



# List of abbreviations

ANSI	American National Standard	Tg	Malleable Iron
ASTM	American Society for Testing and Materials	d	Pipe outside diameter
BS	British Standard	FM	Fusion Method
DIN	Deutsche Industrie-Normen	DN	Nominal diameter
ISO	International Standardization Organisation	PN	Nominal pressure at 20°C, water
ABS	Acrylnitril Butadien Styrene	kg	Weight in kilograms
PVC-U	Polyvinyl Chloride unplasticized	g	Weight in grams
PVC-C	Polyvinyl Chloride chlorinated	SP	Standard pack. The figure given indicates the quantity of fittings contained in a standard pack
PP	Polypropylene, heat stabilised	GP	Gross pack. The figure given indicates the quantity of fittings contained in a gross pack
PP-N	Polypropylene, Random copolymer unpigmented	G	Pipe thread, not pressure tight in the thread to ISO 228/1
PE	Polyethylene	NPT	Taper male thread pressure tight in the thread to ANSI B 1.20.1
PVDF	Polyvinylidene fluoride	R	Taper male thread, pressure tight in the thread to ISO 7/DIN 2999/1
EPDM	Ethylene Propylene Diene Monomer	Rc	Taper female thread, pressure tight in the thread to ISO 7/1
FKM	Fluorine Rubber, e.g. Viton®	Rp	Parallel female thread, pressure tight in the thread to ISO 7/DIN 999/1
NBR	Nitrile Butadiene Rubber	Tr	Trapezoid thread
IIR	Butyl Rubber	SC	Size of hexagon bolts
CSM	Chlore Sulphonyl Polythene, e.g. Hypalon®	s	A/F
CR	Chloroprene Rubber, e.g. Neoprene®	e	Wall thickness
PROGEF	GF of PP	AL	Number of bolt holes
PTFE	Polytetrafluorethylene, e.g. Teflon®	®	Registered trade-mark
UP-GF	Unsaturated polyester resin glassfibre reinforced		
St	Steel		
Ms	Brass		

# Building the lifelines of the world

GF Piping Systems is the global expert for the safe and reliable transportation of water, chemicals, and gas. The maintenance-free and long-lived piping systems made of plastics help implement vital applications of our customers faster, more cost-effectively and more sustainably. GF Piping Systems supports its customers throughout all phases of their projects from planning to commissioning.

## + Maintenance-free plastic

Piping systems made of plastics are maintenance-free, light and very durable. They help reduce repair and overall costs and are suitable for the transport of drinking water, abrasive and aggressive liquids, as well as gas.

## + Complete system solutions

With more than 60'000 products, GF Piping Systems can offer complete system solutions. In addition, custom-made special parts and special series are also possible. Customers benefit from perfectly matched solutions from a single source.

## + Local support

GF Piping Systems has its own sales companies in 31 countries, which means it is always by its customers' side. Our production sites in 36 locations in America, Europe, and Asia ensure sufficient availability and quick, reliable delivery.

## + Service in all project phases

GF Piping Systems supports its customers both in the initial switch from metal to plastic and in retrofits – across all project phases. They benefit from more than 60 years of experience in plastic systems and application knowledge from 100 countries.

## + Partner for digitization

With its advanced automation and digitization solutions, GF Piping Systems allows its customers to optimize their applications and gives them easier access to their system data. Digital tools support you in every phase of the project.

## Facts and figures

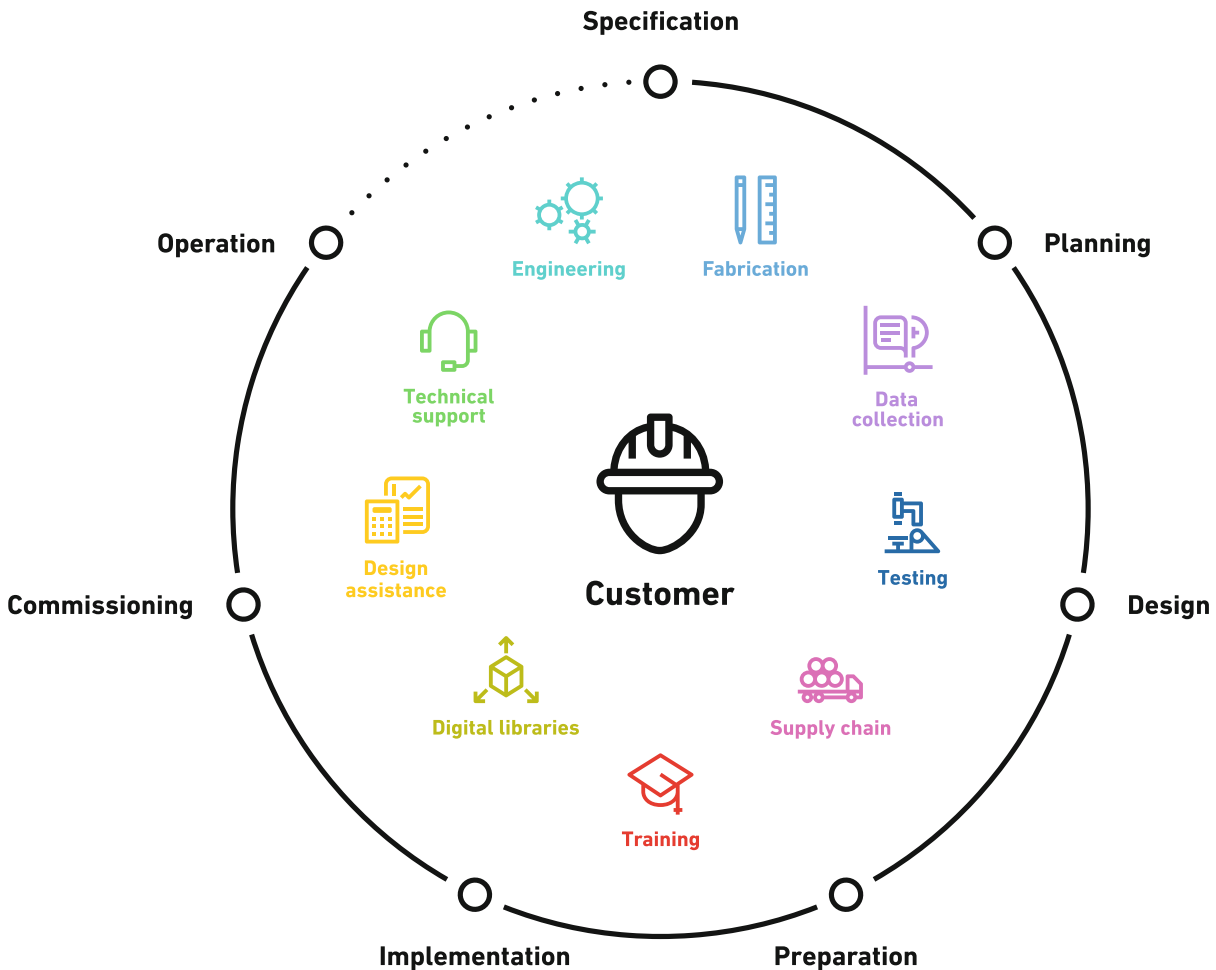
- **Established:** 1802 (Georg Fischer AG) in Schaffhausen, Switzerland
- **Locations:** 31 countries with own sales offices
- **Turnover:** CHF 1.7082 billion (2020)
- **Employees:** 6'893 (2020)



The GF Piping Systems plant in Schaffhausen, Switzerland.

# One partner from planning to commissioning

With Specialized Solutions, the global leader GF Piping Systems provides project support every step of the way to achieve construction excellence. Allowing owners and planners to concentrate on their daily business without interruption.



### Ready when you are

With Specialized Solutions, GF Piping Systems supports the design and installation of state-of-the-art plastic piping systems so that owners and planners can concentrate on their daily business without interruption. GF Piping Systems is present every step of the way, from providing planning support on new projects to testing the condition of old systems.

### Cooling Tool-box

The cooling calculation tool from GF Piping Systems supports the dimensioning and design of the secondary circuit. The cooling calculation tool includes calculation functions for expansion and contraction, energy-saving, surface temperatures, pipe dimensioning, pressure losses, CO<sub>2</sub> footprint, and many more.

### Custom product design

With your individual needs and application in focus, our customizing teams forge the solution that best fits you, developing custom-made parts to complete systems or special solutions produced in small series, individual consulting, and off-site prefabrication. We offer a wide range of comprehensive solutions through our global network of flexible locations. Tailored innovation, inspired by you.

### Digital libraries

The libraries cover three key areas for designing, creating, and maintaining a project: Building Information Modeling, the Plant Design Software, and the CAD Library helping you reduce costs and construction times while ensuring design accuracy and integrity. Reduce time and effort while ensuring design accuracy and integrity.

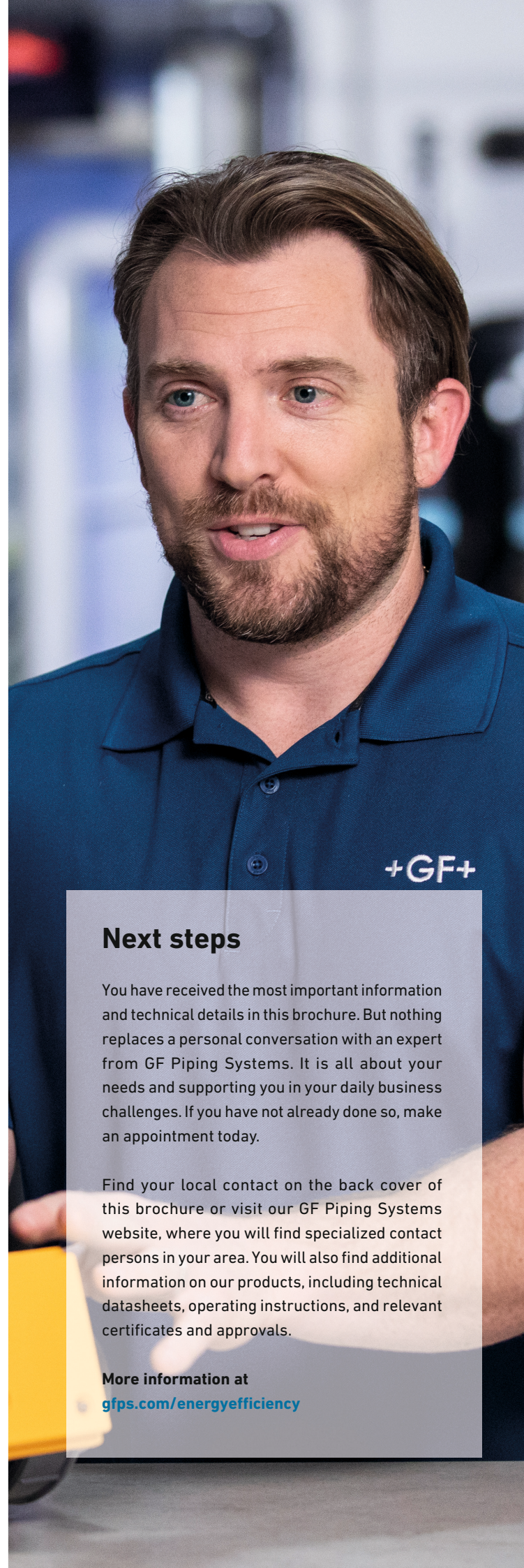
### Engineering

Increase the efficiency of your project with tailor-made analysis packages from GF Piping Systems that help minimize project risks by diminishing incorrect calculations or wrong material selection. Rely on GF's experience in fast project implementation and choose our durable, safe, and reliable piping systems delivery. Established knowledge, guiding you through.

### Instructional and virtual reality training

Installers can master installation techniques related to our portfolio in a safe environment using our instructional courses or our pioneering virtual reality training modules. With each module, your team of installers can become better prepared for the experience of being on-site, welding, and installing our world-leading piping systems.

More information at  
[gfps.com/specialized-solutions](https://gfps.com/specialized-solutions)



## Next steps

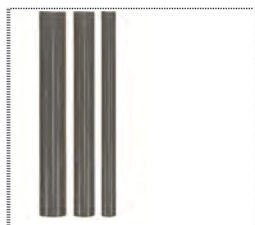
You have received the most important information and technical details in this brochure. But nothing replaces a personal conversation with an expert from GF Piping Systems. It is all about your needs and supporting you in your daily business challenges. If you have not already done so, make an appointment today.

Find your local contact on the back cover of this brochure or visit our GF Piping Systems website, where you will find specialized contact persons in your area. You will also find additional information on our products, including technical datasheets, operating instructions, and relevant certificates and approvals.

More information at  
[gfps.com/energyefficiency](https://gfps.com/energyefficiency)

## PVC-U Piping System

The piping system made of PVC-U material can be used for operating temperatures in the range of 0 °C to +60 °C. Thanks to outstanding chemical resistance, PVC-U piping systems withstand demanding conditions, particularly during the transport of aggressive media, such as acids, bases and salts. The PVC-U piping system is used primarily in the chemical and textile industries, in water treatment and drinking water purification as well as in vacuum lines.



Pipes



Fittings



Jointing technology



Automation



Valves

### Essential system properties

- Food and drinking water approvals, proven physiological harmless
- First-class solution for aggressive media, such as acids, bases and salts
- Possible compact plant construction using PRO-FIT spigots, sockets, fittings
- Safe and simple joining technologies with low costs for tools and materials

### Most important market segments

- Water treatment
- Chemical process industry
- Marine

### Technical data

Nominal pressure	Up to 16 bar
Temperature range	0 °C to +60 °C
Jointing technology	Solvent cementing
Standards and guidelines <sup>1)</sup>	ISO, EN ISO, BS, DIN, DVS, JIS
Approvals <sup>1)</sup>	DIBt, GOST-R, DGS (ACS), KIWA, CSTB, IIP, ABS, BV, CCS, DNV, GL, LR, RINA, RMROS, BSI, LR

<sup>1)</sup> For additional information about standards, guidelines and approvals, see [www.gfps.com](http://www.gfps.com)

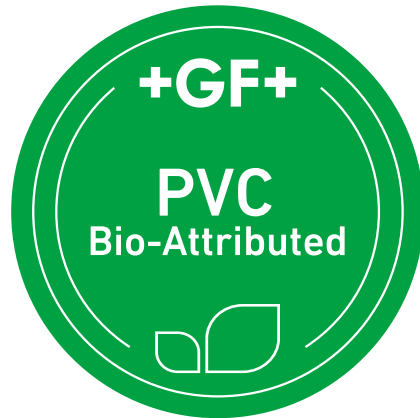


Bio PVC-U

# More sustainable PVC-U piping systems

It is our mission to show our commitment to sustainability, by supporting our customers' success with innovative, energy-saving solutions making the collective global footprint more sustainable. Using bio-attributed raw material for our PVC-U systems, we reduce the CO2 emissions by up to 90%.

- + Each standard pressure pipe, fitting and valve is partially manufactured using this new material.
- + Every installation becomes more sustainable, without the need to change anything in regards to planning, installation or operation.
- + GF Piping Systems marks all relevant products with a new label.
- + All existing approvals (drinking water, food contact, etc.) stay valid.
- + The material has the identical chemical and mechanical properties as conventional PVC-U compounds guaranteed.



Read more about  
GF Piping Systems' PVC-U system



## PVC-U product overview

The following table uses metric units of measure.

Products	PN (bar)	d (mm)	
		DN (mm)	d (mm)
		6	8
		10	12
		16	20
		25	32
		40	50
		63	75
		90	110
		125	140
		160	180
		200	225
		250	280
		300	315
		355	400
		400	
Pipes	16		
	10		
	4		
	6		
Fittings	16		
	10		
	6		
Ball valves	10		
Butterfly valves	16		
	10		
	6		
Check valves	16		
Diaphragm valves	10		
Pressure regulating valves	10		
Flanges			
Gaskets and pipe clips			
Automation			

The following table uses units of measure based on the BS inch system.

Products	PN (bar)	d (mm)																
		3/8"	1/2"	3/4"	1"	1 1/4"	1 1/2"	2"	2 1/2"	3"	4"	5"	6"	8"	10"	12"	14"	16"
	15 - class E																	
	12 - class D																	
	12 - class T																	
Pipes	9 - class C																	
	15 - class E																	
Fittings	9 - class C																	
Ball valves	16																	
Butterfly valves	9																	
Check valves	10																	
Diaphragm valves	10																	
Pressure regulating valves	10																	
Flanges																		
Gaskets and pipe clips																		
Automation																		

For more information about the system specification of PVC-U, visit [www.gfps.com](http://www.gfps.com)



# Polyvinyl chloride, unplasticized (PVC-U)



## PVC-U properties (reference values)

Property	Value <sup>1</sup>	Units	Test standard
Density	1.38	g/cm <sup>3</sup>	EN ISO 1183-1
Yield stress at 23 °C	≥ 54	N/mm <sup>2</sup>	EN ISO 527-1
Tensile e-modulus at 23 °C	≥ 2,700	N/mm <sup>2</sup>	EN ISO 527-1
Charpy notched impact strength at 23 °C	≥ 3	kJ/m <sup>2</sup>	EN ISO 179-1/1eA
Charpy notched impact strength at 0 °C	≥ 2	kJ/m <sup>2</sup>	EN ISO 179-1/1eA
Vicat-heat distortion temperature B/50N	≥ 76	°C	ISO 306
Thermal conductivity at 23 °C	0.15	W/m K	EN 12664
Water absorption at 23 °C	≤ 0.1	%	EN ISO 62
Color	7,011	-	RAL
Limiting oxygen index (LOI)	42	%	ISO 4589-1

<sup>1</sup> Typical characteristics measured at the material should not be used for calculations.



## General

Polyvinylchloride (PVC) is one of the most important and oldest plastics. Worldwide consumption of PVC is exceeded only by PE and PP. PVC was produced for the first time as early as the middle of the 19th century. But an industrial manufacturing process was not patented until the year 1913. Nowadays, many industrial applications could not be implemented without PVC, but PVC has also become irreplaceable in the use of daily products.

PVC is a polymer having approximately 56 % by weight of chlorine. The PVC resin becomes a processable and usable material only by using additives. The choice of the additives allows a wide variation of its characteristics and an adjustment to the planned application. There are two classes of PVC materials. Soft PVC (PVC-P) which is created by adding plasticizers (e.g. phthalates). This type is not used at GF Piping Systems. Hard PVC, also called unplasticized PVC (PVC-U), is used for piping system construction.

PVC-U is an amorphous thermoplastic. The properties of PVC-U molded parts are strongly dependent on the composition of the individual components, but also on the processing. Because of our 65 years of experience in PVC processing and the continuous advancement of our own formulation of materials, GF Piping Systems has become a benchmark in the field of PVC-U piping. Long-term creep strength was tested in long-term tests according to ISO 1167 and calculated according to ISO 9080. According to ISO 12162, our PVC-U types are classified as MRS 25.

## Advantages of PVC-U

- Versatility of use
- Very good chemical and corrosion resistance
- Proven physiological harmlessness and therefore suitable for contact with food
- No influence on drinking water quality
- Biologically inert; no support of microbial growth
- High mechanical tensile strength
- Secure solvent cementing using Tangit
- Use of tin stabilizers for fittings and valves



### UV and weather resistance

PVC-U is very weather-resistant. Even longer exposure to direct sunlight, wind and rain does hardly any damage to the material. In extreme applications, it can be advantageous to protect the material from direct sunlight exposure. Despite its very good weather resistance to ultraviolet radiation, PVC-U loses some of its impact strength. Contact your GF Piping Systems representative for suitable protective measures.



### Chemical resistance

PVC-U shows a good resistance against a broad range of media. For detailed information, observe the comprehensive list of chemical resistance from GF Piping Systems or contact an authorized GF Piping Systems representative.



### Abrasion resistance

As a relatively hard thermoplastic, the resistance of PVC-U against abrasive stress is lower than those of other pipe materials. For this reason, it is seldom used for applications in the area of solid transport.



### Application limits

The application limits of the material on the one hand depend on embrittlement and softening temperatures and on the other hand on the nature and the expected service life of the application. The pressure-temperature diagrams give details on application temperatures and pressures.



### Combustion behavior

The high chlorine content of PVC-U causes an advantageous combustion behavior. Self-ignition resulting from temperature influences occurs only at 450 °C. PVC-U burns when exposed to an open flame, but extinguishes immediately after removing the flame. The oxygen index (LOI) amounts to 42 % (materials that burn with less than 21 % of oxygen in the air are considered to be flammable).

PVC-U thus also falls in the best flammability class V0 according to UL94, and in the building materials classes:

- B1 (flame retardant) for pipe wall thicknesses less than 3.2 mm
  - B2 (normal flammable) for pipe wall thicknesses greater than 3.2 mm according to DIN 4102-1.
- According to the French test method NF P 92-501, PVC-U from GF Piping Systems is tested as M2.

Because the combustion of PVC-U produces hydrogen chloride, which forms a corrosive acid in connection with water, immediate cleaning of areas susceptible to corrosion is necessary after a fire. Danger to personnel from hydrochloric acid (HCl) is minimal because its pungent odor allows early escape from toxic combustion gases, mainly from the odorless carbon monoxide. There are no restrictions for the choice of firefighting agents.



### Electrical properties

PVC-U, like all unmodified thermoplastics, is non-conductive. This means that no electrochemical corrosion takes place in PVC-U systems. On the other hand, these non-conductive properties have to be taken into account because an electrostatic charge can develop in the piping. Special attention must be paid to this fact in environments in which explosive gases may occur. Various methods are available to prevent the occurrence of electrostatic charges. GF Piping Systems representatives can provide support in selecting the right one. The specific volume resistance is at least 1,015 Ωcm.



### Physiological properties

The PVC-U formulas were developed by GF Piping systems for use with drinking water and food. PVC-U's physiological harmlessness regarding neutral, acidic and alcoholic foodstuffs, and the non-influence on drinking water with respect to odor, taste or microbiological effects are not affected and regularly checked and monitored by neutral institutions in various countries. GF Piping Systems offers PVC-U systems free from lead and cadmium for your applications in the fields of drinking water or food. The residual monomer content of vinyl chloride lies below the detection limit of modern analytical methods. For details regarding existing approvals for applications with drinking water or foodstuffs, please contact your authorized GF Piping Systems representative.