

- System Specification - for PROGEF Standard Piping Systems in Polypropylene (PP)

1. Scope

This specification covers the requirements of the PROGEF Standard (PP) Piping Systems intended for a wide range of applications including water, wastewater and effluent treatment as well as a wide range of chemical applications. The complied standards by piping systems of the PROGEF Standard (PP) piping systems will be described in the following.

2. Basic System Data

2.1 Material Specification for PROGEF Standard (PP) System

All **PROGEF Standard (PP)** pipes, fittings and valves from GF Piping Systems are manufactured either from isotactic Polypropylene Homopolymeride **β-PP-H** or from Polypropylene random co-polymeride **PP-R** with a value of MRS 10 MPa, which pipes and fittings are designed for 25 years operational life with water at 20°C. The material is designed for use with pressure bearing piping systems with long-term hydrostatic properties in accordance with EN ISO 15494, as supplied by GF Piping Systems.

2.2 Characteristics of PROGEF Standard (PP) Material

Characteristics	β-PP-H	PP-R	Units	Standard
Density	0.90-0.91		g/cm ³	EN ISO 1183-1
Yield stress at 23°C	31	25	N/mm ²	EN ISO 527-1
Flexural E-Modulus at 23°C	1300	900	N/mm ²	EN ISO 527-1
Charpy notched impact strength at 23°C	50	20	kJ/m ²	EN ISO 179-1/1eA
Charpy notched impact strength at 0°C	4.8	3.4	kJ/m ²	EN ISO 179-1/1eA
Ball indentation hardness (132N)	58	49	MPa	EN ISO 2039-1
Heat distortion temperature HDT B 0,45 MPa	95	75	°C	EN ISO 75-2
Crystallite melting point	150-167	145-150	°C	DIN 51007
Thermal expansion coefficient	0.16...0.18		mm/mK	DIN 53752
Heat conductivity at 23°C	0.23		W/mK	EN 12664
Water absorption at 23°C	0.1		%	EN ISO 62
Colour	Neutral /RAL7032			
Limiting oxygen index (LOI)	19		%	ISO4589-1

2.3 PROGEF Standard (PP) Product Range

Products	SDR	PN	d16 DN10	d20 DN15	d25 DN20	d32 DN25	d40 DN32	d50 DN40	d63 DN50	d75 DN65	d90 DN80	d110 DN100	d125 DN100	d140 DN125	d160 DN150	d200 DN200	d225 DN200	d250 DN250	d280 DN250	d315 DN300	d355 DN350	d400 DN400	d450 DN450	d450 DN500	d500 DN500	d560 DN600	d630 DN600																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																												
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available

For more technical information, please see the GF Piping Systems Planning Fundamentals on the +GF+ website (www.gfps.com).

2.4 Approvals / Acceptance / Conformance

This **PROGEF Standard (PP)** material specification is met the directives of GF Piping Systems. Therefore GF Piping Systems is approved according to the different categories all over the world. For more information please see our approvals database on the +GF+ website.

	FDA	USP 25 class VI	DIBt	GOST-R	CE	DNVGL	Lloyd's register	RINA	BV
	Marine								
Raw material									
Pipe									
Fittings									
Valves									
Backing Flanges									
Gaskets									

available

3. Pipes

PROGEF Standard pipes are made of **β-PP-H** and comply with a MRS class of 10 MPa. Processing of pipes is done according to EN ISO 15494, DIN 8077 (dimensions) and DIN 8078 (quality specifications).

Outer diameter, ovality and wall thickness are defined according to Tables 1 - 3.

Table 1: Measurements SDR 7.4

In millimeters

Nominal outer diameter	Min. wall thickness	Tolerance limit of outer diameter	Maximum deviation for ovality	Tolerance limit of wall thickness	Pipe series	Nominal pressure
d_n	e_{min}			a	S	PN
16	2.2	+ 0.3	1.2	+ 0.5	3.2	16
20	2.8	+ 0.3	1.2	+ 0.5	3.2	16
25	3.5	+ 0.3	1.2	+ 0.6	3.2	16

Tolerance limit of wall thickness: $0.1e + 0.2$ mm, rounded to 0.1mm

Maximum deviation for ovality: $0.015 d_n$, rounded to 0.1 mm

Table 2: Measurements SDR 11

In millimeters

Nominal outer diameter	Min. wall thickness	Tolerance limit of outer diameter ¹	Maximum deviation for ovality	Tolerance limit of wall thickness	Pipe series	Nominal pressure
d_n	e_{min}			a	S	PN
16	1.8	+ 0.3	1.2	+ 0.4	5	10
20	1.9	+ 0.3	1.2	+ 0.4	5	10
25	2.3	+ 0.3	1.2	+ 0.5	5	10
32	2.9	+ 0.3	1.3	+ 0.5	5	10
40	3.7	+ 0.3	1.4	+ 0.6	5	10
50	4.6	+ 0.3	1.4	+ 0.7	5	10
63	5.8	+ 0.4	1.6	+ 0.8	5	10
75	6.8	+ 0.5	1.6	+ 0.9	5	10
90	8.2	+ 0.6	1.8	+ 1.1	5	10
110	10.0	+ 0.6	2.2	+ 1.2	5	10
125	11.4	+ 0.8	2.5	+ 1.4	5	10
140	12.7	+ 1.9	2.8	+ 1.5	5	10
160	14.6	+ 1.0	3.2	+ 1.7	5	10
180	16.4	+ 1.1	3.6	+ 1.9	5	10
200	18.2	+ 1.2	4.0	+ 2.1	5	10
225	20.5	+ 1.4	4.5	+ 2.3	5	10
250	22.7	+ 1.5	5.0	+ 2.5	5	10
280	25.4	+ 1.7	9.8	+ 2.8	5	10
315	28.6	+ 1.9	11.1	+ 3.1	5	10
355	32.2	+ 3.2	12.5	+ 3.5	5	10

- System Specification -



In millimetres

Nominal outer diameter	Min. wall thickness	Tolerance limit of outer diameter ¹	Maximum deviation for ovality	Tolerance limit of wall thickness	Pipe series	Nominal pressure
400	36.3	+ 3.6	14.0	+ 3.9	5	10
450	40.9	+ 3.8	15.8	+ 4.3	5	10
500	45.4	+ 4.0	17.5	+ 4.8	5	10

d16–125 suitable for socket-, butt and electrofusion welding technologies

d140–500 suitable for butt- and electrofusion welding technologies

Table 3: Measurements SDR 17.6

In millimetres

Nominal outer diameter	Min. wall thickness	Tolerance limit of outer diameter ¹	Maximum deviation for ovality	Tolerance limit of wall thickness	Pipe series	Nominal pressure
d_n	e_{min}			a	S	PN
50	2.9	+ 0.3	1.4	+ 0.5	8.3	6
63	3.6	+ 0.4	1.6	+ 0.6	8.3	6
75	4.3	+ 0.5	1.6	+ 0.7	8.3	6
90	5.1	+ 0.6	1.8	+ 0.8	8.3	6
110	6.3	+ 0.6	2.2	+ 0.9	8.3	6
125	7.1	+ 0.8	2.5	+ 1.0	8.3	6
140	8.0	+ 0.9	2.8	+ 1.1	8.3	6
160	9.1	+ 1.0	3.2	+ 1.2	8.3	6
180	10.2	+ 1.1	3.6	+ 1.3	8.3	6
200	11.4	+ 1.2	4.0	+ 1.4	8.3	6
225	12.8	+ 1.4	4.5	+ 1.5	8.3	6
250	14.2	+ 1.5	5.0	+ 1.7	8.3	6
280	15.9	+ 1.7	9.8	+ 1.8	8.3	6
315	17.9	+ 1.9	11.1	+ 2.0	8.3	6
355	20.1	+ 3.2	12.5	+ 2.3	8.3	6
400	22.7	+ 3.6	14.0	+ 2.5	8.3	6
450	25.5	+ 3.8	15.8	+ 2.8	8.3	6
500	28.4	+ 4.0	17.5	+ 3.1	8.3	6

d16–125 suitable for socket-, butt and electrofusion welding technologies

d140–500 suitable for butt- and electrofusion welding technologies

- System Specification -

The mean outer diameter (d_{em}) is the average value which results from the measurements of the outer diameter at an interval of d_n and $0.1 d_n$ to the end of the test piece. It is determined by measuring the circumference to 0.1 mm accuracy with a measuring tape.

The minimum and maximum wall thickness is determined to 0.1 mm, whereby the measurement points should be distributed on the pipe circumference as evenly as possible. Individual exceedances of the pipe wall thickness maybe

for	$e \leq 10 \text{ mm}$	+ 0.2 mm
and for	$e > 10 \text{ mm}$	+ 0.15 e

The mean value of the wall thickness must be within the allowable tolerance limit. Smaller wall thicknesses are not allowed.

Ovality is the difference between the measured maximum and the measured minimum external diameter (d_e) at the same cross-section. It is calculated to 0.1 mm and measured immediately after production. The ovality requirement applies to the timepoint of manufacture.

Approved pipes comply with the corresponding quality specifications of DIN Certco ZP 9.4.1.


Pipe material has been designed for industrial service and an enhanced chemical resistance (esp. at elevated temperatures) based on modified thermo-stabilizer package used. The chemical resistance comply with the DIBt-list as a minimum.

3.1 Product Marking

All pipes must be marked permanently and consecutively at intervals of at least 1 meter.

- Material identification: +GF+ manufacturing plant identification **PROGEF**
- Material code: PP-H 100
- Pipe diameter, wall thickness, SDR and PN: see Tables 1 - 3
- RAL symbol and Z-40.23-4 (DIBt)
- Manufacture date, shift and machine number
- Product norm: DIN 8077/78

Example of marking :

PROGEF +GF+  DEKAPROP PP-H 100 63 x 5.8 DIN 8077/78 PN10 SDR 11
Manufacture date Shift Machine no. RAL symbol 006 Z-40.23-4 Ü

The marking shall be done by hot embossing and a yellow/black coding tape. Marking is also possible with an inkjet device.

4. Fittings

All **PROGEF Standard (PP)** fittings are either as butt fusion type, metric sizes d20-500 or socket fusion type, metric sizes d16-110, labelled with +GF+. The dimensions of both fitting types fulfil the tolerance requirements of the standard

EN ISO 15494. They need to be tested according to EN 10204. All threaded connections have pipe threads in accordance with the requirements of ISO 7-1.

PROGEF Standard fittings from d16-315 are manufactured from isotactic Polypropylene Homopolymeride **β-PP-H**. Fittings from d355-500 are manufactured from Polypropylene random- copolymeride **PP-R**.

All butt fusion spigot fittings of the dimension d20-315 are manufactured with laying lengths designed for use with the fusion machine IR-63 Plus, IR-110 Plus, IR-110 A, IR-225 Plus and IR-315 A from GF Piping Systems.

4.1 Product Marking

Each part is marked according to EN ISO15494:

- Logo of manufacturer
- SDR-rating / PN rating
- Dimension (without the letter “d”)
- Material
- Permanently embossed date indicating the year and the production series

4.2 Packaging and Labelling

The packaging must ensure that the fittings are not damaged during transportation.

Packaging and labelling must meet the following requirements:

- Identification of the content, in type, quantity and product details
- Information about standards and approvals covered by the product
- Content of the label has to accomplish legal requirements
- Labels must be EAN coded for automatic identification
- Comply to GF standards as well as to international standards such as ISPM15

5. Accessories

5.1 Flanges

Backing flanges in metric sizes DN15-400 shall be designed according to EN ISO 15494, in a thermo plastic-oriented design, consisting of 100% glass fibre reinforced polypropylene, PP-GF30, graphite black and UV stabilized. These flanges are manufactured in a seamless technology injection moulding process by GF Piping Systems. The backing flange shall be optimised with a V-groove in the inner diameter to ensure an evenly distributed force on the thermo plastic flange adapter. The backing flanges shall be marked with dimension, PN-value, standards, brand and lot number. Connecting dimensions metric according to ISO 7005, EN 1092; Bolt circle diameter PN10; Inch: ANSI B 16.5, BS 1560; class 150 (1/2" – 12").

As an alternative backing flanges in metric sizes DN15-600 shall be designed according to EN ISO 15494, in a thermo plastic-oriented design, consisting of glass fibre reinforced polypropylene, PP-GF30, graphite black and UV stabilized with steel or cast inserts. The backing flanges shall be marked with dimension, PN-value, standards, brand and lot number. Connecting dimensions metric according to ISO 7005, EN 1092; Bolt circle diameter PN10 (DN15-600) + PN16 (DN15-400); Inch: ANSI B 16.5, BS 1560; class 150 (1/2" – 8").

5.2 Gaskets

Gaskets in metric sizes DN10–600 shall consist of elastomeric material according to EN681, designed with or without metal reinforcement for use with flange adaptors according to EN ISO 15493. Gaskets with reinforcement shall be designed to be centred by the outer diameter. Gaskets with reinforcement shall provide fixation aids to fit on the flange bolts.

5.3 Pipe Support System

Pipe Support System shall be KLIP-IT, sizes d10-400, supplied by GF Piping Systems.

6. Valves

All **PROGEF Standard (PP)** valves shall be metric sizes manufactured by GF Piping Systems or equal in accordance with EN ISO 16135, 16136, 16137, 16138, tested according to the same standard.

6.1 Ball Valves

All **PROGEF Standard** ball valves, which are made from isotactic Polypropylene Homopolymeride **β-PP-H** with metric sizes DN15-100 shall be GF Piping Systems Type 546, 543, 523 with true double union design manufactured by GF Piping Systems in accordance with EN ISO 16135. Incorporated into its design shall be a safety stem with a predetermined breaking point above the bottom O-ring, preventing any media leaking in the event of damage. The valve nut threads shall be buttress type to allow fast and safe radial mounting and dismounting of the valve during installation or maintenance work. Seats shall be PTFE with backing rings creating self-adjusting seals and constant operating torque. Backing rings and seals shall be EPDM or FKM. The handle shall include in its design an integrated tool for removal of the union bush. Union bushes shall have left-hand threads to prevent possible unscrewing when threaded end connectors are removed from pipe.

Following accessories shall be available:

- A Multi-Functional Model (MFM) in PPGF equipped with internal limit switches for reliable electrical position feedback, is mounted directly between the valve body and the valve handle. This MFM is also the necessary interface for later mounting of actuators.
- Mounting plate in PPGF with integrated inserts for later screw mounting on any support
- Lockable multi-functional handle

6.1.1 Electrically Actuated Ball Valves

Electric actuators shall be Types EA15 (metric sizes DN10-50), EA25 (metric sizes DN10-50), EA45 (metric sizes DN65) and EA120 (metric sizes DN80-100) shall be available manufactured by GF Piping Systems in accordance with EN 61010-1, EC directives 89/336/EWG-EMV and 73/23/EWG (LVD). Additionally they need to be CE marked. Actuator housing shall be made of PPGF (polypropylene glass fibre reinforced), flame retardant with external stainless steel screws. All electric actuators shall have an integrated emergency manual override and integrated optical position indication. All electric actuator types shall have the following accessories available:

Accessories

EA15 / EA25 / EA45 / EA120 / EA250:

- Failsafe return unit
Battery incorporated into the housing for moving to a safe position in case of power outage (open or closed).

EA25 / EA45 / EA120 / EA250:

- positioner

For continuous valve control with 4-20mA or 0-10V and 4-20mA feedback

- Monitoring board
 - Cycle time extension
 - Cycle time monitoring
 - Cycle counter
 - Motor current monitoring
- Fieldbus connection
 - Profibus DP auxiliary card
 - AS interface module

- System Specification -



The system Specifications for electric actuators are as follows:

* at rated torque

Specification

Combinations	EA15	2-Way Ball valve type 546 upto DN50 3-Way Ball valve type 543 up to DN50
	EA25	2-Way Ball valve type 546 up to DN50 3-Way Ball valve type 543 up to DN50
	EA45	2-Way Ball valve type 546 up to DN65 Butterfly valve types 567/578, Type 038/039
	EA120	2-Way Ball valve type 546 up to DN100 Butterfly valve types 567/578, Type 038/039
	EA250	Butterfly valve types 567/578, Type 038/039
Rated voltage	AC	100 – 230 V, 50/60 Hz
	AC/DC	24 V, 50/60 Hz
Rated voltage tolerance	- 10 ... + 15%	
Protection class	IP67per EN 60529	
Contamination level	2 according to EN 61010-1	
Overload protection	Current/time-dependent (resetting)	
Overvoltage category	II	
Ambient temperature	-10 °C to +45 °C	
Allowable humidity	Max. 90% relative humidity, non-condensing	
Housing material	PP-GF for very good chemical resistance	

	EA15	EA25	EA45	EA120	EA250
Power input max.	45 VA	45 VA	65 VA	60 VA	70 VA
Rated torque MDN. (peak)	10 (20)	10 (25)	20 (45)	60 (120)	100 (250)
Duty cycle at 25 °C / 15 min	40%	100%	50 %	50 %	35 %
Cycle time s/90 at Mdn.	5s	5 s	6s	15 s	20 s
Connection	F05	F05	F05	F07	F07
Tested cycles (at 20 °C and Mdn.)	150 000	250 000	100 000	100 000	75 000
Weight	1.85 kg	2.193 kg	2.193 kg	3.356 kg	4.995 kg
Actuating angle	Max. 355°, set to 90 °				

6.1.2 Pneumatically Actuated Ball Valves

Pneumatic actuators shall be GF Piping Systems Types PA11 (for valve sizes DN15-25) and PA21 (for valve sizes DN32-50). They shall be manufactured by GF Piping Systems. Pneumatic actuators shall be available as fail safe close, fail safe open and double acting and have an integrated optical position indication. Actuator housing shall be made of Polypropylene fibre glass reinforced (PPGF) and flame retardant. Actuators shall contain a preloaded spring assembly to ensure safe actuator operation and maintenance. Actuators shall contain integrated Namur interface for the easy mounting of positioners, limit switches and accessories. The valve shall be equipped with a Multi-functional-module for reliable electric feedback, mounted directly between the valve body and the actuator as manufactured by GF Piping Systems.

- For valve size DN65 pneumatic actuators shall be Type PA 30 (fail safe to close or open function), Type PA35 (double acting function).
- For valve size DN80 pneumatic actuators shall be Type PA 35 (fail safe to close or open function), Type PA40 (double acting function).
- For valve size DN100 pneumatic actuators shall be Type PA 45 (fail safe to close or open function), Type PA45 (double acting function)

Pneumatic actuators shall have an integrated optical position indicator. Actuator housing shall be made of hardened anodized aluminium. Actuators shall contain integrated Namur interface for the easy mounting of positioners, limit switches and accessories.

All pneumatically actuated ball valves shall have the following accessories available:

- Pilot valve remote or direct mounted in voltages 24VDC/AC, 110VAC, 230VAC
- Positioner Type DSR 500-3
- Limit switch kits AgNi, Au, NPN, PNP
- Stroke limiter
- Manual override for all sizes up to d110
- AS Interface control module with incorporated position feedback and a solenoid pilot valve

- System Specification -

6.2 Diaphragm Valves

6.2.1 Manual Diaphragm Valves

6.2.1.1 Diaphragm Valves DN15 to DN50

All **PROGEF Standard** Diaphragm Valves, which are made from isotactic Polypropylene Homopolymeride **β-PP-H** with metric sizes d20-63, shall be either:

- - Type 514 (true double union design, DN15-50), or
 - Type 515 (spigot design, DN15-50), or
 - Type 517 (flange design, DN15-50), or
 - Type 519 (T-type design, DN15-15 to 50-25)

All diaphragm Valves shall be manufactured by GF Piping Systems in accordance with EN ISO 16138. The upper body shall be PPGF (polypropylene glass fibre reinforced) connected to the lower body with a central union avoiding exposed screws.

A two colored position indicator integrated into the hand wheel must be present to determine diaphragm position. The hand wheel shall have an integrated locking mechanism.

Diaphragms are to be EPDM, FKM, NBR, PTFE with EPDM or FOM supporting diaphragm. Following options shall be available:

- Electrical feedback unit with either AgNi or AU contacts
- Pressure proof housing

The diaphragm valve shall have following KV values:

d [mm]	DN [mm]	KV [l/min @ ΔP=1 bar]
20	15	125
25	20	271
32	25	481
40	32	759
50	40	1263
63	50	1728

6.2.1.2 Diaphragm Valves DN65 to DN150

All **PROGEF Standard** Diaphragm Valves, which are made from isotactic Polypropylene Homopolymeride **β-PP-H** with metric sizes shall be Type 317 (flanged design, DN65-150).

- System Specification -

All diaphragm valves shall be manufactured by GF Piping Systems in accordance with EN ISO 16138. The upper body shall be PPGF (polypropylene glass fibre reinforced) connected to the lower body with exposed stainless steel bolts. A position indicator integrated into the hand wheel must be present to determine diaphragm position. Diaphragms are to be EPDM, FKM, NBR, or PTFE with EPDM or FKM supporting diaphragm.

6.2.2 Pneumatic Diaphragm Valves

6.2.2.1 Pneumatic Diaphragm Valves DN15 to DN50

All **PROGEF Standard** Diaphragm Valves, which are made from isotactic Polypropylene Homopolymeride **β-PP-H** with metric sizes DN15-50, shall be either:

- true double union design, DN15-50, or
- spigot design, DN15-50, or
- flange design, DN15-50 or
- T-type design, DN15-15 to DN50-25

All Diaphragm Valves shall be manufactured by GF Piping Systems in accordance with EN ISO 16138. The upper body shall be connected to the lower body with a central union avoiding exposed screws.

Diaphragms are to be EPDM, FKM, NBR, PTFE with EPDM or FKM supporting diaphragm. Following options shall be available:

The diaphragm valve shall have following KV values:

d [mm]	DN [mm]	KV [l/min @ ΔP=1 bar]
20	15	125
25	20	271
32	25	481
40	32	759
50	40	1263 (960*)
63	50	1728 (1181*)

*DIASTAR Six

Pneumatic actuators shall be GF Piping Systems Type DIASTAR or 604/605 and shall be available as

- Type 604/605
- DIASTAR Six for PN up to 6 bar,
- DIASTAR Ten for PN up to 10 bar,
- DIASTAR Sixteen for PN up to 16 bar

The mode of operation shall be fail safe close (FC), fail safe open (FO) and double acting (DA). The valves shall have an integrated optical position indicator. Actuator housing shall be made of PPGF (polypropylene glass fibre reinforced). Actuators with FC mode shall contain a preloaded galvanised steel spring assembly to ensure safe actuator operation and maintenance. The actuator DIASTAR Ten and DIASTAR Sixteen shall have following accessories available:

- Solenoid pilot valve remote or direct mounted in voltages 24VDC/AC, 110VAC, 230VAC
- Positioner Type DSR 500-1
- Feedback with following limit switches AgNi, Au, NPN, PNP, NAMUR
- Stroke limiter & emergency manual override
- ASI controller

6.2.2.2 Pneumatic Diaphragm Valves DN65 to DN150

All **PROGEF Standard** diaphragm valves, which are made from isotactic Polypropylene Homopolymeride **β-PP-H** with metric sizes shall be flanged design, DN65-150.

All diaphragm valves shall be manufactured by GF Piping Systems in accordance with EN ISO 16138. The upper body shall be connected to the lower body with exposed stainless steel bolts. Diaphragms are to be EPDM, FKM, NBR, or PTFE with EPDM or FKM supporting diaphragm.

Pneumatic diaphragm actuators shall be GF Piping Systems Type DIASTAR Type 025. The mode of operation shall be fail safe close (FC), fail safe open (FO) and double acting (DA). The valves shall have an integrated optical position indicator. Actuator housing shall be made of PPGF (polypropylene glass fibre reinforced). Actuators with FC mode shall contain a preloaded galvanised steel spring assembly to ensure safe actuator operation and maintenance. The actuator DIASTAR 025 shall have following accessories available:

- Solenoid pilot valve remote or direct mounted in voltages 24VDC/AC, 110VAC, 230VAC
- Positioner Type DSR 500-2
- Feedback with following limit switches AgNi, Au, NPN, PNP, NAMUR
- Stroke limiter & emergency manual override
- ASI Controller

6.3. Butterfly Valves

All **PROGEF Standard** butterfly valves from DN50 (2") – DN300 (12") are made from isotactic Polypropylene Homopolymeride **β-PP-H** and in dimension DN350 (14") – DN600 (24") are made from Polypropylene random co-polymeride **PP-R** with metric sizes. They shall be GF Piping Systems Type 567/578/563 wafer/lug type with a double eccentric disc design manufactured by GF Piping Systems in accordance with EN ISO 16136. Seals shall be available in both EPDM and FKM. The lever handle shall be lockable in increments of 5 degrees. There shall always be six teeth engaged between the ratchet and the index plate to ensure accurate and safe positioning of the lever. There shall be the option of fine adjustment by use of a specific hand lever, allowing the disc to be exposed at any angle between 0° und 90°.

As an option, the hand lever shall be lockable. The hand lever shall be manufactured of high strength PPGF (polypropylene glass fibre reinforced). The option of an integrated electric position indicator shall be available. Optional the valves can be actuated by gear box with hand wheel. The electric position indicator shall be integrated into the mounting flange. Butterfly valves shall have low actuation torque to enable easy operation. All butterfly valves Type 567 manufactured by GF Piping Systems are in dimension DN50-200 designed for a nominal pressure rate of 10 bar and in dimension DN250-300 for a nominal pressure rate of 8 bar. All butterfly valves Type 563 are designed for a nominal pressure rate of 4 bar.

6.3.1. Electrically Actuated Butterfly Valves

Electric actuators shall be GF Piping Systems Types EA45, EA120 or EA250 dependent on valve size up to DN300. For valve size from DN350 - 600 with Valpes VS300, VT600 and VT1000.

They shall be manufactured by GF Piping Systems in accordance with EN 61010-1, as per the above specifications. Actuator housing shall be made of PPGF (polypropylene glass fibre reinforced), flame retardant and feature external stainless steel screws. All electric actuators shall have an integrated emergency manual override and integrated optical position indication.

All electric actuator types shall have the following accessories available:

- Failsafe return unit
Battery incorporated into the housing for moving to a safe position in case of power outage (open or closed).
- positioner

- System Specification -

For continuous valve control with 4-20mA or 0-10V and 4-20mA feedback

- Monitoring board
 - Cycle time extension
 - Cycle time monitoring
 - Cycle counter
 - Motor current monitoring
- Fieldbus connection
 - Profibus DP auxiliary card
 - AS interface module

6.3.2. Pneumatically Actuated Butterfly Valves

Pneumatic actuators shall be GF Piping Systems Types PA 35 (metric sizes DN50-65), PA40 (metric size DN80 only), PA45 (metric size DN100-125), PA55 (metric size DN150-200), PA60 (metric sizes DN200 FC), PA65 (metric sizes DN250 FC) PA70 (metric sizes DN300 FC). For valve size from DN350 – 600 with Revac types.

They shall be supplied by GF Piping Systems. Pneumatic actuators shall be available as fail safe close, fail safe open and double acting and have an integrated optical position indication. Actuator housing shall be made of hardened anodized aluminium. Actuators shall contain integrated Namur interfaces for the easy mounting of positioners, limit switches and accessories. All pneumatically actuated butterfly valves shall have the following accessories available:

- Solenoid pilot valve remote or direct mounted in voltages 24VDC/AC, 110VAC, 230VAC
- Positioner Type DSR 500-3
- Feedback with following limit switches AgNi, Au, NPN, PNP, NAMUR
- Stroke limiter & emergency manual override
- ASI-controller

6.4 Check Valves

All **PROGEF Standard** check valves, which are made from isotactic Polypropylene Homopolymeride **β-PP-H** according to EN ISO 16137 with metric sizes DN10-100 metric, shall be Type 561/562 true double union design. Seals shall be EPDM or FKM. Union bushes shall have a left hand thread to prevent possible unscrewing when threaded end connectors are removed from pipe. This valve shall be suitable for mounting in a vertical and horizontal position. Type 562 shall be equipped with a spring made of stainless steel (V2A) to allow position independent installation. The valves are designed for a nominal pressure of 10 bar.

- System Specification -

6.4.1 Wafer Check Valves

All **PROGEF Standard (PP)** Wafer Check Valves shall be GF Piping Systems Type 369, metric size DN32-300. The minimum water column of 2m is required for sealing. They have to be equipped with a spring (either in 316 stainless steel or Hasteloy C) guaranteeing closing in all installation positions. Attention: A stabilizing pipe zone of at least 5 times nominal diameter (DN) (recommended 10 times nominal diameter) before and after the wafer check valve should be provided.

The wafer check valves are dimensioned in metric sizes DN32-125 for nominal pressure 10 bar and in metric sizes DN150-300 for nominal pressure 6 bar.

6.5 Pressure Regulating Valves

All **PROGEF Standard (PP)** pressure regulating valves as supplied by GF Piping Systems shall have the following characteristics:

Pressure ranges for all pressure regulating valves are the following:

- DN10–50 from 0 up to max. 10 bar
- DN65–80 from 0 up to max. 6 bar
- DN100 from 0 up to max. 4 bar

6.5.1 Pressure Reducing Valves

As supplied by GF Piping Systems reduces the pressure within the system to a pre-set value. By using the differential pressure, the pressure reducing valve adjusts itself to the set working pressure. The outlet pressure (working pressure) is not directly related to the inlet pressure. If the outlet pressure increases above the set value, the diaphragm is lifted against the spring force. If the outlet pressure falls below the set value, the diaphragm is pressed down by the spring force. The pressure reducing valve begins to close/open until a state of equilibrium is re-established; in other words, the outlet pressure remains constant irrespective of an increasing or decreasing inlet pressure. Following types and sizes are available:

- Type 582, compact Pressure Reducing Valve, sizes DN10–50
Features:
 - Metal free central housing union nut
 - Set pressure selectable 0 - 9 bar or 0.3 – 3 bar
 - Manometer optional
 - Manometer assembly possible on both sides
 - Selection of direct manometer assembly or with gauge guard
 - Possibility to show either inlet or outlet pressure
 - Injection molded directional arrow for direction of flow
 - Threaded inserts for assembly

- System Specification -

- Type V82, Pressure Reducing Valve with an integrated manometer, sizes DN50-100

6.5.2 Pressure Retaining Valves

As supplied by GF Piping Systems serves to keep the working or system related pressures constant, to balance out pressure pulsation, and to reduce pressure peaks in chemical process systems. If the inlet pressure rises above the set value, the pressurized valve piston is lifted against the spring force. Consequently,

the valve opens and there is a reduction of pressure through the outlet pipe. The valve closes as soon as the inlet pressure sinks below the pre-set spring tension.

Following types and sizes are available:

- Type 586, compact Pressure Retaining Valve, sizes DN10-50
Features:
 - Metal free central housing union nut
 - Set pressure selectable 0 - 9 bar or 0.3 – 3 bar
 - Manometer optional
 - Manometer assembly possible on both sides
 - Selection of direct manometer assembly or with gauge guard
 - Possibility to show either inlet or outlet pressure
 - Injection molded directional arrow for direction of flow
 - Threaded inserts for assembly
- Type V86, Pressure Retaining Valve, sizes DN65-100

6.6 Direct-acting Solenoid Valves

Supplied by GF Piping Systems serves to regulate and control fluids, if no compressed air is available or not wanted. They are used for diverse functions, e.g. opening, shutting, dosing, distribute and mixing. The medium flow is switched directly by the armature moved by the magnetic force.

- Safety position shall be available

Following type and sizes are available:

- Type 166, sizes DN3-5

6.7 Servo-assisted Solenoid Valves

- System Specification -

Supplied by GF Piping Systems serves to regulate and control fluids, if no compressed air is available or not wanted. They are used for diverse functions, e.g. opening, shutting, dosing, distribute and mixing. Opening large orifices using the direct-acting method would require enormous and expensive coils. Servo assisted valves use the power of the fluid to open the flow channel by controlling a small pilot channel to alter the forces on a larger main seal. A Δp of 0.5 bar is mandatory with servo-assisted valves.

- Type, 165, sizes DN10-50

6.8 Ventilating- and Bleed Valves

All **PROGEF Standard** Ventilating- and Bleed valves, which are made from isotactic Polypropylene Homopolymeride **β -PP-H** shall be GF type 591. Dimensions DN10-100 are with pressure rating PN10. They shall be equipped with a PP-H floater with density of 0,91 g/cm³.

6.9 Ventilating Valves

All **PROGEF Standard** Ventilating Valves, which are made from isotactic Polypropylene Homopolymeride **β -PP-H** shall be GF type 595.

Dimensions DN10-100 are with pressure rating PN10. They shall be equipped with plastic coated stainless steel spring with minimal opening pressure (10-80 mbar).

7. Welding and Assembly

All butt fusion fittings and valves in dimension d20-315 shall also be manufactured with laying lengths designed for use with fusion machines IR-63 Plus, IR-110 Plus, IR-110 A, IR-225 Plus and IR-315 A from GF Piping Systems, providing welds with increased mechanical and chemical stability than conventional welding methods (socket- and butt fusion).

The IR Plus fusion machines use non-contact radiant heating.

The cooling time for is calculated on the basis of ambient temperature and the bead surface temperature. To increase the cooling capacity, an additional cooling fan is included in the IR-225 Plus and in the IR-315 A.

Only authorised welders by GF Piping Systems are allowed to perform fusion on the IR Plus machines.

As an alternative to IR fusion, conventional butt fusion according to DVS 2207-11 may be used, preferably with automated CNC controllers and weld recorders.

Socket fittings require the use of Socket Fusion welding tools according to DVS 2007-11, with heating bushes System B.

The welding and the installation should be in accordance with GF Piping Systems guidelines.

- System Specification -

8. Measurement & Control / Instrumentation

The following parameters can be measured (Sensors), indicated and/ or transmitted (transmitters) to PLC, PC and other Data Acquisition Systems. All products comply with the CE standard.

Parameter	Technology	Compatible liquids (*)
Flow	Paddlewheel	clean liquids
	Rotameter	clean liquids
	Magmeter	contaminated liquids
Level	Hydrostatic/Ultrasonic/Radar	all liquids
pH-ORP	Glas electrodes	all liquids
Conductivity	Contact	all liquids
Pressure	Piezoresistive	all liquids
Temperature	Pt1000	all liquids

(*) please check first the sensors limitations in material, pressure and temperature (data sheet) and chemical resistance list

8.1 Sensors

The sensors listed hereafter will transfer the measured value to a GF Piping Systems Transmitter, to indicate the measured value and allowing simple calibration and maintenance of the devices. Alternatively the measured values of the sensors can be sent directly to a PLC, PC or other local made electronics using either an analogue signal (4-20mA, open collector or sinusoidal voltage) or a digital signal called S3L (GF Piping Systems Signet serial signal).

8.1.1 Installation Fittings

Depending on the sensor type, special installation fittings shall be used for connection to the pipeline: Installation T-Fitting metric sizes DN15-50 with union ends for socket or butt fusion, Screw-On Saddle metric sizes DN65-300, Weld-On Fitting ("Weld-o-let") metric sizes DN65-600 and Wafer Fittings metric sizes DN65-300. Sensor thread connection for flow- and pH-sensors shall be 1 ¼" NPSM. For all further sensors standard threaded fittings, as well as adaptor sockets or nipples with ½", ¾" ISO, or ¾" NPT thread shall be used.

- System Specification -

8.1.2 Flow sensors

8.1.2.1 Paddlewheel sensors

515 and 525 sensors:

All sensors of this family are “sinusoidal” sensors. This sensor from GF Piping Systems SIGNET requires no external power source to produce a signal. Internal to the body of the sensor is a wire coil which when excited by the rotor assembly produces a small sinusoidal signal. The rotor assembly consists of four paddles; inserted into each of the paddles of the rotor are magnets. As liquid flows past the rotor assembly it rotates each of the four paddles produces a sine wave signal as it passes the centre of the body (two paddles of the rotor produces a full AC sine wave).

The sensors as manufactured by GF Piping Systems SIGNET produce a signal output which is proportional to the flow rate. A K-factor (number of pulses generated by the sensor per 1 liter or 1 gallon of fluid the sensor) is used to define the size of the pipe that the sensor is inserted into.

3-2536 and 3-2537 sensors:

All sensors of this family of sensors are “Hall Effect” sensors. Internal to the GF Piping Systems SIGNET sensors body is an open collector relay. The sensor is supplied with a voltage from the 3-8550 transmitters or an external power supply ranging from 5 to 24 volts. This voltage is switched through the open collector relay as the paddlewheel (rotor) of the sensor rotates. The sensor’s rotor assembly has four paddles. Inserted in two of the paddles is a magnet. As the paddles pass the centre of the sensors body, the magnetic field switches the open collector relay on and off which generates a square wave pulse as manufactured by GF Piping Systems SIGNET. Two pulses indicates a complete rotation (on/off cycle) of the open collector relay. The pulse output is directly proportional to the fluid velocity. A K-factor (number of pulses generated by the sensor per 1 liter or 1 gallon of fluid passing the sensor) is used to define the size of the pipe that the sensor is inserted into.

8.1.2.2 Rotameters

As supplied by GF Piping Systems are radially installed dismountable meters for flow rate measuring in industrial piping applications. If needed, minimum or maximum flow can also be monitored via limit switches. Also, analogue flow measurement with a 4...20mA Signal is possible.

The working principle of the rotameter is based in gravity and equilibrium of forces. If a medium flows upwards at a sufficient flow rate through the vertically mounted taper tube, the float is raised to the point at which a state of equilibrium sets in between the lifting force of the medium and the weight of the float. Since the mean rate of flow is proportional to the quantity flowing through per unit of time, this state of equilibrium corresponds to the measurement of the instantaneous flow rate.

Following types and sizes are available:

- Type SK, DN10–65mm
- Type 335, DN25–65mm
- Type 350, DN25–65mm

8.1.2.3 Magmeter

The Magmeter sensor from GF Piping Systems SIGNET consists of two metallic pins that produce a small magnetic field across the inside of the pipe. The The Magmeter measures the velocity of a conductive liquid (20 μ S or greater) as it moves across the magnetic field produced by the Magmeter. A voltage occurs on the sensor tips, which is directly proportional to the flow rate of the fluid. The magnetic signal is conditioned and translated in to a pulse signal. A K-factor (number of pulses generated by the sensor per 1 liter or 1 gallon of fluid passing the sensor) is used to define the size of the pipe that the sensor is inserted into. The Magmeter of GF Piping Systems SIGNET is offered as a blind frequency, 4-20 mA or digital S3L output, or with integral display and control relays.

8.1.2.4 Ultrasonic Flowmeter

The U3000/4000 and PF220/330 from GF Piping system are transit time ultrasonic flow meter designed to work with clamp-on transducers, to provide accurate measurement of liquid flowing within a closed pipe, without the need for any mechanical parts to be inserted through the pipe wall or to protrude into the flow system. It takes just a few minutes to install and there is no need to shut down flow or drain the system! From process control in industrial applications, to water management from raw to deionized water, the Ultraflow 3000/4000 for fixed installation and the PF220/330 for portable flow monitoring cover a wide spectrum of flow monitoring and process control in many industries.

Using ultrasonic transit time techniques enables to be used with pipes having an outside diameter range from d13 to d2000 as standard and up to d5000 as an option. The instruments will also operate over a wide range of fluid temperatures. All of the Ultrasonic Flowmeters have the same basic features.

However, the standard U4000 and PF330 can also perform data logging and allows site details and flow data to be reordered with a memory, that is able to log more than 150 000 separate readings. The standard U4000 and PF330 is also capable of downloading the stored data via the USB or RS232 interface to the Portagraph software supplied with the unit.

8.2 Level Sensor and Level Switches

8.2.1 Hydrostatic Level Sensors

Hydrostatic pressure is the pressure exerted on a column of fluid by the weight of the fluid above it. Internal to the GF Piping Systems SINGET PVDF sensor body is a ceramic diaphragm sensor and capillary tube/cable assembly. The ceramic diaphragm sensor exposed to the fluid senses the hydrostatic pressure of the fluid and compares the pressure to the atmospheric pressure monitored the capillary tube/cable assembly. The hydrostatic level sensor from GF Piping Systems SINGET only senses the hydrostatic pressure of the fluid. The Level Sensor is offered as a blind output 4-20 mA or digital S3L output connected to the GF Piping Systems SINGET Transmitter unit.

8.2.2 Ultrasonic Level

8.2.2.1 Ultrasonic Level Sensors (Series 2260 / 2270)

Ultrasonic level sensors are non-contact devices, using the travel time of sound and its reflection, for measuring the distance to a liquid or solid surface. Based on this information, GF Piping Systems sensors are capable of calculating a liquid level or volume. Their outstanding narrow 5° beam, allow reliable measurement even at the presence of disturbing objects or when space is limited. The GF Piping Systems portfolio contains sensing ranges 4 m, 6 m and 15 m.

Sensors with integrated display or blind sensors are available and provide 4-20 mA, HART protocol or relay outputs. GF Piping Systems ultrasonic level sensors are compatible with GF Piping Systems transmitters, indicators, controllers and valve actuators.

8.3 Radar

8.3.1 Radar 2290

The 25 GHz (K-band) 2290 Pulse Radars are the most progressive non-contact level transmitters for industrial processes. With an excellent accuracy, compact antennas and a user-friendly set-up the 2290 is an effective, simple, low cost choice for demanding level applications. GF's new K-band radar featuring ± 3 mm (± 0.1 inch) accuracy and short dead band excels with its robust full plastic housing. Its antenna range incorporates a stainless steel horn and enclosed plastic tube choices. The enclosed antenna versions can be replaced without removing the antenna enclosure from the process. Local programming of type 2290 is aided by a plug-in display module. The signal processing algorithm of the 2290 is based on years of experience with non-contact level measurement making it an excellent choice for applications simple and challenging alike. Process enclosures are available in PTFE, PP & PE

8.3.2 Radar 2291

With its ability to read accurately when other non-contacting or invasive methods fail, the guided level transmitter type 2291 using GWR (guided wave radar) is the solution to your level needs.

The radar signal is sent down the probe assembly eliminating the interferences caused by low dielectric liquids, heavy fuming, slightly conductive foams, internal tank obstructions, etc. By focusing its energy along the probe, the type 2291 can be installed in tanks with limited space. The type 2291 is also less sensitive to turbulence that would normally upset the readings in ultrasonic and unguided radar technologies. The probes are also available as coated options in FEP & PFA

8.4 Point Level Switches (Series 2280)

The GF Piping Systems portfolio of point level switches contains various different detection technologies, to provide a solution for various liquids and application requirements.

- Type 2280

Vibration Forks detect a liquid level with two vibrating stainless steel wings. In air they vibrate with a specific, calibrated frequency. By the contact with a liquid the frequency changes which forces an electrical output to switch. GF Piping Systems vibration forks are equipped with digital PNP/NPN or relay output. Versions with ATEX or WHG approval are available.

- Type 2281

Conductive Multipoint Switch contains up to 5 stainless steel electrodes, which allow to detect 4 different liquid levels in a tank. Up to 2 external relay pairs allow to switch pumps or valves. GF Piping Systems conductive multipoint switches work with liquids of min. 10 μ S conductivity.

Their four-in-one design allows fast installation and provides attractive solutions concerning costs.

- Type 2282

Guided Float Switches are equipped with an air filled float with embedded magnet. Rising liquid lifts up the float. The magnetic field forces a reed contact to switch. GF Piping Systems guided float switches are available in PP and PVDF to provide best chemical compatibility to corrosive liquids.

- Type 2284

Ultrasonic Gap Switches are equipped with an ultrasonic transducer and receiver in their fork tips. Based on the switch design, the sound waves are damped in air. Thus the output is disabled. In contact with liquid the sound waves start to travel from transmitter to receiver, which enables the output. GF Piping Systems ultrasonic gap switches provide an electronic relay output which allows to control pumps and valves. Thanks to their PPS full-plastic body they provide a very high resistance against mechanical impacts and corrosive liquids. They work with no moving parts, so they do not require any maintenance.

- Type 2285

Float Switches are primarily used in open basins and pump shafts for detecting liquid level. In an empty tank they hang in vertical position, attached to the tank wall at their cable. Rising liquid carry them on the liquid surface. At an angle of approximately 45° an integrated switch is enabled. GF Piping Systems float switches are double chambered and equipped with a mercury-free switch. Hence they may be used for drinking and for waste water applications.

8.5 Analytic

8.5.1 pH Sensors

All pH sensors from GF Piping Systems SIGNET are constructed commonly called combination electrodes. The measuring cell is constructed of hydrogen sensitive glass that can detect the concentration of hydrogen ions (+H) in a solution. The concentration of +H ions directly determines the pH of the fluid. The reference cell is used to provide a stable reference signal. The pH signal is measured against the stable reference signal. The reference junction allows the reference cell to come in contact with the fluid being measured. The measured signals are then conditioned and sent as a blind 4-20 mA or as a digital S3L signal to the GF Piping Systems SIGNET Transmitter unit.

8.5.2 ORP Sensors

All ORP sensors from GF Piping Systems SIGNET are constructed similar to the pH sensors, except that a noble metal like platinum or gold replaces the silver chloride element of the measuring and reference cell of the pH electrode. Temperature compensation is not used in ORP measurements as well. ORP is an abbreviation for Oxidation-Reduction Potential. Oxidation is a term used to denote the occurrence of a molecule losing an electron. Reduction occurs as a molecule gains an electron. The “potential” is simply an indication of a solution’s propensity to contribute or accept electrons. ORP reactions (sometimes referred to as REDOX) always take place simultaneously. There is never oxidation without reduction, and ORP electrodes are used to detect electrons exchanged by molecules as these reactions occur. The measured signals are then conditioned and sent as a blind 4-20 mA or as a digital S3L signal to the GF Piping Systems SIGNET Transmitter unit.

8.5.3 Conductivity Sensors

All Conductivity sensors from GF Piping Systems SIGNET are manufactured using two stainless steel electrodes. Alternative materials are available in case of chemical incompatibility. Conductivity sensors measure the ability of a fluid to conduct an electrical current between two electrodes. The proper term for this ability of a solution is electrolytic conductivity, since only ions conduct electric current in solution. Electrolytic conductivity (or simply conductivity) is therefore an indirect measure of the ionic concentration of a solution. Generally, conductivity increases and decreases with the concentration of ions.

Most conductivity electrodes consist of two measuring half-cells. The geometry of the half-cells can be tailored to provide highly accurate measurements over a specific conductivity range. Cell constants help to describe electrode geometry for the purpose of selecting the appropriate electrode for a given application.

A cell constant is defined as the length between the two half cells divided by the area of the cells. All conductivity sensors have a temperature compensation circuits in order to increase the sensors accuracy.

The measured signals are then conditioned and sent as a blind 4-20mA or as a digital S3L signal to the GF Piping Systems SIGNET Transmitter unit.

8.6 Multi Parameter Instruments

8.6.1 Transmitters

The GF Piping Systems Signet 9900 Transmitter provides a single channel interface for many different parameters including Flow, pH/ORP, Conductivity/Resistivity, Salinity, Pressure, Temperature, Level and other sensors that output a 4 to 20 mA signal. The display shows separate lines for units, main and secondary measurements as well as a dial-type digital bar graph.

The 9900 is offered in both panel or field mount versions. Both configurations can run on 12 to 32 VDC power (24 VDC nominal). The 9900 can also be loop powered with compatible sensors.

Designed for complete flexibility, plug-in modules allow the unit to easily adapt to meet changing customer needs. Optional modules include Relay, Direct Conductivity/Resistivity, H COMM and a PC COMM configuration tool.

- 1 sensor input (Flow, pH/ORP, Conductivity/Resistivity, Salinity, Pressure, Temperature, Level and other sensors that output a 4 to 20 mA signal, Signet 8058 i-Go™ Signal Converter required)
- 1 analogue output (4-20 mA)
- 1 Open Collector output
- Optional relay module with 2 Dry Contact Relay SPDT
- Power supply 12-32 VDC

The GF Piping Systems Signet 8900 Multi-Parameter Controller takes the concept of modularity. Each 8900 is field commissioned with the users specified combination of inputs, outputs, and relays using simple-to-install modular boards into the base unit. Configure the system by selecting either two, four, or six input channels which accepts any of the Signet sensors listed below, and/or other manufacturer's sensors via a 4 to 20 mA signal converter (Signet Model 8058). To complete your unit, choose a power module with universal AC line voltage or 12 to 24 VDC. Analog output and relay modules are available and easily installed. Derived measurements include difference, sum, ratio, percent recovery, percent rejection, percent passage and BTU.

The menu system can be programmed to display in multi-languages including English, German, French, Spanish, Italian, and Portuguese.

- 2,4 or 6 sensor input (Flow, Level, pH-ORP, Conductivity, Pressure Temperature)
- 0,2 or 4 analogue output (4-20 mA or 0-10 Volts)
- 0,2,4,6 or 8 relay output
- Power supply 12-30 VDC or 110-230 VAC

- System Specification -

8.7 Batch Control

The batch controller manufactured by GF Piping Systems Signet Type 5600 allows batching a pre-selected quantity of liquid. After selection of the quantity to be dosed, a start signal (local or remote) will close a batch controller contact to energize or de-energize a valve and/or switch on a pump. The batch controller count the pulses coming from any Signet sensor with frequency output and stop the batch process as the pre-selected quantity is reached. Advanced features include a user-set security code, an automatic calibration option, and overrun compensation. The batch process is repeatable and is designed for intensive industrial applications.

9. Quality

9.1 Production Conditions

Pipes, fittings, valves and accessories shall be manufactured in an environment operating a Quality Assurance System to ISO 9001 and an Environmental Management System conform to ISO 14001.

9.2 Marking

All components are embossed with a permanent identification during the production process to ensure full traceability. The following information will be mentioned:

- Manufacturer's name or trade mark
- Production lot number
- Material
- Dimension
- Pressure rating

9.3 Uniformity

Pipes, fittings, valves and Fusion IR Plus machines shall be supplied from one manufacturer, namely GF Piping Systems to ensure correct and proper jointing between components and uniform chemical and physical properties of the piping system.

- System Specification -



9.4 CAD/BIM Library

All components shall be available in GF Piping Systems CAD and BIM library.
Available at: <http://cad.georgfischer.com> & <http://bim.gfps.com>

9.5 Training, Certification and Installation

Site personnel, involved with **PROGEF Standard (PP)** piping installation, shall undergo training and certification from an authorised local institution prior to performing any jointing operations on site. For further information and training please contact GF support under

Contact:

GF Piping Systems Ltd.

Phone: +41 52 631 11 11

E-mail: info.ps@georgfischer.com

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