

- System Specification -

for PVC-U Metric Piping Systems

1. Scope

This specification covers requirements for the Georg Fischer PVC-U 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 PVC-U piping systems are in accordance with the following standards.

2. Basic System Data

2.1 Material Specification for Unplasticised Polyvinylchloride (PVC-U)

PVC-U pipes, fittings and valves from Georg Fischer Piping Systems shall be manufactured from unplasticised polyvinylchloride, of which pipes and fittings are designed for 25 years of operation with water as medium (20 °C). PVC-U has also an optimal chemical resistance against many mineral acids, bases and salt solutions. For detailed information, please refer to the list of chemical resistance provided by Georg Fischer Piping Systems. The raw material used shall be material designed for use with pressure bearing piping systems with long term hydrostatic properties in accordance with EN ISO 15493, as supplied by Georg Fischer Piping Systems.

2.1 Characteristics of PVC-U Material

Characteristic	Value	Test Standards
Density	1.38 g/cm ³	ISO 1183-1
Tensile E-modules	>2400 N/mm ²	EN ISO 527-1
Charpy notched impact strength at 23 °C	6 kJ/m ²	EN ISO 179/1eA
Charpy notched impact strength at 0 °C	3 kJ/m ²	EN ISO 179/1eA
Vicat heat distortion temp. B/50N	≥76 °C	ISO 306
Chemical resistance	DIBT agreement	based on the medium list 40.1.4
Thermal expansion coefficient	0.07 - 0.08 mm/mK	DIN 53752
Temperature range in °C	0 °C - 60 °C	
Colour	dark grey; 7011 -RAL	

2.2 PVC-U Dimensional Range & Pressure** (at 20 °C)

Products	d	6	8	10	12	16	20	25	32	40	50	63	75	90	110	125	140	160	180	200	225	250	280	315	355	400
Pipe	16																									
	10																									
	6																									
Fittings	16																									
	10																									
	6																									
ball valve*	16																									
butterfly valve*	10																								***	***
diaphragm valve*	10																									
Flange*	16																									
	10																									
gaskets*	16																									
pipe clips	--																									

* for detailed information please consult the Georg Fischer Piping Systems online catalog

** values in table at the max. pressure in units of bar, at 20 °C

*** metal butterfly valves

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For more detailed physical properties and product pressure – temperature curves, please consult the Georg Fischer Piping Systems Planning Fundamentals on the Georg Fischer Piping Systems website.

2.3 Approvals

This material specification for PVC-U is met by Georg Fischer Piping Systems. Therefore Georg Fischer Piping Systems is approved according to different categories all over the world. For more information please consult our approvals database on the Georg Fischer Piping Systems website.

Approvals	DVGW	DIBT	GOST-R	DGS (ACS)	KWA	CSTB	IIP	ABS	BV	CCS	DNV	GL	LR	RINA	RMROS
								ship building							
Raw Material															
Pipe															
Fittings															
Valves*															
Flange															
gaskets															

** For details on which valve (ball, butterfly, diaphragm etc. ...) please contact GF database

3. Pipes

Pipes are made of **PVC-U** and processed according to the quality specifications and dimensions according to EN ISO 15493. Pipe formulation has been designed for an enhanced chemical resistance (content of $\text{CaCO}_3 < 3\%$), enhanced thermo stabilizer package etc.

Processed pipes are straight and show a very low out-of-roundness. The wall structure is homogeneous and even.

OD-tolerances surpass the requirements of ISO 4065 and are compatible with the fitting programme of Georg Fischer Piping Systems for easy pre-assembly and minimized gaps.

For highly demanding applications in the chemical industry, the application of pressure rating SDR 9 pipes and PN 16 fittings is strongly recommended for OD ≤ 110 mm.

Any installation should follow the Georg Fischer Piping Systems installation guidelines for industrial piping and the guidelines issued by the DVS.

Approved pipes comply with the corresponding quality specifications of DIN Certco ZP 1.1.1.

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4. Fittings

All **PVC-U** fittings shall be metric sizes manufactured by Georg Fischer Piping Systems, and shall be of a type suitable for solvent cementing, with dimensions and tolerances in accordance with EN 1452-1 & 3, EN ISO 15493 and ISO 727-1. They need to be tested according to EN 10204. All threaded connections shall have pipe threads in accordance with the requirements of ISO 7-1.

4.1 PRO-FIT Fittings in PVC-U

All PRO-FIT fittings (elbows 45 ° and 90 °, tee equal, reducing bushes, and unions) shall be metric sizes from d 20-63 mm in PVC-U as manufactured by Georg Fischer Piping Systems. The PRO-FIT fittings shall have a 45° marking as well as integrated marking for vertical mounting and a spigot-socket design, reducing bushes shall offer the possibility of a spigot and cemented socket connection on each side of the fitting as manufactured by Georg Fischer Piping Systems.

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 ISPM 15

5. Accessories

5.2.1 Flanges

Backing flanges in metric sizes DN 15-225 mm shall be designed according to EN ISO 15493, 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 Georg Fischer Piping Systems. The flange shall be optimised with a V-groove in the inner diameter to ensure an evenly distributed force on the thermo plastic flange adapter. Connecting dimensions metric according to ISO 7005, EN 1092; Bolt circle diameter PN 10; Inch: ANSI B 16.5, BS 1560; class 150.

Alternatively the backing flanges in metric sizes can be from or unplasticized polyvinyl chloride, PVC-U designed according to EN ISO 15493, in a thermo plastic-oriented design. 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 PN 10; Inch: ANSI B 16.5, BS 1560; class 150.

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5.2.2 Gaskets

Gaskets in metric sizes DN10 – 300 shall consist of elastomeric material according to EN681, designed with or without metal reinforcement for use with solvent cementable 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.

5.2.3 Pipe Support System

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

6. Valves

All **PVC-U** valves shall be metric sizes manufactured by Georg Fischer Piping Systems or equal in accordance with EN ISO 16135 and following, tested according to the same standard.

6.1. Ball Valves

All **PVC-U** ball valves with metric sizes DN 15 - 100 mm, shall be Georg Fischer Piping Systems Type 546 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 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 FPM. 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 EA11 (sizes DN 10-50 mm), EA21 (sizes DN10-50 mm), EA31 (sizes DN 65-100 mm) shall be available manufactured by Georg Fischer Piping Systems in accordance with EN 61010-1, EC directives 89/336/EEC-EMV and 73/23/EEC, LVD and needs to be **CE** marked. Actuator housing shall be made of PPGF (polypropylene glass fibre reinforced), flame retardant with external

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stainless steel screws. All electric actuators shall have an integrated emergency manual override and integrated optical position indication. All electric actuator types (with the exception of EA11) shall have the following accessories available:

- Fail-safe unit
- Heating element
- Cycle extension, cycle time monitoring, and cycle counting
- Motor current monitoring
- Position signalisation
- Positioner Type PE25
- Limit switch kits Ag-Ni, Au, NPN, PNP, NAMUR
- AS Interface Plug Module

Electric actuator specifications of the actuators shall be as follows:

Specification	EA11	EA21	EA31	EA42
Nominal torque (Nm)	10	10	60	100
Control time (s/90°)*	5	5	15	25
Cycles at 20 °C *	150,000	250,000	100,000	75,000
Duty cycles ED at 20 °C	40%	100%	50%	35%
Protection class	IP65 per EN 60529 - IP67 (for vertical cable mounting and wall feed through).			
Voltage	100-230, 50-60 Hz or 24V= /24V, 50/60 Hz versions			

* = at nominal torque

6.1.2. Pneumatically Actuated Ball Valves

Pneumatic actuators shall be Georg Fischer Piping Systems Types PA11 (for valve sizes DN 15-25 mm) and PA21 (for valve sizes DN 32-50 mm). They shall be manufactured by Georg Fischer 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 Georg Fischer Piping Systems.

- For valve size DN 65 mm pneumatic actuators shall be Type PA 30 (fail safe to close or open function), Type PA35 (double acting function).
- For valve size DN 80 mm pneumatic actuators shall be Type PA 35 (fail safe to close or open function), Type PA40 (double acting function).
- For valve size DN 100 mm pneumatic actuators shall be Type PA 45 (fail safe to close or open function), Type PA45 (double acting function)

All actuators shall be manufactured by Georg Fischer Piping Systems. 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:

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- Pilot valve remote or direct mounted in voltages 24VDC/AC, 110VAC, 240VAC
- Positioner Type DSR 201
- Limit switch kits Ag-Ni, Au, NPN, PNP
- Stroke limiter
- Manual override for all sizes up to d 110 mm
- AS Interface control module with incorporated position feedback and a solenoid pilot valve

6.2. Diaphragm Valves

All **PVC-U** diaphragm valves, metric sized, shall be either:

- Type 314 (true double union design, DN 15-50), or
- Type 315 (spigot design, DN 15-50) or
- Type 317 (flanged design, DN 15-150)

All diaphragm valves shall be manufactured by Georg Fischer 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, FPM, NBR, or PTFE with EPDM or FPM supporting diaphragm. Following option shall be available:

- Handwheel with built in locking mechanism

6.2.1. Pneumatically Actuated Diaphragm Valves

Pneumatic diaphragm actuators shall be Georg Fischer Piping Systems Type DIASTAR sizes DN 15- 150 mm. Pneumatic actuators shall be available as fail safe close, fail safe open and double acting and have an integrated optical position indicator. Actuator housing shall be made of PPGF (polypropylene glass fibre reinforced), flame retardant. Actuators with FC mode shall contain a preloaded galvanised steel spring assembly to ensure safe actuator operation and maintenance. The pneumatically actuated diaphragm valves type 025 and 028 shall have the following accessories available:

- Solenoid pilot valve remote and direct mounted in voltages 230V, 50-60 Hz; 115V 50-60Hz; 24V 50-60 Hz; 24 VDC
- Positioner Type DSR 100/101
- Feedback with following limit switches Ag-Ni, Au, NPN, PNP, NAMUR
- Stroke limiter & emergency manual override
- ASI controller

6.3. Butterfly Valves

All **PVC-U** butterfly valves, metric sizes DN 50 (1 1/2") – 200 (8") mm, shall be Georg Fischer Piping Systems Type 567 / 563 wafer type with a double eccentric disc design manufactured by Georg Fischer Piping Systems in accordance with EN ISO 16136. Butterfly valves $\geq$ DN 200 mm are metal butterfly valves. Seals shall be

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available in both EPDM and FPM. 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. 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 Georg Fischer Piping Systems are designed for a nominal pressure rate of 10 bar. All butterfly valves Type 563 are designed for a nominal pressure rate of 4 bar.

All **PVC-U** butterfly valves, metric sizes DN 350-400, shall be Georg Fischer Piping Systems Type 567, design supplied by Georg Fischer Piping Systems in accordance with EN ISO 16136. The butterfly valves Type 567 supplied by Georg Fischer Piping Systems are designed for a nominal pressure rate of 6 bar.

6.3.1. Electrically Actuated Butterfly Valves

Electric actuators shall be Georg Fischer Piping Systems Types EA31 or EA 42 dependent on valve size. They shall be manufactured by Georg Fischer 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:

- Fail-safe unit
- Heating element
- Cycle extension, monitoring, and counting
- Motor current monitoring
- Position signalisation
- Positioner Type PE25
- Limit switch kits Ag-Ni, Au, NPN, PNP
- Manual override
- AS-Interface Plug Modul

6.3.2. Pneumatically Actuated Butterfly Valves

Pneumatic actuators shall be Georg Fischer Piping Systems Types PA 35 (metric sizes DN 50-65 mm), PA40 (metric size DN 80 mm only), PA45 (metric size DN 100 - 125 mm), PA55 (metric size DN 150-200 mm), PA60 (metric sizes DN 200mm FC), PA65 (metric sizes DN 250 mm FC) PA70 (metric sizes DN 300 mm FC). They shall be supplied by Georg Fischer 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

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of positioners, limit switches and accessories. All pneumatically actuated butterfly valves shall have the following accessories available:

- Solenoid pilot valve remote and direct mounted in voltages 230V, 50-60 Hz; 115V 50-60Hz; 24V 50-60 Hz; 24 VDC
- Positioner Type DSR 100/101
- Feedback with following limit switches Ag-Ni, Au, NPN, PNP, NAMUR
- Stroke limiter & emergency manual override
- ASI controller

6.4 Angle Seat Valves

All **PVC-U** Angle Seat Valves, Type 300 shall be manufactured by +GF+ according to EN ISO 21787 and overall length according to EN 558, available in metric sizes DN 10-80 mm, with an internal piston cone end in PE or PTFE, and solvent cement spigots. The Angle Seat valves manufactured by +GF+ are designed for a nominal pressure rate of 10 bar.

6.5. Check Valves

All **PVC-U** Ball check valves, according to EN ISO 16137, metric sizes DN 10-80 mm metric, shall be Type 360 true double union design. Seals shall be EPDM or FPM. 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 position.

6.5.2. Angle Seat Check Valves

All **PVC-U** Angle Seat Check Valves, Type 303 shall be manufactured by Georg Fischer Piping Systems according to EN ISO 16137 and overall length according to EN 558-1, available in metric sizes DN 10-80 mm with EPDM or FPM seals and with solvent cement spigots. The Angle Seat Check Valves shall be leakproof from a water column of 2 m for EPDM and 3 m for FPM seals as supplied by Georg Fischer Piping Systems. The Angle Seat Check valves manufactured by Georg Fischer Piping Systems are designed for a nominal pressure rate of 10 bar.

6.5.3. Wafer Check Valves

All **PVC-U** Wafer Check Valves shall be Georg Fischer Piping Systems Type 369, metric size DN 32-300 mm. The minimum water column of 2 m 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.

6.6. Pressure Regulating Valves

All **PVC-U** pressure regulating valves as supplied by Georg Fischer Piping Systems shall have the following characteristics:

Pressure ranges for all pressure regulating valves are the following:

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- DN 10 – 50 from 0 up to max. 10 bar
- DN 65 – 80 from 0 up to max. 6 bar
- DN 100 from 0 up to max. 4 bar

6.6.1. The Pressure Reducing Valve

as supplied by Georg Fischer 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 V82, compact Pressure Reducing Valve with an integrated manometer, sizes DN 10 -100 mm
- Type V182, compact Pressure Reducing Valve offering easy adjustment and real time visual control of the actual pressure reduction on the integrated manometer, sizes DN 10-40 mm
- Type V782, compact Pressure Reducing Valve, offering an easy adjustment, excellent flow rate and very low hysteresis, sizes DN 10-40 mm

6.6.2. Pressure Relief Valve

as supplied by Georg Fischer Piping Systems serves to keep the working or system pressures constant, to balance out pressure pulsation, and to reduce pressure peaks in process systems. The third pipe spigot fitted on the valve body means the valve can be installed directly in the main pipeline. If the inlet pressure rises above the set value, the pressurized valve piston is lifted against the spring force. Consequently, the valve opens and there is a reduction of pressure in the outlet pipe. The excess pressure can exhaust or be redirected via the third outlet. The valve closes as soon as the inlet pressure sinks below the pre-set spring tension. Following types and sizes are available:

- Type V185, Pressure Relief Valve, sizes DN 10-50 mm
- Type V85, Pressure Relief Valve, sizes DN 65 -100 mm

6.6.3. The Pressure Retaining Valve

as supplied by Georg Fischer 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:

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- Type V186, Pressure Retaining Valve, sizes DN 10-50 mm
- Type V86, Pressure Retaining Valve, sizes DN 65-100 mm
- Type V786, Pressure Retaining Valve, sizes DN 10-40 mm

7. Solvent Cement & Cleaner

For adhesive jointings, PVC-U cement with gap-filling adhesives must be used for solvent cementing. Georg Fischer recommends the Henkel cement system TANGIT PVC-U for all PVC-U solvent cement joints. All specifications are based on using TANGIT PVC-U, including strength and chemical resistance. For all other cements please refer to the manufacturers' instructions.

PVC-U TANGIT contains app. 20% PVC-U, dissolved in a blend of solvents. The solvents soften and macerate the edges of the surfaces they are applied to. Once the solvents have evaporated, they leave a homogenous joint with the same mechanical, thermic and chemical properties as of the PVC-U pipe system.

The jointing surfaces of pipe and fitting must be clean and free of grease, otherwise they must be cleaned with TANGIT cleaner.

For chemical concentrations $\geq 70\%$ sulphuric acid; $\leq 10\%$ chromic acid, $\geq 25\%$ hydrochloric acid; $\geq 20\%$ nitric acid; sodium hypochlorite $\geq 6\%$ active chlorine, $\geq 5\%$ hydrogen peroxide and hydrofluoric acid in any concentration, subject to the application and operating conditions, Dytex solvent cement and Dytex Cleaning for PVC-U, manufactured by Henkel, must be used in accordance with the instruction of Henkel.

8. 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	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 (data sheet) and chemical resistance list

8.1 Sensors

The sensors listed hereafter will transfer the measured value to a Georg Fischer Piping Systems Transmitter, allowing simple calibration and maintenance of the

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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 (mA, open collector or sinusoidal voltage) or a digital signal called S3L (Georg Fischer Piping Systems Signet serial signal).

8.1.1 Installation Fitting

Depending on the sensor type, special installation fittings shall be used for connection to the pipeline: Installation T-Fitting sizes d20-63 mm with double true union in PVC-U, clamp on saddles sizes d75 – 315 mm and weld-o-let sizes d75 – 400mm with as supplied by Georg Fischer Piping Systems. Connection can be Weld-o-let, direct union 1/2", 3/4" ISO, 3/4" NPT, Submersion kits. These fittings will be socket solvent cemented version.

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 Georg Fischer 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 Georg Fischer 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 Georg Fischer 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 to each of the paddles is a magnet. As the paddles pass the center of the sensors body, the magnetic field switches the open collector relay on and off which generates a square wave pulse as manufactured by Georg Fischer Piping Systems SIGNET. One pulse 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:

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as supplied by Georg Fischer 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, DN 10 – 65 mm
- Type 335, DN 25 – 65 mm
- Type 350, DN 25 – 65 mm

8.1.2.3 Magmeter

The Magmeter sensor of Georg Fischer Piping Systems SIGNET consists of two metallic pins that produce a small magnetic field across the inside of the pipe. 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. The magnetic field produced by the sensor is directly proportional to the flow rate of the fluid. The magnetic signal is conditioned and translated in to a pulse signal (K-factor). The Magmeter of Georg Fischer Piping Systems SIGNET is offered as a blind output (frequency or 4-20 mA), or with integral display and control relays.

8.1.3 Level Sensor (hydrostatic level)

Hydrostatic pressure is the pressure exerted on a column of fluid by the weight of the fluid above it. Internal to the Georg Fischer Piping Systems SIGNET 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. Because the hydrostatic level sensor from Georg Fischer Piping Systems SIGNET only senses the pressure of the fluid, interference and inaccuracies of the signal are dramatically reduced. The measured signals are boosted sent to a Georg Fischer Piping Systems SIGNET Transmitter unit.

8.1.4 pH Sensors

All pH sensors from Georg Fischer Piping Systems SIGNET are constructed of three key elements measuring cell, reference cell and reference junction. 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 mV-signal to which the measuring cell compares its own signal. The reference junction allows the reference cell to come in contact with the fluid being measured. The measured

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signals are then conditioned and sent to a Georg Fischer Piping Systems SIGNET Transmitter unit.

8.1.5 ORP Sensors

All ORP sensors from Georg Fischer Piping Systems SIGNET are constructed similar to the pH sensors, except that a noble metal like platinum or gold replaces the hydrogen sensitive glass. is replaced with a noble metal such as platinum or gold.

The noble metal measures the activity of oxidizing or reducing chemicals agents. The electrical signals are then conditioned and translated into pulse signals (K-factor), which are sent to a Georg Fischer Piping Systems SIGNET Transmitter unit.

8.1.6 Conductivity Sensors

All Conductivity sensors from Georg Fischer 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 conductivity monitor/transmitter sends a signal into one of the electrodes and depending on the fluids availability to conduct a charge (concentration of ions) measures the amount of current required to sense the signal on the second electrode. The correct selection of a sensor with the right cell constant, which depends on the conductivity level, is paramount. a sensor that has the proper cell constant (depends on the conductivity level). All conductivity sensors from Georg Fischer Piping Systems SIGNET have temperature compensation circuits in order to increase the sensors accuracy.

8.2 Transmitters

The analogue data transfer with or without display as well as optional relay contacts will be provided by a Georg Fischer Piping Systems transmitter. This transmitter can be built:

- Directly inline on the sensor (INTEGRAL Version)
- On a wall, pipe, frame etc... by using a universal mounting kit (UNIVERSAL Version)
- On the door of a cabinet or a panel (PANEL Version)

Both displays – analogue or digital – allow you to calibrate the piping system, relay set points and set up all process parameters like the measuring range.

A Multi parameter (Multi channel) allows to build your own to build his own customised transmitter by mixing and matching In- and Output as supplied by Georg Fischer Piping Systems. Following selection are possible:

- 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

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8.3 Batch Control

A batch controller manufactured by +GF Signet Type 5600 allows dosing a pre-selected quantity of liquid. After a start signal (local or remote), the 5600 will close a contact to open an automatic valve and/or switch on a pump, count pulses coming from a flow sensor (Paddlewheel, Vortex or Magmeter) and open the contact again as soon as the pre-selected quantity is reached. This batch process is repeatable and the Georg Fischer Piping Systems Batch Transmitter is designed for intensive industrial applications.

9. Quality

9.1 Production Conditions

Pipes, fittings, solvent cement, cleaner, 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, solvent cement and cleaner shall be supplied from one manufacturer, namely Georg Fischer 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 an online CAD Library.

9.5 Training, Certification and Installation

Site personnel, involved with PVC-U 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 Georg Fischer Piping Systems Georg Fischer support under

Phone: +41 52 631 11 11 or
e-mail: info.ps@georgfischer.com.