part	Code	Description
3-2700.395	159 001 605	Calibration kit: includes 3 polypropylene cups, box used as cup stand, 1 pint pH 4.01, 1 pint pH 7.00
3822-7115	159 001 606	20 gm bottle quinhydrone for ORP calibration (must use pH 4.01 and/or pH 7.00 buffer solutions)
3-0700.390	198 864 403	pH Buffer Kit (1 each 4, 7, 10 pH buffer in powder form, makes 50 ml of each)
3822-7004	159 001 581	pH 4.01 buffer solution, 1 pint (473 ml) bottle
3822-7007	159 001 582	pH 7.00 buffer solution, 1 pint (473 ml) bottle
3822-7010	159 001 583	pH 10.00 buffer solution, 1 pint (473 ml) bottle
3-2759	159 000 762	pH/ORP System Tester (adapter cable sold separately)
3-2759.391	159 000 764	2759 DryLoc adapter cable (for use with 2750 and 2760)
3-2722	Special order	BNC adapter
3800-5000	159 838 107	3.0M KCl storage solution for pH and ORP, 1 pint (473 ml) bottle
3-2700.398	159 001 886	O-ring lubricant kit (5 packs of Super Lube, 1cc each)

2.5 GF Signet 3719 pH/ORP Wet-Tap Assembly



3719 Assembly

2756, 2757 Wet-Tap
Electrodes
(Sold Separately)

2.5.1 Product description

The GF Signet 3719 pH/ORP Wet-Tap allows installation and removal of pH or ORP electrodes, even under process pressure, without the need for process shutdown during routine electrode maintenance and calibration.

Process isolation is achieved during electrode retraction with two sets of double O-ring seals on a unique and compact retraction assembly; no separate valve is required.

The Wet-Tap body design allows full access to the plunger and internal O-rings, to easily perform maintenance such as lubrication/replacement of O-rings and the cleaning of the internal plunger/housing to remove material build up in difficult applications.

A patented cam-activated automatic locking mechanism, SafeLoc™, and the short stroke design help to assure operator safety. The wet-tap unit can be mounted at any angle and can be used with the GF Signet DryLoc® Wet-Tap electrodes.

Features

- Electrode removal without process shutdown
- Space saving 45 mm (1.75 in.) short-stroke design
- Sealed pneumatic dampening for smooth and safe operation
- SafeLoc™: Cam-activated automatic locking mechanism
- Protects electrode sensing surface from breakage
- Suitable for mounting in any orientation
- Process threaded connection NPT or ISO
- Fully serviceable internal O-rings

Applications

- Aquatic Animal Life Support Systems
- Recreational Water Monitoring
- Water & Wastewater Treatment
- Effluent Monitoring
- Neutralization Systems
- Sanitization Systems
- Pool and Spa Control

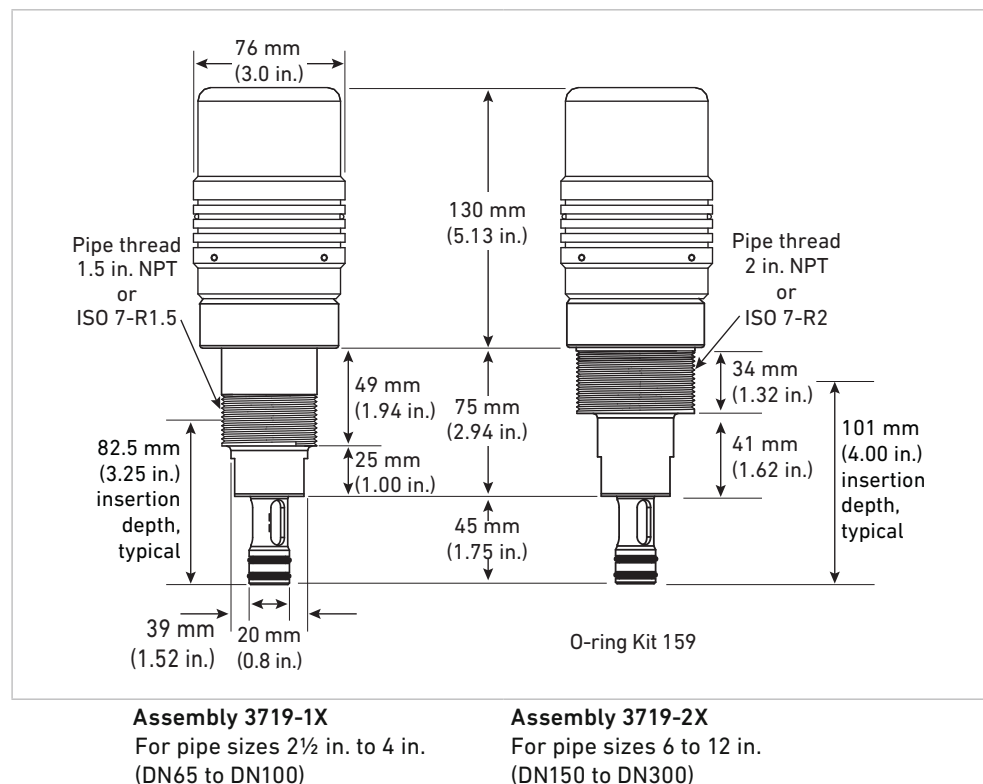
2.5.2 Specifications

Specifications

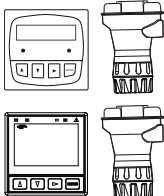
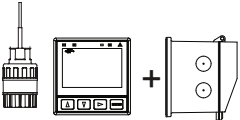
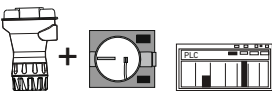
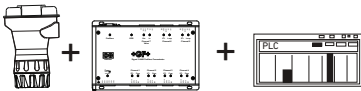

General		
Compatible DryLoc® Electrodes	2756-WTP, 2756-WTP-1	Plastic
	2757-WTP	Plastic
Process Connection	3719-11	NPT 1½ in.
	3719-21	NPT 2 in.
	3719-12	ISO 7/1 - R 1.5
	3719-22	ISO 7/1 - R 2
Maximum Flow Velocity	3 m/s	10 ft/s
Materials		
Retraction Housing (Wetted)	CPVC	
O-rings (Wetted)	FKM (O-Rings are lubricated with Super Lube multi-purpose grease with PTFE)	
Locking Shroud	PVC	
Hardware	316 stainless steel	
Max. Temperature/Pressure Rating		
Operating Pressure	100 psi (6.9 bar) maximum @ 25 °C	
Shipping Weight		
	1.2 kg	2.7 lb
Standards/Approvals		
	Manufactured under ISO 9001 for Quality, ISO 14001 for Environmental Management and OHSAS 18001 for Occupational Health and Safety	

See pressure-temperature diagrams for more information.

Dimensions

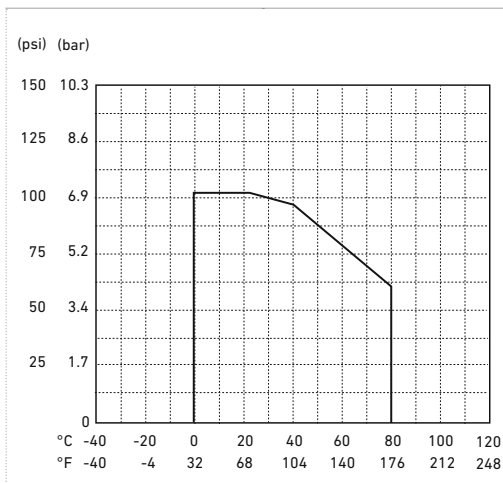


2.5.3 System Overview

Panel Mount	Pipe, Tank, Wall	4 to 20 mA Output	Automation System
GF Signet Instruments with 2751 Smart Sensor Electronics - 8900 - 9900 - 9950 	GF Signet Instruments with 2751 Smart Sensor Electronics - 9900 and Rear Enclosure 	2751 Smart Sensor Electronics with - Customer Supplied Chart Recorder Programmable Logic Controller, or - Programmable Automation Controller 	2751 Smart Sensor Electronics with - 0486 Profibus Concentrator and Customer Supplied Programmable Logic Controller or - Programmable Automation Controller 
GF Signet Model 3719 Wet-Tap Assembly with Wet-Tap Electrode 3-2756-WTP or 3-2757-WTP 		Customer supplied tees and fittings <div style="text-align: right;">All sold separately</div>	

Pressure-temperature diagram

i The pressure-temperature diagram are specifically for the GF Signet sensor. During system design the specifications of all components must be considered. In the case of a metal piping system, a plastic sensor will reduce the system specification.



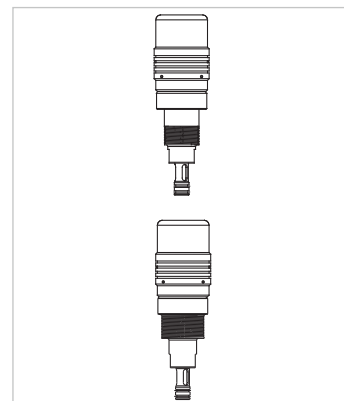
2.5.4 Ordering Information

Wet-Tap Assembly

Mfr. Part No.	Code	Process Thread Connection	For Pipe Size
3-3719-11	159 000 804	1½ inch NPT	2½ to 4 in. (DN65-DN100)
3-3719-12	159 000 806	ISO 7/1-R 1.5	2½ to 4 in. (DN65-DN100)
3-3719-21	159 000 805	2 inch NPT	6 to 12 in. pipes (DN150-DN300)
3-3719-22	159 000 807	ISO 7/1-R 2	6 to 12 in. pipes (DN150-DN300)

Ordering Information

- 1) Use a mounting saddle or a standard threaded part to mount Wet-Tap assembly.
- 2) ASTM fittings are available to order; metric fittings are customer supplied.
- 3) Use -11 or -12 versions for pipe sizes 2½ in. to 4 in. (DN65-DN100)
- 4) Use -21 or -22 versions for pipe sizes 6 in. to 12 in. (DN150-DN300)



2.5.5 Accessories and Replacement Parts

Mfr. Part No.	Code	Description
3-3719.392	159 310 304	O-ring service kit
3-3719.390	159 000 855	3719 locking shroud (spare part)

3 Sensor Electronics

3.1 GF Signet 2756-2757 pH/ORP Wet-Tap Electrodes



3.1.1 Product description

The GF Signet 2756-2757 Wet-Tap pH and ORP electrodes are general purpose sensors ideal for a wide range of applications where the installation and removal of the electrode can be performed without the need for system shutdown.

The GF Signet 3719 pH/ORP Wet-Tap Assembly allows installation and removal of pH or ORP electrodes, even under process pressure, without the need for process shutdown during routine electrode maintenance and calibration. Process isolation is achieved during electrode retraction with two sets of double O-ring seals on a unique and compact retraction assembly; no separate valve is required.

The DryLoc connector with corrosion resistant gold plated contacts readily connects the sensor to the mating 2751 pH/ORP Smart Sensor Electronics or the 2760 Preamplifier. The robust polyarylsulphone (PAS) body and choice of bulb pH or flat ORP sensing elements allow a broad range of chemical compatibility for a wide range of applications.

The quick temperature response is available in either a Pt1000 or 3 KΩ temperature sensor and allows compatibility with all GF Signet pH/ORP instruments.

The Wet-Tap assembly unit can be mounted at any angle and can be used with the GF Signet DryLoc® Wet-Tap pH and ORP electrodes.

Features

- PTFE reference junction resists fouling and chemical attack
- Polyarylsulphone (PAS) body for broad range of chemical compatibility
- General purpose bulb pH glass suitable in a wide range of applications
- Patented DryLoc connector with gold plated contacts
- Pt1000 or 3 KΩm Balco temperature element for quick temperature response
- Electrode removal without process shutdown when installed in the GF Signet 3719 pH/ORP Wet-Tap Assembly
- Memory chip enabled for access to a wide range of unique features when connected to the GF Signet 2751 pH/ORP Smart Sensor Electronics
- Special design allows for installation at any angle, even inverted or horizontal

Applications

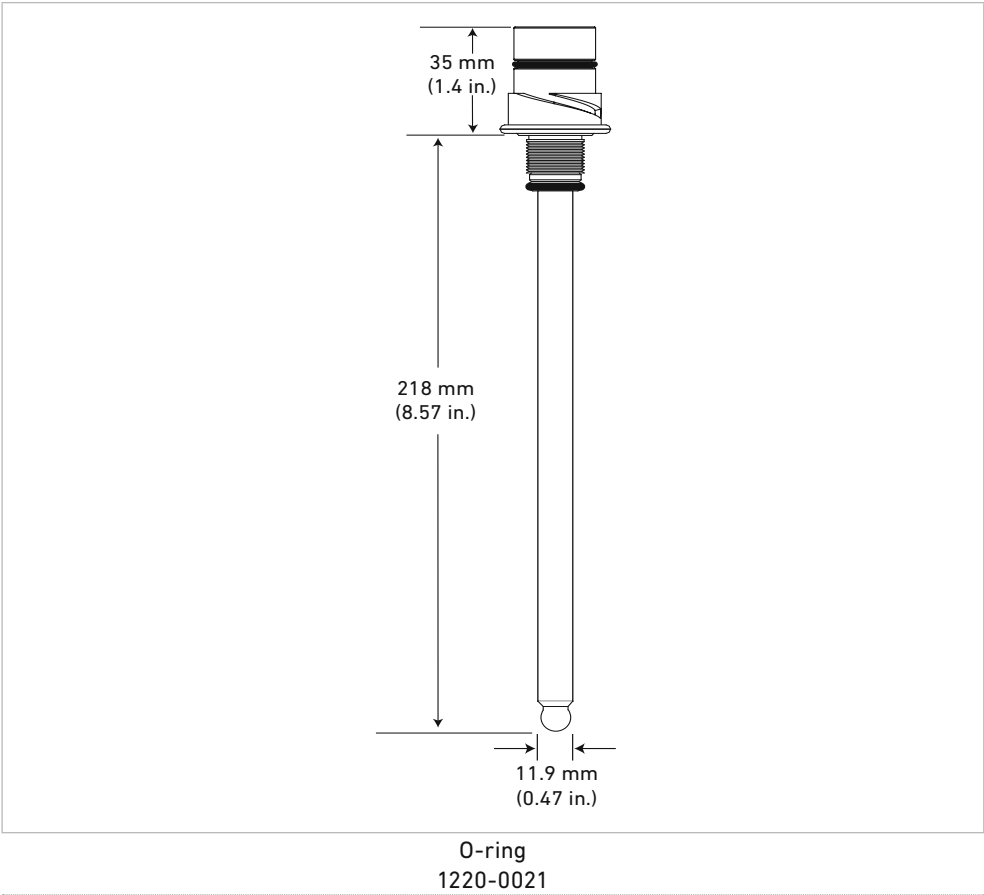
- Aquatic Animal Life Support Systems
- Recreational Water Monitoring
- Water & Wastewater Treatment
- Effluent Monitoring
- Neutralization Systems
- Sanitization Systems
- Pool and Spa Control

3.1.2 Specifications

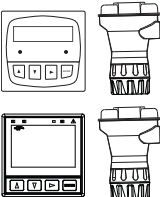
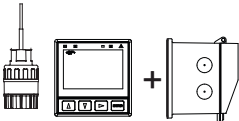
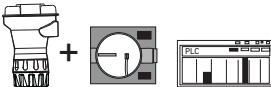


Specifications		
General		
Compatibility	GF Signet 3719 Wet-Tap Assembly, 2751 Smart Sensor Electronics or 2760 Preamplifier	
Operating Range	pH	0 to 14 pH
	ORP	±1500 mV
Connector	CPVC	DryLoc
Temperature Sensor (pH)	Pt1000 or 3K Balco for pH	
Reference Junctions	Porous PTFE	
	Electrolyte	Saturated KCl
	Elements	Ag/AgCl
Response Time		
	pH	< 5s for 95% of signal change
	ORP	Application dependent
Impedance (pH)	< 150 MΩ @ 25 °C	
Wetted Materials		
Body	PAS (Polyarylsulphone)	
Reference Junction	Porous PTFE	
Sensing Surface	pH	Glass membrane
	ORP	Platinum
O-rings	FKM	
Connector	CPVC	
Max. Temperature Rating		
Operating Temperature	0 °C to 85 °C	32 °F to 185 °F
Recommended Storage Temperature		
	0 °C to 50 °C	32 °F to 122 °F
The electrode glass will shatter if shipped or stored at temperature below 0 °C (32 °F)		
The performance life of the electrode will shorten if stored at temperatures above 50 °C (122 °F)		
Mounting		
	Any angle is acceptable. Use with 3719 Wet-Tap assembly for mounting electrodes.	
Shipping Weight		
	0.2 kg	0.4 lb
Standards and Approvals		
	Manufactured under ISO 9001 for Quality	

Dimensions

Electrodes 3-2756 Wet-Tap pH, 3-2757 Wet-Tap ORP

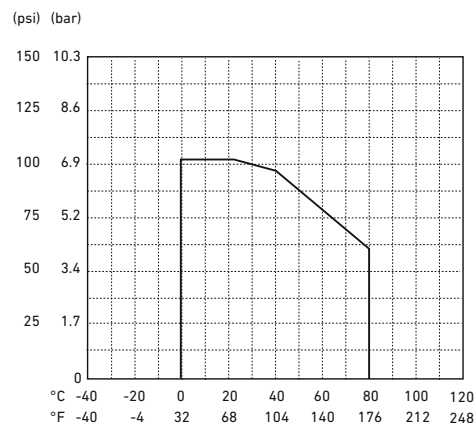


3.1.3 System Overview

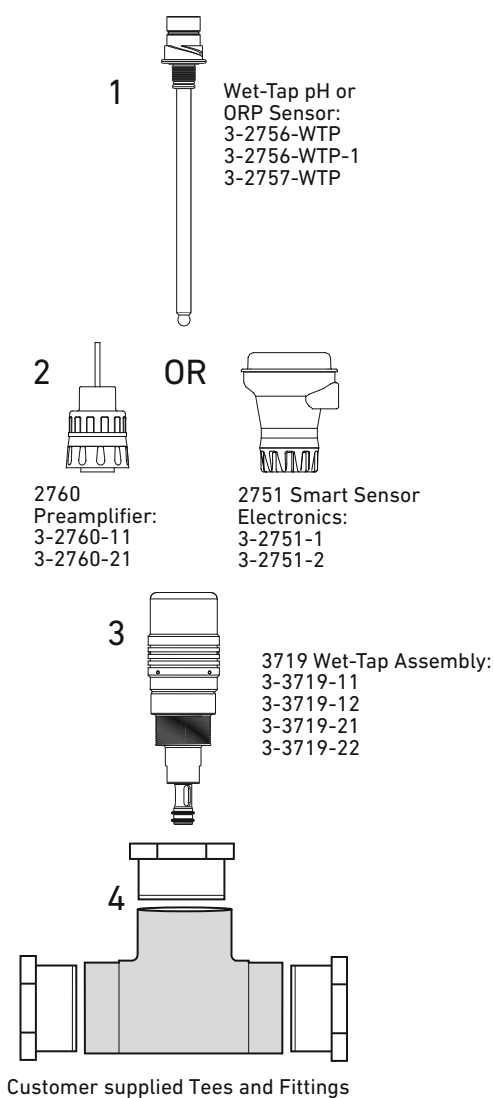
Panel Mount	Pipe, Tank, Wall	4 to 20 mA Output	Automation System
<p>GF Signet Instruments with 2751 Smart Sensor Electronics</p> <ul style="list-style-type: none">- 8900- 9900- 9950 	<p>GF Signet Instruments with 2751 Smart Sensor Electronics</p> <ul style="list-style-type: none">- 9900 and Rear Enclosure 	<p>2751 Smart Sensor Electronics with</p> <ul style="list-style-type: none">- Customer Supplied Chart Recorder- Programmable Logic Controller, or- Programmable Automation Controller 	<p>2751 Smart Sensor Electronics with</p> <ul style="list-style-type: none">- 0486 Profibus Concentrator and Customer Supplied Programmable Logic Controller or- Programmable Automation Controller 
<p>GF Signet Model 3719 Wet-Tap Assembly with Wet-Tap Electrode 3-2756-WTP or 3-2757-WTP</p> 		<p>Customer supplied tees and fittings</p> <p>All sold separately</p>	

Pressure-temperature diagram

i The pressure-temperature diagrams are specifically for the GF Signet sensor. During system design the specifications of all components must be considered. In the case of a metal piping system, a plastic sensor will reduce the system specification.



Product Selection Guide



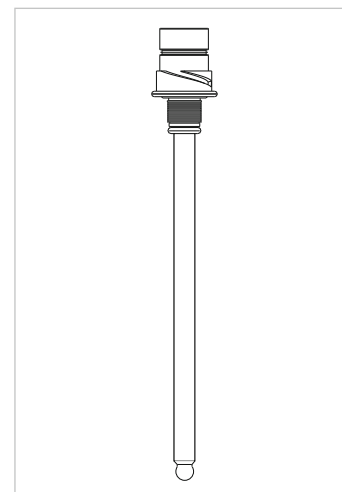
- Step 1 - Choose sensor
- Step 2 - Choose preamplifier or sensor electronics
- Step 3 - Choose Wet-Tap assembly
- Step 4 - Choose a customer supplied mounting option

3.1.4 Ordering Information

Mfr. Part No.	Code	Tip design	Temperature Element	Use With
DryLoc pH Electrodes				
3-2756-WTP	159 001 390	Bulb	Pt1000	2751 Smart Sensor Electronics*
3-2756-WTP-1	159 001 384	Bulb	3 KΩ Balco	2751 or 2760 Preamplifier**
DryLoc ORP Electrodes				
3-2757-WTP	159 001 391	Flat	N/A	2751 Smart Sensor Electronics* or 2760 Preamplifier**

* The 2751 Smart Sensor Electronics has a digital (S³L) output which is used with the 8900, 9900 or 9950 instruments, and the Profibus Concentrator. It also has a 4 to 20 mA output for connections to PLC's, data recorders, etc.

** The 2760 preamplifier is used for connection directly to older GF Signet analog transmitters.



Model 2756-2757 Ordering Notes

- 1) pH and ORP electrodes require connection to model 2751-1 or 2751-2 or 2760-X1

3.1.5 Accessories and Replacement Parts

Mfr. Part No.	Code	Description
3-2700.395	159 001 605	Calibration kit: includes 3 polypropylene cups, box used as cup stand, 1 pint pH 4.01, 1 pint pH 7.00
3822-7115	159 001 606	20 gm bottle quinhydrone for ORP calibration (must use pH 4.01 and/or pH 7.00 buffer solutions)
Other		
1220-0114	159 000 854	3719 O-ring, FKM (spare part)
3-0700.390	198 864 403	pH buffer kit (1 each 4, 7, 10 pH buffer in powder form, makes 50 ml of each)
3822-7004	159 001 581	pH 4 buffer solution, 1 pint (473 ml) bottle
3822-7007	159 001 582	pH 7 buffer solution, 1 pint (473 ml) bottle
3822-7010	159 001 583	pH 10 buffer solution, 1 pint (473 ml) bottle
3-2759	159 000 762	pH/ORP system tester kit for all pH instruments
3-2759.391	159 000 764	Adapter cable for use with 2751 and 2760
3800-5000	159 838 107	3.0M KCl storage solution for pH and ORP, 1 pint (473ml) bottle
3-2700.398	159 001 886	O-ring Lubricant Kit (5 packs of Super Lube, 1cc each)

3.2 GF Signet 2751 DryLoc® pH/ORP Smart Sensor Electronics



DryLoc® Electrodes sold separately

3.2.1 Product description

The GF Signet 2751 pH/ORP Smart Sensor Electronics featuring the DryLoc® connector, is the solution for field-free calibration, out of range glass impedance and broken glass detection, alerting the operator to probe failure or maintenance needs.

The 2751 features two different outputs: a two-wire 4 to 20 mA loop output with optional EasyCal function or a digital (S³L) output which allows for longer cable lengths and is compatible with all GF Signet 8900, 9900 and 9950* instruments or in blind, 4 to 20 mA.

The pH/ORP Smart Sensor Electronics will allow for calibration of electrodes in a laboratory setting and installation of pre-calibrated probes in the field, reducing system downtime. Memory chip enabled electrodes will store operational data such as minimum and maximum pH/mV readings, runtime, minimum and maximum temperature (pH only), for troubleshooting and operational evaluation. To take full advantage of all features and benefits of the 2751, use with GF Signet 9900 (Generation IV or later), 9950 Transmitter or 0486 Profibus Concentrator. The 2751 self-configures for pH or ORP operation via automatic recognition of the electrode type. The optional EasyCal feature allows simple push-button calibration and includes an LED indicator for visual feedback.

The 2751 submersible Smart Sensor Electronic can also be used in-line when used with the 3/4" or 1" threaded sensors including the 272X, 273X, 275X, 276X and 277X series of electrodes. The 2751 in-line sensor electronics can be used with GF Signet fittings up to DN100 (4 in.) and Wet-Tap assemblies.

Features

- Probe health monitoring, glass impedance and broken glass detection
- Memory chip interface that allows for transferable calibration, runtime data, and manufacturing information
- In-line integral mount and submersible installation versions
- Automatic temperature compensation
- Auto configuration for pH or ORP operation
- Optional EasyCal calibration aid with automatic pH buffer recognition for 4, 7 and 10 pH and ORP solutions: quinhydrone saturated pH 4 or 7 buffers and Light's Solution +469 mV
- Junction boxes for convenient wiring
- Patented DryLoc® connector provides a quick and secure connection to the sensor**

* Users of 9950 Gen I and 9950 (Gen 2a) should update to 9950 (Gen 2b, available in Q4) to take full advantage of the 2751 features and benefits. Visit www.gfGF-Signet.com for the latest software update.



** U.S. Patent No.: 6,666,701

Applications

- Water and Wastewater Treatment
- Neutralization Systems
- Scrubber Control
- Effluent Monitoring
- Surface Finishing
- Flocculent Coagulation
- Heavy Metal Removal and Recovery
- Toxics Destruction
- Sanitization Systems
- Pool & Spa Control
- Aquatic Animal Life Support Systems

3.2.2 Specifications

General

Compatible Electrodes

GF Signet DryLoc® pH and ORP Electrodes, Models 2724-2726, 2734-2736, 2756-2757 Wet-Tap, 2764-2767, 2774-2777		
Operating Range	pH	-1 to 15 pH
	ORP	±2000 mV
Response Time	pH	< 6 sec. for 95% of change
	ORP	Application dependent
Materials	In-line	PBT (thermal plastic polyester) and polypropylene (retaining nut)
	Submersible	CPVC

Electrical

Cable	4.6 m	15 ft	3-conductor shielded (3-2751-1 in-line and the 3-2751-3 or -4 submersible sensor electronics only)	
	22 AWG		For 9900, 9950 and 4 to 20 mA max. cable length is 300 m (1000 ft.). For 8900, please refer to the Cable Calculation Table of the GF Signet catalog for max. cable length.	
Power	12 to 24 VDC		±10%, regulated for 4 to 20 mA output	
	5 to 6.5 VDC		±5% regulated recommended, 3 mA max., for digital (S ³ L) output	
Current Output	pH		Fixed 4 to 20 mA, isolated, = 0 to 14 pH (custom scaling available with 0252 tool)	
	ORP		Fixed 4 to 20 mA, isolated, = -1000 to +2000 mV (custom scaling available from ± 2000 mV with 0252 tool)	
Max Loop Resistance	100 Ω max. @ 12 V	325 Ω max. @ 18 V	600 Ω max. @ 24 V	
Accuracy	±32 µA			
Resolution	±5 µA			
Update Rate	0.5 seconds			
Error Indication	3.6 mA, 22 mA, or none			
Digital (S ³ L) Output	Serial ASCII, TTL level 9600 bps			
Accuracy	pH	± 0.02 pH @ 25 °C	± 0.02 pH @ 77 °F	
	ORP	± 1.5 mV @ 25 °C	± 1.5 mV @ 77 °F	
	Temperature	≤ 0.4 °C	0.72 °F	
Resolution	pH	≤ 0.01 pH		
	ORP	1.5 mV		
Update Rate	0.5 seconds			
Available Data	Raw mV, pH or ORP, Temperature (pH), Glass Impedance (pH), Minimum mV (pH), Maximum mV (pH), Minimum Temperature (pH), Maximum Temperature (pH), Model Number, Serial Number, Manufacturing Date, Runtime, Slope pH/mV, Measurement Offset, and Temperature			
Error Indication	Open input diagnostic, broken glass detection (pH), High Impedance			
Input Impedance Z	>10 ¹¹ Ω			

Environmental

Enclosure	3-2751-1 & -2	NEMA 4X/IP65 with electrode connected
	3-2751-3 & -4	NEMA 6P/IP68 with electrode and watertight conduit and/or extension pipe connected

Max. Temperature/Pressure Rating

Operating Temperature		
Submersible	0 °C to 85 °C	32 °F to 185 °F
In-line	0 °C to 85 °C	32 °F to 185 °F
Storage Temperature	-20 °C to 85 °C	-4 °F to 185 °F
Relative Humidity	0 to 95%, non-condensing (without electrode connected)	

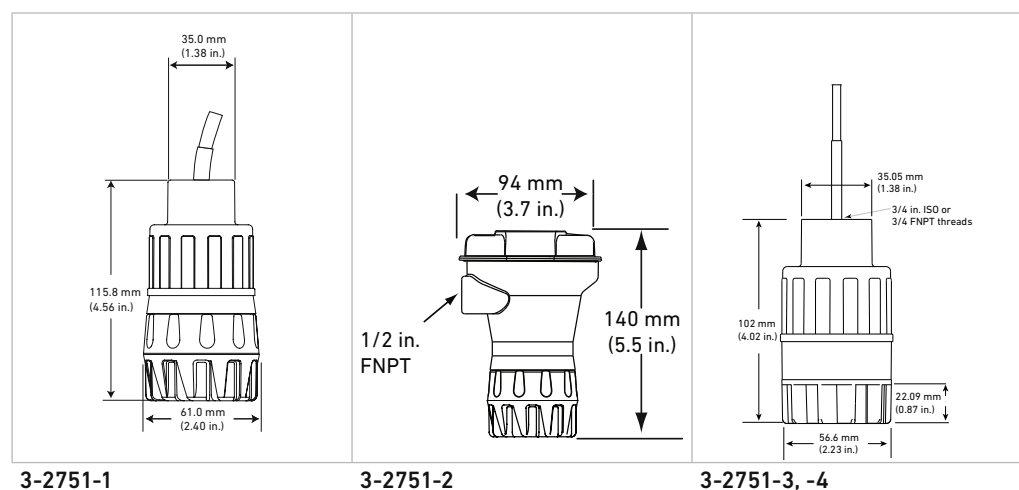
Shipping Weight

2751-2	0.75 kg	1.65 lb
2751-1, -3 & -4	0.64 kg	1.41 lb

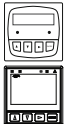


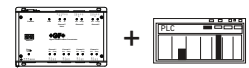

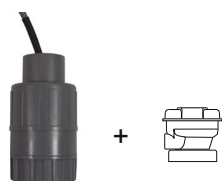

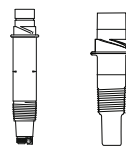
Standards and Approvals

CE, FCC
RoHS compliant, China RoHS
Manufactured under ISO 9001 for Quality and ISO 14001 for Environmental Management and OHSAS 18001 for Occupational Health and Safety

Dimensions



3.2.3 System Overview

Panel Mount	Pipe, Tank, Wall Mount	4 to 20 mA Output*	Automation System
In-Line Installation			
<p>GF Signet Instruments with 2850 Sensor Electronics</p> <ul style="list-style-type: none">- 8900- 9900- 9950 	<p>GF Signet Instruments</p> <ul style="list-style-type: none">- 9900 and Rear Enclosure 	<p>GF Signet 2751 Smart Sensor Electronics with</p> <ul style="list-style-type: none">- Customer Supplied Chart Recorder or Programmable Logic Controller or- Programmable Automation Controller 	<ul style="list-style-type: none">- 0486 Profibus Concentrator and- Customer Supplied Programmable Logic Controller or- Programmable Automation Controller 
<p>GF Signet 2751 Smart Sensor Electronics</p> 	<p>GF Signet 2751 Smart Sensor Electronics</p> <p>with</p> <ul style="list-style-type: none">- GF Signet 3-8050-2 Universal Junction Box (EasyCal) 	<p>GF Signet 2751 Smart Sensor Electronics</p> 	
<p>GF Signet Electrodes</p> <ul style="list-style-type: none">- 2724-2726- 2734-2736- 2764-2767- 2774-2777 			

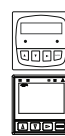




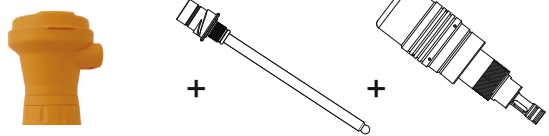
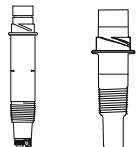
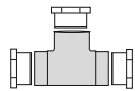
2724-2726 and 2734-2736 DryLoc Electrodes: Use GF fittings* or customer supplied 3/4 in. NPT fittings

2764-2767 and 2774-2777 DryLoc Electrodes: Use customer supplied 3/4 in. or 1 in. NPT fittings

All sold separately

2724-2726 and 2734-2736 DryLoc Electrodes: Use GF fittings* or customer supplied 3/4 in. NPT fittings
 2764-2767 and 2774-2777 DryLoc Electrodes: Use customer supplied 3/4 in. or 1 in. NPT fittings

All sold separately




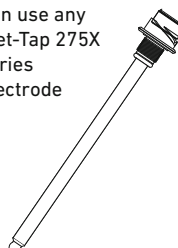
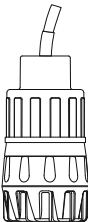
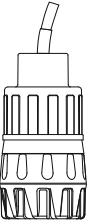

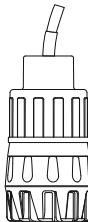



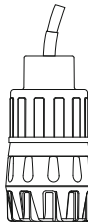
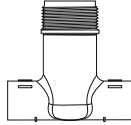
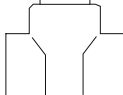
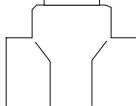
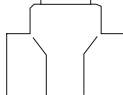
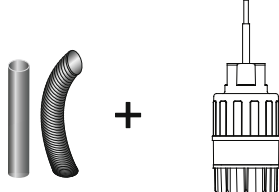

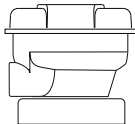


Panel Mount	Pipe, Tank, Wall Mount	4 to 20 mA Output*	Automation System
Submersible Installation			
Wet-Tap Installation			
GF Signet Instruments with 2850 Sensor Electronics - 8900 - 9900 - 9950 	GF Signet Instruments - 9900 and Rear Enclosure 	GF Signet 2751 Smart Sensor Electronics with - Customer Supplied Chart Recorder or Programmable Logic Controller or - Programmable Automation Controller 	- 0486 Profibus Concentrator and - Customer Supplied Programmable Logic Controller or - Programmable Automation Controller 
GF Signet 2751 Smart Sensor Electronics with customer supplied pipe extension or conduit, 3/4 in. NPT or ISO 7/1-R 3/4 threads** 	GF Signet 2751 Smart Sensor Electronics with GF Signet Wet-Tap Electrode 2756, 2757 and GF Signet 3719 Wet-Tap 		
GF Signet Electrodes 2724-2726 2734-2736 2764-2767 2774-2777 	GF Tees and Fittings see model 3719 for more info 		

All sold separately

* See fittings section for more information.

**Refer to the GF Signet Submersion Kit brochure (3-0000.707) located on our website for installation suggestions and options.

2751 Product Selection Guide

1. Choose the Electrode	<p>2724-2726, 2734-2736</p> <p>Can use Any 3-272X or 273X series electrode</p> 	<p>2764-2767 Differential</p> <p>3-2764-1 3-2764-2 3-2766-1 3-2766-2</p> 	<p>2774-2777</p> <p>ORP electrodes must have 10K ID resistor use: 3-2775, 3-2777</p> <p>pH electrodes can be either the 1K or 3K use: 3-2774, 3-2774-1, 3-2776, 3-2776-1</p> 	<p>2756 and 2757 Wet-Tap</p> <p>Can use any Wet-Tap 275X series electrode</p> 				
2. Determine the mounting style:								
In-line	 <p>2751-1 or -2</p>	 <p>2751-1 or -2</p>	 <p>2751-3 or -4</p>	 <p>2751-1 or -2</p>	 <p>2751-3 or -4</p>	 <p>2751-1 or -2</p>	 <p>2751-3 or -4</p>	 <p>2751-1 or -2</p>
And								
-In-line fitting	 <p>1/2" to 4" Signet fitting</p>	 <p>3/4" reducing tee</p>	 <p>1" threaded tee</p>	 <p>3/4" reducing tee</p>				
Or								
Submersible	<p>2751-3 or -4 and cable conduit (customer supplied) connected to 3/4" sensor electronics</p> 						 <p>3719 Wet-Tap Assembly</p> <p>(Submersible not applicable with Wet-Tap assembly)</p>	
3. Junction Boxes	<p>3-8050-1: Use when extending the submersible cable over long distance.</p> <p>3-8050-2: Use with the submersible 2751-3 or -4 and the in-line 2751-1 for best calibration results with the EasyCal function when using the blind 4 to 20 mA output.</p>							
4. Choose the output instrument								
Digital (S ^L)				OR				
Or								
4 to 20 mA	9900 or 9950 Instruments, Profibus Concentrator							PLCs or Chart Recorders

Application Tips

- The EasyCal feature automatically recognizes standard 4.0, 7.0, and 10.0 pH buffer or ORP quinhydrone solutions of +87 and +264 mV or Light's Solution, +469 mV, and simplifies calibration. For EasyCal ORP only single point calibration is used.
- Frequency of calibration of electrodes is dependent upon the application.

3.2.4 Ordering Information

Model 2751 Ordering Information

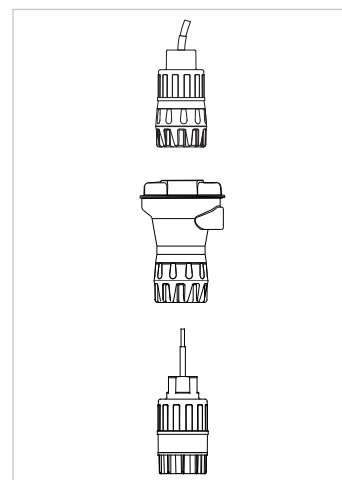
1. Model 2751 requires 12 to 24 VDC to function as a blind 4 to 20 mA output transmitter.
2. Order a 3-2751-2 or any other 2751 with a junction box 3-8050-2 if the EasyCal feature is desired.
3. Conduit and mounting brackets for submersion installation must always be used (customer supplied).
4. The 3-2759 System Tester must be ordered with the adapter cable 3-2759.391 for exclusive use with the 2751.
5. All sensor electronics, preamplifiers and connectors require a DryLoc electrode for full system installation.
6. The 2751 Smart Sensor Electronics is compatible with all GF Signet 8900, 9900 and 9950 instruments. To take full advantage of the advanced features use the 9900 SmartPro Transmitters (Generation IV or greater), 9950 and 0486 Profibus Concentrator.

Mfr. Part No.	Code	Description
In-line Smart Sensor Electronics (Yellow body)		
3-2751-1	159 001 804	with 4.6 m (15 ft) cable, recommended for 9900 or 9950 instruments
3-2751-2	159 001 805	with junction box and EasyCal, recommended for 4 to 20 mA use
Submersible Smart Sensor Electronics (Gray body)		
3-2751-3	159 001 806	with 4.6 m (15 ft) cable and ¾ in. NPT threads - when 4 to 20 mA is required use the 3-8050-2 junction box with EasyCal
3-2751-4	159 001 807	with 4.6 m (15 ft) cable and ISO 7/1-R 3/4 threads - when 4 to 20 mA is required use the 3-8050-2 junction box with EasyCal

Sensor Electronics with preamplified signal and Digital (S³L) output (for use with the SmartPro Instruments) or 4 to 20 mA output - power supplied to unit dictates output type.



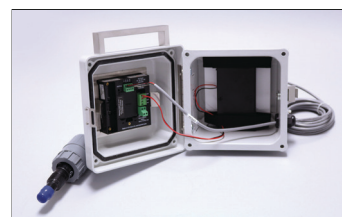
The 2751 Smart Sensor Electronics is compatible with 8900, 9900 and 9950 SmartPro Transmitters, and GF Signet 0486 Profibus Concentrator. To take full advantage of the 2751 features, use 9900 (Generation IV or later), 9950 or 0486 Profibus Concentrator.



3.2.5 9900 pH/ORP Calibrator (150 399 007)

The 9900 battery operated calibrator is built to enhance the user experience with the new line of 2751 Smart pH/ORP sensor electronics. This unit can be kept in a lab or taken in to the field. The calibration storage capability of the pH/ORP electrodes when used with the 2751 Smart sensor electronics, allows the user the ability to rotate electrodes, meaning unplug an aged/ dirty electrode replacing with a pre-calibrated electrode.

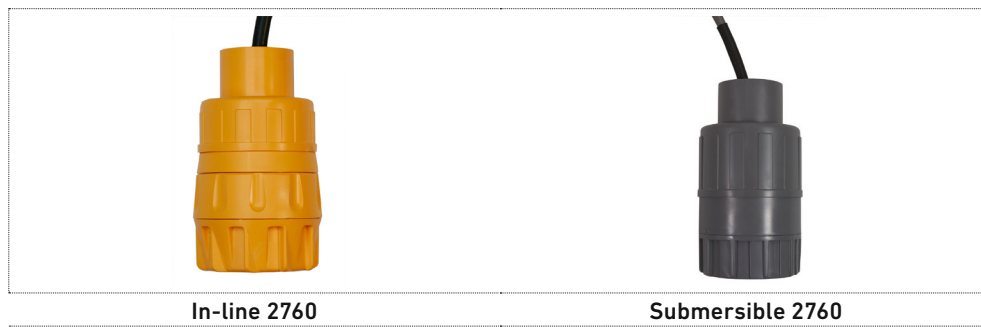
With larger installations, all collected dirty and uncalibrated electrodes can be taken to a central well organized location where proper cleaning and calibration can be performed. This improves efficiency of this process resulting more stable readings, higher sensitivity, faster response time, and overall more accurate readings. Runs on (8) AA Alkaline batteries (included).



3.2.6 Accessories and Replacement Parts

Mfr. Part No.	Code	Description
Calibration		
3-2700.395	159 001 605	Calibration kit: includes 3 polypropylene cups, box used as cup stand, 1 pint pH 4.01, 1 pint pH 7.00
3822-7115	159 001 606	20 gm bottle quinhydrone for ORP calibration (must use pH 4.01 and/or pH 7.00 buffer solutions)
3-2759	159 000 762	pH/ORP system tester (adapter cable sold separately)
3-2759.391	159 000 764	2759 adapter cable for use with 2751 DryLoc sensor electronics
3-0700.390	198 864 403	pH buffer kit (1 each 4, 7, 10 pH buffer in powder form, makes 50 ml of each)
3822-7004	159 001 581	pH 4 buffer solution, 1 pint (473 ml) bottle
3822-7007	159 001 582	pH 7 buffer solution, 1 pint (473 ml) bottle
3822-7010	159 001 583	pH 10 buffer solution, 1 pint (473 ml) bottle
Mounting		
3-8050.390-3	159 310 116	Retaining nut replacement kit, Black Polypropylene
3-8050-1	159 000 753	Universal mount junction box
3-8050-2	159 000 754	Universal mount junction box w/EasyCal (for submersible applications, use with 3-2751-3 and -4 where 4 to 20 mA is required)
3-9000.392-1	159 000 839	Liquid tight connector kit, NPT (1 connector)
3-9000.392-2	159 000 841	Liquid tight connector kit, PG 13.5 (1 connector)
Other		
5523-0322	159 000 761	Sensor cable (per ft), 3-cond. plus shield, 22 AWG, black/red/white (for use with 2751)
P31515-0P200	159 000 630	Universal Pipe Adapter PVC
P31515-0C200	159 000 631	Universal Pipe Adapter CPVC
P31515-0V200	159 000 459	Universal Pipe Adapter PVDF
7310-1024	159 873 004	24 VDC power supply, 10W, 0.42 A
7310-2024	159 873 005	24 VDC power supply, 24W, 1.0 A
7310-4024	159 873 006	24 VDC power supply, 40W, 1.7 A
7310-6024	159 873 007	24 VDC power supply, 60W, 2.5 A
7310-7024	159 873 008	24 VDC power supply, 96W, 4.0 A
3-2700.398	159 001 886	O-ring Lubricant Kit (5 packs of Super Lube, 1cc each)

3.3 GF Signet 2760 DryLoc® pH/ORP Preamplifiers (Not for new designs or installations)



3.3.1 Product description

The GF Signet 2760 pH/ORP Preamplifiers features the DryLoc® connector, providing a robust connection to GF Signet DryLoc electrodes.

The 2760 preamplifier allows any DryLoc pH/ORP electrode to work with GF Signet ProcessPro® and ProPoint® pH/ORP instruments.

The DryLoc electrode connector system quickly forms a robust assembly for submersible and in-line installations. Optional NEMA 4X junction enclosures extend the preamplifier cable to long distances.

The 2760 submersible preamplifier can also be used as an In-line preamplifier when used with the ¾ in. or 1 in. threaded sensors including the 2724, 2774 and 2764 series electrodes.

The 2760 In-line preamplifier can be used with GF Signet fittings up to DN100 (4 in.) and Wet-Tap assemblies.

The 2760 pH/ORP Preamplifiers are compatible with the GF Signet 8750 and older analog transmitters. The 8900 and 9900 instruments and Profibus Concentrator require the use of the 2751 Smart Sensor Electronics, and are **not** compatible with the 2760 preamplifier.

Features

- In-line integral mount and submersible installation versions
- Compatible with pH or ORP sensors
- Patented DryLoc® connector provides a quick and secure connection to the sensor*

*U.S. Patent No.: 6,666,701

Applications

- Water/Wastewater Treatment
- Neutralization Systems
- Scrubber Control
- Effluent Monitoring
- Surface Finishing
- Flocculent Coagulation
- Heavy Metal Removal and Recovery
- Toxic Destruction
- Sanitization Systems
- Pool & Spa Control
- Aquatic Animal Life Support Systems



3.3.2 Specifications

General

Compatible Electrodes	GF Signet DryLoc pH and ORP Electrodes Models 2724-2726, 2756-2757 Wet-Tap, 2764-2767, 2774-2777 All pH sensors used with the 2760/8750 must have a 3K Temperature sensor	
Compatible Instruments	8750 and 5700	
Operating Range	pH	0 to 14 pH
	ORP	±2,000 mV
Response Time	pH	< 6 sec. for 95% of change
	ORP	application dependent
Materials	In-line	Valox® (PBT)
	Submersible	CPVC

Electrical

Cable	4.6 m (15 ft) supplied, 120 m (400 ft) max 6 cond., foil shield with drain wire, 24 AWG
-------	--

Max. Temperature/Pressure Rating

Operating Temperature	Submersible	0 °C to 85 °C	32 °F to 185 °F
	In-line	0 °C to 110 °C	32 °F to 230 °F
Storage Temperature	-20 °C to 85 °C	-4 °F to 185 °F	
Relative Humidity	0 to 95%, non-condensing (without electrode connected)		

Environmental

Enclosure	Submersible	NEMA 6P/IP68 with electrode and watertight conduit and/or extension pipe connected
	In-line	NEMA 4 with electrode and watertight conduit and/or extension pipe connected

Shipping Weight

	0.64 kg	1.14 lb
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Standards and Approvals

CE, FCC

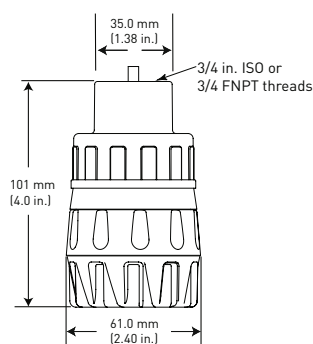
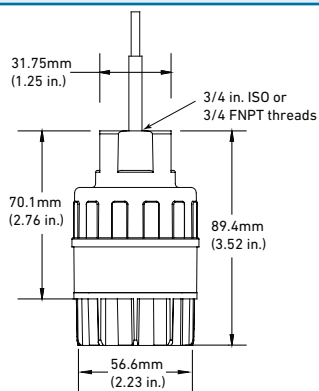
RoHS compliant, China RoHS

Manufactured under ISO 9001 for Quality and ISO 14001 for Environmental Management and OHSAS 18001 for Occupational Health and Safety

Dimensions

3-2760-1, -2




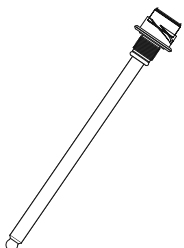
3-2760-11, -21



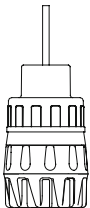
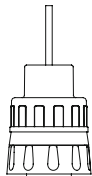

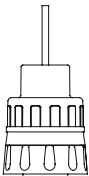

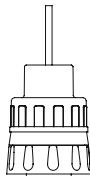
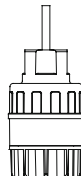
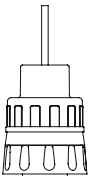
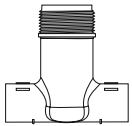
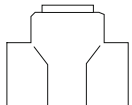
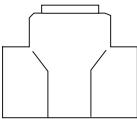
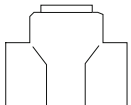

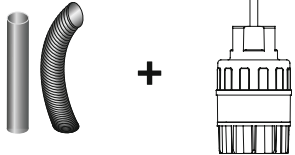
3.3.3 2760 Product Selection Guide

2760 Product Selection Guide

1. Choose the Electrode

2724-2726	2764-2767 Differential	2774-2777	2756 and 2757 Wet Tap
3-2724-10, -11 3-2724-HF-10, -11 3-2725-60, -61 3-2726-10, -11 3-2726-HF-10, -11 3-2726-LC-10, -11	3-2764-1 3-2765-1 3-2766-1 3-2767-1	3-2774 3-2775 3-2776 3-2777	3-2756-WTP 3-2756-WTP-1 3-2757-WTP
			

2. Determine the mounting style

2. Determine the mounting style								
In-line								
	2760-11 or -21	2760-11 or -21	2760-1 or -1	2760-11 or -21	2760-1 or -1	2760-11 or -21	2760-1 or -1	2760-11 or -21
And								
In-line fitting	GF Signet fitting	3/4" reducing tee	1" reducing threaded tee	3/4" reducing tee				
Or	Submersible						3719 Wet-Tap Assembly	
	2760-1 or -2 and cable conduit (customer supplied) connected to 3/4" sensor electronics						Submersible not applicable with Wet-Tap assembly	

Application Tips

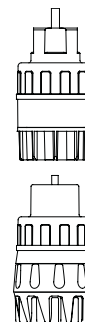
- The EasyCal feature automatically recognizes standard 4.0, 7.0, and 10.0 pH buffer or ORP Quinhydrone solutions of 87 and 264 mV and simplifies calibration.
- Frequency of calibration of electrodes is dependent upon the application.

3.3.4 Ordering information

Model 2760 Ordering Notes

1. Conduit and mounting brackets for submersion installation must always be used (customer supplied).
2. The 3-2759 System Tester must be ordered with the adapter cable 3-2759.391 for exclusive use with the 2760.
3. All sensor preamplifiers and connectors require a DryLoc electrode for full system installation.
4. Use Models 2724-2726, 2756-WT, 2757-WT, 2764-2767 and 2774-2777 pH and ORP electrodes with the 2760.




Mfr. Part	Code	Description
Submersible pH/ORP Preamplifier (gray body) for use with the 8750 instrument		
3-2760-1	159 000 939	¾ in. NPT threads and 4.6 m (15 ft) cable
3-2760-2	159 000 940	¾ in. ISO threads and 4.6 m (15 ft) cable
In-line pH/ORP Preamplifier (yellow body); use with GF Signet fittings or Wet-Tap sensors and other manufacturer's instruments		
3-2760-11	159 001 367	¾ in. NPT threads and 4.6 m (15 ft) cable
3-2760-21	159 001 368	¾ in. ISO threads and 4.6 m (15 ft) cable



3.3.5 Accessories and Replacement Parts

Mfr. Part	Code	Description
Calibration		
3-2700.395	159 001 605	Calibration kit: includes 3 polypropylene cups, box used as cup stand, 1 pint pH 4.01, 1 pint pH 7.00)
3822-7115	159 001 606	20 gm bottle quinhydrone for ORP calibration (must use pH 4.01 and/or pH 7.00 buffer solutions)
3-2579	159 000 762	pH/ORP system tester (adapter cable sold separately)
3-2759.391	159 000 764	2759 adapter cable for use with 2750 and 2760 DryLoc® sensor electronics
3-0700.390	198 864 403	pH buffer kit (1 each 4, 7, 10 pH buffer in powder form, makes 50 ml of each)
3822-7004	159 001 581	pH 4 buffer solution, 1 pint (473 ml) bottle
3822-7007	159 001 582	pH 7 buffer solution, 1 pint (473 ml) bottle
3822-7010	159 001 583	pH 10 buffer solution, 1 pint (473 ml) bottle
Other		
5523-0624	159 000 636	Cable, 6-cond. plus shield, 24 AWG, black/red/white (for use with 2760, orders must specify length per foot)
3-8050	159 000 184	Universal mounting kit
3-8050.390-1	159 001 702	Retaining nut replacement kit, Valox K4530

4 GF Signet Single and Multi-Parameter Specification Matrix

	9950	9900	8900
			
Description	Multi-Channel (2 channel) Multi-Parameter Controller	Single-Channel 9900: Multi-Parameter Transmitter	Multi-Channel, Multi-Parameter Controller
Modular Components	Yes	Yes	Yes
Number of Flow Totalizers	2 Permanent 2 Resettable	1 Permanent 1 Resettable	6 Permanent 6 Resettable
Max. Sensor Inputs	2 frequency or S ³ L inputs	1	(up to 2 frequency and 4 (S ³ L) or 6 (S ³ L) 6 total sensor inputs
Mounting Options	Panel	Panel, Wall, Pipe, Tank	Panel
Display	LCD, Dot matrix	LCD with digital bar graph	LCD
Analog Output Types	2 Standard Passive, 4 to 20 mA outputs 2 or 4 optional passive, 4 to 20 mA Outputs via Channel Dual Modules 2 Passive 4 to 20 mA	9900: 2 Passive 4 to 20 mA 1 Standard, 1 Optional with 4 to 20 mA Output module HART optional with H COMM module	4 Passive/Active 4 to 20 mA or (4) 0 to 5/10 VDC
Max. Relays / O.C.	4 dry contact relays or 2 mechanical and 2 solid state relays (optional relay module)	1 open collector (standard) 2 relays (optional relay module)	up to 8 relays (via 8059)
Derived Measurements	6 derived measurements sum, delta (difference), ratio, % passage % reject, % recovery	N/A	Sum, Difference, % Recovery, % Reject, % Passage, Ratio, Power (BTU)
Languages	English, French, German, Spanish and Simplified Chinese	English	English, French, German, Spanish, Italian, and Portuguese
Ambient Temperature	DC: -10°C to 70°C (14 to 158 °F) AC: -10°C to 60°C (14 °F to 140 °F) -15 °C to 70°C (5 °F to 158 °F)	-10 °C to 70 °C (14 °F to 158 °F) -15 °C to 70 °C (5 °F to 158 °F)	-10 °C to 55 °C (14 °F to 131 °F) -15 °C to 80 °C (5 °F to 176 °F)
Storage Temperature			
Relative Humidity	0 to 95%, non-condensing	0 to 95%, non-condensing	0 to 95%, non-condensing
Power Requirements	DC – 24 VDC nominal (12 to 32 VDC, ± 10% regulated) AC – 100 to 240 VAC, 50 to 60 Hz, 24V	24 VDC input; range: 10.8 to 35.2 VDC regulated	12 to 24 VDC ±10%, regulated or 100 to 240 VAC ±10%, regulated, 50/60 Hz
Standards and Approvals	CE, UL, CUL, FCC, RoHS compliant, China RoHS , NEMA TYPE 4X/IP65 (front face only on panel mount)	9900: CE, FCC, UL, CUL, RoHS compliant, Lloyd's Register, China RoHS, NEMA TYPE 4X/IP65 (front face only on panel mount); field mount is 100% NEMA TYPE 4X/IP65	CE, FCC, UL, CUL, RoHS compliant, China RoHS NEMA 4X/IP65 (front face only)

Planning Fundamentals of Valves and Automation

Measurement and Control - Conductivity/ Resistivity Sensors

Content

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1 Technical basics - Conductivity/Resistivity Sensors

1.1 System Compatibility

The chart below outlines the compatibility between GF Signet pH/ORP and conductivity/resistivity electrodes, instruments and sensor fittings. Refer to individual product pages and fittings section of the catalog for more information.

Instruments, Sensor Electronics, and Preamplifiers	Electrodes						
	pH/ORP				Conductivity		
	2724- 2726	2734- 2736	2764- 2767	2774- 2777	2818- 2821	2822- 2823	2839- 2842
2751 pH/ORP Smart Sensor Electronics	✓	✓	✓	✓			
2760 pH/ORP Preamplifier	✓		✓	✓			
2850 Conductivity Sensor Electronics					✓	✓	✓
8900 Multi-Parameter Controller with Sensor Electronics	✓	✓	✓	✓	✓	✓	✓
9900 Transmitter with Sensor Electronics	✓	✓	✓	✓	✓	✓	✓
9950 Transmitter	✓	✓	✓	✓	✓	✓	✓
Fittings - Customer Supplied	✓	✓		✓	✓	✓	✓
¾ in. process connections	✓	✓					✓
ISO 7/1-R3/4 process connections					✓		
Tri-clamp fittings			✓				
1 in. process connections							
GF Fittings For use with fittings up to DN100 (4 in.) only	✓	✓					
Fiberglass Glue-On Saddle	✓	✓					
Metric PP Union Tee	✓	✓					
Metric PVDF Union Tee	✓	✓					
PVC SCH 80 Tee	✓	✓					
PVC SCH 80 Tee w/pipe	✓	✓					
PVC-C SCH 80 Tee	✓	✓					
PVC-C SCH 80 Tee w/pipe	✓	✓					
PVC Clamp-on Saddle	✓	✓					
Fiberglass Glue-On Tee	✓	✓					
Iron Threaded Tee (NPT)	✓	✓					
Iron Strap-On Saddle	✓	✓					
Copper Sweat-On Tee	✓	✓					
Brass Brazolet	✓	✓					
Carbon Steel Tee (NPT)	✓	✓					
Carbon Steel Weldolet	✓	✓					
316 SS Threaded Tee (NPT)	✓	✓					
316 SS Weldolet	✓	✓					
Brass Threaded Tee (NPT)	✓	✓					
Metric/BSP PVC Union Tee*	✓	✓					
Metric/BSP PVC Saddle*	✓	✓					

*Available only through your local GF Piping Systems sales office.

1.2 Technical Reference Section: Conductivity/Resistivity

Information in this section addresses frequently asked questions regarding Conductivity (Resistivity) and is provided as REFERENCE ONLY to supplement procedures and recommendations specifically outlined in individual product instruction manuals.

i All manuals, data sheets, and additional helpful information are available at www.gfsignet.com

Definition of Conductivity and Resistivity

Conductivity is a measure of the ability of a material to convey an electric current. The proper term for this ability of a solution is electrolytic conductivity, since only ions conduct electric current in solution. When dissolved in solution, many substances such as salts, acids and bases dissociate into ions. Electrolytic conductivity (or simply conductivity) is therefore an indirect measure of the ionic concentration of a solution. Generally, conductivity increases and decreases with the concentration of ions.

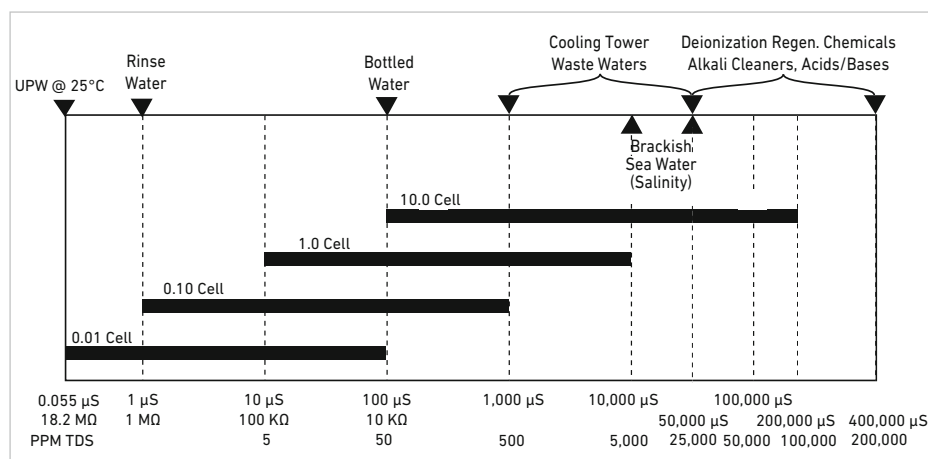
Unlike pH, which is a specific measure of Hydrogen ion concentration, conductivity is a non-selective measurement of all the dissolved ionic species in a solution. As such, it is a highly utilized parameter in water, wastewater and industrial process analyses. For example, conductivity is used to monitor the salt load of waters entering treatment facilities, to monitor and control the quality of drinking water and ultra-pure water, and to otherwise detect contaminants in industrial processes.

According to the International Standards Organization (ISO) the unit of conductance is the Siemens (S), after Werner von Siemens (1816-1892). However, the following three separate units of measure are commonly used to express conductivity: Siemens/cm (S/cm), mhos/cm, and $\mu\text{S/cm}$.

For any given measurement Siemens/cm and mhos/cm are exactly equal; they are merely different labels for the same value. The denominator in these units (cm) is sometimes truncated but is always assumed to be present.

Ohm•cm is a unit of resistivity (the inverse of conductivity) and is frequently replaced by " Ω " the symbol for electrical resistance. Units of resistivity are most commonly associated with ultra-pure water measurements in the millions of ohm•cm, or M Ω (megohms). Some users will also find it desirable to express conductivity in terms of parts per million (PPM) or parts per billion (PPB) of total dissolved solids (TDS). GF Signet instruments accommodate this by allowing the entry of a TDS factor to convert from standard units of conductivity. (See the instruction manual of any current GF Signet conductivity instrument for details.)

Conductivity is a measurement parameter with a very wide range. For example, ultra-pure water has a theoretical maximum resistivity of approximately 18.2 M Ω , approximately 0.055 μS (microsiemens), whereas concentrated acids and bases can exceed 400,000 μS . Despite the wide-ranging possibilities most applications for conductivity measurement are much narrower. Tap water, for instance, typically measures between 50 and 1,000 μS .



Principle of Operation

Most conductivity electrodes consist of two measuring half-cells. The geometry of the half-cells can be tailored to provide highly accurate measurements over a specific conductivity range. Cell constants help to describe electrode geometry for the purpose of selecting the appropriate electrode for a given application. A cell constant is defined as the length between the two half-cells divided by the area of the cells.



$$\text{Conductivity Cell Constant} = \frac{\text{Length}}{\text{CSA}^*} = \frac{z}{xy}$$

* CSA is cross sectional area

As an example, When $x = y = z = 1\text{cm}$ the cell constant becomes



$$\frac{1\text{cm}}{1\text{cm}^2} = 1\text{cm}^{-1}$$

Solutions of very low conductivity (high resistivity) such as ultra-pure water are best measured with half-cells that are very close together (i.e., cell constant = 0.01 cm^{-1}). Highly conductive solutions should be measured with half-cells that are farther apart and have relatively little cross sectional area between them (i.e., cell constant = 20.0 cm^{-1}).

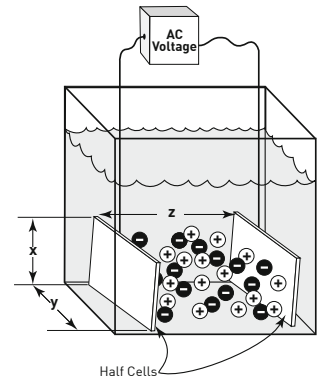
Temperature Compensation

The conductivity of a solution is highly dependent upon temperature. Therefore, conductivity measurements are almost always converted to an equivalent conductivity at the common reference temperature of $25\text{ }^{\circ}\text{C}$ ($77\text{ }^{\circ}\text{F}$). This is accomplished by means of temperature compensation algorithms in the instruments, which require temperature as well as conductivity measurement input. To simplify and facilitate this requirement all GF Signet conductivity electrodes contain high-quality temperature sensing elements intelligently positioned for quick and accurate response. Temperature effects on conductivity are more or less linear for normal water-based solutions, hovering around 2% per $^{\circ}\text{C}$. However, the actual linear relationship varies considerably with the ionic composition of the solution and can range from less than 1% to more than 3% per $^{\circ}\text{C}$.

This is true of regional ground water sources as well as for other solutions such as brackish water, acids and bases. GF Signet instruments allow the entry of custom linear compensation coefficients for these applications. See the instruction manual of any GF Signet conductivity instrument for details. The conductivity or resistivity of pure water is not a linear function with respect to temperature. In fact, the latest GF Signet conductivity instruments utilize a sophisticated polynomial to compensate for the peculiar effects. For seamless measurement accuracy all current GF Signet conductivity instruments switch automatically between linear and pure-water compensation as certain measurement thresholds are crossed.

Temperature Compensation Exception

One exception to the requirement for temperature compensation has been established by USP (United States Pharmacopeia), which prescribes limits of acceptability for ultra-pure water quality based upon non-compensated measurements. This methodology is used to eliminate measurement variances that may result from differences in the pure-water temperature compensation algorithms used by different manufacturers of conductivity measurement equipment. A more thorough treatment of the USP standard and instrument functionality can be found in the instruction manuals of the following GF Signet conductivity instruments: Model 8900 Multi-Channel, Multi-Parameter Controller (Appendix D), model 8860 Dual Channel Conductivity/Resistivity Controller.

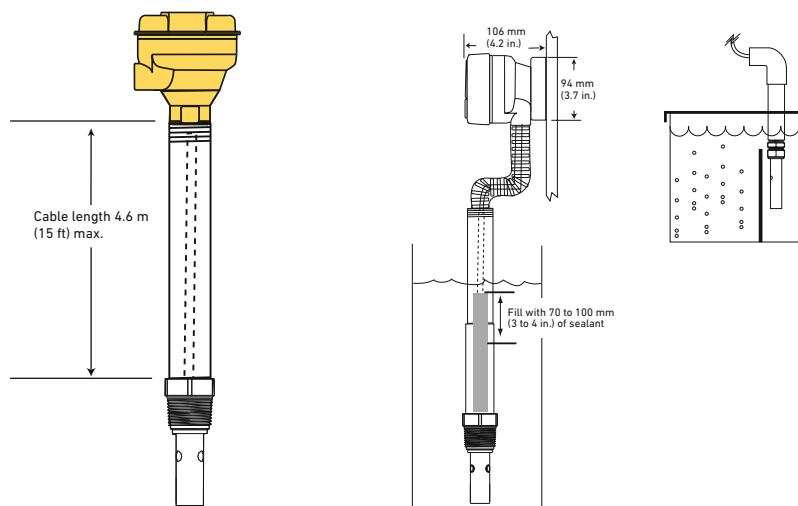


1.3 Installation of Conductivity/Resistivity Electrodes

Submersible Installation

2819 to 2823/2839-1 to 2842-1 with 2850 Sensor Electronics

- All mounting brackets, electrical conduits, and pipe extensions are customer supplied.
- Sensor Models 2819-2823 are mounted similarly, except use a $\frac{3}{4}$ " MNPT Thread to mount to a $\frac{3}{4}$ " FNPT pipe thread (customer supplied).



Use a 2850-52 to transmit a (S³L) signal to a 9900 or 8900.

Use a 2850-52 to transmit a 4 to 20 mA signal more than 300 m (1,000 ft)

Use a 9900 and proper accessories to allow a local display.

Installation Tips

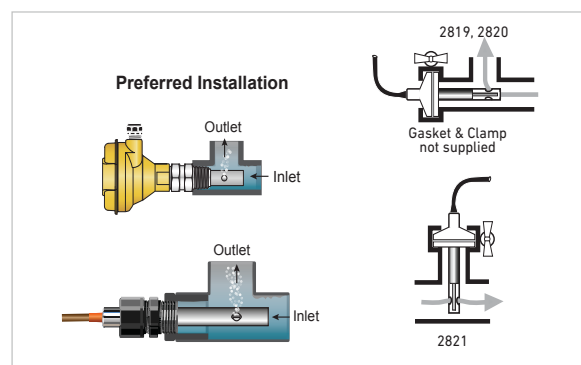
In aerated vessels install the electrode in a stilling well to prevent air from being trapped inside the electrode.

In-Line Installation

- Conductivity/Resistivity electrodes can be installed into standard $\frac{3}{4}$ inch NPT fittings or ISO 7/1-R $\frac{3}{4}$ threaded fittings.
- The preferred installation for in-line applications directs flow straight into the electrode. This configuration reduces the probability of entrapped air bubbles, and provides the best continuous sampling of the fluid content.
- If the electrode is mounted vertically in a tee, do not recess the orifices inside the tee. Mounting upside down may help prevent air entrapment.
- At least 4 threads (ANSI B1.20.1) must be engaged to meet pressure rating per published specifications.








Tri-clamp Connections

Models 2819-2821 are offered with 1 to 1½ inch and 2 inch sanitary fittings.



2 Electrodes

2.1 2818-2823 Conductivity / Resistivity Electrodes

						
2818	2819	2820	2821	2822	2823	Sanitary
in-line only				Reversible threads for in-line or submersible installation.		tri-clamp flange version

2.1.1 Product description

GF Signet 2818-2823 Conductivity/Resistivity Electrodes are designed to provide versatile installation and accurate sensing across a very broad dynamic range. These electrodes are built with a controlled surface finish to ensure accuracy and repeatability. The standard electrode is constructed 316 SS, but there are other materials available for maximum chemical compatibility.

Reversible threads or sanitary flanges allow for maximum installation versatility.

Sanitary flange versions are available in stainless steel and Titanium with surface quality finish of less than RA 25 and with an optional NIST Traceability Certificate to meet USP requirements.

Coupled with GF Signet patented measuring circuitry, a three decade measurement range is achieved without the need for troublesome electrode platinization. A platinum RTD (Pt1000) located within the electrode allows optimal temperature sensing.

Features

- Standard process connections
 - ¾ in. NPT Polypro
 - ¾ in. NPT SS on 10 and 20 cell
 - Tri-clamp 1 -1½ in., 2 in.
 - Opt. ½ in. NPT 316 SS
- 316 SS or Titanium (indicated tri-clamp only) standard electrode
- Alternative electrode materials available
 - Hastelloy-C
 - Monel
 - Titanium
- In-line or submersible mounting
- NIST traceable certified cells ±1% meet USP requirements



Applications

- Pure Water Treatment
 - Reverse Osmosis
 - Deionization
 - Distillation
- Boiler Condensate
- Semiconductor Water Production
- Rinse Water Monitoring and Control
- TDS (Total Dissolved Solids)
- Salinity
- USP Purified Water
- WFI Water Production
- Ultra Pure Water

2.1.2 Specifications

Models 3-2818-1 (0.01 cm⁻¹ Cell), 3-2819-1* (0.01 cm⁻¹ Cell), 3-2820-1* (0.1 cm⁻¹ Cell), Models 3-2821-1* (1.0 cm⁻¹ Cell)

* Certified versions available
(add "C" suffix to part no.)

General				
Operating Range	3-2818,	0.055 to	18.2 MΩ to	0.02 to 50 ppm
	3-2819	100 μS	10 KΩ	
	3-2820	1 to 1000 μS	1 MΩ to 1 KΩ	0.5 to 500 ppm
	3-2821	10 to 10,000 μS	5 to 5,000 ppm	
Cell Constant Accuracy	±2% of reading (certified cells ±1%)			
Temperature Compensation Device	Pt1000			
Cable Length (use for the 2818, 19, 20, 21, 22 and 23)	3-2818,	4.6 m (15 ft) used with 8860 and 2850 sensor electronics.		
	3-2819-1 sensors			
	0.01 cells			
	standard	4.6 m (15 ft)		
	maximum	30 m (100 ft) all sensors when used with 9900 or 9950 and Direct Conductivity/Resistivity Module. 2819, 2819 maximum 4.6 m (15 ft) when used with 2850		

Wetted Materials	
O-rings	EPR (EPDM)
Insulator Material	Carbon fiber reinforced PTFE
Electrodes	316L stainless steel (1.4408, DIN 17440) or Titanium

Max. Temperature/Pressure Rating		
Standard Polypro Fitting	6.9 bar @ 100 °C	100 psi @ 212 °F
Optional 1/2: NPT 316 SS fitting (3-2820.392)	13.8 bar @ 120 °C	200 psi @ 248 °F
Sanitary Connection	6.9 bar @ 120 °C	100 psi @ 248 °F
Temperature Response, τ		
0.01 cell	7 sec.	
0.1 cell	53 sec.	
1.0 cell	21 sec.	
Temperature Accuracy	0.3 °C	

Shipping Weight		
	0.4 kg	0.8 lb

Standards and Approvals	
RoHS compliant, China RoHS	

Model 3-2822-1 (10.0 cm⁻¹ Cell)**General**

Operating Range	100 to 200,000 µS	50 to 100,000 ppm
Cell Constant Accuracy	±2% of reading (certified cells ±1%)	
Temperature Compensation Device	Pt1000	
Cable length	Standard	4.6 m
	Maximum	30 m
		15 ft
		100 ft

Wetted Materials

O-rings	EPR (EPDM)	
Body	CPVC	
Electrodes	316 stainless steel (1.4408, DIN 17440)	
Process Connection	Standard 316 SS fitting	¾ in. NPT threads
	Optional 316 SS submersion adapter fitting (3-2820.390)	¾ in. NPT threads

Max. Temperature/Pressure Rating

	6.9 bar @ 95 °C	100 psi @ 203 °F
Temp. Response	5 seconds	
Temp. Accuracy	0.3 °C	

Shipping Weight

	0.4 kg	0.8 lb
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Standards and Approvals

	RoHS compliant, China RoHS	
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Model 3-2823-1 (20.0 cm⁻¹ Cell)**General**

Operating Range	200 to 400,000 µS	100 to 200,000 ppm
Cell Constant Accuracy	±2% of reading	
Temperature Compensation Device	Pt1000	
Cable Length	Standard	4.6 m (15 ft)
	Maximum	30 m (100 ft)

Wetted Materials

O-rings	EPR (EPDM)	
Insulator Material	PEEK®	
Process Connection	Electrodes	316 stainless steel (1.4408, DIN 17440)
	Standard 316 SS fitting	¾ in. NPT threads

Max. Temperature/Pressure Rating

	6.9 bar @ 150 °C	100 psi @ 302 °F
Temp. Response	120 seconds	
Temp. Accuracy	±0.3 °C	

Shipping Weight

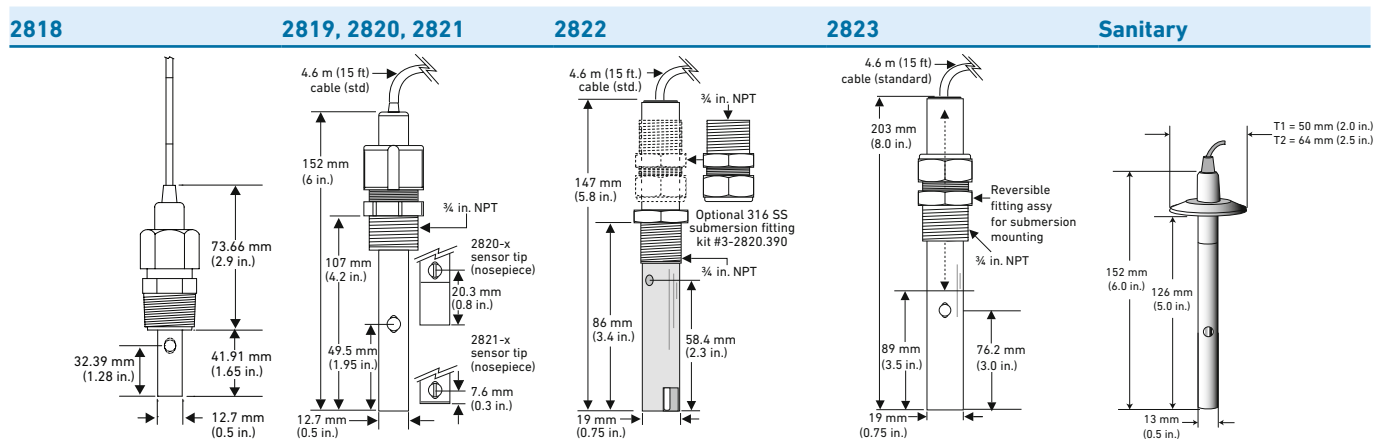
	0.3 kg	0.6 lb
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Standards and Approvals

	RoHS compliant, China RoHS	
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See pressure-temperature diagrams for more information.

Dimensions



Note

Tri-clamp is available for 2819, 2820, 2821 only. T1 or S1 is for 1 to 1½ in. tees or flanges.
T2 or S2 is for 2 in. tees or flanges.

2.1.3 System Overview

Panel Mount	Pipe, Tank, Wall Mount	4 to 20 mA Output*	Automation System	Field (Integral) Mount*
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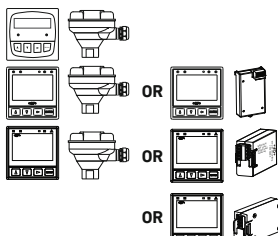
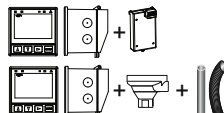
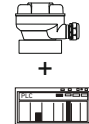
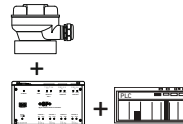

In-Line Installation

<p>GF Signet Instruments with 2850 Sensor Electronics</p> <ul style="list-style-type: none"> - 8900 - 9900 or with 3-9900.394 Direct Conductivity/Resistivity Module - 9950 with 9950.394 Direct Conductivity/Resistivity Module or with 3-9950.394-2 Dual Channel Conductivity Module 	<p>GF Signet Instruments with 2850 Sensor Electronics</p> <ul style="list-style-type: none"> - 9900 and Rear Enclosure or with 3-9900.394 Direct Conductivity/Resistivity Module and Rear Enclosure 	<p>GF Signet 2850 Sensor Electronics with</p> <ul style="list-style-type: none"> - Customer Supplied Programmable Logic Controller or - Programmable Automation Controller 	<p>GF Signet 2850 Sensor Electronics with</p> <ul style="list-style-type: none"> - 0486 Profibus Concentrator and - Customer Supplied Programmable Logic Controller or - Programmable Automation Controller 	<p>GF Signet Instrument</p> <ul style="list-style-type: none"> - 9900 with 3-9900.394 Direct Conductivity/Resistivity Module and Angle Adapter
<p>GF Signet 2818-2823 Conductivity Electrodes</p>				<p>GF Signet 2819-2823 Conductivity Electrodes</p>

Special order for 0.01, 0.1 and 1.0 cells**

Fittings- Customer Supplied

All Sold Separately

Panel Mount	Pipe, Tank, Wall Mount	4 to 20 mA Output*	Automation System
Submersible Installation			
<p>GF Signet Instruments with 2850 Sensor Electronics</p> <ul style="list-style-type: none"> - 8900 - 9900 or with 3-9900.394 Direct Conductivity/Resistivity Module - 9950 with 9950.394 Direct Conductivity/Resistivity Module or with 3-9950.394-2 Dual Channel Conductivity Module 	<p>GF Signet Instruments with 2850 Sensor Electronics</p> <ul style="list-style-type: none"> - 9900 and Rear Enclosure or with 3-9900.394 Direct Conductivity/Resistivity Module, Rear Enclosure and customer supplied pipe extension or conduit with 3/4 in. FNPT threads*** 	<p>GF Signet 2850 Sensor Electronics with</p> <ul style="list-style-type: none"> - Customer Supplied Programmable Logic Controller or - Programmable Automation Controller 	<p>GF Signet 2850 Sensor Electronics with</p> <ul style="list-style-type: none"> - 0486 Profibus Concentrator and Customer Supplied Programmable Logic Controller or - Programmable Automation Controller 
<p>GF Signet 2818-2823 Conductivity Electrodes</p> 			
Special order for 0.01, 0.1 and 1.0 cells**			All Sold Separately

*If required distance is greater than 100 ft, use 3-2850-52 (S3L) or 3-2850-52 4 to 20 mA sensor electronics.

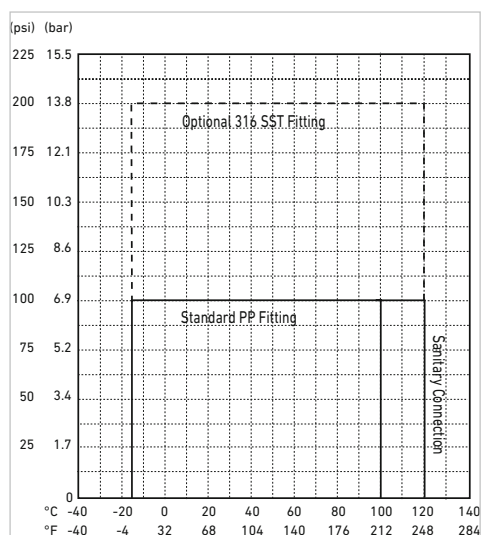
** Special Order for 0.01, 0.1 and 1.0 cells. Submersible installation not applicable for Sanitary Conductivity Electrode.

***Refer to the GF Signet Submersion Kit brochure (3-0000-707) located on our website for installation suggestions and options.

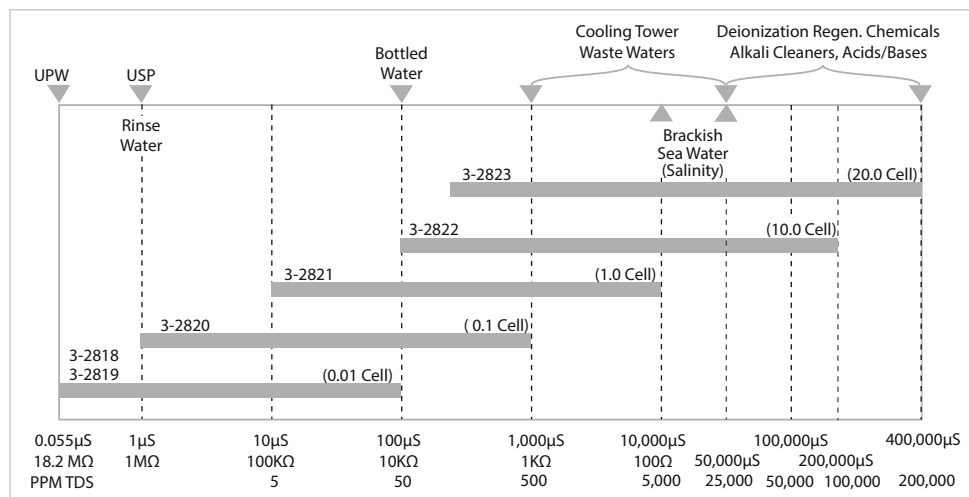
Pressure-temperature diagram

Note

The pressure-temperature diagrams are specifically for the GF Signet sensor. During system design the specifications of all components must be considered. In the case of a metal piping system, a plastic sensor will reduce the system specification.



Operating Range Chart



Application Tips

- GF Signet advises all conductivity sensors be installed in a piping system as shown in Fig 1.
- Liquid levels must be high enough to cover vent hole on sensor body.
- Threads on models 2823 can be reversed in the field.
- Use 2819 series electrodes with the 3-2850-63 electronics and 8900 for applications requiring multiple measuring points.
- Install sensors in an area that will remain free of air bubbles and sediment build-up.
- Conductivity measurements are affected if electrodes are coated by process substances.

2.1.4 Ordering information

Ordering Notes

- Alternate wetted materials and sensor lengths are available through special order.
- The 2818 and 2819 maximum cable length is 7.6 m (25 ft) unless used with the 9900 or 9950.
- All other sensors - cable lengths of up to 30 m (100 ft) are available - consult factory.
- Use PN 3-2820.390 or 3-2820.391 for a submersible threaded connection.

CERTIFICATE

Date: November 10, 2017
 Sensor Part Number: 3-2819-T1C
 Sensor Serial Number: 980159-04
 Sensor Cell Constant: 0.0102
 Temp. Element Offset: 0.1 °C
 Measured at: 24.8 °C

NIST Certified

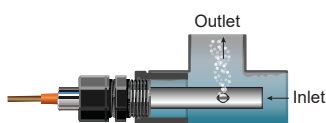


Fig. 1

Example information on NIST Traceability Certificate

Please refer to Wiring, Installation, and Accessories sections for more information.

Mfr. Part No.	Code	Cell Constant	Sensor Material and Mounting	Insertion into Tee size
3-2818-1**	159 000 718	0.01 cm ⁻¹	316 SS electrode, ¾ in.	in-line only
3-2819-1	198 844 010	0.01 cm ⁻¹	316 SS electrode, ¾ in. threads	in-line only
3-2819-1C	159 000 651	0.01 cm ⁻¹	316 SS electrode, ¾ in. threads (certified)	in-line only
3-2819-S1	159 000 085	0.01 cm ⁻¹	316 SS electrode, Sanitary Tri-clamp flange	1 to 1½ in.
3-2819-S1C†*	159 000 087	0.01 cm ⁻¹	316 SS electrode, Sanitary Tri-clamp flange	1 to 1½ in.
3-2819-S2†	159 000 086	0.01 cm ⁻¹	316 SS electrode, Sanitary Tri-clamp flange	2 in.
3-2819-S2C†*	159 000 088	0.01 cm ⁻¹	316 SS electrode, Sanitary Tri-clamp flange	2 in.
3-2819-T1†	159 000 081	0.01 cm ⁻¹	Titanium electrode, Sanitary Tri-clamp flange	1 to 1½ in.
3-2819-T1C†*	159 000 083	0.01 cm ⁻¹	Titanium electrode, Sanitary Tri-clamp flange	1 to 1½ in.
3-2819-T2†	159 000 082	0.01 cm ⁻¹	Titanium electrode, Sanitary Tri-clamp flange	2 in.
3-2819-T2C†*	159 000 084	0.01 cm ⁻¹	Titanium electrode, Sanitary Tri-clamp flange	2 in.
3-2820-1	198 844 000	0.1 cm ⁻¹	316 SS electrode, ¾ in. threads	in-line only
3-2820-1C	159 000 654	0.1 cm ⁻¹	316 SS electrode, ¾ in. threads (certified)	in-line only
3-2820-S1	159 000 089	0.1 cm ⁻¹	316 SS electrode, Sanitary Tri-clamp flange	1 to 1½ in.
3-2820-S1C†*	159 000 091	0.1 cm ⁻¹	316 SS electrode, Sanitary Tri-clamp flange	1 to 1½ in.
3-2820-S2†	159 000 090	0.1 cm ⁻¹	316 SS electrode, Sanitary Tri-clamp flange	2 in.
3-2820-S2C†*	159 000 092	0.1 cm ⁻¹	316 SS electrode, Sanitary Tri-clamp flange	2 in.
3-2820-T1†	159 000 624	0.1 cm ⁻¹	Titanium electrode, Sanitary Tri-clamp flange	1 to 1½ in.
3-2820-T2†	159 000 625	0.1 cm ⁻¹	Titanium electrode, Sanitary Tri-clamp flange	2 in.
3-2821-1	198 844 001	1.0 cm ⁻¹	316 SS electrode, ¾ in. threads	in-line only
3-2821-1C	159 000 650	1.0 cm ⁻¹	316 SS electrode, ¾ in. threads (certified)	in-line only
3-2821-S1†	159 000 093	1.0 cm ⁻¹	316 SS electrode, Sanitary Tri-clamp flange	1 to 1½ in.
3-2821-S1C†*	159 000 095	1.0 cm ⁻¹	316 SS electrode, Sanitary Tri-clamp flange	1 to 1½ in.
3-2821-S2†	159 000 094	1.0 cm ⁻¹	316 SS electrode, Sanitary Tri-clamp flange	2 in.
3-2821-S2C†*	159 000 096	1.0 cm ⁻¹	316 SS electrode, Sanitary Tri-clamp flange	2 in.
3-2821-T1†	159 000 626	1.0 cm ⁻¹	Titanium electrode, Sanitary Tri-clamp flange	1 to 1½ in.
3-2821-T2†	159 000 627	1.0 cm ⁻¹	Titanium electrode, Sanitary Tri-clamp flange	2 in.
3-2822-1	198 844 002	10 cm ⁻¹	316 SS electrode, ¾ in. threads	in-line or submersible mounting only
3-2823-1	198 844 003	20 cm ⁻¹	316 SS electrode, ¾ in. reversible threads	in-line or submersible mounting only

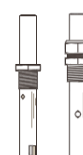
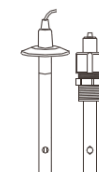
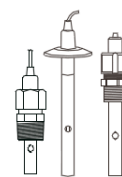
† Available for 0.01 cm⁻¹, 0.1 cm⁻¹, and 1.0 cm⁻¹ cells only

* NIST Certified

** NIST certificate available. Contact the factory.

Special Order Options - Please consult the factory

- High Temperature and Pressure options.
- Wetted materials (Hastelloy-C, Monel and Titanium) and sensor lengths.
- Cable length restrictions when using the 8850, 8860 or 2850 electronics on ALL cell constants 0.01 to 4.6 m (15 ft).
- Wet-Tap, ball valve retractable sensor for long insertion length available as a special order.



2.1.5 Accessories and Replacement Parts

Mfr. Part	Code	Description
3-2850.101-1	159 001 392	Plug-in NIST traceable recertification tool, 1.0 μ S simulated, for use with 8900, 9900, 9950, 2850 and the 2850 4-20 mA output
3-2850.101-2	159 001 393	Plug-in NIST traceable recertification tool, 2.5 μ S simulated, for use with 8900, 9900, 9950, 2850 and the 2850 4-20 mA output
3-2850.101-3	159 001 394	Plug-in NIST traceable recertification tool, 10.0 μ S simulated, for use with 8900, 9900, 9950, 2850 and the 2850 4-20 mA output
3-2850.101-4	159 001 395	Plug-in NIST traceable recertification tool, 18.2 M Ω simulated, for use with 8900, 9900, 9950, 2850 and the 2850 4-20 mA output
3-2850.101-5	159 001 396	Plug-in NIST traceable recertification tool, 10.0 M Ω simulated, for use with 8900, 9900, 9950, 2850 and the 2850 4-20 mA output
3-8050-1	159 000 753	Universal mount junction box
3-2820.390	198 840 223	3/4 in. NPT fitting, 316 SS for use with 2822-1 and 2823-1 for submersible mounting
3-2820.391	198 840 221	3/4 in. NPT fitting, Polypro replacement for 2819-1, 2820-1 or 2821-1
3-2820.392	198 840 222	1/2 in. NPT fitting, 316 SS for use with 2819-1, 2820-1 or 2821
3-2850-61	159 001 400	Universal junction box, conductivity electronics, digital (S ³ L) output
3-2850-62	159 001 401	Universal junction box, conductivity electronics, 4 to 20 output
5523-0322	159 000 761	Sensor cable (per ft), 3 cond. plus shield, 22 AWG (for cable extension through a junction box for the following sensors: 3-2820, 3-2821, 3-2822, 3-2823)
3-8050-1	159 000 753	Universal mount junction box

Note: GF Signet recommended sensors that require extended cable lengths can be ordered from the factory.

2.2 2839-1V(D) to 2842-1V(D) PVDF Conductivity Electrodes



2.2.1 Product description

The GF Signet 2839-1V(D) to 2842-1V(D) Conductivity/Resistivity Electrodes are available in four cell constants from 0.01 to 10.0 cm⁻¹, and are suitable for a wide variety of applications from high purity water quality monitoring to weak acids and bases. 316 SS electrode surface finishes are controlled in a precision bead blasting operation to ensure measurement accuracy and repeatability.

The PVDF insulator and process connections are injection over-molded to minimize variance between electrodes. Double threaded connections in either 3/4 in. NPT or ISO 7/1-R 3/4 enable quick and easy installation in submersible or in-line configurations. Transmitter integral mounting kit and junction boxes are available as accessories. A Certificate of Calibration is included with all 2839-1V(D) to 2842-1V(D) Conductivity/Resistivity Electrodes. The electrodes are calibrated to meet $\pm 2\%$ accuracy. Electrodes can be shipped back to the GF Signet factory for recertification. The certificate includes calculated cell constant and temperature offset which when entered into the „custom cell“ menu of any GF Signet meter would provide a 2% accuracy of the sensors reading.

Features

- $\pm 2\%$ accuracy - Custom calibration certificate provided
- Dual-threaded
- Compact electrode length for easy in-line installation in small pipe sizes
- Triple orifice flow-through design reduces clogging and bubble entrapment
- 316 SS electrodes with injection molded PVDF process connections and insulators
- Meets USP requirements



Applications

- Water Treatment & Water Quality Monitoring
- Reverse Osmosis
- Deionization
- Cooling Tower and Boiler Protection
- Distillation
- Desalination
- Demineralizer
- Semiconductor
- Aquatic Animal Life Support Systems

! The installation must be performed in accordance with the instruction manual. The instruction manual is included with the product, see also online on www.gfps.com/signet

2.2.2 Technical Details

* 2850 cable length 4.6 m (15 ft)
maximum for all cells.

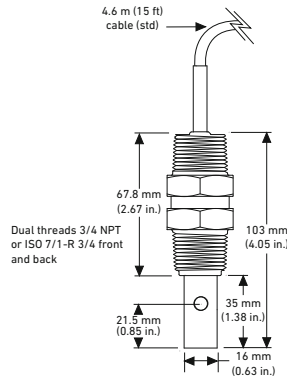
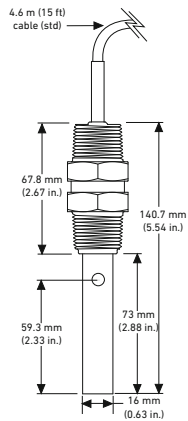
General				
Operating Range				
	2839	0.055 to 100 μS	0.02 to 50 ppm	18.2 MΩ to 10 KΩ
	2840	1 to 1,000 μS	0.5 to 500 ppm	1 MΩ to 1 KΩ
	2841	10 to 10,000 μS	5 to 5,000 ppm	
	2842	100 to 200,000 μS	50 to 100,000 ppm	
Cell Constant Accuracy	± 2%. When the information provided on the certificate of calibration is entered into the transmitter/controller. ± 5% when entered as a standard cell constant			
Dual-Threaded Process Connection	-1V versions: ¾ in. NPT -1VD versions: ISO 7/1-R 3/4			
Cable Length (use for the 2839, 40 ,41 and 42)	standard	4.6 m (15 ft)		
	maximum	30 m (100 ft) all sensors when used with the 9900		
	0.01 cells	4.6 m (15 ft) used with 8850, 8860, and 2850*		
Temperature Element	PT1000			
Temp. Response,				
	0.01 cell	5 sec.		
	0.10 cell	10 sec.		
	1.0 cell	20 sec.		
	10.0 cell	30 sec.		
Temperature Accuracy	±0.5 °C		±0.9 °F	
Wetted Materials				
Internal O-ring (2841 and 2842)	FKM			
Insulator Material	PVDF			
Electrode Material	316 SS			
Threaded Process Connection	PVDF			
Max. Temperature/Pressure Rating				
	131 °C @ 2.76 bar		268 °F @ 40 psi	
Storage Temperature	-20 °C to 131 °C		-4 °F to 268 °F	
Shipping Weight				
2839	0.34 kg		0.74 lb	
2840, 2841, 2842	0.30 kg		0.66 lb	
Standards and Approvals				
RoHS compliant, China RoHS				
Manufactured under ISO 9001 for Quality and ISO 14001 for Environmental Management and OHSAS 18001 for Occupational Health and Safety				

Dimensions

Dual-Threaded Electrodes

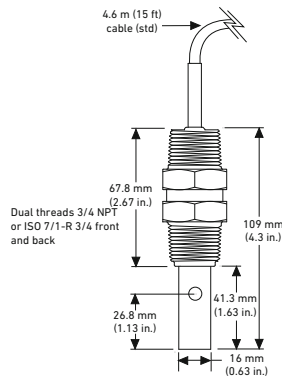
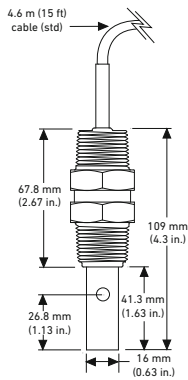
3-2839-1V(D) (0.01 cell)

3-2840-1V(D) (0.1 cell)



3-2841-1V(D) (1.0 cell)*

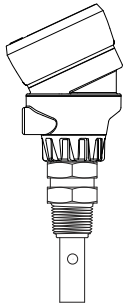
3-2842-1V(D) (10.0 cell)*



- * Although these electrodes look similar in design, there is an inherent difference. From the bottom view, the 2841 electrode features a simple plastic insert. However, the 2842 electrode features a complex plastic insert with four holes through which liquid flows.

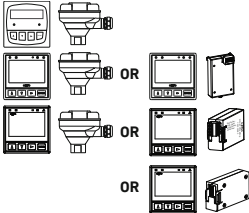
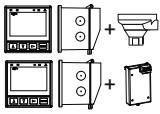

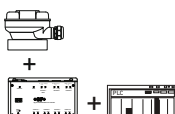

Integral Mount Sensor

The 2839-2842 Dual Threaded Conductivity Electrodes can be directly mounted to a 3-9900-1 transmitter, 3-9900.396 direct conductivity module, 3-9900.396 angle adjust adapter and the 8052 Integral Mount Kit, and a customer modified sensor cable length.



2.2.3 System Overview

In-Line Installation

Panel Mount	Pipe, Tank, Wall Mount	4 to 20 mA Output*	Automation System	Field (Integral) Mount*
GF Signet Instruments with 2850 Sensor Electronics - 8900 - 9900 or with 3-9900.394 Direct Conductivity/Resistivity Module - 9950 with 9950.394 Direct Conductivity/Resistivity Module or with 3-9950.394-2 Dual Channel Conductivity Module	GF Signet Instruments with 2850 Sensor Electronics - 9900 and Rear Enclosure or with 3-9900.394 Direct Conductivity/Resistivity Module and Rear Enclosure	GF Signet 2850 Sensor Electronics with - Customer Supplied Programmable Logic Controller or - Programmable Automation Controller	GF Signet 2850 Sensor Electronics with - 0486 Profibus Concentrator and - Customer Supplied Programmable Logic Controller or - Programmable Automation Controller	GF Signet Instrument - 9900 with 3-9900.394 Direct Conductivity/Resistivity Module and Angle Adapter
				

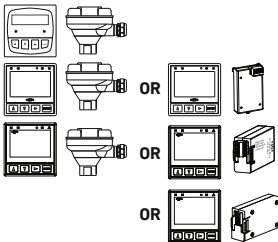
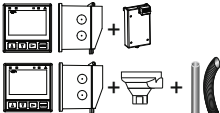
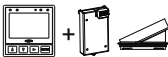
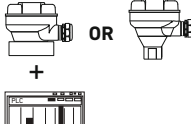
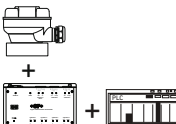
GF Signet 2839-2842 Conductivity Electrodes



Customer Supplied Fittings, 3/4 in. NPT or ISO threaded

All Sold Separately

Submersible Installation

Panel Mount	Pipe, Tank, Wall Mount	Field (Integral) Mount	4 to 20 mA Output*	Automation System
GF Signet Instruments with 2850 Sensor Electronics - 8900 - 9900 or with 3-9900.394 Direct Conductivity/Resistivity Module - 9950 with 9950.394 Direct Conductivity/Resistivity Module or with 3-9950.394-2 Dual Channel Conductivity Module	GF Signet Instruments with 2850 Sensor Electronics - 9900 and Rear Enclosure or with 3-9900.394 Direct Conductivity/Resistivity Module, Rear Enclosure and customer supplied pipe extension or conduit with 3/4 in. FNPT threads	GF Signet Instrument - 9900 with 3-9900.394 Direct Conductivity/Resistivity Module and Angle Adapter	GF Signet 2850 Sensor Electronics with - Customer Supplied Programmable Logic Controller or - Programmable Automation Controller	GF Signet 2850 Sensor Electronics with - 0486 Profibus Concentrator and Customer Supplied Programmable Logic Controller or - Programmable Automation Controller
				

GF Signet 2839-2842 Conductivity Electrodes



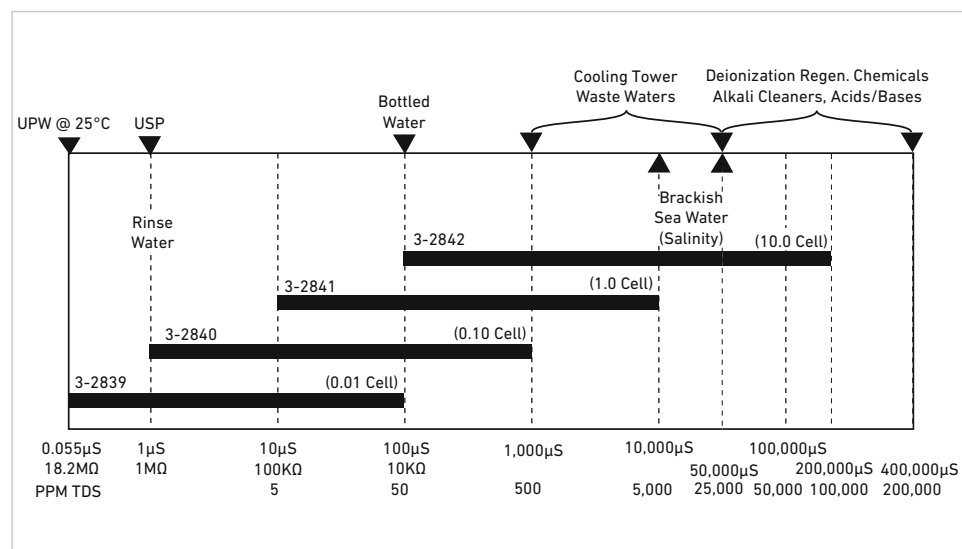
All Sold Separately

*Refer to the GF Signet Submersion Kit brochure (3-0000.707) located on our website for installation suggestions and options.

Application Tips

- Use 2839 series electrodes with the 3-2850-63 electronics and 9950 or 8900 for applications requiring multiple measuring points.
- Liquid levels must be high enough to cover vent hole on sensor body.
- Install sensors in an area that will remain free of air bubbles and sediment build-up.
- Conductivity measurements are affected if electrodes are coated by process substances.
- Use Model 2839 with the 2850/8900 for low conductivity applications requiring multiple measuring points.

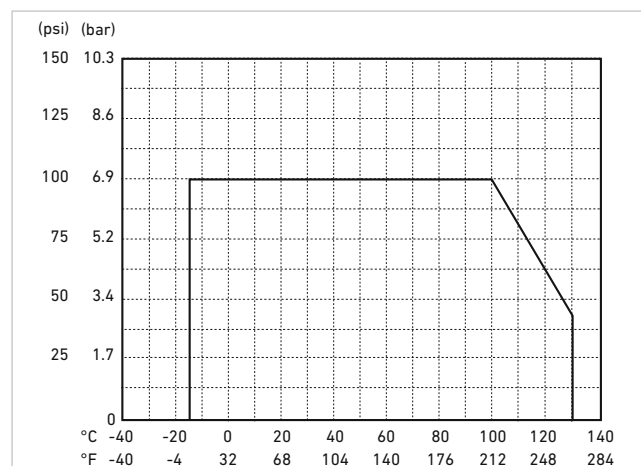
Operating Range Chart



Pressure-temperature diagram

Note

The pressure-temperature diagrams are specifically for the GF Signet sensor. During system design the specifications of all components must be considered. In the case of a metal piping system, a plastic sensor will reduce the system specification.



2.2.4 Ordering information

Ordering Notes

1. The Conductivity Certification tools are compatible with the following GF Signet Instruments: 8900, 9900 and 9950.
2. The sensor cable can be extended up to 30 m (100 ft). See restrictions under General specifications.

Georg Fischer Signet LLC
Signet Conductivity/Resistivity Electrodes
+GF+

Test Certificate

Part information

Code: 159 310 244
Mfr. Part #: 3-2840.310-3
Serial number: 61501061446
Description: 0.1 cm-1, dual threaded, ½" NPT, PVDF
Temperature Element: RTD PT1000
Test date: 1/6/2015 2:36:23 PM

Measuring Standard(s)

ID#: RS-11
Cal due date: 7/14/2015

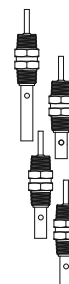
Test Conditions

KCl solution concentration: 203.50 µS
Solution temperature: 24.46°C

Test Data

Cell constant: 0.998
Temperature: 24.46°C

Mfr. Part No.	Code	Cell Constant	Connection	Thread Size(s)	Cable Length
3-2839-1V	159 001 810	0.01 cm-1	Dual threaded	¾ inch NPT	4.6 m (15 ft)
3-2839-1VD	159 001 811	0.01 cm-1	Dual threaded	ISO 7/1-R ¾	4.6 m (15 ft)
3-2840-1V	159 001 812	0.1 cm-1	Dual threaded	¾ inch NPT	4.6 m (15 ft)
3-2840-1VD	159 001 813	0.1 cm-1	Dual threaded	ISO 7/1-R ¾	4.6 m (15 ft)
3-2841-1V	159 001 814	1.0 cm-1	Dual threaded	¾ inch NPT	4.6 m (15 ft)
3-2841-1VD	159 001 815	1.0 cm-1	Dual threaded	ISO 7/1-R ¾	4.6 m (15 ft)
3-2842-1V	159 001 816	10 cm-1	Dual threaded	¾ inch NPT	4.6 m (15 ft)
3-2842-1VD	159 001 817	10 cm-1	Dual threaded	ISO 7/1-R ¾	4.6 m (15 ft)



Special Order Options - Please consult the factory

- Cable length extensions of up to 30 m (100 ft) are available.
- For resistivity measurements above 10 MΩ when used with the 8850-3 or the 8860 cable lengths of the sensor should not exceed 4.6 m (15 ft)

2.2.5 Accessories

Mfr. Part	Code	Description
3-2850.101-1	159 001 392	Plug-in NIST traceable recertification tool, 1.0 µS simulated, for use with 8900, 2850 and 9900
3-2850.101-2	159 001 393	Plug-in NIST traceable recertification tool, 2.5 µS simulated, for use with 8900, 2850 and 9900
3-2850.101-3	159 001 394	Plug-in NIST traceable recertification tool, 10.0 µS simulated, for use with 8900, 2850 and 9900
3-2850.101-4	159 001 395	Plug-in NIST traceable recertification tool, 18.2 MΩ simulated, for use with 8900, 2850 and 9900
3-2850.101-5	159 001 396	Plug-in NIST traceable recertification tool, 10.0 MΩ simulated, for use with 8900, 2850 and 9900
3-2850-61	159 001 400	Universal junction box, conductivity electronics, digital (S ³ L) output
3-2850-62	159 001 401	Universal junction box, conductivity electronics, 4 to 20 output
3-8052	159 000 188	¾ in. integral mounting k
5523-0322	159 000 761	Sensor cable (per ft), 3 cond. plus shield, 22 AWG, for cable extension through a junction box for the following sensors: 3-2840, 3-2841, 3-2842
3-8050-1	159 000 753	Universal mount junction box

3 Sensor Electronics

3.1 2850 Conductivity/Resistivity Sensor Electronics and Integral Systems with PVDF Sensor

		
Universal Mount Junction Box	NPT Mount Junction Box	2850 Integral Conductivity System for in-line installations, PVDF

3.1.1 Product description

The GF Signet 2850 Conductivity/Resistivity Sensor Electronics are available in various configurations for maximum installation flexibility. The universal mount version is for pipe, wall, or tank mounting and enables single or dual (digital versions only) inputs using any standard GF Signet conductivity/resistivity sensor. The threaded j-box version can be used with these same GF Signet sensors for submersible sensor mounting. It is also available as a combined integral system configuration for in-line mounting and includes a conductivity electrode in a choice of 0.01, 0.1, 1.0, 10.0 or 20.0 cm⁻¹ cell constants. The 2850 is ideal for applications with a conductivity range of 0.055 to 400,000 µS or a resistivity range of 18.2 MΩ to 10 kΩ.

All 2850 units are available with a choice of a single or dual digital (S³L) outputs, or a single 4 to 20 mA. The single digital (S³L) output version can be paired with the 9900 Transmitter to extend the distance between the measuring points to 120 m (400 ft).

The 8900 Multi-Parameter Controller allows for up to six 2850 (S³L) output conductivity sensors to be used with the GF Signet 8900 Multi-Parameter Controller. All 2850 units are built with NEMA 4X/IP65 enclosures which allow output wiring connections with long cable runs of up to 305 m (1,000 ft). The two-wire 4 to 20 mA output version is available with eight 4 to 20 mA output ranges for each electrode cell constant. Each range can be inverted and is field selectable. EasyCal is a standard feature that automatically recognizes conductivity test solution values for simple field calibration. A certification tool is available for validation of the sensor electronics according to USP requirements.

Features

- Test certificate supplied with all sensors
- Custom cell constant programmed into the electronics
- Integral mount systems for quick and easy installation
- Compact design for maximum installation flexibility
- Extends the distance between the measuring point and the 9900 Transmitter to 120 m (400 ft)
- Digital (S³L) interface or two-wire 4 to 20 mA output
- EasyCal with automatic test solution recognition
- Dual channel unit available for low cost installation with GF Signet 8900 Multi-Parameter Controller
- For use with ALL GF Signet conductivity electrodes



U.S. Patent No.: 7,550,979 B2

Applications

- Water Treatment & Water Quality Monitoring
- Reverse Osmosis
- Deionization
- Demineralizer, Regeneration & Rinse
- Scrubber, Cooling Tower and Boiler Protection
- Aquatic Animal Life Support Systems



The installation must be performed in accordance with the instruction manual. The instruction manual is included with the product, see also online on www.gfps.com/signet

3.1.2 Technical Details

General

Compatible Electrodes	All GF Signet Sensors
-----------------------	-----------------------

Materials

NPT Mount Junction Box for Integral Mount	PBT
Universal/Remote Mount	PBT, PVC-C
EasyCal - Automatic Recognition of the Following Conductivity Values	
	146.93 µS, 1408.8 µS, 12856 µS (@25 °C) (Test solutions Per ASTM D1125-95)
	10 µS, 100 µS, 200 µS, 500 µS, 1000 µS, 5000 µS, 10,000 µS, 50,000 µS, 100,000 µS (@ 25 °C) (Standard test solutions)

Electrical

Power	12 to 24 VDC ±10%, regulated for 4 to 20 mA output (typically called “Loop Powered”)	
	5 to 6.5 VDC ±5% regulated recommended (provided by the GF Signet 8900), 3.0 mA max for Digital (S³L) output (Reverse polarity and short circuit protected)	
Digital (S³L) Output: Serial ASCII, TTL level 9600 bps		
Accuracy	Conductivity	± 2% of reading
	Temperature	< 0.2 °C
Resolution	Conductivity	0.1% of reading
	Temperature	< 0.2 °C
Update Rate	Single channel models	< 600 ms
	Dual channel models	< 1200 ms
Available Data via Digital (S³L) Output		
	Raw conductivity	
	Calibrated conductivity	
	Calibrated temperature-compensated conductivity	
	Temperature	

Max. Temperature/Pressure Rating

Operating Temperature	-10 °C to 85 °C	14 °F to 185 °F
Storage Temperature	-20 °C to 85 °C	-4 °F to 185 °F
Relative Humidity	0 to 95%, non-condensing	
Enclosure	NEMA 4X/IP65	
Current Output		
Field-selectable ranges		
Factory Set Span	0.01 cell (2839**)	4 to 20 mA = 0 to 100 µS
(Integral mount only)	0.10 cell (2840**)	4 to 20 mA = 0 to 1000 µS
	1.0 cell (2841**)	4 to 20 mA = 0 to 10,000 µS
	10.0 cell (2842**)	4 to 20 mA = 0 to 200,000 µS
	20.0 cell (2823)*	4 to 20 mA = 0 to 400,000 µS

*Special Order

**Test certificate supplied with all sensors.

Custom cell constant programmed into the electronics.

Max. Loop Resistance	50 Ω @ 12 VDC
	325 Ω @ 18 VDC
	600 Ω @ 24 VDC
Accuracy	± 2% of output span
Resolution	7 µA
Update Rate	< 600 ms
Error Indication	22 mA
Pure Water Compensation	When using 0.01-cm cell and raw conductivity value < 0.5 µS, the 2850 auto-switches to compensate for non-linear temperature effects found in this low conductivity (high resistivity) range.

Shipping Weight

NPT Mount Junction Box	0.75 kg	1.75 lb
Universal Mount	0.75 kg	1.75 lb

Standards and Approvals

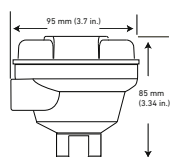
CE, FCC

RoHS compliant, China RoHS

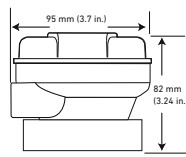
Manufactured under ISO 9001 for Quality and ISO 14001 for Environmental Management and OHSAS 18001 for Occupational Health and Safety

Dimensions

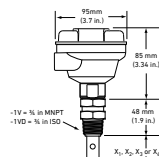
2850-5X NPT Mount Junction Box Systems



2850-6X Universal Mount Systems





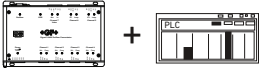

2850-5X-XX-1V(D) Integral Mount Systems





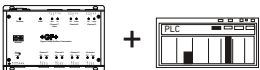

Sensor	Insertion Depth
X1 (3-2839-1V(D))	73 mm (2.88 in.)
X2 (3-2840-1V(D))	35 mm (1.38 in.)
X3 (3-2841-1V(D))	41.3 mm (1.63 in.)
X4 (3-2842-1V(D))	41.3 mm (1.63 in.)

3.1.3 System Overview

In-Line Installation

Panel, Wall Mount	4 to 20 mA Output	Automation System
GF Signet Instruments - 8900 - 9900 - 9950 	- Customer Supplied Programmable Logic Controller, or - Programmable Automation Controller 	- 0486 Profibus Concentrator and Customer Supplied Programmable Logic Controller or - Programmable Automation Controller 
GF Signet 2850 Conductivity System or 2850 Universal Mount 		
Fittings - Customer Supplied 3/4 in. NPT or ISO threads		All sold separately

Submersible Installation

Panel, Wall Mount	4 to 20 mA Output	Automation System
GF Signet Instruments - 8900 - 9900 - 9950 	- Customer Supplied Programmable Logic Controller, or - Programmable Automation Controller 	- 0486 Profibus Concentrator and Customer Supplied Programmable Logic Controller or - Programmable Automation Controller 
GF Signet 2850 Universal Mount or NPT Mount Junction Box 		
Fittings - Customer Supplied 3/4 in. NPT or ISO threads		All sold separately

* If the 2850 is used with the 9900, it is not necessary to use the 9900 conductivity module.





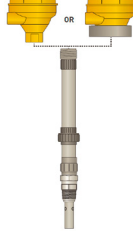

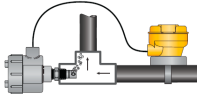
Note

The 9900 (with Direct Conductivity/Resistivity module) can run all conductivity sensors with 30 m (100 ft) of cable.

The 2850 (S3L) signal can be used for distances over 30 m (100 ft). The 2850 has a limited sensor cable input length of 4.6 m (15 ft).

Application Tips

Maximum distance between sensor and 2850 electronics is 4.6 m (15 ft).

		
-5X NPT Mount Junction Box	-6X Universal Mount Junction Box	
		
Integral System includes the 2850 sensor electronics and a choice of Conductivity/Resistivity electrode.	Universal j-box assembly allows sensors without the 3/4" rear thread to be used.	Submersible application options

Field Selectable Ranges for 4 to 20 mA Operation

The chart below indicates the field selectable ranges in which the 2850 sensor electronics can be set via internal switches. All ranges can be inverted if required. GF Signet Models listed below are compatible Conductivity/Resistivity electrodes.

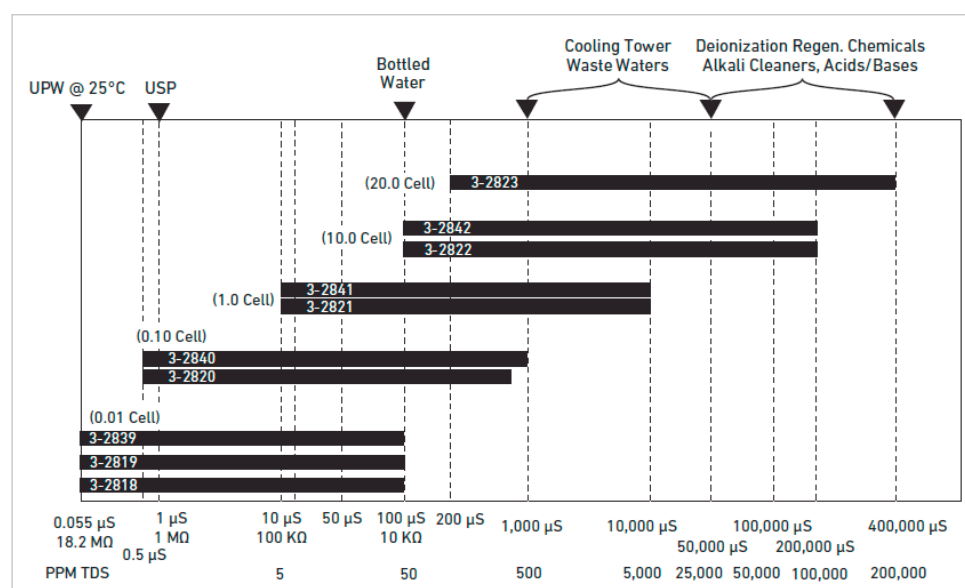
0.01 Cell	0.10 Cell	1.0 Cell	10.0 Cell	20.0 Cell
GF Signet Model 2839	GF Signet Model 2840	GF Signet Model 2841	GF Signet Model 2842	GF Signet Model 2823 (Special Order)
10 to 20 MΩ	0 to 2 μS	0 to 20 μS	0 to 200 μS	0 to 400 μS
2 to 10 MΩ	0 to 5 μS	0 to 50 μS	0 to 500 μS	0 to 1,000 μS
0 to 2 MΩ	0 to 10 μS	0 to 100 μS	0 to 1,000 μS	0 to 2000 μS
0 to 1 MΩ	0 to 50 μS	0 to 500 μS	0 to 5,000 μS	0 to 10,000 μS
0 to 5 MΩ	0 to 100 μS	0 to 1,000 μS	0 to 10,000 μS	0 to 200,000 μS
0 to 10 MΩ	0 to 200 μS	0 to 2000 μS	0 to 50,000 μS	0 to 100,000 μS
N/A	0 to 500 μS	0 to 5,000 μS	0 to 100,000 μS	0 to 200,000 μS
N/A	0 to 1,000 μS	0 to 10,000 μS	0 to 200,000 μS	0 to 200,000 μS

The 4 to 20 mA output ranges shown in this chart can be inverted using the internal switch. Resistivity Ranges are in BOLD.

Note: The 2819-2823 series Integral Systems must be ordered through special order products

Operating Range Chart

The 2850 is capable of measuring conductivity and resistivity values over a wide range. Below is a chart of GF Signet Conductivity/Resistivity electrodes (listed in each range box) that is recommended for the specified measurement range.



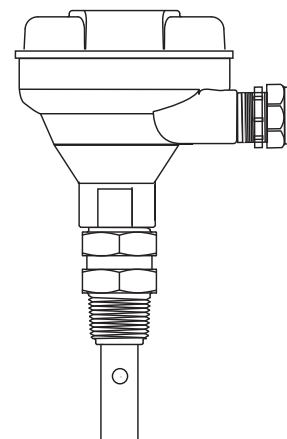
3.1.4 Ordering information

Ordering Notes

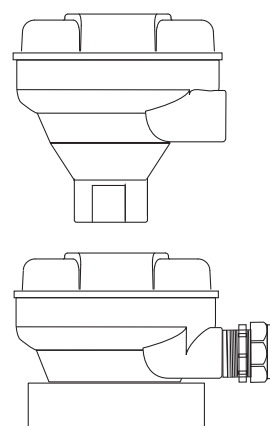
1. All 2850 units can be used with any GF Signet Conductivity/Resistivity electrode
2. Integral systems are only offered with GF Signet models 2839-2842 electrodes. 2818-2823 require a special order sensor.
3. Dual channel units are only available in the universal mount junction box/remote mount configuration and with digital (S³L) output for use with the Multi-Parameter instruments.

Mfr. Part No.	Code	Sensor	Process Threaded Connection
2850 Integral Mount Systems, PVDF* (includes Sensor Electronics and PVDF Electrodes) with EasyCal			
Digital (S³L) output			
3-2850-51-39V	159 001 818	2839 Electrode, 0.01 cell	NPT threads
3-2850-51-40V	159 001 819	2840 Electrode, 0.1 cell	NPT threads
3-2850-51-41V	159 001 820	2841 Electrode, 1.0 cell	NPT threads
3-2850-51-42V	159 001 821	2842 Electrode, 10.0 cell	NPT threads
3-2850-51-39VD	159 001 822	2839 Electrode, 0.01 cell	ISO threads
3-2850-51-40VD	159 001 823	2840 Electrode, 0.1 cell	ISO threads
3-2850-51-41VD	159 001 824	2841 Electrode, 1.0 cell	ISO threads
3-2850-51-42VD	159 001 825	2842 Electrode, 10.0 cell	ISO threads
4 to 20 mA output			
3-2850-52-39V	159 001 826	2839 Electrode, 0.01 cell	NPT threads
3-2850-52-40V	159 001 827	2840 Electrode, 0.1 cell	NPT threads
3-2850-52-41V	159 001 828	2841 Electrode, 1.0 cell	NPT threads
3-2850-52-42V	159 001 829	2842 Electrode, 10.0 cell	NPT threads
3-2850-52-39VD	159 001 830	2839 Electrode, 0.01 cell	ISO threads
3-2850-52-40VD	159 001 831	2840 Electrode, 0.1 cell	ISO threads
3-2850-52-41VD	159 001 832	2841 Electrode, 1.0 cell	ISO threads
3-2850-52-42VD	159 001 833	2842 Electrode, 10.0 cell	ISO threads

- * For use when an integral 2850 system is desired (uses 2839-2842 series electrodes). Integral systems are shipped with a sensor and 2850 combined. Other 2850 systems are available with GF Signet 2818 to 2823 electrodes upon request. See individual electrode product pages for more information.



Mfr. Part No.	Code	Output
2850 Sensor Electronics** with EasyCal		
NPT mount junction box (¾ inch threaded) for standpipe or integral mounting, single input only		
3-2850-51	159 001 398	One input/one digital (S ³ L) output
3-2850-52	159 001 399	One input/one 4 to 20 mA output
Universal mount junction box for remote mount, single or dual input		
3-2850-61	159 001 400	One input/one digital (S ³ L) output for use with 8900 or 9900
3-2850-62	159 001 401	One input/one 4 to 20 mA output
3-2850-63	159 001 402	Dual input, dual (S ³ L) output for use with 8900 only



3.1.5 Accessories

Mfr. Part	Code	Description
3-2850.101-1	159 001 392	Plug-in NIST traceable recertification tool, 1.0 µS simulated
3-2850.101-2	159 001 393	Plug-in NIST traceable recertification tool, 2.5 µS simulated
3-2850.101-3	159 001 394	Plug-in NIST traceable recertification tool, 10.0 µS simulated
3-2850.101-4	159 001 395	Plug-in NIST traceable recertification tool, 18.2 MΩ simulated
3-2850.101-5	159 001 396	Plug-in NIST traceable recertification tool, 10.0 MΩ simulated
3-2839-1V	159 001 799	Electrode PVDF/SS- 0.01 µS/cm, ¾ inch NPT, 4.6 m (15 ft) cable
3-2839-1VD	159 001 800	Electrode PVDF/SS- 0.01 µS/cm, ISO 7/1-R 3/4, 4.6 m (15 ft) cable
3-2840-1V	159 001 801	Electrode PVDF/SS- 0.1 µS/cm, ¾ inch NPT, 4.6 m (15 ft) cable
3-2840-1VD	159 001 802	Electrode PVDF/SS- 0.1 µS/cm, ISO 7/1-R 3/4, 4.6 m (15 ft) cable
3-2841-1V	159 001 803	Electrode PVDF/SS- 1.0 µS/cm, ¾ inch NPT, 4.6 m (15 ft) cable
3-2841-1VD	159 001 804	Electrode PVDF/SS- 1.0 µS/cm, ISO 7/1-R 3/4, 4.6 m (15 ft) cable
3-2842-1V	159 001 805	Electrode PVDF/SS- 10.0 µS/cm, ¾ inch NPT, 4.6 m (15 ft) cable
3-2842-1VD	159 001 806	Electrode PVDF/SS- 10.0 µS/cm, ISO 7/1-R 3/4, 4.6 m (15 ft) cable
5523-0322V	159 001 807	Sensor cable (per ft), 3 cond. plus shield, 22 AWG

3.2 Conductivity / Resistivity Integral Systems with 9900 Transmitters

Member of the SmartPro® Family of Instruments



3.2.1 Product description

GF Signet has combined the 9900 SmartPro® Transmitter with conductivity and resistivity sensors to create integral systems that are easy to order and simple to install. Also available in flow, level, temperature and pressure configurations, each integral system features a 9900 Transmitter which provides a local and easy to read LCD display. The push button keypad makes it easy to navigate through the transmitter's menu. The DC-powered 9900 features a scalable 4 to 20 mA output and open collector for process control.

The integral system is also offered with a choice of GF Signet conductivity and resistivity sensors, Models 2839, 2840, 2841, and 2842 in 0.01, 0.1, 1.0, or 10.0 cm⁻¹ cell constants, respectively. These sensors are field proven and reliably perform in ranges from 18.2 MΩ (0.055 μS) to 200,000 μS. They are ideal for installation into standard pipes via the 3/4 inch sensor threaded (NPT or ISO) process connection. The sensors are available with 316 stainless steel and PVDF wetted materials.

Features

- Local Display for sensor mounted instruments
- Provides 4 to 20 mA output
- „At a glance“ visibility
- „Dial-type“ digital bar graph
- NEMA 4X/IP65 enclosures
- Large selection of GF Signet Conductivity and Resistivity sensors available

Applications

- RO/DI System Control
- Cooling Tower Control
- Water Quality Monitoring
- Filtration Systems
- Scrubber Systems
- Boiler Condensate
- Semiconductor Water Production
- Leak Detection



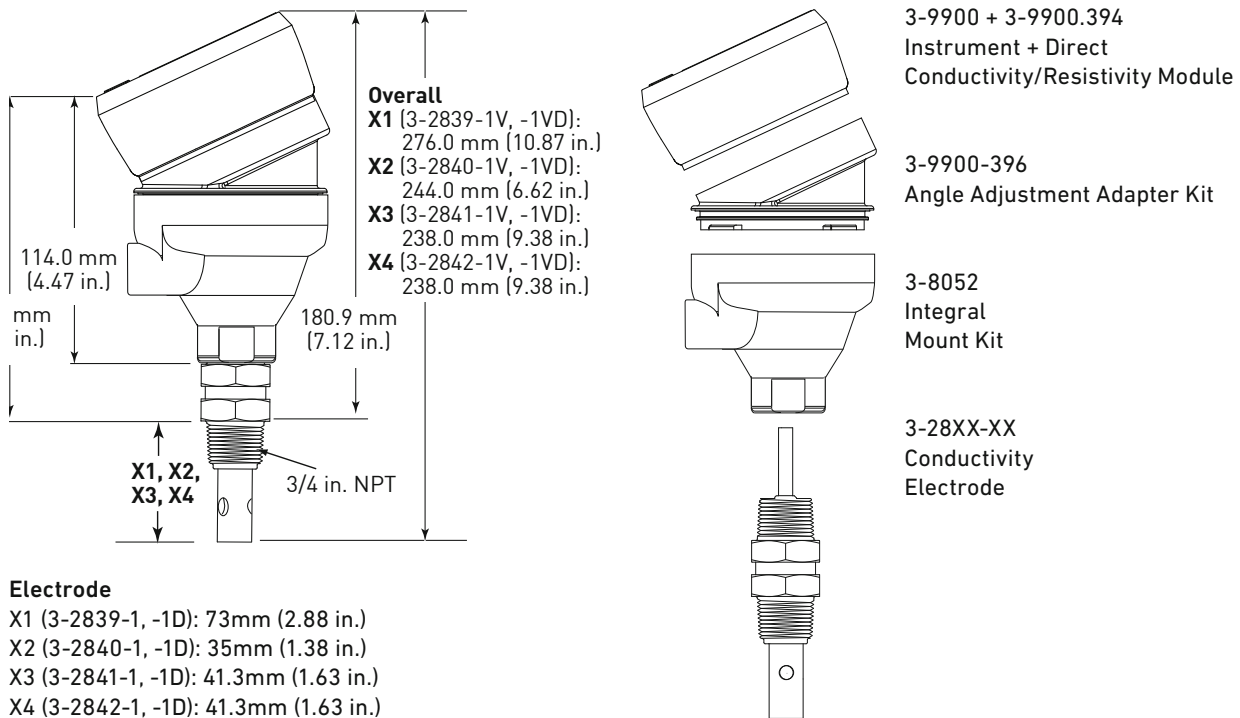


The installation must be performed in accordance with the instruction manual. The instruction manual is included with the product, see also online on www.gfps.com/signet

3.2.2 Technical Details

See individual instrument and sensor/electrode catalogue pages for more information. Refer to Models 2839, 2840, 2841, 2842, and 9900 technical specifications for more details on these products.

Dimensions



Ordering Notes

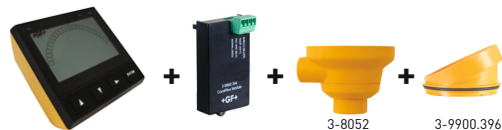
Integral Mounts are available with all parts conveniently assembled (transmitter, sensor, and mounting kits). Alternatively, all three parts can be purchased separately. See individual instrument and sensor pages for more information. Only available in Europe.

3.2.3 System Overview

Integral Installation

GF Signet Model 9900 Transmitter

3-9900.394 Direct Conductivity/Resistivity Module, 3-8052 Integral Mount Kit and 3-9900.396 Angle Adapter



GF Signet Dual Threaded Conductivity Electrodes

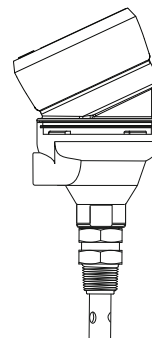
- 2839
- 2841
- 2840
- 2842



Customer supplied standard 3/4 in fittings

3.2.4 Ordering information




Mfr. Part No./ Code	Instrument + Sensor	Description
159 001 728	3-9900-1 + 3-2839-1V	Cell constant: 0.01 cm-1, 3/4 in. NPT
159 001 729	3-9900-1 + 3-2840-1V	Cell constant: 0.1 cm-1, 3/4 in. NPT
159 001 730	3-9900-1 + 3-2841-1V	Cell constant: 1.0 cm-1, 3/4 in. NPT
159 001 731	3-9900-1 + 3-2842-1V	Cell constant: 10.0 cm-1, 3/4 in. NPT
159 001 757	3-9900-1 + 3-2839-1VD	Cell constant: 0.01 cm-1, ISO 7/1-R 3/4
159 001 758	3-9900-1 + 3-2840-1VD	Cell constant: 0.1 cm-1, ISO 7/1-R 3/4
159 001 759	3-9900-1 + 3-2841-1VD	Cell constant: 1.0 cm-1, ISO 7/1-R 3/4
159 001 732	3-9900-1 + 3-2842-1VD	Cell constant: 10.0 cm-1, ISO 7/1-R 3/4



3.2.5 Accessories

Mfr. Part	Code	Description
3-9900.396	159 001 701	Angle adjustment adapter kit

4 GF Signet Single and Multi-Parameter Specification Matrix

	9950	9900	8900
			
Description	Multi-Channel (2 channel) Multi-Parameter Controller	Single-Channel 9900: Multi-Parameter Transmitter	Multi-Channel, Multi-Parameter Controller
Modular Components	Yes	Yes	Yes
Number of Flow Totalizers	2 Permanent 2 Resettable	1 Permanent 1 Resettable	6 Permanent 6 Resettable
Max. Sensor Inputs	2 frequency or S ³ L inputs	1	(up to 2 frequency and 4 (S ³ L) or 6 (S ³ L) 6 total sensor inputs
Mounting Options	Panel	Panel, Wall, Pipe, Tank	Panel
Display	LCD, Dot matrix	LCD with digital bar graph	LCD
Analog Output Types	2 Standard Passive, 4 to 20 mA outputs 2 or 4 optional passive, 4 to 20 mA Outputs via Channel Dual Modules 2 Passive 4 to 20 mA	9900: 2 Passive 4 to 20 mA 1 Standard, 1 Optional with 4 to 20 mA Output module HART optional with H COMM module	4 Passive/Active 4 to 20 mA or (4) 0 to 5/10 VDC
Max. Relays / O.C.	4 dry contact relays or 2 mechanical and 2 solid state relays (optional relay module)	1 open collector (standard) 2 relays (optional relay module)	up to 8 relays (via 8059)
Derived Measurements	6 derived measurements sum, delta (difference), ratio, % passage % reject, % recovery	N/A	Sum, Difference, % Recovery, % Reject, % Passage, Ratio, Power (BTU)
Languages	English, French, German, Spanish and Simplified Chinese	English	English, French, German, Spanish, Italian, and Portuguese
Ambient Temperature	DC: -10°C to 70°C (14 to 158 °F) AC: -10°C to 60°C (14 °F to 140 °F) -15 °C to 70°C (5 °F to 158 °F)	-10 °C to 70 °C (14 °F to 158 °F) -15 °C to 70 °C (5 °F to 158 °F)	-10 °C to 55 °C (14 °F to 131 °F) -15 °C to 80 °C (5 °F to 176 °F)
Storage Temperature			
Relative Humidity	0 to 95%, non-condensing	0 to 95%, non-condensing	0 to 95%, non-condensing
Power Requirements	DC – 24 VDC nominal (12 to 32 VDC, ± 10% regulated) AC – 100 to 240 VAC, 50 to 60 Hz, 24V	24 VDC input; range: 10.8 to 35.2 VDC regulated	12 to 24 VDC ±10%, regulated or 100 to 240 VAC ±10%, regulated, 50/60 Hz
Standards and Approvals	CE, UL, CUL, FCC, RoHS compliant, China RoHS , NEMA TYPE 4X/IP65 (front face only on panel mount)	9900: CE, FCC, UL, CUL, RoHS compliant, Lloyd's Register, China RoHS, NEMA TYPE 4X/IP65 (front face only on panel mount); field mount is 100% NEMA TYPE 4X/IP65	CE, FCC, UL, CUL, RoHS compliant, China RoHS NEMA 4X/IP65 (front face only)

Planning Fundamentals of Valves and Automation

Measurement and Control - Temperature, Pressure and Level Sensors

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6	GF Signet Single and Multi-Parameter Specification Matrix	828

1 Technical basics

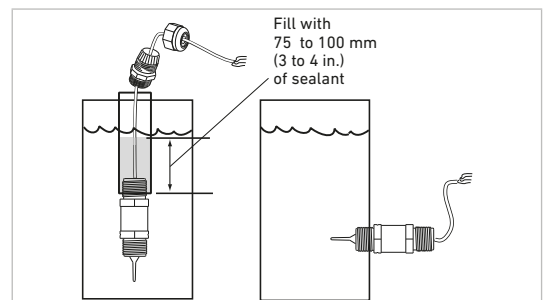
1.1 Temperature Sensors

Submersible Installation

- Use the 2350 sensor with 4.6 m (15 ft) cable.
- Mount the sensor to an extension pipe or watertight conduit using thread sealant.
- Use a cable gland at the top of the extension to prevent moisture intrusion/accumulation inside the pipe.
- For additional defense against possible accumulation of condensation at the back seal area of the sensor, fill the lower 75-100 mm (3-4 inches) of conduit or extension pipe with a flexible sealant such as silicone.

Installation Tips

8050-1 and 8052-1 junction boxes can be useful for this installation option.



In-Line Installation

- The 2350 can be mounted in a pipe-tee using the threads closest to the sensing end.
- The sensor can be mounted with or without an integral kit. This kit mounts a junction box to an instrument.
- See below for more information on instrument integral mount and junction box/remote mount examples.

Integral Assembly

- The 3-8052 Integral Kit connects the 9900 Temperature Transmitter directly onto the 2350 sensor.
- Apply sealant or PTFE tape to the process connection threads, after inspecting threads to ensure integrity. Do not install a sensor with damaged threads.
- Tighten the sensor 1½ turns past finger tight into the process connection.

Remote Assembly

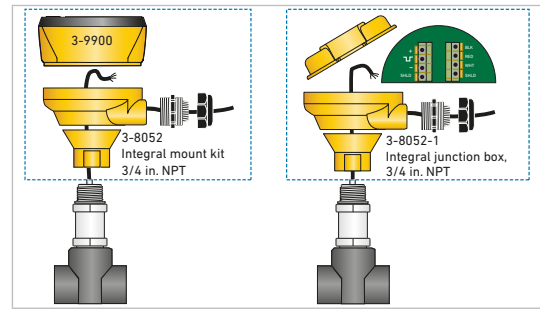
- The optional 3-8052-1 Integral Junction Box with ¾ in. process connection offers a convenient terminal point to extend the 2350 cable over a distance.

The kit includes:

- ¾ in. NPT process connection
- Conduit base and cap with junction terminals
- 3-9000.392-1 liquid tight connector, ½ in. NPT
- Apply sealant or PTFE tape to the process connection threads, after inspecting threads to ensure integrity. Do not install a sensor with damaged threads.
- Tighten the sensor 1½ turns past finger tight into the process connection.

Installation Tips

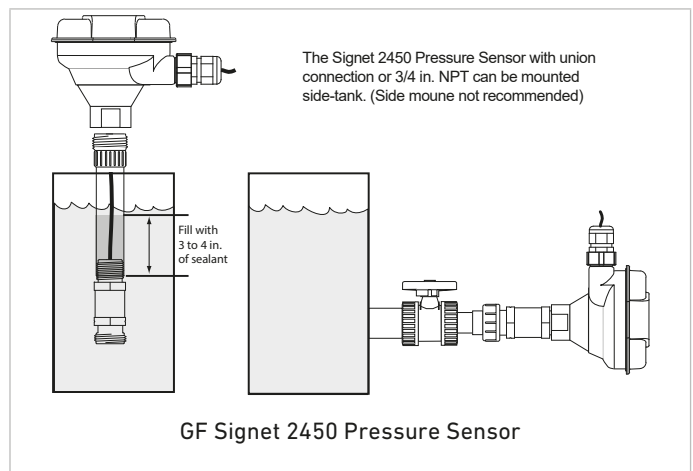
Sensors can be mounted into any DN20 (¾ in.) FNPT pipe tee (customer supplied)



1.2 Pressure and Level Sensors

Submersible Installation

- Use the 2450 and 2250 sensors with 4.6 m (15 ft) cable and 10 m (32.8 ft).
- Mount the sensor to an extension pipe or watertight conduit using thread sealant.
- Use a cable gland at the top of the extension to prevent moisture accumulation inside the pipe.
- For 2450 sensors: DO NOT hermetically seal (i.e. applying silicone sealant or epoxy) the back of sensor. This may introduce measurement errors resulting from changes in atmospheric pressure and/or temperature. Instead, use a 2250 which has an extended atmospheric breather tube (same length of sensor cable). Do not to pinch breather tube.

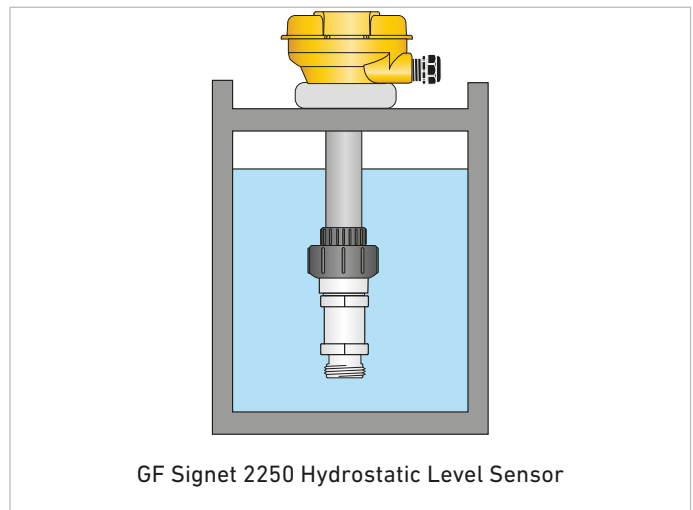


In-Line Installation

- The 2450 can be mounted in a pipe-tee using the threads closest to the sensing end.
- The sensor can be mounted with or without an integral mount kit. This kit mounts a junction box or an instrument.
- See below for more information on instrument integral mount and junction box/remote mount examples.

Installation Tips

8050-1 and 8050-2 junction boxes can be useful for this installation option.



Integral Assembly

The 3-8052 Integral Kit connects the 8450 Pressure Transmitter directly onto the 2450 sensors.

- Use the 2450 sensor with 15.2 cm (6 in.) cable and digital (S³L) output.
- Apply sealant or PTFE tape to the process connection threads, after inspecting threads to ensure integrity. Do not install a sensor with damaged threads.
- Tighten the sensor 1½ turns past finger tight into the process connection.

Remote Assembly

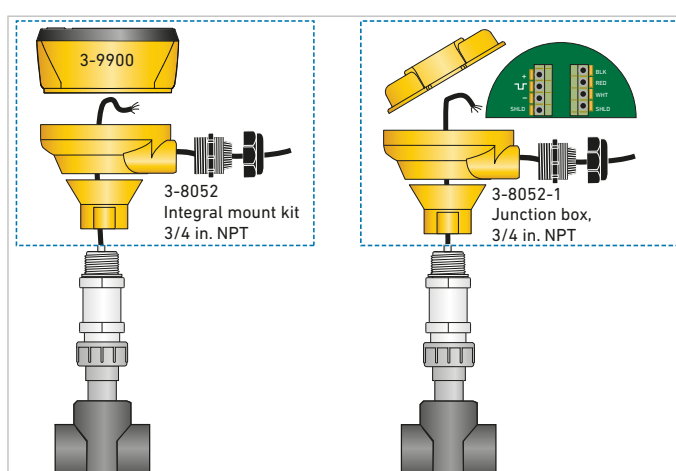
The optional 3-8052-1 Integral Kit with Junction Box and ¾ in. NPT sensor connection provides a convenient terminal point to extend the 2450 and 2250 cable over a distance.

The kit includes:

- ¾ in. NPT sensor connection
- Conduit base and cap with junction terminals
- 3-9000.392-1 liquid tight connector, ½ in. NPT

Installation Tips

Sensors can be mounted into any DN20 (¾ in) FNPT pipe tee (customer supplied)



The in-line 2450 pressure sensor with union connection can be mounted using GF parts. See below for list of GF Part Numbers.

Union Matrix for Pressure Sensor 3-2450 ½ in. (DN15) Union Connection

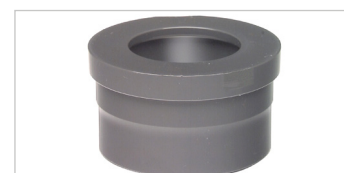
Nuts

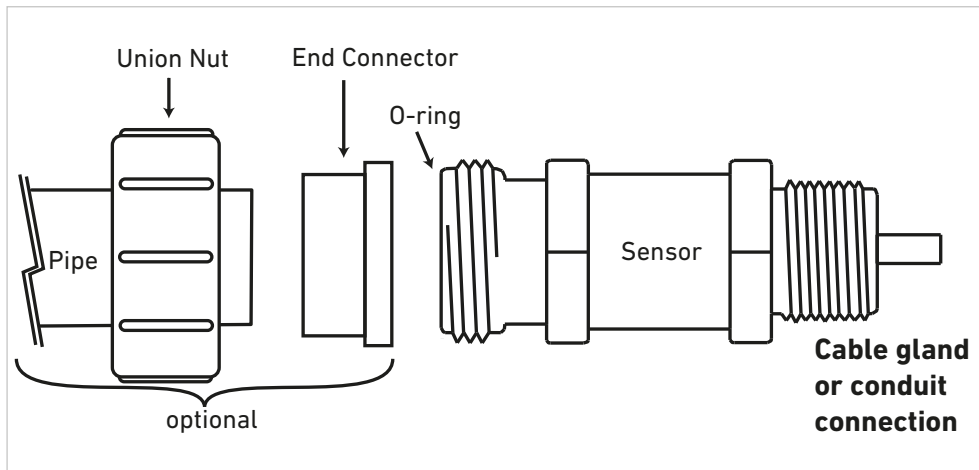
Material	Part Number
PVC	721 690 006
PVC-C	723 690 006
PVDF	735 690 406
PP	727 690 406



End Connector

Material	Part Number	Description
PVC	721 500 106	Union end metric socket
PVC	721 602 006	Union end IPS socket
PVC	721 602 656	Union end NPT thread
PVC-C	723 602 006	Union end socket
PP-H	727 508 506	Union end butt
PP-H	727 500 106	Union end socket
PP-H	157 203 603	Union end threaded NPT
PP-N	728 608 506	Union end butt
PVDF	735 608 606	Union end butt
PVDF	735 600 106	Union end socket
PVDF	198 203 611	Union end threaded





2 Temperature Sensors

2.1 2350 Temperature Sensor

Blind Transmitter or Digital (S³L) Sensor



2.1.1 Product description

The GF Signet 2350 Temperature Sensor has a one piece injection molded PVDF body that is ideal for use in high purity applications. It also outlasts metal sensors in aggressive liquids and eliminates the need for costly custom thermowells. These sensors are available with a proprietary digital (S³L) output or field-scaleable 4 to 20 mA output.

Dual threaded ends (¾ in. NPT) allow submersion in process vessels, or in-line installation with conduit connection. An integral adapter kit (sold separately) may be used to create a compact assembly with field mount versions of the GF Signet 9900 Transmitter.

Features

- 4 to 20 mA or digital (S³L) output
- Standard ¾ in. NPT process connection
- One-piece injection molded PVDF body
- Platinum RTD in extended tip for quick response
- Easy installation
- Threaded for in-line or submersible installation



Applications

- Plating Bath Temperature Control
- Heat Exchange Monitor
- R.O. and D.I. System Monitor
- Hot/Cold Mixing System Monitor
- Data Acquisition
- Cooling Loops
- Effluent Monitoring
- HVAC
- Chemical Processing



The installation must be performed in accordance with the instruction manual. The instruction manual is included with the product, see also online on www.gfps.com/signet

2.1.2 Technical Details

General

Output	Digital (S ³ L) output or 4 to 20 mA
Accuracy	±0.5 °C (±0.9 °F)
Response Time	10 secs.
Repeatability	±0.1 °C (±0.2 °F)
Resolution	0.01 °C (0.02 °F)
Sensing-End Connection	¾ in. NPT male thread
Cable-End Connection	¾ in. NPT male thread

Wetted Materials

Sensor Housing	PVDF
----------------	------

Electrical

Power Requirements		
	Digital (S ³ L)	5 to 6.5 VDC ±10 %, <1.5 mA
	4 to 20 mA	12 to 24 VDC ±10 %, regulated
Cable Length	4.6 m (15 ft) cable length can also be extended up to 121 m (400 ft)	
Digital (S ³ L) Output	Serial ASCII, TTL Level 9600 bps. Reverse polarity and short circuit protected. Cable Type: PVC jacketed, 3-conductor with shield 22 AWG, Blk/Red/White/Shld	
4 to 20 mA Output		
Accuracy	±32 µA	
Resolution	<5 µA	
Span	4 to 20 mA factory calibrated 0 °C to 100 °C (32 °F to 212 °F)	
Max. Loop Impedance	50 Ω @ 12 V 325 Ω @ 18 V 600 Ω @ 24 V	
Update Rate	<100 ms	

Max. Temperature/Pressure Rating

Operating Temperature		
In-line Mounting	-10 °C @ 16 bar to 100 °C @ 7.5 bar	14 °F @ 232 psi to 212 °F @ 108 psi
Submersible Mounting	-10 °C @ 16 bar to 100 °C @ 7.5 bar	14 °F @ 232 psi to 185 °F @ 108 psi
Storage Temperature	-55 °C to 85 °C -67 °F to 212 °F	
Relative Humidity	0 to 95% non-condensing	

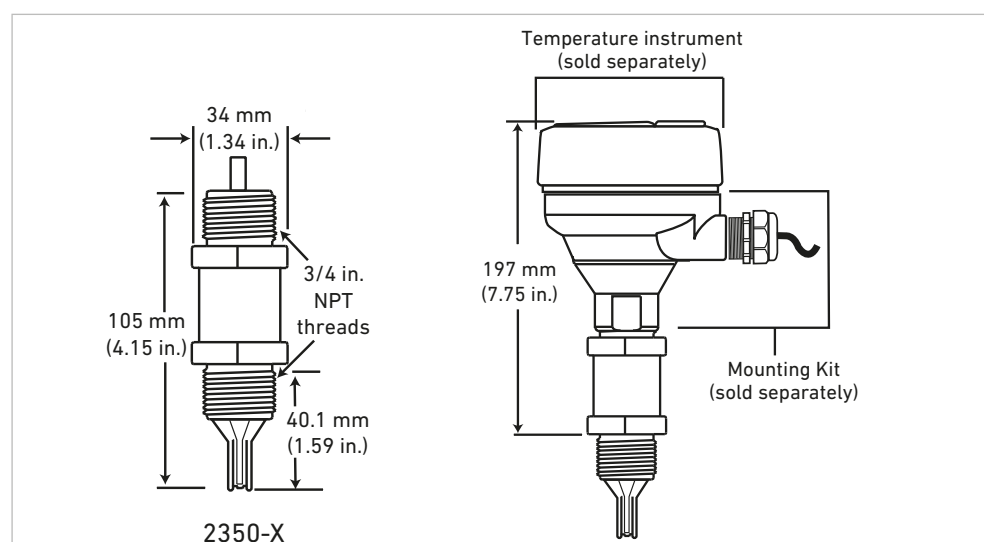
Shipping Weight

0.22 kg	0.5 lb
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Standards and Approvals

CE, FCC
RoHS compliant, China RoHS
Manufactured under ISO 9001 for Quality and ISO 14001 for Environmental Management

Dimensions



2.1.3 System Overview

In-Line Installation

Panel Mount	Pipe, Tank, Wall Mount	Field Mount	4 to 20 mA Output	Automation System
GF Signet Instruments - 8900 - 9900 - 9950	GF Signet Instruments* - 9900-1P with Rear Enclosure - 9900-1 with 3-8050 Universal Mount Kit*	GF Signet Instruments with 3-8052 Integral Mount Kit - 9900	- Customer Supplied Chart Recorder, Programmable Logic Controller or - Programmable Automation Controller	- 0486 Profibus Concentrator and Customer Supplied Programmable Logic Controller or - Programmable Automation Controller

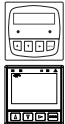
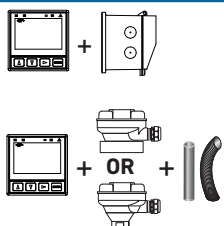

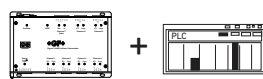
GF Signet 2350 Temperature Sensor



In-Line Installation - Fittings Customer Supplied

All sold separately

Submersible Installation

Panel Mount	Pipe, Tank, Wall Mount	4 to 20 mA Output	Automation System
<p>GF Signet Instruments</p> <ul style="list-style-type: none">- 8900- 9900- 9950 	<p>GF Signet Instruments*</p> <ul style="list-style-type: none">- 9900-1P with Rear Enclosure- 9900-1 with 3-8050 Universal Mount Kit or 3-8052 Integral Mount Kit and Pipe Extension or Conduit with 3/4 in. FNPT Threads** 	<ul style="list-style-type: none">- Customer Supplied Chart Recorder- Programmable Logic Controller or- Programmable Automation Controller 	<ul style="list-style-type: none">- 0486 Profibus Concentrator and Customer Supplied Programmable Logic Controller or- Programmable Automation Controller 

GF Signet 2350 Temperature Sensor



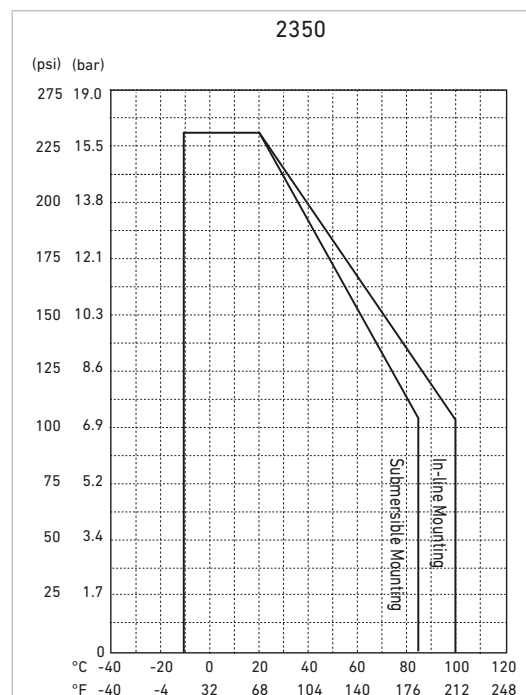
All sold separately

*For tank or wall mount installations, user must use the Universal Adapter Kit (3-8050)
**Refer to the GF Signet Submersion Kit brochure (3-0000.707) located on our website for installation suggestions and options.

2.1.4 Pressure-temperature diagram

Note

The pressure-temperature diagrams are specifically for the GF Signet sensor. During system design the specifications of all components must be considered. In the case of a metal piping system, a plastic sensor will reduce the system specification. When using a PVDF sensor in a PVC piping system, the fitting will reduce the system specification.



Application Tips

- For submersible sensor mounting, always use a water tight conduit and a cable gland to prevent moisture intrusion.
- To extend the cable, use a 3-conductor shielded cable and junction box.
- Sensors with extended cables available, contact Special Order products.

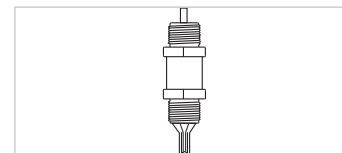
2.1.5 Ordering information

Ordering Notes

3-2350-X sensor can be mounted with an instrument in an integral configuration by doing the following:

- Order Integral adapter kit 3-8052 (sold separately) to connect the instrument (sold separately) directly onto the sensor.
- Order an instrument (sold separately). The following instrument part numbers are compatible with the 2350 for integral mounting: 3-9900-1
- Refer to the GF Signet Submersion Kit brochure (3-0000.707) located on our website for installation suggestions and options.

Mfr. Part No.	Code	Output and Cable Length
Temperature Sensor		
3-2350-1	159 000 021	Digital (S ³ L) and 4.6 m (15 ft) cable
3-2350-3	159 000 920	Current (4 to 20 mA) and 4.6 m (15 ft) cable



2.1.6 Accessories

Mfr. Part	Code	Description
5523-0322	159 000 761	Sensor cable (per ft), 3 cond. plus shield, 22 AWG
3-8052	159 000 188	¾ in. Integral mounting kit
3-8052-1	159 000 755	¾ in. NPT mount junction box with one liquid tight connector and cap with junction terminals
3-9000.392-1	159 000 839	Liquid tight connector kit, NPT (1 connector)
3-9000.392-2	159 000 841	Liquid tight connector kit, PG 13.5 (1 connector)
3-0252	159 001 808	Configuration Tool
	Contact Factory	Custom cable length available

2.2 Temperature Integral System with 9900 Transmitter

Member of the SmartPro® Family of Instruments



2.2.1 Product description

GF Signet has combined the 9900 SmartPro™ Transmitter with the 2350 Temperature sensors to create integral systems that are easy to order and simple to install. Also available in conductivity, flow, level, and pressure configurations, each integral system features a 9900 Transmitter which provides a local and easy to read LCD display. The push button keypad makes it easy to navigate through the transmitter's menu. The DCpowered 9900 features a scalable 4 to 20 mA output and open collector for process control.

The integral system is offered with a GF Signet 2350 Temperature sensor and is available in a range of -10 °C to 100 °C (14 °F to 212 °F). Sensor installation is achieved into standard pipes via the 3/4 inch sensor threaded NPT process connection. The sensor is available with PVDF wetted materials.

Features

- Local display for sensor mounted instruments
- Provides 4 to 20 mA output
- "At a glance" visibility
- "Dial-type" digital bar graph
- NEMA 4X/IP65

Applications

- Cooling Tower Control
- Filtration Systems
- Chemical Production
- Semiconductor Water Production
- Aquariums
- Aquatic Monitoring
- Heat Exchangers
- Galvanic Plating



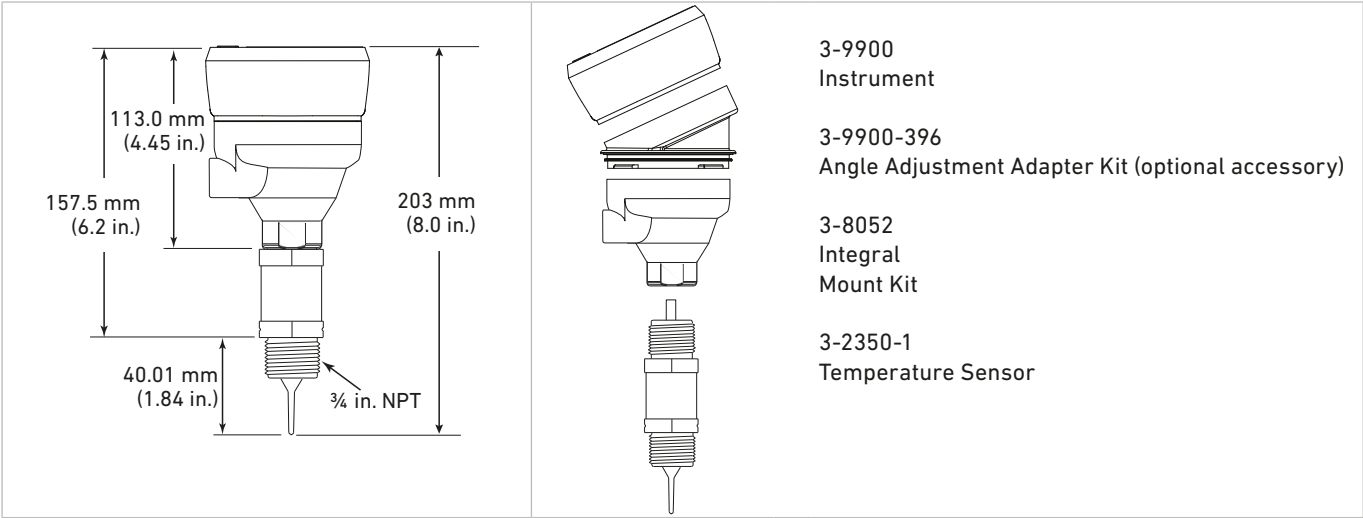
The installation must be performed in accordance with the instruction manual. The instruction manual is included with the product, see also online on www.gfps.com/signet



2.2.2 Technical Details

i See individual transmitter and sensor product pages for more information.

Dimensions



2.2.3 System Overview

Integral Installation

GF Signet Model 9900 Transmitter
with 3-8052 Integral Adapter Kit

3-8052

GF Signet 2350 Temperature Sensor

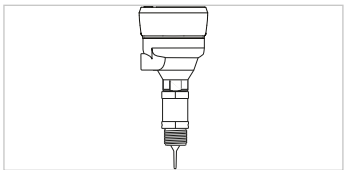
Customer supplied standard 3/4 in fittings

2.2.4 Ordering information

Ordering Notes

The Integral Mount is available with all parts conveniently assembled (instrument, sensor, and mounting kit). Alternatively, all three parts can be purchased separately. See individual transmitter and sensor pages for more information. Only available in Europe.

Mfr. Part No.	Instrument + Sensor	Description
159 001 745	3-9900-1 + 3-2350-1	4 to 20 mA and one open collector + digital (S ³ L) temperature sensor



2.2.5 Accessoires

Mfr. Part	Code	Description
3-9900.396	159 001 701	Angle adjustment adapter kit

3 Pressure Sensors

3.1 2450 Pressure Sensor

1/2 in. union mount Blind transmitter or digital (S³L) sensor



3.1.1 Product description

The 2450 Pressure Sensor has a one-piece injection molded PVDF body and ceramic diaphragm for superior compatibility in corrosive liquids. Three pressure versions allow for optimal resolution matched to your sensing needs. Solid state circuitry eliminates drift (no internal potentiometers).

These sensors are available with a proprietary digital (S³L) output, or field-scaleable 4 to 20 mA output. Dual-threaded ends allow in-line installation with conduit connection, or add the integral adapters to create a compact assembly with a field mount version of the GF Signet 9900 Transmitter.

Features

- Test certificate included
- 4 to 20 mA or digital (S³L) output
- ½ in. male union process connection
- One-piece injection molded PVDF body
- Flush ceramic diaphragm
- Easy installation
- Choice of three pressure ranges
- Pressure or level measurement
- NEMA 4X/IP65 rated when using the 3-8052-1

Applications

- Level or Depth Sensing
- HVAC
- Scrubber Systems
- Pump Protection
- Water Management
- Irrigation Systems
- Wastewater
- Chemical Processing
- Pressure Regulation/Monitoring



The installation must be performed in accordance with the instruction manual. The instruction manual is included with the product, see also online on www.gfps.com/signet



VI

3.1.2 Technical Details

General

Output	Digital (S ³ L) or 4 to 20 mA
Accuracy	
For all pressure ranges	±1% of full scale @ 25 °C
Response Time	< 100 ms
Sensing-End Connection	½ in. union male thread (requires end connector and union nut) (See installation section for end connector and nut recommendation)
Cable-end connection	¾ in. NPT male thread

Wetted Materials

Sensor Housing	PVDF
Diaphragm	Ceramic
Diaphragm Seal and Union O-ring	FKM

Electrical

Power Requirements		
Digital (S ³ L)	5 to 6.5 VDC < 1.5 mA	
4 to 20 mA	12 to 24 VDC ±10%, regulated	
Cable Length	4.6 m	15 ft
Cable Type	3 cond. + shield, 22 AWG, PVC jacketed, Blk/Red/White/Shld	
Digital (S ³ L) Output	Serial ASCII, TTL level 9600 bps.	
	Reverse polarity and short circuit protected.	
4 to 20 mA Output		
Accuracy	±32 µA	
Resolution	< 5 µA	
Span	4 to 20 mA factory calibrated to operating ranges shown below	
Max. Loop Impedance	100 Ω @ 12 V	
	325 Ω @ 18 V	
	600 Ω @ 24 V	

Max. Temperature/Pressure Rating

Operating Temperature	-15 °C to 85 °C	5 °F to 185 °F
Storage Temperature	-20 °C to 100 °C	-4 °F to 212 °F
Operating Pressure		
-XU	0 to 0.7 bar	0 to 10 psi
-XL	0 to 3.4 bar	0 to 50 psi
-XH	0 to 17 bar	0 to 250 psi
Vacuum Range		
-XU	-0.1 to 0.7 bar	-1.5 to 10 psi
-XL	-0.41 to 3.4 bar	-6 to 50 psi
-XH	-0.96 to 17.2 bar	-14.6 to 250 psi
Proof Pressure		
-XU	1.4 bar	20 psig
-XL	5.2 bar	75 psig
-XH	20.7 bar	300 psig

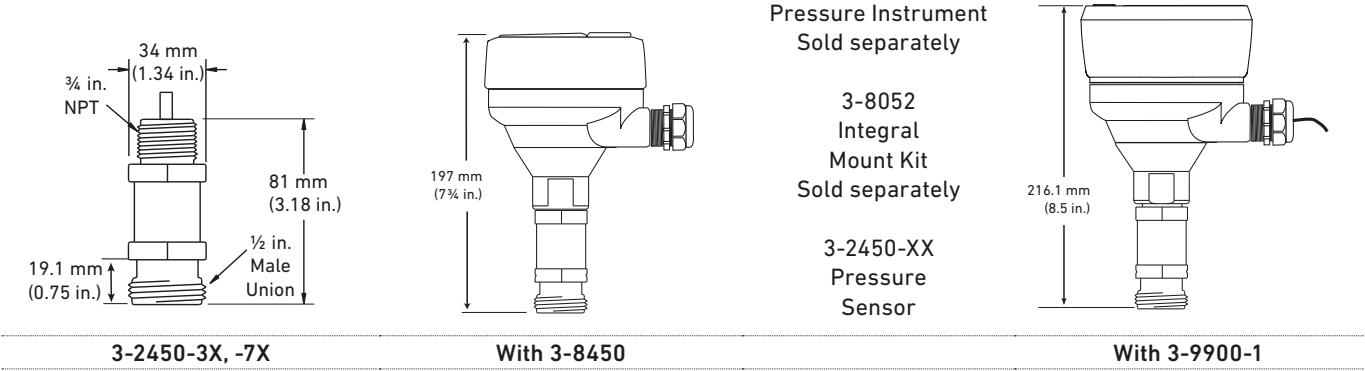
Shipping Weight

Shipping weight	0.150 kg	0.33 lb
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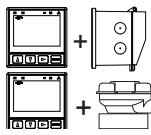
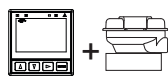

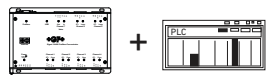

Standards and Approvals

CE, FCC
RoHS compliant, China RoHS
Manufactured under ISO 9001 for Quality and ISO 14001 for Environmental Management

Dimensions



3.1.3 System Overview

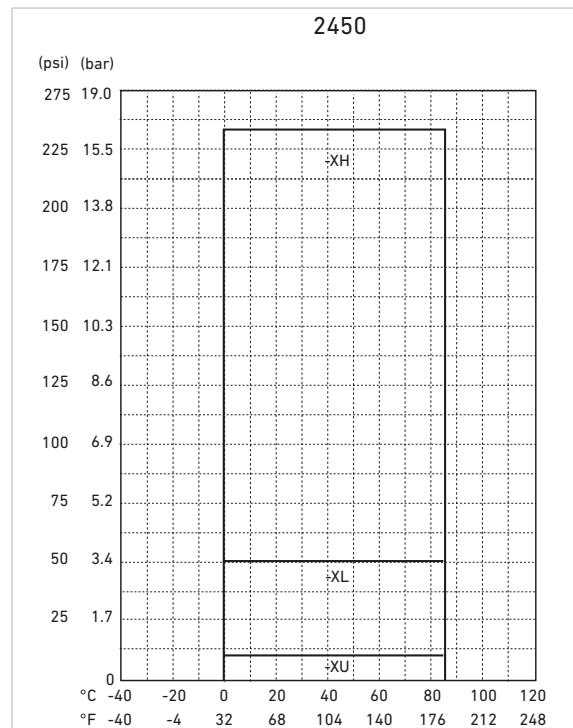
Panel Mount	Pipe, Tank, Wall Mount	Field Mount	4 to 20 mA Output	Automation System
GF Signet Instruments - 8900 - 9900 - 9950 	GF Signet Instruments* - 9900-1P with Rear Enclosure - 9900-1 with 3-8050 Universal Mount Kit* 	GF Signet Instruments with 3-8052 Integral Mount Kit - 9900 	- Customer Supplied Chart Recorder, Programmable Logic Controller or Programmable Automation Controller 	- 0486 Profibus Concentrator and Customer Supplied Programmable Logic Controller or Programmable Automation Controller 
GF Signet 2450 Pressure Sensor 				
In-Line Installation - Fittings Customer Supplied			All sold separately	

* The capillary tube located at the rear of the sensor must be exposed to the atmosphere.

3.1.4 Pressure-temperature diagram

Note

The pressure-temperature diagrams are specifically for the GF Signet sensor. During system design the specifications of all components must be considered. In the case of a metal piping system, a plastic sensor will reduce the system specification. When using a PVDF sensor in a PVC piping system, the fitting will reduce the system specification.



Application Tips

- These sensors can also be used for tank level measurements.
- Place a ball valve between tank and 2450 sensor for maintenance ease.
- Back end of sensor must be exposed to atmospheric pressure.
- To extend the cable, use a 3-conductor shielded cable & junction box.
- For submersible sensor mounting, always use the 3-2250 Submersible Hydrostatic Pressure Sensor.
- EPDM available contact special order

3.1.5 Ordering information

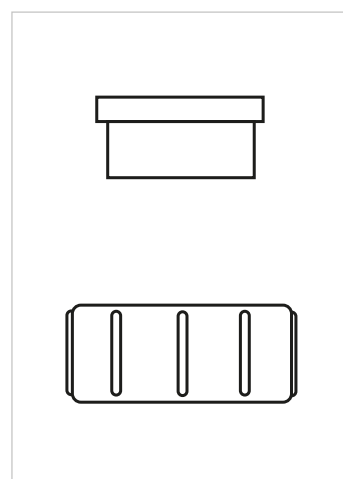
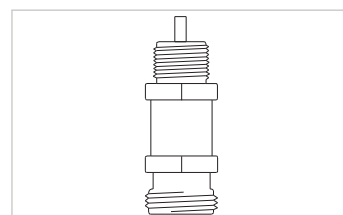
Ordering Notes

Any sensor can be mounted with an instrument in an integral configuration by doing the following:

1. It is advised to protect the capillary tube located on the back of the sensor with the NEMA 4X/IP65 rated 3-8052-1.
2. Order Integral adapter kit PN 3-8052 or 3-8052-1 (sold separately) to connect the instrument (sold separately) directly on to the sensor.
3. Order an instrument (sold separately). The following instrument part numbers are compatible with the 2450 for integral mounting: 3-9900-1.
4. Union mount version installs into pipe with end connector and union nut. See Installation and Wiring section for more information on parts required.

Mfr. Part No.	Code	Output	Process Connection
Pressure Sensor with 4.6 m (15 ft) cable			
Operating Pressure Range 0 to 10 psi			
3-2450-3U	159 000 683	Digital (S ³ L)	½ in. male union
3-2450-7U	159 000 906	Current (4 to 20 mA)	½ in. male union
Operating Pressure Range 0 to 50 psi			
3-2450-3L	159 000 682	Digital (S ³ L)	½ in. male union
3-2450-7L	159 000 908	Current (4 to 20 mA)	½ in. male union
Operating Pressure Range 0 to 250 psi			
3-2450-3H	159 000 681	Digital (S ³ L)	½ in. male union
3-2450-7H	159 000 910	Current (4 to 20 mA)	½ in. male union

Material	Code	Description
Union Matrix for Pressure Sensor 3-2450 ½ in. Union Connection		
End connector		
PVC	721 500 106	Union end metric socket
PVC	721 602 006	Union end IPS socket
PVC	721 602 656	Union end NPT thread
PVC-C	723 602 006	Union end socket
PP-H	727 508 506	Union end butt
PP-H	727 500 106	Union end socket
PP-H	157 203 603	Union end threaded NPT
PP-N	728 608 506	Union end butt
PVDF	735 608 606	Union end butt
PVDF	735 600 106	Union end socket
PVDF	198 203 611	Union end threaded
Nuts		
PVC	721 890 006	PVC nut
PVC-C	723 690 006	PVC-C nut
PVDF	735 690 406	PVDF nut
PP	727 890 406	Poly Pro nut



3.1.6 Accessories

Mfr. Part	Code	Description
5523-0322	159 000 761	Sensor cable (per ft), 3 cond. plus shield, 22 AWG
3-8052	159 000 188	¾ in. Integral mounting kit
3-8052-1	159 000 755	¾ in. NPT mount junction box with one liquid tight connector and cap with junction terminals (NEMA 4X/IP65 rated)
3-9000.392-1	159 000 839	Liquid tight connector kit, NPT (1 connector)
3-9000.392-2	159 000 841	Liquid tight connector kit, PG 13.5 (1 connector)
3-9900.396	159 001 701	Angle Adjustment Adapter Kit (for Field Mounting)
3-0252	159 001 808	Configuration tool
Contact Specials	Special Order	1/2" union to a 3/4" NPT adapter is available

3.2 Pressure Integral Systems with 9900 Transmitter

Member of the SmartPro® Family of Instruments



3.2.1 Product description

GF Signet has combined the 9900 SmartPro® Transmitter with the 2450 Pressure sensors to create integral systems for level applications that are easy to order and simple to install. Also available in conductivity, temperature, and flow configurations, each integral system features a 9900 Transmitter which provides a local and easy to read LCD display. The push button keypad makes it easy to navigate through the transmitter's menu. The DC-powered 9900 features a scalable 4 to 20 mA output and open collector for process control.

The integral system offers a local display, a scalable 4 to 20 mA output and open collector for process control. A 2450 Pressure sensor with wetted material of ceramic and PVDF installs into a 1/2" union fitting. The 2450 Pressure sensor is offered in three pressure ranges which could also be used as a hydrostatic level for tank level management.

Features

- Utilizes the 2450 sensor for pressure or hydrostatic level measurement
- Local display for sensor mounted instruments
- Provides 4 to 20 mA output
- „At a glance“ visibility
- „Dial-type“ digital bar graph
- NEMA 4X/IP65



Applications

- Water Quality
- Filtration Systems
- Chemical Production
- Liquid Delivery Systems
- Level Management
- Media Filtration
- Reverse Osmosis Systems



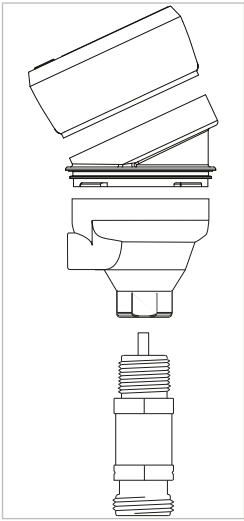
The installation must be performed in accordance with the instruction manual. The instruction manual is included with the product, see also online on www.gfps.com/signet

3.2.2 Technical Details

i See individual transmitter and sensor product pages for more information.

Sensor can be mounted through the side of a tank for hydrostatic level measurement. Tip: Add a ball valve to isolate the sensor from the tank to allow the removal of the sensor for service.

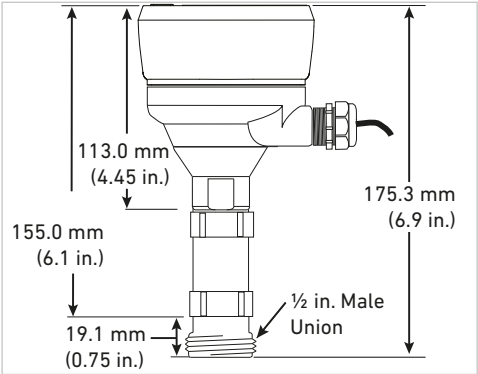
Pressure/Level Ranges*:	
3-2250-XU	0 to 10 psi = 0 to 7.03 meters = 0 to 23.06 ft
3-2250-XL	0 to 50 psi = 0 to 35.15 meters = 0 to 115.32 ft



- 3-9900 Instrument
- 3-9900-396 Angle Adjustment Adapter Kit (optional accessory)
- 3-8052 Integral Mount Kit
- 3-2450-3X Pressure Sensor

It is not recommended to use the 2450 Pressure sensor mounted inside a tank. For all tank installations where the sensor is mounted inside a tank, use 3-2250 Hydrostatic Level sensor only.


Dimensions




3.2.3 System Overview

Integral Installation

GF Signet Model 9900 Transmitter
with 3-8052 Integral Adapter Kit



GF Signet 2450 Pressure Sensor



Customer supplied standard 3/4 in fittings

3.2.4 Ordering information

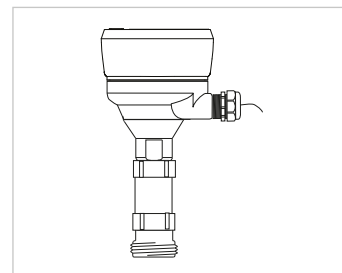
Ordering Notes

Integral Mounts are available with all parts conveniently assembled (transmitter, sensor, and mounting kit). Alternatively, all three parts can be purchased separately. See individual transmitter and sensor pages for more information. Only available in Europe.

Mfr. Part No./Code	Instrument + Sensor	Description
159 001 726	3-9900-1 + 3-2450-3U	0 - 0.7 bar (0 - 10 psi), ½ in. Union process connection
159 001 727	3-9900-1 + 3-2450-3L	0 - 3.4 bar (0 - 50 psi), ½ in. Union process connection
159 001 744	3-9900-1 + 3-2450-3H	0 - 17 bar (0 - 250 psi), ½ in. Union process connection

3.2.5 Accessories

Mfr. Part	Code	Description
3-9900.396	159 001 701	Angle adjustment adapter kit



4 Ultrasonic Level Sensors

4.1 Technical basics – 2260 and 2270 ultrasonic level sensors

4.1.1 Description

Fill level

GF ultrasonic level sensors are used for continuous monitoring of liquid levels in tanks and shafts. The contact-free measuring principle and the material variants PP and PVDF make measurements possible even in applications with high chemical concentrations. The level sensors are equipped with intelligent signal processing. Through software, the devices can also be tailored to uses in which conventional ultrasonic products reach their limits. The especially narrow sound beam guarantees especially good flexibility during installation even in very cramped conditions.

Flow

The GF level sensors can be used for flow measurements of open channels that function according to the Venturi principle. In this way, the flow rate can be determined via the detection of the backwater quantity before the tapering of a channel. The measurement results are output via an analog signal with 4 to 20 mA. Furthermore, digital communication via HART is possible.

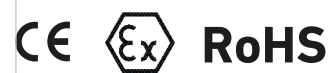
Function

The basic principle is an ultrasonic distance measurement between the sensor and the surface of the liquid. The sensor generates an ultrasonic pulse which is reflected back to the sensor when it contacts the medium. The time difference between the pulse and detection of the echo allows one to calculate the distance to the medium – a runtime measurement.

If the maximum tank height is known, the level of the liquid can be determined. Additionally, it is possible to perform volume calculations if the other tank dimensions are known.

Benefits/features

- 2-wire compact transmitter
- Contact-free level measurement
- Narrow 5° sound beam angle
- Fully temperature-compensated electronics
- No long-term drift
- Excellent signal processing software that delivers very precise measurements
- PP or PVDF sensor provides superior chemical resistance
- Quick-start operating menu for efficient installation
- Display or blind version available
- Switch relay for high-level/low-level alarm
- 4 – 20 mA / HART interface
- Secondary lightning protection





4.1.2 Technical basics

Ultrasonic technology is one of the most commonly used measuring principles in the area of level measurement. These sensors provide reliable measurement data. There is no long-term drift of the sensor here, as there can be in other technologies. If one assumes a constant atmosphere, only temperature has an influence on the measurement – this factor is compensated for in GF ultrasonic sensors directly for every measurement, however, with an integrated pt100 temperature sensor.

The quality of the useful echo is definitive for good measurements. It is influenced by the state of the surface of the medium to be measured and by the location of the sensor in the tank. The following points must be observed when selecting the proper measuring method:

Use areas for GF ultrasonic level sensors

	Optimal	Limited	Not recommended
No foam	✓		
Solids		✓	
Moderate amount of foam		✓	
Heavy foam			✓

Additional factors to be considered

Wind

Strong air turbulence can degrade the quality of measurements. This is only relevant for outdoor installations, for instance in open channels.

Light turbulence in the air

Light air turbulence created by high temperatures directly influences the speed of sound. GF sensors compensate for these effects in cases of process temperatures up to 90 °C.

Vapors, gases

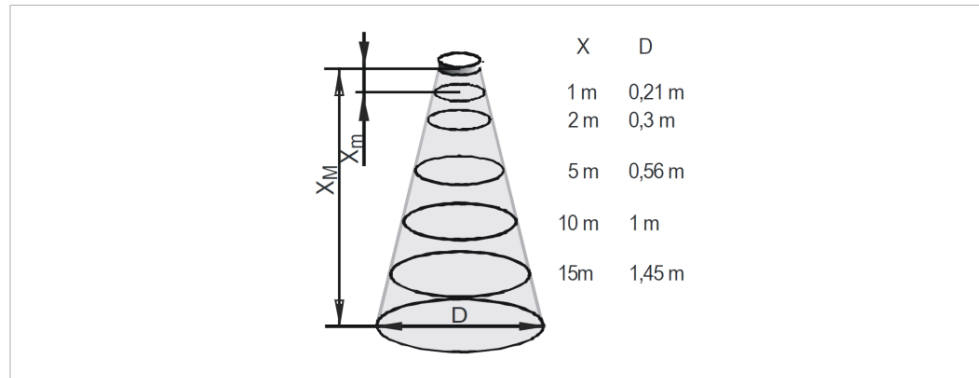
Strong, suddenly occurring chemical vapors and gases can also influence ultrasonic measurement. GF ultrasonic sensors can be adjusted for static conditions using software.

Agitated surface

Oscillations in measurements may result if the medium has an agitated surface. The measuring oscillations can be reduced to a minimum, however, through the attenuating function of the GF sensors.

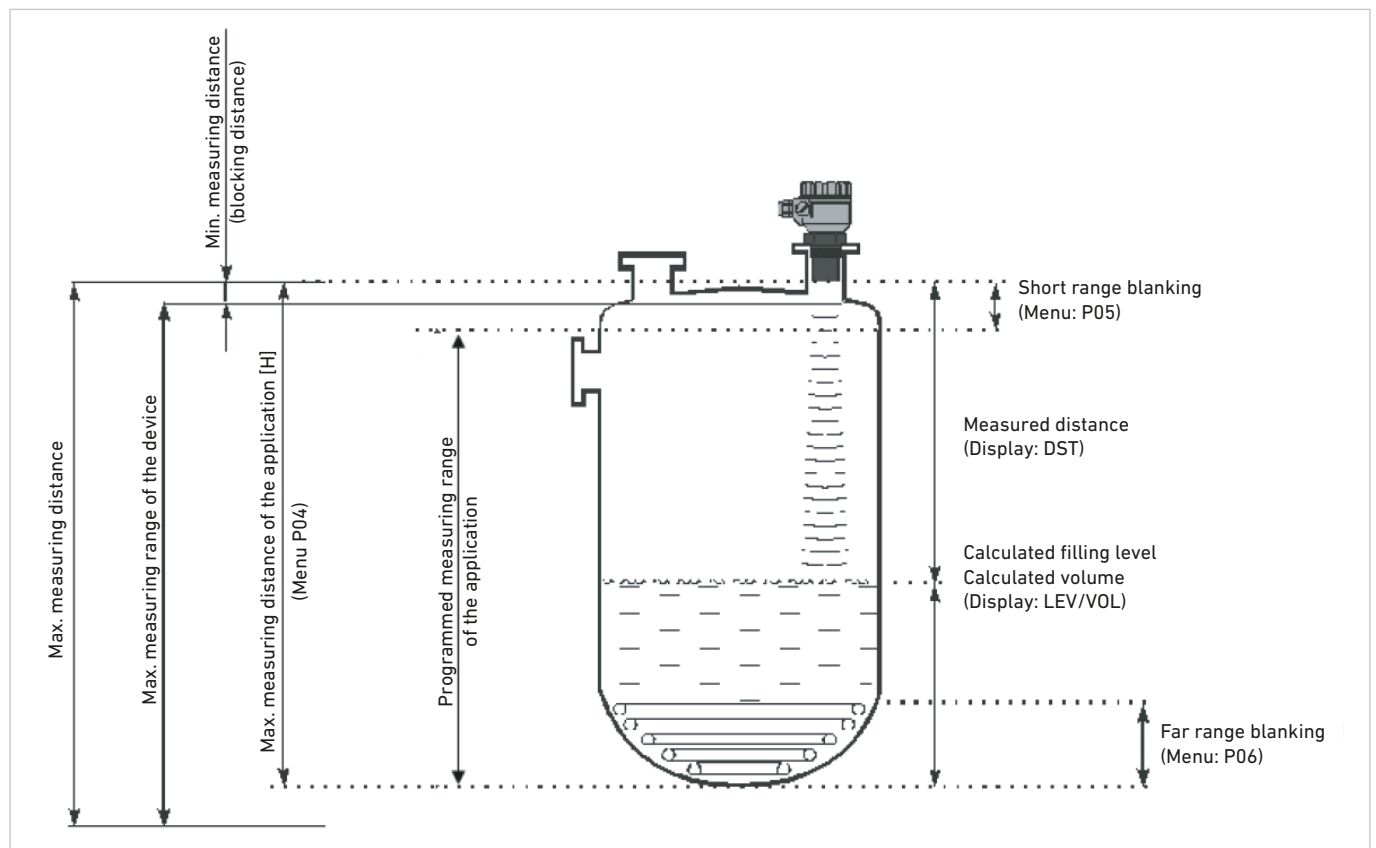
Sound beam in types 2260 and 2270

Both types bundle the sound waves extremely tightly. This ensures that even light foams can be penetrated. Even small concentrations of gases and vapors can be compensated in this way. Additionally, types 2260 and 2270 can be used in small and irregularly formed tanks. Make certain that the sound strikes the surface of the liquid as free from interference as possible.



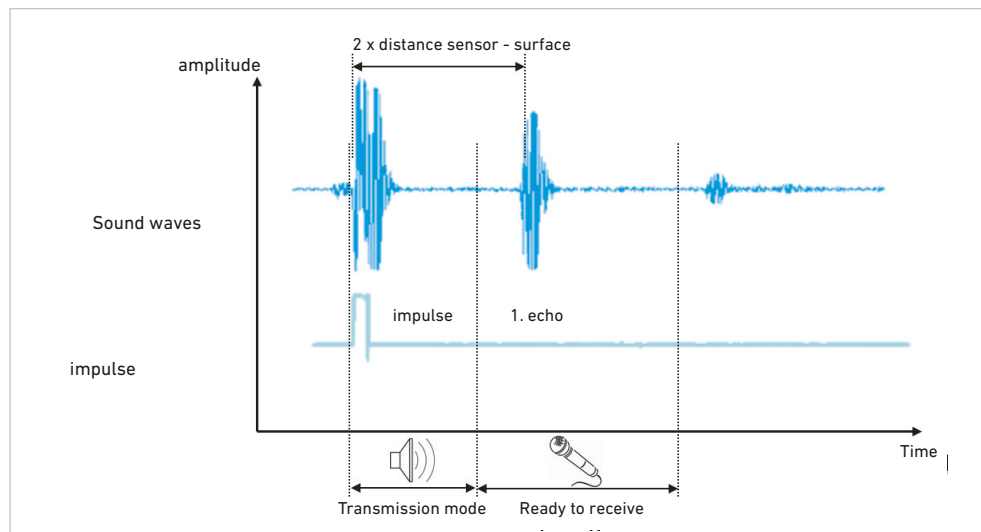
Diameter of the sound beam
5° handling

Basic principle and concepts of ultrasonic level measurement



Minimum measuring distance

With ultrasonic sensors, the entire measuring range cannot be used for technical reasons. A minimum distance from the sensor is necessary so that the medium can be detected. The reason lies in the basic function of the ultrasonic transducer. It is a pulse sensor and receiver simultaneously. Electronic switching between both modes is necessary. During this switching time, no useful echo can be received.



Distance	Distance of the sensor from the medium
Fill level	Maximum distance – measured distance
Long-range blanking	A distance value is measured starting from the sensor. Can be entered in order to not interpret the useful echo of heating or agitating elements on the bottom of a tank as a valid measurement signal. If the level sinks below this point, the level display and the control signal are frozen.

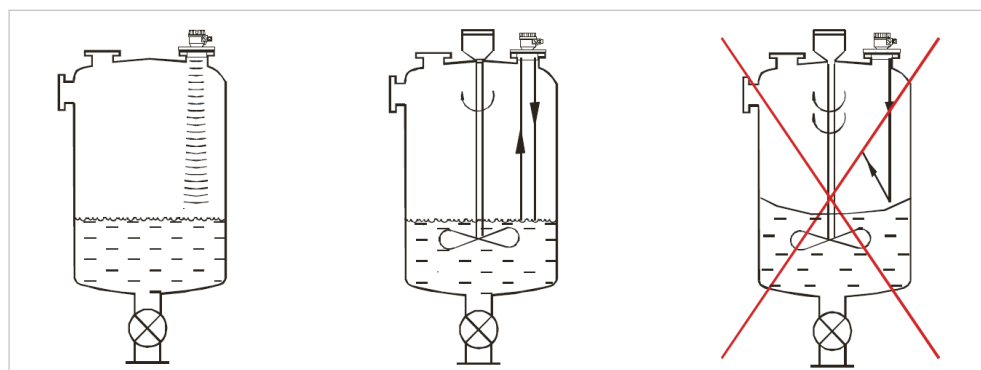
4.1.3 Handling

Installation notes

The following points should be taken into consideration both before and during installation:

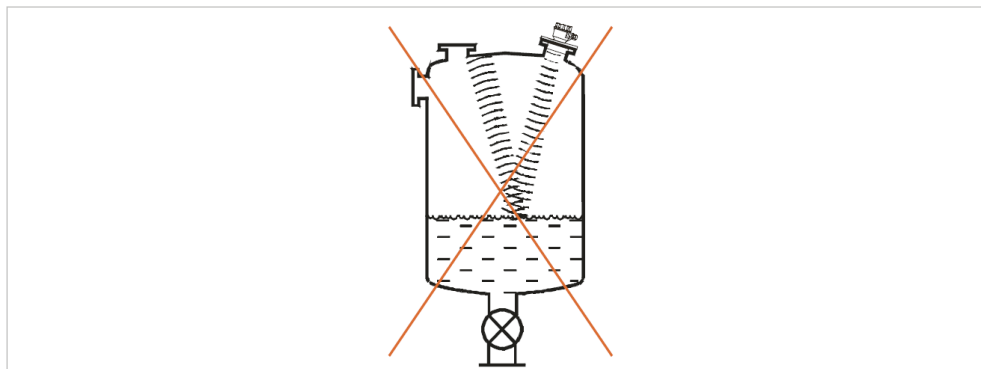
Sensor position

The optimal position for installing GF ultrasonic level sensors is between 0.3 and 0.5 x the radius of a cylindrical tank. It must be ensured that the sound beam from the sensor can strike the surface of the liquid as freely as possible.



Alignment of the sensor

In order to achieve measurements that are as accurate as possible, the sound transducer must be aligned as close to parallel to the surface of the medium as possible. In this way, the sensor receives a clear useful echo after every pulse. If the sensor is installed in a diagonal fashion, the echo is deflected away from the sensor.



$\pm 2^\circ - 3^\circ$ deviation are permissible at a maximum

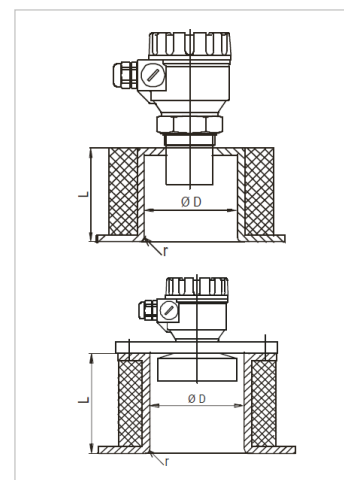
Installation with sensor mount

In certain cases it is necessary to install the sensor on a mount. This is most often the case in relatively small tanks, so that as great a degree of the measuring range of the sensor can be utilized as possible. In this way, the „minimum measuring distance“ can be displaced to a location outside the tank. A maximum level can thereby be detected just under the top of the tank. When selecting the mount, the expansion of the sound beam should be taken into account.

We make the following suggestions:

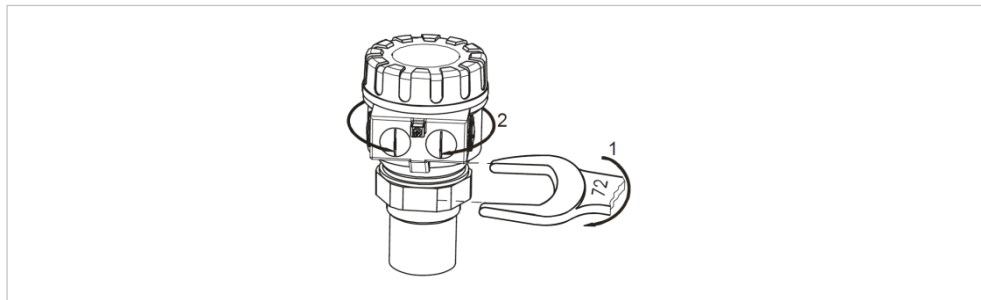
L (mm)	D _{min} (mm)	
	BSP/NPT 1½"	BSP/NPT 2"
150	50	60
200	50	60
250	65	65
300	80	75
350	95	85

L (mm)	D _{min} (mm)	
	Flange Jointing	
90	130	
200	140	
350	150	
500	160	



Installation of thread types 2260 and 2270

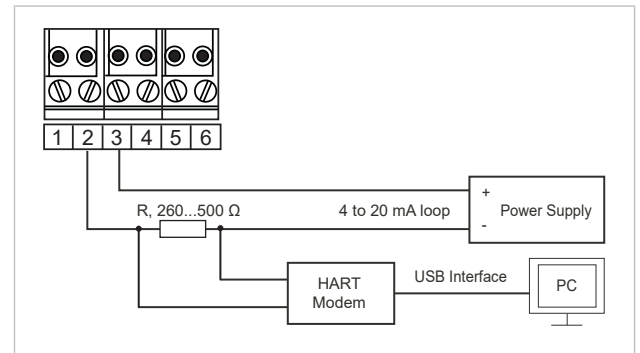
A maximum torque of 20 Nm may not be exceeded when screwing in these thread types.



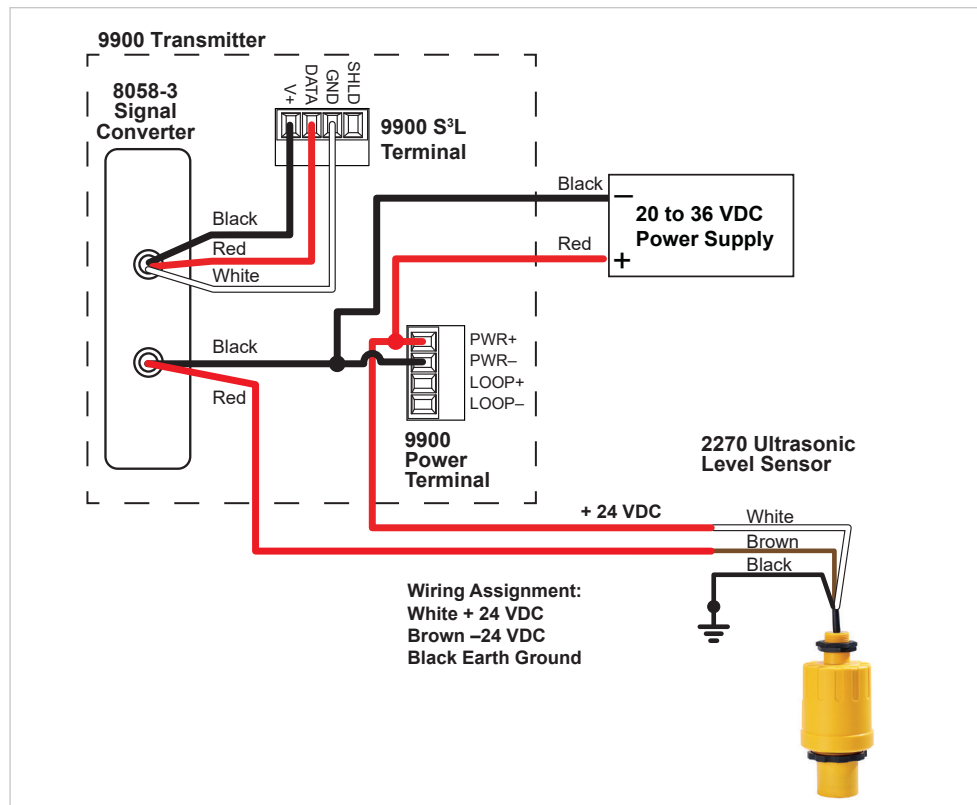
Max. 20 Nm torque

Wiring type 2260 HART digital

Component	Description
HART modem	For parameterization of the level sensors 2260 and 2270 with software GF EView
HART network	Up to 15 HART slaves can be operated simultaneously in a HART loop. The sensors must be properly addressed.
Termination resistor	In both cases, the HART loop must be closed with a termination resistor. A value of 250 to 500 Ω is ideal.

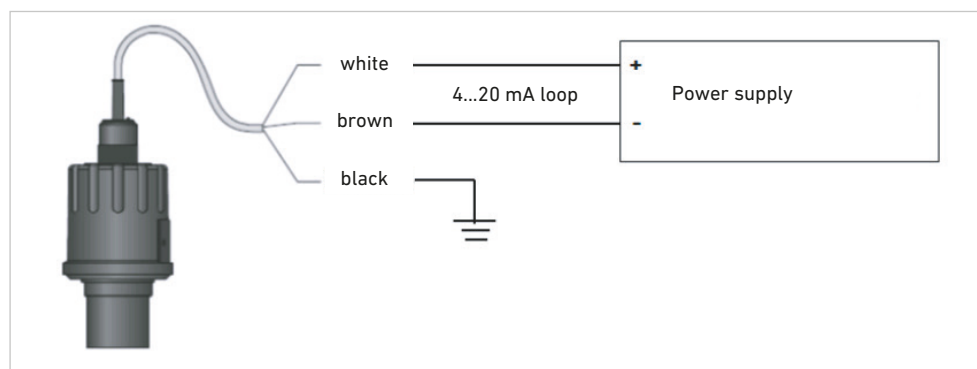


Operation of a 2260 or 2270 on a GF 9900 transmitter via iGo converter



In addition to correct wiring, it must be ensured that the scaling of the input on the 9900 matches the output signal of the ultrasonic level sensor.

Analogue connection of 2270



Tips on use

Quick set

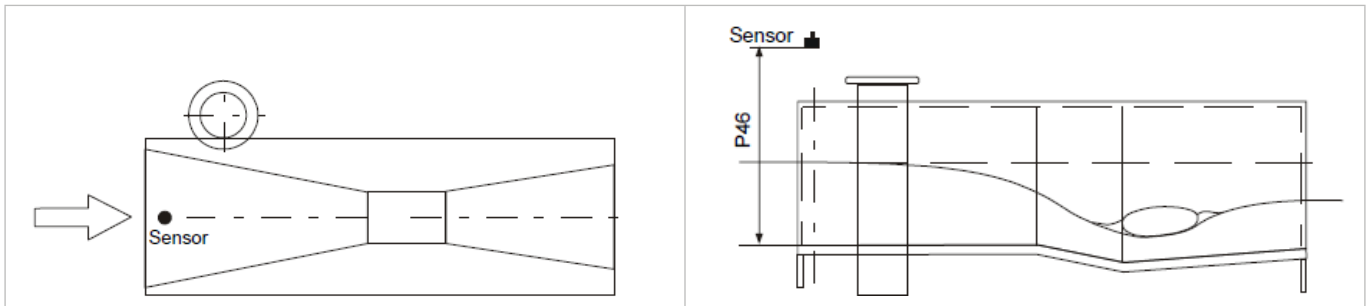
The GF ultrasonic level sensors can have a variety of settings applied to them. For the majority of the level measurements, setting the following 6 parameters will suffice:

1. Technical dimensional units P00: metric or US
2. Maximum measuring distance P04: corresponds in most cases to the height of the tank
3. Establish level value for 4 mA: mostly empty tank or maximum measuring distance
4. Establish level value for 20 mA: full tank
5. Error signal: Select between "Hold value", 3.8 mA or 22 mA
6. Signal damping: Establish temporal damping. 0 – 300 s

Flow measurements on open channels

The GF level sensors can be used for flow measurements of open channels that are constructed according to the Venturi principle. In order to measure the flow, all dimensions of the channels must be known. Only the height of the backwater can be detected by the sensor. The sensor calculates the current flow using the known dimensions. If all dimensions are known, the backwater is proportionate to the flow.

A variety of channel types are already preset for sensor types 2260 and 2270. This is an example of a Parshall channel. Also ensure correct positioning of the sensor.



4.2 Technical basics – 2290 and 2291 radar level transmitter

4.2.1 Description

Filling level

GF radar level transmitters are chosen when other technologies tend to fail due to challenging process conditions in industrial tank applications.

Those challenges can be dense chemical fumes, vapors, highly variable temperatures or pressure, viscous and residue forming liquids etc.

GF radar level transmitters come in two versions:

- 2290 Non-contacting radar
- 2291 Contacting, guided-wave radar

Both measure the filling level based on the microwave principle which is more resistant to external disruptive factors than for example ultrasonic or hydrostatic sensors.

Function

Radar level transmitters measure the filling level by analyzing the distance between the mounting height of the sensor and the surface of the process liquid. Internal electronics calculate the filling level or even the remaining volume. Same apply to the ultrasonic sensor.

Yet microwaves are extremely robust compared to ultrasonic signals. Whereas ultrasonic pulses easily can be disturbed by any influence on the air (propagation media) in the head space above the liquid, microwaves travel through vapors, gases etc. almost unaffected. This is possible because of the nature of microwaves being a result of positive and negative charges – unswayable by most process conditions.

GF radar level transmitters emit high frequency microwaves at 25GHz. The liquid reflects a partial amount of this energy which can be detected by the transmitter. Based on the transit-time principle a microprocessor calculates the exact distance by comparing the time stamp of an emitted signal and the time of a signal received based on the time-of-flight principle.

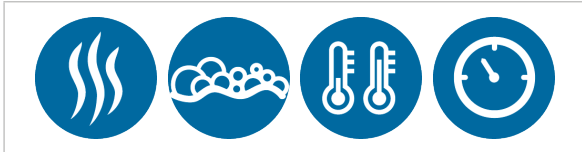
It is crucial to know the exact reflection coefficient also known as dielectric constant. Depending on this value process liquids are measurable or only restricted detectable.

The 2290 provides a reliable non-contact level measurement in challenging conditions. In tanks with an extreme turbulent surface, considerable foaming or process liquids with a low dielectric constant the 2291 with its rod and rope is able to provide steady filling information thanks to the ability to guide signals to the media and back to the sensing electronics.

Benefits

- Non-contacting or contacting technologies
- Plastic enclosures available in PP, PTFE or coatings in PP & PFA
- Tank mapping features to ignore internal obstructions
- Short dead-bands
- Minimum detectable dielectric constant of 1.9
- Customizable volume linearizations
- Output scalable according to level, distance, mass or volume
- Large graphical displays
- Text-based menu structure
- HART or 2 wire current outputs



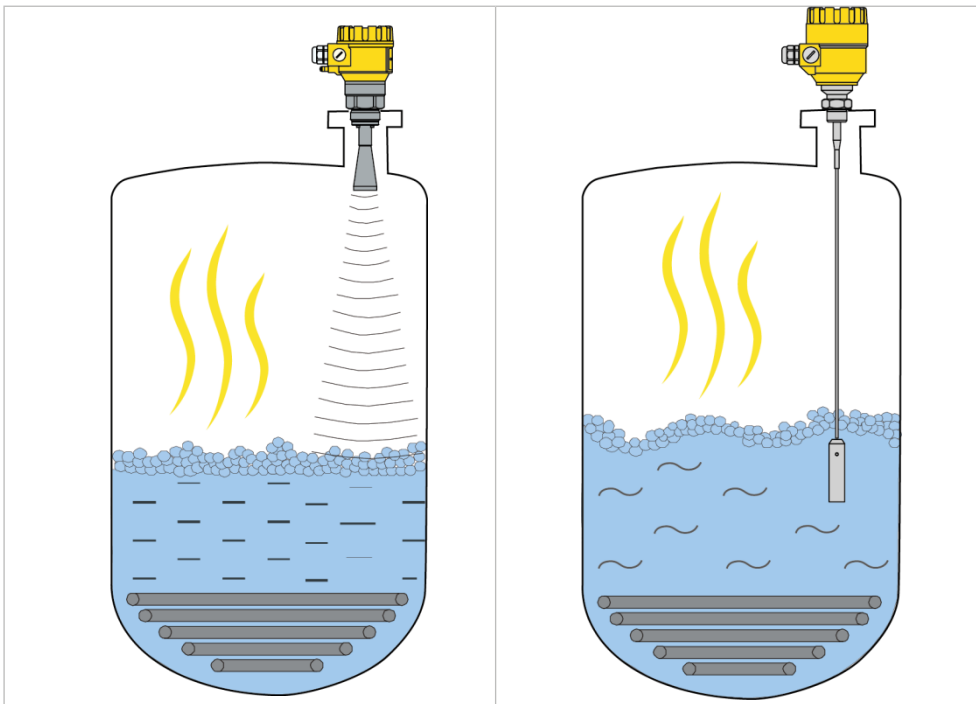


4.2.2 Technical basis



General Information

Hence there are two types of radar level transmitters available it is important to understand the differences of the technologies in order to provide the right choice of cost and benefits. This chapter explains the principle of both non-contacting radar and contacting (GWR guided-wave radar):



Non-contacting radar type 2290

Contacting guided wave radar type 2291



Important application consideration ex ante

Electromagnetic characteristics of the process liquid

The reflection of the emitted microwave varies in quality depending on the relative dielectric constant of the measured medium. The ideal condition of microwave level measurement is that the relative dielectric constant (ϵ_r) for the medium should be greater than 1.9. The lower the value the shorter the maximum measuring ranges of both types 2290 and 2291.

In general the guided type 2291 is less sensitive to low dielectric liquids compared to the 2290.

Verify the dielectric constant value of a wide range of chemicals on www.gfps.com/level

Microwaves travel through plastic materials

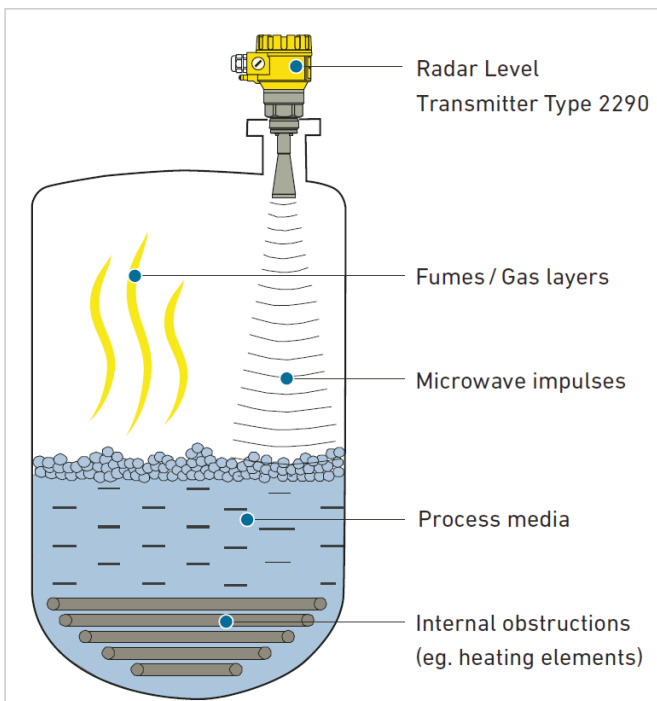
Microwaves have the ability to travel through most plastic materials of low thickness. This ability can be a benefit to protect the radar antenna from the process conditions. Robust plastic enclosures such as PP, PE or PTFE avoid corrosion on the metal antennas.

On the other hand this ability can create additional challenges during the setup on plastic tanks. Here the microwaves could detect obstructions installed around the tank. This phenomenon can make it difficult for the electronics to identify the correct filling level.

4.2.3 Technical basics type 2290

Working principle type 2290

2290 is able to provide an excellent non-contact level measurement for those substances which tend to steam, or for liquids with a gas layer. Since microwaves do not need a defined propagation media, the 2290 is applicable in a vacuum.



The operation of the non-contact microwave level transmitters is based on the measurement of the time of flight of the reflected signals, so-called Time Domain Reflectometry (TDR) method.

The propagation speed of microwave impulses is practically the same in air, gases and in vacuum, independently from the process temperature and pressure, so the measured distance is not affected by the physical parameters of medium to be measured.

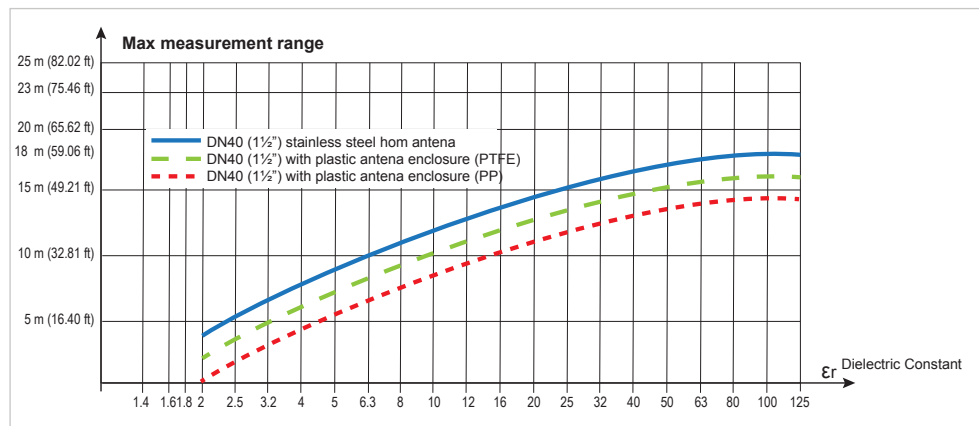
The 2290 level transmitter is a Pulse Burst Radar operating at 25 GHz (K-band) microwave frequency.

The 25 GHz models' most noticeable advantage over the lower frequency (5-12 GHz) radars are the smaller antenna size, the better focusing, lower dead-band and smaller transmission angle.

The level transmitter emits nanosecond length impulses from the antenna, and part of the emitted energy reflects back from the measurement surface, the strength of the reflection varies on the medium being measured. The time of flight of the reflected signal is measured and processed by the electronics, and then this is converted to distance, level or volume proportional data.

Determining the maximum measuring range of type 2290

The maximum measuring range of the 2290 radar is dependent upon the circumstances of the application environment and on the selected type of antenna enclosure. Depending on the relative dielectric constant of the measuring medium and the process conditions the maximum measurement range (achievable under the reference conditions) may decrease by even 85% (!).





Attention

The maximum measuring distance is illustrated in the above diagram for various Dielectric Constants. This diagram is based upon the following conditions, liquids with still surface, no foam, vapors, and ideally a slow (<5m/h, 16.4 ft/h) rate of level change.

Depending on the process conditions or the plastic antenna enclosure the following typical reducing factors are recommended to be considered in order to calculate the maximum measuring range. When more than one reducing factors occur at the same time then all the factors should be included for the calculation:

Process condition	Reflection reduction in amplitude	Max. measuring range distance decrease	Reducing factor
Slow mixing or slightly waving	2...6 dB	20-50%	0.8...0.5
Foaming	2...6 dB	20-50%	0.8...0.5
Fast mixing, vortex	8...10 dB	60-70%(the measurement might be completely terminated)	0.4...0.3
Vapors, Steam, Condensation	3...10 dB	30-70%(the measurement Might be completely terminated)	0.7...0.3
PP antenna enclosure	2 dB	20%	0.8
PTFE antenna enclosure	1 dB	10%	0.9



Benefits of the radar level transmitter type 2290

- ✓ Non-contacting principle, great for corrosive chemicals
- ✓ Great performance in vapors
- ✓ Outgassing liquids
- ✓ Applicable in vacuums applications
- ✓ Applicable in high-pressure applications
- ✓ Can penetrate light foam layers (requires detailed applications considerations)



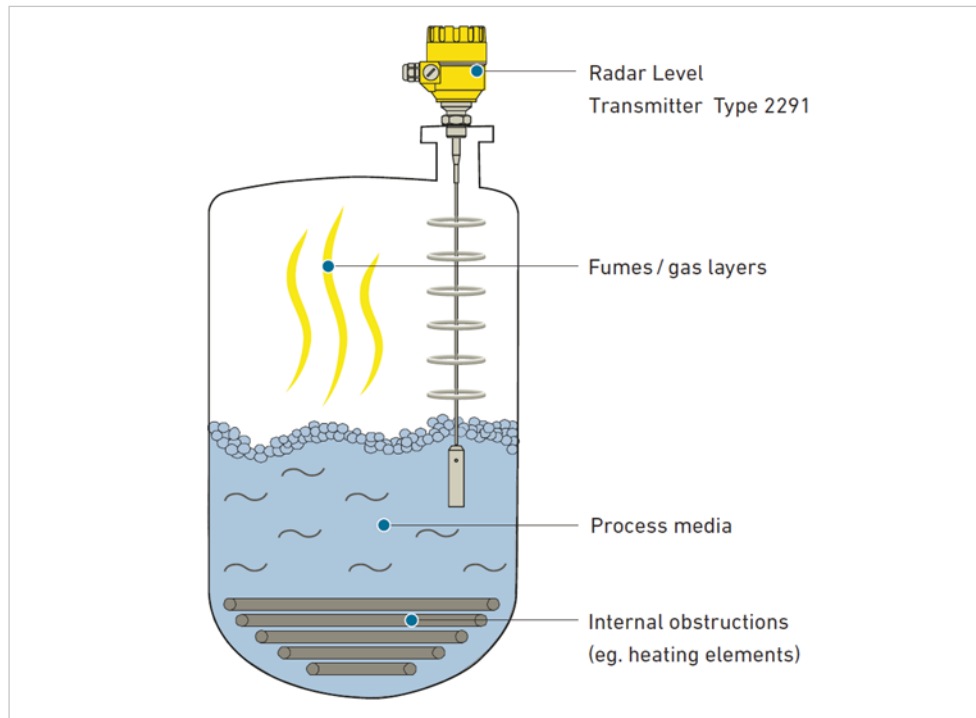
Limitations of the radar level transmitter type 2290

- Extreme turbulent surfaces may lead to signal loss
- The combination of a low dielectric constant liquid in a tall tank can be impossible
-> check max. measuring range possible
- Extreme condensation on the antenna can make the signal generation impossible

4.2.4 Technical basics type 2291

Working principle type 2291 guided-wave radar

The Type 2291 guided microwave level transmitter uses the TDR (Time Domain Reflectometry) principle. The instrument sends low power ns wide pulses along an electrically conductive rod or cable with a known propagation speed (the speed of light).



As the pulse reaches the surface of the medium or phase of two liquids (altered dielectric constant), a part of it is reflected back to the electronic module. The efficiency of the reflected signal depends on the dielectric constant difference of the mediums or layers. (From the plain surface of air-water phase the reflected signal's strength will be approx. 80% of the emitted signal).

The reflected pulse is detected as an electrical voltage signal and processed by the electronics. Level distance is directly proportional to the flight time of the pulse.

The measured level data is converted into 4-20 mA current and HART signals and is displayed on the LCD display. From the level data further derived measuring values can be calculated such as volume and mass. The TDR technology is unaffected by the other properties of the medium as well as that of the space above it.

TDR or GWR (Guided Wave Radar) is one of the most robust technologies available at GF and come in place when all other technologies fail.

Gain and voltage on the type 2291

As explained in the measuring principle in the introduction, the level of a product is converted from a return signal (the product reflection) received by the gauge: this signal has taken a certain amount of time to return to the gauge and it has a certain strength / size measured in milli-volts (dependant on the dielectric constant of the product).

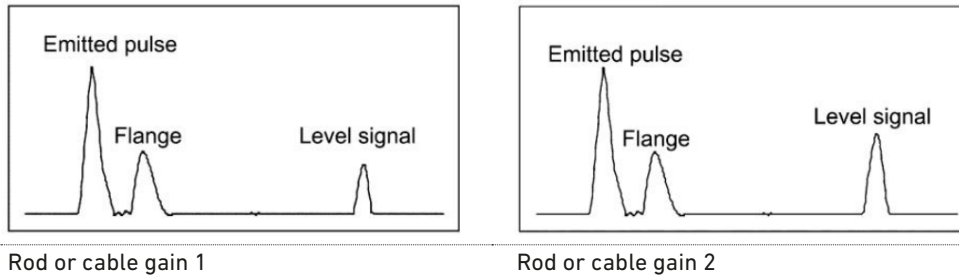
All pulse signals returning to the gauge electronics block (including flange, obstruction and the product surface reflections) are converted to voltage amplitudes. The gauge's microprocessor looks for part of the largest signal that is over a set voltage amplitude, called the "threshold" and identifies this as the product being measured. For this signal to be usable by the gauge, the microprocessor will amplify the signal by increasing the gain.

Once the signal is within a set "working" range, the gauge follows this signal. The gauge registers any changes in time for this part of the signal to return to the converter and translate this into a displayed level or volume.

Gain is a function of voltage amplitude. This defines the default threshold value when the gauge is searching for the product level. A strong return signal will be given a low gain (i.e. Gain 0 or a small amplification). However, if the signal is very weak, then a Gain of 3 (i.e. high signal amplification) is given.

Typical signal trends on a 2291

The following diagrams show characteristic signals that have been recorded with the oscilloscope function.



The signal from coaxial probes does not include the flange reflection, due to the mechanical setup which does not produce any change in impedance at the flange. The amplitude of reflection from the product surface increases as the level rises and decreases as the level falls.



Benefits of the radar level transmitter type 2291

- ✓ Best choice for the most challenging tank applications
- ✓ Contacting but safe signal transmission
- ✓ Extreme turbulence has almost no effect on performance
- ✓ Suitable for tall tanks holding low dielectric liquids
- ✓ Handles foam more reliable than non-contacting 2291
- ✓ Easily adjustable in length on site (if not coated)
- ✓ Handles also quick changes in level reliable



Limitations of the radar level transmitter type 2291

Contacting principle often requires coating
 Every coated sensor is unique and cannot be adjusted in length anymore
 2291 might not be suitable along with stirrers etc. installed in a tank

4.3 2250 Submersible Hydrostatic Level Sensor



4.3.1 Product description

The GF Signet 2250 Hydrostatic Level Sensor for level and depth control has a one-piece injection molded PVDF body and ceramic diaphragm for superior compatibility in corrosive liquids. Using hydrostatic pressure, the 2250 Hydrostatic Level Sensor ignores false level signals for steam, foam or other deposits on the surface of the liquid. Two pressure ranges allow for optimal resolution matched to the needs of different applications. Semiconductor circuits avoid drift in measurements (no internal potentiometers).

Function

These sensors are available with a proprietary digital (S³L) output, or 4 to 20 mA output. The extended cable and capillary tubing with the union connection and a customer supplied conduit, allow submersion in process vessels.

Benefits/features

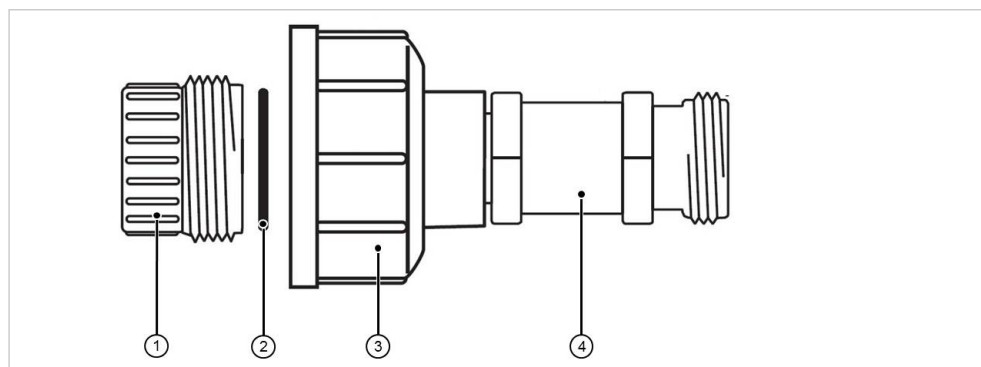
- Level and depth measurement
- 4 to 20 mA output or digital output (S³L)
- Flush ceramic diaphragm
- Easy submersible installation
- Choice of two pressure ranges
- Standard threaded connection, extended cable and capillary tubes (10 m)

Applications

- Inventory management
- Storage tank monitoring
- Neutralization tanks
- Galvanizing systems
- Sumps
- Sedimentation tanks
- Overflow protection



4.3.2 Technical data



- ① PVC-U threaded connection
- ② FKM sealing ring
- ③ PVC-U coupling nut
- ④ Sensor with end connector

Specification

General

Output	Digital (S ³ L) or 4 – 20 mA
Accuracy	± 1 % of the full scale value
-XU	0,001 psi
-XL	0,01 psi
Response time	< 100 ms

Materials that come into contact with media

Union and Union Bushing	PVC-U
Sensor housing	PVDF
Diaphragm	Ceramic
Diaphragm seal	FKM

Electronics

Power supply

Digital (S ³ L)	5 – 6.5 V DC < 1.5 mA (power supplied by 8900, 9900, 9950 and 0486)
4 to 20 mA	12 – 24 V DC ± 10 %, regulated
Cable length	10 m
Cable type	3-phase plus shielding, 22 AWG, PVC-coated, black/red/white/shielding with capillary tube
Digital (S ³ L) output	Serial ASCII, TTL level 9600 bps Reverse polarity protection and short-circuit-proof

4 – 20 mA output

Accuracy	±32 µA
Resolution	< 5 µA
Range	4 – 20 mA, factory-calibrated operating ranges illustrated below
Max. loop impedance	100 Ω at 12 V 325 Ω at 18 V 600 Ω at 24 V

Max. temperature/pressure nominal value

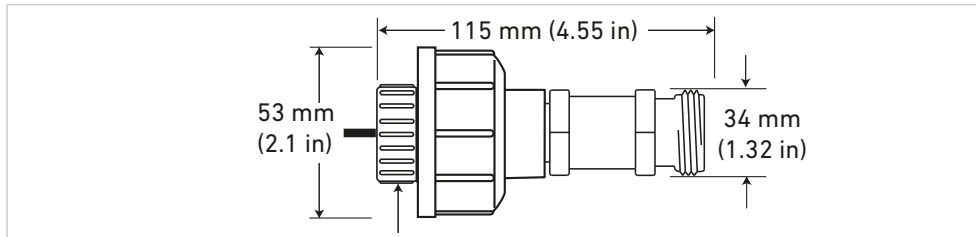
Operating temperature	15 – 85 °C
Storage temperature	-20 – +100 °C
Operating pressure	-XU 0 – 0.7 bar -XL 0 – 3.4 bar
Test pressure	-XU 1.4 bar -XL 5.2 bar

Standards and approvals

CE, FCC
RoHS-compliant, China RoHS
Manufactured according to ISO 9001 for quality and ISO 14001 for environmental management and OHSAS

For further information see the pressure-temperature diagrams.

Dimensions



3/4 inch (ANSI) or 25 mm (ISO)
solvent cement socket connection

4.3.3 System overview

Submersible Installation

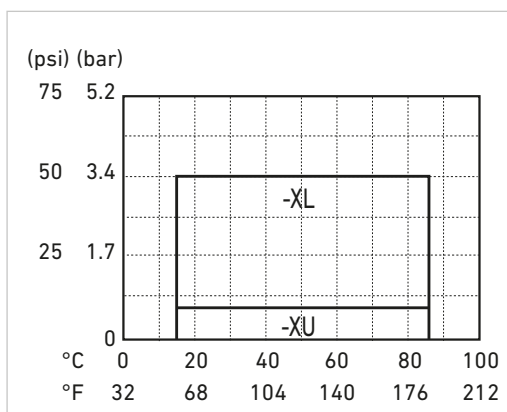
Panel, Wall Mount	4 to 20 mA Output	Automation System
GF Signet Instruments - 9900-1P with Rear Enclosure GF Signet Instruments with 3-8050-1 Universal Mount Kit or 3-8052-1 Integral Mount Kit - 8900 - 9900 GF Signet Instruments with 3-8050-1 Universal Mount Kit or 3-8052-1 Integral Mount Kit - 9950	- Customer Supplied Programmable Logic Controller, or - Programmable Automation Controller 	- 0486 Profibus Concentrator and Customer Supplied Programmable Logic Controller or - Programmable Automation Controller
Customer supplied pipe extension or conduit with pipe assembly* 		
GF Signet 2250 Submersible Hydrostatic Pressure Sensor with union connection, extended cable and capillary tubing (10 m)** 		

All sold separately

*Refer to the GF Signet Submersion Kit brochure (3-0000.707) located on our website for installation suggestions and options.

** Cable must be exposed to the atmosphere

Pressure-temperature diagrams



For further information see the sections "Installation and wiring" and "Accessories and spare parts".

4.3.4 Order overview

Manufacturer's part no.	Part no.	Sensor output	Operating pressure
Hydrostatic Level Sensor with ½ in. union connector and 10 m (32.8 ft) cable			
PVC-U threaded connection – ¾-inch pipe connection			
3-2250-11L	159 000 241	Digital (S ³ L), 35 m	0 – 3,4 bar
3-2250-11U	159 001 242	Digital (S ³ L), 7 m	0 – 0,7 bar
3-2250-21L	159 001 247	Current (4 – 20 mA), 35 m	0 – 3,4 bar
3-2250-21U	159 001 248	Current (4 – 20 mA), 7 m	0 – 0,7 bar
PVC-U threaded connection – metric pipe connection			
3-2250-11U-1	159 001 478	Digital (S ³ L), 7 m	0 – 0,7 bar
3-2250-11L-1	159 001 479	Digital (S ³ L), 35 m	0 – 3,4 bar
3-2250-21U-1	159 001 482	Current (4 – 20 mA), 7 m	0 – 0,7 bar
3-2250-21L-1	159 001 483	Current (4 – 20 mA), 35 m	0 – 3,4 bar

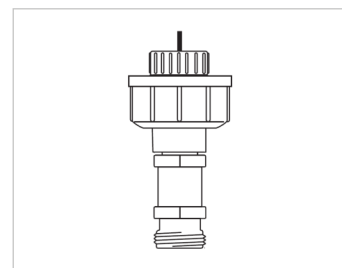
Ordering notes

1. Instrument is sold separately. The following instrument part numbers are compatible with the 2250: 8900, 9900, 9950 and 0486.
2. Union mount installs into pipe w/end connector and union nut.
3. Refer to the GF Signet Submersion Kit brochure (3-0000.707) located on our website for installation suggestions and options.

Pressure/fill ranges¹⁾


3-2250-XU 0 – 0.7 bar = 0 – 7.03 m
3-2250-XL 0 – 3.4 bar = 0 – 35.15 m

- ¹⁾ Ranges have been calculated using the specific gravity of water. Maximum ranges may vary for other liquids.



4.3.5 Accessories

Manufacturer's part no.	Part no.	Description
3-8052	159 000 188	¾-inch kit for integrated assembly
3-8052-1	159 000 755	¾-inch NPT assembly connection socket with water-tight cable conduit and cap with connection terminals
3-8050	159 000 184	Universal assembly kit
3-8050-1	159 000 753	Universal connection socket
3-9000.392-1	159 000 839	Kit for water-tight cable conduit, NPT (1 connecting piece)
3-9000.392-2	159 000 841	Kit for water-tight cable conduit, PG 13.5 (1 connecting piece)
3-0252	159 001 808	Configuration Tool

 Installation and maintenance must be performed according to the corresponding installation instructions. The installation manual is included with the product, see also the online product catalog at www.gfps.com

4.4 2260 Ultrasonic Level Transmitters



4.4.1 Product description

The type 2260 is a rugged, high performance ultrasonic level measurement transmitter, having transducer and processing electronics and a display/programming unit incorporated in one single housing.

All type 2260 Level Transmitters are using established high end pulse echo transducers, which provide narrow beam angles and reliable measurement ranges up to a distance of 15 meters.

For small, stand alone tanks the transmitter provides a simple 2-wire 4 to 20 mA output, with additional power relay contacts. It can be programmed using push buttons and the large, graphic display. For large and/or multiple tank applications versions with HART interface are recommended, communicating directly with a panel mount controller or PLC. The HART protocol can easily be used for programming these versions.

Features

- 2-wire compact transmitters
- Non-contact level metering
- Narrow 5° beam angle
- Level, volume and open channel flow
- Fully temperature compensated electronics
- Outstanding signal processing software providing highly accurate measuring results
- PP or PVDF sensor body provides best chemical resistance
- Quick-set menu for efficient installation
- Plug-in keypad and display
- Switching relay for high / low alarm
- 4 to 20 mA / HART interface (Optional)
- Secondary lightning protection
- Intrinsically safe (Option)
- 32-point linearization

Applications

- River water
- Seawater
- Potable water
- Demineralized water
- Treated water

CE



www.gfps.com/level

4.4.2 Specifications

General				
Type	2260-Y-YYY-4	2260-Y-YYY-6	2260-Y-YYY-8	2260-Y-YYY-15
Range	0.2 to 4 m / 0.65 to 13 ft	0.25 to 6 m / 0.82 to 20 ft	0.35 to 8 m / 1.1 to 26 ft	0.45 to 15 m / 1.5 to 49 ft
Measuring Frequency	80 kHz	80 kHz	50 kHz	40 kHz
Total Beam Angle	6°	5°	7°	5°
Accuracy *	± (0.2 % of measured distance plus 0.05 % of range)			
Resolution	<2 m (6.6 ft): 1 mm (0.04 in.) 2 to 5 m (6.6 to 16.4 ft): 2 mm (0.08 in.) 5 to 10 m (16.4 to 32.8 ft): 5 mm (0.2 in.) >10 m (32.8 ft): 10 mm (0.39 in.)			

Environmental	
Process Temperature	-30 °C to +90 °C (-22 °F to + 194 °F)
Ambient Temperature	-25 °C to +70 °C (-13 °F to + 158 °F)
Process Pressure (absolute)	0.03 to 0.3 MPa (0.3 to 3 bar) 4.35 psi - 43.5 psi

Enclosure

Enclosure Material	
Sensor Body	PP or PVDF
Housing	PBT

Ingress Protection	
Sensor	IP68
Housing	IP67

Process Connection	1 1/2" BSP / NPT	2" BSP / NPT	2" BSP / NPT	DN125 / 5 inch flange
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Sealing	
PP sensor	EPDM
PVDF sensor	FKM (Viton)

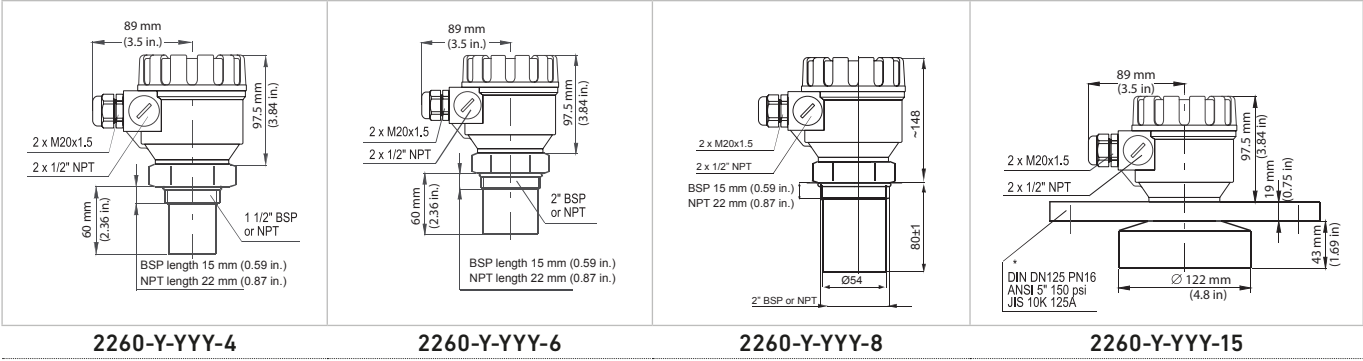
Electrical	
Outputs	2-wire 4–20 mA , max. 600 Ohm; HART interface, $R_t \geq 250 \Omega$
Relay	(SPDT) 250V AC, 3A AC1
Power Supply	12 to 36 V DC / 44 to 800 mW
Power Consumption	DC 3.6 W, AC 4 VA
Connection	2 x M20x1,5 plastic cable gland: Cable: Ø6 ... 12 mm

Standards and Approvals	
General Approvals	CE, RoHS

* Under optimal circumstances of reflection and stabilized transducer temperature

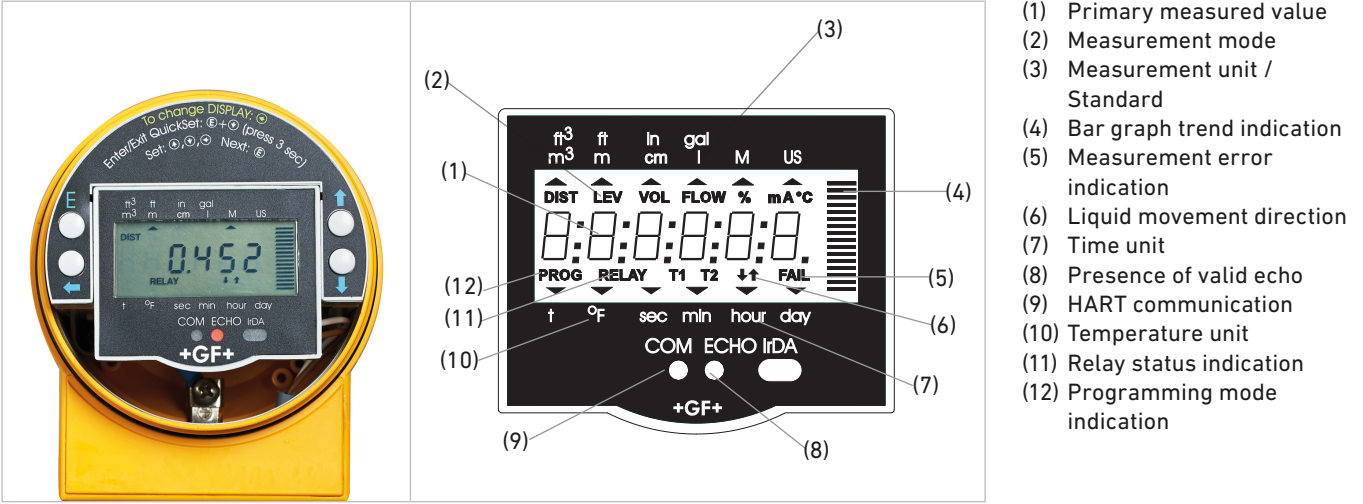
Dimensions (mm)

2-wire level transmitters

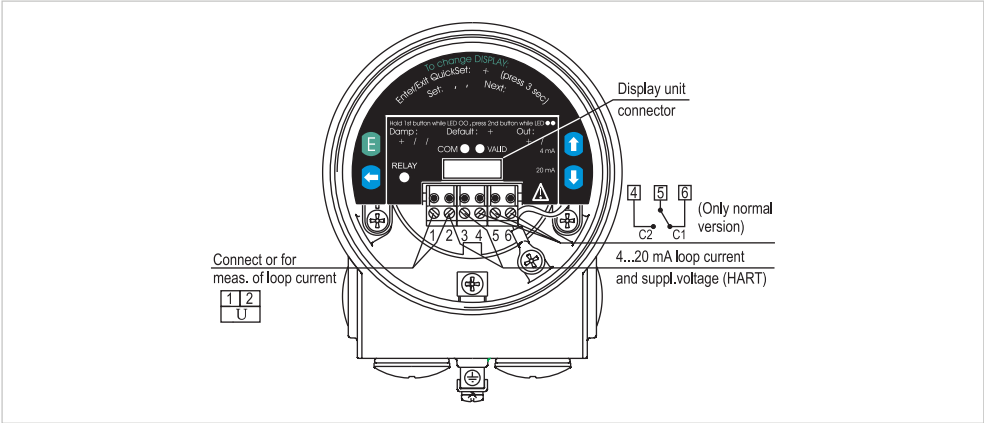


4.4.3 System Overview

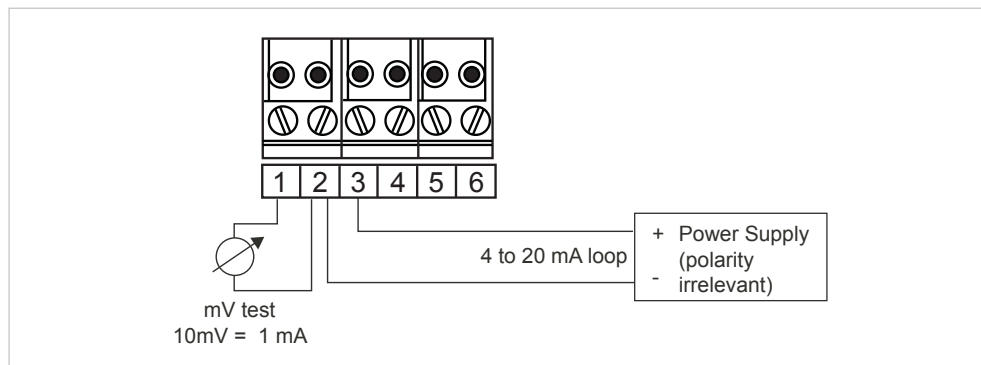
Display Unit



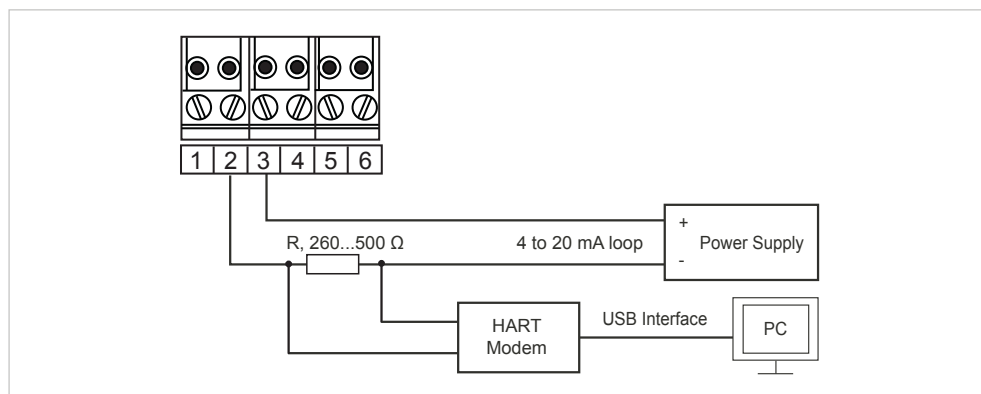
2260 Transmitter Terminals



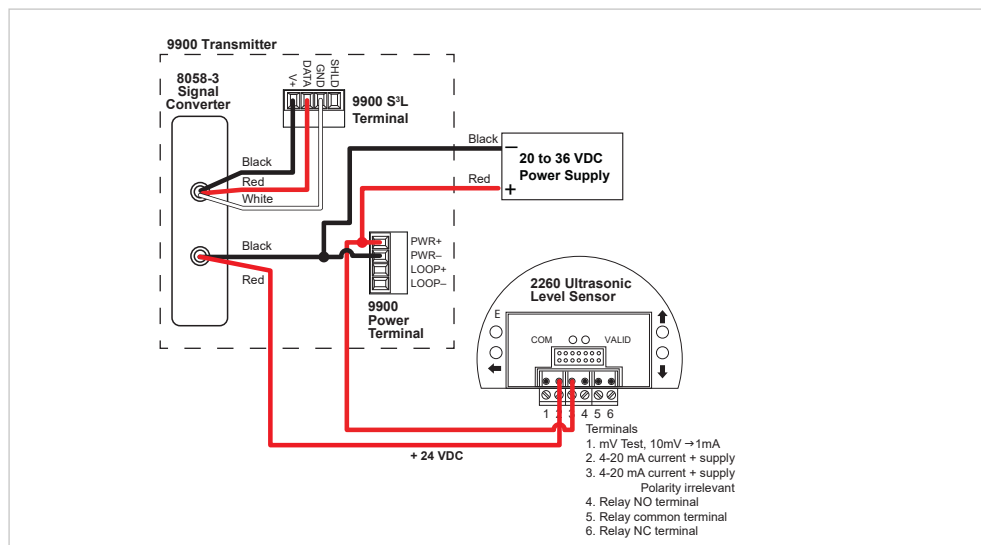
4 to 20 mA Loop Wiring



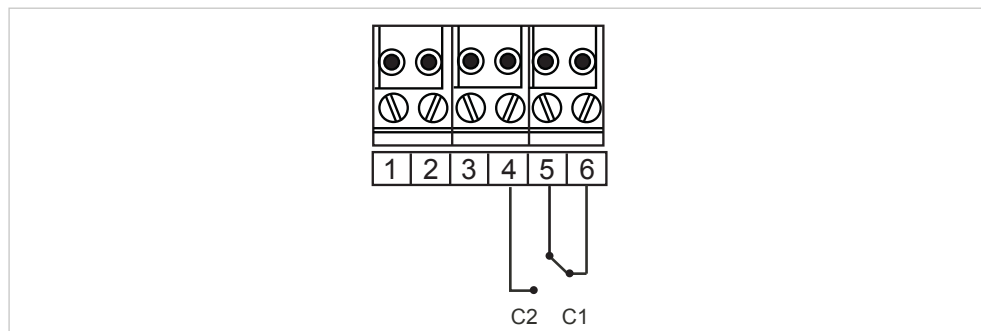
HART Interface Wiring



Wiring to 9900 Universal Transmitter

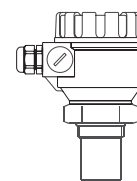


Relay Output Wiring



4.4.4 Ordering Information

Mfr. Part No	Code	Description
2260-P-0DN-4	159 300 120	Range 4 m (13.1 ft), PP body, 4..20 mA 2-wire, NPT thread
2260-P-2DN-4	159 300 121	Range 4 m (13.1 ft), PP body, 4..20 mA 2-wire/relay/HART, NPT thread
2260-P-0DN-6	159 300 122	Range 6 m (19.7 ft), PP body, 4..20 mA 2-wire, NPT thread
2260-P-2DN-6	159 300 123	Range 6 m (19.7 ft), PP body, 4..20 mA 2-wire/relay/HART, NPT thread
2260-P-0DN-8	159 300 109	Range 8 m (26.2 ft), PP body, 4..20 mA 2-wire, NPT thread
2260-P-0DA-15	159 300 124	Range 15 m (49.2 ft), PP body, 4..20 mA 2-wire, ANSI Flange 5 inch
2260-P-2DA-15	159 300 125	Range 15 m (49.2 ft), PP body, 4..20 mA 2-wire/relay/HART, ANSI Flange 5 in.
2260-V-0DN-4	159 300 131	Range 4 m (13.1 ft), PVDF body, 4..20 mA 2-wire, NPT thread
2260-V-2DN-4	159 300 132	Range 4 m (13.1 ft), PVDF body, 4..20 mA 2-wire/relay/HART, NPT thread
2260-V-0DN-6	159 300 133	Range 6 m (19.7 ft), PVDF body, 4..20 mA 2-wire, NPT thread
2260-V-2DN-6	159 300 134	Range 6 m (19.7 ft), PVDF body, 4..20 mA 2-wire/relay/HART, NPT thread
2260-V-0DN-8	159 300 110	Range 8 m (26.2 ft), PVDF body, 4..20 mA 2-wire, NPT thread
2260-V-0DA-15	159 300 135	Range 15 m (49.2 ft), PVDF body, 4..20 mA 2-wire, ANSI Flange 5 inch
2260-V-2DA-15	159 300 136	Range 15 m (49.2 ft), PVDF body, 4..20 mA 2-wire/relay/HART, ANSI Flange 5 in.
Versions with NPT thread / ANSI flange		
2260-V-1DNX-4	159 300 142	Range 4 m (13.1 ft), PVDF body, 4..20 mA 2-wire/HART, ATEX, NPT thread
2260-V-1DNX-6	159 300 143	Range 6 m (19.7 ft), PVDF body, 4..20 mA 2-wire/HART, ATEX, NPT thread
2260-V-1DAX-15	159 300 144	Range 15 m (49.2 ft), PVDF body, 4..20 mA 2-wire/HART, ATEX, ANSI Flange 5 in.
Versions with BSP thread / DIN flange		
2260-P-0DB-4	159 300 090	Range 4 m (13.1 ft), PP body, 4..20 mA 2-wire, BSP thread
2260-P-2DB-4	159 300 091	Range 4 m (13.1 ft), PP body, 4..20 mA 2-wire/relay/HART, BSP thread
2260-P-0DB-6	159 300 092	Range 6 m (19.7 ft), PP body, 4..20 mA 2-wire, BSP thread
2260-P-2DB-6	159 300 093	Range 6 m (19.7 ft), PP body, 4..20 mA 2-wire/relay/HART, BSP thread
2260-P-0DB-8	159 300 107	Range 8 m (26.2 ft), PP body, 4..20 mA 2-wire, BSP thread
2260-P-0DF-15	159 300 094	Range 15 m (49.2 ft), PP body, 4..20 mA 2-wire, DIN Flange DN125
2260-P-2DF-15	159 300 095	Range 15 m (49.2 ft), PP body, 4..20 mA 2-wire/relay/HART, DIN Flange DN125
2260-V-0DB-4	159 300 101	Range 4 m (13.1 ft), PVDF body, 4..20 mA 2-wire, BSP thread
2260-V-2DB-4	159 300 102	Range 4 m (13.1 ft), PVDF body, 4..20 mA 2-wire/relay / HART, BSP thread
2260-V-0DB-6	159 300 103	Range 6 m (19.7 ft), PVDF body, 4..20 mA 2-wire, BSP thread
2260-V-2DB-6	159 300 104	Range 6 m (19.7 ft), PVDF body, 4..20 mA 2-wire/relay / HART, BSP thread
2260-V-0DB-8	159 300 108	Range 8 m (26.2 ft), PVDF body, 4..20 mA 2-wire, BSP thread
2260-V-0DF-15	159 300 105	Range 15 m (49.2 ft), PVDF body, 4..20 mA 2-wire, DIN Flange DN125
2260-V-2DF-15	159 300 106	Range 15 m (49.2 ft), PVDF body, 4..20 mA 2-wire/relay/HART, DIN Flange DN125
2260-V-1DBX-4	159 300 112	Range 4 m (13.1 ft), PVDF body, 4 to 20 mA 2-wire/HART, ATEX, BSP thread



Mfr. Part No	Code	Description
2260-V-1DBX-6	159 300 113	Range 6 m (19.7 ft), PVDF body, 4 to 20 mA 2-wire/HART, ATEX, BSP thread
2260-V-1DFX-15	159 300 114	Range 15 m (49.2 ft), PVDF body, 4 to 20 mA 2-wire/HART, ATEX, DIN Flange DN125

4.4.5 Accessories

Code	Description
159 300 181	HART - USB Modem
159 300 182	HART - USB Modem, DIN Rail
159 300 183	HART - USB Modem, DIN Rail, ATEX
159 300 180	Display unit for type 2260 Transmitter

4.5 2260 Ultrasonic Level Transmitters with Ex Approval



4.5.1 Product description

The type 2260 is a rugged, high performance ultrasonic level measurement transmitter, having transducer and processing electronics and a display/programming unit incorporated in one single housing.

All type 2260 Level Transmitters are using established high end pulse echo transducers, which provide narrow beam angles and reliable measurement ranges up to a distance of 15 meters (49.2 ft).

For small, stand alone tanks the transmitter provides a simple 2-wire 4 to 20 mA output, with additional power relay contacts. It can be programmed using push buttons and the large, graphic display. For large and/or multiple tank applications versions with HART interface are recommended, communicating directly with a panel mount controller or PLC. The HART protocol can easily be used for programming these versions.

For hazardous areas the type 2260 Level Transmitters are available with explosion proof approvals.

Features

- 2-wire compact transmitters
- Non-contact level metering
- Narrow 5° beam angle
- Level, volume and open channel flow
- Fully temperature compensated electronics
- Outstanding signal processing software providing highly accurate measuring results
- PP or PVDF sensor body provides best chemical resistance
- Quick-set menu for efficient installation
- Plug-in keypad and display
- 4 to 20 mA / HART interface (Optional)
- Secondary lightning protection
- Intrinsically safe (Option)
- 32-point linearization

Applications

- River water
- Seawater
- Potable water
- Demineralized water
- Treated water



www.gfps.com/level

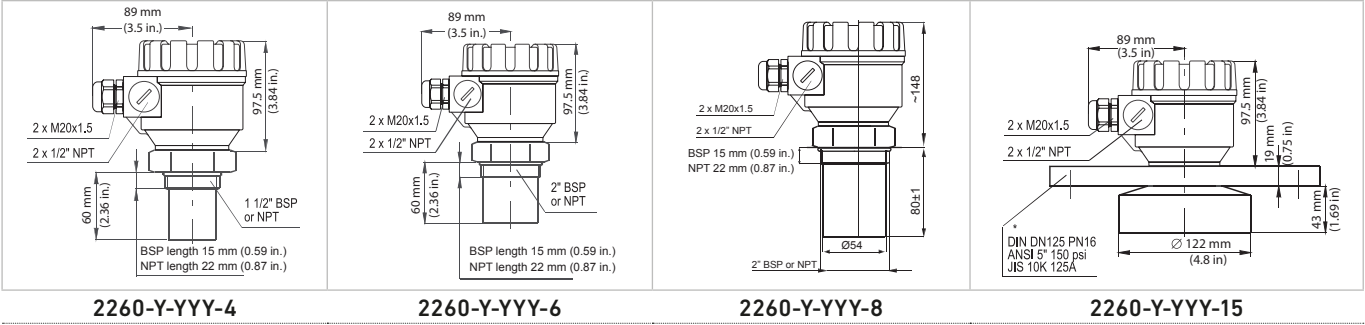
4.5.2 Specifications

General				
Type	2260-Y-YYYYX-4	2260-Y-YYYYX-6	2260-Y-YYY-8	2260-Y-YYYYX-15
Range	0.2 to 4 m (0.65 to 13 ft)	0.25 to 6 m (0.82 to 20 ft)	0.35 to 8 m (1.1 to 26 ft)	0.45 to 15 m (1.5 to 49 ft)
Measuring Frequency	80 kHz	80 kHz	50 kHz	40 kHz
Total Beam Angle	6°	5°	7°	5°
Accuracy *	± (0.2 % of measured distance plus 0.05 % of range)			
Resolution	<2 m (6.6 ft): 1 mm (0.04 in.) 2 to 5 m (6.6 to 16.4 ft): 2 mm (0.08 in.) 5 to 10 m (16.4 to 32.8 ft): 5 mm (0.2 in.) >10 m (32.8 ft): 10 mm (0.39 in.)			
Environmental				
Process Temperature				
PP sensor	-20 °C to +70 °C (-4 °F to 158 °F)			
PVDF sensor	-20 °C to +80 °C (-4 °F to 176 °F)			
Ambient Temperature	-20 °C to +60 °C (-4 °F to 140 °F)			
Process Pressure (absolute)	0.03 to 0.3 MPa (0.3 to 3 bar) 4.35 psi - 43.5 psi			
Enclosure				
Enclosure Material				
Sensor Body	PP or PVDF			
Housing	PBT			
Ingress Protection				
Sensor	IP68, NEMA 6P			
Housing	IP67, NEMA 6P			
Process Connection	1 1/2" BSP / NPT	2" BSP / NPT	DN125 / 5 inch flange	
Sealing				
PP sensor	EPDM			
PVDF sensor	FKM (Viton)			
Electrical				
Outputs	2- wire 4–20 mA , HART interface, $R_t \geq 250 \Omega$			
Power Supply	12 to 30 V DC, Note: Ex-devices must be powered by EEx ia power supplies			
Power Supply Loading	$U_o < 30 \text{ V}$, $I_o < 140 \text{ mA}$, $P_o < 1 \text{ W}$, $R_t \text{ max} = (U_s - 12 \text{ V}) / 0,02 \text{ A}$			
Intrinsically safety data	$C_i \leq 15 \text{ nF}$, $L_i \leq 200 \mu\text{H}$, $U_i \leq 30\text{V}$, $I_i \leq 140 \text{ mA}$, $P_i \leq 1 \text{ W}$			
Connection	2 x M20x1,5 metal cable gland: Cable: Ø7 ... 13 mm			
Standards and Approvals				
General Approvals	CE, RoHS			
ATEX Approval	ATEX II 1 G EEx ia IIB T6, IP68, NEMA 6P			

* Under optimal circumstances of reflection and stabilized transducer temperature

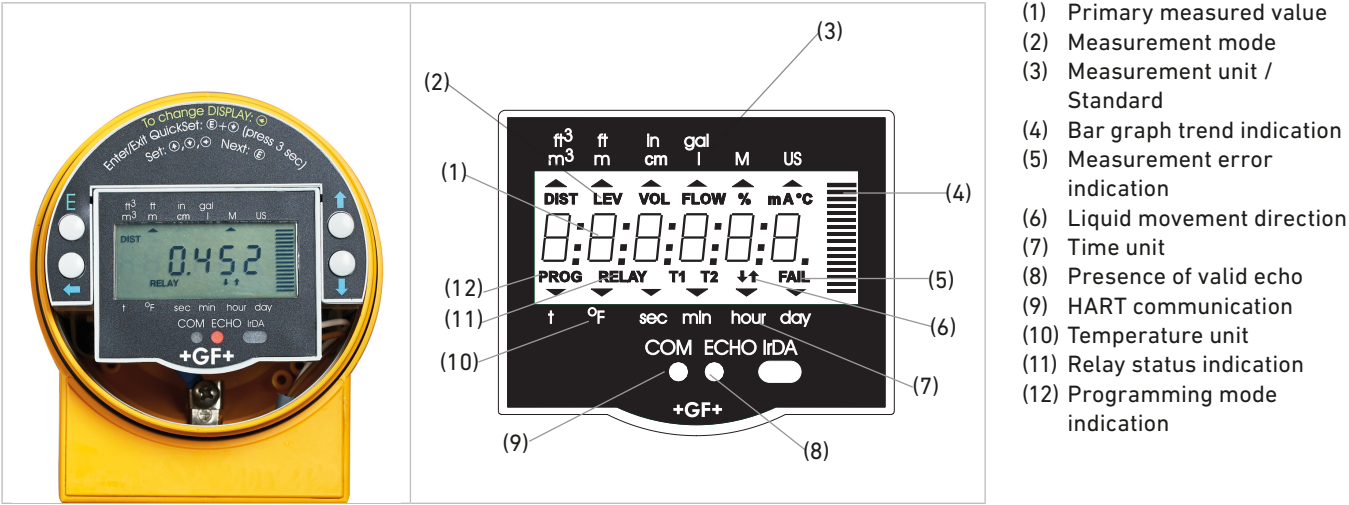
Dimensions (mm)

2-wire level transmitters

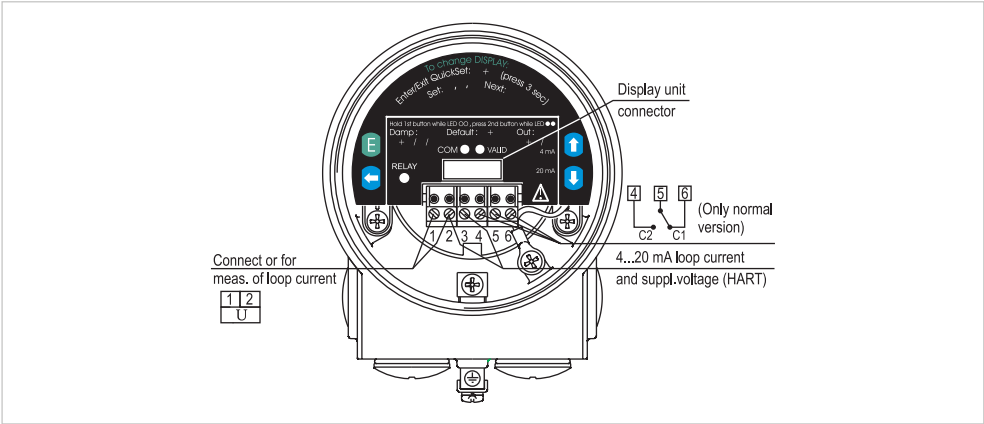


4.5.3 System Overview

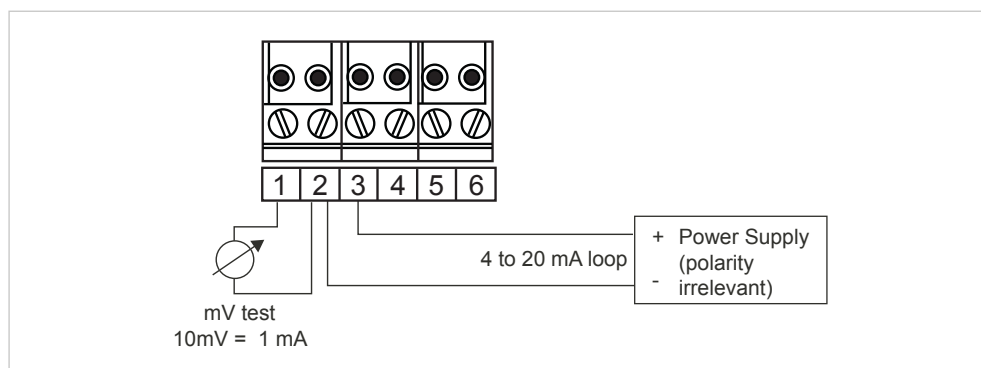
Display Unit



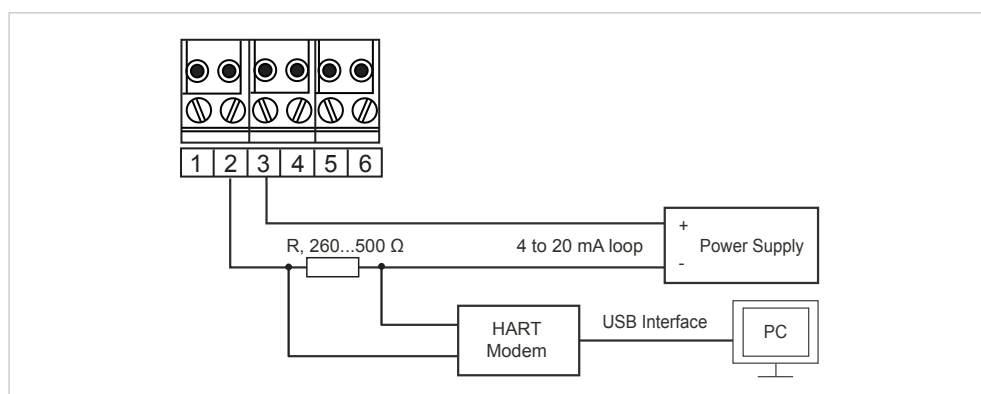
2260 Transmitter Terminals



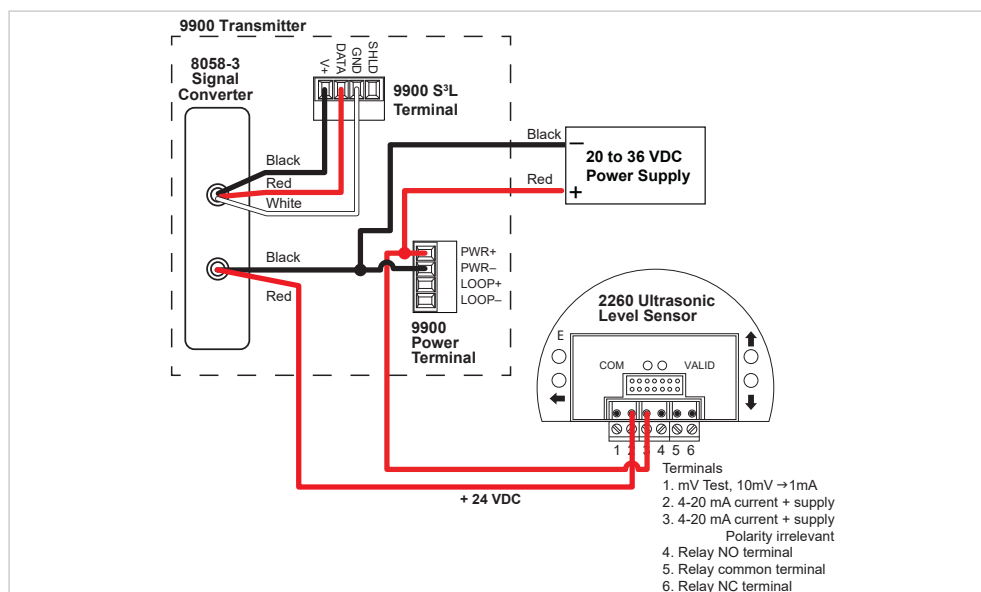
4 to 20 mA Loop Wiring



HART Interface Wiring

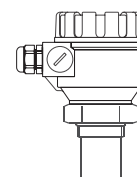


Wiring to 9900 Universal Transmitter



4.5.4 Ordering Information

Mfr. Part No	Code	Description
2260-P-0DN-4	159 300 120	Range 4 m (13.1 ft), PP body, 4..20 mA 2-wire, NPT thread
2260-P-2DN-4	159 300 121	Range 4 m (13.1 ft), PP body, 4..20 mA 2-wire/relay/HART, NPT thread
2260-P-0DN-6	159 300 122	Range 6 m (19.7 ft), PP body, 4..20 mA 2-wire, NPT thread
2260-P-2DN-6	159 300 123	Range 6 m (19.7 ft), PP body, 4..20 mA 2-wire/relay/HART, NPT thread
2260-P-0DN-8	159 300 109	Range 8 m (26.2 ft), PP body, 4..20 mA 2-wire, NPT thread
2260-P-0DA-15	159 300 124	Range 15 m (49.2 ft), PP body, 4..20 mA 2-wire, ANSI Flange 5 inch
2260-P-2DA-15	159 300 125	Range 15 m (49.2 ft), PP body, 4..20 mA 2-wire/relay/HART, ANSI Flange 5 in.
2260-V-0DN-4	159 300 131	Range 4 m (13.1 ft), PVDF body, 4..20 mA 2-wire, NPT thread
2260-V-2DN-4	159 300 132	Range 4 m (13.1 ft), PVDF body, 4..20 mA 2-wire/relay/HART, NPT thread
2260-V-0DN-6	159 300 133	Range 6 m (19.7 ft), PVDF body, 4..20 mA 2-wire, NPT thread
2260-V-2DN-6	159 300 134	Range 6 m (19.7 ft), PVDF body, 4..20 mA 2-wire/relay/HART, NPT thread
2260-V-0DN-8	159 300 110	Range 8 m (26.2 ft), PVDF body, 4..20 mA 2-wire, NPT thread
2260-V-0DA-15	159 300 135	Range 15 m (49.2 ft), PVDF body, 4..20 mA 2-wire, ANSI Flange 5 inch
2260-V-2DA-15	159 300 136	Range 15 m (49.2 ft), PVDF body, 4..20 mA 2-wire/relay/HART, ANSI Flange 5 in.
Versions with NPT thread / ANSI flange		
2260-V-1DNX-4	159 300 142	Range 4 m (13.1 ft), PVDF body, 4..20 mA 2-wire/HART, ATEX, NPT thread
2260-V-1DNX-6	159 300 143	Range 6 m (19.7 ft), PVDF body, 4..20 mA 2-wire/HART, ATEX, NPT thread
2260-V-1DAX-15	159 300 144	Range 15 m (49.2 ft), PVDF body, 4..20 mA 2-wire/HART, ATEX, ANSI Flange 5 in.
Versions with BSP thread / DIN flange		
2260-P-0DB-4	159 300 090	Range 4 m (13.1 ft), PP body, 4..20 mA 2-wire, BSP thread
2260-P-2DB-4	159 300 091	Range 4 m (13.1 ft), PP body, 4..20 mA 2-wire/relay/HART, BSP thread
2260-P-0DB-6	159 300 092	Range 6 m (19.7 ft), PP body, 4..20 mA 2-wire, BSP thread
2260-P-2DB-6	159 300 093	Range 6 m (19.7 ft), PP body, 4..20 mA 2-wire/relay/HART, BSP thread
2260-P-0DB-8	159 300 107	Range 8 m (26.2 ft), PP body, 4..20 mA 2-wire, BSP thread
2260-P-0DF-15	159 300 094	Range 15 m (49.2 ft), PP body, 4..20 mA 2-wire, DIN Flange DN125
2260-P-2DF-15	159 300 095	Range 15 m (49.2 ft), PP body, 4..20 mA 2-wire/relay/HART, DIN Flange DN125



Mfr. Part No	Code	Description
2260-V-0DB-4	159 300 101	Range 4 m (13.1 ft), PVDF body, 4..20 mA 2-wire, BSP thread
2260-V-2DB-4	159 300 102	Range 4 m (13.1 ft), PVDF body, 4..20 mA 2-wire/relay /HART, BSP thread
2260-V-0DB-6	159 300 103	Range 6 m (19.7 ft), PVDF body, 4..20 mA 2-wire, BSP thread
2260-V-2DB-6	159 300 104	Range 6 m (19.7 ft), PVDF body, 4..20 mA 2-wire/relay /HART, BSP thread
2260-V-0DB-8	159 300 108	Range 8 m (26.2 ft), PVDF body, 4..20 mA 2-wire, BSP thread
2260-V-0DF-15	159 300 105	Range 15 m (49.2 ft), PVDF body, 4..20 mA 2-wire, DIN Flange DN125
2260-V-2DF-15	159 300 106	Range 15 m (49.2 ft), PVDF body, 4..20 mA 2-wire/relay/HART, DIN Flange DN125
2260-V-1DBX-4	159 300 112	Range 4 m (13.1 ft), PVDF body, 4 to 20 mA 2-wire/HART, ATEX, BSP thread
2260-V-1DBX-6	159 300 113	Range 6 m (19.7 ft), PVDF body, 4 to 20 mA 2-wire/HART, ATEX, BSP thread
2260-V-1DFX-15	159 300 114	Range 15 m (49.2 ft), PVDF body, 4 to 20 mA 2-wire/HART, ATEX, DIN Flange DN125

4.5.5 Accessories

Code	Description
159 300 181	HART - USB Modem
159 300 182	HART - USB Modem, DIN Rail
159 300 183	HART - USB Modem, DIN Rail, ATEX
159 300 180	Display unit for type 2260 Transmitter

4.6 2270 Ultrasonic Level Sensor



4.6.1 Product description

The type 2270 is a rugged, high performance ultrasonic level measurement sensor, having transducer and processing electronics incorporated in one single housing. It provides all the sophisticated echo detection features of the well accepted 2260 Ultrasonic Level Transmitters.

For single and multiple tank applications 2-wire sensors are recommended using either HART protocol or 4 to 20 mA for the direct communication with a panel mount controller or a PLC.

Either for liquid level measurement in sumps or tanks, for tank contents measurement, or open channel flow measurement, the 2270 Level Sensors provide the answer. Sensing ranges up to 6 m (19.7 ft) are available. PP and PVDF sensor bodies provide best chemical resistance in applications where concentrated chemical shall be detected.

Features

- 2 wire compact sensor
- Non-contact level measuring
- Narrow 5° beam angle
- Level, volume and open channel flow
- Compact housing
- 32 points of linearization
- Fully temperature compensated electronics
- Outstanding signal processing software providing highly accurate measuring results
- PP or PVDF sensor body provides best chemical resistance
- Secondary lightning protection
- 4 to 20 mA / HART interface

Applications

- River water
- Seawater
- Potable water
- Demineralized water
- Treated water

CE



www.gfps.com/level

4.6.2 Specifications

Type 2270-X-XX-4

General	
Range	0.2 to 4 m / 0.65 to 13 ft
Total Beam Angle	6°
Measuring Frequency	80 kHz
Accuracy *	± (0.2 % of measured distance plus 0.05 % of range)
Resolution	<2 m (6.6 ft): 1 mm (0.04 in.) 2 to 4 m (6.6 to 13.1 ft): 2 mm (0.08 in.)

Environmental	
Process Temperature	−30 °C to +90 °C (−22 °F to +194°F)
Ambient Temperature	−30 °C to +80 °C (−22 °F to +176°F)
Process Pressure (absolute)	0.05 to 0.3 MPa (0.5 to 3 bar) 7.25 psi to 43.5 psi

Enclosure	
Enclosure and Sensor Material	PP or PVDF
Cable Material	Cable sealing: EPDM, cable isolation: PVC
Ingress Protection	IP68 / NEMA 6P
Process Connection	1½" BSP / NPT

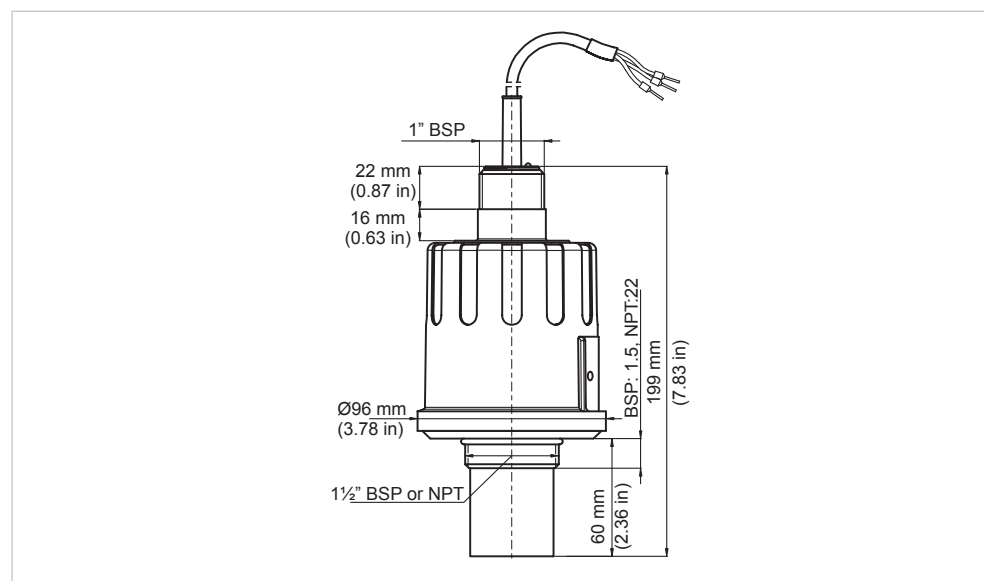
Sealing	
PP sensor	EPDM
PVDF sensor	FKM (Viton)

Electrical	
Outputs	2-wire 4–20 mA , max. 600 Ohm; HART interface, $R_t \geq 250 \text{ Ohm}$
Power Supply	DC 12 to 36 V
Power Consumption	max. 720 mW, overload protected
Connecting	6 x 0,5 mm ² shielded cable; Ø 6 mm x 5 m (30 m max.)
Electric shock protection	Class III, low voltage

Standard and Approvals	
General Approvals	CE

* Under optimal circumstances of reflection and stabilized transducer temperature

Dimensions



Type 2270-X-XX-6 / 2270-X-XX-8

General

Type	2270-X-XX-6	2270-X-XX-8
Range	0.25 to 6 m / 0.82 to 20 ft	0.35 to 8 m
Total Beam Angle	5°	7°
Measuring Frequency	80 kHz	50 kHz
Accuracy *	± (0.2 % of measured distance plus 0.05 % of range)	
Resolution	<2 m (6.6 ft): 1 mm (0.04 in.) 2 to 5 m (6.6 to 16.4 ft): 2 mm (0.08 in.) 6 m (19.7): 5 mm (0.2 in.)	

* Under optimal circumstances of reflection and stabilized transducer temperature

Environmental

Process Temperature	−30 °C to +90 °C (−22 °F to +194 °F)
Ambient Temperature	−30 °C to +80 °C (−22 °F to +176 °F)
Process Pressure (absolute)	0.05 to 0.3 MPa (0.5 to 3 bar) 7.25 psi to 43.5 psi

Enclosure

Enclosure and Sensor Material	PP or PVDF
Cable Material	Cable sealing: EPDM, cable isolation: PVC
Ingress Protection	IP68 / NEMA 6P
Process Connection	2" BSP / NPT

Sealing

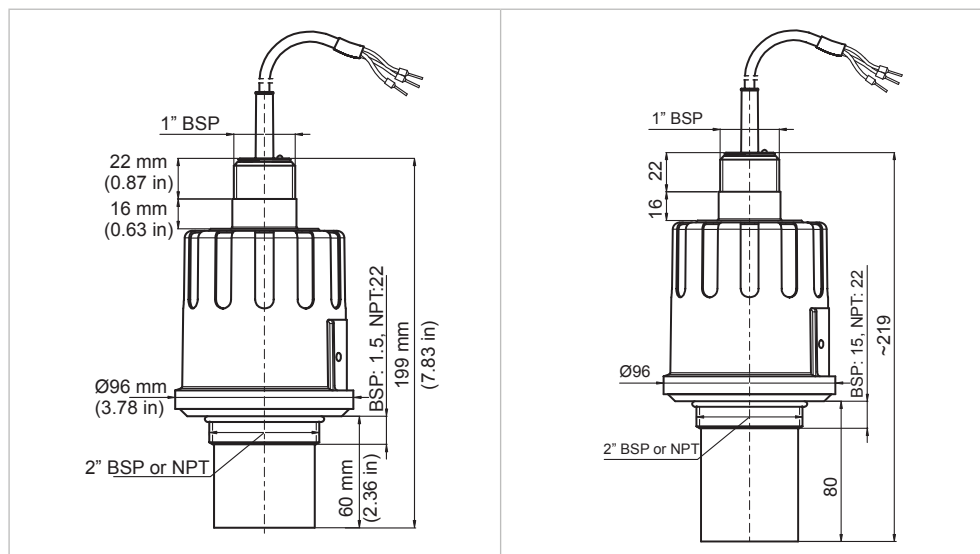
PP sensor	EPDM
PVDF sensor	FKM (Viton)

Electrical

Outputs	2-wire 4–20 mA , max. 600 Ohm; HART interface, $R_t \geq 250 \text{ Ohm}$
Power Supply	DC 12 to 36 V
Power Consumption	max. 720 mW, overload protected
Connecting	6 x 0,5 mm ² shielded cable; Ø 6 mm x 5 m (30 m max.)
Electric Shock Protection	Class III, low voltage

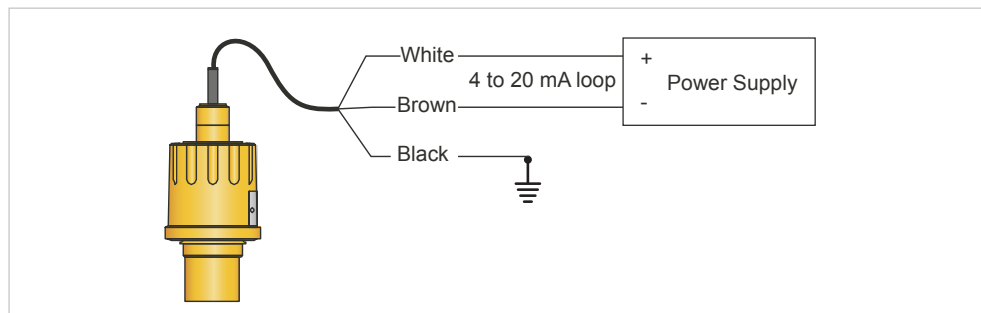
Standard and Approvals

General Approvals	CE
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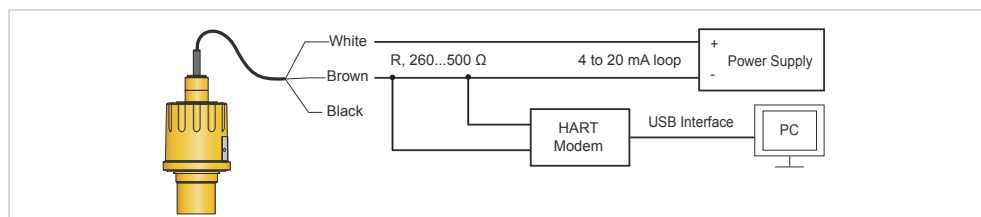
Dimensions

4.6.3 Wiring

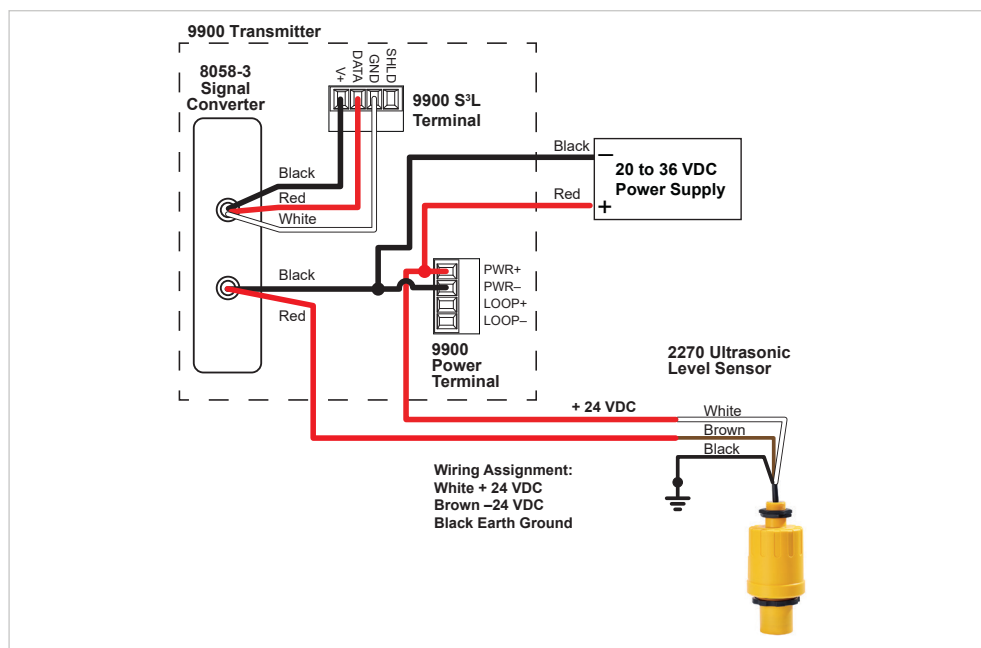
4 to 20 mA Loop Wiring



HART Interface Wiring



Wiring to 9900 Universal Transmitter



4.6.4 Ordering Information

Mfr. Part No.	Code	Description
Versions with NPT thread		
2270-P-1N-4	159 300 169	Range 4 m (13.1 ft), PP body, 4 to 20 mA 2-wire/HART, NPT thread
2270-P-1N-6	159 300 170	Range 6 m (19.7 ft), PP body, 4 to 20 mA 2-wire/HART, NPT thread
2270-P-1N-8	159 300 116	Range 8 m (26.2 ft), PP body, 4 to 20 mA 2-wire/HART, NPT thread
2270-V-1N-4	159 300 176	Range 4 m (13.1 ft), PVDF body, 4 to 20 mA 2-wire/HART, NPT thread
2270-V-1N-6	159 300 177	Range 6 m (19.7 ft), PVDF body, 4 to 20 mA 2-wire/HART, NPT thread
2270-V-1N-8	159 300 117	Range 8 m (26.2 ft), PVDF body, 4 to 20 mA 2-wire/HART, NPT thread
Versions with BSP thread		
2270-P-1B-4	159 300 155	Range 4 m (13.1 ft), PP body, 4 to 20 mA 2-wire/HART, BSP thread
2270-P-1B-6	159 300 156	Range 6 m (19.7 ft), PP body, 4 to 20 mA 2-wire/HART, BSP thread
2270-P-1B-8	159 300 111	Range 8 m (26.2 ft), PP body, 4 to 20 mA 2-wire/HART, BSP thread
2270-V-1B-4	159 300 162	Range 4 m (13.1 ft), PVDF body, 4 to 20 mA 2-wire/HART, BSP thread
2270-V-1B-6	159 300 163	Range 6 m (19.7 ft), PVDF body, 4 to 20 mA 2-wire/HART, BSP thread
2270-V-1B-8	159 300 115	Range 8 m (26.2 ft), PVDF body, 4 to 20 mA 2-wire/HART, BSP thread



4.6.5 Accessories

Code	Description
159 300 181	HART - USB Modem
159 300 182	HART - USB Modem, DIN Rail
159 300 183	HART - USB Modem, DIN Rail, ATEX

4.7 2290 Non-contact Radar Level Transmitter



4.7.1 Product description

The 25 GHz (K-band) 2290 Pulse Radars are the most progressive non-contact level transmitter technology for industrial processes. With an excellent accuracy, compact antennas and a user-friendly set-up the 2290 is an effective, simple, low cost choice for demanding level applications. GF's new K-band radar featuring ± 3 mm (± 0.1 inch) accuracy and short dead band excels with its full plastic housing. Its antenna range incorporates a stainless steel horn and enclosed plastic tube choices.

The enclosed antenna versions can be replaced without removing the antenna enclosure from the process. Local programming of type 2290 is aided by a plug-in display module. The signal processing algorithm of the 2290 is based on years of experience with non-contact level measurement making it an excellent choice for applications simple and challenging alike.

Features

- 19° beam angle
- Tank mapping function
- Large dot matrix LCD display
- Predefined tank shapes
- Works with fumes, condensation, and light foam layers



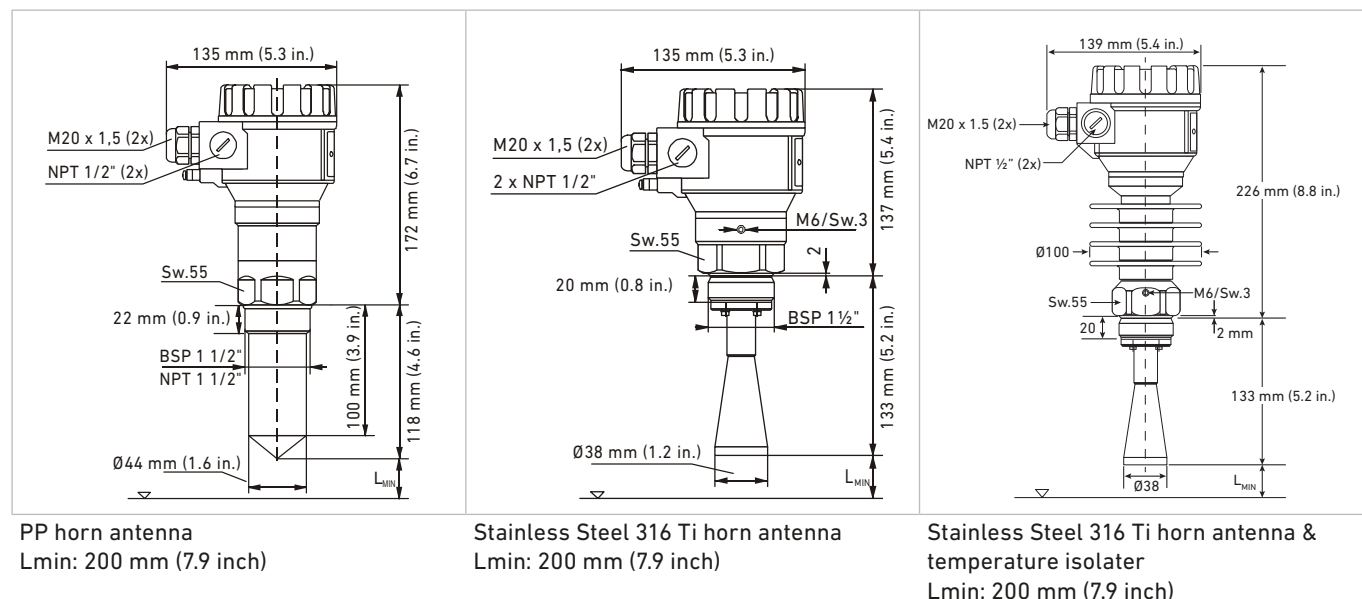
Applications

- Bulk Storage Tanks
- Day Tanks
- Process vessels for Mixing and Batching
 - Buffer Tanks
 - Conditioning vessels
 - Metal or Plastic

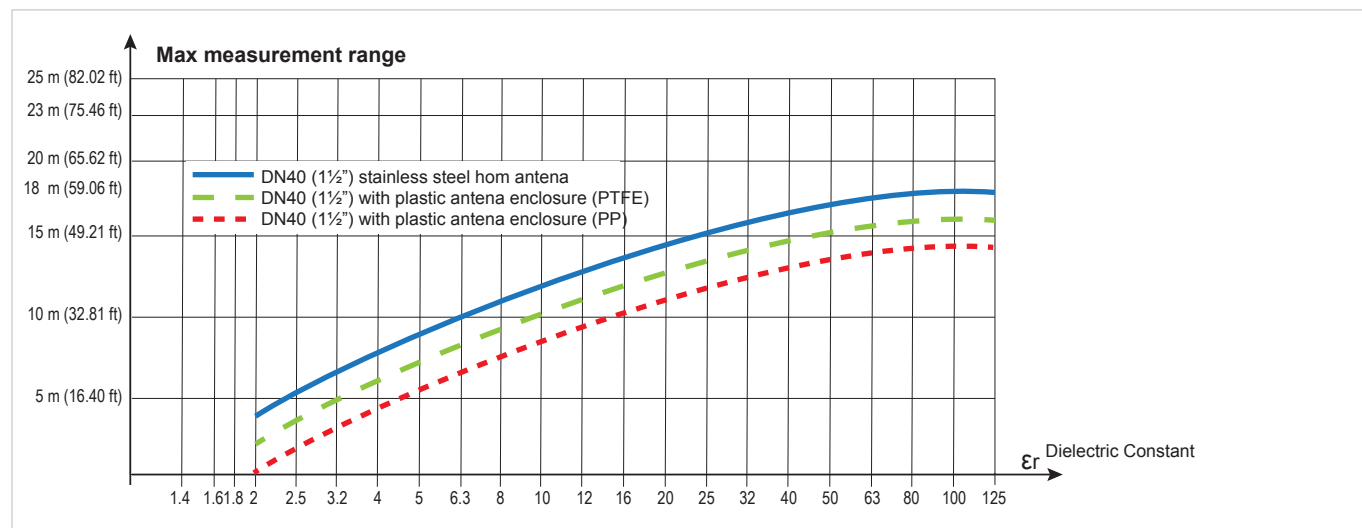
4.7.2 Specifications

General		
Measured Values		Level, Distance; Calculated values: Volume, Mass
Wetted Parts	Horn Antenna	Stainless Steel 316 Ti
	Antenna enclosure	PTFE, PP
Frequency of the Measuring Signal		~25 GHz (K-band)
Measuring Range		0.2 m – 18 m (0.65 – 59 ft) (depending on ϵ_r of the process liquid)
Accuracy		±3 mm (0.1 inch)
Linearity Error (as per EN 61298-2)		< 0.5 m: ±25 mm (< 1.6 ft: ±0.9 inch); 0.5 – 1 m: ±15 mm (1.6 – 3.2 ft: ±0.6 inch); 1 – 1.5 m: ±10 mm (3.2 – 4.9 ft: ±0.4 inch); 1.5 – 8 m: ±3 mm (4.9 – 26.3 ft: ±0.1 inch); > 8 m: ±0.04% (> 26.3 ft: ±0.04%) of the measured distance
Beam Angle		Minimum 19°
Minimum dielectric constant ϵ_r of the Medium		1.9 (refer to range diagram below)
Resolution		1 mm (0.04 in.)
Temperature Error (as per EN 61298-3)		0.05% FSK / 10 °C (50 °F) -20 °C... +60 °C (-68 °F... +140 °F)
Power Supply Voltage		20 V ...36 V DC
Output Digital Communication		4 – 20 mA + HART
Output Display		64 x 128 Dot Matrix LCD Graphical display unit
Measuring Frequency		10...60 sec as per the application settings
Antenna Diameter		38 mm (1 1/2")
Antenna Material		Horn: Stainless Steel; enclosure: PP, PTFE
Medium Process Temperature		-30 °C... +100 °C (-22 °F - 212 °F), (up to 120 °C (248 °F) for max. 2 min); with PP antenna enclosure: max.: 80 °C (176 °F) 2290 HT (high-temperature, SS316 horn antenna): -30°C ... +180°C (-22°F ... + 356°F)
Maximal Medium Pressure		25 bar at 120 °C (248 °F); with plastic antenna enclosure: 3 bar at 25 °C (77 °F)
Ambient Temperature		-20 °C... +60 °C (-4 °F - 140 °F)
Process Connection		DN 40 / 1 1/2" BSP, 1 1/2" NPT" thread
Ingress Protection		IP 67
Electrical Connection		2x M 20 x 1.5 cable glands + internal thread for 2x 1/2" NPT cable protective pipe, cable outer diameter: Ø 7 ... Ø 13 mm (0.3 ... 0.5 inch), wire cross section: max. 1.5 mm ² (AWG 15), wire cross section: max. 1.5 mm ²
Electrical Protection		Class III
Housing Material		Plastic (/PBT)
Sealing		FKM
Communication Certifications		R&TTE, FCC
EX-Approvals		ATEX (ia): II 1/2 G Ex ia IIB T6...T5 Ga/Gb ICEX (ia): EX ia IIB T6...T5 Ga/Gb CE, FCC

Dimensions

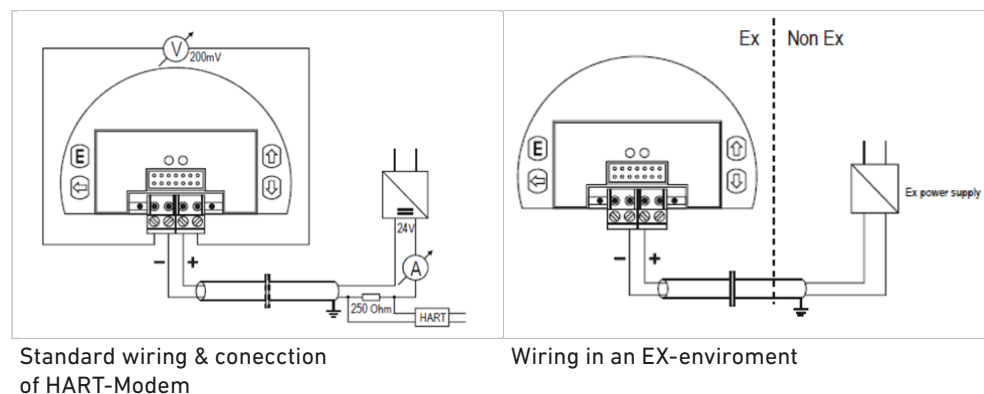


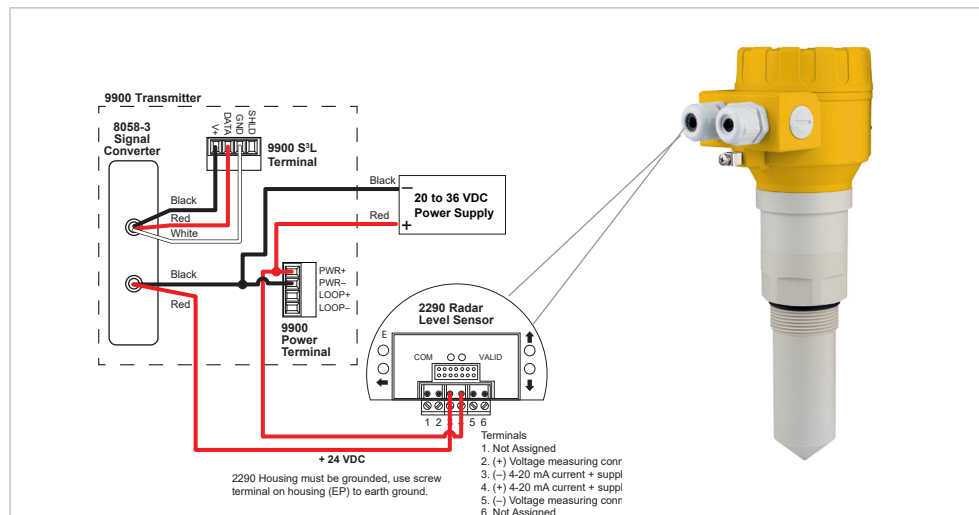
Measurement range diagram*



Under reference conditions of reflection (as per EN 61298-3, moreover in case of interface-free environment, from min. 10 m² target surface) and stabilized temperature.

Connections / Wiring



To iGo Converter – (S³L) / 4 to 20 mA

Pin No.	Assignment
1	Not Assigned
2	(+) Voltage measuring connector (200 mV)
3	(-) 4-20 mA loop current + supply (HART)
4	(+) 4-20 mA loop current + supply (HART)
5	(-) Voltage measuring connector (200 mV)
6	Not Assigned

4.7.3 Ordering Information

Mfr. Part No	Code	Description
2290-P-1DB2-18	159 300 184	2290 Radar Level Transmitter, LCD, PP/PBT housing, 1 1/2" BSP
2290-P-1DN2-18	159 300 185	2290 Radar Level Transmitter, LCD, PP/ PBT housing, 1 1/2" NPT
2290-S-DB2-18	159 300 186	2290 Radar Level Transmitter, LCD, PBT housing/SS316 Ti antenna, 1 1/2" BSP
2290-S-DN2-18	159 300 187	2290 Radar Level Transmitter, LCD, PBT housing/SS316 Ti antenna, 1 1/2" NPT
2290-F-DB2-18	159 300 206	2290 Radar Level Transmitter, LCD, PBT housing / PTFE antenna, 1 1/2" BSP
2290-F-DN2-18	159 300 207	2290 Radar Level Transmitter, LCD, PBT housing/ PTFE antenna, 1 1/2" NPT
2290-P-1DB2X-18	159 300 194	2290 EX Radar Level Transmitter, LCD, PP/PBT housing, 1 1/2" BSP
2290-P-1DN2X-18	159 300 195	2290 EX Radar Level Transmitter, LCD, PP/ PBT housing, 1 1/2" NPT
2290-S-DB2X-18	159 300 196	2290 EX Radar Level Transmitter, LCD, PBT housing/SS316 Ti antenna, 1 1/2" BSP
2290-S-DN2X-18	159 300 197	2290 EX Radar Level Transmitter, LCD, PBT housing/SS316 Ti antenna, 1 1/2" NPT
2290-F-DB2-18	159 300 188	PTFE antenna enclosure, 1 1/2" BSP
2290-F-ENC-N2	159 300 189	PTFE antenna enclosure, 1 1/2" NPT
On Request	2290-S-DB2-18-HT	2290 High Temperature Radar Level Transmitter, LCD, Aluminium housing/SS316 Ti antenna, 1 1/2" BSP
On Request	2290-S-DN2-18-HT	2290 High Temperature Radar Level Transmitter, LCD, Aluminium housing/SS316 Ti antenna, 1 1/2" NPT

4.7.4 Accessories

Mfr. Part No	Code	Description
	159 300 181	HART - USB Modem
3-8058-3	159 000 966	Wire-mount GF Signet i-Go signal (4 to 20 mA / S ³ L) converter to connect 2290 to 9900 Transmitter, 8900 Multi-Parameter Controller. Single input
3-8058-2	159 300 967	DIN rail mount GF Signet i-Go (4 to 20 mA / S ³ L) converter to connect 2290 to 9900 Transmitter, 8900 Multi-Parameter Controller. Two inputs
3-9900-1P	159 001 695	9900 Transmitter - Panel Mount
3-9900-1	159 001 696	9900 Transmitter - Field Mount
3-9950-1	159 001 841	9950 Base Unit – Two Channel Multi-Parameter Inputs, Two 4 to 20 mA Outputs, Panel Mount, DC Power
3-9950-2	159 001 842	9950 Base Unit – Two Channel Multi-Parameter Inputs, Two 4 to 20 mA Outputs, Panel Mount, AC or DC Power

4.8 2291 Guided Wave Radar Level Transmitter



4.8.1 Product description

The 2291 Guided Wave Radar level transmitter is designed for continuous level measuring of conductive or non-conductive liquids, pulps and solids. The 2291 level gauge operates based on the well-known TDR (Time Domain Reflectometry) principle. Micropulses are sent along a probe guide at the speed of light. As soon as the impulse reaches the surface of the medium, it is reflected back to the electronic module. Level distance is directly proportional to the flight time of the impulse.

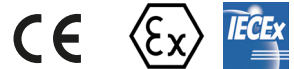
The reflected signal is dependent on the dielectric constant of the material; the feasibility of the measurement is $\epsilon_r \geq 1.9$. The TDR technology is unaffected by the properties of the medium as well as that of the space above it. Measurement is also unaffected by the change in the physical properties of the materials such as temperature, pressure, dielectric constant.

Features

- Measuring range up to 6 m (19.6 ft)
- Accuracy: ± 5 mm (0.2 in)
- PP / PFA coated probes available on request
- Rod & cable versions available
- Minimum ϵ_r 1.9
- 2-wire version
- Graphic LCD display
- 4 to 20 mA + HART output
- Medium temperature range: -30 °C to $+90$ °C (-22 °F to $+194$ °F)
- Maximum process pressure: 40 bar (580 psi)
- IP67 protection

Applications

- Inventory Tanks
- Day Tanks
- Process Vessels for Mixing & Batching
- Bypass Applications (requires calibration)
- Stilling-wells
- Powders
- Slightly Conductive Foams
- Low Dielectric Constant Liquids



4.8.2 Specifications

General	
Measured Values	Level, Distance; Calculated values: Volume, Mass
Measuring Range	Depends on the probe type and dielectric constant (ϵ_r) of the measured medium
Probe Types	Mono cable, mono rod
Accuracy: Linearity Error ¹	For liquids: ± 5 mm (0.2 inch), if probe length ± 10 m (32 feet): ± 0.05 % of the probe length
Accuracy: Resolution	± 3 μ A
Minimal ϵ_r of the Medium	1.9
Power Supply	18 V... 35 V DC
Output: Digital Communication	4-20 mA + HART
Output: Display	Graphical LCD display unit
Medium Temperature	-30 °C... +90 °C (-22 °F... +194 °F),
Maximum Medium Pressure	4 MPa (40 bar g/ 580 psi g); with plastic lined flange: max. 2.5 MPa (25 bar g/ 363 psi g)
Ambient Temperature	-20 °C... +60 °C (-4 °F... +140 °F)
Process Connection	1" BSP, 1" NPT Thread
Ingress Protection	IP 67
Electrical Connection	2x M20x1.5 cable glands + internal thread for 2x ½" NPT cable protective pipe, cable outer diameter: $\varnothing 7 \dots \varnothing 13$ mm (0.3 ... 0.5 inch), wire cross section: max. 1.5 mm ² (AWG 15)
Electrical Protection	Class III
Housing Material	Plastic (PBT)
Sealing	FKM, On request: FFKM, EPDM
Mass (head unit)	1.5 kg (3.3 lb)
EX-Approvals	ATEX (ia): II 1/2 G Ex ia IIB T6...T5 Ga/Gb ICEX (ia): EX ia IIB T6...T5 Ga/Gb

¹ Under reference conditions and stabilized temperature

Probe specifications*

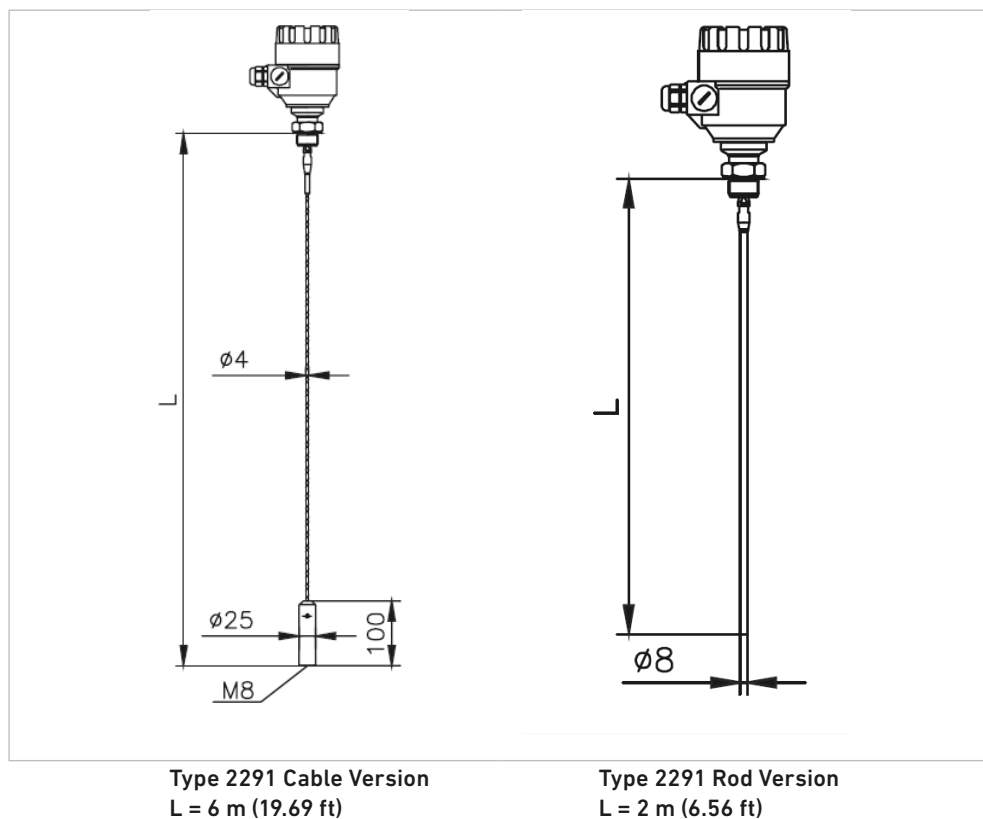
Probe Type	Max. Measuring Range	Dead-zone ²		Process Connection	ϵ_r min.
		Upper (t) /lower (b) $\epsilon_r = 80$	Upper (t) /lower (b) $\epsilon_r = 2.4$		
Mono cable $\varnothing 4$ mm (0.15 inch)	6 m (19.6 feet)	300 / 20 mm (12 / 0.75 inch)	400 / 100 mm (16 / 4 inch)	1"	1.9
Mono rod $\varnothing 8$ mm (0.3 inch)	2 m (6.56 feet)	300 / 20 mm (12 / 0.75 inch)	400 / 100 mm (16 / 4 inch)	1"	1.9

* The unmeasurable upper and lower part of the tank. The lower dead zone is extended by the length of the counterweight (cable versions only).

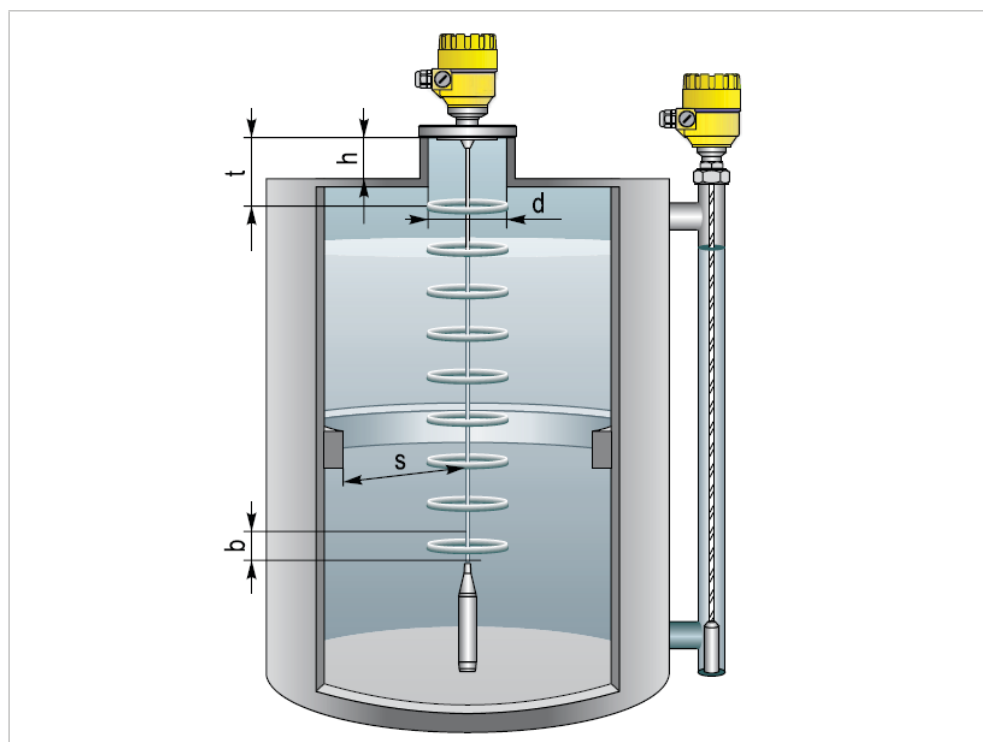
² The unmeasurable upper and lower part of the tank, the lower dead-zone is extended with the length of the counterweight (cable version)

Technical data of the probes		
	Cable	Rod
Max. meas. dist.	24 m (80 feet)	3 m (10 feet)
Min. meas. Dist. ($\epsilon_r = 80 / \epsilon_r = 2.4$)	0.3 m / 0.4 m (1 feet / 1.3 feet)	
Minimal medium ϵ_r	1.9	
Sensing space around the probe	$\varnothing 600$ mm (2 feet)	
Process connection	1" BSP, 1" NPT	
Probe material	1.4401 (316)	1.4571 (316 Ti)
Probe nominal \varnothing	4 mm (0.15 inch)	8 mm (0.3 inch)
Mass	0.12 kg/m (0.08 lb/ft)	0.4 kg/m (0.25 lb/ft)
Counterweight dimensions	$\varnothing 25 \times 100$ mm (1x4 inch)	
Counterweight material	1.4571 (316 Ti)	

Dimensions

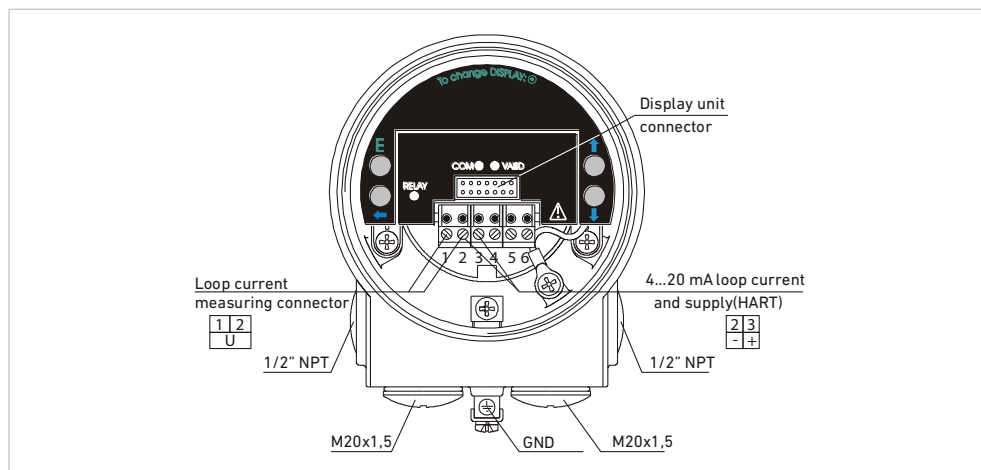


4.8.3 Installation



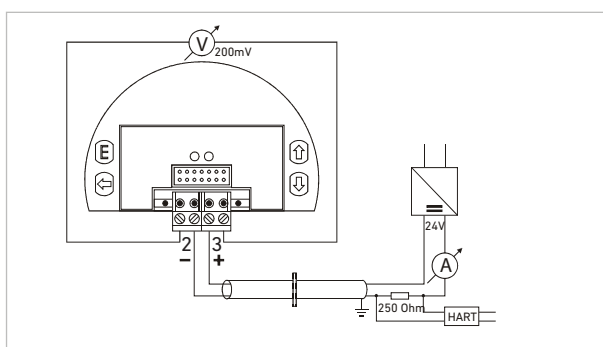
The probes can be removed from the head unit by the user.
 s = minimum distance from the internal disturbing objects.
 Objects that are parallel to the probe do not disturb the measurement. $s > 300 \text{ mm (12 in.)}$, $h \leq d$, t

Wiring

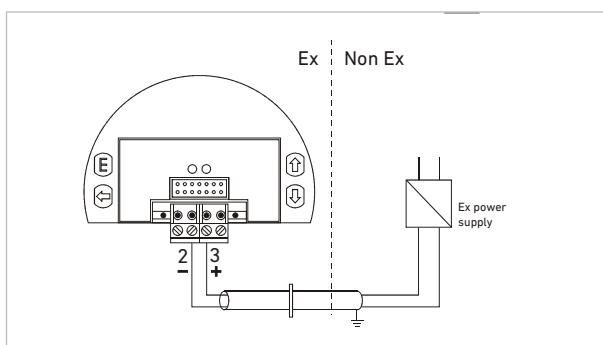


To Power Supply / HART Modem

Standard wiring & connection of HART-Modem



Wiring in an EX-environment



4.8.4 Ordering Information

4.8.5 Accessories

+GF+

5 Point Level Switches

5.1 2280 Swing Forks



5.1.1 Product description

Swing Forks are suitable for level detection of liquids or granular, powdered solids. Filling or draining a tank can be controlled with these devices. Swing Forks can also be used to protect a tank against overfilling or a pump against running dry.

The operation principle is based on the electronic circuit exciting the fork probe making it vibrate. When the medium reaches and covers the fork, its vibration changes or stops completely. The electronics senses the change in vibration and activates an output signal after a selected delay.

Swing Forks are frequently used in combination with ultrasonic or hydrostatic level sensors as an additional safety mechanism. They react directly to physical contact with a medium and therefore offer a good protective function in case the continuous technology fails.

Function

When operating, the fork vibrates at a high frequency. As soon as a liquid or solid encloses the fork, this vibrating movement is dampened. An internal sensor detects this state and initiates switching of the contacts.

The sensor also has a failsafe function and thus guarantees additional safety.

Benefits/features

- Maintenance-free principle of vibration
- Independent of conductivity, permittivity, pressure and temperature
- Selectable sensitivity
- Relay or electronic output
- Up to 130 °C medium temperature
- ATEX and WHG approvals

Applications

- Cooling water
- Dematerialized water
- Water/glycol solutions
- Chemicals
- Leak detection in double pipes or tank walls
- Limit value switch against overfilling
- Protection of pumps against running dry

CE, ATEX, RoHS



5.1.2 Technical basics

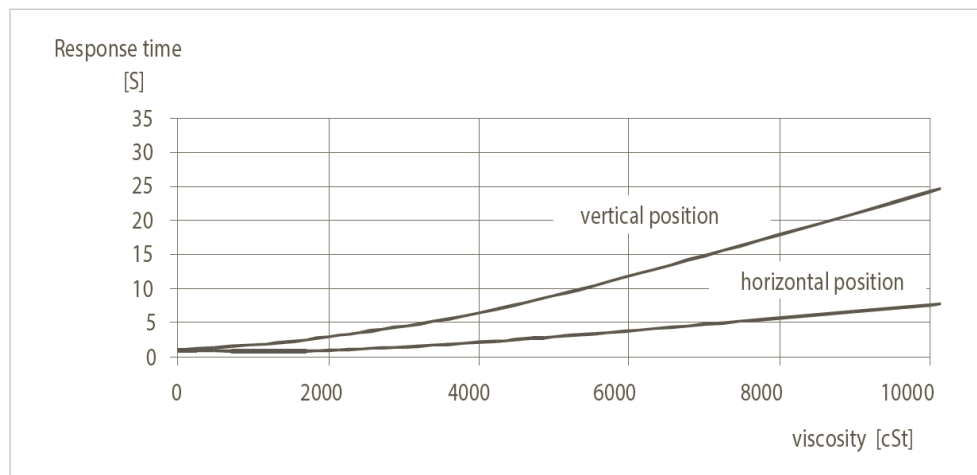
Since this concerns an invasive measuring principle, the composition of the medium to be measured plays an important role with regard to the functionality of the 2280 Swing Forks.

First check whether the medium is resistant to the sensor housing. The sensor housing consists of stainless steel DIN 1.4571, 316.

Furthermore, the viscosity determines whether the measuring principle can be used. Especially if it is assumed that the liquid repeatedly comes into contact with the switch without it being cleaned in the interim.

Media with a maximum viscosity of 10,000 mm²/s (cSt) can be detected reliably. Liquids with higher values overwhelm the self-cleaning function of the fork. There is a risk that the switch will no longer be able to discern a change in frequency. It remains in the switched state, even though the fill level has already fallen.

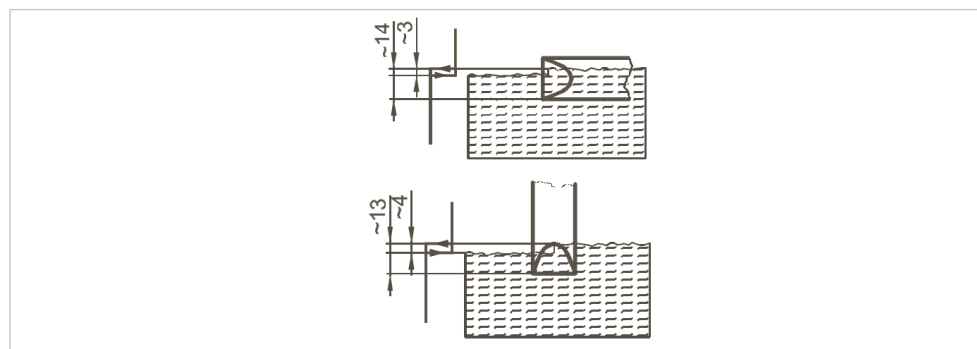
Depending on the viscosity, there is a certain time delay before the fork becomes free.



Reaction time / viscosity

Switching point

The following graphic illustrates the switching point on the fork. This point also depends on the density of the contact liquid.



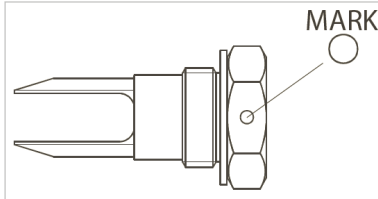
Switching points: values in mm with water 25 °C

5.1.3 Handling

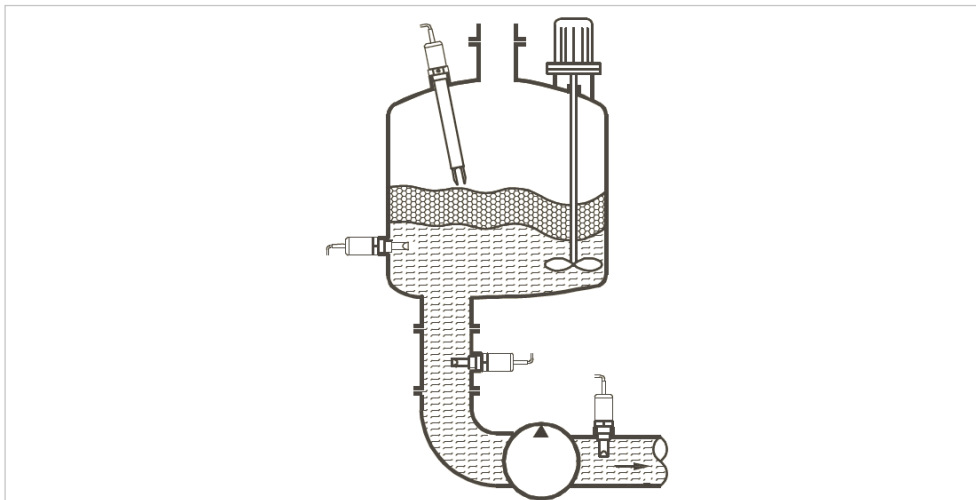
Installation notes

Position

In order to attain the best possible measuring performance, the 2280 Swing Forks can be installed in different ways. Here, marking the side on the hexagon helps. With PTFE tape on the thread, the required end position can be reached. If no particular position is necessary, installation of the standard sealing ring is sufficient.

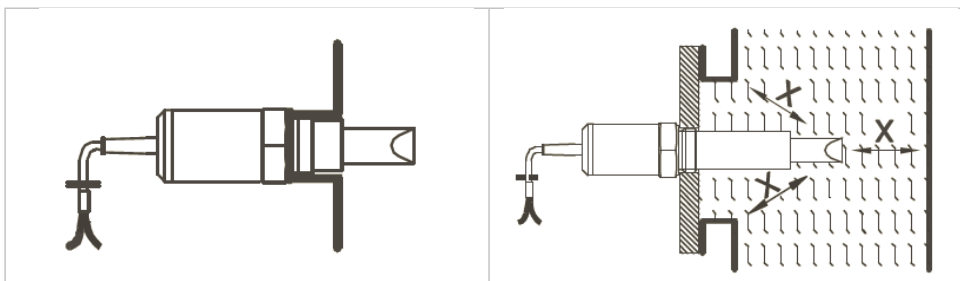


- **Low viscosity**
 - No particular position is to be maintained here. The sensor can be installed in any desired position.
- **High viscosity**
 - Install the sensor vertically, if possible. This can substantially improve the reaction time after submersion.



Examples of installation positions of the 2280

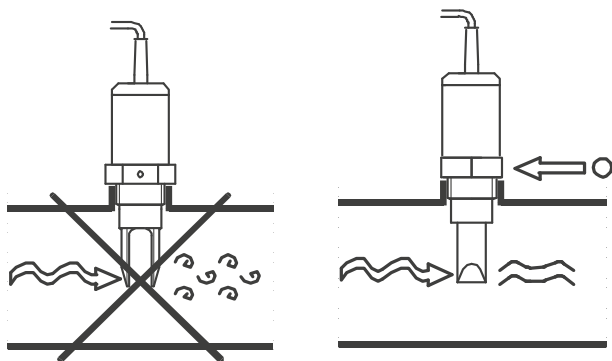
Additionally, it must be ensured that there is sufficient free space around the sensor, in order to prevent deposits. This is particularly true for installations in pipes. The fork must also be able to be completely immersed in the medium.



Caution when assembling fittings and pipes with small dimensions.

Special note on installations in pipes

When installing into pipes it must be ensured that the fork of the 2280 is aligned parallel to the flow. This is necessary in order to prevent deposits and to achieve the best possible reaction time. The mark on the hexagon will help with orientation.

**Function test with test magnet**

Each 2280 can be checked for proper function as soon as there is power. This requires a magnet (RPS-101). If the test magnet is placed on the marked spot on the housing, the switching state of the 2280 changes.

Function diagram

Overview of the various switching states and LED displays

Voltage	Swing Forks	Operating mode	LED	Output	
On	Covered	HIGH	Red	OFF	
		LOW	Green	ON	
	Open	HIGH	Green	ON	
		LOW	Red	OFF	
Failure	Open or covered	HIGH or LOW	Off		

Maintenance notes

The 2280 Swing Forks are rugged sensors for industrial applications. Therefore, in general no maintenance is necessary. In certain cases it may become necessary to clean residues from the Swing Forks at regular intervals. Heavy soiling can cause the 2280 Swing Forks to no longer reliably change switching states.



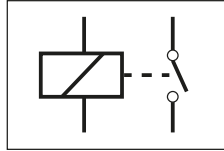
Installation and maintenance must be performed according to the corresponding installation instructions. The installation manual is included with the product, see also the online product catalog at www.gfps.com

Tips on use

Overfill protection

It is recommended that a level switch also be installed for every continuous measuring system (hydrostatic or ultrasonic). Particularly in order to be able to reliably detect the highest allowed level.

Placed correctly, the 2280 provides a HIGH alarm for this purpose, and can be directly connected to a stop relay in order to stop the feed pump in an emergency.



GF level switches in connection with a stop relay offer a simple, redundant safety concept in case the continuous system fails.

5.1.4 Technical data

General

Type	2280-Y-YYC-Y	2280-Y-YYO-Y	2280-Y-YYT-Y
Special length	69 mm or 125 mm (2.7 inch or 4.9 inch)		
Indicator light	Two-color LED		

Environment

Process temperature	-40 °C ... +130 °C (-40 °F... +266 °F)
Ambient temperature	-40 °C...+70 °C (-40 °F...+158°F) / -30 °C...+70 °C (-22 °F...+158°F)
Process pressure (absolute)	4 MPa (40 bar)
Min. medium density	≥ 0.7 kg/dm ³
Max. medium density	≤10'000 mm ² /s (cSt)

Housing

Sensor	Stainless steel DIN 1.4571	
Housing	Stainless steel DIN 1.4571	PBT
Protection rating	IP 67, NEMA 6P	
Process connection	1" BSP / NPT	

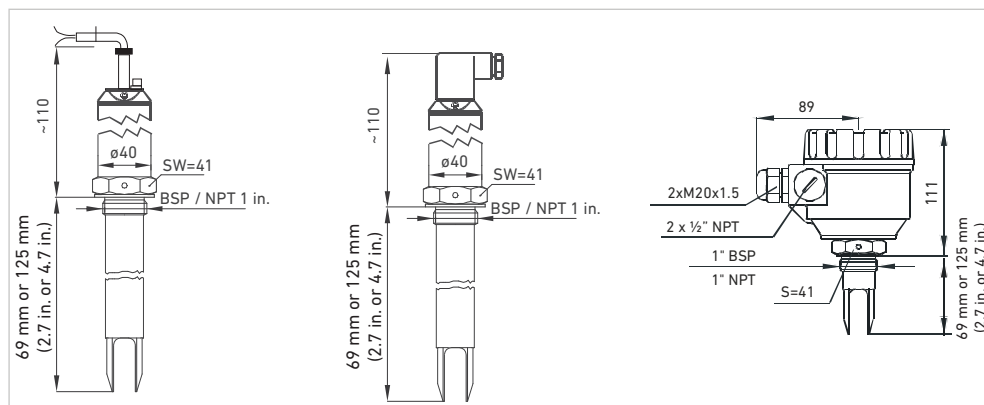
Electronics

Switching function	2-wire AC, 3-wire PNP-NPN	1 SPDT relay
Voltage/current outputs	AC 9 mA free, 14 mA wetted 3-wire max. 350 mA, < 4.5 V (on)	250 V AC, 8 A AC1
Power supply	12...55 V DC oder 20 ... 255 V AC, 50/60 Hz	20 ... 255 V AC und 20 ... 60 V DC
Reaction time	≤ 0.5 s	
Power consumption	0.6 W	AC: 1.2 ... 17 V A; DC: <3 W
Process Connection	Cable PVC 5 x 0.5 mm 2, 3 m	DIN plug Terminal
Protection rating	Class III	Class I

Approvals/standards

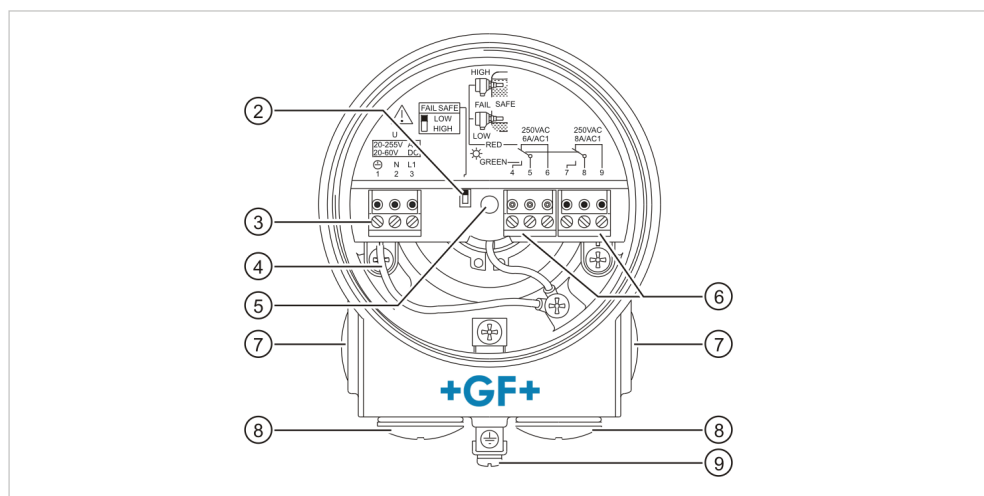
ATEX approval	ATEX II 1 G Ex ia IIC T6, IP68
General approvals	CE, RoHS

Dimensions



5.1.5 Wiring

Version with PBT housing

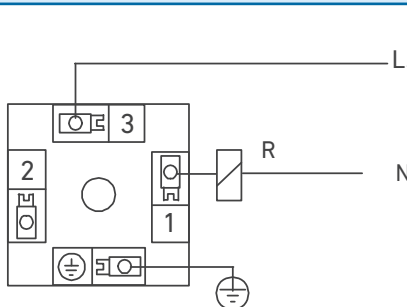
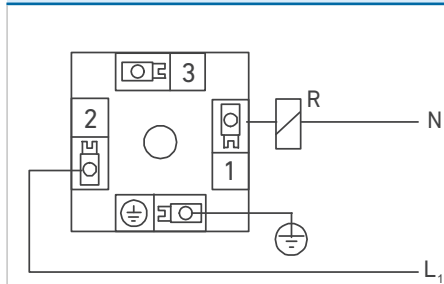


- ② Operating mode
- ③ Supply
- ④ Grounding
- ⑤ Status LED
- ⑥ Output
- ⑦ 1/2" NPT (glands)
- ⑧ M20 x 1.5 (glands)
- ⑨ Grounding screw

Version with DIN plug and 2-wire DC

Min. safety switching (LOW)

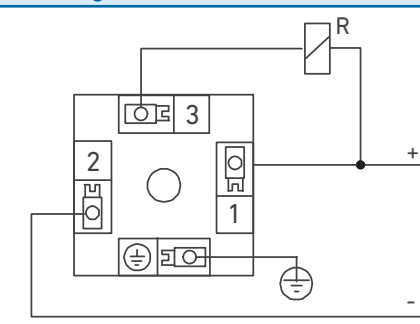
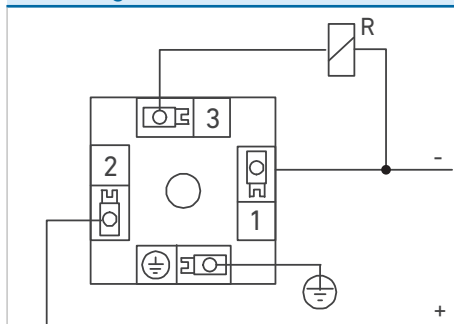
Max. safety switching (HIGH)



Version with DIN plug and 3-wire DC

PNP wiring

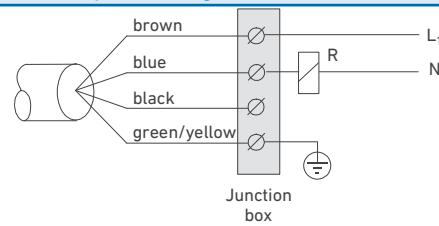
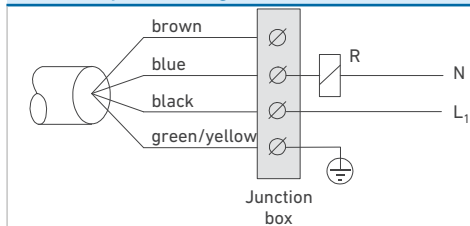
NPN wiring



Version with DC cable, 2-wire DC

Min. safety switching (LOW)

Max. safety switching (HIGH)



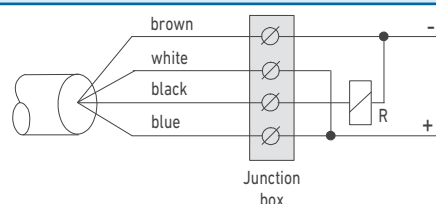
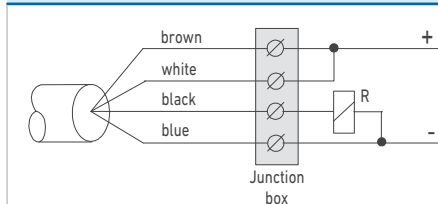
Version with DC cable, 3-wire DC

Min. safety switching (LOW)

Max. safety switching (HIGH)

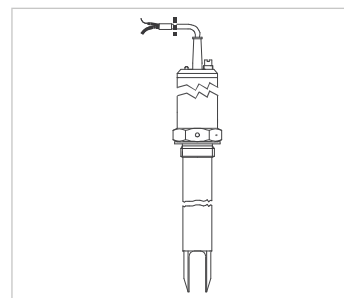
PNP wiring

NPN wiring



5.1.6 Order overview

Manufacturer's part no.	Part no.	Description
2280-S-5WBO-1	159 300 200	Length 69 mm, stainless steel, 3-wire PNP-NPN output, DIN plug, BSP thread
2280-S-5WBC-1	159 300 201	Length 69 mm, stainless steel, 3-wire PNP-NPN output, cable, BSP thread
2280-S-5WBO-2	159 300 202	Length 125 mm, stainless steel, 3-wire PNP-NPN output, DIN plug, BSP thread
2280-S-5WBC-2	159 300 203	Length 125 mm, stainless steel, 3-wire PNP-NPN output, cable, BSP thread
2280-S-5XWBO-1	159 300 210	Length 69 mm, stainless steel, 2-wire AC, DIN plug, BSP thread, ATEX
2280-S-5XWBC-1	159 300 211	Length 69 mm, stainless steel, 2-wire AC output, cable, BSP thread, ATEX
2280-S-5XWBO-2	159 300 212	Length 125 mm, stainless steel, 2-wire AC, DIN plug, BSP thread, ATEX
2280-S-5XWBC-2	159 300 213	Length 125 mm, stainless steel, 2-wire AC, cable output, cable, BSP thread, ATEX
2280-S-5WNO-1	159 300 220	Length 69 mm, stainless steel, 3-wire PNP-NPN output, DIN plug, NPT thread
2280-S-5WNC-1	159 300 221	Length 69 mm, stainless steel, 3-wire PNP-NPN output, cable, NPT thread
2280-S-5WNO-2	159 300 222	Length 125 mm, stainless steel, 3-wire PNP-NPN output, DIN plug, NPT thread
2280-S-5WNC-2	159 300 223	Length 125 mm, stainless steel, 3-wire PNP-NPN output, cable, NPT thread
2280-S-5XWNO-1	159 300 230	Length 69 mm, stainless steel, 2-wire AC output, DIN plug, NPT thread, ATEX
2280-S-5XWNC-1	159 300 231	Length 69 mm, stainless steel, 2-wire AC output, cable, NPT thread, ATEX
2280-S-5XWNO-2	159 300 232	Length 125 mm, stainless steel, 2-wire AC output, DIN plug, NPT thread, ATEX
2280-S-5XWNC-2	159 300 233	Length 125 mm, stainless steel, 2-wire AC output, cable, NPT thread, ATEX
2280-S-5WBT-1	159 300 240	Length 69 mm, stainless steel, PBT housing, 1 SPDT relay, BSP thread
2280-S-5WBT-1	159 300 241	Length 125 mm, stainless steel, PBT housing, 1 SPDT relay, BSP thread
2280-S-5WBT-2	159 300 242	Length 69 mm, stainless steel, PBT housing, 1 SPDT relay, NPT thread
2280-S-5WBT-2	159 300 243	Length 125 mm, stainless steel, PBT housing, 1 SPDT relay, NPT thread



5.2 2281 Multipoint Switch



2281 Multipoint Switch

Single-channel relay

Dual-channel relay

5.2.1 Product description

The Multipoint Switch type 2281 is based on the conductivity principle. The conductivity must be at least $10 \mu\text{S}/\text{cm}$.

The electrodes have to be immersed into the tank for detecting the level. Filling liquid in the tank will change the electrical conductivity between the reference probe and external electrodes. The established connection will be converted and will activate a relay, which in turn generates an output signal.

Function

The Multipoint Switch is mostly used for controlling filling or draining processes. Compared with other measuring principles, the 2281 has special advantages through its simple installation. The electrodes can be customized on site in accordance with the required switching points. Also, up to 4 different switching points can be covered with one compact device.

To control pumps, a load relay (250 V, 16 A) is available for each switching point.

The use of dual-channel relays allows for the connection of 2 multipoint switches. Levels can thereby be detected in different tanks simultaneously.

Benefits/features

- Easy on site electrode length configuration
- Fast installation due to 2 to 4 individual switching points integrated in one sensor
- Up to 4 relays for pump and valve control
- Adjustable sensitivity
- Adjustable delay time

CE RoHS

Applications

- Drinking water
- Cooling water
- Chemicals
- Pump control

5.2.2 Technical basics

The measuring principle requires a minimum conductivity of 10 $\mu\text{S}/\text{cm}$. When the medium covers the reference as well as the measuring electrode, a current < 1 mA AC will flow, which can be detected by the switching unit. The switching state is changed accordingly.

The limit switch consists of 1 or 2 switching units and the sensors of type KLN-2. The sensors are introduced into the sensor frame type 2281, which can be screwed into the container. If the container material or the insulation is not conductive on the inside, a reference sensor should be used in addition to the one, two, three or four sensor(s). If the container material is conductive, the container can serve as a reference sensor.

5.2.3 Handling

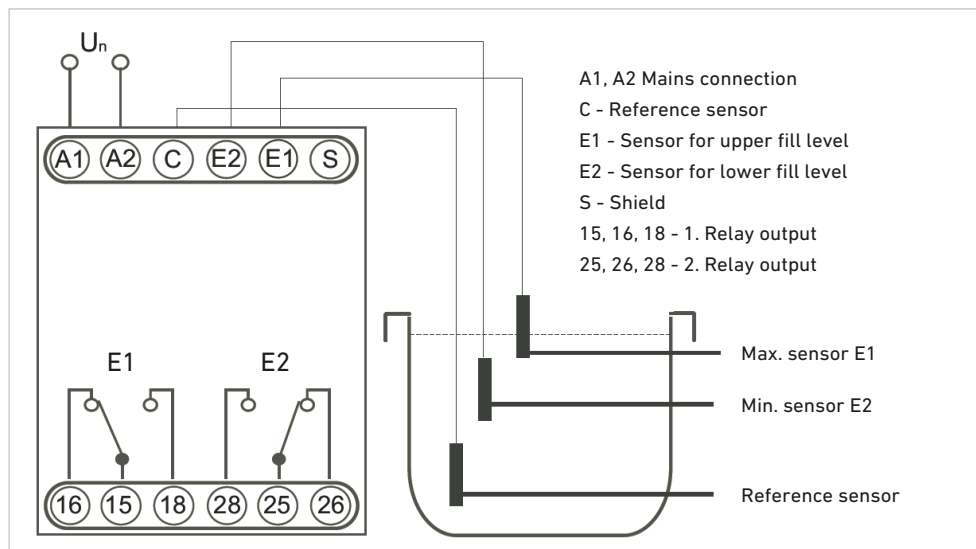
Installation notes

The 2281 is ready for use in only a few steps:

- Install switching unit onto rail (DIN EN 60715).
- Customize the sensors of type KLN-2 on site to the length required for the level measurement.
- Screw sensors into the frames.
- Tighten sensors with M6 nut.
- For devices with several sensors, use all 0.5 m spacers in order to separate the sensors from one another.

Electrical connection

If the container wall is conductive, no reference sensor is necessary. In this case, connection C should be attached to the container. In cases of several sensors, E1 and E2 are to be marked 1 to 4, and the reference sensor C. The permissible cable length between the signal processor and sensors depends on the cable capacity and conductivity. Ensure that E1 reaches the upper fill level, and E2 the lower one.



Maintenance notes

No special maintenance steps are stipulated. Simply make sure that no deposits remain on the reference sensor or the measuring sensors. Such are to be removed in order to ensure full functionality.

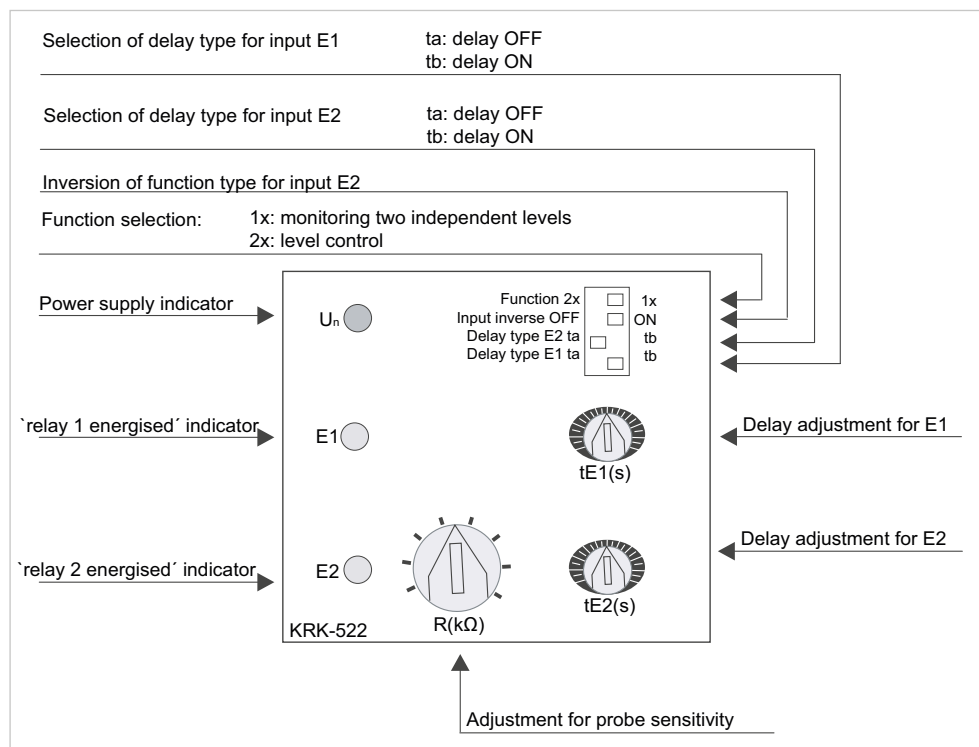
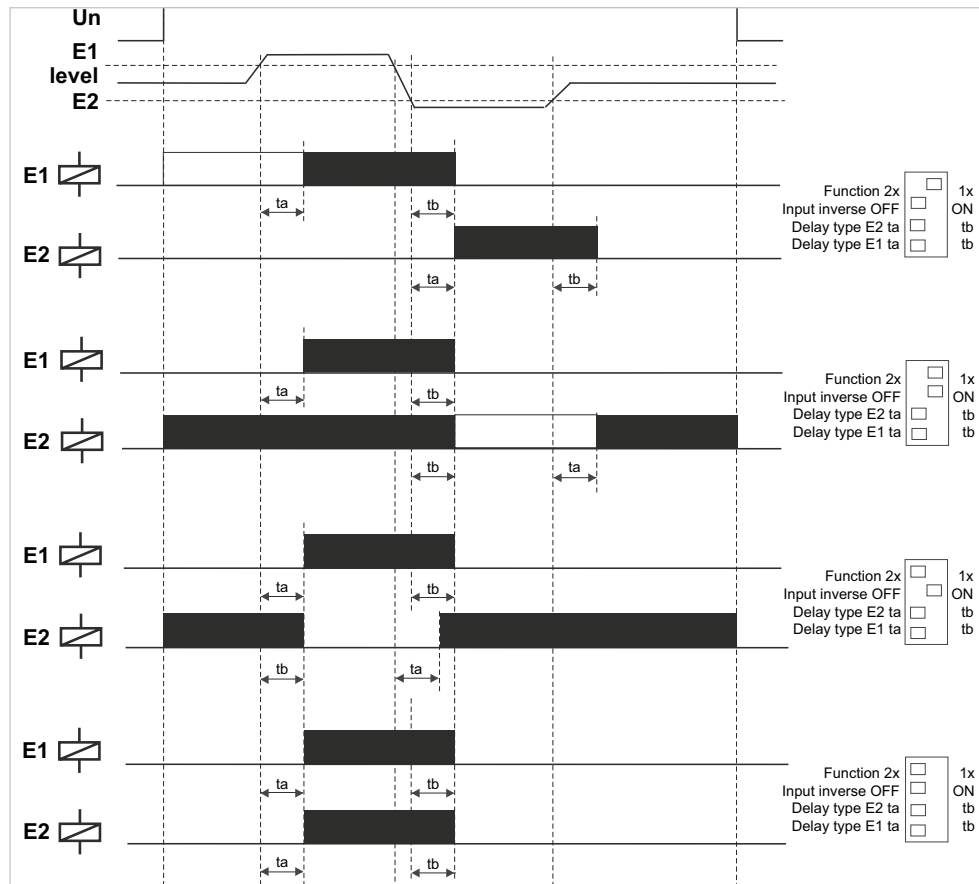


Installation and maintenance must be performed according to the corresponding installation instructions. The installation manual is included with the product, see also the online product catalog at www.gfps.com

Tips for installation

Recommended settings for the switching unit

The green LED (Un) shows that the unit is switched on. The LEDs E1 and E2 show that the relay is in the active state. Operating mode and delay ON or OFF can be set using the DIP switch on the operating panel. On the potentiometers tE1(s) and tE2(s), the delay can be set. The sensitivity setting (potentiometer R) should match the conductivity of the liquid. The sensitivity should not be set higher than required, otherwise there will be precipitation.



5.2.4 Technical data

General

Type	2281-Y-YY-Y	2281-1-relay	2281-2-relay
Switching points	2, 3, 4 + reference		
Min. conductivity	10 µs/cm		

Environment

Process temperature	Max. +80 °C (176 °F)
Ambient temperature	-20 °C bis +50 °C (-4 °F bis +122 °F)
Process pressure (absolute)	0.1 MPa (1 bar)

Housing

Housing material	PBT	
Process connection material	PP	
Electrode material	Stainless steel 1.4571	
Protection rating	IP 65	IP 20
Process connection	1 ½" BSP	

Electrodes

Material	Stainless steel 1.4571
Standard length	0.5m (19.69"), 1.0m (39.37"), 1.5m (59.06")

Spacer

Material	PP
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Electronics

Electrode voltage	3.5 V AC	5 V AC
Current through sensor	<0.2 mA AC	<1mA AC
Reaction time	Max. 400 ms	
Delay	Setting range 0.5 – 10 s	
Relay output	1x SPDT	2x SPDT
Max. nominal voltage	250 V AC1, 24 V DC	
Max. nominal current	8 A AC1	16 A AC1
Switching capacity	2500 VA AC1, 240 W DC	4000 VA AC1, 384 W DC
Power supply	24 V bis 240 V AC / DC	24 V AC / DC
Mechanical connection	DIN EN 60715 rail	
Electronic protection	Class II	Class III

Standards/approvals

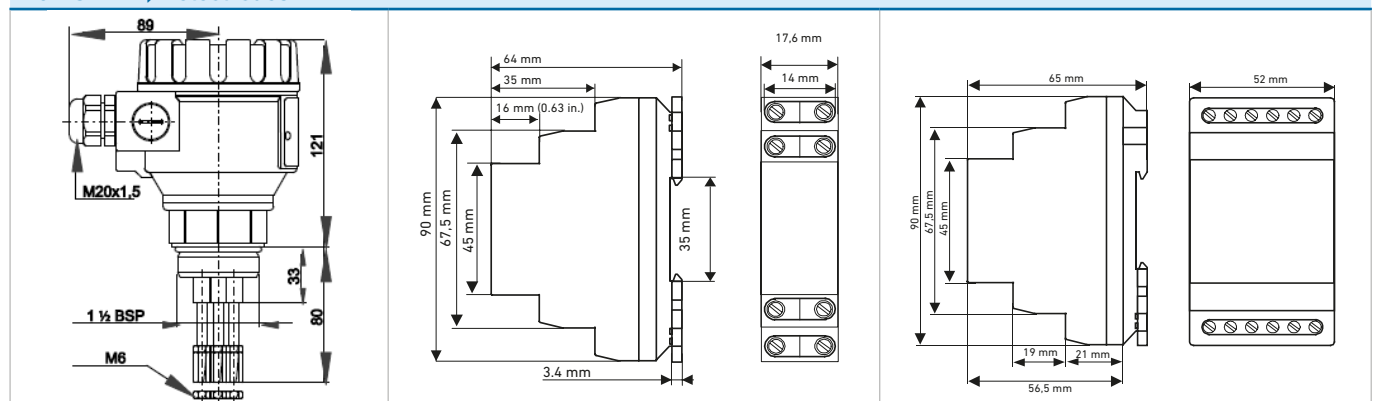
General approvals	CE, RoHS
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Dimensions

2281-S-BT-2, 2 electrodes
2281-S-BT-3, 3 electrodes
2281-S-BT-4, 4 electrodes

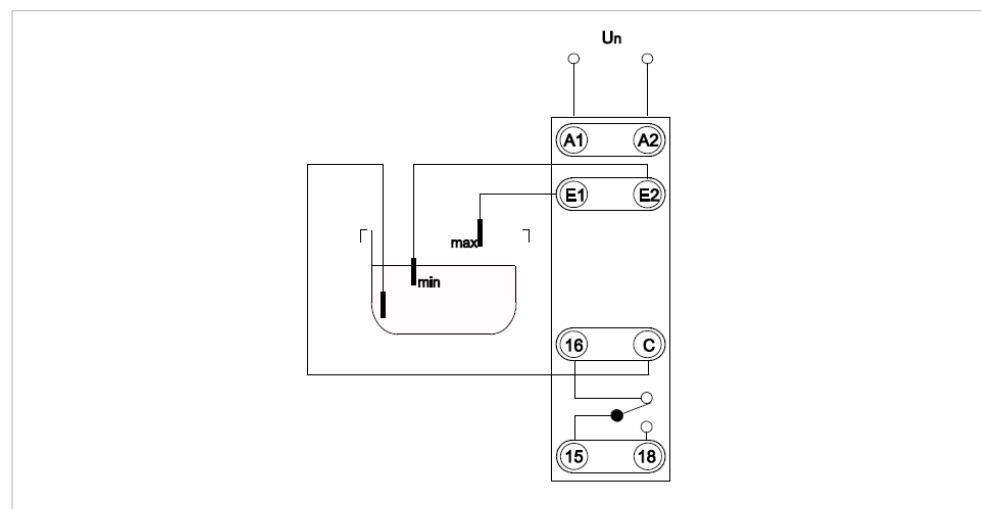
Conductive multipoint switch type 2281-1
relay; 1 SPDT relay

Conductive multipoint switch type 2281-2
relay; 2 SPDT relay



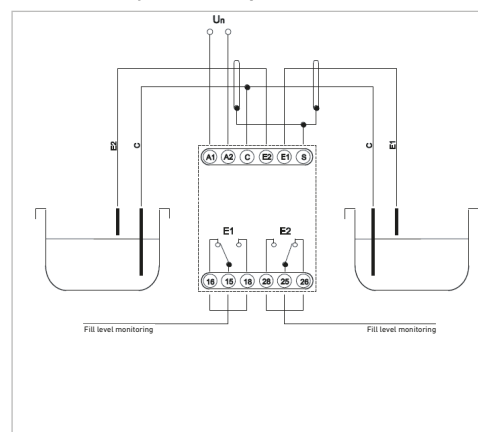
5.2.5 Wiring

1 SPDT relay

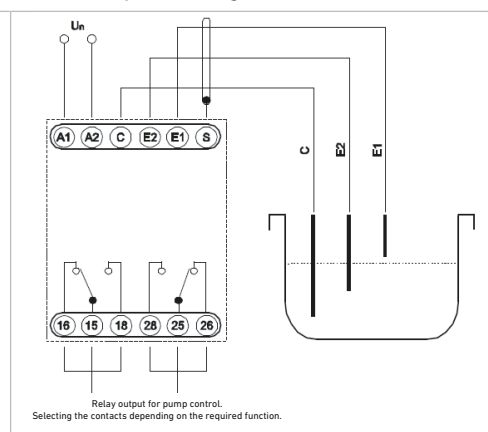


- A1, A2 Mains connection
- C Reference sensor
- E1 Sensor for upper fill level
- E2 Sensor for lower fill level
- 15, 16, 18 Relay output

2 SPDT relay in two separate tanks

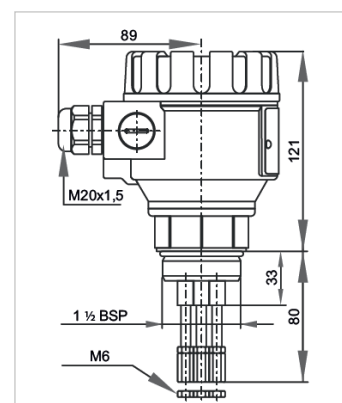


2 SPDT relays in a single tank

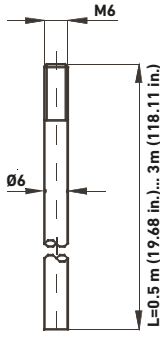
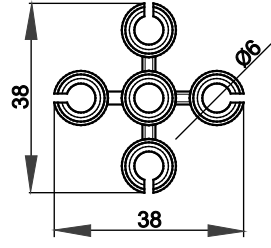


5.2.6 Order overview

Manufacturer's part no.	Part no.	Description
2281-S-BT-2	159 300 250	PBT container for 2 electrodes + reference, 1 1/2" BSP thread
2281-S-BT-3	159 300 251	PBT container for 3 electrodes + reference, 1 1/2" BSP thread
2281-S-BT-4	159 300 252	PBT container for 4 electrodes + reference, 1 1/2" BSP thread
2281-E-205	159 300 253	Stainless steel, 0.5 m
2281-E-210	159 300 254	Stainless steel, 1.0 m
2281-E-215	159 300 255	Stainless steel, 1.5 m
2281-5-Spacer	159 300 257	Spacer for conductive level switch
2281-1-Relais	159 300 258	Conductive level switch, 1 SPDT relay, 24 – 240 V AC/DC
2281-2-Relais	159 300 259	Conductive level switch, 2 SPDT relay, 24 V AC/DC



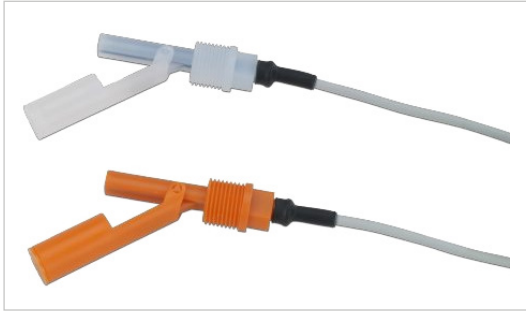
5.2.7 Accessories

Electrodes, stainless steel	Spacer
	
0.5 mm: 2281-E-205, art. 159 300 253 1 m: 2281-E-210, art. 159 300 254 1.5 mm: 2281-E-215, art. 159 300 253	2281-5 spacer, art. 159 300 257



For further information on accessories, refer to the online product catalog at www.gfps.com

5.3 2282 Guided Float Switch



5.3.1 Product description

The Guided Float Switch 2282 is designed for economical control of liquids in tanks. The switch is remarkable for its maintenance-free compact design. The reed contacts have high switch capacity.

The reed contact in the sensor body is switched with a magnet. The switching function (N/O contact and N/C contact) is determined by the installation position. The function can be changed by simply turning 180°.

Function

The 2282 level switch is specially suited for simple, mechanical monitoring of highest and lowest fill levels. Its compact construction allows it to be installed into very small tanks.

With its housing made of PP or PVDF, the 2282 is especially resistant to a number of chemicals.



Benefits/features

- Optimized chemical compatibility
- Very compact design
- PP and PVDF version available
- For small tanks

Applications

- Cooling water
- Demineralized water
- Water/glycol solutions
- Chemicals
- Especially fit for small tanks

CE RoHS

5.3.2 Handling

Installation notes

Ensure before installation that the medium to be measured is free of floating solid matter and ferrous pieces. These can influence the switching mechanics or have a direct effect on the reed contact. It may be possible to protect the switch from floating particles through appropriate precautions.

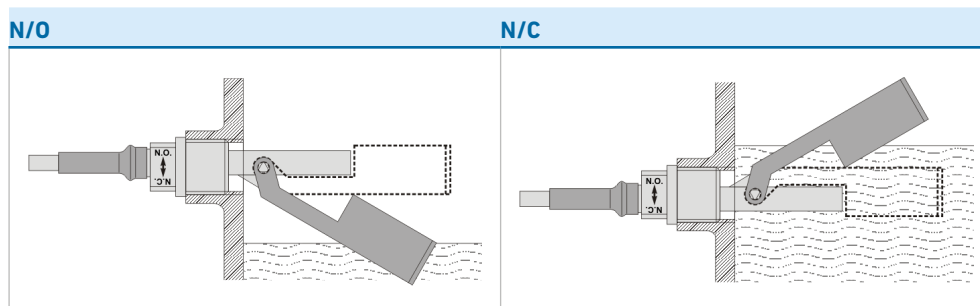
Installation position

- Account for the following points when selecting the position:
- The float switch must be able to be moved along the entire length.
- It does not run into the walls, the bottom or the top of the container.
- Turbulence caused by inlet valves or agitators has been excluded.
- If possible, install in an easily accessible position. This makes later maintenance and replacement steps easier.
- Mounting position is horizontal.
- Observe whether being installed as N/C or N/O contact.

Mechanical installation

- The following should also be observed during installation:
- The cable of the float switch is not connected.
- Ensure that the thread in the container is free of contamination.
- Slide the float switch carefully into the opening and turn it several turns by hand.
- Tighten the float switch with a maximum torque of 4 Nm until the flattened side edges are as vertical as possible.
- Check whether the correct mounting position (NO/NC) has been reached.
- Check whether the connection is leak-tight.
- If it is not leak-tight, remove the sensor completely and reinstall using additional sealing material (e.g. PTFE tape).

Function and mounting position



Maintenance notes

If the switch is used according to our recommendations, no maintenance will be necessary. If there is a chance that floating particles will be in the medium, then clean the sensor regularly.



Installation and maintenance must be performed according to the corresponding installation instructions. The installation manual is included with the product, see also the online product catalog at www.gfps.com

5.3.3 Technical data

General

Type	2282-Y-YY-Y
------	-------------

Environment

Max. temperature	-65 °C bis +100 °C (-85 °F bis +212 °F)
Max. pressure	1 MPa (10 bar)
Medium density	>0.6 g/cm ³

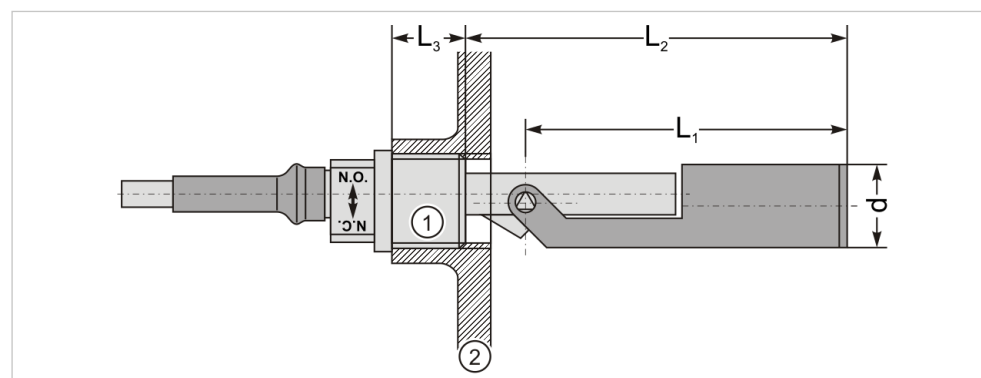
Housing

Housing/float material	PP or PVDF
Cable material	PVC
Protection rating	IP 68
Process connection	½" BSP, NPT

Electronics

Output	Dry reed contact
Contact resistance	Max. 80 mΩ
Max. nominal voltage	230 V AC/DC
Max. nominal current	2 A / 40 VA
Cable type	AWG 20, 2-wire, PVC, 1m
Switching contact	N/O or N/C depending on the installation

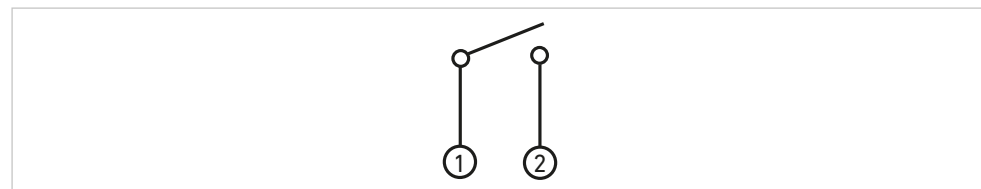
Dimensions



- L1 68 mm
- L2 81 mm
- L3 15 mm
- d Ø 17,5 mm
- ① G ½" oder ½" – 14 NPT
- ② Container wall

5.3.4 Wiring

Connection configuration

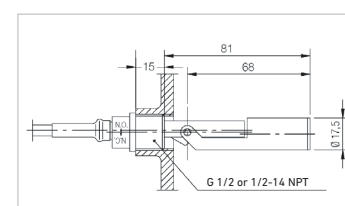


Max.230 V 2A contact rating:

- ① Brown
- ② Black

5.3.5 Order overview

Manufacturer's part no.	Part no.	Description
Versions with BSP thread		
2282-P-60B	159 300 261	PP housing, cable ½" BSP thread
2282-P-60B	159 300 263	PVDF housing, cable, ½" BSP thread
Versions with NPT thread		
2282-P-6CN	159 300 265	PP housing, cable, ½" NPT thread
2282-V-6CN	159 300 267	PVDF housing, cable, ½" NPT thread



5.4 2284 Ultrasonic Gap Switch



5.4.1 Product description

The Ultrasonic Gap Switch consists of polyphenylene sulphide (PPS) and is highly corrosion resistant in most liquids. The gap switch is designed for high or low level alarms in different tank applications as well as pump control. When liquid is located between the forks, the integrated relay switches.

It can be mounted in any position in a tank using a 3/4" or 1" thread available in BSP and NPT thread forms.

Function

In one end of the fork there is an ultrasonic generator, on the other end a receiver. The sensor always attempts to transmit an ultrasonic signal over the fork gap. The ultrasonic waves are received when the gap is closed via the medium. As long as there is air between the generator and the receiver, no transfer will take place.

When the receiver discerns ultrasonic waves, the load relay switches.

The principle makes the 2284 less prone to deposits than other level switches. As long as there is an air gap between the ultrasonic generator and the receiver, the state is recognized accurately.

Since the sensor has no moving parts, it is mechanically particularly rugged and long-lived.

The cable connection is completely encapsulated. The entire sensor can therefore be submerged.

Benefits/features

- Relay output
- Corrosion-resistant PPS housing
- 1"- and 3/4" thread connections
- Small in-tank dimensions
- Compact sensor for narrow spaces
- Self contained full plastic body
- No moving sensor parts
- Insensitive to light deposits

Applications

- Cooling water
- Demineralized water
- Water/glycol solutions
- Chemicals
- Pump control
- Leak detection in dual-wall tanks and piping systems



5.4.2 Technical basics

The sensor changes its switch position when the fork gap is covered by a medium. Ensure prior to assembly that the switch can be positioned such that the fork can be freed of the medium without cleaning becoming necessary.

5.4.3 Handling

Installation notes

Position

Also observe the following points when positioning:

- The liquid can run out from the sensor gap.
- The distance between the sensor gap and container walls (or other installations in the container) should be at least 25 mm, so that no air or liquid bubbles can form.
- Turbulence in the vicinity of inlet/outlet valves or agitators is to be avoided.
- Do not install directly in the flow path of the liquid. If necessary, install baffle plates.

Maintenance notes

When used in media that leave behind no residues, no special maintenance steps are necessary. If deposits do occur, the sensor should be cleaned regularly.



Installation and maintenance must be performed according to the corresponding installation instructions. The installation manual is included with the product, see also the online product catalog at www.gfps.com

Tips for installation

Interior and exterior installation

Since the sensor has a thread on both sides of the hexagonal hub, it can be installed on a tank either from the outside or the inside. Due to its completely encapsulated electronics, the sensor can be submerged entirely, if necessary.

Leak detection

Due to its material composition, the 2284 is also very well suited for use in detecting leaks in double pipes or double-wall tanks. In both cases, one should select as deep of a position as possible, in order to guarantee a quick reaction time in a moment of danger.

5.4.4 Technical data

General

Type	2284-Y-YYY
Repeatability	±2 mm (0.08 in.)

Environment

Process temperature	-20 °C bis + 70 °C (-4 °F bis +158 °F)
Ambient temperature	-20 °C bis + 70 °C (-4 °F bis +158 °F)
Process pressure (absolute)	72.5 psi (5 bar)
Maximum viscosity	5000 cSt 20 °C (68 °F)

Housing

Housing and sensor material	PPS
Cable material	PVC
Protection rating	IP66/IP68 (3m) / NEMA 6P (10 ft.)
Process connection	¾" or 1" BSP/NPT

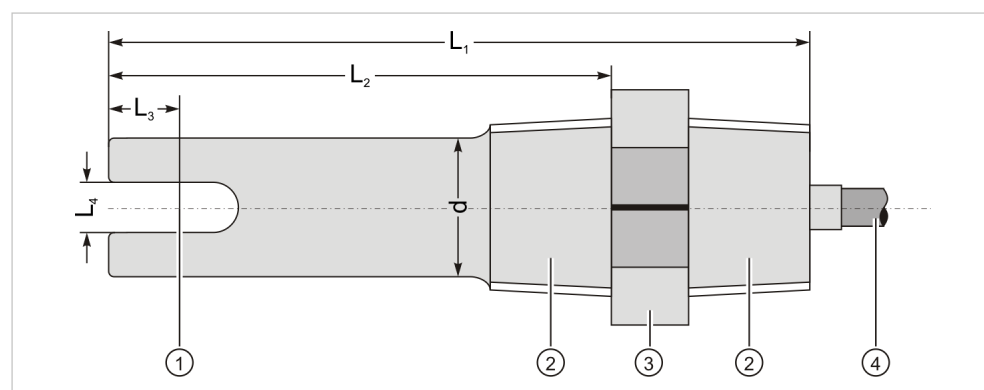
Electronics

Power supply	18 to 30 VDC / AC
Power consumption	≥ 25 mA
Maximum switching voltage	30 VDC / AC
Maximum switching current	1 A at 30 V residual voltage 0.25 A at 30 V inductive voltage
Reaction time	50 ms wet-dry, 0.5 s dry-wet
Cable type	5-adrig 7/0.2mm, 3m
Switching function	SPCO relay NO/NC

Standards/approvals

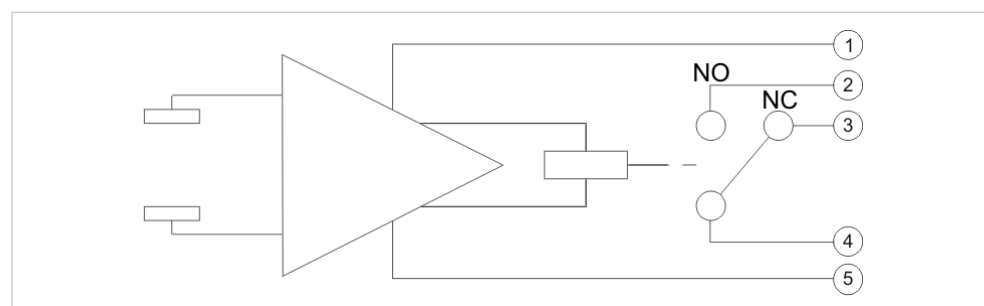
General approvals	CE, RoHS
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Dimensions



- L₁ 110 mm
- L₂ 79 mm
- L₃ 6 mm
- L₄ 7 mm
- d Ø 22 mm
- ① Nominal switch level gauge
- ② Conical pipe thread
- ③ Hexagonal bridge (SW32 – SW36)
- ④ Cable with PVC coating

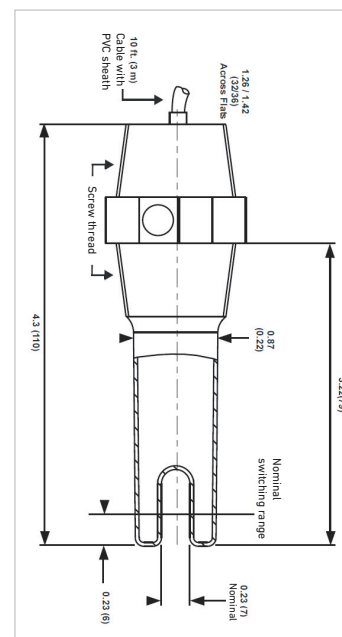
5.4.5 Wiring



- ① Red, +Ve
- ② Yellow, contact NO
- ③ Green, contact NC
- ④ White, ground
- ⑤ Blue, -Ve

5.4.6 Order overview

Manufacturer's part no.	Part no.	Description
Versions with BSP thread		
2284-Q-4BC	159 300 270	PPS housing, 3/4" BSP thread, cable length 3 m
2284-Q-4BC	159 300 274	PPS housing, 1" BSP thread, cable length 3 m
Versions with NPT thread		
2284-Q-4NC	159 300 272	PPS housing, 1" NPT thread, cable length 3 m



5.5 2285 Float Switch



5.5.1 Product description

The Float Switch type 2285 is designed for a variety of media. It can be used in shafts, tanks, basins or cisterns. The double-chambered float body is made of injection moulded tough polypropylene that ensures a high degree of protection to the internal microswitch.

The float switch cable is completely waterproof and PVC insulated. Different control tasks such as liquid level monitoring and pump control can be performed with ease. Its mercury-free contact makes it suitable for use in applications involving potable water, raw water or wastewater with low solid content.

The float switch is actuated by default when the contact reaches an angle of $\pm 45^\circ$. However, this angle can be adjusted by placing a counterweight on the float. When multiple switches are in use, it is important to ensure that the cables do not become tangled.

Function

The float switch's mercury-free microswitch uniquely suits it for use as a limit switch for applications involving potable water and other liquids. The double-walled float housing and cable entry gasket ensure that the float is hermetically sealed. The switching hysteresis can be set by moving the counterweight on the cable.

Benefits/features

- Double-chamber float switch
- Mercury-free microswitch
- Use for drinking and wastewater applications

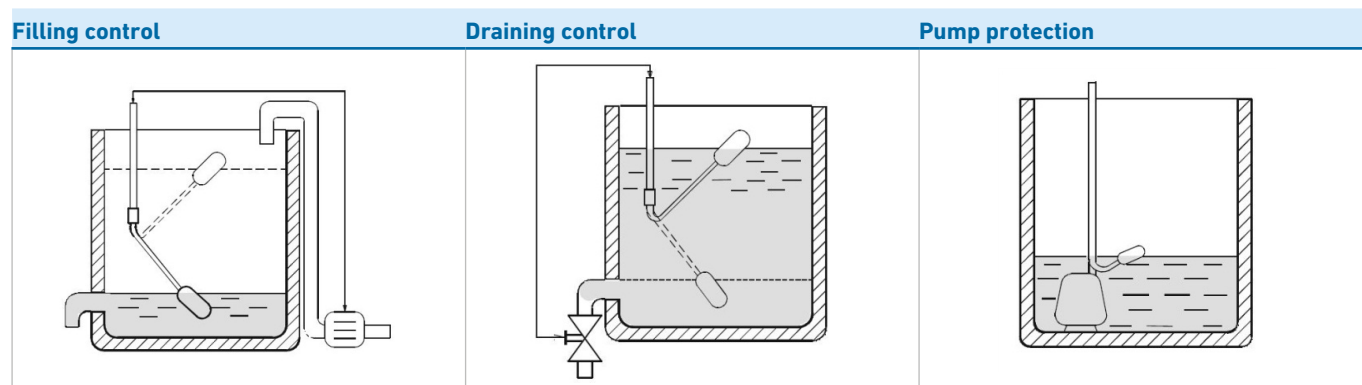
Applications

- Drinking water
- River water
- Sump shafts

CE RoHS

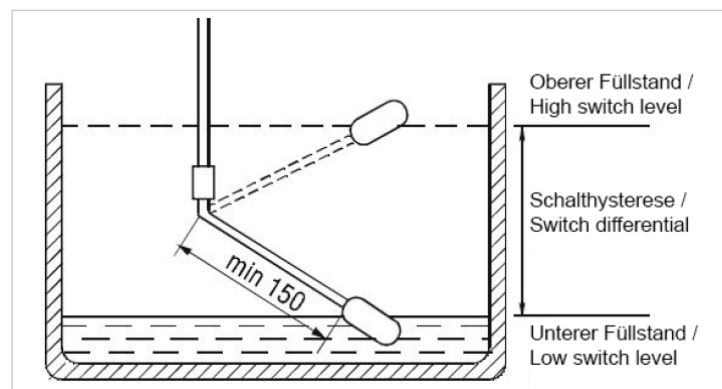
5.5.2 Technical basics

Overview of functions



5.5.3 Handling

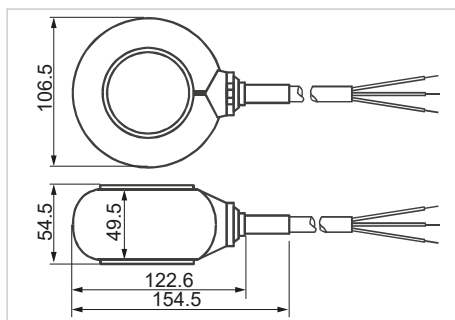
Installation notes



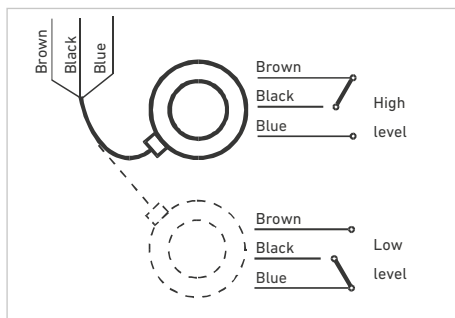
5.5.4 Technical data

General	Float switch	Counterweight
Type	2285-P-6C-Y	
Cable length	5m (16.5 ft), 10m (33 ft), 20m (66 ft)	
Switching angle	± 45°	
Weight	250 g (0.55 lb), without cable	
Environment		
Medium temperature	0 °C bis +50 °C (+32 °F bis +122 °F)	
Medium density	Min. 0.8g/cm ³	
Medium pressure	0.1 Mpa (1 bar g – 14.5 psi g)	
Housing		
Housing material	PP	PP
Cable material	PVC	
Protection rating	IP68	IP68
Electronics		
Microswitch	250V AC, 3A No/Nc	
Cable	9 mm (0.35 inch)/ 3 x 1 mm ² (AWG 17)	
Standards/approvals		
General approvals	CE, RoHS	

Dimensions

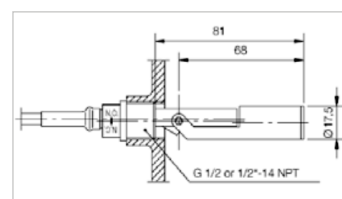


5.5.5 Wiring






5.5.6 Order overview

Manufacturer's part no.	Part no.	Description
2285-P-6C-5	159 300 285	Float, PP, neoprene 5 m, microswitch No/Nc
2285-P-6C-10	159 300 281	Float, PP, neoprene 10 m, microswitch No/Nc
2285-P-6C-20	159 300 282	Float, PP, neoprene 20 m, microswitch No/Nc
2285-P-weight	159 300 289	Counterweight for Float Switch type 2285



6 GF Signet Single and Multi-Parameter Specification Matrix

	9950	9900	8900
			
Description	Multi-Channel (2 channel) Multi-Parameter Controller	Single-Channel 9900: Multi-Parameter Transmitter	Multi-Channel, Multi-Parameter Controller
Modular Components	Yes	Yes	Yes
Number of Flow Totalizers	2 Permanent 2 Resettable	1 Permanent 1 Resettable	6 Permanent 6 Resettable
Max. Sensor Inputs	2 frequency or S ³ L inputs	1	(up to 2 frequency and 4 (S ³ L) or 6 (S ³ L) 6 total sensor inputs
Mounting Options	Panel	Panel, Wall, Pipe, Tank	Panel
Display	LCD, Dot matrix	LCD with digital bar graph	LCD
Analog Output Types	2 Standard Passive, 4 to 20 mA outputs 2 or 4 optional passive, 4 to 20 mA Outputs via Channel Dual Modules 2 Passive 4 to 20 mA	9900: 2 Passive 4 to 20 mA 1 Standard, 1 Optional with 4 to 20 mA Output module HART optional with H COMM module	4 Passive/Active 4 to 20 mA or (4) 0 to 5/10 VDC
Max. Relays / O.C.	4 dry contact relays or 2 mechanical and 2 solid state relays (optional relay module)	1 open collector (standard) 2 relays (optional relay module)	up to 8 relays (via 8059)
Derived Measurements	6 derived measurements sum, delta (difference), ratio, % passage % reject, % recovery	N/A	Sum, Difference, % Recovery, % Reject, % Passage, Ratio, Power (BTU)
Languages	English, French, German, Spanish and Simplified Chinese	English	English, French, German, Spanish, Italian, and Portuguese
Ambient Temperature	DC: -10°C to 70°C (14 to 158 °F) AC: -10°C to 60°C (14 °F to 140 °F) -15 °C to 70°C (5 °F to 158 °F)	-10 °C to 70 °C (14 °F to 158 °F) -15 °C to 70 °C (5 °F to 158 °F)	-10 °C to 55 °C (14 °F to 131 °F) -15 °C to 80 °C (5 °F to 176 °F)
Storage Temperature			
Relative Humidity	0 to 95%, non-condensing	0 to 95%, non-condensing	0 to 95%, non-condensing
Power Requirements	DC – 24 VDC nominal (12 to 32 VDC, ± 10% regulated) AC – 100 to 240 VAC, 50 to 60 Hz, 24V	24 VDC input; range: 10.8 to 35.2 VDC regulated	12 to 24 VDC ±10%, regulated or 100 to 240 VAC ±10%, regulated, 50/60 Hz
Standards and Approvals	CE, UL, CUL, FCC, RoHS compliant, China RoHS , NEMA TYPE 4X/IP65 (front face only on panel mount)	9900: CE, FCC, UL, CUL, RoHS compliant, Lloyd's Register, China RoHS, NEMA TYPE 4X/IP65 (front face only on panel mount); field mount is 100% NEMA TYPE 4X/IP65	CE, FCC, UL, CUL, RoHS compliant, China RoHS NEMA 4X/IP65 (front face only)

Planning Fundamentals of Valves and Automation

Measurement and Control - Water Analysis

Content

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1.1	Technical basics	830
1.2	Installation of the Free Chlorine Analyzer System 4630	834
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2.1	2610 Process Optical Dissolved Oxygen Sensor Gen II	863

1 Chlorine analysis

1.1 Technical basics

General Theory of Operation

The process of disinfecting drinking water to remove water-borne viruses and bacteria is essential to protecting public health. Chlorination of water prior to distribution is important, however other factors must also be taken into consideration to prevent outbreaks of water-borne diseases. Examples include protection of the water source itself, filtration of surface water supplies to remove pathogens and partials (turbidity), the integrity of the distribution piping system and ensuring there is enough Chlorine residual in the water to maintain a safe disinfectant level at the end of the distribution network.

Chlorine is very effective in killing a wide variety of common water-borne viruses such as e-coli, salmonella and leptospira. Chlorine is also very effective in the removal of foul taste and odor from water and reduces bio-slime in tanks, heat exchangers and distribution piping systems.

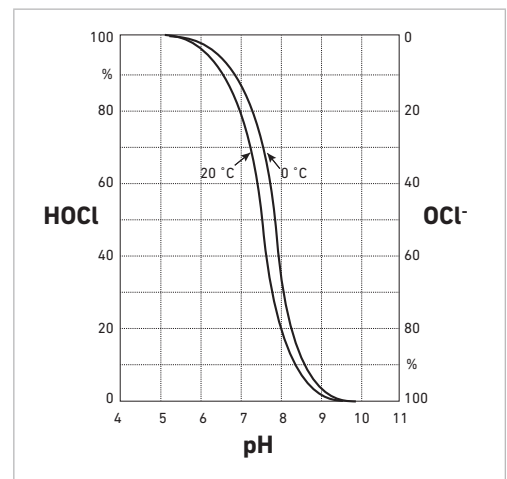
Chlorine is available in three forms that are used in water treatment, Chlorine gas and sodium or calcium hypochlorite.

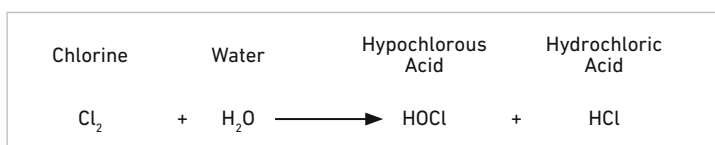
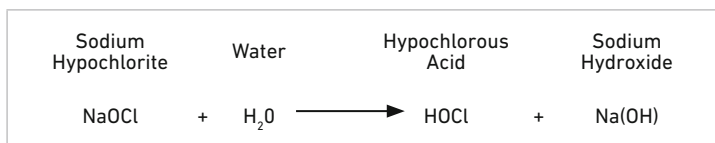
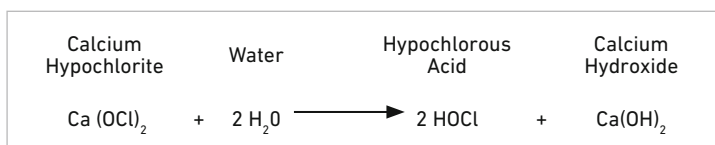
Chlorine gas is the most cost effective method of disinfecting water and is the predominant form of chlorine used in the USA and Asia. The main concerns for the use of Chlorine gas is the need for specialized training and a response program in case of a storage tank rupture or leaks.

Hypochlorite (sodium hypochlorite or calcium hypochlorite) is the second choice of chlorination. Sodium hypochlorite is more expensive to generate on-site, but is favored in remote locations where there is electrical power available. Hypochlorites are usually selected if there is no availability of chlorine gas or if a good safety program can not be put into place.

Chloride dissociates in water to form two chemicals, Hypochlorous acid (HOCl) and hypochlorite ion (OCl⁻). Both are considered "free" chlorine, however, the HOCl provides the strongest disinfectant and oxidizing characteristics. The ratio between these chemicals is pH dependent.

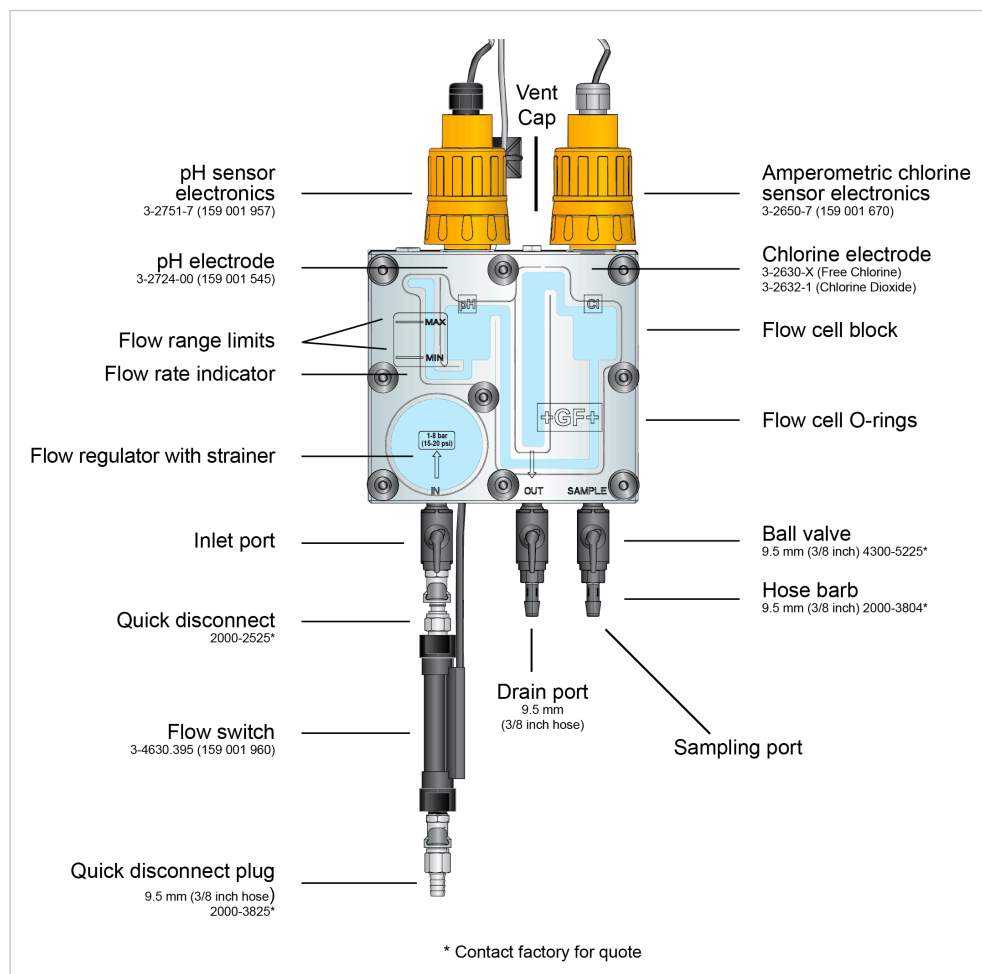
At pH 4 to 5.5, HOCl is Exclusively present. At this pH, the HOCl is very aggressive and causes corrosion. When pH levels exceed 9.0, OCl⁻ is exclusively present. Although OCl⁻ is still considered a disinfectant, the contact time at these pH levels need to be extended to properly disinfect. At pH 7.5, there is an even amount of HOCl and OCl⁻. Processes that maintain a pH level of 7.2 create a strong presence of HOCl, which is a faster disinfectant than the OCl⁻. Free chlorine is measured in parts per million (ppm) or milligrams per liter (mg/l). Chlorine gas and sodium or calcium hypochlorite reactions produce the desired HOCl, however, the end products of the reaction are very different. The reaction of chlorine gas and water produces an end product of hydrochloric acid (HCl) which tends to lower the pH, while the Hypochlorite reaction tends to raise the pH of the water due to the creation of the hydroxyl ions.



Chlorine Gas:**Sodium Hypochlorite:****Calcium Hypochlorite:**

There are six factors that influence the effectiveness of chlorine.

1. pH - Chlorine is most effective between 7.2 and 7.5 when the predominate chemical is HOCl.
2. Temperature - Higher temperatures allows fast reaction.
3. Turbidity - Suspended particals act as a food source and shelter for organisms.
4. Contact time - Must be calculated using the pH level and temperature of the water.
5. Adequate mixing - Mixing of chlorine is very important.
6. Measurement control system - A system that can accurately measure the chlorine levels and control the dosing of chlorine to maintain the proper chlorine levels.



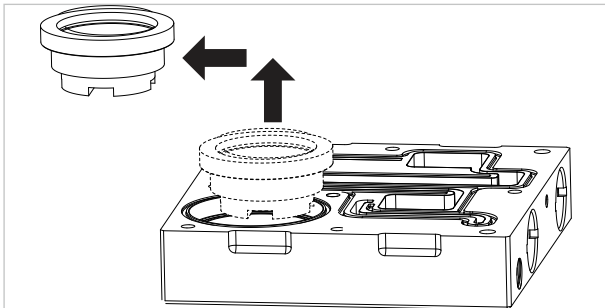
4630 Flow Cell Design

The 4630 Free Chlorine Analyzer System's flow cell is designed with unique features:

1. Built in flow regulator - Allows the system to be installed into any service line with pressures ranging from 15 to 120 psi (1 to 8 bar).
2. Built in VAFM - To provide at a quick glance that the water flow across the sensor membrane is good.
3. Flow cell design and sensor placement – Reduces the build up of bubbles on the sensor.
4. Sensors press fit into the flow cell - For easy removal during service and calibration.
5. Inlet port connector with check valve - The internal check valve allows the technician to interrupt flow by simply removing the connector from the flow cell.
6. Cut off valves - Provided to isolate the drain and influent flow stream
7. A sample port - Provided for DPD test verification

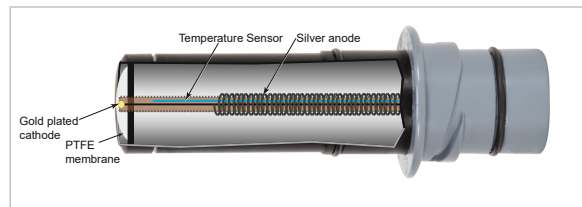
For gravity feed applications or systems that have an influent pressure below 15 psi will need to have the internal flow regulator removed. As long as there is a constant steady flow stream across the sensor and the VAFM indicator is above the "MiN" line accurate chlorine levels can be obtained.

- Open the flow cell by removing the six bolts
- Remove the regulator assembly
- Reinstall flow cell bolts and torque bolts per instructions on the back of the flow cell or in the manual. (see cleaning)



2630 Amperometric Free Chlorine Electrode Theory of Operation

The GF 2630 Amperometric Free Chlorine Electrode is an electrochemical sensor which generates an internal current that is proportional to the concentration of the chlorine in the sample.



The electrochemical sensors' construction includes a hydrophobic membrane that allows the diffusion of hypochlorous acid (HOCl), which causes a reaction with the gold cathode (working electrode) and destroys the HOCl. This electrochemical reaction consumes two electrons.

Cathode (working electrode): $\text{HOCl} + \text{H}^+ + 2\text{e}^- \rightarrow \text{Cl}^- + \text{H}_2\text{O}$ (reduction of hypochlorous acid)

A silver/silver chloride Anode (counter electrode) provides the source of electrons for the cathode reaction and also acts as a reference electrode.

Anode (reference electrode): $2\text{Cl}^- + 2\text{Ag}^0 \rightarrow 2\text{AgCl} + 2\text{e}^-$ (oxidation of the silver)

The two metal electrodes are separated by an electrolyte solution that allows the transfer of ions to pass from cathode to anode, generating a small nA signal; typically 20 to 60 nA per 1 ppm of chlorine. A PT1000 temperature element ensures accurate chlorine measurements over a wide range of temperatures. The 2630 electrode is connected to the 2650 electronics which provides the polarizing voltage between the cathode and anode and provides chlorine information to be displayed on the 9950-3 Chlorine Controller.

2630 Sensor Maintenance

Servicing of the sensor is necessary. Sensor maintenance consists of changing the membrane when it is torn and changing the internal electrolyte solution when the system can not maintain calibration or the chlorine level drifts.

Membrane Change

1. Remove the membrane cap (do not use tools) by holding the sensor in one hand and twist off the membrane cap with the other hand.
2. Inspect the sensor cathode for any defects and verify the 8 openings in the tip of the sensor are clear and unobstructed.

Electrolyte Replacement

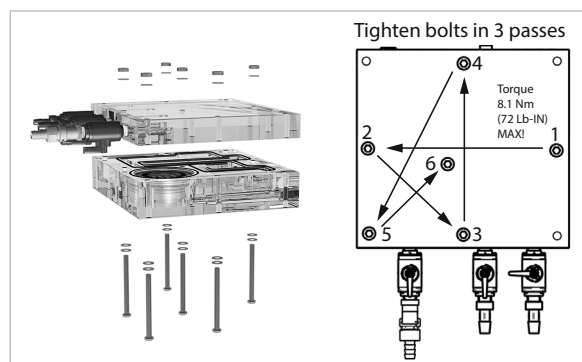
1. Remove the membrane cap (do not use tools) by holding the sensor in one hand and twist off the membrane cap with the other hand
2. Inspect the sensor cathode for any defects and verify the 8 openings in the tip of the sensor are clear and unobstructed.
3. Turn the sensor upside down and shake the internal electrolyte out of the sensor.
4. Using the syringe provided with the sensor inject 14 ml of the new electrolyte into one of the eight holes in the sensor tip until the electrolyte bubbles out.
5. Install new membrane cap slowly.

Easy Cleaning of the Flow Cell

The design of the 4630 flow cell allows for easy cleaning:

1. Remove the electrodes from the flow cell
2. Remove the three knurl nuts and remove the cell from the panel
3. Remove the 6 bolts that hold the two halves of the cell together
4. Remove the O-ring string and inspect and replace if necessary

Do not use an abrasive cleaner or brush that could damage the O-ring groove. Assembly of the flow cell requires the six bolts to be torqued in the proper sequence. The torqued information is provided on the back of the flow cell for easy reference.



Common Terms*

Free available residual chlorine

That portion of the total available residual chlorine composed of dissolved chlorine gas (Cl_2), hypochlorous acid (HOCl), and/or hypochlorite ion (OCl^-) remaining in water after chlorination. This does not include chlorine that has combined with ammonia, nitrogen, or other compounds.

Total residual chlorine

The amount of available chlorine remaining after a given contact time. The sum of the combined available residual chlorine and the free available residual chlorine.

Combined available residual chlorine

The concentration of residual chlorine which is combined with ammonia (NH_3) and/or organic nitrogen in water as a chloramine (or other chloro derivative) yet is still available to oxidize organic matter and utilize its bactericidal properties.

Chlorine demand

Chlorine demand is the difference between the amount of chlorine added to water and the amount of residual chlorine remaining after a given contact time. Chlorine demand may change with dosage, time, temperature, pH, and nature and amount of the impurities in the water.

* Referenced from: <http://water.epa.gov/drink/resources/glossary.cfm>

Breakpoint chlorination

Addition of chlorine to water until the chlorine demand has been satisfied. At this point, further additions of chlorine will result in a free residual chlorine that is directly proportional to the amount of chlorine added beyond the breakpoint.

Hypochlorite (Hi-poe-KLOR-ite)

Chemical compounds containing available chlorine; used for disinfection. They are available as liquids (bleach) or solids (powder, granules and pellets). Salts of hypochlorous acid.

Dechlorination (dee-KLOR-uh-NAY-shun)

The deliberate removal of chlorine from water. The partial or complete reduction of residual chlorine by any chemical or physical process.

Turbidity (ter-BID-it-tee)

The cloudy appearance of water caused by the presence of suspended and colloidal matter. In the waterworks field, a turbidity measurement is used to indicate the clarity of water. Technically, turbidity is an optical property of the water based on the amount of light reflected by suspended particles. Turbidity cannot be directly equated to suspended solids because white particles reflect more light than dark-colored particles and many small particles will reflect more light than an equivalent large particle.

1.2 Installation of the Free Chlorine Analyzer System 4630

Sensor Installation - System Startup

All new chlorine and pH sensors require calibration during the start up of a system and also throughout the life of the sensor. A new chlorine sensor requires a 4 hour conditioning period with power on and water flowing past the sensor prior to calibration. See the 4630 manual for chlorine calibration and set up procedure. If optional pH sensor is not being used, pH must be „hard-coded“ into the system. Refer to 4630 manual for manual pH compensation. If optional pH sensor is installed, refer to 4630 manual to calibrate pH electrode.

1. Remove sensor access plugs from the flow cell. If the optional pH sensor is NOT used, do not remove the left-side plug from the flow cell.
2. Install sensor into the electronics (see 4630 manual). Chlorine sensor is installed in the rightside access port, optional pH sensor is installed in the left-side access port.
3. Remove the protective cap from the electrode tip and install the electrode into the flow cell. (Keep the electrode tip cap in a safe place for future use. It is recommend to use the cap to protect the sensor during the removal of the electrode for cleaning or maintenance of the flow cell.).
4. Repeat step 2 and 3 if the optional pH sensor is being used.
5. Install the influent water source to the "Inlet Port" nipple assembly of the flow cell. Install 3/8 inch tubing and secure with a hose clamp (customer supplied).
6. Install 3/8 inch tubing and secure with a hose clamp on the "Drain" port and direct the tube to a proper drain (customer supplied).
7. Verify the inlet and drain ball valves are in the open position and the sample port is in the off position.
8. Turn on the influent water source and check the system for leaks.
9. Apply power to the system, and allow system to initialize. Calibrate per instructions (See 4630 manual).
10. Calibrate system per instruction manual. For greater accuracy it is recommended that the initial calibration of the system is performed in the following order:
 - Temperature
 - pH electrode (if optional pH sensor is purchased).
 - Chlorine sensor

1.3 4630 Free Chlorine Analyzer System



1.3.1 Product Description

The GF 4630 Free Chlorine Analyzer System is an integrated all-in-one system designed to measure free chlorine. The 3-4630 Free Chlorine Analyzer with pH sensor is used to accurately calculate free chlorine in applications that have varying pH values (± 0.20 pH units).

The advanced 9950-3 Chlorine Controller includes a new feature called the "Chemical Guard" relay control.

Because free chlorine concentration is pH dependent, the Chemical Guard feature interrupts/disables the relay that is assigned to the oxidant chemical (such as sodium hypochlorite) until the pH of the application is corrected. The 4630 series also comes complete with a flow switch that will disable the mechanical relays to the dosing pumps when the system is off or flow is interrupted to the flow cell.

The unique integrated clear flow cell accommodates the free chlorine and pH electrode, flow regulator, filter and variable area flow indicator in one compact unit. An integrated flow regulator with removable filter accepts inlet pressures of 1 to 8 bar (15 to 120 psi), while maintaining constant flow and minimal pressure to the sensors.

Water flows vertically into sensor tip eliminating bubble entrapment. The flow cell is designed to maintain a minimum amount of water to ensure sensors stay submerged, even when the system and flow is turned off.

The 4630 Free Chlorine Analyzer System comes complete with everything needed to support chlorine monitoring for 1 full year of operation. Panel design allows quick and easy installation and comes complete with four 4 to 20 mA outputs, flow switch with relay interrupt, four binary inputs and two mechanical relays. The 9950-3 can also be used with the optional 3-9950.395-M (159 001 905) Modbus Module.

Features

- EPA 334.0 Compliant
- Reagent free measuring
- Chemical Guard prevents over dosing of oxidants chemicals
- Built in flow switch
- Chlorine and pH electrode performance data
- Automatic time stamp after successful calibration
- Customer enabled alarm feature for recalibration
- Complete panel system allows for quick and easy installation
- Built-in flow regulator maintains constant flow and pressure to the sensors regardless of inlet pressure
- Automatic pH compensation

Applications

Residual Chlorine Monitoring:

- Water Distribution
- Ground Water
- Surface Water
- HVAC Applications (cooling water)
- Food and Beverage
- Swimming Pools
- Water Parks

EPA Compliant According to Method 334.0

The 3-4630 Free Chlorine Analyzer System can be used for reporting chlorine residuals in accordance with EPA Method 334.0



The installation must be performed in accordance with the instruction manual.
The instruction manual is included with the product, see also online on www.gfps.com/signet

1.3.2 Technical Details

General

Compatibility	3-2630-1 Free Chlorine Electrode, 0.02 to 2 ppm / 3-2650-7 Amperometric Electronics
	3-2630-2 Free Chlorine Electrode, 0.05 to 5 ppm / 3-2650-7 Amperometric Electronics
	3-2630-3 Free Chlorine Electrode, 0.1 to 20 ppm / 3-2650-7 Amperometric Electronics
	GF 3-2724-00 Flat pH Electrode, 0 to 14 pH/ 3-2751-7 pH Sensor Electronics

Materials

Panel	Black Acrylic
Flow Cell	Acrylic
Wiring Enclosure	Polycarbonate

Wetted Materials

Flow Cell, Spacer Rings	Acrylic
Flow Regulator Housing	Polycarbonate
Strainer, E-clip, Regulator Spring, Float	Stainless Steel
Valves, Vent	Polypropylene
Flow Cell O-rings, Diaphragm	EPDM, FKM
Chlorine Electrode	PVC, PTFE, FKM, Nylon, Silicone
pH electrode	PPS, Glass, UHMW PE, FKM

Wetted Materials

Sealing Tape on Valves, Plug and Vent	PTFE
Plug	Polyethylene

Max. Temperature/Pressure Rating

System Inlet Pressure Rating	1 to 8 bar	15 to 120 psi
Pressure Regulator	< 0.69 bar (10 psi) variation over all ranges of flow and pressure	
Flow Tolerance	± 15% or rated specification above	
Flow Rate Limits	30.24 to 45.36 LPH	8 to 12 US gal/h
Storage Temperature	0 °C to 65 °C	32 °F to 149 °F
Operating Temperature	0 °C to 45 °C	32 °F to 113 °F
pH Range	5.0 to 8.2 pH	

Power Requirements

DC Input (3-9950-3, standard)	24 VDC nominal (12 to 32 VDC, ± 10% regulated), UL 60950-1 or UL 61010-1
3-9950-3 Relay Mode	Current draw up to 500 mA
Current Loop	12 to 32 VDC, ±10% regulated, 4 to 20 mA (30 mA max.)
Overvoltage Protection	Protection 48 Volt Transient Protection Device. Current limiting for circuit protection. Reverse-voltage protection.

Environmental

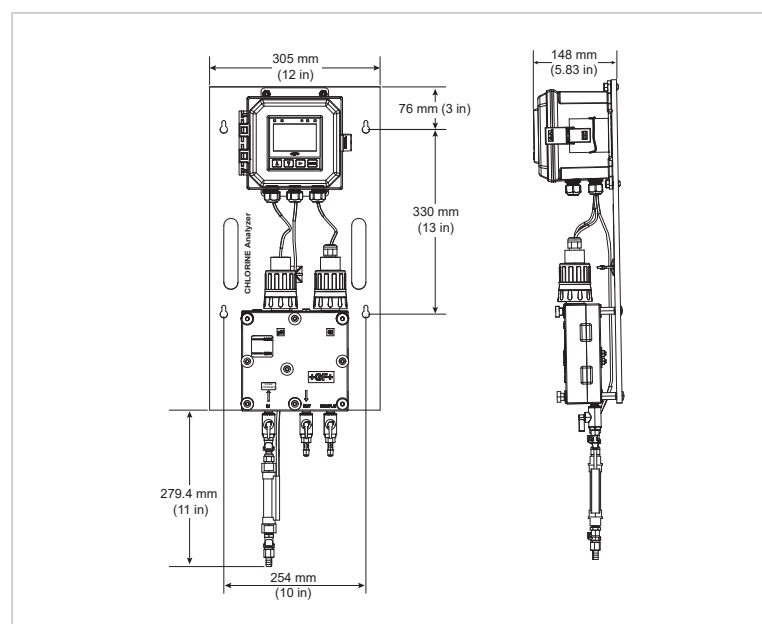
Relative Humidity	0 to 95%
Maximum Altitude	4000 m (13,123 ft)
Enclosure	NEMA 4X (with output wire glands sealed)

Shipping Weight

	10 kg	22 lb
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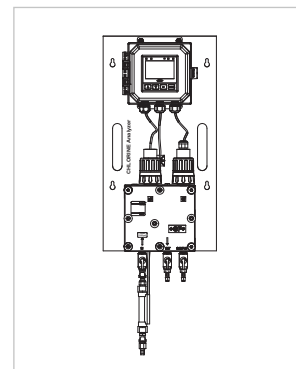
Standards and Approvals

CE, FCC, UL, CUL, WEEE
China RoHS
Manufactured under ISO 9001, ISO 14001, and ISO 45001

Dimensions

1.3.3 Ordering Information

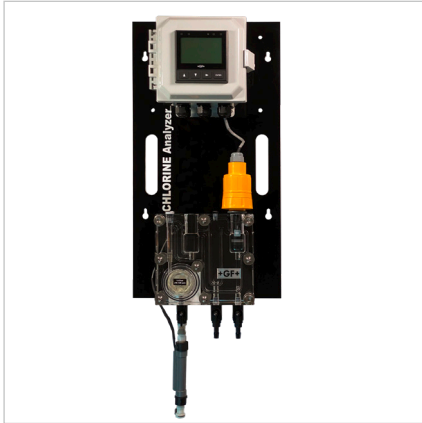
Mfr. Part No.	Code	Description
Chlorine System:		
Chlorine Panel, Free Chlorine Electrode with Sensor Electronics, and pH Electrode with Sensor Electronics		
3-4630-13	159 001 949	Chlorine panel, free chlorine sensor (0.02 to 2 ppm) w/ sensor electronics, pH sensor w/ electronics
3-4630-23	159 001 950	Chlorine panel, free chlorine sensor (0.05 to 5 ppm) w/ sensor electronics, pH sensor w/ electronics
3-4630-33	159 001 951	Chlorine panel, free chlorine sensor (0.01 to 20 ppm) w/ sensor electronics, pH sensor w/ electronics



1.3.4 Accessories and Replacement Parts

Mfr. Part No.	Code	Description
3-9950-3	159 001 954	Chlorine Controller, with 4 to 20 mA output and Relay Module
3-9950-5	159 001 956	Chlorine Monitor, no relays or output modules
3-9950.395-M	159 001 905	Modbus Module
3-2630-1	159 001 746	Free Chlorine sensor, 0 to 2 ppm (mg/l)
3-2630-2	159 001 662	Free Chlorine sensor, 0 to 5 ppm (mg/l)
3-2630-3	159 001 747	Free Chlorine sensor, 0 to 20 ppm (mg/l)
3-2724-00	159 001 545	pH Electrode, Flat Glass, Pt1000 Temp Element, 3/4 in. MNPT
3-2650-7	159 001 670	Chlorine - In-line Amperometric Electronics, Digital (S ³ L), 4.6 m (15 ft) cable
3-2751-7	159 001 957	pH - Inline Electronics, Digital (S ³ L), 4.6 m (15 ft) cable
3-4630.390	159 001 688	Rebuild kit: O-rings, boots, screws, 1 filter screen
3-4630.391	159 001 689	Pressure Regulator with 1 spare filter screen
3-4630.392	159 001 690	Acrylic Flow Cell complete with all components and connections
3-2630.391	159 001 674	Electrolyte kit, 30 ml bottle with syringe and needle
3-2630.394	159 310 164	Free Chlorine Replacement PTFE membrane (1) (sensors sold after Nov 1, 2012)
3-2630.398	159 310 166	Free Chlorine Sensor maintenance kit - (2) electrolyte and (2) PTFE membranes, (2) silicone bands
3-0700.390	198 864 403	pH Buffer Kit: 1 each 4, 7, 10 pH buffer in powder form, makes 50 ml of each
3822-7004	159 001 581	pH 4.01 buffer solution, 1 pint (473 ml) bottle
3822-7007	159 001 582	pH 7.00 buffer solution, 1 pint (473 ml) bottle
3822-7010	159 001 583	pH 10.00 buffer solution, 1 pint (473 ml) bottle
3-2700.395	159 001 605	Calibration kit: 3 polypropylene cups, box used as cup stand, 1 pint pH 4.01, 1 pint pH 7.00
3800-5000	159 838 107	3.0M KCl Storage Solution for pH and ORP, 1 pint (473 ml) bottle
3-2700.397	159 001 870	Protective Cap for pH/ORP electrodes, 5 pieces
3-2700.398	159 001 886	Lubricant Kit
3-4630.393	159 310 162	Flow Switch Kit, PP
7300-0024	159 001 693	VDC Power Supply
1220-0021	159 801 182	O-ring, FKM
3-2759	159 000 762	pH/ORP System Tester (adapter cable sold separately)

1.4 4632 Chlorine Dioxide Analyzer System



1.4.1 Product Description

The GF 4632 Chlorine Dioxide Analyzer System is an integrated all-in-one system designed to measure Chlorine Dioxide residual up to 2 ppm/mg/L.

The unique integrated clear flow cell accommodates the Chlorine Dioxide and optional pH electrode, flow regulator, filter and variable area flow indicator in one compact unit. An integrated flow regulator with removable filter accepts inlet pressures of 1 to 8 bar (15 to 120 psi), while maintaining constant flow and minimal pressure to the sensors. Water flows vertically into sensor tip eliminating bubble entrapment. The flow cell is designed to maintain a minimum amount of water to ensure sensors stay submerged, even when the system and flow is turned off. The 4632 Chlorine Dioxide Analyzer System comes complete with everything needed to support chlorine monitoring for 1 full year of operation. Panel design allows quick and easy installation and comes complete with four 4 to 20 mA outputs, flow switch with relay interrupt, four binary inputs and two mechanical relays. The 9950-3 can also be used with the optional 3-9950.395-M (159 001 905) Modbus Module.

Features

- Reagent free measuring
- Chemical Guard, prevents over dosing of oxidants chemicals
- Built-in flow switch
- Chlorine Dioxide and pH electrode performance data (optional pH)
- Automatic time stamp after successful calibration
- Customer enabled alarm feature for re-calibrate
- Complete panel system allows for quick and easy installation
- Built-in flow regulator maintains constant flow and pressure to the sensors regardless of inlet pressure

Applications

Residual Chlorine Monitoring:

- Cooling Towers
- Fruit and Vegetable Washing
- Water Distribution
- Wastewater Odor Control
- Poultry and Meat Processing
- UPW Treatment
- Hospital and Healthcare Facilities





The installation must be performed in accordance with the instruction manual.
The instruction manual is included with the product, see also online on www.gfps.com/signet

1.4.2 Technical Details

General

Compatible	3-2632-1 Chlorine Dioxide Electrode, 0 to 2 ppm / 3-2650-7 Amperometric Electronics
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Materials

Panel	Black Acrylic
Flow Cell	Acrylic
Wiring Enclosure	Polycarbonate

Wetted Materials

Flow Cell, Spacer Rings	Acrylic
Flow Regulator Housing	Polycarbonate
Strainer, E-clip, Regulator Spring, Float	Stainless Steel
Valves, Vent	Polypropylene
Flow Cell O-rings, Diaphragm	EPR (EPDM), FKM
Chlorine Electrode	PVC, PTFE, FKM, Nylon, Silicone
pH electrode	PPS, Glass, UHMWPE, FKM
Flow Switch	Polypropylene
Sealing Tape on Valves, Plug and Vent	PTFE
Plug	Polyethylene

Max. Temperature/Pressure Rating

System Inlet Pressure Rating	1 to 8 bar	15 to 120 psi
Pressure Regulator	< 0.69 bar (10 psi) variation over all ranges of flow and pressure	
Flow Tolerance	± 15% or rated specification above	
Flow Rate Limits	30.24 to 45.36 LPH	8 to 12 US gal/h
Storage Temperature	0 °C to 65 °C	32 °F to 149 °F
Operating Temperature	0 °C to 45 °C	32 °F to 113 °F

Electrical

DC Input - Optional Configuration	24 VDC nominal (12 to 32 VDC ±10% regulated)
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Environmental

Relative Humidity	0 to 95%
Maximum Altitude	4000 m (13,123 ft)
Enclosure	NEMA 4X (with output wire glands sealed)

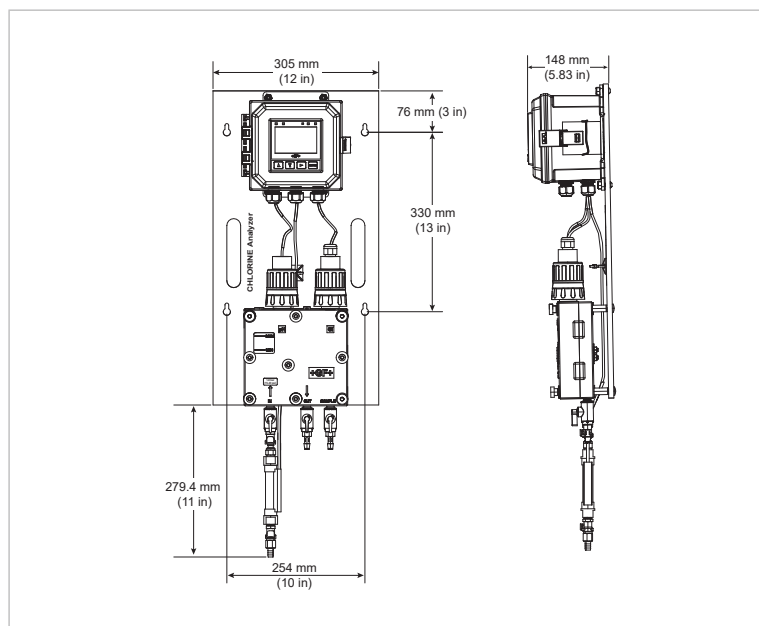
Shipping Weight

	10 kg	22 lb
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Standards and Approvals

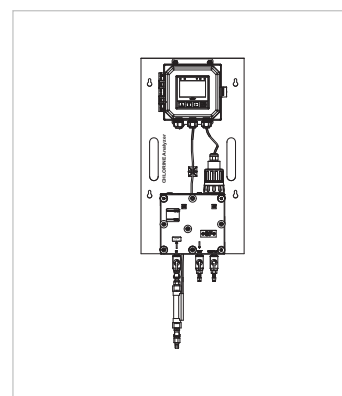
CE, UL, CUL, FCC, WEEE
China RoHS
Manufactured under ISO 9001, ISO 14001, and ISO 45001

Dimensions



1.4.3 Ordering Information

Mfr. Part No.	Code	Description
3-4632-12	159 001 952	Chlorine Dioxide Panel, 0.02 to 2 ppm/mg/l, no pH sensor
3-4632-13	159 001 958	Chlorine Dioxide Panel, 0.02 to 2 ppm/mg/l, with pH sensor



1.4.4 Accessories and Replacement Parts

Mfr. Part No.	Code	Description
3-9950-3	159 001 954	Chlorine Controller, with 4 to 20 mA output and Relay Module
3-9950-5	159 001 956	Chlorine Monitor, no relays or output modules
3-2632-1	159 001 767	Chlorine Dioxide Electrode, 0 to 2 ppm (mg/L)
3-2650-7	159 001 670	Chlorine – In-line Amperometric Electronics, Digital (S ³ L), 4.6 m (15 ft) cable
3-2724-00	159 001 545	pH Sensor, Flat Glass , Pt1000 Temp Element, 3/4" MNPT
3-2751-7	159 001 957	pH – In-line Electronics, Digital (S ³ L) , 4.6 m (15 ft) cable
3-4630.390	159 001 688	Rebuild Kit: O-rings, boots, screws, 1 filter screen
3-4630.391	159 001 689	Pressure Regulator with 1 spare filter screen
3-4630.392	159 001 690	Acrylic Flow Cell complete with all components and connections
3-2632.391	159 310 160	Chlorine Dioxide Electrolyte, 30 mL (2) bottles
3-2632.398	159 310 165	Chlorine Dioxide Maintenance Kit - (2) electrolyte, (2) PTFE membranes, (2) silicone bands, and polishing paper
3-2630.394	159 310 164	Free Chlorine and Chlorine Dioxide Replacement PTFE membrane (1)

1.5 2630 Amperometric Free Chlorine Electrode



1.5.1 Product Description

The GF 2630 Amperometric Chlorine electrode is designed to measure free chlorine in fresh water treatment applications. The electrode is available with a measurement range of 0.02 to 2 ppm, 0.05 to 5 ppm or 0.1 to 20 ppm. This electrode requires the 2650 Amperometric Electronics to output a digital (S3L) signal to the 9950-3 Chlorine Controller.

Utilizing smart-sensor technology, this electrode has a unique embedded memory chip and can communicate a wide variety of information to the 9950-3 Chlorine Controller. The 9950-3 can display the electrodes stored information which includes the serial number, electrode type, service time in hours, chlorine range, high and low temperatures, and the maximum and minimum pH detected over time.

The patented DryLoc® connector with its Gold plated contacts and O-ring seal ensure a waterproof and reliable interconnect to the 2650 electronics and allows quick assembly during system start up, while providing a easy way to service or replace the Amperometric electrode.

NOTE: This electrode is required to be in chlorinated water at ALL times.

Features

- Embedded memory chip accessible via the 9950-3 Chlorine Controller
- Quick assembly with GF 's patented DryLoc® connector
- Integrated temperature element for automatic temperature compensation
- Separate drive electronics (2650 Electronics), for easy servicing and electrode replacement



Applications

Residual Chlorine Monitoring:

- Water Distribution
- Ground Water
- Surface Water
- HVAC Applications (cooling water)
- Food and Beverage
- Swimming Pools
- Water Parks

U.S. Patent No.: 6,666,701



The installation must be performed in accordance with the instruction manual. The instruction manual is included with the product, see also online on www.gfps.com/signet

1.5.2 Technical Details

General

Polarization Source	2650 Amperometric Electronics
Compatibility	3-3610-1(159 001 683)
	3-3610-2 (159 001 684)
	3-4630.392 (159 001 690)
Mounting	DryLoc connection
Materials	CPVC
Free Chlorine	
Membrane Material	PTFE
O-ring Material	FKM
Working Electrode	Gold
Counter Reference Electrode	Silver halide

Wetted Material

PVC, PTFE, FKM, Nylon, Silicone

Performance

Electrode

Repeatability	±0.08 ppm (mg/l) or 3% of selected range whichever is less
Slope	15 to 60 nA/ppm (mg/l) @ 25 °C
Response Time, T90	< 2 minutes

System (including electronics and instrument)

Accuracy	< ±3% of electrode signal after calibration
Resolution	±0.5% of electrode range

Sensor Conditioning

New, first start-up	4 hours maximum before calibration
Subsequent start-ups	2 hours maximum
Temperature Element	Pt1000

Operational Ranges and Limits

Free Chlorine Range	0.02 to 2 ppm (mg/l)	0.05 to 5 ppm (mg/l)	0.1 to 20 ppm (mg/l)
Free Chlorine pH Operating	5.5 to 8.2 pH		
Operational Temperature	5 °C to 45 °C	41 °F to 113 °F	

Maximum Operating Pressure

Membrane	0.48 bar @ 25 °C (7 psi @ 77 °F)
Flow Velocity Across Membrane Surface	
Minimum	15 cm/s (0.49 ft/s)
Maximum	30 cm/s (0.98 ft/s)
Interferences	ClO ₂ , ozone, bromine
Chemical Compatibility	< 50% ethanol/water, < 50% glycerol/water

Environmental

System Temperature	-10 °C to 60 °C	-4 °F to 140 °F
Storage Temperature	-10 °C to 60 °C	-4 °F to 140 °F
Relative Humidity	0 to 95% indoor/outdoor non-condensing to rated ambient	

Shipping Weight

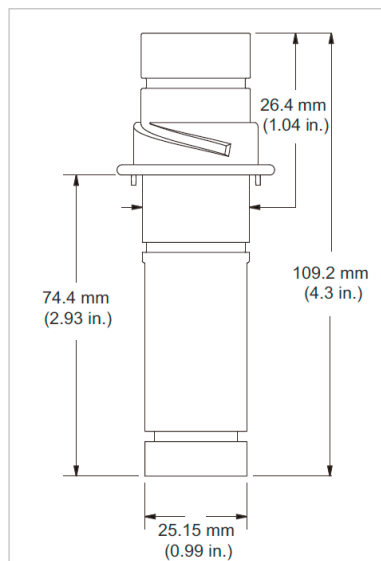
	0.14 kg	0.30 lb
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Standards and Approvals

CE, FCC
RoHS compliant, China RoHS
Manufactured under ISO 9001 for Quality

Dimensions

3-2630-X



1.5.3 System Overview

Panel Mount

GF Instrument 9950-3
Chlorine Controller



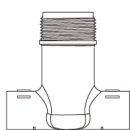
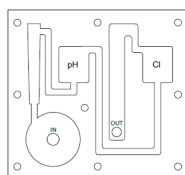
GF Amperometric
Electronics
2650-7



GF 2630-X
Chlorine Electrode



GF Flow Cell
GF Fitting
3610



All sold separately

Application Tips

Amperometric sensors require the water to be chlorinated at ALL times.

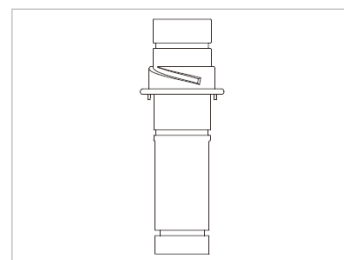
The sensors should not be used in water containing surfactants, oils, organic chlorine or stabilizers such as cyanuric acid.

1.5.4 Ordering Information

Ordering Notes

The sensor must have a stable and constant flow of water past its membrane for accurate free chlorine measurement. Typical flow rate should be 30.24 - 45.36 lph (8 - 12 gph).

Mfr. Part	Code	Description
3-2630-1	159 001 746	Free Chlorine electrode, 0.02 to 2 ppm (mg/l)
3-2630-2	159 001 662	Free Chlorine electrode, 0.05 to 5 ppm (mg/l)
3-2630-3	159 001 747	Free Chlorine electrode, 0.1 to 20 ppm (mg/l)



1.5.5 Accessories

Mfr. Part	Code	Description
3-2630.398	159 310 166	Free Chlorine Sensor Maintenance Kit - (2) electrolyte and (2) PTFE membranes, (2) silicone bands, polishing papers
3-2630.391	159 001 674	Free Chlorine Electrolyte Kit, 30 ml (2) bottles with syringe and needle
3-2630.394	159 310 164	Free Chlorine and Chlorine Dioxide replacement PTFE membrane (1)
3-2600.510	159 500 422	Silicone Band, Chlorine Sensor
3-3610-1	159 001 683	Flow Cell, Clear PVC 1/2" Tee
3-3610-2	159 001 684	Flow Cell, Clear PVC 1/2" Tee, Barb Conn

1.6 2632 Amperometric Chlorine Dioxide Electrode



1.6.1 Product description

The 2632 Amperometric Chlorine Dioxide electrode is designed to measure chlorine dioxide residual in water treatment applications. The electrode is available with a measurement range of 0.02 to 2 ppm. This electrode requires the 2650 Amperometric Electronics to output a digital (S3L) signal to the 9950-3 Chlorine Controller.

Utilizing smart-sensor technology, this electrode has a unique embedded memory chip and can communicate a wide variety of information to the 9950-3 Chlorine Controller. The 9950-3 can display the electrodes stored information which includes the serial number, electrode type, service time in hours, chlorine range, high and low temperatures.

The patented DryLoc® connector with its Gold plated contacts and O-ring seal ensure a waterproof and reliable interconnect to the 2650 electronics and allows quick assembly during system start up, while providing a easy way to service or replace the Amperometric electrode.

NOTE: This electrode is required to be in chlorinated water at ALL times.

Features

- Embedded memory chip accessible via the GF 9950-3 Chlorine Controller
- Quick assembly with the patented DryLoc® connector
- Integrated temperature element for automatic temperature compensation
- Separate drive electronics (2650 Electronics), for easy servicing and electrode replacement



Applications

Residual Chlorine Monitoring:

- Water Distribution
- Ground Water
- Surface Water
- HVAC Applications (cooling water)
- Food and Beverage

U.S. Patent No.: 6,666,701



The installation must be performed in accordance with the instruction manual. The instruction manual is included with the product, see also online on www.gfps.com/signet

1.6.2 Technical Data

General

Polarization Source	2650 Amperometric Electronics
Compatibility	3-4630.392 (159 001 690) 3-3610-1 (159 001 683) 3-3610-2 (159 001 684)
Mounting	DryLoc® connection
Materials	CPVC

Chlorine Dioxide

Membrane Material	PTFE
O-ring Material	FKM
Working Electrode	Gold
Counter Reference Electrode	Silver halide

Wetted Material

	PVC, PTFE, FKM, Nylon, Silicone
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Performance

Electrode

Repeatability	±0.08 ppm (mg/l) or 3% of selected range, whichever is less
Slope	40 to 200 nA/ppm (mg/l) @ 17 °C
Response Time, T90	< 2 minutes

System (including electronics and instrument)

Accuracy	< ±3% of electrode signal after calibration
Resolution	±0.5% of electrode range

Sensor Conditioning

New, first start-up	4 hours maximum before calibration
Subsequent start-ups	2 hours maximum
Temperature Element	Pt1000

Operational Ranges and Limits

Free Chlorine Range	0.02 to 2 ppm (mg/l)
Free Chlorine pH Operating	4.0 to 11.0 pH
Maximum Media Temperature	5 °C to 45 °C 41 °F to 113 °F

Maximum Operating Pressure

Membrane	0.48 bar @ 25 °C (7 psi @ 77 °F)
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Flow Velocity Across Membrane Surface

Minimum	15 cm/s (0.49 ft/s)
Maximum	30 cm/s (0.98 ft/s)
Sensitivity	Free Chlorine, ozone
Chemical Compatibility	< 50% ethanol/water, < 50% glycerol/water

Environmental

System Temperature	-10 °C to 60 °C 14 °F to 140 °F
Storage Temperature	-10 °C to 60 °C 14 °F to 140 °F
Relative Humidity	0 to 95% indoor/outdoor non-condensing to rated ambient

Shipping Weight

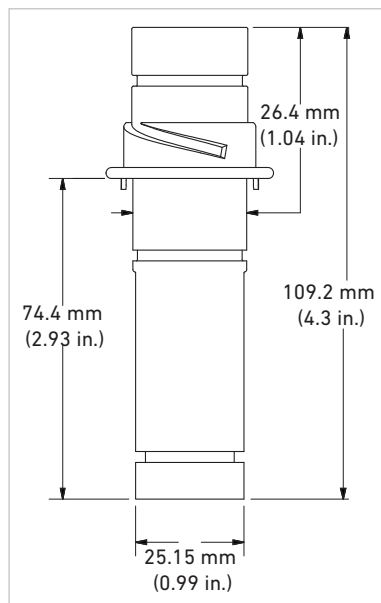
	0.14 kg	0.30 lb
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Standards and Approvals

CE, FCC
RoHS compliant, China RoHS
Manufactured under ISO 9001 for Quality

Dimensions

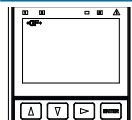
3-2632-1



1.6.3 System Overview

Panel Mount

GF Instrument
9950-3 Chlorine Controller



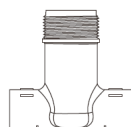
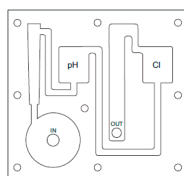
GF Amperometric
Electronics
2650-7



GF 2632-1
Chlorine Dioxide
Electrode



GF Flow Cell
GF Fitting
3610



All sold separately

Application Tips

Amperometric sensors require the water to be chlorinated at ALL times.

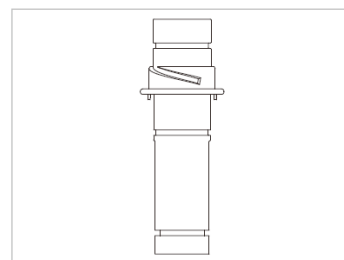
The sensors should not be used in water containing surfactants, oils, organic chlorine or stabilizers such as cyanuric acid.

1.6.4 Ordering Information

Ordering Notes

The sensor must have a stable and constant flow of water past its membrane for accurate free chlorine measurement. Typical flow rate should be 30.24 - 45.36 lph (8 - 12 gph).

Mfr. Part	Code	Description
3-2632-1	159 001 767	Chlorine Dioxide Electrode, 0 to 2 ppm (mg/l)



1.6.5 Accessories

Mfr. Part	Code	Description
3-2632.398	159 310 165	Chlorine Dioxide Sensor Maintenance Kit - (2) electrolyte and (2) PTFE membranes, (2) silicone bands, polishing papers
3-2632.391	159 310 160	Chlorine Dioxide Electrolyte Solution, 30 ml (2) bottles with syringe and needle
3-2630.394	159 310 164	Free Chlorine and Chlorine Dioxide replacement PTFE membrane (1)
3-2600.510	159 500 422	Silicone Band, Chlorine Electrode
3-3610-1	159 001 683	Flow Cell, Clear PVC 1/2" Tee
3-3610-2	159 001 684	Flow Cell, Clear PVC 1/2" Tee, Barb Conn

1.7 2650 DryLoc® Amperometric Electronics



1.7.1 Product description

The GF 2650 Amperometric Electronics provide the polarization voltage and signal conditioning required by all GF Amperometric Sensors. The 2650 Amperometric Electronics also relays important sensor information that is stored on a memory chip inside the sensor to be displayed on the 3-9950-3 Chlorine Controller. Information includes factory calibration data, service life, calibration information and more.

The patented DryLoc® connector provides a quick and secure connection to the sensor. Gold-plated contacts and an O-ring seal ensure a waterproof and reliable interconnect to the sensor.

Sensor maintenance, replacement and troubleshooting has never been easier. The DryLoc® electronics can be separated from the sensor, which allows the user to detect a faulty sensor, electronics or cable assembly.

Features

- Provides polarization voltage and conditions the signal from the 2630 and 2632 electrodes
- Provides access to the Amperometric electrode's stored data for display on the 9950-3 Chlorine Controller
- Patented DryLoc® connector provides a quick and secure connection to the sensor
- Waterproof and reliable interconnect to the sensor
- Easy sensor replacement without running new cable
- Easy sensor removal for servicing

Applications

Residual Chlorine Monitoring:

- Water Distribution
- Ground Water
- Surface Water
- HVAC Applications (cooling water)
- Food and Beverage
- Aquariums
- Water Park

U.S. Patent No.: 6,666,701



The installation must be performed in accordance with the instruction manual. The instruction manual is included with the product, see also online on www.gfps.com/signet

1.7.2 Technical Details

General

Compatibility	All GF Amperometric DryLoc Sensors 9950-3 Chlorine Controller All 4630 Chlorine panel assemblies
Mounting	DryLoc connection
Materials	PC+PBT
Cable	4.6 m (15 ft) 3 conductor shielded, 22 AWG

Performance

Electronics Accuracy	< 5 nA or 1% of reading, whichever is greater @ 25 °C over full input range
Temperature	±1.0 °C (Pt1000) over full operation range (when calibrated at ambient temperature)
Update Rate	500 ms
Operational Range	±450 nA
Resolution	0.1 nA

Electrical

Input Specifications

Sensor	Raw Signal
Temperature	Pt1000 RTD

Output Specifications

Digital (S ³ L)	Serial ASCII, TTL level 9600 bps
Max. Cable Length	30 m (100 ft)
Power Supply Input	Digital (S ³ L) mode 5 to 6.5 V ± 10%, 3 mA max.

Environmental

Operating Temperature	0 °C to 85 °C 32 °F to 185 °F
Storage Temperature	-20 °C to 85 °C -4°F to 185 °F
Relative Humidity	0 to 95%, non-condensing (no electrode connected)
Enclosure	NEMA 4X/IP65 with electrode connected

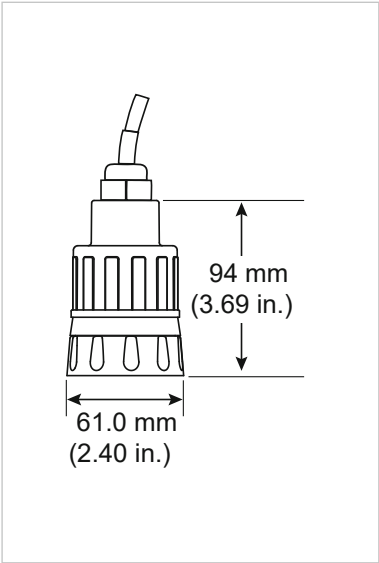
Shipping Weight

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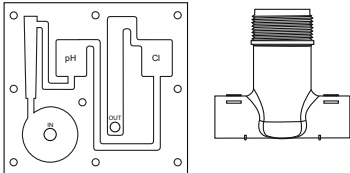
Standards and Approvals

CE, FCC
RoHS compliant, China RoHS
Manufactured under ISO 9001, ISO 14001 and ISO 45001

Dimensions



1.7.3 System Overview

Panel Mount		
GF Model 9950-3 Chlorine Controller		
GF Amperometric Electronics 2650-7		
GF Electrode 2630-1 2630-2 2630-3 2632-1		
GF Flow Cell GF Fitting 3610		All sold separately

1.7.4 Ordering information

Mfr. Part	No. Code	Description
3-2650-7	159 001 670	Amperometric in-line sensor electronics, Digital (S ³ L), 4.6 m (15 ft) cable

1.8 2751-7 pH Electronics



1.8.1 Product description

When used with the GF 9950-3 Chlorine Controller, the GF 2751-7 pH/ORP Smart Sensor Electronics featuring the DryLoc® connector is the solution for field-free calibration, broken glass and high impedance detection, alerting the operator to probe failure or maintenance needs.

The pH/ORP Smart Sensor Electronics will allow for calibration of electrodes in a laboratory setting and installation of pre-calibrated probes in the field, reducing system downtime. The data stream also includes important information regarding the performance and life span of the pH electrode. The 9950-3 Chlorine Controller provides the operator with a calculated slope of the electrode (electrode health) and can detect when the electrode requires cleaning. Sensor maintenance, replacement and troubleshooting has never been easier. The DryLoc® electronics can be separated from the sensor, which allows the user to detect a faulty sensor, electronics or cable assembly.

Features

- Amplifies the output from the pH electrode and converts it to a reliable (S³L) signal
- Patented DryLoc connector provides a quick and secure connection to the sensor
- Waterproof and reliable interconnect to the sensor
- Easy sensor replacement without running new cable
- Easy sensor removal for servicing

Applications

- Water Distribution
- Ground Water
- Surface Water
- HVAC Application (cooling water)
- Food and Beverage
- Swimming Pools
- Water Parks



The installation must be performed in accordance with the instruction manual. The instruction manual is included with the product, see also online on www.gfps.com/signet



1.8.2 Technical Details

General

Compatibility	DryLoc pH and ORP Electrodes, 2724 and 2725
Mounting	DryLoc connection
Materials	PC+PBT
Cable	4.6 m (15 ft) 3 conductor shielded, 22 AWG

Performance

Electronics Accuracy	±0.02 pH @ 25 °C
Operational Range	-1.0 to 15.0 pH
Response Time	< 6 s for 95% of change (includes electrode response)

Electrical

Input Specifications

Input Impedance	> 10 ¹¹ Ω
Temperature Drift	±0.002 pH per °C
Input Resolution	0.02 pH, 0.3 °C

Output Specifications

Digital (S ³ L)	Serial ASCII, TTL level 9600 bps
Max. Cable Length	30 m (100 ft)

Environmental

Operating Temperature	0 °C to 85 °C	32 °F to 185 °F
Storage Temperature	-20 °C to 85 °C	-4 °F to 185 °F
Relative Humidity	0 to 95%, non-condensing	
Enclosure	NEMA 4XI/IP65 with electrode connected	

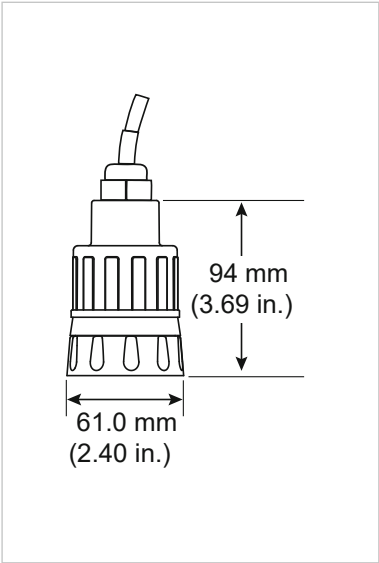
Shipping Weight

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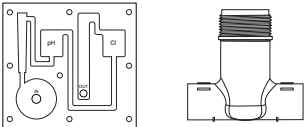
Standards and Approvals

CE, FCC
RoHS compliant, China RoHS
Manufactured under ISO 9001, ISO 14001 and ISO 45001

Dimensions



1.8.3 System Overview

Panel Mount		
GF Instrument 9950-3		
GF 2750-7 pH Electronics		
GF Electrodes 2724-2726		
All sold separately		
GF Flow Cell GF Fitting 3610		
	All sold separately	

1.8.4 Ordering information

Mfr. Part No.	Code	Description
3-2751-7	159 001 957	pH Electronics

1.9 9950-3 Chlorine Controller

Member of the SmartPro® Family of Instruments



1.9.1 Product description

The 9950-3 Chlorine Controller is a two channel controller that can support two sensors in one instrument. The sensor types supported by the 9950-3 are GF Free Chlorine (FCl), Chlorine Dioxide (ClO₂) and pH.

The 9950-3 (which is used in the GF Chlorine panels) software, combined with smart electronics connected to the Chlorine sensor (FCl, ClO₂) and the pH electrode, delivers a real-time, accurate Chlorine measurement of the application process.

Includes improved calibration support by automatically timestamping the successful single-point calibration of the Chlorine electrode and supports a two-point calibration of the pH electrode. An operator can enter the next calibration date and the 9950-3 will display a message and illuminate the red background light to alert the operator when a calibration is due.

The new "Chemical Guard" relay mode for free chlorine ensures that the proper dosing of oxidants and pH-adjusting chemicals is delivered safely and accurately. When Chemical Guard mode is selected, the pH control and adjustment is always a priority over dosing oxidizing chemicals whose concentration is pH dependent.

The 9950-3 comes standard with the 3-9950.393-3 Relay Module, comprising four binary inputs and two mechanical relays. Binary input #1 is dedicated to an external flow switch input which enables access to the new relay mode "Chemical Guard" that disables the relays when there is no flow through the system. The 9950-3 also supports the -1 and -2 relay modules without flow switch or Chemical Guard.

The 3-9950-3 also comes standard with four, 4 to 20 mA outputs. The optional 3-9950.395-M Modbus module makes adding the GF Chlorine Controller / panel assembly into a new or existing communication network very simple.

Features

- One instrument for multiple disinfectant sensor types: Free Chlorine, Chlorine dioxide, pH
- Multiple language support for Simplified Chinese, English, French, German, Italian and Spanish
- Two different sensor types can be combined in one instrument
- Chemical Guard (for free chlorine): software that controls relay actions to safely deliver oxidizing and pH adjustment chemicals
- Flow switch interrupt to disable alarms and chemical dosing when there is no flow to the system
- Four standard, 4 to 20 mA current loop outputs (2 in base unit, 2 in additional module)
- USB Port for Field Firmware Upgrades using standard USB Flash Drive
- Modbus Module for connections to Serial RS485 Automation networks



Applications

Residual Chlorine Monitoring:

- Water Distribution
- Ground Water
- Surface Water
- HVAC Applications (cooling water)
- Food and Beverage
- Swimming Pools
- Water Parks

EPA 334.0 Compliant



The installation must be performed in accordance with the instruction manual.
The instruction manual is included with the product, see also online on www.gfps.com/signet

1.9.2 Technical Details

General

Input Channels	Two Channels
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Enclosure and Display

Case Material	PBT
Window	Shatter-resistant glass
Keypad	4 buttons, injection-molded silicone rubber seal
Display	Dot matrix, LCD
Indicators	Two horizontal digital bar graphs, four LED relay status indicators
Update Rate	1 s
LCD Contrast	5 settings
Enclosure Size	¼ DIN

Mounting

Panel	¼ DIN, ribbed on four sides for panel mounting clip inside panel, silicon gasket included
Wall	Wall Mount enclosure (sold as an accessory)

Terminal Blocks

Pluggable Screw Type	Use minimum 105 °C rated wire	
Torque Ratings	Power/Loop	0.49 Nm (4.4 lb-in.)
	Freq/S ³ L	0.49 Nm (4.4 lb-in.)
	Relay Module	0.49 Nm (4.4 lb-in.)
Connector Wire Gauge	Power, Loop	12 to 28 AWG
	Freq/S ³ L	16 to 28 AWG
Module Connector Wire Gauge	Relay	12 to 28 AWG

Environmental

Ambient Operating Temperature		
DC Power	-10 °C to 70 °C	14 °F to 158 °F
Storage Temperature	-15 °C to 70 °C	5 °F to 158 °F
Relative Humidity	0 to 100% condensing for (front only); 0 to 95% non-condensing (rear panel)	
Max. Altitude	4,000 m (13,123 ft)	
Enclosure Rating	NEMA 4X/IP65 (front face only)	

Performance Specifications

System Accuracy	Primarily dependant upon the electrode	
System Response	Primarily dependent upon the electrode. Controller adds a maximum of 150 ms processing delay to the sensor electronics	
	Minimum update period is 500 ms	
	System response is tempered by the display rate, output averaging	

Electrical Requirements

Power to Electrodes		
	Voltage	+4.9 to 5.5 VDC @ 25 °C, regulated
	Current	30 mA maximum
Short Circuit	Protected	
Isolation	Low voltage (< 48 V AC/DC)	

Electrical Requirements**Power to Electrodes**

	Voltage	+4.9 to 5.5 VDC @ 25 °C, regulated
	Current	30 mA maximum
Short Circuit		Protected
Isolation		Low voltage (< 48 V AC/DC)

Power Requirements

DC (3-9950-3, 3-9950-5)	24 VDC nominal (12 to 32 VDC, $\pm 10\%$ regulated), UL60950-1 or UL61010-1 certified power supply rated for operation at 4,000 m (13,123 ft) altitude
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Sensor Input Specifications

Digital (S ³ L) Sensors	Serial ASCII, TTL level, 9600 bps
Accuracy	$\pm 0.5\%$ of reading max error @ 25 °C
Resolution	1 μ s
Repeatability	$\pm 0.2\%$ of reading

Input Types

	Chlorine (FCl/ClO ₂) input via the Digital (S3L) output from the 2650 Amperometric Electronics
	pH input via the Digital (S3L) output from the 2751-7 pH Electronics
Sensor Types	Chlorine and pH

Power Supply

Rejection	No Effect $\pm 1 \mu$ A per volt
Short Circuit	Protected
Reverse Polarity	Protected

Binary Input (3-9950.393-3)

Input Voltage Range (without damage)	-5 VDC to 30 VDC (No operation below 0 VDC)
Maximum Current Rating	6.0 mA
Maximum Voltage Rating	30 VDC
Maximum Input Voltage for signal "Off" (low or "0")	1.5 VDC
Minimum Input Voltage for signal "On" (high or "1")	3.0 VDC
Maximum Current Draw for Signal "0" (low)	≤ 500 µA DC
Minimum Current Draw for Signal "1" (high)	500 µA
Typical Current Draw for Signal "1" (high)	6.0 mA at 30 VDC 4.8 mA at 24 VDC 2.4 mA at 12 VDC 1.0 mA at 5 VDC

Current Loop Specifications

Current Loop Out	ANSI-ISA 50.00.01 Class H (Passive, external voltage required)		
Voltage	12 to 32 VDC, ±10% regulated, UL 60950-1 or UL 61010-1 Power Supply rated for operation at 4,000 m (13,123 ft) altitude		
Maximum Impedance	250 Ω @ 12 VDC	500 Ω @ 18 VDC	750 Ω @ 24 VDC
Span	3.8 to 21 mA Adjustable, reversible		
Accuracy	± 32 µA max. error @ 25 °C @ 24 VDC		
Resolution	6 µA or better		
Temperature Drift	± 1 µA per °C		
Isolation	Low voltage (< 48 VAC/DC)		
Update Rate	100 mS nominal		
Zero	4.0 mA factory set; user programmable from 3.8 to 5.0 mA		
Full Scale	20.0 mA factory set; user programmable from 19.0 to 21.0 mA		
Power Supply Rejection	± 1 µA per V		
Actual Update Rate Determined by Sensor Type			
Short Circuit and Reverse Polarity Protected			
Adjustable Span, Reversible			
Error Condition	Selectable error condition 3.6 or 22 mA or None		
Test Mode	Increment to desired current (range 3.8 to 21.00 mA)		
Analog Outputs	2 Passive		

Relay Specifications

Dry Contact Relays

Type	SPDT
Form	C
Maximum Voltage Rating	30 VDC or 250 VAC
Maximum Current Rating	5 A resistive

Solid State Relay, Optional Relay Module

Type	SPDT
Form	C
Maximum Voltage Rating	30 VDC or 30 VAC
Maximum Current Rating	5 A resistive
Hysteresis	Adjustable (absolute in Engineering Units)
On Delay	9999.9 seconds (max)
Test Mode	Set On or Off
Maximum Pulse Rate	300 pulses/minute

Display Ranges

Free Chlorine (FCl)	0 to 20 ppm	
Chlorine Dioxide (ClO ₂)	0 to 2 ppm	
pH	-1.00 to 15 pH	
pH Temperature	-99 °C to 350 °C	-146 °F to 662 °F

Shipping Weights

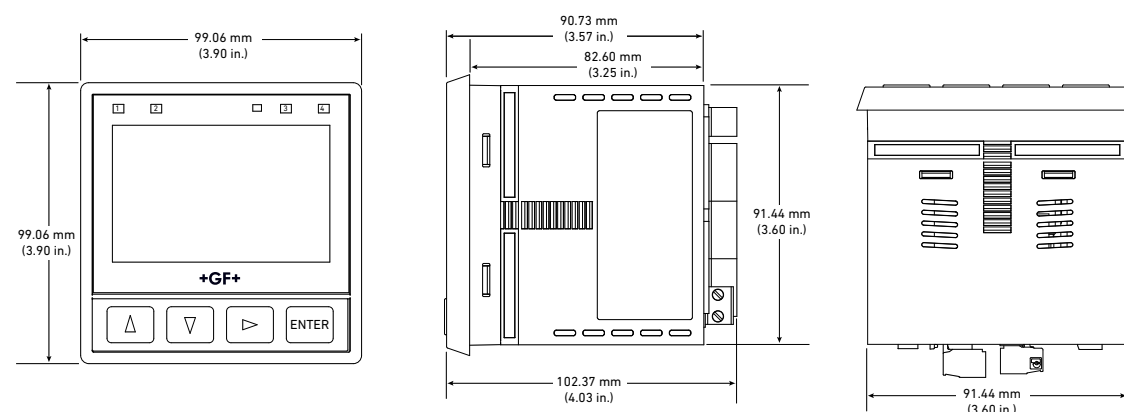
Base Unit	0.63 kg	1.38 lb
9950-3	1.0 kg	2.2 lb
9950-5	0.63 kg	1.38 lb
Relay Module	0.19 kg	0.41 lb

Standards and Approvals

CE, UL, CUL, WEEE, FCC

RoHS compliant, China RoHS

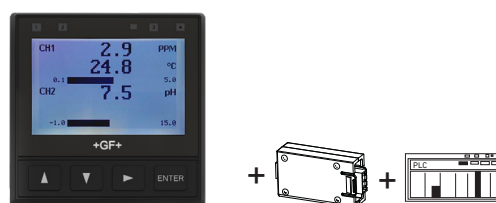
Manufactured under ISO 9001, ISO 14001 and ISO 45001

Dimensions**1.9.3 System Overview****Panel or Wall Mount**

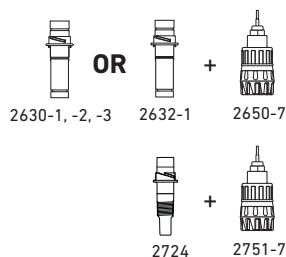
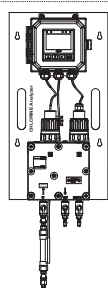
GF Model 9950-3 Transmitter
(Includes mounting bracket and panel gasket)

**Automation System**

GF Model 9950-3 Transmitter with Modbus Module
and
- PLC (Customer supplied)



GF Sensors -
Chlorine, pH
Use with 2751-7 or
2651-7
Smart Sensor
Electronics



GF Fittings - See individual sensor data sheets

All Sold Separately

1.9.4 Ordering information

Mfr. Part No.	Code	Description
3-9950-3	159 001 954	9950 Base Unit - DC Powered, 2 Channel Input, 2 Passive 4 to 20 mA Output, 2 Active 4 to 20 mA Output (Module) 2 Mechanical Relays, 4 Binary Inputs
3-9950-5	159 001 956	9950 Base Unit - DC Powered, 2 Channel Input, 2 Passive 4 to 20 mA Output
Optional Accessory Modules		
3-9950.393-1	159 310 268	Relay Module with 4 Mechanical Relays
3-9950.393-2	159 310 269	Relay Module with 2 Mechanical and 2 Solid State Relays
3-9950.393-3	159 310 270	Relay Module with 2 Mechanical Relays and 4 Binary Inputs
3-9950.395-M	159 001 905	9950 Modbus Module
3-9950.398-2	159 001 848	Dual Channel 4 to 20 mA Current Loop Output Module

1.9.5 Accessories and Replacement Parts

Mfr. Part No.	Code	Description
3-8050.396	159 000 617	RC Filter Kit (for relay use), 2 per kit
3-9950.391	159 310 278	Connector Kit, In-Line, 9950 Transmitter
3-9950.392	159 310 279	Relay Module Connector Kit, 9950 Transmitter
3-9000.392	159 001 700	Wall Mount Enclosure Kit
3-9000.392-1	159 000 839	Liquid tight connector kit, NPT (1 connector)

2 Dissolved Oxygen

2.1 2610 Process Optical Dissolved Oxygen Sensor Gen II



2.1.1 Product Description

The GF 2610 RDO® Pro is a rugged, reliable sensor designed to deliver accurate dissolved oxygen (DO) data across a wide measuring range while reducing maintenance costs. It features the latest optical technology for DO measurement and eliminates the replacement of membrane and reference solutions.

The GF 2610 optical sensor cap is calibrated at the factory and requires no field calibration. The optical measurement technology resists abrasion and bleaching allowing for a long life in many harsh applications. The DO sensor has a built in Modbus RS485 and 4 to 20 mA current loop outputs for ease of interface to existing control systems. The 3-2610-51 version includes the GF (S³L) digital interface for direct connection with the 9900 SmartPro® Transmitter, 9950 SmartPro® Dual Channel Transmitter and 8900 Multi-Parameter Controller.

Additional features include a 10 m (32.8 ft) cable with stripped and tinned ends as well as a titanium temperature sensor for improved compatibility in salt water applications.

Features

- Two year measurement cap life
- Optical DO measurement, no flow requirements
- Rugged construction
- Calibration built into the measurement cap 2% of range 0 to 20 mg/l
- No membranes or filling solutions
- Flexible communications Digital (S³L), 4 to 20 mA or Modbus
- Measurement Range: 0.2 to 20 mg/L, in-line or submersible
- 3-2610-51 compatible with 9900 SmartPro Transmitter, 9950 SmartPro Dual Channel Transmitter and 8900 Multi-Parameter Controller

Applications

- Municipal and Industrial Wastewater Treatment
- Drinking Water Reservoir Monitoring
- Environmental Water Discharge Monitoring
- Aquatic Life Support

RDO is a registered trademark of In-Situ® Inc., Fort Collins, CO USA



2.1.2 Specifications

General

Sensor Type	Luminescent dissolved oxygen sensor
Transmitter/Local Display	Optional, not required. Compatible with 8900 and SmartPro instruments
Communications Options	Digital (S ³ L), 4 to 20 mA Modbus (RS485)
Maximum Cable Length	Modbus and 4 to 20 mA: up to 1219 m (4000 ft) Digital (S ³ L): 38 m (125 ft)
Internal Mounting Thread	1¼ NPT
Power Requirements	12 to 24 VDC ±10% regulated
4 to 20 mA output span	0 to 20 mg/L

Performance

Salinity Range	0 to 42 PSU, fixed or real-time capable
pH Range	2 to 10 pH
Barometric Range	507 to 1115 mbar, fixed or real-time capable
Maximum Pressure	300 psi
Range	0 to 20 mg/L concentration, 0 to 200% saturation
Accuracy (DO)	±0.1 mg/L, 0 to 8 mg/L, ±0.2 mg/L, 8 to 20 mg/L
Response Time of Cap	T90: 30 sec T95: 37 sec @ 25 °C
Repeatability	0.05 mg/L
Resolution	0.01 mg/L

Environmental

Wetted Materials	ABS, Titanium and FKM
Usage Life of Cap	2 years from the first instrument reading
Shelf Life of Cap	24 months from date of manufacture (install within 12 mo. of manufacture)
Operating Temperature	0 °C to 50 °C 32 °F to 122 °F
IP Rating	IP-67 with cap off, IP-68 with cap installed
Compliance	Heavy industrial, IEC 61000-6-2:2005
Storage Conditions, Cap	1 °C to 60 °C 33 °F to 140 °F, in factory container
Storage Conditions, Sensor	-5 °C to 60 °C 23 °F to 140 °F

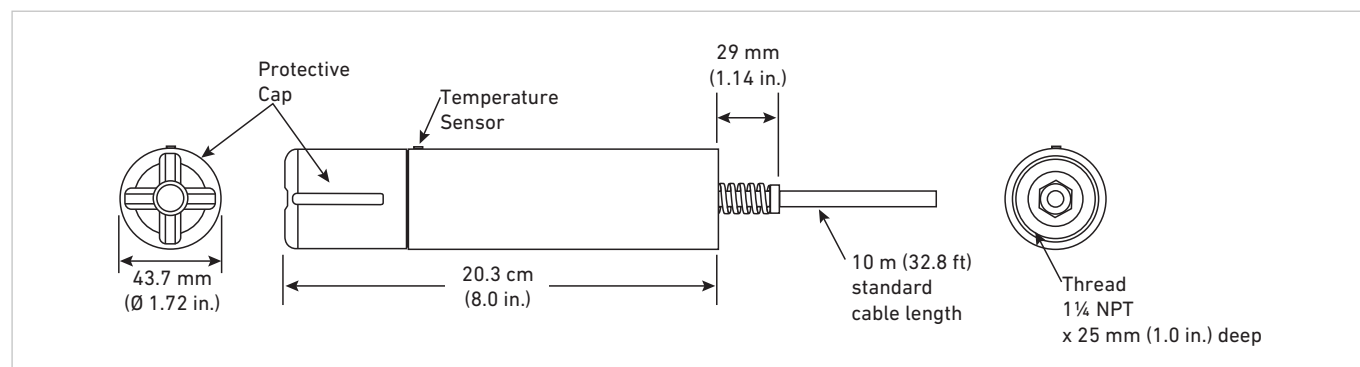
Warranty

Sensor	3 years from date of manufacture
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Standards and Approvals

CE, FCC
RoHS Compliant, China RoHS

Dimensions



2.1.3 System Overview

Panel Mount	Pipe, Tank, Wall	4 to 20 Input	Automation System	In-line Installation
GF Instruments - 8900 - 9900 - 9900-1BC - 9950	GF Instruments 9900 with 3-8050 Universal Mount Kit	Customer Supplied Chart Recorder, Programmable Logic Controller, or Programmable Automation Controller	0486 Profibus Concentrator and Customer Supplied Programmable Logic Controller or Programmable Automation Controller	GF Pipe Adapter 3-2610.501
				
GF 2610-41 Process Optical Dissolved Oxygen Sensor				All sold separately

2.1.4 Ordering information

Mfr. Part No.	Code	Description
3-2610-51	159 001 849	Gen II Optical Dissolved Oxygen Sensor (0.2 to 20 ppm) with Digital S ³ L, 4 to 20 mA, and Modbus output
3-2610.392	159 310 122	Replacement Optical Dissolved Oxygen Sensor cap (0.2 to 20 ppm) for 3-2610-31 and 3-2610-41 DO Sensors
3-2610.394	159 310 301	Replacement Optical Dissolved Oxygen Sensor cap (0.2 to 20 ppm) for Gen II 3-2610-51 DO Sensor
3-2610.501	159 500 413	DO Threaded Pipe Adapter kit, includes one each: 2 in. male NPT pipe adapter, 1 1/4 in. closed nipple, 3/4 in. closed nipple
3-0252	159 001 808	Configuration Tool

For installation options, see instruction manual and Specials Catalog (3-0000.720)

Planning Fundamentals of Valves and Automation

Network and Communication

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1 Introduction Fieldbus

A fieldbus is a bus system that connects field devices such as sensors and actuators to an automation device for communication purposes. If several communication participants wish to send their messages via the same line, then it must be specified who (identifier) sends what (measured value, command) when (initiative). There are standardized transmission protocols for this.

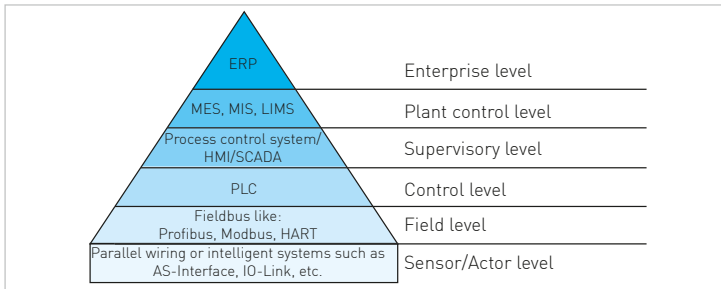
Fieldbuses usually operate in master-slave mode. The master takes over the control of the processes and protocols and the slave the processing of the subtasks.

Benefits/features

- Decentralized structure
- Low wiring costs
- Transmission of diagnostic information (temperatures, operating hours...)
- More efficient device maintenance
- Higher reliability due to short signal paths
- A device failure has no influence on the bus
- Manufacturer independence through standardized bus protocols

Automation pyramid

The automation pyramid serves to classify techniques and systems in control technology and represents the various levels in industrial production. Diverse and complex tasks can thus be presented in an orderly and clear manner. Each level has its own task in production, with flowing boundaries depending on the operational situation.

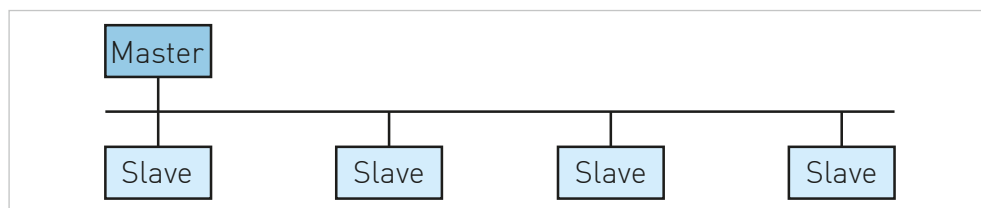


Level	Typical tasks	System
Enterprise level	Production planning, order processing	ERP
Plant control level	Detailed production planning, production data acquisition, KPI determination, material management, quality management	MES, MIS, LIMS
Supervisory level	Operation and monitoring, recipe management and execution, measured value archiving	Process control system, HMI, SCADA
Control level	Control and regulation of production processes	PLC, CNC, NC, IPC
Field level	Interface between production process and control level	Fieldbuses such as Profibus, Modbus, HART
Sensor/Actor level	Data collection and command execution	Parallel wiring, AS-Interface, IO-Link

1.1 Device types

Master/Slave is a topology of asymmetric control or communication.

A device (master) controls one or more other devices (slave) and serves as their communication center.



Master devices

The master devices determine all necessary specifications for communication on the bus and are responsible for data traffic. As long as the master has the so-called token, i.e. the bus access right, it can also send messages without an external request.

Slave devices

The slave devices, on the other hand, are the peripheral devices that extend from the valves to the actuators to the transmitters. They are only authorized to acknowledge incoming messages and send them back in response to requests from the master.

2 Profibus

2.1 System description

Profibus (Process Field Bus) according to IEC 61158/61784 is a worldwide leading standard for fieldbus communication in manufacturing, process and building automation. Particular advantages of this fieldbus technology are, for example, the simple and cost-saving topology, bidirectional communication, extensive information options and standardization of device functions (profiles). Profibus also enables communication between devices from different manufacturers without special interface adaptations.



Benefits/features

- Established transmission technology
- Quick and easy device configuration
- Real-time capable protection mechanisms against incorrect parameterization (DP)
- Safe condition in case of failure
- Standardized by Profibus standards IEC 61158/61784, thus easily expandable or interchangeable
- Communication of devices from different manufacturers
- Wide range of applications
- Real-time capable protection mechanisms against incorrect parameterization (DP)
- Safe condition in case of failure

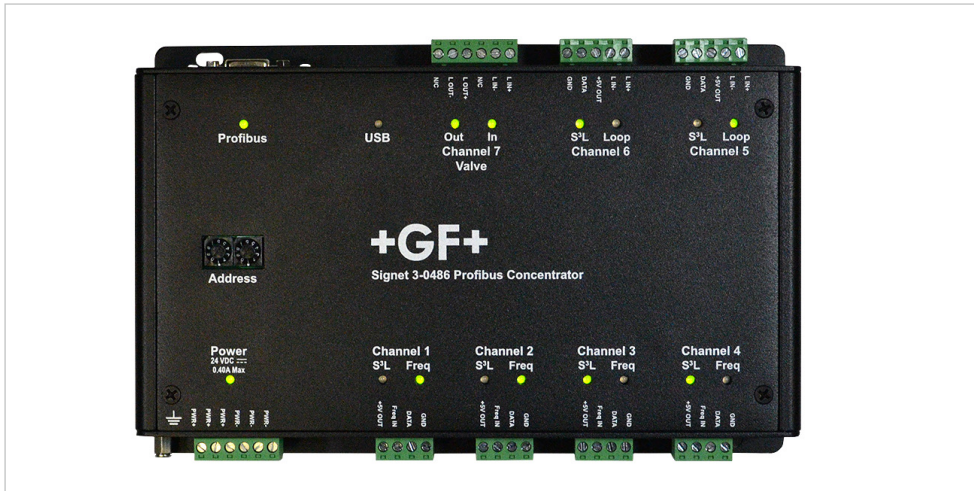
2.2 Technical basics

Profibus variants

Profibus DP	Profibus PA
PROFIBUS DP (Decentralized Peripherals, formerly FMS) is used for communication of central automation devices with decentralized field devices such as I/Os, actuators, valves and transmitters via a fast serial connection. In addition to user data transmission DP also provides powerful functions for diagnostics and commissioning. Data transmission rates of up to 12 MBit/sec on twisted two-wire lines and/or fiber optic cables are possible.	PROFIBUS PA (Process Automation) is used to control measuring devices by a process control system in process engineering. PROFIBUS PA represents a digital alternative to the classic analog connection of devices (4...20 mA technology) and offers additional functions through bidirectional communication. This variant of PROFIBUS is suitable for explosion-endangered areas due to power limitation. The maximum data transmission rate is 31.25 kbps.

2.3 GF Components

2.3.1 GF Signet 0486 Profibus Concentrator



Product description

The GF Signet 0486 Profibus Concentrator allows for simplified connection of GF Signet sensors to a PROFIBUS network. The 0486 supports six sensor interfaces and a 4 to 20 mA current loop proportional valve interface. The 0486 supports PROFIBUS DPV1 and is available with either DB9 or M12 network connectors.

The 0486 sensor interfaces are multifunctional. All six inputs are compatible with GF Signet digital (S³L) sensors, four inputs are compatible with frequency output flow sensors, and two inputs are compatible with 4 to 20 mA current loops. The 0486 PLC interface allows for complete control of the GF Signet sensors. The programmer is able to configure the sensor for the specific needs of their application, read measurements in engineering units, and gather diagnostic data to ensure accuracy and correctness of readings.

In addition to interfacing to GF Signet sensors the six (S³L) inputs will also support the 8059 four channel relay module allowing for on/off control of GF valves or other devices. Up to six 8059 can be connected to a single 0486 giving the user the ability to control 24 on/off devices.

The proportional valve interface is designed to interface with Georg Fischer electric and pneumatic actuators offering proportional valve positioning control or other 4 to 20 mA current loop devices. The interface will send a 4 to 20 mA current loop to the proportional interface, and read back a 4 to 20 mA current loop signal from the valve to ensure proper valve positioning.

Fail-safe control of valves is built into the 0486. The programmer is able to configure the state of each individual relay, off or on, and the current level of the proportional valve interface in case of communications disruption. This will ensure that the system will fail in a safe, known state.

The 0486 supports diagnostic messaging for the sensors; the programmer can read the state of each sensor to ensure control is based on accurate readings. Mis-wiring, probe failure, or other events will be reported back to the PLC for proper handling and alerting.

Features

- Interface six GF Signet sensor or relay modules and a proportional valve to a PROFIBUS network with a single service
- Four channels support (S³L) or flow frequency devices
- Two channels support (S³L) or 4 to 20 mA current loops
- One channel for dedicated 4 to 20 mA current loop input and output. Ideal for proportional valve control or other current loop uses.
- Support for PROFIBUS DP V1 and DP V0
 - Supports 9.6K to 12M bits/second network speeds
 - System and sensor diagnostic support (DP V1)
 - Fail-safe for 8059 Relay Modules and proportional valve outputs on communication failure
- Simplifies the programming of sensors, saving programming time and reducing errors.
- Convenient DIN Rail or surface mountable enclosure



Applications

- Automation Upgrades
- Filter and RO Skids
- Neutralization Systems
- Water and Wastewater Treatment
- Pool and Spa Control
- Aquatic Animal Life Support Systems and Aquaculture

Specifications

General

Channels	4 channels digital (S ³ L) or frequency input (open collector or sinusoidal)
	2 channels digital (S ³ L) or 4 to 20 mA current loop
	1 channel 4 to 20 mA current loop input/output for valve positioning or current loop uses
Accuracy	Frequency, accuracy $\pm 0.5\%$ of reading max error @ 25 °C, resolution 1 uS
	4 to 20 mA current loop input, accuracy ± 32 uA @ 25 °C, resolution 16 uA
	4 to 20 mA current loop output, accuracy ± 32 uA @ 25 °C, resolution 6 uA
Terminal Plug Type	Pluggable screw types, 24 to 12 AWG
Enclosure	
Material	Aluminum 6063 T3 and 5052 H32 powder coated
Mounting	Surface (not included)
	35 mm DIN rail mounts (included)

Input Power

DC	24 VDC $\pm 10\%$ @ 10 W max., 0.40 A max. External Surge Protection is Required, 2KV Common Mode, 1KV Differential Mode.
----	---

Input Specifications

Digital (S³L)	Channels 1, 2, 3, 4, 5 and 6
Output Power	5 VDC regulated @ 20 mA
Overcurrent Protected	Each channel independently protected
	A short on a channel will not impair the other channels
Frequency	Channels 1, 2, 3 and 4
Range	1 to 1300 Hz

4 to 20 mA Current Loop Input Channels 5, 6 and 7

Maximum Voltage	40 VDC
Maximum Current	40 mA
Maximum Voltage Drop	5 VDC
Minimum Update Rate	100 mS
Reverse Voltage and Over Current Protected	

Output Specifications**4 to 20 mA Current Loop Input** Channel 7

Maximum Excitation Voltage	24 VDC
Minimum Excitation Voltage	12 VDC
Maximum Resistance	250 Ω @ 12 VDC
	500 Ω @ 18 VDC
	750 Ω @ 24 VDC
Minimum Update Rate	100 mS

Environmental

Operating Temperature	-10 °C to 70 °C	14 °F to 158 °F
Storage Temperature	-20 °C to 85 °C	-4 °F to 185 °F
Relative Humidity	5 to 95% non-condensing	

Profibus

Output Signal	Profibus-DP V1 according to IEC 61158-2
DP Function	Slave
Transfer Rates	9.6 kbps to 12 Mbps
Signal Coding	NRZ Code
Physical Layer	RS 485
Connection 3-0486-D	9-pin D-sub female connector
Connection 3-0486-M	M12 connector (Special Order)

Electrical Requirements**Power to Sensors**

Voltage	+4.9 to 5.5 VDC @ 25 °C, regulated
Current	30 mA Maximum
Short Circuit	Protected
Isolation	Low voltage (< 48 V AC/DC)

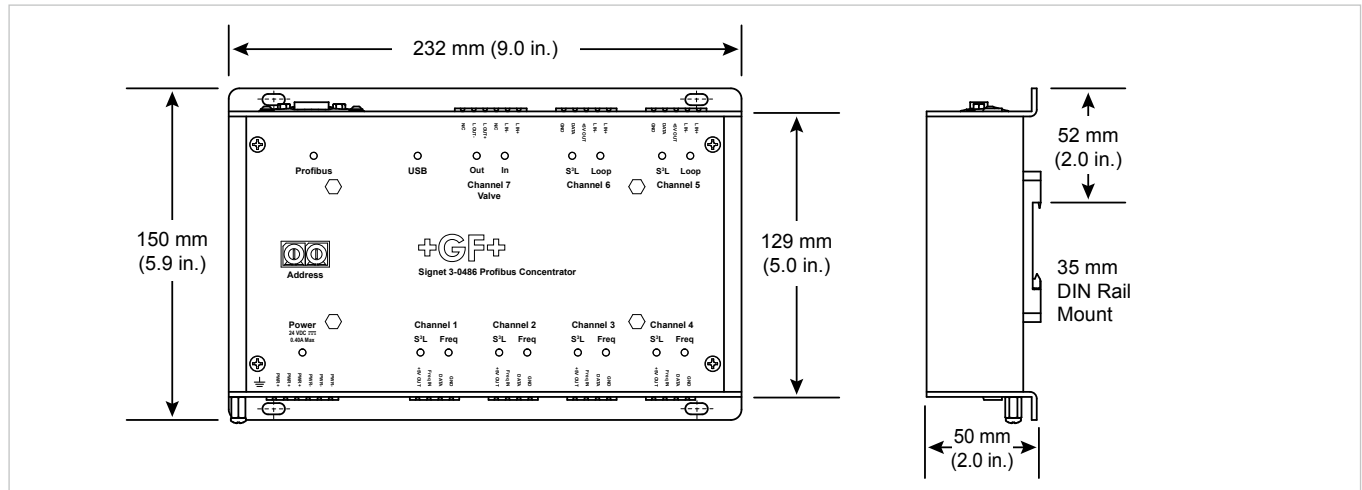
Shipping Weight

1.4 kg	3.0 lb
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Standard and Approvals

RoHS compliant, China RoHS
Profibus Certified
Manufactured under ISO 9001 for Quality
Safety: UL 61010-1, CAN/CAS-C22.2 No. 61010-1, IEC 61010-1:2010
EMC: EN 61000-6-3:2007+A1, IEC 61000-6-3:2006+A1, FCC 15.107 Class B, FCC 15.109 Class B, FCC 15.109(g) Class B, EN 61000-6-2

Dimensions



Support

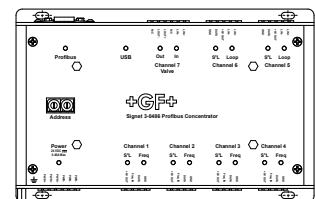
- 2250 Hydrostatic Level
- 2350 Temperature
- 2450 Pressure or Hydrostatic Level
- 515, 525, 2536, 2540, 2000, 2100, 2507, 2551 or 2552 Flow
- 2610-51 Dissolved Oxygen
- 2751 pH/ORP Smart Sensor Electronics
- 2850 Conductivity
- 8058 iGo Signal Converter
- 8059 Relay Module
- PA11, 21, 30 or 90 Pneumatic Actuators Pilot Valve and 5-Series DIASTAR Pneumatically Actuated Diaphragm Valves On/Off Control (requires 8059)
- EA11, 21, 31, or 42 Electric Actuator On/Off Control and Type 104 Electrically Actuated Ball Valves (requires 8059)
- Electropneumatic positioner type SPC/RPC
- EA21, 31, or 42 with PE25 Electric Valve Positioner

Ordering Information

Mfr. Part No	Code	Description
3-0486-D	159 001 839	DB9 Profibus Concentrator
Special Order Options - Please consult the factory		
3-0486-M		Profibus Concentrator with M12 connector

Accessories and Replacement Parts

Mfr. Part No	Code	Description
6682-1104	159 001 712	Loop power plug, 4-pos, right angle
6682-0051	159 866 089	Terminal block plug, 5-pos
6682-0061	159 866 090	Terminal block plug, 6-pos
3-0486.390	159 310 266	Profibus DIN mount kit (two DIN mount plates and six screws)



2.3.2 Profibus DP module for EA25 – 250



General

Profibus is realized via an accessory board and M12 plug adapter. The actuator in a Profibus network can be looped through or used as an end position via a termination resistor.

- Profibus DP V0
- Baud rate 9600 – 1.5M
- Connector: M12 (male & female for daisy chain)
- Power supply via standard device plug

Profibus commands

Signal type	Description	Parameter
Digital output (command)	Stop	
	OPEN	
	CLOSED	
	MIDDLE	
	Positioner	
	Desired actuator position	0 – 100 % of the end position
Digital input (feedback)	Actuator moving	
	Position OPEN	
	Position CLOSED	
	Position MIDDLE	
	Measured actuator position	0 – 100 % of the end position
	Remote control selected	
	Monitoring relay	
	Motor current	0-2000 mA
	Internal temperature	0-100° C
Feedback from basic board	Low power voltage	
	Overtemperature active	
	Cycle time expired	
	Motor protection active	
	Thermostat triggered	
	Heater failed	
	Position detection failed	
	Actuator position invalid	
	Teaching mode active	
	Emergency manual active	
	Accessory failure	

Signal type	Description	Parameter
Accessories		
Fail-safe return (Failsafe return unit)	Fail-safe active	
	Battery active	
	Fail-safe time exceeded	
	Battery weak	
	Battery failure	
Monitoring (monitoring card)		
Digital output (command)	Activation of cycle time extension	
	Cycle time extension	0 ... 9
	Activation of cycle time monitoring	
	Limit cycle time monitoring	0 ... 9
	Activation cycle counter	
	Limit cycle counter	0 ... 9
	Activation of motor current monitoring	
	Motor current limit	0 ... 9
Digital input (feedback)	Cycle time extension active	
	Cycle time monitoring active	
	Cycle time monitoring exceeded	
	Cycle counter active	
	Cycle counter exceeded	
	Motor current monitoring active	
	Motor current exceeded	
Profibus		
Digital input (feedback)	Watchdog recovery	
	.	

3 Modbus

3.1 System description

Modbus is an open communication protocol for the transmission of information between electronic devices via a serial line. The protocol ensures that a master device and one or more slave devices are connected to each other. In this way, different devices can be controlled or data can be transmitted. Modbus has developed into a widely used protocol used by many manufacturers in different sectors, but especially in industry.

Benefits/features

- Widely used and proven
- Open system without license fees
- Simplistic protocol
- Low demands on the hardware performance of the system
- Very high transmission accuracy
- Communication of devices from different manufacturers
- Uncomplicatedly expandable

3.2 Technical basics

The following different operating modes are distinguished for data transmission:

Modbus RTU	Modbus ASCII	Modbus TCP
Asynchronous, serial transmission via RS-232 or RS-485.	Similar to the RTU protocol, only a different data format, rarely used.	ETHERNET TCP/IP communication based on the client/server topology.

3.3 GF Components

3.3.1 Accessories for GF Signet 9900 Transmitter

Modbus Modules (3-9900.270-MX)

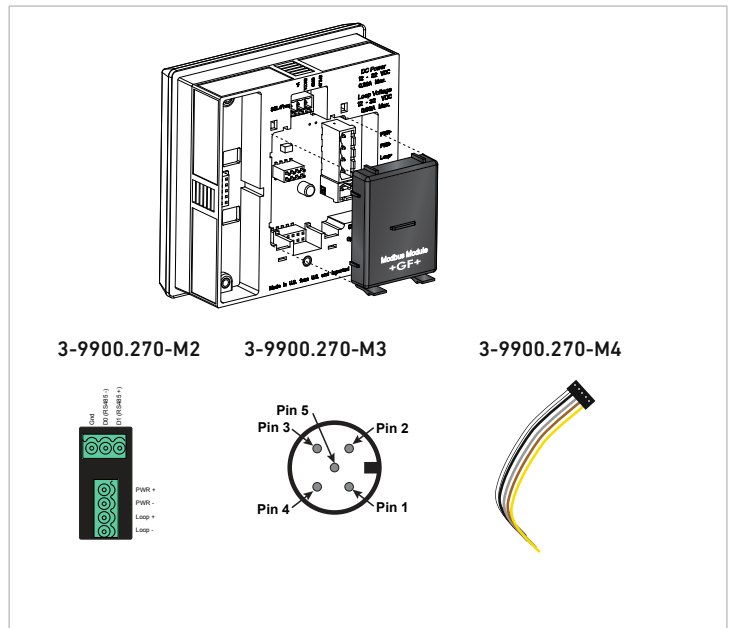
These Modules allow the 9900 to communicate with Automation systems using the Modbus serial RS485 Protocol.

3-9900.270-M1 - Modbus module, with 6 Wire Cable Assembly

3-9900.270-M2 - Terminal Block Connections (Panel Mount Only)

3-9900.270-M3 - M12 Connector (Field Mount Only)

3-9900.270-M4 - Modbus Module with 5 Wire Cable Assembly



4 HART

4.1 System description

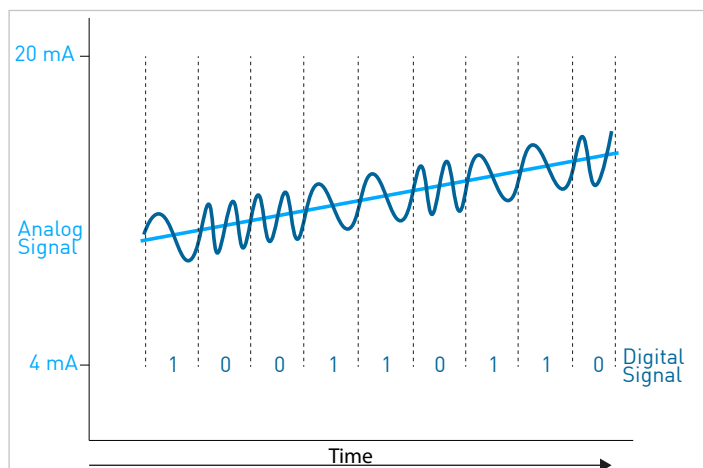
HART (Highway Addressable Remote Transducer) is a standardized, widely used communication system for setting up industrial fieldbuses. HART enables the digital communication of several fieldbus participants via a common data bus. This system is based specifically on the widely used 4...20 mA standard. Existing lines of the existing analog system are overlaid with additional information using Frequency Shift Keying (FSK) technology. The HART protocol communicates at 1,200 bit/s without interruption of the 4...20 mA signal and enables the host application (master) to receive two or more digital updates per second from a field device. Since the digital signal of the frequency shift keying takes place in continuous phases, the 4...20 mA signal is not disturbed. Since 2007, HART has been part of the IEC 61158 fieldbus standard.

Benefits/features

- Cost-effective and simple: use of existing analog wiring
- Transport of additional process information with the existing analog signal
- Particularly robust fieldbus solution
- Open protocol
- Worldwide spread and proven
- The protocol is constantly evolving
- Bidirectional and acyclic communication

4.2 Technical basics

The analog current signal is superimposed with a sinusoidal signal. Depending on whether a logical „1“ or the „0“ is transmitted, the modulated frequency changes from 1.2 to 2.2 kHz. This frequency change occurs after FSK (Frequency Shift Keying) and can be generated and evaluated by the field device or the operator terminal.



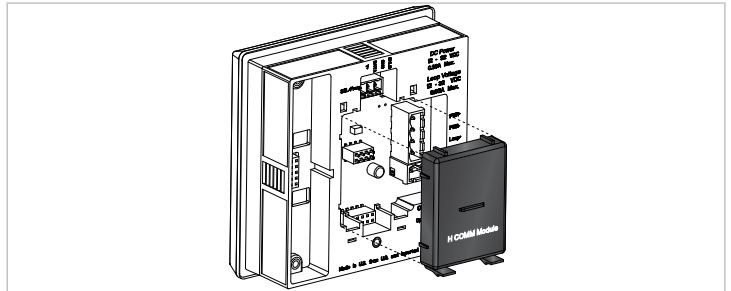
4.3 GF Components

4.3.1 Accessories for GF Signet 9900 Transmitter

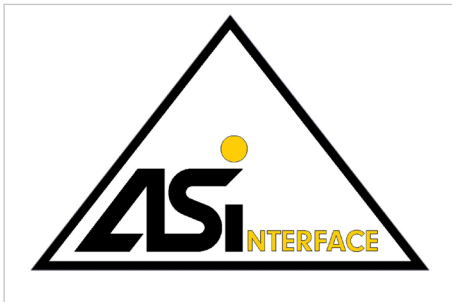
H COMM Module (HART®) (3-9900.395)

The H COMM Module enables communication between the 9900 and a HART® enabled device.

(Not available for use on 3-9900-1BC Batch Controller)



5 ASI (Actuator sensor interface)



5.1 System description

The industry has placed various demands on modern automation systems. The aim of development is a cost-efficient, intuitive system for the lower field level with which binary sensors and actuators can be networked simply, reliably and efficiently and connected to the higher control level.

Today the AS interface is a central component of the modern industry landscape. Many sensors and actuators can be networked and supplied with power via the AS interface-specific two-conductor cable. The wiring harnesses used in traditional cabling are obsolete. The result is a massive cost reduction through simple wiring, which is possible through proven click-and-go technology without a great need for training, and the elimination of material. The system AS interface has proven itself to be a technologically and economically logical supplement to the normal field bus through its cost-efficiency. The AS interface cannot replace complex networks.

The freely selectable network topology simplifies the installation of an AS-i network just as much as its simple configuration does. The susceptibility to errors that other systems have often leads to delays in installation. For this reason, the AS interface system was conceived with steady focus on a reduction in causes of errors. Reverse polarity protection with the profiled cable is only one example.

Simple and safe – penetration technology

Simple installation of the AS interface is possible through the special installation technology that is known as penetration technology, or, less frequently, as click-and-go technology. The technology is based on the use of the usually yellow AS-i cable, a reverse-polarity-proof flat cable with two conductors. During installation, the penetration spikes of the device to be connected bore into the conductors of the cable and establish contact safely.

Benefits/features

- Economical cabling concept for the lower field level for the harsh industrial setting
- Connection to all common field bus systems via gateways, links or network couplers
- Low connection costs per participant
- Low cost of installation
- Simple handling during commissioning and service
- Effective error detection and immunity
- High operational readiness, even in an industrial setting
- Electronic slave addressing
- Free selection of network topology
- Simple and affordable installation, low connection costs
- Can be installed in a practically foolproof manner through use of the profiled AS-i cable
- More room in the control cabinet thanks to absence of traditional wiring harnesses
- Simple configuration
- Simple diagnostic options
- Expandable through modular concept

5.2 Technical basics

AS interface system data

- Master-slave principle
- No limitations to structure
- Data and power on a two-wire line
- Fail-safe
- Medium: unshielded cable 2 x 1.5 mm²
- Signals, data and power up to 8 A
- 4 inputs and outputs each per slave, other combinations of 1 to 16 inputs and outputs are possible
- Protection rating IP67 for control cabinet and industrial use
- Penetration technology
- Cable length 100 m per segment, expandable via repeaters up to 500 m. Integrated terminators can extend the cable length, different solutions are available on the market.
- Effective error detection and immunity
- Address can be set electronically via the bus connection
- Full backward-compatibility

Fail-safe

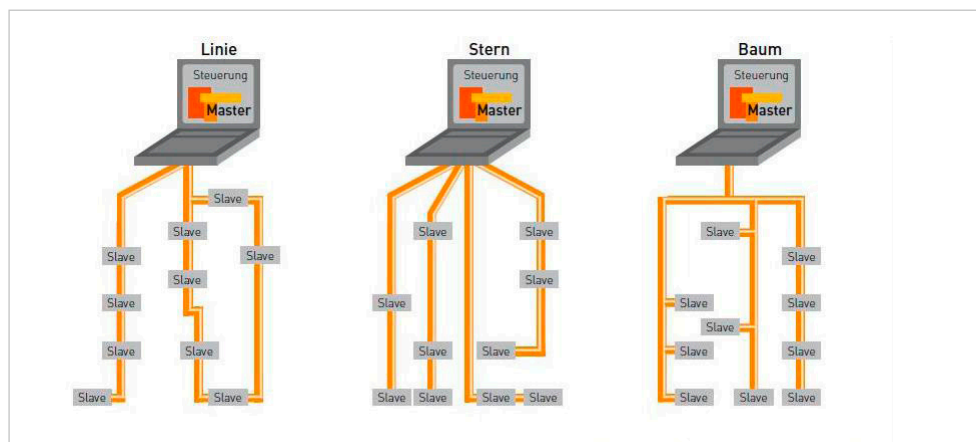
The transfer of data on the AS-i network is absolutely reliable. Every AS interface telegram is monitored in the recipient with respect to a parity bit and additional independent variables. This guarantees extremely high security in the recognition of individual and multiple malfunctions. The use of the AS interface is thereby also possible without any problems under very rough conditions, such as in fusion facilities or when using frequency converters.

Standardized efficiency

All AS interface products meet the Euro standard EN 50295 and the global standard IEC 62026-2.

Type of actuation

The use of sensors and actuators is continually increasing in piping construction. The AS interface is an alternative here to the costly routing of multiple-wire cables. The AS interface system offers a simple and cost-efficient option to integrate sensors and actuators in a field bus system. The field bus system connects the field devices (such as sensors) for communication with a control module.

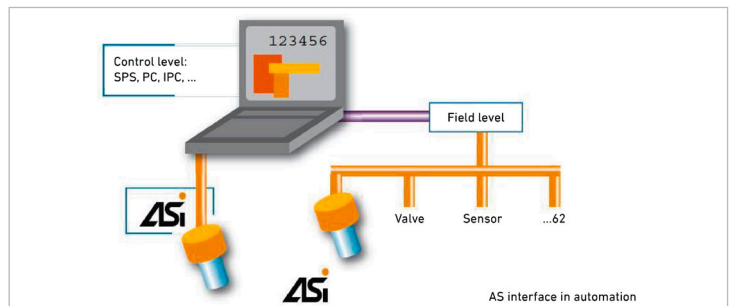


Free network topology choice

The lowermost unit in the system are the slaves. They are integrated into the respective actuators or sensors or connected upstream of these. Via a line, star or tree topology, the slaves are connected to the master. The master sends address messages and receives the response of the addressed slave back directly. An AS interface master can control and manage an AS interface network independently.

AS interface in automation

Integrated as a plug-in card in an PLC control, the master is addressed from there. The master transmits the system responses from the slaves to the control level, which derives the control commands to be performed from these and then prescribes their implementation. By means of an AS interface gateway, the master can also be coupled to a higher-level field bus system.



5.3 GF Components

AS interface for electrical rotary actuators

Actuator types EA25-250



AS interface for pneumatic rotary actuators

Actuator types PA11/21
FC, FO, DA
PA30-90
FC, FO, DA



AS interface for pneumatic lift actuators DN15 – DN50

Actuator types DIASTAR Ten
DIASTAR Ten Plus
DIASTAR Sixteen



AS interface for pneumatic lift actuators DN65 – DN150

Actuator types DIASTAR 025
FC/FO
DN65 - 150



AS interface for manual valves

With integrated feedback Ball valve
Butterfly valve
Diaphragm valve



AS interface for sensors

With switch output Level sensor
Flow sensor
Pressure sensor
Temperature sensor



Additional components for an AS interface system

Figure	Description
	Gateway (master) Interface for higher-level systems or as „stand-alone“ solution
	AS-i power supply Separates signal and power supply, is always needed
	Auxiliary power supply for „black“ cables Is needed if electric actuators are operated in the network
	Connecting plug
	AS-i profiled cable
	Programming device For addressing the slaves
	Repeater Can extend line lengths > 100 m

5.4 Accessories

Activation and electrical feedback integrated	AS interface version 3.0 up to 62 slaves
Manual override is standard	All-plastic housing
For 24 V DC actuators	Supplied with NAMUR mounting block
Extra power supply required	Optical status display
Optical status display	Pilot valve (5/2-way) and electrical feedback integrated
AS interface version 3.0 up to 62 slaves	



For further information on accessories, refer to the online product catalogue at www.gfps.com

More information, see <http://www.as-interface.net/knowledge-base>



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