

# Section 4: Metric

## System Specification - ecoFIT Piping Systems Metric Polyethylene (PE)

### 1.0 Scope

This specification covers the requirements for the Georg Fischer ecoFIT (PE) Metric and IPS Piping Systems intended for a wide range of industrial applications including water, wastewater and effluent treatment as well as a wide range of chemical applications. The components of the ecoFIT Metric and IPS (PE) piping system are in accordance with the following standards.

### 2.0 Basic System Data

#### 2.1 Material Specification for ecoFIT (PE) Metric Pipe & Fittings

- A. All ecoFIT (PE) metric pipe shall be manufactured from PE100 and comply with a MRS class of 10. Pipe manufactured according to EN ISO 15494, DIN 8074 (dimensions) and DIN 8075 (quality specifications) as well as ASTM D3350. The pipes are NSF 61 approved. Pipe shall be manufactured to SDR 11 or SDR 17 dimensions with a pressure rating of 200 psi or 130 psi respectively when measured at 68°F. Pipe shall be supplied capped off at the extruder and supplied in 5 Meter lengths.
- B. All ecoFIT (PE) metric fittings and valves from Georg Fischer Piping Systems are manufactured according to ASTM D3350 from PE100 with a value of MRS 10 MPa, designed for 25 years operational life with water at 20°C. Fittings shall be manufactured to SDR 11 or SDR 17 dimensions with a pressure rating of 200 psi or 130 psi respectively when measured at 68°F. 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 Georg Fischer Piping Systems.

#### 3.0 Material Specification for ecoFIT (PE) Metric Ball Valves

All valves shall be metric sizes manufactured by Georg Fischer Piping Systems or equal in accordance with EN ISO 16135, 16136, 16137, 16138, tested according to the same standard.

#### 3.1 Ball Valves

- A. Ball valves consist of a valve body out of PP, ABS, or PVC combined with connection parts in PE.

##### 3.1.1 Manual operated Ball Valves

- A. All ecoFIT (PE) ball valves with metric sizes d20mm – d110mm, shall be Georg Fischer Piping Systems Type 546, 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 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.

##### 3.1.2 Ball Valve Accessories

- A. 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.
- B. Mounting plate in PPGF with integrated inserts for mounting on any support
- C. Lockable multi-functional handle

### 3.1.3 Electrically Actuated Ball Valves

- A. Electric actuators shall be Types EA11 (sizes DN10-50), EA21 (sizes DN10-50), EA31 (sizes DN65-100) shall be available manufactured by Georg Fischer Piping Systems in accordance with EN 61010-1, EC directives 2004/108/EC (EMC) and 2006/95/EC, LVD and needs to be CE marked. Actuator housing shall be made of PPGF (polypropylene glass fiber 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 (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 signalization
  - Positioner Type PE25
  - Limit switch kits Ag-Ni, Au, NPN, PNP, NAMUR
  - AS Interface Plug Module

### 3.1.4 Pneumatically Actuated Ball Valves

- A. Pneumatic actuators shall be Georg Fischer Piping Systems Types PA11 (for valve sizes d20-32mm) and PA21 (for valve sizes d40-63mm). 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 fiber glass reinforced (PPGF) and flame retardant. Actuators shall contain a pre-loaded 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 optionally 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 d75mm pneumatic actuators shall be Type PA 30 (fail safe to close or open function), Type PA35 (double acting function).
  - For valve size d90mm pneumatic actuators shall be Type PA 35 (fail safe to close or open function), Type PA40 (double acting function).
  - For valve size d110 mm pneumatic actuators shall be Type PA 45 (fail safe to close or open function), Type PA45 (double acting function)
- B. Pneumatic actuators shall have an integrated optical position indicator. Actuator housing shall be made of hardened anodized aluminum. Actuators shall contain integrated Namur interface for the easy mounting of positioners, limit switches and accessories.
- C. 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 Ag-Ni, 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

## 3.2 Material Specification for ecoFIT (PE) Metric Diaphragm Valves

Diaphragm valves consist of valve body out of PP-H, ABS, or PVC combined with connection parts in PE.

### 3.2.1 Manual Diaphragm Valves

#### 3.2.1.1 Diaphragm Valves d20mm to d63mm

- A. All ecoFIT (PE) diaphragm valves, metric sized from d20mm to d63mm, shall be either:
- Type 514 (true double union design)
  - Type 517 (flange design)

- B. 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 fiber reinforced) connected to the lower body with a central union avoiding exposed screws.
- C. 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, FPM, NBR, PTFE with EPDM or FPM supporting diaphragm. Following options shall be available:
  - Electrical feedback unit with either Ag-Ni or AU contacts
  - Pressure proof housing

### 3.2.1.2 Diaphragm Valves d75mm to d160mm

- A. All ecoFIT (PE) diaphragm valves, metric sized, shall be Type 317 (flanged design) consisting of valve body out of PP-H or PVC-U with integrated fixed flange. 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 fiber 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.

## 3.2.2 Pneumatic Diaphragm Valves

### 3.2.2.1 Pneumatic Diaphragm Valves d20mm to d63mm

- A. All ecoFIT (PE) diaphragm Valves, metric sized from d20mm to d63mm, shall be either:
  - Type 514: true double union design
  - Type 517: flange design
- B. All diaphragm Valves shall be manufactured by Georg Fischer 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.
- C. Diaphragms have to be EPDM, FPM, NBR, PTFE with EPDM or FOM supporting diaphragm.
- D. 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 fiber reinforced). Actuators with FC mode shall contain a pre-loaded galvanized 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 Type DSR 500-1
  - Feedback with following limit switches Ag-Ni, Au, NPN, PNP, NAMUR
  - Stroke limiter & emergency manual override
  - ASI controller

### 3.2.2.2 Pneumatic Diaphragm Valves d75mm to d160mm

- A. All ecoFIT (PE) diaphragm valves, metric sized, shall be flanged design consisting of valve body out of PP-H, ABS or PVC with integrated fixed flange.
- B. All diaphragm valves shall be manufactured by Georg Fischer 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, FPM, NBR, or PTFE with EPDM or FPM supporting diaphragm.
- C. Pneumatic diaphragm actuators shall be Georg Fischer 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 fiber reinforced)
- D. Actuators with FC mode shall contain a pre-loaded galvanized 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 Ag-Ni, Au, NPN, PNP, NAMUR
  - Stroke limiter & emergency manual override
  - ASI Controller

### 3.3 Butterfly Valves

#### 3.3.1 Plastic Butterfly Valves

- A. Butterfly valves suitable for the ecoFIT (PE) System of Georg Fischer Piping Systems are made from PP-H or PVC Material.
- B. All butterfly valves, metric sizes 2" (d63mm) – 10" (d250mm), shall be Georg Fischer Piping Systems Type 567/568/563 wafer/lug type with a double eccentric disc design manufactured by Georg Fischer Piping Systems in accordance with EN ISO 16136. Seals shall be available in EPDM, FPM and PTFE/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° and 90°. As an option, the hand lever shall be lockable. The hand lever shall be manufactured of high strength PPGF (polypropylene glass fiber reinforced). The option of an integrated electric position indicator shall be available. As an option 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 567/568 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.

##### 3.3.1.1 Electrically Actuated Butterfly Valves

- A. Electric actuators shall be Georg Fischer Piping Systems Types EA31 or EA42 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 fiber reinforced), flame retardant and feature external stainless steel screws. All electric actuators shall have an integrated emergency manual override and integrated optical position indication.
- B. All electric actuator types shall have the following accessories available:
  - Fail-safe unit
  - Heating element
  - Cycle extension, monitoring, and counting
  - Motor current monitoring
  - Position signalization
  - Positioner Type PE25
  - Limit switch kits Ag-Ni, Au, NPN, PNP
  - Manual override
  - AS-Interface Plug Module

##### 3.3.1.2 Pneumatically Actuated Butterfly Valves

- A. Pneumatic actuators shall be Georg Fischer Piping Systems Types PA 35 (metric sizes d63-75mm), PA40 (metric size d90mm only), PA45 (metric size d110mm), PA55 (metric size d160mm), PA60 (metric sizes d225mm FC), PA65. 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 aluminum. 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 Ag-Ni, Au, NPN, PNP, NAMUR
  - Stroke limiter & emergency manual override
  - ASI-controller

### 3.4 Material Specification for ecoFIT (PE) Metric Check Valves

- A. Check valves consist of valve body out of PP-H, ABS, or PVC combined with connection parts in PE or flanged.
- B. All cone check valves, according to EN ISO 16137, metric sizes d20-d110mm metric, shall be Type 561/562 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 and horizontal position. Type 562 shall be equipped with a spring made of stainless steel (V2A, Nimonic, halar coated) to allow position independent installation. The valves are designed for a nominal pressure of 16 bar.

### 3.5 Ventilating and Bleed Valves

- A. All ecoFIT (PE) Ventilating and Bleed valves shall be Georg Fischer Type 591. Dimensions d20-d110mm are with pressure rating PN10. They shall be equipped with a PP-H floater with density of 0,91 g/cm<sup>3</sup>.

### 3.6 Ventilating Valves

- A. All ecoFIT (PE) Ventilating valves shall be Georg Fischer Type 595. Dimensions d20-d110mm are with pressure rating PN10. They shall be equipped with plastic coated stainless steel spring with minimal opening pressure (10-80 mbar).

## 5.0 Welding and Assembly

- A. All electrofusion fittings shall be manufactured under strict quality requirements as stated by the manufacturer such as ISO9001:2000 or equivalent. All electrofusion fittings must be packaged to ensure cleanliness and protection from contamination. All electrofusion fittings shall be manufactured with molded built-in restraint capabilities in sizes 20mm – 63mm. Sizes above 63mm shall use external restraint type clamps. All metric electrofusion fittings shall be made with fusion indicators to visually indicate that the fusion process has been made.
- B. All butt fusion fittings and valves shall also be manufactured with laying lengths designed for use with electrofusion capabilities with model MSA330/340 and for butt fusion machines according to DVS 2207-11 model TM160, TM315, TM400, and TM630 including CNC control parameters from Georg Fischer Piping Systems.
- C. Optional IR Plus fusion machines, IR63 Plus, IR225 Plus 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.
- D. Only authorized and certified welders by Georg Fischer Piping Systems are allowed to perform fusion on GF approved equipment.
- E. The welding and the installation should be in accordance with Georg Fischer Piping Systems guidelines.

## 6.0 Quality

### 6.1 Production Conditions

Pipes, fittings, valves and accessories shall be manufactured in an environment equivalent to, or meeting the requirements of a Quality Assurance System such as ISO 9001.

### 6.2 Uniformity

Pipes, fittings, valves and welding machines 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.

### 6.3 Handling of Material

- A. Material shall be stored in original packaging and protected from environmental damage until installation.
- B. Pipe shall be supported sufficiently to prevent sagging. Care shall be taken not to gouge or otherwise notch the pipe in excess of 10% of the wall thickness.

### 6.4 Training, Certification and Installation

- A. Site personnel, involved with ecoFIT (PE) piping installation, shall undergo training and certification from an authorized local institution prior to performing any jointing operations on site.

### 6.5 Testing

- A. The system shall be tested in accordance with the manufacturers' recommendations.
- B. Following is a general test procedure for Georg Fischer Piping Systems. It applies to most applications. Certain applications may require additional consideration. For further questions regarding your application, please contact your local GF representative.
  - 6. All piping systems should be pressure tested prior to being placed into operation.
  - 7. All pressure tests should be conducted in accordance with the appropriate building, plumbing, mechanical and safety codes for the area where the piping is being installed.
  - 8. When testing plastic piping systems, all tests should be conducted hydrostatically and should not exceed the pressure

rating of the lowest rated component in the piping system (often a valve). Test the system at 150% of the designed operational pressure. (i.e.: If the system is designed to operate at 80PSI, then the test will be conducted at 120PSI.)

9. When hydrostatic pressure is introduced to the system, it should be done gradually through a low point in the piping system with care taken to eliminate any entrapped air by bleeding at high points within the system. This should be done in four stages, waiting ten minutes at each stage (adding ¼ the total desired pressure at each stage).
10. Allow one hour for system to stabilize after reaching desired pressure. After the hour, in case of pressure drop, increase pressure back to desired amount and hold for 30 minutes. If pressure drops by more than 6%, check system for leaks.

**Note: If ambient temperature changes by more than 10°F during the test, a retest may be necessary.**

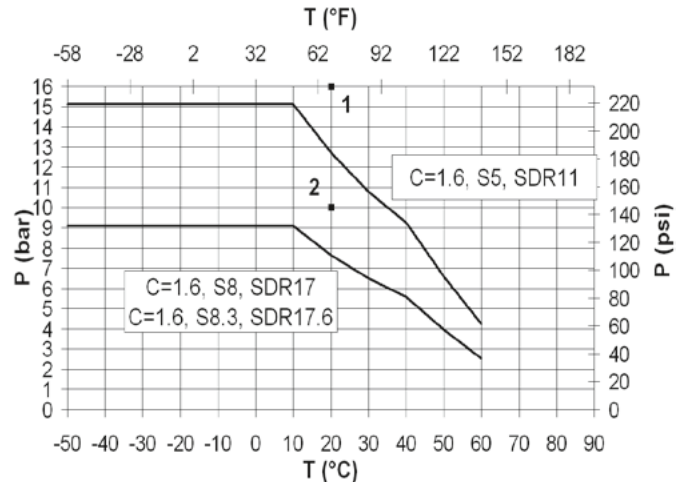
## Pressure/Temperature

### Pressure/temperature diagram for PE 100

The following pressure/temperature diagram for PE100 pipes and fittings is valid for a lifetime of 25 years. The design factor of 1.6 (respective 1.25) recommended by GF is incorporated. It can be used for water or media resembling water, in other words, media which have no derating factor regarding the chemical resistance.

Remark: Please take into account the pressure/temperature diagrams for valves and special fittings. Because of the construction and/or sealing material used, differences are possible when compared with pipes and fittings. This information can be found in the planning fundamentals of the relevant types of valves, respectively special fittings.

In case of long-term applications at continuous pressure with temperatures above 40°C, please contact your GF representative.



- 1 Design Factor C = 1.25, S5, SDR11 for 20 °C water, 50 years
  - 2 Design Factor C=1.25, S8.3, SDR17.6 and S8, SDR17 for 20°C water, 50 years
- P Permissible pressure in bar, psi  
T Temperature in °C, °F

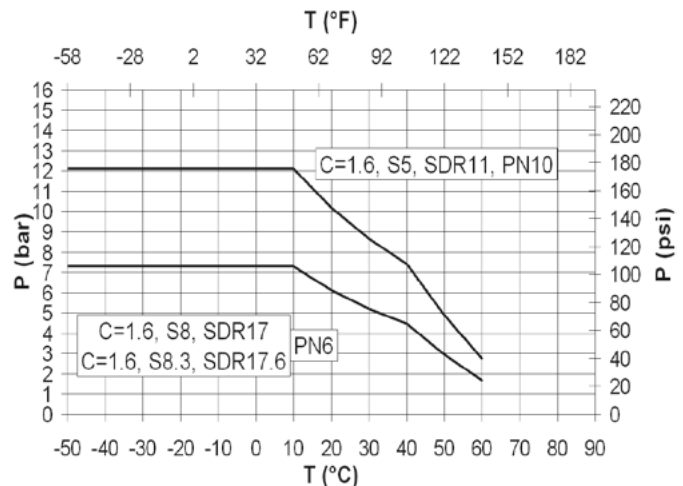
### Pressure/temperature diagram for PE 80

The following pressure/temperature diagram for PE80 pipes and fittings is valid for a lifetime of 25 years.

The design factor of 1.6 recommended by GF is incorporated. It can be used for water or media resembling water, in other words, media which have no derating factor regarding the chemical resistance.

Remark: Please take into account the pressure/temperature diagrams for valves and special fittings. Because of the construction and/or sealing material used, differences are possible when compared with pipes and fittings. This information can be found in the planning fundamentals of the relevant types of valves, respectively special fittings.

In case of long-term applications at continuous pressure with temperatures above 40°C, please contact your GF representative.



- P Permissible pressure in bar, psi  
T Temperature in °C, °F