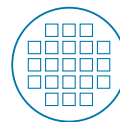


Semiconductor
Photovoltaic
TFT/HB-LED
StorageMedia

From the application to
the product

Microelectronics



Adding Quality to People's Lives

GF Piping Systems operates in 3 business areas:
Industry, Utility and Building Technology

Our Mission

We are dedicated to designing, manufacturing and marketing piping systems for the safe and secure conveyance of liquids and gases.

Our Values

We put customers first

We all constantly bear customers in mind when developing products, when handling orders or when answering the phone. We continuously measure ourselves against customer satisfaction. We treat customers the same way we wish to be treated.

We act fast

We differ from our competitors in agile thinking and acting. We quickly spot customer needs and develop new products earlier than the competition. We promptly answer customer queries and immediately address potential quality issues.

We do what we say

We keep all the promises we make. This is the basis of trustworthiness. We meet delivery deadlines, finish product developments as planned or reach individual goals, just to name a few examples.

We reward performance

We have ambitious goals and celebrate achievements. Promotions are linked to performance. We benchmark ourselves against the best.

We respect people

We value every contribution. We try to understand before being understood. And we trust and empower our collaborators.

Imprint

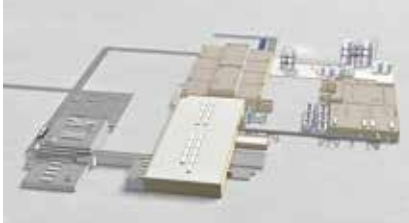
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TFT/HB-LED and Storage Media

Microelectronic integrated circuits for consumer-/computer technology or memory devices.

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Our Environment

Plastics are environmentally friendly

A carbon footprint is the sum of all greenhouse gases given off to the atmosphere during the processes of extraction and refining of a material, production, transportation, use and recycling. Comparisons show that the sum of greenhouse gases released in manufacturing plastic solutions is smaller than in manufacturing other traditional materials.



«Pioneering Green Solutions»
www.gfps.com

A comparison of materials

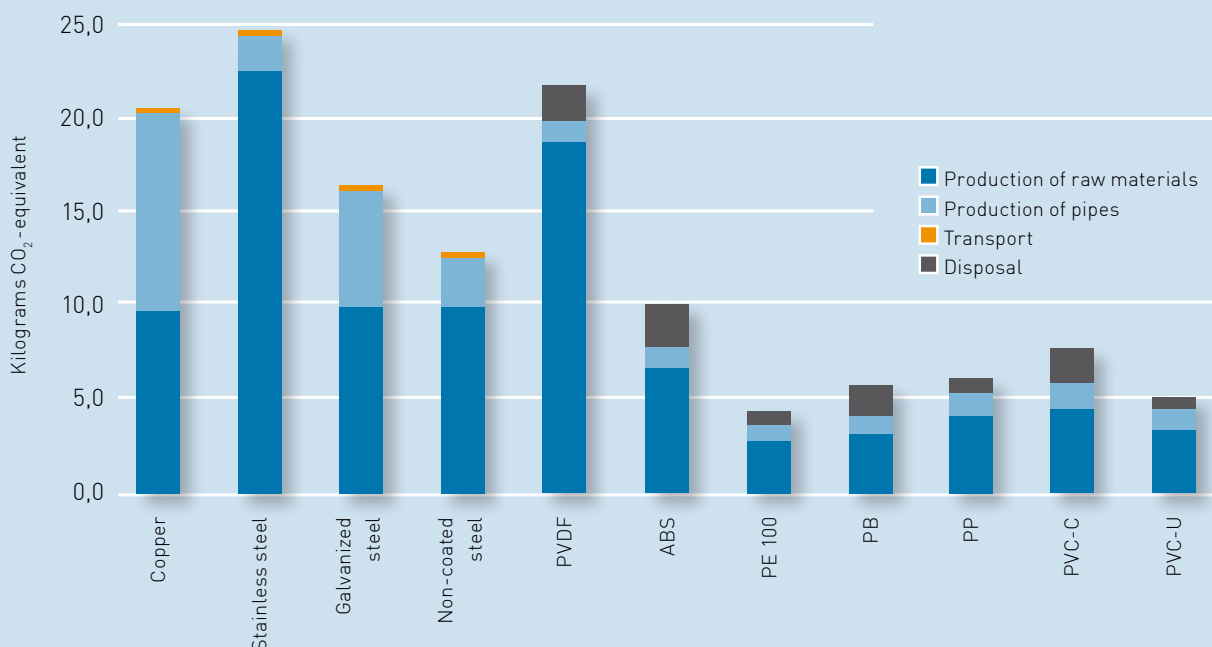
In the framework of an in-depth study, pipes in a length of one metre and made of various materials were compared. The results showed that a plastic pipe has a carbon footprint which is up to five times lower than that of a comparable steel pipe.

Lightweight all-plastic solutions

Plastics score particularly well because of their low weight, which pays off especially in the areas of transportation and processing. All-plastic solutions from GF Piping Systems are lighter in weight than other piping systems made of conventional materials and this has a positive effect on the carbon footprint.

Lower energy costs

Energy costs can be reduced with targeted layout planning and optimal sizing for pressure needs, allowing lower pump capacity requirements. Using plastic components contributes to a steady flow rate as well as a stable energy requirement. Pre-insulated plastic pipes further reduce energy requirements and have a positive impact on the carbon footprint.



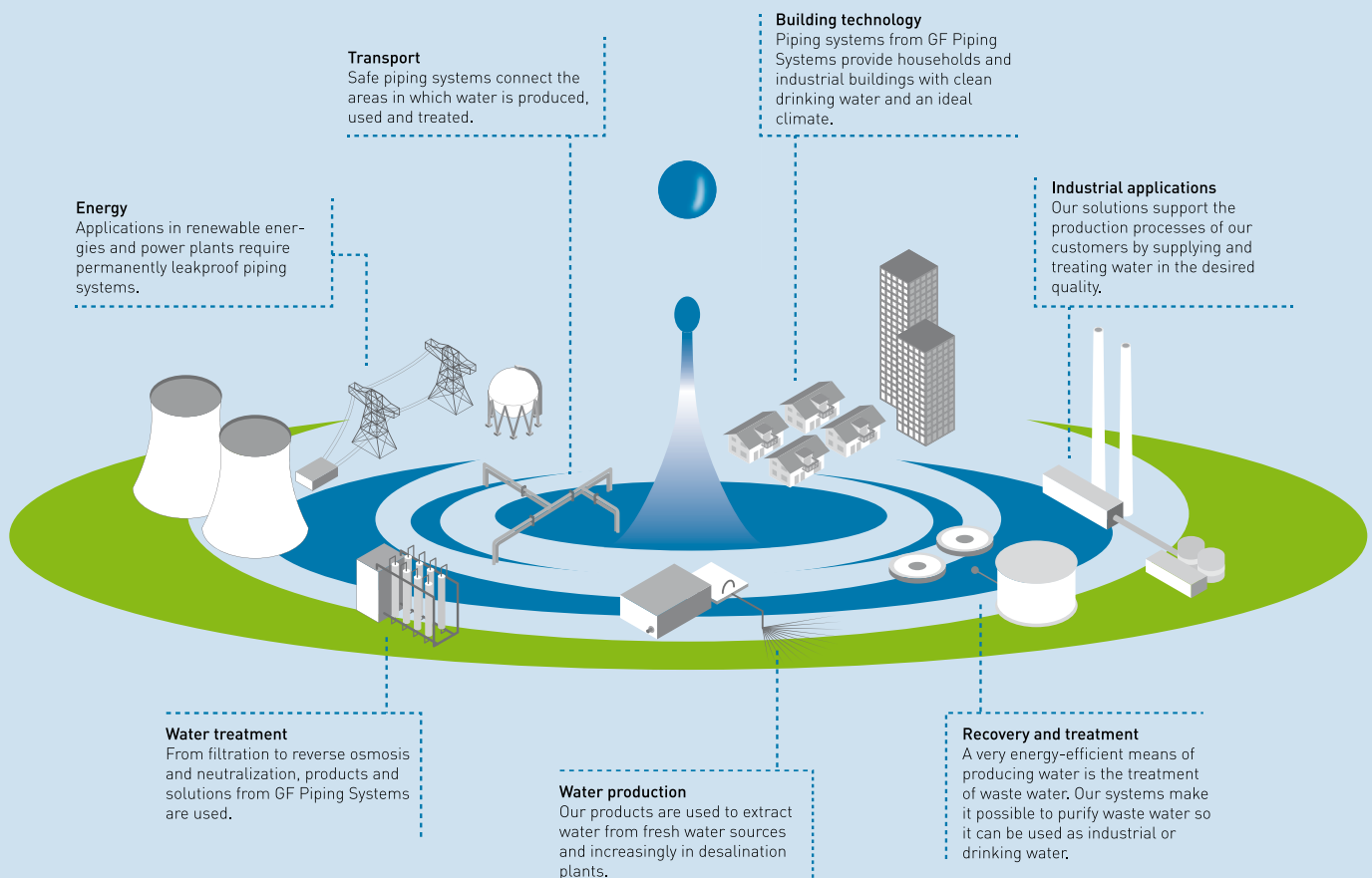
CO₂ footprint of plastic and metal pipes (1-meter DN80 pipe) – Comparison of various piping materials for building technology, industry and distribution.

Study of S. Büsser and R. Frischknecht, ESU-services Ltd. commissioned by Georg Fischer Piping Systems, 2008.

Sustainable Water and Energy Management

Solutions from GF Piping Systems are a valuable contribution to resource conservation along the whole value-added chain

Water and energy are becoming more scarce, and thereby more valuable resources. The shortage of drinking water is essentially due to the unequal distribution and limited supply of fresh water. At the same time, the medium-term energy supply is jeopardized because the demand for energy is rising while raw material resources dwindle. This is why sustainable management of water and energy resources is increasingly important. GF Piping Systems, a leading supplier of complete solutions in plastic, sees a stable water supply and better energy efficiency as the main challenges for this century. Developing reliable solutions for numerous water applications in energy and high-tech sectors of industry, GF Piping Systems is thus contributing to the efficient, resource-conserving and economic use of water and energy.



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GEORG FIECHER
PIPE & SYSTEMS

GF Piping Systems – The Best Choice

Corrosion and chemical resistant products, systems and complete solutions from GF Piping Systems

Georg Fischer focuses on three core businesses: GF Piping Systems, GF Automotive and GF AgieCharmilles. The industrial corporation founded in 1802 headquarters in Switzerland and operates approximately 130 companies with more than 13000 employees in 30 countries.

GF Piping Systems is a leading supplier of plastic and metal piping systems with global market presence. For the treatment and distribution of water and chemicals, as well as the safe transport of liquids and gases in industry, we have the corresponding joining technologies, fittings, valves, automation products and pipes in our portfolio.



GF Piping Systems headquarters in Schaffhausen, Switzerland.

Our market segments

Being a strong implementation partner GF Piping Systems supports its customers in every phase of the project. No matter which processes and applications are planned in the following market segments:

- Building Technology
- Chemical Process Industry
- Energy
- Food & Beverage/Cooling
- Microelectronics
- Marine
- Water & Gas Utilities
- Water Treatment

Global presence

Our global presence ensures customer proximity worldwide. Sales companies in over 25 countries and representatives in another 80 countries provide customer service around the clock. With 50 production sites in Europe, Asia and the USA we are close to our customers and comply with local standards. A modern logistics concept with local distribution centers ensures highest product availability and short delivery times. GF Piping Systems specialists are always close by.

Complete solutions provider

Our extensive product range represents a unique form of product and competence bundling. With over 60000 products, allied with a broad range of services, we offer individual and comprehensive system solutions for a variety of industrial applications. Our automation offering perfectly fits into our complete system approach and is thus an integral part of our portfolio. Having the profitability of the projects in focus, we optimize processes and applications that are integrated into the whole system.

Continually setting standards in the market, we directly provide our customers with technological advantages. Due to our worldwide network customers benefit directly from our 50 years+ experience in plastics.

From start to finish, we support our customers as a competent, reliable and experienced partner, actively contributing the know-how of an industrial company that has been successful in the market for over 200 years.

Microelectronics Industry

Providing advanced key technologies to create solutions of tomorrow

The highly specialized sub-area of electronics, more precisely semiconductor electronics, dealing with the design and manufacturing of integrated circuits, is considered to be the nucleus of today's and future high technology fields. With unique developments in the consolidation and miniaturization of electronic components the microelectronics industry changed what was stated as technology standard for years. In special manufacturing processes under clean room conditions high quality devices are produced for industries such as consumer electronics, communication, computer technologies and automotive, to name a few. GF Piping Systems keeps up with this fast growing sector offering reliable and safe piping solutions optimally aligned to the demanding production processes for maximum safety, quality and productivity.



A technology requiring outstanding solutions.

High Purity Piping Systems

Absolute reliability and definitive assurance that high purity requirements are met throughout the entire production process characterize the high standards of quality set in the microelectronics industry.

GF Piping Systems offers the experience, the material and technology expertise as well as comprehensive system solutions for optimally covering those needs. With the integration of SYGEF Plus systems out of high purity PVDF and the corresponding jointing technology, state-of-the-art

solutions for high end water applications are provided ensuring safety, reliability and purity at the highest level.

Exceeding the standards

GF Piping Systems exceeds standards with outstanding solutions for completely controlled high purity manufacturing processes in the microelectronics industry. Besides the edge in quality, the portfolio, covering proven

technologies and innovative plastic piping systems, offers longevity as well as highest process and cost efficiency. Furthermore, our customers benefit from individual value added services completing the product portfolio. With this complete system approach in focus GF Piping Systems is able to provide the most qualified solutions for high end water applications in microelectronics.



High-quality systems for high-tech microelectronics factories.

Semiconductor

Intelligent plastic solutions for successfully managing the complexity of highly specialized processes

Being one of the fastest growing industries the relatively young semiconductor sector showed high growth rates over the last decades and is still increasing its market share globally. With the rising demand for semiconductors, representing a key input for the electronic industry, manufacturing processes had to be geared to fast production while ensuring highest levels of safety and quality at the same time. Highly specialized facilities handle the complexity and sensitiveness of the processes and products by operating in strictly controlled clean room production areas in compliance with the requirements of quality assurance. With advanced solutions out of high purity plastics GF Piping Systems offers an extensive portfolio for the safe and reliable conveyance of critical processing fluids in the production of electric circuits.



Safety without compromise

The capital-intensive production in the semiconductor environment is characterized by a sequence of multiple photolithographic and chemical processing steps, where highly toxic and aggressive media is used. Therefore reliable, leak-free piping systems for media conveyance are indispensable to avoid chemical contamination caused by leakage.

Top performance at every moment of operation

Ultrapure and Hot Ultrapure Water are the lifeblood of semiconductor wet processing. With SYGEF Plus systems out of PVDF high purity material and the corresponding IR-Plus fusion technology GF Piping Systems offers the industrial benchmark solution, representing a key success factor in every process phase.

Added value for our customers

GF Piping Systems complies with the specific requirements of the semiconductor industry, providing reliable systems of highest purity performance. Thus customers profit sustainably from:

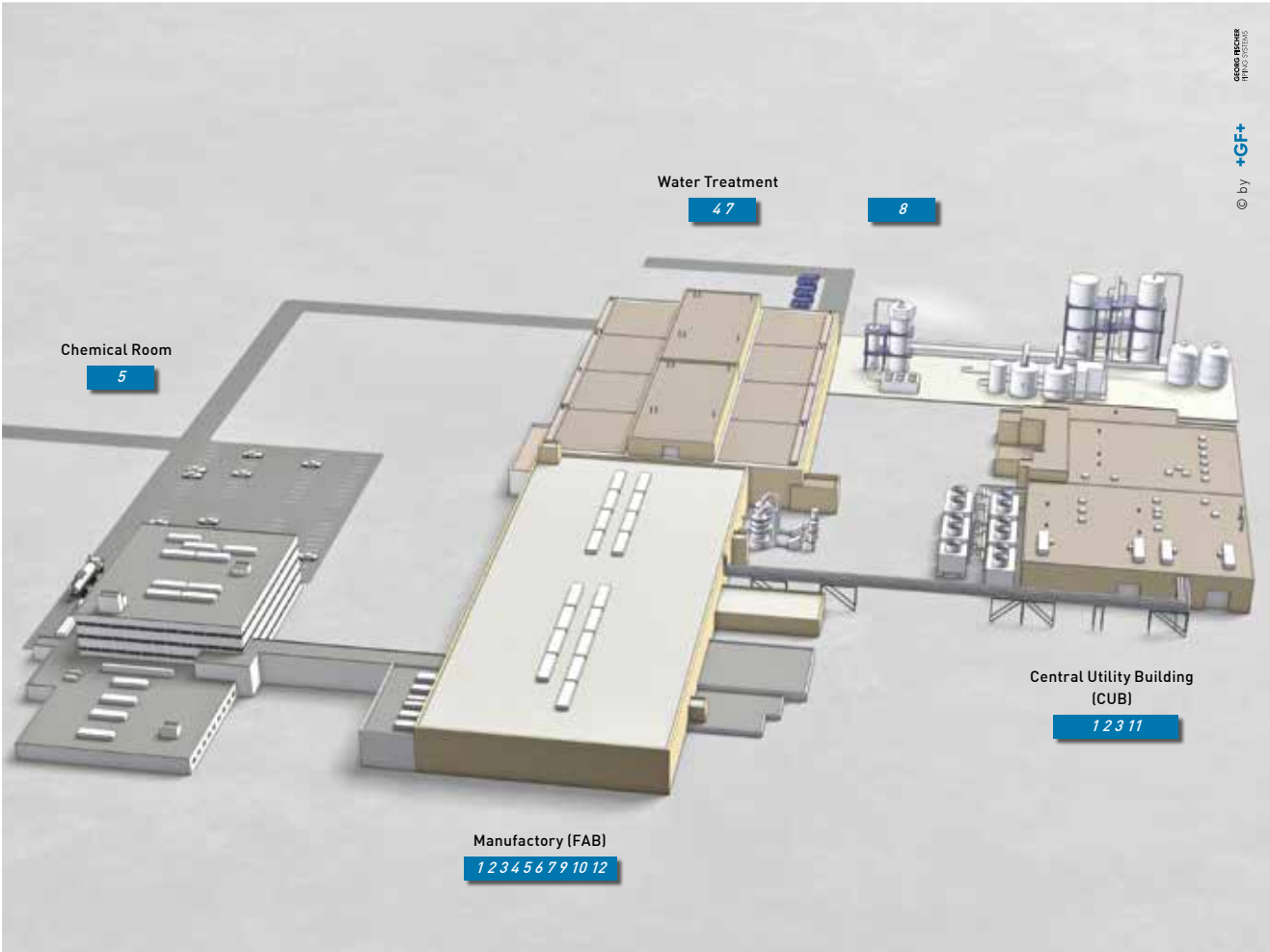
- Reliable, safe and pure operation
- Corrosion resistant and contamination free systems
- Reduced maintenance and operational costs
- Completely quality controlled and assured processes
- 100% repeatability and traceability

Providing the most suitable piping systems including the appropriate jointing technology is of particular importance in this demanding sector. GF Piping Systems is well aware of this responsibility, not only fulfilling it by an outstanding system offering, but also with global project support and certification training programs.

Applications in Semiconductor

High-purity piping systems in clean room applications

With its years of experience, GF Piping Systems stands prepared to provide systems that guarantee highly productive and efficient manufacturing non-stop, 24/7. For liquids and vacuum used in the demanding semiconductor field, GF Piping Systems offers safe and dependable piping solutions for different applications. Our systems safely convey ultrapure water, the lifeblood of the fab used in cleaning wafers as well as process cooling water, necessary for cooling heat intensive equipment. With waste systems to carry away spent chemicals, industrial and scrubber water, the factory is kept comfortable and in compliance with environmental regulations. House vacuum for hands free transport of wafers and Chemical Mechanical Planarization, just to name a few, are other common applications, where customers rely on our systems.

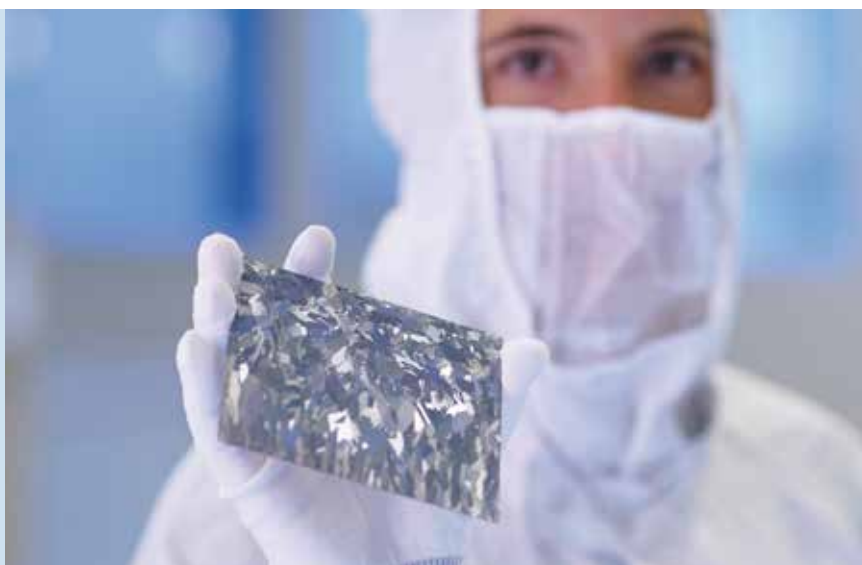


1	Ultrapure Water / Hot UPW	5	Chemical Distribution	9	Wet Bench Process Tools (OEM)
2	DI Water/ Specified Water	6	Process/ House Vacuum	10	CMP
3	Process Cooling Water	7	Industrial Grade Water	11	Industrial Cooling Water
4	Specialty Waste	8	Air Cleaning (Gas Scrubber)	12	Compressed Air

Photovoltaic

The «Total Plastic Solution» piping systems are strengthening a dynamic industry in shaping the future of energy

Generating energy by means of photovoltaic technology is a highly promising market of the future. The industry is still expected to remain one of the most dynamic sectors globally. Today's solar cell industry already plays a pivotal role in developing and rolling out renewable energy solutions and therefore in preventing global climate change. Similar to the requirements of the semiconductor industry, the high demands regarding purity, safety and quality characterize the processes in the production of photovoltaic systems. Reliable conveyance of media under clean production conditions has to be assured and appropriately controlled. Whether it is process technology or the production flow, the portfolio of superior products and systems of GF Piping Systems covers all high-end water applications in the photovoltaic industry, meeting the specified requirements and hence making a contribution to shape the energy market of the future.



Innovative piping systems for the solar cell future

Complex wet processes are necessary in the conventional photovoltaic production to deeply clean the silicon wafers and etch them on the surface. Sawed out of a polycrystalline silicon ingot, the wafers are treated by adding diverse acids, as well as oxidizing chemicals, alkalis and inorganic salts to reach the requested quality. Water with diverse attributes such as distilled, deionized, demineralized or ultrapure water is used as well. Due

to the highly corrosive nature of many of these media and compounds, plastic piping offers not only the highest resistance and longevity compared to metal piping but also a more economical and easier way to process.

A total plastic solution considering individual differences

The decision for the plastic system to use must be made on an individual basis, considering all process and application characteristics. GF Piping Systems offers the right solution,

depending on the type of chemicals and their concentration and the pressure or temperature application conditions. Thereby the total system approach focuses not only on the most suitable pipes, but also on joining elements, seals, valves and the automation range.

Added value for our customers

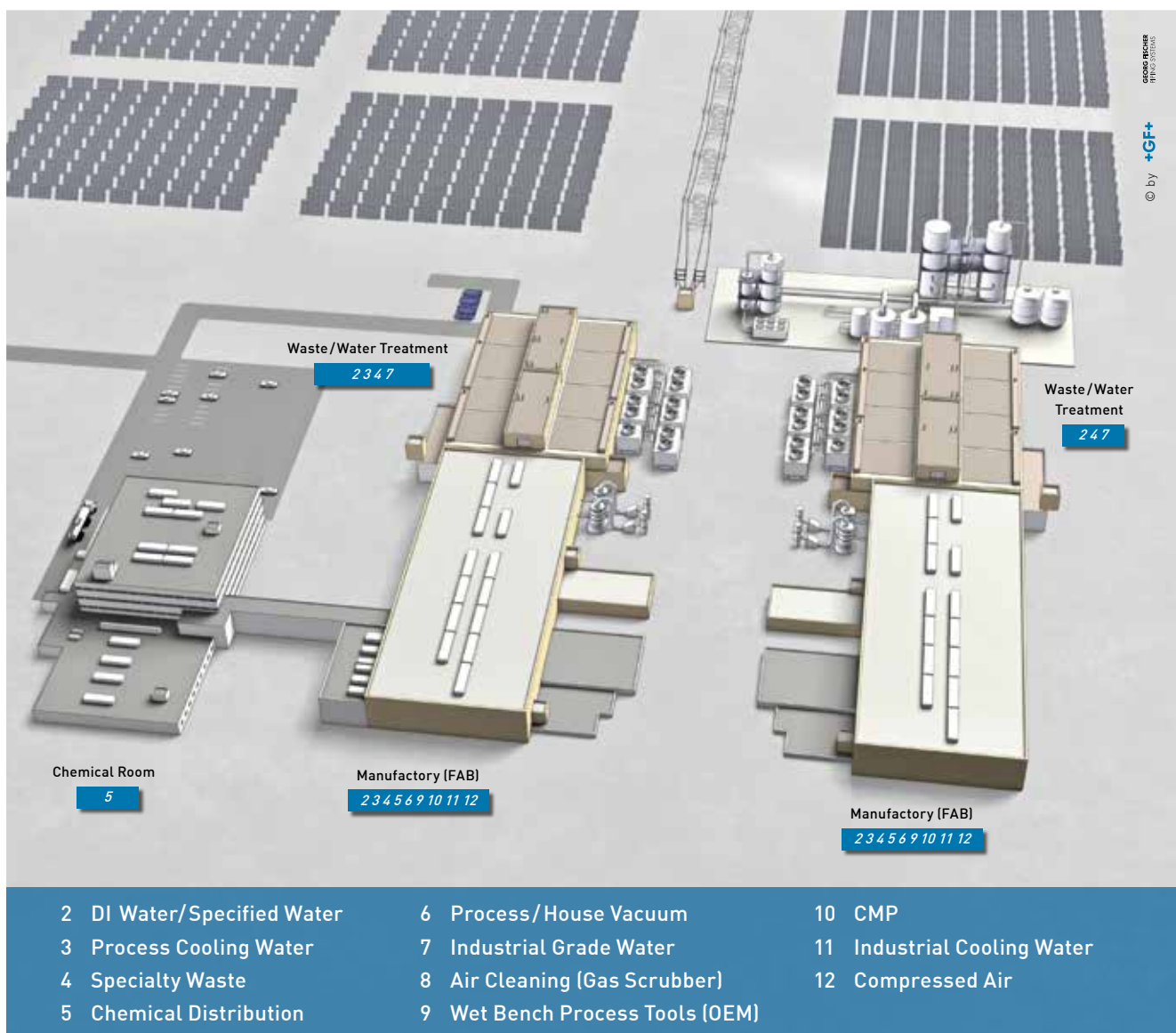
With innovative application oriented solutions GF Piping Systems meets the high requirements of the photovoltaic industry, giving its customers a cutting edge.

- Highest chemical resistance
- Widest range of material specific solutions incl. components
- Process safety
- Individual and economical high purity system solutions
- Twin-pipe system CONTAIN-IT Plus for safe media conveyance
- Excellent life-span expectations, even at elevated temperatures
- Best leach-out characteristics
- Low conductivity
- Competent project support

Applications in Photovoltaic

GF Piping Systems supplies tailored high-quality piping solutions precisely serving the needs

As a global player, GF Piping Systems is well aware of its responsibility to the environment and therefore actively supports eco-friendly energy generation. The reliable all-plastic solutions, specifically tailored to the needs of the photovoltaic industry, comply with the strict requirements for manufacturing large-scale, integrated solar cells. Due to beneficial properties such as non corrosiveness and highest chemical resistance, plastic piping systems successfully cope with the variety of aggressive media - from acids to oxidizing chemicals to alkalis and inorganic salts - used in the complex, water-based etching and cleaning processes in conventional photovoltaic production. Whatever the particular water application is, with its complete and proven plastic product portfolio, GF Piping Systems actively supports the photovoltaic industry in designing reliable and efficient systems for deionized, specified or cooling water processes, to name a few.



TFT/ HB-LED and Storage Media

Advanced plastic piping systems for exceeding required standards in high-technology manufacturing

Besides being an essential part of the microelectronics industry, TFT/ HB-LED and storage media technologies have in common that they are driven by growing market expectations regarding performance and ecological sensibility. Not only more sophisticated energy efficient products are demanded in the context of ecological challenges, but also the manufacturing processes have to be more environmental oriented with a focus on operational and cost efficiency at the same time. Existing specification limits will be consequently pushed forward. By offering future-oriented solutions GF Piping Systems continues to demonstrate credibility in the markets and keeping its position as a supplier of high-end systems for high-technology products.



TFT



HB-LED



Storage Media

Covering the entire process chain

Similar to the high demanding semiconductor production, the manufacturing of TFT-/LED and storage media technologies is structured in wafer cleaning and metallization, patterning and etching. Incoming water supply, process cooling, neutralization, chemical distribution and liquid waste handling, have to be managed. With plastic piping solutions from GF Piping Systems customers benefit

from the wide range of materials to be selected according to the diverse process requirements, temperature conditions and chemical concentrations demanded.

Following the developments of a changing market

Increasing global environmental awareness and a fast technological progress make these pioneering markets continuously renew them-

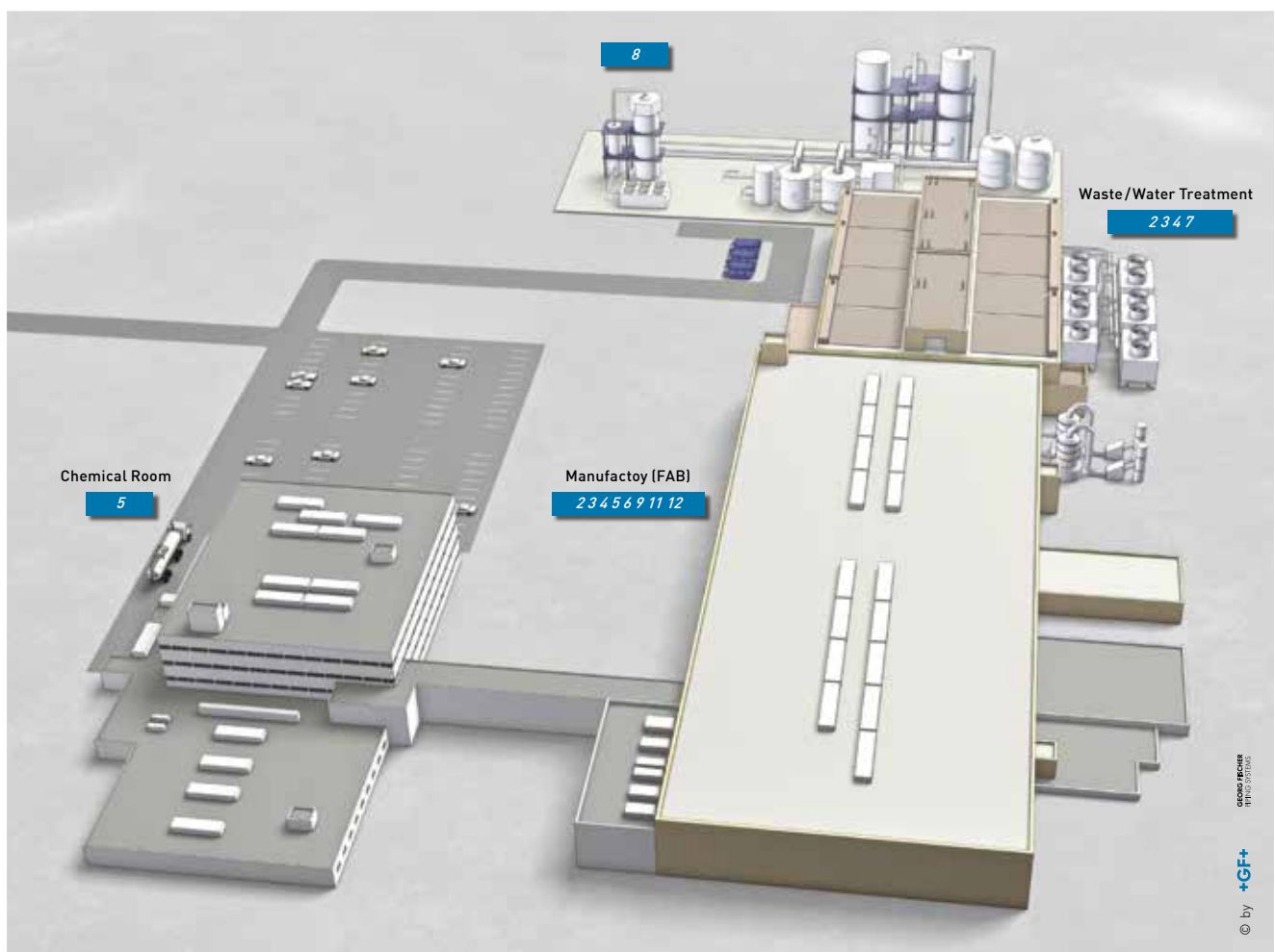
selves. GF Piping Systems offers innovative systems following the developments of those similar acting industries and their changing requirements and provides outstanding added value. Among others, the product and service offer includes:

- High quality and purity solutions
- Highest chemical resistance
- Maximum of safety and efficiency
- In-depth market know-how

Applications in TFT/HB-LED and Storage Media

State-of-the-art systems for guaranteeing consistent water qualities in demanding application areas

Increasing storage memory capacity per footprint, the trend towards flash memory and other market relevant technological developments, more and more affect the manufacturing environment in high-technology sectors. All microelectronics applications in these constantly growing high-technology industries are characterized by highest demands regarding system quality and performance. Pure and high pure materials and systems are a must if one wants to ensure the customer expected conditions of production and applications. Based on its wide experience in microelectronics, GF Piping Systems has developed comprehensive system solutions out of plastics that meet those high requirements. Combined with specified automation and jointing technology, these piping systems allow installations to be optimized regarding efficiency and safety in site construction at the same time.



- | | | |
|----------------------------|---------------------------------|-----------------------------|
| 2 DI Water/Specified Water | 6 Process/House Vacuum | 10 CMP |
| 3 Process Cooling Water | 7 Industrial Grade Water | 11 Industrial Cooling Water |
| 4 Specialty Waste | 8 Air Cleaning (Gas Scrubber) | 12 Compressed Air |
| 5 Chemical Distribution | 9 Wet Bench Process Tools (OEM) | |

Ultrapure Water / Hot Ultrapure Water

Being ready for <22 nm devices up to 450 mm and beyond, GF Piping Systems offers high-purity solutions for high-end water applications

Main Benefits:	Purity	=	Completely controlled high-purity manufacturing processes
	Safety	=	Comprehensive quality assurance and quality control systems
	Efficiency	=	100 % process repeatability
	Performance	=	Unique complete system offering along with global support and training



© by **+GF+** GEORG FIECHER
PIPE SYSTEMS

- | | | |
|---|--|---------------------------------|
| a) SYGEF (PVDF) Plus System
up to d 450 mm | e) Clamp-on flow meter Ultraflo
U3000 / U4000 / U1000 | i) DIASTAR Sixteen |
| b) Diaphragm valve type 519 | f) Butterfly valve type 365 | j) SYGEF Plus HP gasket |
| c) Variable area flow meter type 801 | g) IR-Plus (Infrared) fusion technology | k) Pressure sensor type 2250 |
| d) High Purity Union | h) Ball valve type 546 | l) Temperature sensor type 2350 |

Solutions - Ultrapure Water / Hot Ultrapure Water

An overview of the key systems and products

Considering the diversity of individual end user high-quality water demands, ultrapure water sets the highest standards and requirements in regard to particle control, system purity and quality assurance. Therefore, detection, reliable control and filtration of bacteria, particles, organic and inorganic sources of contamination to gain ultrapure water quality is an absolute necessity for microelectronics industries today. Depending on the process-oriented defined UPW quality, different methods of chemical or physical treatment form an aligned series of purification steps including for example gross-, carbon- or ultrafiltration, water softening, reverse osmosis and distillation. Thanks to the pure material character of plastic solutions from GF Piping Systems and due to completely controlled cleanroom manufacturing sites, highest quality and purity standards can be assured, supporting the industry in designing efficient and secure water processing applications.

Purity



SYGEF (PVDF) Plus System

Polyvinylidene fluoride piping solution for demanding water applications. Completely controlled processes, regarding particle control and impurities, to ensure customer expected performance of overall ultrapure water system integrity. Matched with state-of-the-art welding technologies, system reliability, purity and safety are assured.

Safety



IR-Plus (Infrared) fusion

Wherever highest purity and quality needs to be guaranteed, this non-contact heating jointing technology is predestined. Highest demands on weld strength, full traceability and entirely reproducibility are fulfilled, along with easiest operation and short welding time. Absolute process precision allows minimized, well-defined weld beads.

Efficiency



Pneumatic diaphragm valve DIASTAR Sixteen

The optimized geometry of the valve body provides linear flow characteristics and a doubled flow rate at constant energy expenditure. Together with high closing forces and an innovative plastic housing without metal bolts it is ideally suited for control applications, guaranteeing both increased efficiency and process stability up to line pressure of 16 bar.*

Performance



SYGEF (PVDF) Plus System, d 450 mm

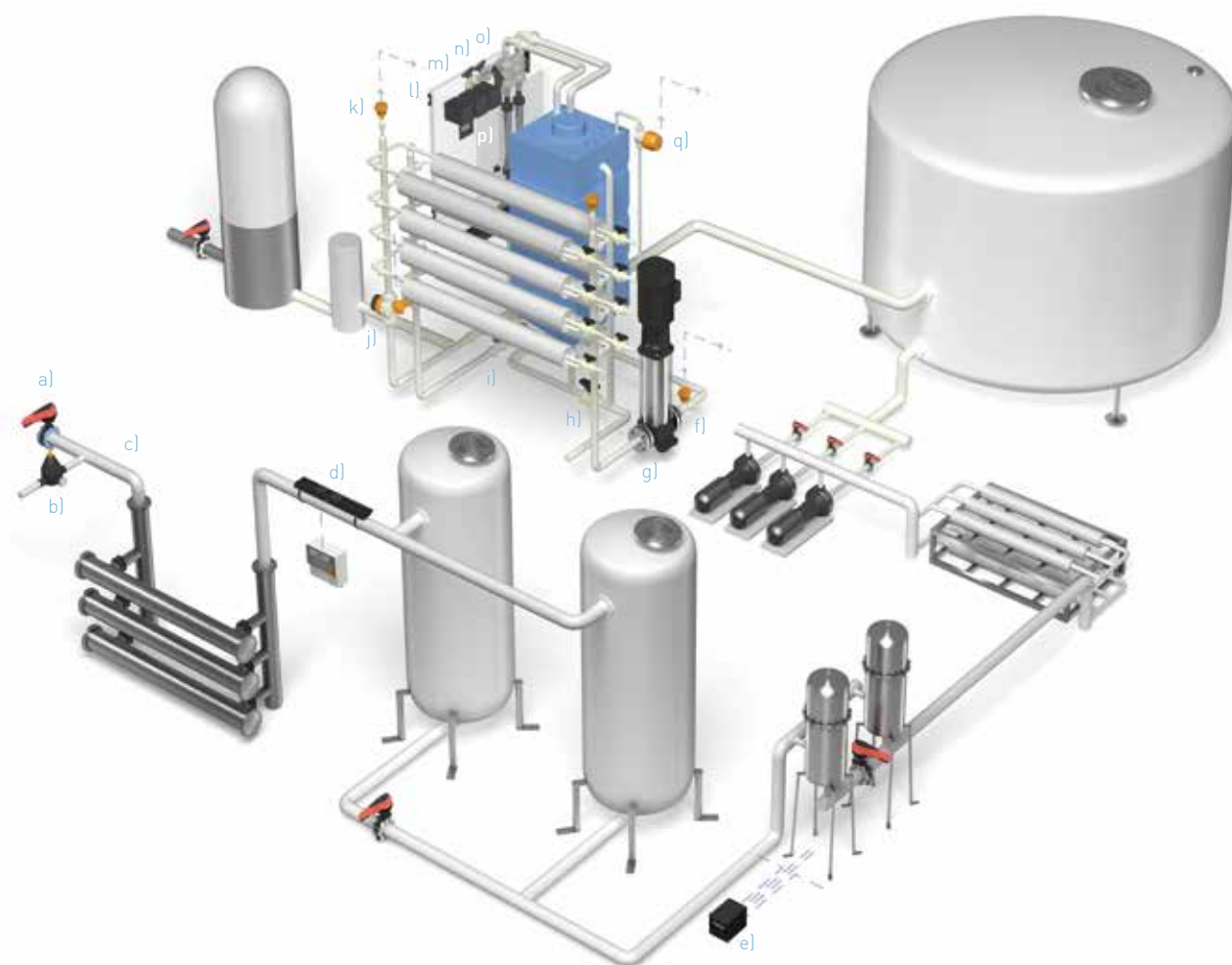
With upscaling the unsurpassed SYGEF Plus product line to the dimensions d 355 - d 450 mm, increased demands regarding UPW flow capacity can be met. A wide selection of pipes, fittings and accessories is covered by this pioneering, SEMI F57 compliant, range extension, offering excellent surface characteristics and low-weight design.

*water applications only

DI Water/Specified Water

Advanced solutions for clean water processing that guarantee defined and specified water qualities

Main Benefits:	Purity	=	Specified system performance
	Safety	=	Defined quality guidelines guaranteeing safe and reliable systems
	Efficiency	=	Reproducible and fast jointing technology for economic installation
	Performance	=	Minimum TOC ensures high water quality in clean water systems



Please see below a typical selection of products which stand exemplarily for this application.

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PIPE SYSTEMS

a) Butterfly valve, manual, type 567/568	g) Flange type PP-V, DN32	m) Conductivity electrode type 2842 including type 8050
b) Pressure reducing valve V82/V782	h) Ball valve, manual type 546	n) Pressure sensor type 2450 including type 8050
c) PROGEF (PP) Plus System	i) Flow sensor type 2536	o) Ball valve, manual, type 543
d) Clamp-on flow meter Ultraflo U3000 /U4000 /U1000	j) Diaphragm valve type 514	p) Variable area flow meter type 350
e) Multiparameter controller type 8900	k) Temperature sensor type 2350 including type 8050	q) Diaphragm valve, pneumatic, type DIASTAR Ten
f) Electromagnetic flow sensor type 2551	l) DryLoc pH/ORP sensor electrode type 2750 including preamplifier type 2757	

Solutions - DI Water / Specified Water

An overview of the key systems and products

Completely controlled processes in industrial or laboratory applications with highest purity and quality standards in manufacturing require process water of specified qualities at different levels such as deionized water or less demanding UPW water. For initial industrial water treatment and for guaranteeing a consistently specified water quality throughout the entire process chain, physical water properties, parameters and concentrations have to be precisely controlled and reliably maintained. Deionization systems use a two-stage process of ion exchanging to affect the removal of all mineral ionic materials such as cations from sodium, calcium, iron and anions. GF Piping Systems provides high-quality systems for these demanding binding and filter processes, meeting all relevant industry standards. In several applications, solutions from GF Piping Systems assure the processing of water in a way that it maintains the given specifications.

Purity



PROGEF (PP) Plus System

The specified polypropylene system, based on certified raw materials, is the ideal choice for mid-range water applications, where features such as outstanding surface finish and excellent leach-out characteristics are required. The silicone- or oil-free system has a high pureness factor and is resistant to impact, abrasion, corrosion and chemicals.

Safety



High Purity Union

The low-weight and corrosion resistant plastic unions guarantee a safe and reliable system, especially when high purity applications need to be ensured. The mechanical joints are delivered bagged to ensure cleanliness and to prevent contamination prior to installation. Depending on the area of application, unions are available in several materials.

Efficiency



Diaphragm valve type 514

The optimal flow geometry provides twice the flow with the same amount of energy. Installation dimensions identical to previous models allow easy backward compatibility.

Innovative body design with no metal fasteners.

Performance



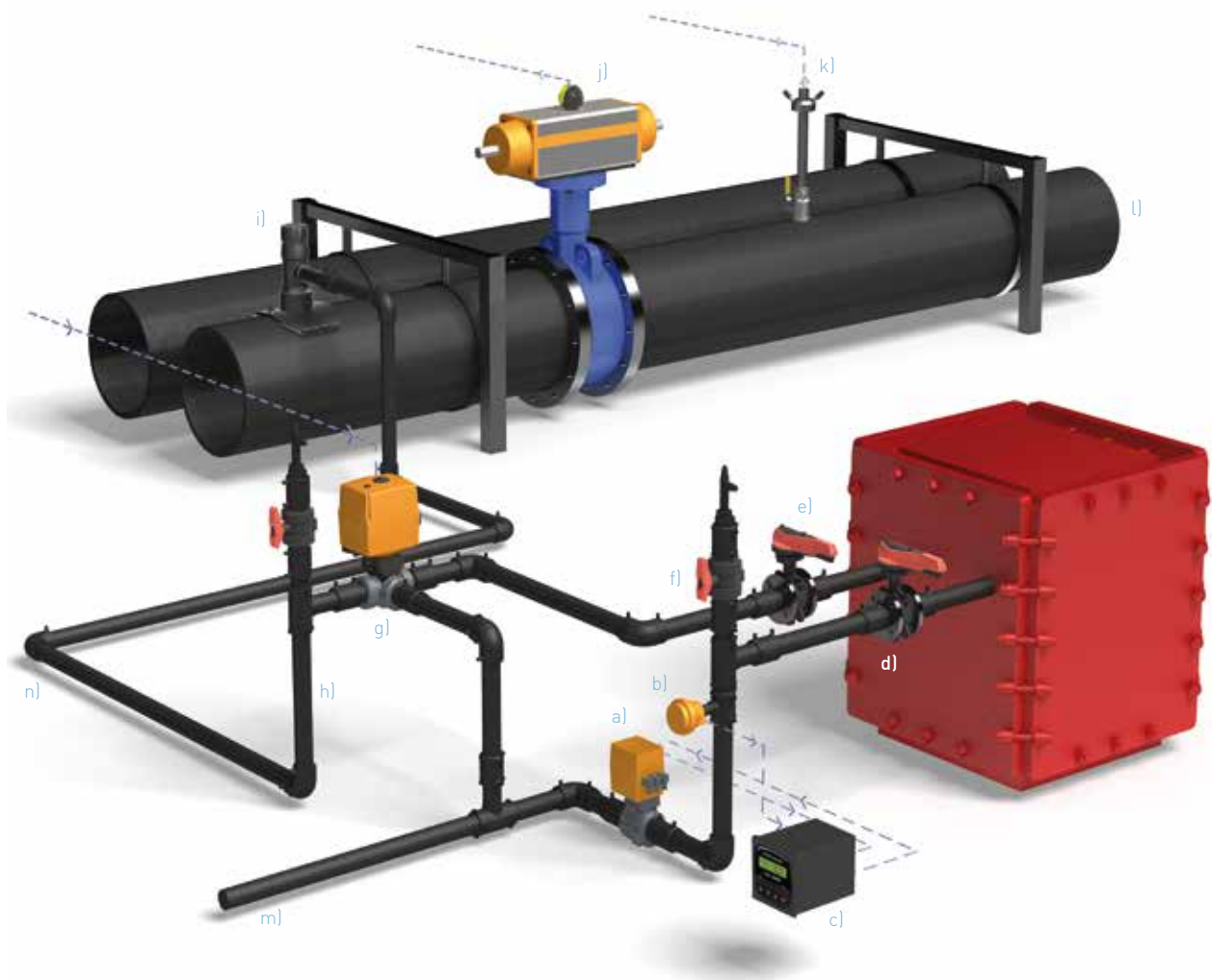
Pneumatic diaphragm valve DIASTAR TenPlus

This type has the strongest actuation and the highest closing forces. It is implemented wherever high line pressure, up to 10 bar, needs to be reliably controlled. Together with a maximum of operational safety, efficiency and flexibility are valuable characteristics. Additional features like the integrated accessory interface offer easy system integration.

Process Cooling Water

Non corroding piping systems reliably supplying high-tech manufacturing processes with temperature-controlled water

Main Benefits:	Purity	=	Avoidance of metallic contamination in clean manufacturing areas
	Safety	=	Flexibility of plastic pipes minimizes the risk of water hammer
	Efficiency	=	No corrosion and no incrustations limit maintenance to a minimum
	Performance	=	Low heat conductivity of the system results in minimum heat loss



© by +GF+ GEORG FIECHER PIPE SYSTEMS

- | | | |
|---|--|---|
| a) Ball valve, electric, type 130 | e) Butterfly valve, manual, type 567 | i) ELGEF Plus Saddles |
| b) Temperature sensor type 2350 including type 8052 | f) Ball valve, manual, type 546 with tee valve, type 546 true union ball valve | j) Ball valve, pneumatic, type 037/039 |
| c) Multiparameter controller type 8900 | g) 3-way ball valve, type 546 with electric actuator | k) Electromagnetic flow sensor type 2551/2552 |
| d) Flange PP-V, DN50 | h) PE100 System | l) Big dimension pipes |
| | | m) IR-Plus (Infrared) fusion technology |
| | | n) ELGEF Plus Elbows |

Solutions - Process Cooling Water

An overview of the key systems and products

Cooling of media, single components or entire systems is an integral part of many industrial processes. Thanks to its higher specific heat capacity, density and thermal conductivity, water is more and more used in today's cooling systems. Thereby, heat transmission from the production environment or component that has to be cooled to water used as the coolant and subsequent the heat convection characterize the functional principle of process cooling systems. Intelligent piping solutions from GF Piping Systems represent the excellent cooling infrastructure behind the scenes, allowing fast, efficient and accurate process cooling in industrial manufacturing operations. Longevity, low heat loss and lower energy consumption are the main benefits customers can profit from, when using products from GF Piping Systems in their cooling circuits.

Purity



PE100 System

Thanks to its high impact resistance - even at low temperatures - its outstanding flexibility, its homogeneous wall structure as well as easy and safe jointing by welding, polyethylene piping systems are widely used. ELGEF Plus, the electric welding fittings out of polyethylene, complements the modular and versatile system.

Safety



Electric ball valve type 130

The modular constructed ball valves were designed with the safety requirements of our customers, in addition to the ecological and economic requirements, in mind. For the ball valve type 130 the base body of the ball valve type 546 is combined with the electric actuator in the EA series.

Efficiency



Multiparameter controller type 8900

The Signet multiparameter controller has perfected the concept of modularity. It is equipped with the combination of inputs, outputs and relays specified by the user. The unit accepts up to six input devices to measure flow rate, pH-value, conductivity, pressure, level and temperature.

Performance



Butterfly valve type 567/568

The double eccentric operating principle of the butterfly valve type 567 /568 guarantees good friction behavior and therefore less wear and tear compared to conventional centric butterfly valves. A high level of security against water hammer is thus provided.

Specialty Waste

Cost-effective solutions from GF Piping Systems for safely conveying corrosive fluids even at elevated temperatures

Main Benefits:	Purity	=	Reduced environment impact due to avoided chemical contamination
	Safety	=	Leak-tight systems for the safe handling of aggressive chemicals
	Efficiency	=	No need for passivation and 50 % reduced welding times versus steel
	Performance	=	Highest chemical-/ corrosion resistance results in zero maintenance



© by +GF+ GEORO FRISCH PIPING SYSTEMS

- a) Pneumatic diaphragm valve
DIASTAR Ten
- b) Ball valve, manual, type 546
- c) Ball check valve type 561/562
- d) Paddlewheel flow sensor type 2536

- e) CONTAIN-IT Plus System
- f) Pressure sensor type 2250
- g) Butterfly valve, manual, type 567
- h) pH/ORP Wet-Tap unit type 3719
- i) Electromagnetic flow sensor
type 2551

- j) pH-sensor type 2724
- k) Multiparameter controller type 8900
- l) Temperature sensor type 2350
including type 8052
- m) PVC-U System
(other system solutions available)

Solutions - Specialty Waste

An overview of the key systems and products

Wherever hazardous or aggressive media is used in industrial manufacturing or treatment processes, reliable solutions for conveying the related specialty waste have to be considered to the same extent as the certain production process itself. Strict regulations control and monitor specialty waste systems, focusing on avoiding any form of chemical contamination and thereby reducing environmental impacts. GF Piping Systems offers complete plastic systems of highest chemical and corrosion resistance for intra-productional distribution, disposal, reclaim or recycling applications. Even at elevated temperatures absolute safety and leak-tightness can be assured. Combined with appropriate measurement and control technologies and the right jointing method customers can trust in and benefit from a complete system solution.

Purity



PVC-U System

Ensuring highest possible thermal stability, chemical and corrosion resistance, the polyvinyl chloride unplasticized system stands up to the most demanding conditions. The universal cemented system solution includes jointing technologies, fittings, valves, sensors and pipes, covering all aspects of safety, economic and operating efficiency and reliability.

Safety



Double containment system CONTAIN-IT Plus

Wherever environmentally hazardous media is transported, double containment pipe systems and leak monitoring can be implemented to virtually exclude the risk of accidents. The innovative technology permits laying the inner and outer pipeline separately. Before final jointing, pressure testing is carried out.

Efficiency



Pneumatic diaphragm valve DIASTAR Six

The cost-efficient solution with long service life for elastomer diaphragms up to 6 bar. It unites high quality with the basic functions of a pneumatic actuator. Optimal flow geometry provides twice the flow with the same amount of energy. Backward compatibility to previous models is also warranted.

Performance



Electromagnetic flow sensor type 2551

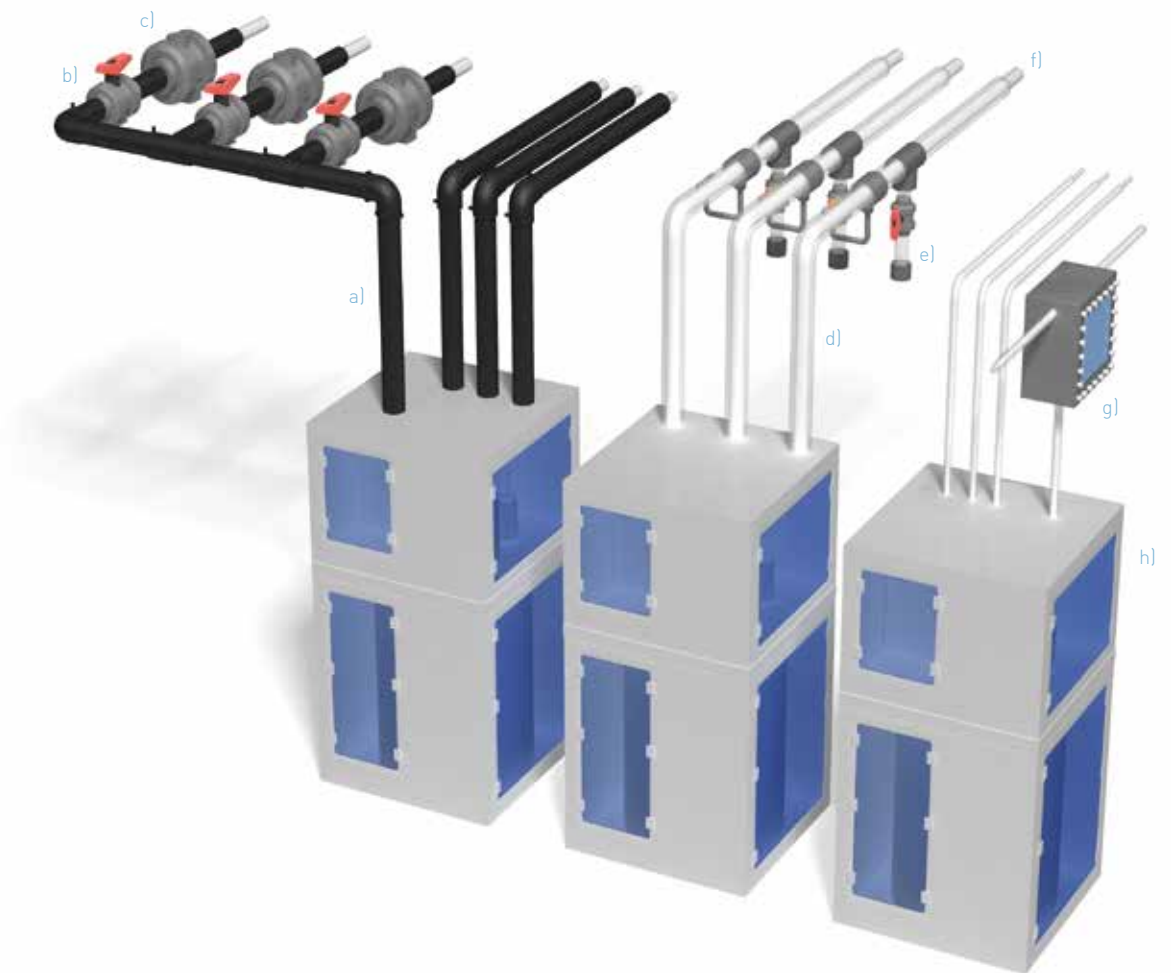
The patented magnetic flow sensor type 2551 (size range: DN15–900 mm) is an insertion sensor without moving parts. All versions are corrosion-resistant to ensure a long service life and minimal maintenance costs. The sensor is also available as a metal version, type 2552 (up to DN2550 mm - 102"-).

Chemical Distribution/Conveyance

Plastic piping systems from GF Piping Systems creating a safe environment in the company

Main Benefits:

Purity	=	No contamination of pure chemicals
Safety	=	Double containment systems for highest safety of operations
Efficiency	=	Lowest initial investment and minimal operating costs
Performance	=	Highest chemical/ corrosion resistance results in zero maintenance



© by +GF+ GEORG FISCHER PIPING SYSTEMS

a) CONTAIN-IT Plus System
b) Ball valve, manual, type 546
c) Mechanical joint

d) SYGEF (PFA) System
e) Monitoring pipe
f) Georg Fischer Harvel PVC-C FM 4910 and PVC-Clear

g) Valve Manifold Box
h) OEM Chemical Distribution Module

Solutions - Chemical Distribution/Conveyance

An overview of the key systems and products

To transport chemicals from a storage tank to the areas of use, we need pumps and pipe systems. The material selected for the transport lines, storage and measurement of chemicals must be compatible with the chemicals' properties. All chemicals must be handled in such a way as to minimize the probability of stress cracking in plastic piping. Double containment systems and special jointing technologies, such as infrared and bead and crevice-free fusion, are additional parameters that should be taken into consideration when selecting the right system. The expert teams at GF Piping Systems advise our customers, at their request, on how to configure the individual system and support them in developing customized solutions.

Purity



SYGEF (PFA) System

Leak-free high purity system solution for superior purity performance in microelectronics applications. Patented features and material properties guarantee minimum particle generation and highest cleanliness. The improved design with the unique triple seal construction and compatibility to Flaretek standard ensure suitability up to 200°C.

Safety



Mechanical joint

Mechanical joints are an economic, simple and fast alternative to conventional pipe jointing techniques such as welding or flanging. As no metal parts are used, no corrosion can occur and the weight of the joint is reduced. The availability of several coupling materials and compatibility with chemicals ensure a flexible use in a variety of applications.

Efficiency



Georg Fischer Harvel Clear PVC pipes* System

The unique range with optimum clarity provides all-round visibility in specialized applications where continuous monitoring is required. Due to exceptional corrosion and chemical resistance, smooth interior walls and its non-contaminating nature, the clear system is ideal for double containment pipes.

Performance



Ball valve type 546

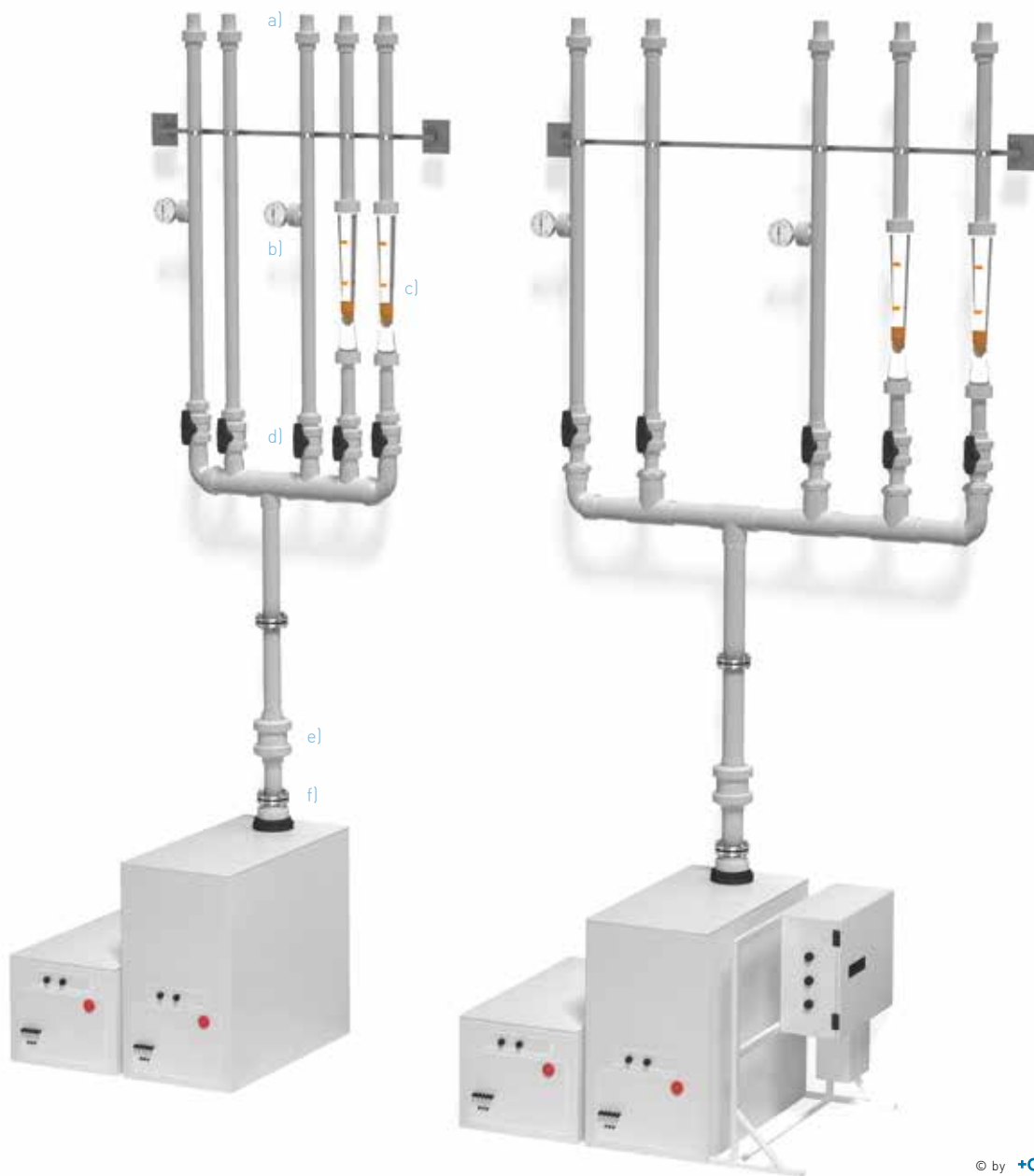
Quality, design and innovative features make this ball valve unique. A modular system and compact design with many connection options ensure maintenance-free operation. It is also available in a 5-series diaphragm valve configuration.

* Sch40/Sch80

Process/ House Vacuum

Complete system offering for usage in applications at different vacuum levels down to finest vacuum

Main Benefits:	Purity	=	No metal contamination in clean installation areas
	Safety	=	Advanced jointing technology guaranteeing leak-tight systems
	Efficiency	=	Compliance with < TA Luft/ VDI 2440 > leads to operating cost savings
	Performance	=	Minimum pressure loss owing to smooth surface character



© by +GF+ GEORO FECHER
HPLC SYSTEMS

- | | | |
|--------------------------|---|----------------------------------|
| a) Union jointing | c) Variable area flow meter type 335/350 | e) Ball check valve type 561/562 |
| b) Gauge guard Z 700/701 | d) Ball valve, manual, type 546 with
tee valve, type 546 true union ball valve | f) Flange PP-V, DN50 |

Solutions - Process/ House Vacuum

An overview of the key systems and products

Several applications in microelectronics such as drying, coating, distillation, vaporisation and handling need process or house vacuum systems for the generation of vacuum in levels from low, medium and down to finest vacuum. Depending on the specific application, the production environment or the handling process, different types of vacuum systems, vacuum chambers and pumps are used, fulfilling the particular demanding requirements. GF Piping Systems offers complete process and house vacuum piping solutions with maximum energy efficiency and high-speed operation, ensuring accuracy, safety, velocity and very low pressure loss at the same time.

Purity



PRO-FIT

The innovative and unique socket-spigot system saves labor time, space as well as material and installation costs. Its compact design with up to 20 % closer spacing in axial distances, less cementing effort and reduced material requirements through direct transitions are big advantages that result in a maximum of efficiency.

Safety



Tee valve, type 546 true union ball valve

In applications where continuous flow system operation is critical, the innovatively designed tee valve provides required safety and strength features as well as significant savings regarding installation time and labor expenses. By combining valve, tee and plug into one assembled unit, one benefits from a strong and equally convenient connection.

Efficiency



Ball valve type 546

Quality, design and innovative features make this ball valve unique. A modular system and compact design with many connection options ensure maintenance-free operation. Besides its cost-saving and long-lasting operative usage, the ball valve offers absolute leak-proofness and is fully compliant with legal requirements according to VDI 2440 (TA Luft).

Performance



Variable area flow meter type 335 /350

The large range of these radially dismountable measurement devices opens the way for a wide array of uses with diverse media. For example, the type 350 is available in the installation length 350 mm. The great advantage of the variable area flow meter is the easy-to-read measured value without electrical connections.

Further Applications in the Microelectronics Industry

Being subject to constant change, the fast growing microelectronics industry with its multitude of demanding application areas and high material requirements has a definite need for safe, reliable, efficient and economical plants, components and piping systems. For over 50 years GF Piping Systems has enjoyed considerable success in developing application-oriented system solutions for such challenging tasks.

Industrial Grade Water



Industrial water is a specification category under deionized water. Potable water is produced in a number of steps, for example filtration, decalcification, neutralization and desalination. Industrial water complies with specific criteria, may however contain certain bacteria and impurities per specification.

Air Cleaning (Gas Scrubber)



Exhaust gases must be cleaned before being released into the atmosphere. Harmful substances are washed out by spray capture techniques so that the clean gas rises and can be emitted. Regardless the type of gas, a combination of chemicals is used to neutralize the harmful substances. GF Piping Systems offers a complete solution, perfectly adapted to customer needs.

Wet Bench Process Tools (OEM)



More than 50 % of the fluids used in wet process tools is ultrapure water. In microelectronics, the ultrapure water or high purity chemicals have wafer contact in at least 20 % of the manufacturing steps. Besides the superior performance in high purity applications, plastic solutions from GF Piping Systems perfectly handle the highly corrosive nature of the used process chemicals.

Chemical Mechanical Polishing/Slurry Process



Chemical mechanical planarization and polishing (CMP) is a wafer flattening and polishing process that combines mechanical buffing with chemical removal. With PROGEF Natural, GF Piping Systems offers a fully welded system solution that meets the demanding customer requirements and can possibly eliminate the need of double containment.

We support our customers in implementing sustainable, future-oriented and well-designed plant concepts with state-of-the-art planning techniques to optimize the technical and economic efficiency of processes. When planning and implementing our individual solutions, factors such as flexibility, quality and reliability particularly set apart our services and guarantee added value for our customers.

Ion Exchanger



In the chemical process industry ion exchangers are primarily used in water treatment, specification and decontamination. The compact design of these installations presumes flexible piping components. GF Piping Systems has the fitting solution for every application, satisfying even the highest standards.

Compressed Air



Compressed air is expensive, which is why the compressed air system must be leakproof and durable over its entire lifetime. To compensate pressure surges, it must be flexible and not transmit vibration. GF Piping Systems has developed safe, efficient and ecological plastic piping systems for this demanding application.

Water Distribution



Connecting mains, supply pipes and hydrants safely and reliably is crucial for water distribution. GF Piping Systems offers a comprehensive package of products that includes typical diameters of 355 mm as well as larger dimensions with an average pressure of 6.0 bar, but which can reach 25.0 bar or higher.

Neutralization



In many water treatment processes water needs to be adapted to a pH-value that complies with treatment specifications. Several chemicals or acids are generally used directly or in combination with a precipitation of soda solution. GF Piping Systems with its custom-made offer in the field of automation provides high process reliability and efficiency in this cost-intensive area.

Further Applications in the Microelectronics Industry

GF Piping Systems develops application-oriented system solutions that enable profitable operation and are ideally suited for the microelectronics industry.

The specific value-adding services that complement our solutions are as diverse as our customers and their individual requirements.

Membrane Technology (Ultrafiltration, RO)



The future-oriented and energy-efficient technology includes diverse chemical-free filtration techniques all based on different degrees of membrane porosity. It is increasingly implemented to harvest drinking and process water from surface- and seawater. GF Piping Systems offers the right solution to set up efficient, safe and economical conduits.

Dosing / Dilution



Dosing and/or diluting chemicals require highly specialized and reliable workflows, especially with aggressive chemicals. Concentrated chemicals in small amounts are dosed in-line or through a static mixer. GF Piping Systems offers a plastic system with a selective combination of pressure control valves, flow meters and control instrumentation, easily constructed to customer specifications.

Cooling Towers



Cooling towers and heat recovery systems are basic components in every cooling and refrigeration plant. Because of outdoor installations, the piping system has to contend with certain conditions, e.g. temperature fluctuation, UV radiation and static restrictions. GF Piping Systems has the answer: the COOL-FIT ABS system.

Media Filtration



In multilevel filtration processes, sand, anthracite or stones can be used to remove particles from fluids. These processes require valves and actuators as well as measurement and control technology. Application-oriented system solutions from GF Piping Systems help to realize these needs efficiently.

In alignment with the demanding customer and industry specific requirements we offer a variety of applications. In an optimal way they fit in the process structure of the overall system and thereby fulfill the claimed high quality and performance standards uncompromisingly when it comes to meeting them.

Water Transport Lines



Water transport pipelines bring water from the source to the point of use. Plastic pipelines are an optimal solution here because they are laid quickly and are also safe and corrosion-free. All the components from GF Piping Systems can be joined together reliably and cost-effectively.

Industrial Cooling Water



Cooling takes place in most industrial processes; either the medium is cooled directly in the process or indirectly via secondary cooling of the process environment. GF Piping Systems offers corrosion-free, complete solutions with low heat loss.

References - Ultrapure Water / Hot Ultrapure Water

SYGEF Plus system solutions ensuring highest purity in high-end water applications of the semiconductor industry

One of the world's largest foundries supplying advanced semiconductor technologies is relying on SYGEF Plus, the industry benchmark piping system for UPW conveyance to sustain the advanced requirements in production.

Project background

A state-of-the-art system that manages the enormous complexity of UPW conveyance for 24/7 semiconductor manufacturing was the main project specification. This included the assurance of a continuous and safe supply of UPW, but also a reliable return flow and water treatment.

Consistently high water quality

The SYGEF Plus piping system, covering a very large diameter range up to 450 mm, as well as the respective jointing technology ensured highest purity and consistent water quality. The fluoropolymer production under clean room conditions, the integrative control encompassing all manufacturing stages and quality criteria as well as compliance with international norms, such as SEMI, SEMATECH, ISO and DIN, were the basis for the high performance level required.

Absolute cleanliness in installation

Having safe, clean pipes and fittings is only half of the equation needed for successfully commissioning a UPW



Safe and reliable supply of ultrapure water with SYGEF Plus system solution.

system. The selected IR-fusion technology developed and time-tested by GF Piping Systems enabled contamination-free and precise installation via non-contact heating. The overlap feature eliminated variation of bead sizes and joining force inconsistencies due to pipeline drag forces. Professional support and training rounded off the project.

Main benefits of our solution

- Global support and training

- Completely controlled high purity manufacturing processes
- Comprehensive quality assurance
- 100 % process repeatability
- Highest flow coefficient (Kv)
- Minimum pressure loss

System and product selection

- SYGEF (PVDF) Plus piping system
- High purity pipes
- 5-series diaphragm valves
- IR-Plus welding technology
- Automation system

References - Ultrapure Water / Hot Ultrapure Water

SYGEF Plus system solutions ensuring highest purity in high-end water applications of the semiconductor industry

Offering one of the industries broadest product portfolios and serving all electronics segments, STMicroelectronics (STM) is among the world's largest semiconductor companies.

The state-of-the-art semiconductor plant of STMicroelectronics in Agrate, Italy, is a leading integrated device manufacturer with key strengths in multimedia, power applications, innovative semiconductor solutions and sensing technology. Manufacturing sites, sales offices as well as advanced research and development centers are located all around the world, making STM a global partner for the semiconductor industry.

Project background

One of STMicroelectronics principal wafer fabs is presently located in Agrate Brianza, Northern Italy. For successfully managing the 24/7 ultrapure water conveyance in the state-of-the-art wafer manufacturing plant, STM decided upon the reliable and competitive ultrasonic flowmeter from GF Piping Systems. The flowmeter complemented the previously installed SYGEF Plus piping system from GF Piping Systems, assuring the safe UPW supply and return flow.

Contamination free flow measurement

The main goal of the project was to implement a precise, non-intrusive flow measurement device into a continuously operating high purity piping system without impacting the ongoing semiconductor production. After the positive technical qualification of the UF3000 Ultrasonic Flowmeter from GF Piping Systems, the device was installed without any problem and is working properly.

Completely controlled processes

With the Ultrasonic Flowmeter, the UPW volumes required for semiconductor manufacturing can be monitored accurately and the data can be processed in real time. Adding the measurement and control device to the already existing and high purity piping system made up a really complete system solution. Thereby, STMicroelectronics benefited from GF Piping Systems acting as an one stop supplier.

Main benefits of our solution

- Complete system solution
- One stop shopping
- Competitive pricing
- Competent service and training
- Fine tuned to plug-and-play to the existing SYGEF Plus system

System and product selection

- SYGEF (PVDF) Plus system
- High purity pipes for UPW loop
- IR-Plus welding technology
- Non-intrusive Ultrasonic Clamp-on-Flowmeter U3000



Precise flow measurement and accurate monitoring in high purity applications.

References - DI Water / Specified Water

Advanced solutions for clean water processing that guarantee defined and specified water qualities

Characterized by its rapid development - from one of the world's largest solar cell manufacturers to a leading photovoltaics company within a few years - our customer offers an extensive portfolio, covering solar cells, crystalline and thin-film solar modules as well as complete photovoltaic systems. Developed and produced in Germany and Malaysia, the advanced products are marketed worldwide through a global network of distributors. This close integration of research, development and production is the decisive fundament for its position as a technology leader.

Project background

To meet the challenging goals and timeline to setting-up a gigawatt scale photovoltaic cell production plant in Malaysia, a reliable partner supplying piping systems for specified water conveyance was a key success criteria for the photovoltaic manufacturer. Having long years experience in continuously meeting the water specification requirements for high volume manufacturers' plants in the photovoltaic cell production, GF Piping Systems was selected to be the right project partner.

High quality total plastic solution

Considering the remote location of the greenfield project and the demanding timeline required to meet the increased market demand for crystalline photovoltaic cells, an one stop solution out of high quality plastics for fast and problem-free FAB ramp-up was offered.

Clean system

Besides reliable supply and fast ramp-up, meeting the technical water



Highly specified water system for clean water processing.

specifications was a main project concern. In view of the challenging and competitive environment in photovoltaic production, the PROGEF Plus system was suggested. Not only offering safe components and jointing technology, but also guaranteeing the technical performance level defined in the relevant standards. Looking at TOC, PROGEF Plus system is the perfect choice offering minimum leach out values and flushing time compared to any PVC clean system.

Main benefits of our solution

- Defined quality guidelines
- Reproducible jointing technology
- Minimum TOC thanks to completely controlled thermally welding
- Full compliance to related standards e.g. SEMI PV3-0310

System and product selection

- PROGEF (PP) Plus system
- Diaphragm and butterfly valves
- IR-Plus welding technology
- Automation system

References - Process Cooling Water (PCW)

Non-corroding piping systems reliably supplying high-tech manufacturing processes with temperature controlled water

The global solar technology corporation, headquartered in Germany, is one of the world's largest producers of high-purity multicrystalline silicon wafers. Operating in business areas such as solar cell, solar wafer and solar module production, recycling and processing of various silicon materials as well as research and development activities, the leading solar manufacturer covers the entire solar value and production chain.

The supplier is internationally renowned for highly efficient photovoltaic applications, its technological innovations and for running one of the most modern and efficient production facilities worldwide. More than 800 employees daily contribute to the sustainable success and the leading market position by comprehensively serving the solar market.

Project background

The producer of high-purity multicrystalline silicon wafers was looking for an experienced partner, providing a non-corroding industrial piping system for reliably supplying high-tech manufacturing processes in a photovoltaic application with temperature controlled water.

The alternative to steel systems

GF Piping Systems was selected since numerous, successful references for process cooling water applications in the industry worldwide showed the company's expertise and experience. The economical PE100 and ELGEF systems together with the related jointing technology and the corresponding training packages convinced the client to go with a plastic piping system. Plastics score particularly well because of low weight and corrosion resistance as well as contamination and incrustation prevention, which pays off in the areas of installation and processing and therefore offers significant advantages against comparable steel

solutions. The used PE100 system ranges up to and including 12" PCW lines together with special lateral saddle connections.

Main benefits of our solution

- Corrosion-free piping systems
- Avoidance of metallic contamination in clean manufacturing areas
- Low heat conductivity resulting in minimum heat loss
- No incrustation

- Reduced maintenance costs and long system life cycle
- Reduced risk of water hammer due to highly flexible plastic pipes

System and product selection

- PE 100
- ELGEF system
- Ball valves and butterfly valves
- Automation system
- IR-Plus, butt fusion and electrofusion welding technology



Non-corroding piping solutions for process cooling water systems in high-tech manufacturing.

References - Specialty Waste

Cost-effective solutions for safely conveying corrosive fluids

As a leading manufacturer of plants for process and ultrapure water treatment as well as for waste water treatment and water and recyclable material recovery, Hager + Elsässer is a highly competent partner for all industries with water needs. Based in Germany and part of the SH+E GROUP, Hager + Elsässer offers construction, modernisation and alteration services for water and waste water treatment plants. With integrated and customized solutions for complex engineering processes, including high-purity applications, Hager + Elsässer is able to offer holistic project support.



International leading supplier for process, ultrapure and waste water treatment.

Project background

The high complexity of state-of-the-art manufacturing processes increases the demands for related waste water treatment and recycling systems. In the installation of a plant for process, ultrapure and waste water treatment, Hager + Elsässer relied on a total plastic solution from GF Piping Systems, combining benefits such as absolute resistance against corrosive media with highest efficiency.

Process reliability and efficiency

Plastic piping systems of highest chemical and corrosion resistance resulting in zero maintenance were a key advantage to reliably sustain the manufacturing uptime 24/7 and to manage related treatment and recycling processes. Depending on the waste stream and chemicals used, GF Piping Systems offered - all from one source - a complete solution in PROGEF (PP), PVC-U, PVC-C, PE100, ELGEF, double containment, available in DIN and ASTM standards, meeting the technical and also the economical needs. Together with the long experi-



State-of-the-art industrial waste water treatment system.

ence in chemical compatibility, GF Piping Systems was able to guarantee a long system lifetime and to offer the most economical solution. Besides the high product quality, H+E appreciated the environmental benefits of the plastic solution, which met all the environmental standards required.

Main benefits of our solution

- Chemical and corrosion resistance
- Highest maintenance savings
- Reduced environmental impact due to avoided chemical contamination

- Leak-tight systems for secure handling of aggressive chemicals
- No need for passivation
- 50 % reduced welding time compared to steel systems

System and product selection

- PROGEF (PP) Standard system
- PVC-U, PVC-C, PE 100, ELGEF
- Double containment systems
- Ball, diaphragm and butterfly valves
- IR-Plus, butt fusion and electrofusion welding technology
- Automation system

References - Chemical Distribution/Conveyance

Complete plastic systems from GF Piping Systems ensure absolutely reliable conveyance of aggressive chemical media

Being a pioneer in the solar industry, the internationally renowned producer of silicon materials, wafers, cells and solar modules serves the needs of customers in the photovoltaics, semiconductors and microelectronics industry.

Acting across the value chain, with a broad market presence, the customer of GF Piping Systems delivers high performance solar energy solutions worldwide. Headquartered in Norway and with production facilities and sales offices in the key solar energy markets in Europe, in the USA and in Asia, the manufacturer confirms its global approach and its position of being one of the largest producers worldwide.

Project background

A reliable and chemical resistant piping system is indispensable to ensure safe chemical distribution processes in an integrated photovoltaic wafer, cell and module plant. To achieve the highest standard of reliability and process safety, the customer decided for GF Piping Systems as implementation partner, offering a high quality plastic solution for the demanding chemical conveyance system.

Successfully facing the challenges of a chemical environment

Chemical media such as hydrofluoric, sulfuric, nitric, phosphoric or acetic acid are among the acids used in the production plant. Due to the highly corrosive nature of many of these media and compounds, metal piping was not a real option. Only a few precious metals, high-alloy steels or special non-ferrous alloys would have been suitable. High conductivity and the formation of galvanic elements are ultimately responsible for the dreaded pitting corrosion. Plastics,

however, are practically predestined for such use, also because they are more economical and easier to process. GF Piping Systems provided the proper material solution with excellent life span expectations even at elevated temperatures. Products made of PVDF, PVC-U, PVC-C, PE and PP-H represented the right solution for the application requirements.

Main benefits of our solution

- No risk of contamination

- Highest operational safety
- Lowest initial investment and minimal operating costs
- Chemical and corrosion resistance
- Minimum maintenance expenditure

System and product selection

- PVC-U, PVC-C, PVC-Clear
- SYGEF PFA system
- Double containment systems
- Ball valves and diaphragm valves
- IR-Plus, butt and electrofusion
- Automation system



Advanced systems for highest operational safety and efficiency.

References - Process / House Vacuum

Complete systems for use in low-pressure applications down to finest vacuum

One of the world's largest foundries supplying advanced semiconductor technologies relies on complete process and house vacuum solutions in PVC-U with maximum energy efficiency.

Project background

State-of-the-art semiconductor fabs comprise an enormous number of various piping systems to convey the different media for the very demanding production processes. The defined requirements of the house-/process vacuum system were to guarantee 24/7 operation and to meet minimum leakage rate paired with fast, safe installation and start-up.

Total plastic solution

GF Piping Systems could make-up the total plastic solution package by supplying the process-/house vacuum application in addition to the UPW, specified water, cooling water, chemical distribution and waste systems. Thereby, the main advantage was the high technical performance level of the products eg. TA Luft VDI2440 paired with ontime delivery, technical service, leak-tight jointing and training during on site installation.



Reliable vacuum installation for maximum energy efficiency and high-speed operation.

Economical operation

Furthermore, due to the smooth surface roughness and high tightness of the system, the end customer benefited from lower costs of ownership during operation.

Main benefits of our solution

- No metal contamination in clean installation areas
- Advanced jointing technologies guaranteeing leak-tight systems
- Compliance with TA Luft (Technical Instructions on Air Quality Control)

- Substantial operating costs savings
- Minimum pressure loss thanks to the smooth surface character of plastic piping systems

System and product selection

- PVC-U solvent cemented piping systems and fittings
- 5-series ball and diaphragm valves
- Gauge guards
- Automation system

Global Company – Worldwide at Home

Products and systems are ideally adapted to customer needs

The name Georg Fischer stands for innovation, reliability and longevity – and has done so for over 200 years. Our global presence ensures customer proximity worldwide. Our sales subsidiaries and partners in over 100 countries offer complete solutions from one source, which include technical advice and planning services as well as training. Our distribution centers have built up an organized network over the years and customers highly appreciate our on-time deliveries. As a system provider we are also glad to develop individual solutions for our customers. On request, our global customizing teams put together tailor-made, individual piping components according to customer specifications – whether as a small series or one-off production.

Everything from one source

Individuality – from the planning stage to installation.



Pipes



Fittings



Manual valves



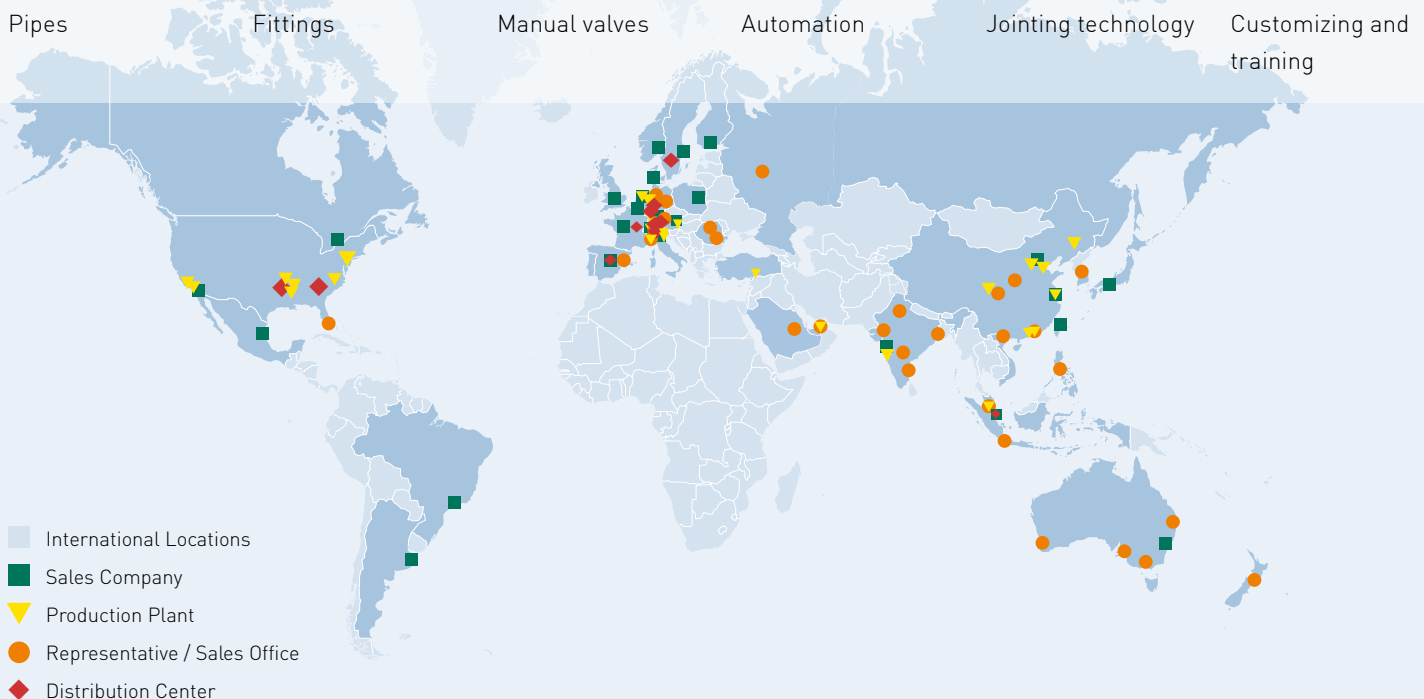
Automation



Jointing technology



Customizing and training



Value Added Services

From planning support to implementation – our specialists are always close by

As a leading provider of piping systems in plastic and metal, we offer our customers not only reliable products, but also a large package of services. Our support ranges from a comprehensive technical manual or the extensive CAD library to an international team of experts, who work closely together with local sales companies. And when it comes to implementing a project, our customers additionally benefit from a wide range of training courses, either on site or in our modern training centers worldwide.



Technical support

Technical support and material selection are key factors for a successful installation. A team of specialists headquartered in Switzerland is available to support the sales companies of GF Piping Systems around the world. For technical advice or for general information, our customers are supported individually by the specialist team in the corresponding sales company.



Chemical resistance

Our specialist teams have decades of experience in the area of chemical resistance. They can offer individual support and advice in selecting the right material for the corresponding system solution. On request, a team will examine and select the appropriate material for special applications.



Training courses

GF Piping Systems offers a wide range of training courses that allow participants to gain confidence in working with our products and proven jointing technologies. The practical training is clearly defined, structured and adapted to the various levels of participants' experience.



On-site training

Our experts are available to support our customers locally and conduct training in diverse fusion and jointing techniques on location. The duration and structure of the training depends on the project and the system being installed.

Generating a genuinely individual added value for our customers is our ultimate goal when implementing our tailor-made solutions. With our application knowledge and product expertise, we support our customers during the planning process, the sustainable realization of the projects and the provision of services. Our expertise in developing and producing piping systems, combined with our profound industry and market knowledge based on longstanding experience, makes us a qualified and professional partner for our customers.



CAD library

The extensive CAD library is the most frequently used planning tool from GF Piping Systems. The database comprises over 30 000 drawings and technical data regarding pipes, fittings, measurement and control technology as well as manual and actuated valves. The big advantage of the CAD library is that the data can be integrated directly in CAD models.



Online and mobile calculation tools

Our numerous, multilingual online calculation tools are very useful for configuring and calculating. By means of pressure /temperature diagrams, the pressure of liquid media recommended for pipes and fittings at various temperatures can be easily defined. FlowCalc App, the mobile application of GF Piping Systems, is an on-site planning tool for pipe diameter and flow velocity calculation to select the right dimension of piping systems when no expert is nearby.



Technical manual

We have documented the extensive know-how of GF Piping Systems in planning and installing plastic piping systems in our technical manual for customers. This detailed documentation is available in both printed and digital versions. The established reference book is helpful in planning large and small projects.



Customizing

The customizing teams at GF Piping Systems work closely together around the globe. The focus of these teams is to manufacture custom parts for special systems. In addition, a variety of special solutions can be produced in small series. Standardized processes guarantee the highest level of quality for the individual solutions of our customers.

For more information go to www.gfps.com

System Overview

Our products bring a system to the applications of our customers

Plastic piping systems are ideal for use in microelectronics. Plastics do not form galvanic elements and are not conductive. GF Piping Systems with its comprehensive product range offers its customers high product reliability in combination with jointing technologies proven over time in practice. Customized solutions are also available on request.



SYGEF Plus and Standard System

Polyvinylidene fluoride, fuseable (socket, butt, IR-Plus and BCF-Plus fusion), excellent chemical resistance.
Dimensions: 16–450 mm
Temperature: -20 °C – + 140 °C



PROGEF (PP) Systems

Polypropylene, socket, butt and BCF-/IR-Plus fusion.
Dimensions:
PROGEF Standard 16–500 mm
PROGEF Plus 20–315 mm
PROGEF Natural 20–63 mm
Temperature: -10 °C – + 80 °C



PVC-U System

Solvent cementable plastic, universal use, good chemical resistance, easy to join with special adhesives.
Dimensions:
6–400 mm / 1/4–16 inch*
Temperature:
0 °C – + 60 °C / 32 °F – + 140 °F*



PE100 System

Fuseable plastic (electro, socket, butt and IR-Plus fusion), UV and impact resistant.
Dimensions: 20–1 200 mm
Temperature: -50 °C – + 60 °C



PVC-C System

Solvent cementable plastic, universal use, good chemical resistance, easy to join with special adhesives.
Dimensions:
16–225 mm / 1/4–12 inch*
Temperature:
0 °C – + 80 °C / 32 °F – + 210 °F*



CONTAIN-IT Plus System (CONTAIN IT System**)

Double containment pipe system for extra protection when hazardous media is conveyed.
Dimensions: 20/50–225/315 mm
Temperature: -40 °C – + 140 °C



FUSEAL System

Joined mechanically or electrofusion system. FUSEAL is flame-retardant and can be used for double containment pipelines.
Dimension range: 1 1/2–12 inch



ABS System

ABS cementable, excellent low-temperature resistance, high impact strength, easy to join with special adhesives.
Dimensions: 16–315 mm
3/8–8 inch
Temperature: -50 °C – + 60 °C

* Sch80

** CONTAIN IT System:

Containment piping system for existing single wall system containment.

Dimensions: 4 inch and 6 inch

Inner pipe containment range: 1/2–4 inch IPS and copper, 20 mm–110 mm

Temperature: 32 °F – + 140 °F

Joining Technology

The material, application and medium are key criteria for selecting the right joining technology

GF Piping Systems offers diverse methods of joining technology with which the same as well as different materials, pressure ratings and dimensions can be joined together. The materials selection ultimately decides the method of joining. For example, piping systems made of PE, PROGEF (PP), PB and SYGEF (PVDF) are fusion joined, while piping components made of PVC-U, PVC-C and ABS are in principle only cemented.

Joining technology

Joint cross-section

Macro-image

**IR-Plus fusion –
the clean connection**



**BCF-Plus fusion –
the smooth connection**



**Butt fusion –
the connection for larger
dimensions**



**Electrofusion –
the easy connection**



**Socket fusion –
the strong connection**



**Solvent cementing –
the fast connection**



**Mechanical joints –
the quick connection**



Benefits of Plastic

A lifetime of consistent performance

The big advantage of plastics compared to metals is that there is no electro-chemical corrosion. In addition to this, plastic is lighter than other materials. Moreover, the outstanding chemical resistance of plastic, especially when conveying highly aggressive or pure media, has a positive impact. The «Total Plastic Solution» from GF Piping Systems ensures safety in all applications. Safe and reliable processes and workflows achieved through the use of plastic piping systems translate into consistently high efficiency for our customers over the entire lifetime of their operations.



Metal pipes

High density

- ▶ Crane required to position
- ▶ Pipe brackets far apart
- ▶ High anchoring forces, strong supports

Thermal conductivity

- ▶ Insulation required for preventing energy loss
- ▶ Condensation causes corrosion

Electrical conductivity

- ▶ Risk of contact corrosion

Chemical resistance

- ▶ Poor resistance to acids necessitates use of alloys – costly



Plastic pipes

Low density

- ▶ Can be carried by hand up to d110
- ▶ Short distances between brackets
- ▶ Low anchoring forces, easy and economical

Low thermal conductivity

- ▶ Little heat conducted due to thermal insulation
- ▶ Low condensation build-up and high chemical resistance prevent corrosion

No electrical conductivity

- ▶ No corrosion

High chemical resistance

- ▶ In combination with the right jointing technology, a minimum service lifetime of 25 years is realized

Technical Information

The right material for every medium



Processing plants in the highly resistant plastic PVDF.



Process cooling system in PVC-U in a cable cooling station.



Less weight means easier handling on building sites, even for large dimensions.

Chemical resistance at 20 °C (Applications can be very dependent on the concentration)		Amorphous thermoplastics		Partially crystalline thermoplastics				Stainless Steel	
Media	Chemical Examples	PVC-U	PVC-C	PE100	PP	PVDF	PFA	1.4401 316	1.4301 304
Oxidizing Acids (HNO ₃ , H ₂ CrO ₄ , H ₂ SO ₄ etc.)	HNO ₃ ≤ 25 %	+	+	0	0	+	+	0	0
	25 % ≤ HNO ₃ ≤ 65 %	0	+	0	-	+	+	0	0
	H ₂ CrO ₄ aqueous solution	0	0	0	0	+	+	0	0
	H ₂ SO ₄ ≤ 70 %	+	+	+	+	+	+	-	-
	70 % ≤ H ₂ SO ₄ ≤ 96 %	+	+	-	-	+	+	-	-
Non Oxidizing Acids (HCl, HF etc.)	HCl ≤ 30 %	+	+	+	+	+	+	0	-
	HF ≤ 40 %	+	-	+	+	+	+	0	-
	40 % ≤ HF ≤ 75 %	-	-	+	+	+	+	-	-
Organic (formic acid, acetic acid, citric acid etc.)	HCOOH ≤ 25 %	+	+	+	+	+	+	0	-
	25 % ≤ HCOOH ≤ tech. pure	+	-	+	+	+	+	0	-
	CH ₃ COOH ≤ 50 %	+	+	+	+	+	+	0	-
	50 % ≤ CH ₃ COOH ≤ tech. pure	0	-	+	+	+	+	0	-
	C ₃ H ₇ OH(COOH) ₃	+	+	+	+	+	+	0	-
Bases	Inorganic (NaOH, KOH, etc.)	+	0	+	+	-	+	+	+
	Organic (amine, imidazole etc.)	0	-	+	+	-	+	0	0
Salts	NaCl, FeCl ₂ , FeCl ₃ , CaCl ₂ , etc.	+	+	+	+	+	+	0	0
Halogens	Chlorine, bromine, iodine, (no fluorine)	0	0	-	-	0	+	0	-
Fuels/Oils	Aliphatic hydrocarbons	+	0	0	0	+	+	+	+
	Aromatic hydrocarbons	-	-	-	-	+	+	+	+
Solvents	Chlorinated hydrocarbons	-	-	-	-	0	+	0	0
	Ketones	-	-	+	+	0	+	+	+
	Alcohols	0	-	+	+	+	+	+	+
	Esters	-	-	0	0	0	+	+	+
	Aldehydes	-	-	+	+	-	+	+	+
Phenols	Phenols, Cresols etc.	-	-	+	+	+	+	+	-
Oxidizing agents	NaOCl, ozone, etc.	0	0	-	-	-	+	0	0

+ resistant

o conditionally resistant, please consult us

- not resistant

Please note: The above list is only intended as a guideline and does not replace an in-depth review of material suitability for the particular application. The information is based on our experience and is state of the art. These data are general indicators only. In practice, however, other factors such as concentration, pressure and jointing technology must also be taken into consideration. The technical data are not binding and are not expressly warranted characteristics of the goods.

Please contact us for help in selecting the right materials.

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