- System Specification -
for SYGEF Standard Piping Systems in Polyvinylidene fluoride (PVDF)

1. Scope

This specification covers requirements for the GF **SYGEF Standard (PVDF)** Piping System intended for a wide range of applications including water, wastewater and effluent treatment as well as a wide range of chemical applications. The components of the **SYGEF Standard (PVDF)** piping systems are in accordance with the following standards.

2. Basic System Data

2.1 Material Specification for SYGEF Standard (PVDF)

SYGEF Standard (PVDF) pipes, fittings and valves from GF Piping Systems are manufactured from polyvinylidene fluoride resin material, unpigmented and opaque, of which pipes and fittings are designed for 25 years of operational life with water at 20°C. The raw material used is designed for use with pressure bearing piping systems with long term hydrostatic properties in accordance with EN ISO 10931, as supplied by GF Piping Systems.

2.2 Characteristics of SYGEF Standard (PVDF)

Characteristics	PVDF	Units	Standards
Density	~ 1.78	g/cm^3	EN ISO 1183-1/ ASTM D792
Yield stress at 23°C	≥ 48	N/mm^2	EN ISO 527-1
Tensile E-modulus at 23°C	≥ 1800	N/mm^2	ISO 527-1/ ASTM D 638
Charpy notched impact strength at 23 °C	≥ 8	kJ/m^2	EN ISO 179/1eA
Charpy notched impact strength at 0°C	≥ 7	kJ/m^2	EN ISO 179/1eA
Heat distortion temperature HDT A 1.80 Mpa	≥ 104	°C	EN ISO 75-2
Crystallite melting point	≥ 168	°C	DIN 51007
Thermal expansion coefficient	0.12 - 0.18	mm/mK	DIN 53752
Heat conductivity at 23°C	0.19	W/mK	EN 12664
Water absorption at 23°C/24 h	≤ 0.04	%	EN ISO 62
Colour	opaque		
Limiting oxygen index (LOI)	≥ 43	%	ISO 4589-1
Inner surface finish for injection moulded and extruded components	d≤ 315, $R_a \leq 0.5$ *d355-400, $R_a \leq 0.65$	µm	ISO 4287/ 4288
Temperature range in °C	-20 - +140	°C	

**Dimensions available in SYGEF Plus*

2.3 SYGEF Standard Product Range

Products	PN	SDR	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
Pipes	16	21	■	■	■	■	■	■	■	■	■	■		■	■	■	■	■	■	■
	10	33									■	■	■	■	■	■	■	■	■	■
Socket fusion fittings	16		■	■	■	■	■	■	■											
Butt fusion fittings IR and BCF	16	21		■	■	■	■	■	■	■	■	■		■	■	■	■	■	■	■
compatible	10	33									■	■	■	■	■	■	■	■	■	■
Ball valves	16	21	■	■	■	■	■	■	■	■	■	■								
	10	33	■	■	■	■	■	■	■	■	■	■								
Diaphragm valves	16	21		■	■	■	■	■	■	■	■	■								
	10	33		■	■	■	■	■	■	■	■	■			■					
Butterfly valves	10								■	■	■	■	■	■	■	■	■	■	■	■
Check valves	16/10	21	■	■	■	■	■	■	■	■	■	■								
Wafer check valves	10/6						■	■	■	■	■	■	■	■	■	■	■	■	■	■
Pressure regulating valves	10			■	■	■	■	■	■	■	■	■								
Ventilating and Bleed valves	16		■	■	■	■	■	■	■	■	■	■								
Automation			■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Flanges PP-V / PP - Steel				■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Flange seal				■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Pipe clips			■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
IR fusion machine				■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
BCF fusion				■	■	■	■	■	■	■	■	■								
Butt fusion machine				■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Socket fusion machine			■	■	■	■	■	■	■	■	■	■	■							
Solenoid Valves	16			■	■	■	■	■	■											

■ Available

2.4 Approvals/ Acceptance/ Conformance

This **SYGEF Standard (PVDF)** material specification meets 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.

	DIBt	ASME BPE	FDA	EU 10/2011	USP 25 class VI	FM-4910 listing	GOST-R	CE	BV
Raw material	■	■	■	■	■	■			
Pipes	■	■		■		■	■		
Fittings	■	■		■		■	■		
Valves	■	■		■			■	■	■
Flanges	■								
Gaskets	■		■	■	■		■		

■ Available

3. Pipes

All **SYGEF Standard (PVDF)** pipes are metric sizes from d16 (3/8") – d315 (12"), manufactured in accordance with the requirements of EN ISO 10931, as supplied by GF Piping Systems. Furthermore the pipes are manufactured stress free and thermally annealed (max. internal stress of 2.5 N/mm^2), without any voids, allowing a high grade of roundness, high degree of straightness and an extreme smooth surface (see „2.2 Characteristics of SYGEF Standard (PVDF)" – Inner surface finish for injection moulded and extruded components). Testing will be done in accordance with EN 10204.

Outer diameter, ovality and wall thickness are defined according to Tables 1 and 2.

Table 1: Measurements SDR21 / PN16

in millimetres

Nominal outer diameter	Min. wall thickness	Tolerance limit of outer diameter	Maximum deviation for ovality	Tolerance limit of wall thickness	Standard Dimension Ratio	Pipe series
d_n	e_{min}			a	SDR	S
16	1.9	+0.3	0.2	+0.4	9	4
20	1.9	+0.3	0.3	+0.4	11	5
25	1.9	+0.3	0.4	+0.4	13.6	6.3
32	2.4	+0.3	0.5	+0.5	13.6	6.3
40	2.4	+0.3	0.5	+0.5	17	8
50	3.0	+0.3	0.6	+0.6	17	8
63	3.0	+0.4	0.8	+0.6	21	10
75	3.6	+0.4	0.9	+0.6	21	10
90	4.3	+0.4	1.1	+0.7	21	10
110	5.3	+0.5	1.3	+0.8	21	10
125	6.0	+0.6	1.5	+0.9	21	10
140	6.7	+0.8	1.7	+0.9	21	10
160	7.7	+1.0	1.9	+1.0	21	10
200	9.6	+1.2	2.4	+1.2	21	10
225	10.8	+1.4	2.7	+1.3	21	10
250	11.9	+1.6	3.0	+1.4	21	10
280	13.4	+1.8	3.4	+1.5	21	10
315	15.0	+2.0	3.8	+1.6	21	10

d16-125 suitable for socket- and butt fusion technologies
d140-315 suitable for butt fusion technologies

Table 2: Measurements SDR33 / PN10

in millimetres

Nominal outer diameter	Min. wall thickness	Tolerance limit of outer diameter	Maximum deviation for ovality	Tolerance limit of wall thickness	Standard Dimension Ratio	Pipe series
d_n	e_{min}			a	SDR	S
75	2.3	+0.4	0.9	+0.5	33	16
90	2.8	+0.4	1.1	+0.5	33	16
110	3.4	+0.5	1.3	+0.6	33	16
125	3.9	+0.6	1.5	+0.6	33	16
140	4.3	+0.8	1.7	+0.7	33	16
160	4.9	+1.0	2.0	+0.7	33	16
200	6.2	+1.2	2.4	+0.9	33	16
225	6.9	+1.4	2.7	+0.9	33	16
250	7.7	+1.6	3.0	+1.0	33	16
280	8.6	+1.8	3.4	+1.1	33	16
315	9.7	+2.0	3.8	+1.2	33	16

d75-125 suitable for socket- and butt fusion technologies
d140-315 suitable for butt fusion technologies

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 mimimum 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. All measured values must be within the allowable tolerance limit.

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.

3.1 Product Marking

The pipes are embossed with a permanent identification during the production process to ensure full traceability.
All pipes are marked permanently and consecutively

- Material identification: +GF+ SYGEF Std or SYGEF Plus Std
- Material code: PVDF
- Pipe diameter, wall thickness, SDR and PN
- Product standard: ISO 10931
- Manufacture date, shift and machine number
- Approvals / Conformance: DIBT-Approval, FM4910 listing

3.2 Packaging and Labelling

The packaging must ensure that the pipes are not damaged during transportation.
Packaging and labelling must meet the following requirements:

- Pipes capped on each end
- Each pipe separately and single bagged in a specified bagging material
- Identification of the content, in type, quantity and product details
- Information about standards and approvals covered by the product
- Content of the label must fulfil legal requirements
- Labels must be EAN coded for automatic identification
- Comply to GF standards as well as to international standards such as ISPM 15

4. Fittings

All **SYGEF Standard (PVDF)** fittings are either as butt fusion type, metric sizes d20 (1/2") – d315 (12”) or socket fusion type, metric size d16 (3/8”) – d63 (2”). Both are manufactured by GF Piping Systems in accordance with EN ISO 10931 and they need to be tested according to EN 10204. The fittings are manufactured with an extreme smooth surface (R_a-value ≤ 0,5 µm for all injection moulded items). All threaded connections have pipe threads in accordance with the requirements of ISO 7-1.
All butt fusion fittings are manufactured with optimal lengths designed for use with fusion machine IR-63 Plus, IR-110 Plus, IR-110 A, IR-225 Plus, IR-315 Plus, IR-315 A, IR-450 or the BCF Plus (Bead and Crevice Free) welding machine supplied by GF Piping Systems.

4.1 Product Marking

The fittings are embossed with a permanent identification during the production process to ensure full traceability.
Each part is marked according to EN ISO 10931:

- Logo of the manufacturer
- SDR (Standard Dimension Ratio) rating or PN (Nominal Pressure) or s (pipe series)
- Dimension
- 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:

- Multiple components separately and single bagged in specified bagging material
- Identification of the content, in type, quantity and product details
- Information about standards and approvals covered by the product
- Content of the label must fulfil legal requirements
- Labels must be EAN coded for automatic identification
- Comply to GF standards as well as to international standards such as ISPM 15

5. Accessories

5.1 Backing Flanges

5.1.1 PP-V Flanges

Backing flanges in metric sizes DN15-400 shall be designed according to ISO 9624, 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 flange is optimized 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: ASME B 16.5, BS 1560; class 150 (1/2” – 12”).

5.1.2 PP-Steel Flanges

As an alternative backing flanges in metric sizes DN15-400 shall be designed according to ISO 9624, in a thermo plastic-oriented design, consisting of glass fibre reinforced polypropylene, PP-GF30, graphite black and UV stabilized with steel 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 (DN15-400) + PN16 (DN15-400); Inch: ASME B 16.5, BS 1560; class 150 (1/2” – 16”).

5.2 Gaskets

Gaskets in metric sizes DN10–450 shall consist of an elastomeric material (EPDM acc EN 681, FKM or NBR acc. EN 682) designed with metal reinforcement for use with flange adaptors according ISO 10931. Gaskets shall be designed to be centred by the outer diameter.

5.3 Pipe Support System

Pipe Support System shall be KLIP-IT sizes d16-315 supplied by GF Piping Systems.

6. Valves

All **SYGEF Standard (PVDF)** 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 **SYGEF Standard (PVDF)** ball valves with metric sizes DN10–100 shall be Georg Fischer Piping Systems Type 546 Pro, 543, 523 with true double union design manufactured by Georg Fischer Piping Systems in accordance with EN ISO 16135. Incorporated into its design shall be a safety stem with a predetermined breaking point above the upper 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 is lockable as standard and 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. A data-matrix code, equipped with production data, is lasered on every single valve after passing a leakage test. Leakage requirements are in accordance with ISO 9393-2 and EN 12266 (leak rate A).

Following accessories shall be available:

- Electrical position feedback for ball valves (DN10 - 50) shall be inductive (PNP, NPN or NAMUR) with visual LED feedback in order to allow long life- and operating time. The sensor shall detect the valve position (and not the actuator position) – hence it shall detect the position feedback below the predefined breaking point of the valve to guarantee the correct valve position under all conditions. Its body shall be made of plastic (PBTGF20) together with IP 67 rating to ensure functioning under all conditions
- Manual spring return unit (DN10 – 25) to ensure self-closing of the valve after manually opening it.
- Labelling (UV-, weather- and chemical resistant) of manual or automated ball valves incorporated in the design of the valve.
- Mounting plate in PPGF with integrated inserts for later screw mounting on any support

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.
In case of a blocked ball, the predefined breaking point shall be within the interface (Multi-functional module) of the valve and the actuator. Thus, the manual ball valve does still work and shut down of the line is prevented.

All electric actuator types (with the exception of EA15) 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

The system Specifications for electric actuators are as follows:

* at rated torque

Specification		
Combinations	EA15	2-Way Ball valve type 546 bis DN50
		3-Way Ball valve type 543 bis DN50
	EA25	2-Way Ball valve type 546 bis DN50
		3-Way Ball valve type 543 bis DN50
	EA45	2-Way Ball valve type 546 bis DN65
		Butterfly valve types 567/578, Type 038/039
	EA120	2-Way Ball valve type 546 bis 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 °			

Furthermore, GF Piping Systems offers the smart Electric Actuator Types dEA 25, dEA45 or dEA120-
This smart electric actuators have following features compared to above mentioned options:

- Connectivity via NFC and WiFi Direct ensuring control, identification and visibility without opening the case
- Most relevant asset data visualized in the app
- Connection and control via app possible
- LED stripe for visual open/close 360° feedback

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 (ISO 5211) 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. In case of a blocked ball, the predefined breaking point shall be within the interface (Multi-functional module) of the valve and the actuator. Thus, the manual ball valve does still work and shut down of the line is prevented.

- For valve size DN65 pneumatic actuators shall be Type PA 35 (fail safe to close or open function), Type PA35 (double acting function).
- For valve size DN80 pneumatic actuators shall be Type PA 40 (fail safe to close or open function), Type PA40 (double acting function).
- For valve size DN100 pneumatic actuators shall be Type PA 40 (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:

- Electrical position feedback for ball valves (DN10 - 50) shall be inductive (PNP, NPN or NAMUR) with visual LED feedback in order to allow long life- and operating time. The sensor shall detect the valve position (and not the actuator position) – hence it shall detect the position feedback below the predefined breaking point of the valve to guarantee the correct valve position under all conditions. Its body shall be made of plastic (PBTGF20) together with IP 67 rating to ensure functioning under all conditions
- Pilot valve remote or direct mounted in voltages 24VDC/AC, 110VAC, 230VAC
- Positioner: Electro-pneumatic positioners series RPC, RPC D, RPC PID for reliable control of pneumatic rotating valves
    - 24V DC supply voltage with 4-20 mA control and analogue feedback
    - Multi-pole plug for easy electrical connection
    - Different function levels standard, extended with display and PID
    - Simple commissioning via TUNE function
- Stroke limiter
- Manual override for all sizes up to DN100
- AS Interface control module with incorporated position feedback and a solenoid pilot valve

6.2 Diaphragm Valves

6.2.1 Manual Diaphragm Valves

6.2.1.1 Diaphragm Valves DN15 to DN100

All **SYGEF Standard (PVDF)** diaphragm valves, with metric sizes DN15-100, 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

All diaphragm valves shall be manufactured by GF Piping Systems in accordance with EN ISO 16138.

The upper body shall be orange PPGF (polypropylene glass fibre reinforced) connected to the lower body with a central union avoiding exposed screws.
A two coloured 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 EPDM, FKM, NBR, PTFE with EPDM or FKM backing diaphragm.

Following options shall be available:

- PN16 pressure rating (upper body shall be black PPS GF (polyphenylene sulphide glass fiber reinforced) for water applications only)
- 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 **SYGEF Standard (PVDF)** diaphragm valves, with metric sizes, shall be Type 317 (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 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 backing diaphragm.

6.2.2 Pneumatic Diaphragm Valves

6.2.2.1 Pneumatic Diaphragm Valves DN15 to DN100

All **SYGEF Standard (PVDF)** diaphragm valves, with metric sizes DN15-100, shall be either:

- Type 604 true double union design, DN15, or
- Type 605 spigot design, DN15
- Type 514 true double union design, DN15-50, or
- Type 515 spigot design, DN15-50, or
- Type 517 flange design, DN15-50, or

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 EPDM, FKM, NBR, PTFE with EPDM or FKM backing 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
63	50	1728

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

- Type 604/605 for PN up to 6 bar (one side)
- DIASTAR Ten for PN up to 10 bar (one side)
- DIASTAR Ten Plus for PN up to 10 bar (both sides)
- DIASTAR Sixteen for PN up to 16 bar (one side)

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, DIASTAR Ten Plus and DIASTAR Sixteen shall have following accessories available:

- Solenoid pilot valve remote or direct mounted in voltages 24VDC/AC, 110VAC, 230VAC
- Positioner: Electro-pneumatic positioners series SPC, SPC*, SPC D, SPC PID, SPC Lite for reliable control of pneumatic stroke valves
  - 24V DC supply voltage with 4-20 mA control and analogue feedback
  - Multi-pole plug for easy electrical connection
  - Different function levels standard, extended with display and PID
  - Simple commissioning via TUNE function
- 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 **SYGEF Standard (PVDF)** diaphragm valves 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 backing diaphragm.
Pneumatic diaphragm actuators shall be GF Piping Systems 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: Electro-pneumatic positioners series SPC, SPC*, SPC D, SPC PID, SPC Lite for reliable control of pneumatic stroke valves
    - 24V DC supply voltage with 4-20 mA control and analogue feedback
    - Multi-pole plug for easy electrical connection
    - Different function levels standard, extended with display and PID
    - Simple commissioning via TUNE function
- Feedback with following limit switches AgNi, Au, NPN, PNP, NAMUR
- Stroke limiter & emergency manual override
- ASI Controller

6.3 Butterfly Valves

All **SYGEF Standard (PVDF)** butterfly valves with metric sizes DN50 (2") – DN300 (12") shall be GF Piping Systems Type 567/578 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 FKM and PTFE. 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°. 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 567/578 manufactured by GF Piping Systems are designed for a nominal pressure rate of 10 bar.

6.3.1 Electrically Actuated Butterfly Valves

Electric actuators shall be GF Piping Systems Types EA45, EA120 or EA250 dependent on valve size. 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:
EA45 / EA120 / EA250:

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

Furthermore GF Piping Systems offeres the smart Electric Actuator Types dEA45, dEA120 or dEA250. This smart Actuators have following features compared to the above mentioned options:

- Connectivity via NFC and Wi-Fi Direct ensuring control, identification and visibility without opening the case
- Most relevant asset data visualized in the app
- Connection and control via app possible
- LED stripe for visual open/close 360° feedback

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), 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). 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 (ISO 5211) 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:

- Electro-pneumatic positioners series RPC, RPC D, RPC PID for reliable control of pneumatic rotating valves
    - 24V DC supply voltage with 4-20 mA control and analogue feedback
    - Multi-pole plug for easy electrical connection
    - Different function levels standard, extended with display and PID
    - Simple commissioning via TUNE function

- Feedback with following limit switches AgNi, Au, NPN, PNP, NAMUR
- Stroke limiter & emergency manual override
- ASI-controller

6.4 Check Valves

6.4.1 Check Valves

All **SYGEF Standard (PVDF)** check valves, according to EN ISO 16137, metric sizes DN10-100 metric, shall be Type 561/562 true double union design. Seals shall be FKM or FFKM. 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 (either V2A, Nimonic 90 or V2A ECTFE coated) to allow position independent installation. The valves are designed for a nominal pressure of 16 bar.

6.4.2 Wafer Check Valves

All **SYGEF Standard (PVDF)** 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 must be equipped with a spring (either in 316 stainless steel or Hastelloy C) guaranteeing closure 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 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

Type V82, Pressure Reducing Valve with an integrated manometer, sizes DN65-100

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

Direct-acting solenoid valves as supplied by GF Piping Systems serve 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

Servo-assisted solenoid valves as supplied by GF Piping Systems serve to regulate and control fluids, if no compressed air is available or unwanted. They are used for miscellaneous functions, e.g. opening and shutting–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.
Δp (pressure) of 0.5 bar is mandatory with servo-assisted valves.

- Type, 165, sizes DN15-50

6.8 Ventilating- and Bleed Valves

All **SYGEF Standard (PVDF)** ventilating- and bleed valves shall be GF type 591. Dimensions DN10-100 are with pressure rating PN16. They shall be equipped with a PVDF floater.

6.9 Ventilating Valves

All **SYGEF Standard (PVDF)** ventilating valves shall be GF type 595. Dimensions DN10-100 are with pressure rating PN16. They shall be equipped with plastic coated stainless steel spring with minimal opening pressure (10-80 mbar). Optionally Nimonic / Nimonic-ECTFE can be used.

7. Welding and assembly

All butt fusion fittings and valves shall also be manufactured with laying lengths designed for use with fusion machines IR-63 Plus, IR-110 Plus, IR-225 Plus and IR-315 Plus 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 for uniform reproducible weld beads for easy weld bead inspection. To increase the cooling capacity, an additional cooling fan is included in the IR-225 Plus and IR-315 Plus.

The IR-weld beads (K-value, wall offset, width, heights, area and angle of the components) shall by measured and documented with the WBI Tool.

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 2207-15 may be used, preferably with automated CNC controllers and weld recorders. Special care needs to be taken to prevent the pipe ends from sticking to the heater plate.

Socket fittings require the use of Socket Fusion welding tools according to DVS 2007-15, with heating bushes System B.

The BCF fusion technology joins **SYGEF Standard (PVDF)** piping components of dimensions d20-110 without any irregularities, beads or crevices. The extremely compact fusion machine, which is also ideal for on-site fusion, is very reliable, easy to handle and creates reproducible and very strong fusion welds.
Only authorized welders by GF Piping Systems are allowed to perform fusion on the BCF Plus machines manufactured by GF Piping Systems.

The welding and the installation should be in accordance with GF Piping Systems Guide to the Installation and Use of Plastic Pipeline.

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, Adaptor Sockets metric sizes DN20-50 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.

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 µS 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 SIGNET 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 SIGNET 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 (±0.1inch) 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. 10µS 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-fee 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

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

SYGEF Standard (PVDF) Pipes, fittings, valves and accessories shall be manufactured in an environment operating within a Quality Assurance System conforming to ISO 9001 and an Environmental Management System conforming 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:

- Manufacturers name or trade mark
- Production lot number
- Material
- Dimension
- Pressure rating

9.3 Uniformity

Pipes, fittings, valves and welding 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.

9.4 CAD 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 **SYGEF Standard (PVDF)** piping installation shall undergo training and certification from an authorized local institution prior to performing any jointing operations on site. For further information and training please contact GF Piping Systems support under

Contact:
GF Piping Systems Ltd.
Phone: +41 52 631 11 11
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