

Technical  
Information and  
Product Range  
2011

COOL-FIT ABS

Pipes, fittings,  
valves and  
accessories



**+GF+**

**GEORG FISCHER**  
PIPING SYSTEMS

# GF Piping Systems

Throughout the world everyone demands a secure supply of clean water.

GF Piping Systems is meeting this challenge by providing complete piping systems suitable for safe operation in virtually all environments.

We have developed systems comprising of pipe, fittings, valves, and measuring and control devices in high quality corrosion resistant thermoplastics for the transport of not only clean water, but also gas and other industrial media.

Whether installed above or below ground, in industrial, commercial or domestic applications, GF Piping Systems provides a solution.

## **Innovation and technology.**

GF Piping Systems, through focussed research, is continually developing new products and technologies, setting new global standards in quality and performance for our customers.

**All from one source.** GF Piping Systems covers the growing demand for complete solutions from a single source in a wide range of applications.

**Quality management.** All system components are stringently tested in accredited test laboratories. Management and production procedures are certified to ISO 9001 and ISO 14001 to guarantee form, fit, function and compliance in whatever application they may be used throughout the world.

## **Sales and service – worldwide.**

Our local sales companies and representatives in over 100 countries provide „one stop“ shopping, including planning support, training and product availability.

**Facts and Figures.** GF Piping Systems with its 3200 employees achieves an annual turnover of about CHF 1100 million (Euros 650 million). GF Piping Systems is part of the Georg Fischer Corporation, which was founded in Schaffhausen, Switzerland in 1802. Today the corporation has more than 13,000 employees and an annual turnover of CHF 4.5 billion (Euros 3 billion).



→ your benefits

- technological expertise
- «one stop» shopping
- premier quality and performance
- system solutions
- know-how and experience
- local support

# COOL-FIT ABS

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The technical data is not binding and not an expressly warranted characteristic of the goods. It is subject to change. Please consult our General Conditions of Supply.

# System COOL-FIT

## General information

COOL-FIT is a complete system solution for secondary cooling and refrigeration piping systems. The system is based on the tried and tested ABS plastic system from GF Piping Systems which contains pipe, fittings, valves and transition fittings, now with the option for pre-insulated pipe and fittings with outer jackets in black.



**Refrigeration and cooling plants in general using plastic pipe as the carrier system offer complete corrosion resistance and a cost effective solution compared to traditional metal materials.**

### Pipe

The ABS pipe and fittings are available in 2 versions.

- standard un-insulated, to be insulated on-site with traditional insulation
- pre-insulated with black jacket

### Fittings

A complete range of fittings compatible to the pipe is also available either as standard or as insulated with black outer jackets.

The ABS range contains shut-off valves, control valves, automated valves pneumatic and electrical as well as a complete range of transition fittings for metal to plastic connections. See standard GF Piping Systems ABS literature for the complete range available in dimensions d16 to d315mm.

### GF Piping Systems ABS raw material

ABS is a material used in a wide range of general engineering applications from general housings for vacuum cleaners for instance to car bumpers. GF Piping Systems ABS raw material has been specifically developed for long-life pressure bearing piping systems. For physical properties see EN ISO 15493 and chapter "The material ABS". Acrylonitrile Butadiene Styrene (ABS) is a styrene acrylonitrile copolymer grafted to polybutadiene to produce an homogeneous material with excellent impact and low temperature characteristics. ABS is halogen free with a low thermal conductivity and non-toxic. GF Piping Systems ABS has a range of internationally recognised approvals. Please ask if you require any details regarding approvals or raw material properties.

### PUR insulation

ABS pre-insulated pipe and fittings are delivered ready to install using high density PUR  $\geq 45 \text{ kg/m}^3$  as the insulation material, the PUR is CFC free and recyclable.

### Jacket pipes in black (metal on request)

The outer jacket in black is manufactured from high density polyethylene (PE). PE offers extremely good impact resistance and a good resistance to oil splashes and grease or other external contamination. The PE is smooth, non-corroding and thus easy to clean with a long life-span. Black PE is UV resistant and thus ideally suited to outdoor applications and for general use.

### Typical working conditions

Working temperatures range from:

- $-50 \text{ }^\circ\text{C}$  to  $+40 \text{ }^\circ\text{C}$  for pre-insulated ABS
- $-50 \text{ }^\circ\text{C}$  to  $+60 \text{ }^\circ\text{C}$  for the standard ABS system

and with a maximum working pressure of 10 bar (water at  $+20 \text{ }^\circ\text{C}$ ) pre-insulated ABS.

### Typical mediums

COOL-FIT can be used for example with the following mediums:

- chilled water and general water
- salt solutions
- glycol solutions
- alcohol solutions

For compatibility of ABS to non-water mediums please consult GF Piping Systems.

**Note:** Pre-insulated ABS is not for use with primary gases such as Ammonia, Propane, R407, R22, and also not for use for compressed air systems.

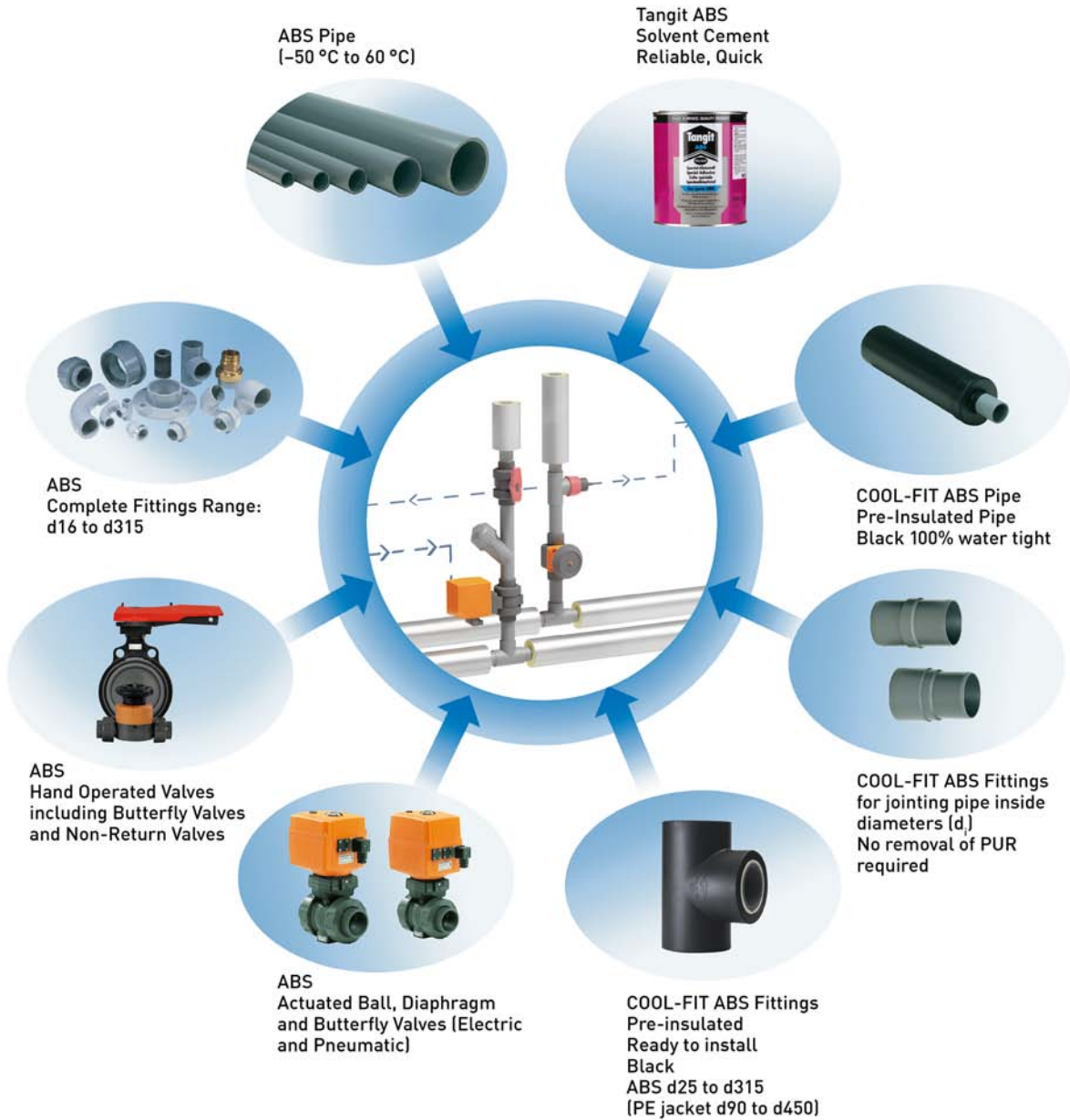
### Application Areas:

Dairies, slaughter houses, meat processing, industrial cooling water, breweries, food production, fish industry and air conditioning.

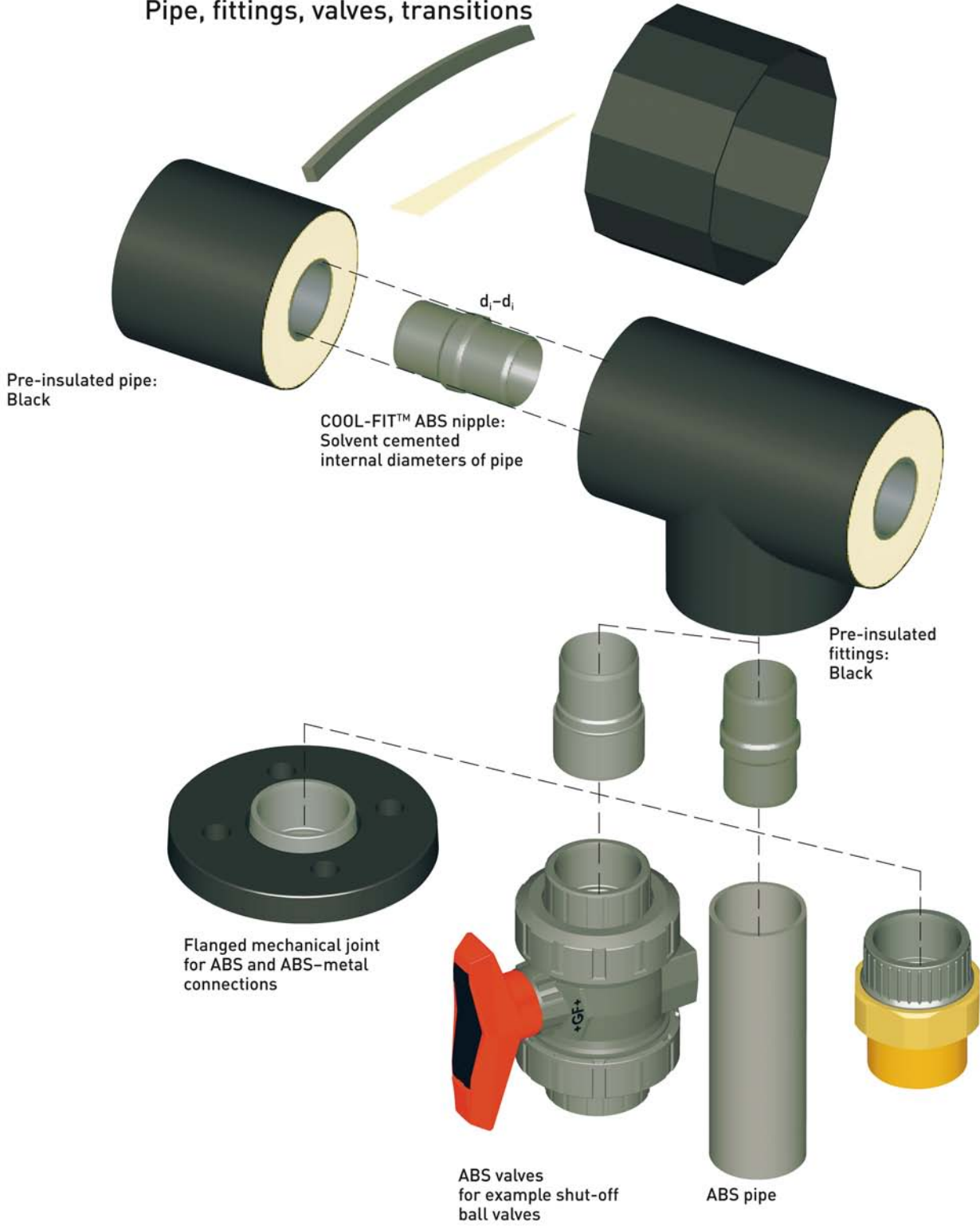
ABS technical information and installation details are available separately on request.

GF offers technical support during the planning phase and on-site training for jointing and handling, please contact GF for details.

**COOL-FIT Top quality**  
**Minimum on site time**



Pre-insulated pipe and fittings  
Standard ABS complete system;  
Pipe, fittings, valves, transitions



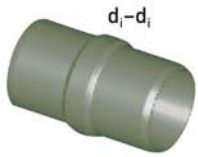
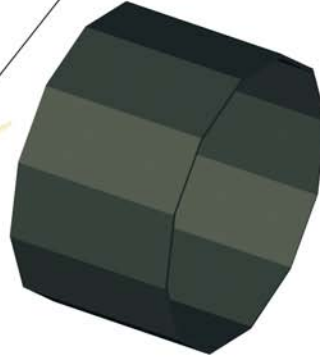
Shrink sleeve, short:  
Vapour tight and  
water tight



Gap insulator:  
For visual check when  
commissioning



Sealing tape:  
For location of sleeve and  
vapour seal, double-sided  
sticky for easy location of  
sleeve



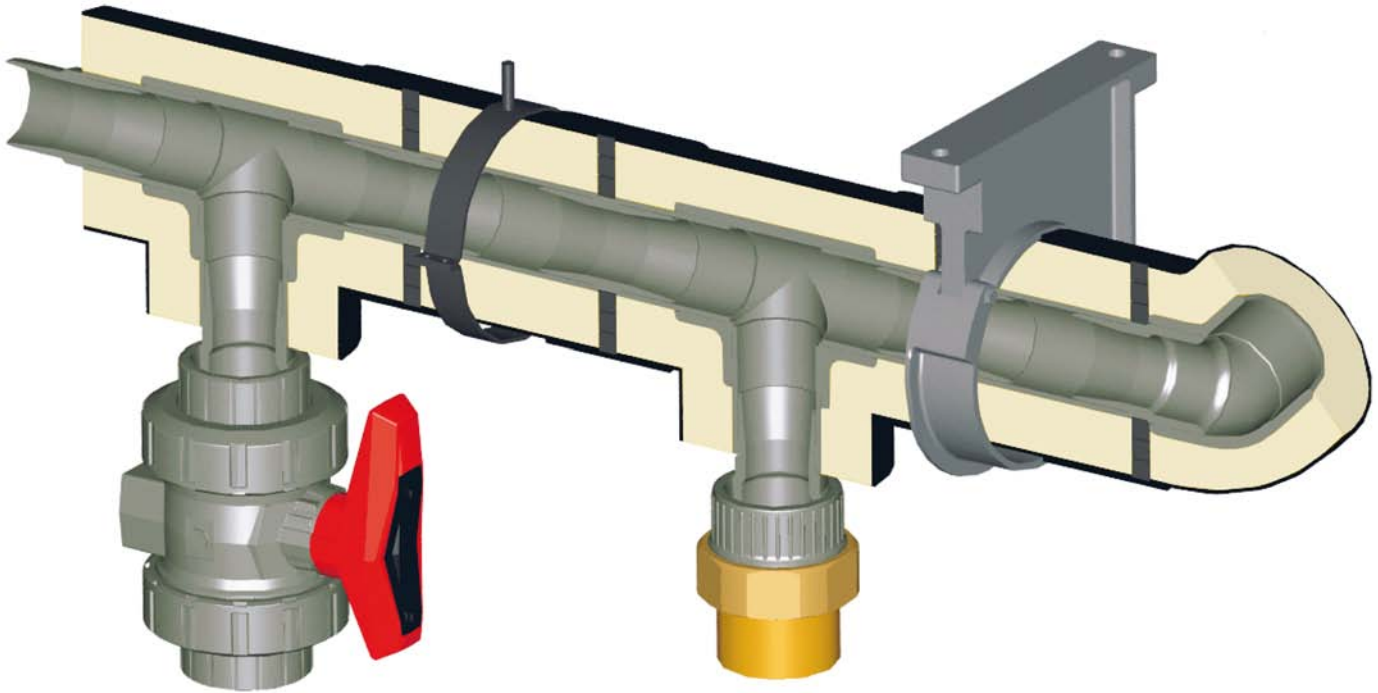
COOL-FIT™ ABS  
nipple: No removal  
of PUR from pipe  
necessary



Pre-insulated fittings;  
For example, elbow 45°

Transition unions:  
Copper-ABS with «O»-ring  
for reliable sealing,  
stainless steel and threaded  
connections also available

## System advantages: Your benefit



### Speed

Fittings and pipes are delivered direct to the site ready to install. Simple installation technique using speedy solvent cementing with no need to remove the PUR using internal diameter jointing fittings. Time and cost saving handling due to the low weight of plastics.

### Zero corrosion

No maintenance, reduced downtime, constant long-term efficiency.

### Reduce costs for your hanging system

Simplified pipe supports on outer jacket, no need for special refrigeration pipe hangers. Preinsulated pipe requires about 30 % less hangers than standard plastic pipe. Lower weight compared to metals means lower structural costs. 0.02 to 0.08 mm/m K expansion coefficient, helps simplify pipeline design.

### Top efficiency

Save energy, thermal conductivity 0.026 W/m K. PUR density  $\geq 45 \text{ kg/m}^3$  with standard thickness of 35 mm for excellent insulating properties. Smooth pipes: no encrustation, low pressure drops, no energy bridges due to support on outer jacket.

### Reliability

Quality: GF Piping Systems products is the number 1 Plastics Industrial Piping system manufacturer in the world. Tried and Tested jointing technique with gap filling solvent cement TANGIT ABS.

### Innovative and clever

Developed for your needs. Internal pipe connections means no need to remove the PUR insulation from the pipe or fitting.

### Outdoor and indoor systems:

Vapour sealed black shrink sleeve for 100 % vapour sealing, 100 % water tight system.

### Hygienic and aesthetic

Top quality in performance and looks. Smooth outer surfaces for hygienic environments. No detrimental effects under high pressure cleaning.

### Full technical design support

[www.cool-fit.georgfischer.com](http://www.cool-fit.georgfischer.com) for online calculations of energy losses, temperature differences and more. CAD libraries for accurate and quicker drawing. Specialist guidelines for design and installation and design of venting equipment, measuring equipment, transitions.

### Full technical support during installation

On-site advice and jointing technique training. Training video for ABS jointing technique.

### Sustainability

Reduce the carbon footprint of your plant and factory with recyclable plastics. Lower ODP and GWP values compared to traditional metal systems.



# System Specification

## ABS Metric Piping System



### 1 Scope

This specification covers requirements for the GF Piping Systems ABS intended for a wide range of applications including water and wastewater treatment as well as process cooling water and secondary refrigeration. The components of the ABS pipe system are in accordance with the following standards.

### 2 Acrylonitrile Butadiene Styrene Material

GF Piping Systems ABS pipes and fittings shall be manufactured from acrylonitrile butadiene styrene, ABS. 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 GF Piping Systems.

### 3 ABS Pipe

All ABS pipe shall be metric sizes manufactured in accordance with the requirements of EN ISO 15493, supplied by GF Piping Systems.

### 4 ABS Fittings

All ABS fittings shall be metric sizes manufactured by GF Piping Systems or equal, with dimensions and tolerances in accordance with ISO 727 and EN ISO 15493. All threaded connections shall have pipe threads in accordance with the requirements of ISO 7.

### 5 ABS Valves

All ABS valves shall be metric sizes manufactured by GF Piping Systems or equal in accordance with EN ISO 16135 to 16138.

### 6 Solvent Cement Jointing and Installation

Should be in accordance with GF Piping Systems Guide to the Installation and Use of Plastic Pipelines.

## Pre-insulated ABS Pipes and Fittings



### 1 Scope

This specification covers requirements for GF Piping Systems pre-insulated ABS pipes and fittings, intended primarily for use in refrigeration and cooling plants for the secondary piping systems. The system consists of preinsulated pipes and fittings using ABS carrier pipes and fittings, with insulation from PUR and outer jacket in PE. The components of the pre-insulated pipes and fittings are in accordance with the following standards.

### 2 ABS Carrier Pipe and Fittings

#### 2.1 Raw Material

GF Piping Systems ABS pipes and fittings shall be manufactured from acrylonitrile butadiene styrene, ABS. The raw material used shall be a material for use with pressure bearing plastic pipe systems in accordance to EN ISO 15493.

#### 2.2 Physical Properties

The ABS carrier pipe and fittings shall be manufactured to metric sizes in accordance with the requirements of EN ISO 15493, supplied by GF Piping Systems.

### 3 PUR Insulation

The insulating material shall be hard polyurethane foam, PUR, with a thermal conductivity,  $\lambda$  value, of  $\leq 0.026$  W/mK and a density of  $\geq 45$  kg/m<sup>3</sup>.

### 4 PE Outer Jacket

The outer jacket shall be manufactured from PE, high density polyethylene, black. Colours of the jacket shall be black to RAL 9004. The black jacket shall be UV resistant according to EN ISO 16871.

### 5 Solvent Cement Jointing and Installation

Should be in accordance with GF Piping Systems Guide to the Installation and Use of Plastic Pipelines.

# COOL-FIT technical details

## Pre-insulated ABS pipes

Pre-insulated ABS is produced using high grade ABS pressure piping raw material, in use for over 20 years together with high grade low temperature PUR produced in high density to offer optimal insulating qualities.

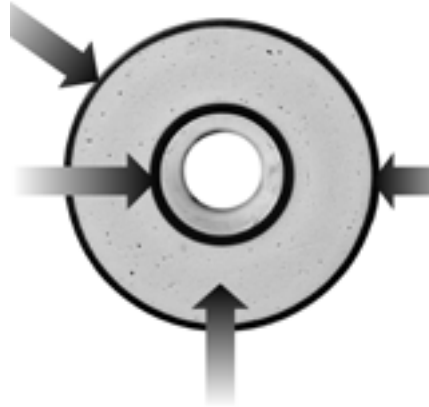
All three materials are bonded together deliberately to ensure expansion and contraction as one. Pre-insulated ABS contraction coefficient: 0.02 to 0.08 mm/m K (the change in length must be calculated per installation).

### Pipe specification

Product identification; PN 10, production date marking, COOL-FIT ABS, product code

### Carrier pipe ABS

10 bar rated, cement jointed ABS plastic pipe. 5 meter lengths (d25 - d225).  
ABS pipe to EN ISO 15493.



### Jacket Pipe

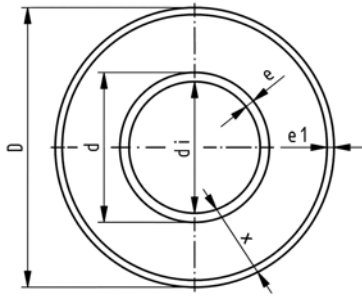
Black RAL 9004, PE to DIN 8075. Functional requirements to EN 253. Black is UV resistant.

### Hard Polyurethane Foam (PUR)

Thermal Conductivity at 20 °C	≤ 0.026 W/m K	Foamed using CO <sub>2</sub>	-
Axial Shear Strength	≥ 0.12 N/mm <sup>2</sup>	Core density	≥ 45 kg/m <sup>3</sup>
Tensile Strength	≥ 0.2 N/mm <sup>2</sup>	Average Cell Sizes	max. 0.5 mm
Compressive Strength	≥ 0.3 N/mm <sup>2</sup>		

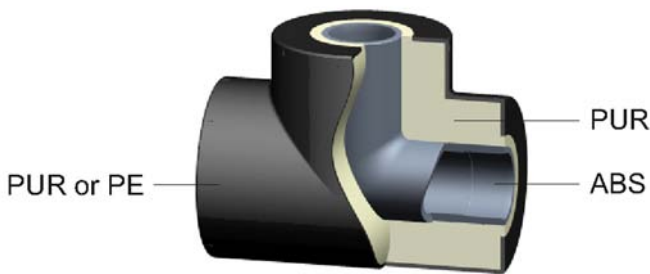
Carrier pipe ABS d x e	Carrier pipe ABS d <sub>i</sub>	Jacket pipe PE D x e1	Weight (PE + ABS + PUR) kg/m	Volume l/m	Pipe support Distance m	Heat transfer coefficient W/m K	Xmax - Xmin ≤ in mm
25 x 2.3	20.4	90 x 2.2	1.24	0.36	1.55	0.13	6
32 x 1.9	28.2	90 x 2.2	1.29	0.61	1.55	0.16	6
40 x 2.4	35.2	110 x 2.7	1.76	0.95	1.65	0.17	6
50 x 3.0	44.0	110 x 2.7	1.89	1.49	1.65	0.21	6
63 x 3.8	55.4	125 x 3.0	2.48	2.34	1.75	0.25	6
75 x 4.5	66.0	140 x 3.0	3.17	3.36	1.90	0.27	6
90 x 5.4	79.2	160 x 3.0	4.11	4.80	2.05	0.29	6
110 x 6.6	96.8	180 x 3.0	5.22	7.21	2.20	0.34	10
140 x 8.6	122.8	225 x 3.2	8.16	11.69	2.55	0.35	10
160 x 9.9	140.2	250 x 3.9	10.34	15.22	2.75	0.37	10
200 x 12.3	175.4	280 x 4.4	13.42	24.50	3.05	0.50	10
225 x 13.9	197.2	315 x 4.9	17.97	30.05	3.30	0.50	10
250 x 9.6	230.8	355 x 5.6	14.90	41.84	3.30	0.49	10
280 x 10.7	258.6	400 x 6.3	18.70	52.50	3.60	0.48	10
315 x 12.1	290.8	450 x 7.0	23.70	66.42	3.80	0.48	10

- COOL-FIT ABS support distances are the same from -50 °C to +40 °C
- d: nominal outside diameter of ABS pipe
- d<sub>i</sub>: nominal internal diameter of ABS pipe
- D: nominal outside diameter of PE pipe
- e and e1: nominal wall thicknesses
- x: radial distance between outside diameter of PE pipe and inside diameter of ABS pipe

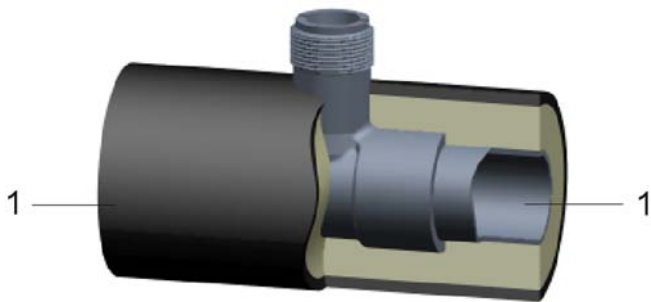


### Pre-insulated ABS fittings

Pre-insulated ABS Fittings are manufactured using the same raw materials as the pipe and are thus completely compatible with the pre-insulated ABS pipe in terms of insulating properties and also jointing technique.

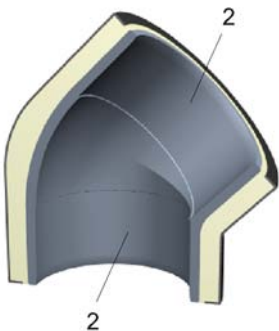


There are 2 types of pre-insulated ABS fittings, namely the  $d_i$  type and the  $d$  type. To cement  $d_i$  fittings to pre-insulated ABS pipe requires a  $d_i$ - $d_i$  nipple.



1 ABS pipe end for  $d_i$  connection

$d_i$  is the designation for a joint which takes place in the internal diameter of the pipe.  $d_i25$  for instance refers to the internal diameter of  $d25$  pipe.

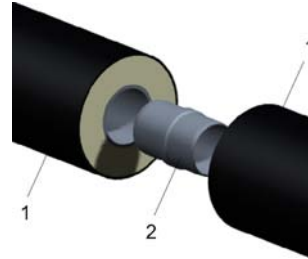


2 ABS socket fitting for  $d$  connection

$d$  is the designation for a normal socket solvent cemented joint as per the standard GF Piping Systems ABS range.

The jointing material and technique for  $d_i$  and  $d$  are the same, with the same cement and the same tooling.

Pre-insulated ABS pipe to pipe connections are achieved using the  $d_i$ - $d_i$  pre-insulated ABS nipple, see diagram.



- 1 Pre-insulated ABS pipe
- 2 COOL-FIT ABS nipple  $d_i$  -  $d_i$

**Note:** Dimensions from  $d_i140$  (incl.) must be calibrated using the COOL-FIT calibration tool.

### Accessory Equipment

#### COOL-FIT ABS Nipple

The nipple exists in three versions:



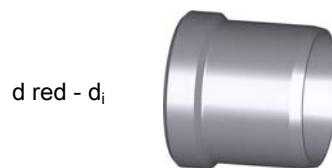
$d_i$  -  $d_i$

for pipe to pipe and pipe to  $d_i$ - $d_i$  type fitting connections using the internal diameter of the pipes



$d_i$  -  $d$

for pipe to  $d_i$ - $d$  type fitting connections



$d$  red -  $d_i$

to reduce diameter of the carrier pipe (Note: for dimensions  $d140$  and above the COOLFIT ABS Calibration Tool is required before jointing the internal diameters of the pipe).

## COOL-FIT ABS Calibration Tool



It is necessary to calibrate pipe in dimension d140 and above to allow jointing using the ABS nipple. This tool calibrates the inside diameter of the pipe to an exact dimension to allow internal jointing.

## COOL-FIT Gap Insulator



Width 13 mm and a  $\lambda$  / heat conductivity of 0.04 W/m K, use of this insulation ensures nearly the same insulating properties in the gap as the pipe.

## COOL-FIT Sealing Tape



A roll of 40mm wide, butylene rubber-based band. For a water- and steam-tight sealing of inspection gaps in combination with shrink sleeves or shrink sockets.

## COOL-FIT Shrink Sleeve, short



Used to vapour seal the control gap on the outer jacket between pipe and pipe or pipe and fitting. The sleeve is 100mm wide and can only seal equal dimensioned jackets. To ensure the proper functionality of the system, the shrink sleeve must be used in conjunction

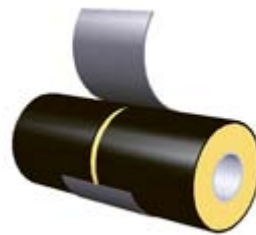
with the gap insulator and the butylene-rubber sealing tape. It can be shrunk with an open burner (soft, yellow flame) or alternatively with a powerful hot-air gun. For a long lasting quality seal GF recommends the use of the shrink sleeve.

## COOL-FIT Shrink socket



Used to vapour seal the control gap on the outer jacket between pipe and pipe or pipe and fitting. The socket is 100mm wide and can therefore only seal equal dimensioned jackets. To ensure the proper functionality of the system, the shrink socket must be used in conjunction with the gap insulator and the butylene-rubber sealing tape. This heavy duty version provides additional mechanical strength with regards to bending forces. It shrinks uniformly, resulting in a good visual appearance. It can be shrunk with an open burner (soft, yellow flame). For a long lasting quality seal combined with high mechanical strength and good appearance, GF recommends the use of the shrink socket.

## COOL-FIT Cold shrink tape



Used to vapour seal the control gap on the outer PE jacket between pipe and pipe or pipe and fitting. For indoor use only! It shrinks without the application of heat. The tape is 100mm wide and can therefore only seal equal dimensioned PE jackets. It is applied pulling firmly with an overlap of ca. 10 cm. To ensure the proper functionality of the system, the shrink tape must be used in conjunction with the gap insulator.

Use of other insulating and sealing methods such as tape is possible. Please consult the manufacturers of these materials for application instructions, insulating properties and lifespan.

## Accessory Equipment for Solvent Cement Jointing, Reducing Diameters and End Caps

### Tangit ABS and Cementing Equipment

The solvent cementing equipment is exactly the same for internal  $d_i$  jointing as for standard  $d$  jointing using Tangit ABS.



GF Piping Systems offers a sealing mass. If silicon products are prohibited then nonsolvent based glues can be used. Chemical compatibility can also be checked by GF Piping Systems.

### Shrink cap



### COOL-FIT Shrink Sleeve, Long

This sleeve is 285 mm long, only to be used when sealing PE to PE outer jackets, not for use on ABS. For exact reducing possibilities see below.



The shrink cap is only to be used to seal PE to PE, not to be used on ABS pipe. The flame used to shrink the sleeve may damage the ABS pipe.

Ideal for use with T90 ° reducers. For dimensions please refer to the product range. No separate sealing tape is required, the sealant is integrated into the cap. If the length of the cap is longer than the surface to be sealed then the cap can be cut back but without removing any sealant.

### Shrink Sleeve, Long Reducing Diameters

The COOLFIT «shrink sleeve, short» can only seal equal dimensions of PE outer jacket. The table below shows which dimensions can be sealed using which long shrink sleeve. NOTE: the sealing tape should be applied to both outer diameters of the PE pipes.

90	110	125	140	160	180	225	250	280	315
738.011.167									
					738.011.170				
							738.011.173		

### Reducing diameters

#### Reducing Pipe Dimensions for COOL-FIT ABS

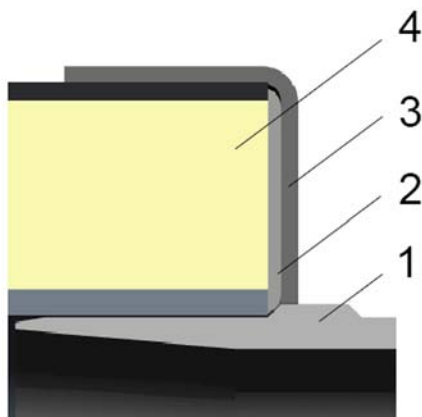
To reduce the ABS carrier pipe diameter see sketches below. The example below shows how the carrier pipe dimension is reduced from COOLFIT ABS d90 / D160 to d50 / D110.

Note: The configuration below results in a gap twice as wide as usual (ca. 20 mm) and therefore twice the amount of gap filler is required.

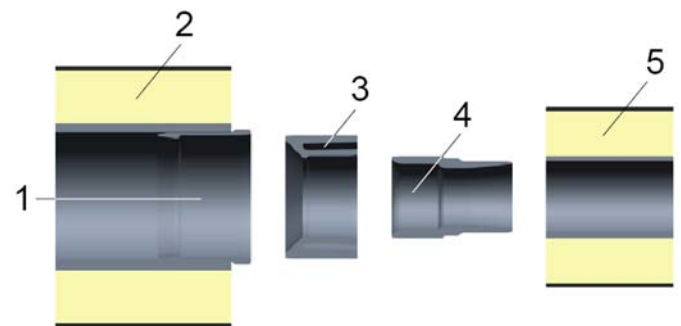
### End-Caps



Endcaps are to be used for sealing the PUR against any water ingress at the transition to ABS standard.



- 1 Connecting nipple (di-di)
- 2 Sealing mass
- 3 PE end cap
- 4 Pre-insulated pipe

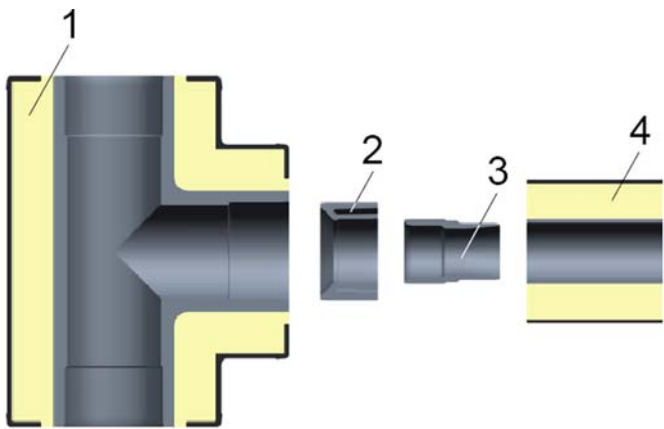


- 1 COOL-FIT ABS nipple di-d red., di90-d75
- 2 COOL-FIT ABS pipe d90 / D160
- 3 ABS short reducer d75-d50
- 4 COOL-FIT ABS nipple d-di, d50-di50
- 5 COOL-FIT ABS pipe d50 / D110

### Reducing from a d type COOL-FIT ABS Fitting to COOLFIT ABS Pipe

The d type fittings have a standard ABS d joint as the fitting connection and therefore the standard ABS short reducers can be used to reduce the diameter and then the d-di COOLFIT ABS nipple for the connection to the COOLFIT ABS pipe.

Sealing the PUR should be achieved using a chemically compatible sealing mass to ABS.



- 1 COOL-FIT ABS tee 90° equal, d75
- 2 ABS short reducer d75-d50
- 3 COOL-FIT ABS nipple d-di, d50-di50
- 4 COOL-FIT ABS pipe d50 / D110

## Technical Data

### General comments to plastics orientated pipeline design and installation

The design and installation of thermoplastic pipe systems requires designers and installers alike to take into account the fact that plastics have different physical characteristics to metal. Although GF Piping Systems ABS and pre-insulated COOLFIT ABS are both very robust systems, nevertheless, care should be taken during handling and transport to avoid damage. Also thermoplastics have certain physical characteristics, such as a high expansion coefficient, which need to be taken into account in the design phase.

GF Piping Systems has been successfully developing and selling plastic pipe systems into a spectrum of high performance installations, such as highly concentrated chemicals, for over 50 years, and experience has shown that when engineers and installers take into account the advice given in our technical literature plastics are an economical and reliable alternative to metals.

As a general rule for designing and installing plastics one of the major differences is that plastics can and should be allowed to move after commissioning i.e. move under the influence of temperature fluctuation and pressure changes. For instance using pipe brackets that allow horizontal movement and not clamping the system in place is a must for plastic piping installations.

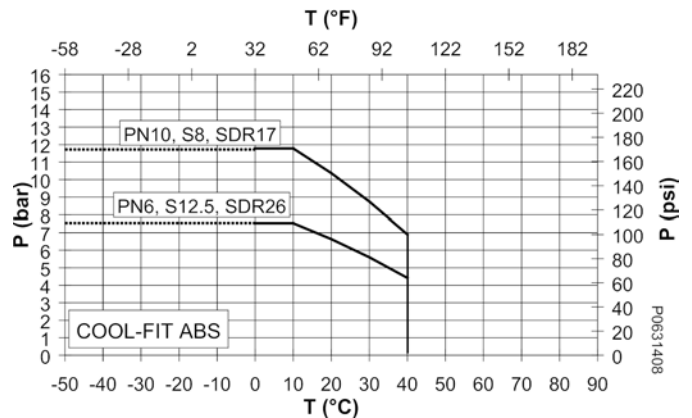
The following technical information covers the fundamental information required to ensure an economical and trouble free installation: Not all details however are published in this document, for more detailed information or if you have a specific question please ask your local GF Piping Systems company, consult [www.coolfit.georgfischer.com](http://www.coolfit.georgfischer.com) or email us at [info@coolfit.georgfischer.com](mailto:info@coolfit.georgfischer.com) for advice if you have any questions.

### COOL-FIT ABS pressure-temperature diagram

Pressure ratings for thermoplastic pipe are always quoted for water at 20 °C. It can be used at higher temperatures but it is a fundamental principle in thermoplastic pipework that if the working temperature is increased then the working pressure must be reduced.

The diagram shows for pre-insulated ABS pipes and fittings the maximum permissible pressures at various temperatures up to the maximum allowable working temperature of +40 °C. The diagram is based on an ambient temperature of 20 °C with water as the medium. A safety factor of 1.8 is incorporated into all calculations with a minimum life time of 25 years.

### Pressure-temperature diagram for pre-insulated ABS pipes and fittings 25-years-values incorporating the safety factor (with water as medium).



P Permissible pressure in bar, psi

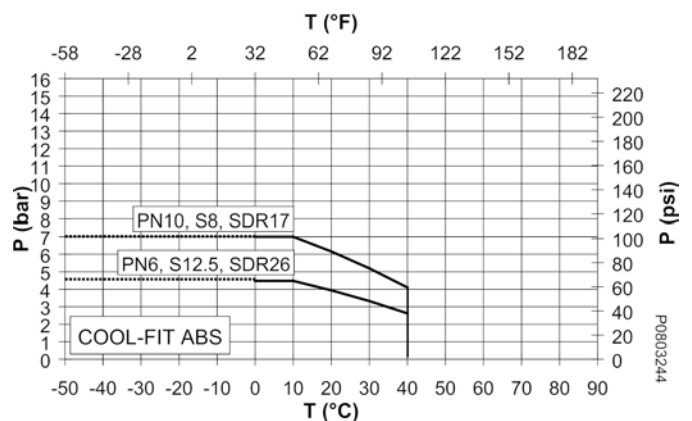
T Temperature in °C, °F

For working temperatures below 0 °C an antifreeze has to be used in the water to prevent freezing. The above pressure temperature curve applies only when the medium is water, therefore for non pure water mediums a derating factor has to be applied to the above curve. This is standard procedure for all plastic piping systems.

### Example: Waterdiluted glycol

For example if the medium is a waterdiluted glycol solutions ≤ 50% (max. concentration allowable for ABS) then a derating factor of 0.6 applies to the standard pressure temperature curve. So at -10 °C for a minimum lifespan of 25 years the maximum allowable working pressure is 0.6 x 11.8 bar = 7.1 bar.

### Pressure-temperature diagram for pre-insulated ABS pipes and fittings 25-years-values incorporating the safety factor (with waterdiluted glycol as medium).



P Permissible pressure in bar, psi

T Temperature in °C, °F

For more details regarding these derating values for chemical solutions or trade named products please consult GF Piping Systems.

### Chemical resistance

ABS is generally resistant to most diluted inorganic acids, bases and salts and to most animal oils and fats. It is not resistant to organic solvents, pure alcohols, petrol, acetic acid and vegetable oils.

Please consult GF Piping Systems for detailed information regarding chemical resistance. GF Piping Systems offers written confirmation on material compatibility for all chemical applications.

### Ice Slurry

Ice slurry is a mixture of ice particles (0.01– 0.03 mm width), water and an antifreeze agent, usually an alcohol, salt or glycol. GF Piping Systems has undertaken extensive testing of ice slurry with ABS and can give recommendations regarding for example pipeline layout, flow rates and pressure drops. Please ask your local GF Piping Systems representative for details.



### Glycol Solutions

ABS can be used with glycol solutions (e. g. Antifrogen L, Dowfrost) however a derating factor applies to the standard water based pressure-temperature curve, see example.

### Organic Salt Solutions

These mediums are usually potassium formate or acetate water based solutions, with low viscosities at low temperatures. Tradename examples: HYCOOL, TEMPER, TYFOXIT, ANTIFROGEN KF. ABS can be used with these types of mediums however, a derating factor applies to the standard water based pressure/temperature curve. Please consult GF Piping Systems for details. It is important that the complete pipe, irrespective of pipe system material is properly devented both during filling and commissioning. It is very important to follow the manufacturers instructions for pipeline design and handling of these mediums.

### COOL-FIT On-Line calculation tool

For further more detailed technical information as well as references and product range documentation please consult the COOL-FIT homepage or the GF Piping Systems homepage:

[www.cool-fit.georgfischer.com](http://www.cool-fit.georgfischer.com)  
[www.georgfischer.com](http://www.georgfischer.com)

The COOL-FIT homepage offers a free of charge, real-time on-line calculation tool to calculate all the important characteristics of a piping system. Available in 9 different languages all the standard fluids and concentrations thereof on the market are available as options.

The planning engineer or consultant can thus calculate his core system parameters using this tool for COOL-FIT ensuring optimal dimensioning and design of the system.

Core functions which can be calculated are shown at the top of the menu, once chosen then the various sub-functions appear below in a drop-down menu. The core functions are: pressure drop, condensation, heat loss, pipe dimensioning, pipe support distances, contraction and temperature.

For example under the Pressure Drop function the user has 5 options. He can calculate individual products in all dimensions, for example pipe, fittings or valves. The network option allows the user to calculate the pressure drop in complete pipeline consisting of different dimensions and products. The last option, comparison, allows the pressure drop along COOL-FIT pipe to be compared to metal pipe (copper, stainless steel or steel). The surface roughness of the metal system can be entered individually, for example if the user would like to compensate for future encrustation and corrosion of the metal pipe.

Many other calculation options exist, including for example energy gain comparison calculation along a piping system, pipe dimensioning, temperature loss along a given piece of pipe etc. All available via the internet page.







Pressure unit  Bar  kPa Units

[Pressure loss](#) ▶ [Condensation](#) ▶ [Heat loss](#) ▶ [Pipe dimensioning](#) ▶ [Pipe supports](#) ▶ [Contraction](#) ▶ [Temperature](#) ▶ [Data](#) ▶

System parameters																										
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**About the calculations**

This is the online calculation tool from Georg Fischer. Please select a calculation such as Pressure drops, Condensation, Heat loss, Contraction, recommended support distances are available. "Data" includes different kinds of

above. It is possible to make different calculations. Under the menu Supports a table with formulas and specifications of materials and fluids.

[Georg Fischer Piping Systems Ltd.](#), Postfach 11111, 4150 Krefeld, Germany  
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Germany/Switzerland,  
Developed by [TechLogic](#)



Pressure unit  Bar  kPa Units

[Pressure loss](#) ▶ [Condensation](#) ▶ [Heat loss](#) ▶ [Pipe dimensioning](#) ▶ [Pipe supports](#) ▶ [Contraction](#) ▶ [Temperature](#) ▶ [Data](#) ▶

- Along pipe**
- Over fittings
- Over valves
- Network calculation
- Comparison

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Pressure loss - Along pipe						Results: Along pipe						Total results	
CoolFit Black						Results: CoolFit Black						Total results	
Dim. [mm]	Flow [m³/h]	Length [m]	Dim. [mm]	Flow [m³/h]	Length [m]	Dim. [mm]	Velocity [m/s]	ΔP [Bar]	Dim. [mm]	Velocity [m/s]	ΔP [Bar]	Pipe system [-]	Total pressure drop [Bar]
16/-	0	0	110/180	0	0	16/-	0	0	110/180	0	0	ABS PN10	0
20/-	0	0	140/225	0	0	20/-	0	0	140/225	0	0	CoolFit Black	0
25/90	0	0	160/250	0	0	25/90	0	0	160/250	0	0	CoolFit White	0
32/90	0	0	200/280	0	0	32/90	0	0	200/280	0	0		
40/110	0	0	225/315	0	0	40/110	0	0	225/315	0	0		
50/110	0	0	250/-	0	0	50/110	0	0	250/-	0	0		
63/125	0	0	280/-	0	0	63/125	0	0	280/-	0	0		
75/140	0	0	315/-	0	0	75/140	0	0	315/-	0	0		
90/160	0	0				90/160	0	0					

# The material acrylonitrile-butadiene-styrene (ABS)

## ABS properties (reference values)

Characteristics	Value	Units	Test Standard
Density	≥ 1.035	g/cm <sup>3</sup>	ISO 1183-1
Yield stress at 23 °C	≥ 40	N/mm <sup>2</sup>	EN ISO 527-1
Tensile e-modulus at 23 °C	≥ 1600	N/mm <sup>2</sup>	EN ISO 527-1
Charpy notched impact strength at 23 °C	42	kJ/m <sup>2</sup>	EN ISO 179-1/1eA
Charpy notched impact strength at -40 °C	≥ 10	kJ/m <sup>2</sup>	EN ISO 179-1/1eA
Ball indentation hardness (358N/30s)	87	MPa	EN ISO 2039-1
Heat distortion temperature HDT A 1.82 MPa	≥ 74	°C	EN ISO 75-2
Vicat-heat distortion temperature B/50N	≥ 94	°C	ISO 306
Thermal expansion coefficient	0.1	mm/m K	DIN 53752
Heat conductivity at 23 °C	0.17	W/m K	EN 12664
Water absorption at 23 °C	≤ 0.45	%	EN ISO 62
Colour	similar 7001	-	RAL
Limiting oxygen index (LOI)	19	%	ISO 4589-1

### General

Acrylonitrile-Butadiene-Styrene (ABS) is a versatile standard polymer. In addition to its application in piping systems, ABS is mainly common in automotive applications and in high-quality household devices.

The wide area of application relates to the versatile characteristic profile of ABS. It can be adapted to the application by varying the composition of its three components: acrylonitrile, styrene and polybutadiene.

While acrylonitrile provides strength to the material and gives ABS an improved chemical resistance relative to polystyrene, the styrenic component provides both strength and a quality surface finish. The chemically bound polybutadiene-rubber particles, on the other hand, give the material its toughness and impact strength, even at very low temperatures.

The ABS used by GF shows a good balance between toughness and strength, making it especially suitable for low temperature applications. Accordingly the areas of application are mainly refrigeration and air-conditioning systems as well as water treatment.

The advantages of ABS include:

- high impact strength even at low temperatures
- corrosion resistance
- simple installation via solvent cement joints
- low heat conductivity
- halogen free
- non-toxic
- biologically inert; no support of microbial growth
- low weight
- low pressure losses due to smooth surfaces
- good abrasion resistance
- problem-free recycling

### Mechanical properties

In addition to the good strength and stiffness, ABS is especially characterised by a very high impact strength. Impact strength is a measure of impact energy that

the material absorbs until it breaks. For this test, a specimen is weakened with a sharp notch and then struck. Without a notch, there is no breakage of the test specimen. The exceptionally high notched impact strength values, even at low temperatures, indicate the material's high robustness and tolerance against surface damage.

GF ABS pipes are routinely tested for their toughness according to EN ISO 15493. In this test, a weight falling from a height of 2 metres hits the pipe that has been cooled to 0 °C. The mass of the falling weight varies, depending on the pipe dimensions, from 0.5 (d<sub>n</sub> = 20 mm) to 9 kg (d<sub>n</sub> = 225 mm). The high load in the falling-weight test ensures that the excellent toughness of the material is not reduced as a result of processing into pipe.

The internal pressure resistance is provided by the hydrostatic strength curve based on the EN ISO 15493 standard (also see the ABS Calculation and Long-Term Behaviour section). The application limits for pipes and fittings, as shown in the pressure-temperature diagram, can be derived from these curves.

### Chemical, weathering and abrasion resistance

ABS is characterised by its good resistance to various chemicals. In general, ABS is resistant to water, salt solutions and most dilute acids and bases. Its resistance to alcohols, aliphatic hydrocarbons, oils and greases is, however, to be regarded as limited. ABS is not resistant to concentrated mineral acids, organic acids and solvents such as esters, ketones and chlorinated and aromatic hydrocarbons. For detailed information, please refer to the detailed list of chemical resistance from GF or contact your local GF subsidiary.

If the ABS piping system is exposed to direct sunlight over a long period, its surface loses its shine and the colour shifts to light grey. Due to the very high impact strength of ABS, the resulting loss of toughness generally causes no problems in moderate climate

zones. For extreme weather conditions or very high loads on the piping system, we nevertheless recommend protecting the surface from direct sunlight.

In addition to the excellent impact strength, the polybutadiene rubber particles in ABS cause an outstanding resistance against abrasion. Because of this, ABS piping systems have been used for a long time to transport solids and slurries, for example, in mining applications.

Experience has shown that ABS, as well as PE, offers considerable advantages over metal and other plastics for many such applications. Please contact GF if you are planning such an application. We would be glad to advise you about the suitability of our ABS, PE and other materials for your media.

### **Thermal properties**

The outstanding characteristics of ABS allow its application in a wide temperature range between - 50 °C and + 60 °C. At higher temperatures, the tensile strength and stiffness of the material drop and at lower temperatures, they rise. Therefore, please consult the pressure-temperature diagram for your maximum working temperature.

As all thermoplastics, ABS shows a higher thermal expansion than metals. This is not a problem if the thermal expansion is taken into account during the planning stage of the piping system. The expansion coefficient amounts to 0.1 mm/m K in the application temperature range.

At 0.17 W/m K, the heat conductivity of ABS is very low. Because of the insulation properties of the material and the resulting savings in energy or insulation, an ABS piping system is notably more economical in comparison to a system made of copper (370 W/m K) or other metals.

Should there be a need for additional insulation, e. g. in cooling applications, GF offers COOL-FIT, a system specially dedicated to this market. COOL-FIT is a pre-insulated ABS system that has the advantage of quick and easy installation.

### **Combustion behaviour**

ABS self-ignites at temperatures exceeding 450 °C. ABS burns when exposed to an open flame. After removing the flame, the material continues burning. The oxygen index amounts to 19 %. (Materials that burn with less than 21 % of oxygen in the air are considered to be flammable).

According to UL-94, ABS has a HB (Horizontal Burning) flammability coefficient and falls into building material class B2 (conventional inflammable, non-dripping) according to DIN 4102-1. Basically, toxic substances are released by all burning processes. Carbon monoxide is generally the combustion product most dangerous to humans. When ABS burns, primarily carbon dioxide, carbon monoxide and water are formed. Tests have shown that the relative toxicity of the products of combustion are similar or even lower than those of natural products such as wood, wool and cotton. ABS combustion gases are not corrosive. Nevertheless, the burning forms soot. Because of this, smoke develops during combustion. Water, foam and carbon dioxide are suitable fire-fighting agents.

### **Electrical properties**

ABS has good electrical insulation capacity. The specific volume resistance is  $3.5 \times 10^{16} \Omega\text{cm}$  and the specific surface resistance is  $10^{13} \Omega$ . These figures have to be taken into account wherever there is a danger of fires or explosion.

### **Physiological properties**

The GF ABS is toxicologically harmless and biologically inert. Drinking water approvals in the UK (DWI) and in Germany (KTR) have been applied for.

# Hydraulic calculation

## What size should the pipe be?

### Formulas

The following formula can be used for a first approximation of the pipe size required for a given flow rate:

$$d_i = 18.8 \sqrt{\frac{Q_1}{v}} \quad \text{or} \quad d_i = 35.7 \sqrt{\frac{Q_2}{v}}$$

where:

- v flow velocity in m/s
- d<sub>i</sub> inside pipe diameter in mm
- Q<sub>1</sub> flow rate in m<sup>3</sup>/h
- Q<sub>2</sub> flow rate in l/s
- 18.8 conversion factor for units
- 35.7 conversion factor for units

The flow velocity must first be approximated according to the intended use of the pipeline. Standard values for the flow velocity are:

Liquids

v = 0.5-1.0 m/s for suction

v = 1.0-3.0 m/s for delivery

Gases

v = 10-30 m/s

The calculations of pipe diameter have not taken into account hydraulic losses. These require special calculations for which we offer the following information and recommendations.

### Conversion table

m <sup>3</sup> /h	l/min	l/s	m <sup>3</sup> /s
1.0	16.67	0.278	2.78 x 10 <sup>-4</sup>
0.06	1.0	0.017	1.67 x 10 <sup>-5</sup>
3.6	60	1.0	1.00 x 10 <sup>-3</sup>
3600	60000	1000	1.0

The following example shows how to utilise the formulas:

PP pipe SDR 11

Flow rate Q<sub>2</sub> = 8 l/sec

Flow velocity v = 1.5 m/sec

Inside pipe diameter ? mm

$$d_i = 35.7 \cdot \sqrt{\frac{8}{1.5}} = 82.4 \text{ mm}$$

In this case a DN 80 or 3" pipe can be used.

After defining the outside diameter, the real flow velocity can be calculated with the following formula:

$$v = 354 \cdot \frac{Q_1}{d_i^2} = 1.9 \frac{\text{m}}{\text{sec}}$$

or

$$v = 1275 \cdot \frac{Q_2}{d_i^2} = 1.9 \frac{\text{m}}{\text{sec}}$$

- v flow velocity in m/s
- d<sub>i</sub> inside pipe diameter in mm
- Q<sub>1</sub> flow rate in m<sup>3</sup>/h
- Q<sub>2</sub> flow rate in l/s
- 354 conversion factor for units
- 1275 conversion factor for units

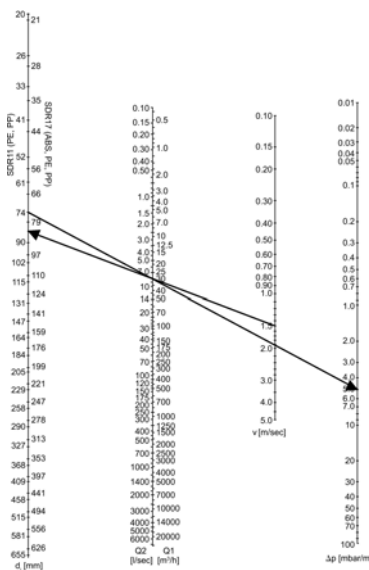
## Nomogram for easy determination of diameter and pressure loss

The following nomogram simplifies the determination of the required diameter. In addition the pressure loss of the pipes per meter pipe length can be read off.

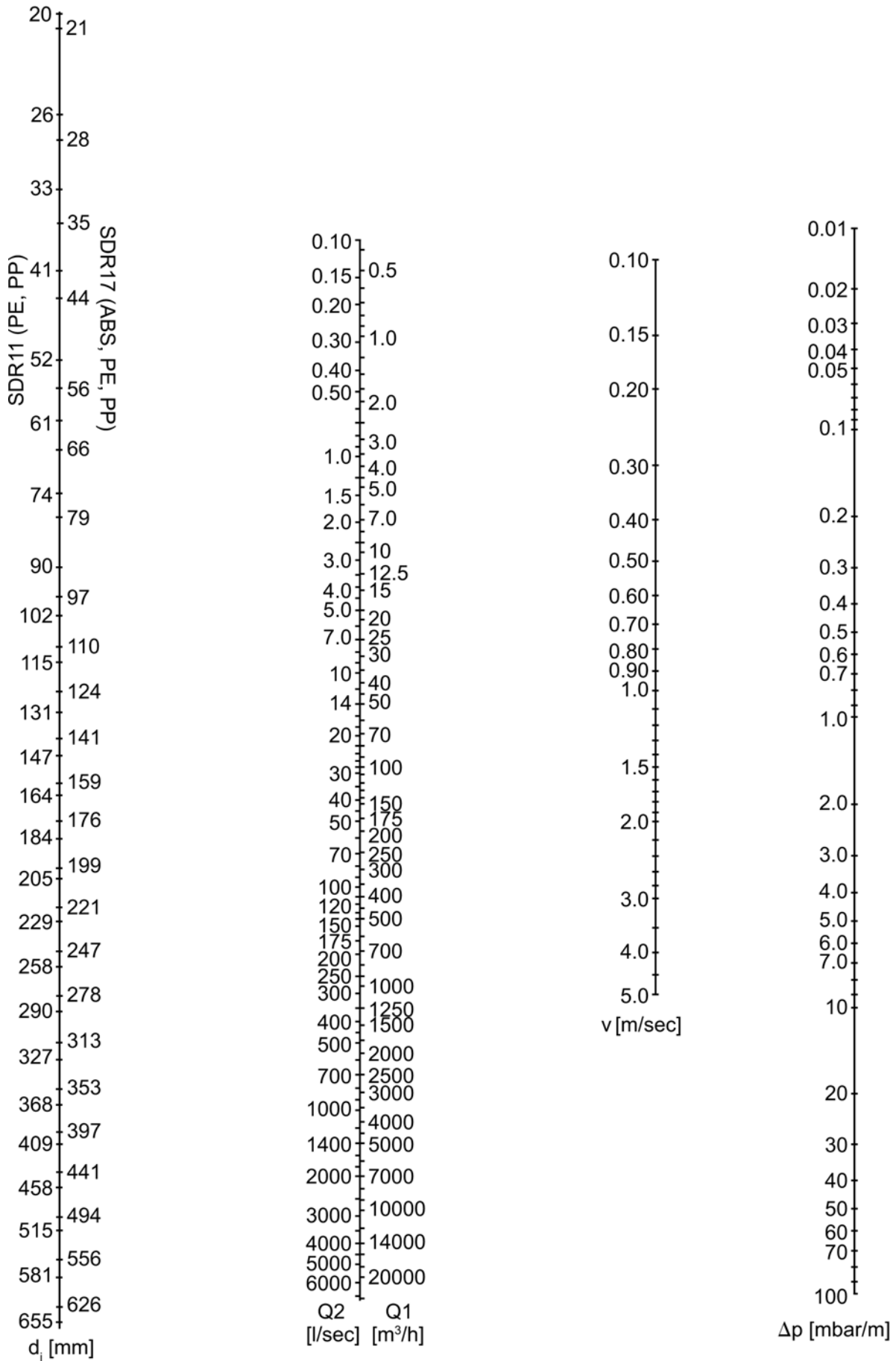
**Remark:** The determined pressure loss from the nomogram applies only to a density of the flow medium of 1000 kg/m<sup>3</sup>, e. g. for water. Further pressure losses of fittings, valves, etc. have to be considered as shown in the following.

### Example how to use the nomogram:

Starting with a flow velocity of 1.5 m/sec draw a line through the required quantity of flow (e. g. 30 m<sup>3</sup>/h) until you cut the axis of the inside diameter d<sub>i</sub> (≈ 84 mm). Then select a diameter nearby (74 mm at SDR11) and draw a second line back through the same quantity of flow to the axis of the pressure losses Δp (5 mbar per meter pipe).



# Nomogram for metric pipes (SDR11, SDR17)



## Pressure losses

### Pressure loss in straight pipes

When calculating the pressure loss in straight pipe lengths there is a distinction between laminar and turbulent flow. The important unit of measurement is the Reynold's number (Re). The changeover from laminar to turbulent flow occurs at the critical value, Reynold's number (Re) = 2320.

Laminar flow occurs, in practice, particularly in the transport of viscous media, i. e. lubricating oil. In the majority of applications, including media similar to water, a turbulent flow, having an essentially steady velocity in a cross-section of pipe, occurs.

The pressure loss in a straight length of pipe is inversely proportional to the pipe diameter and is calculated by the following formula:

$$\Delta p_R = \lambda \frac{L}{d_i} \frac{\rho}{2 \cdot 10^2} v^2$$

**Note:** In practice, when making a rough calculation (i. e. smooth plastic pipe and turbulent flow) it is enough to use the value  $\lambda = 0.02$  to represent the hydraulic pressure loss.

where:

$\Delta p_R$	pressure loss in a straight length of pipe in bar
$\lambda$	pipe friction factor
L	length of the straight length of pipe in m
$d_i$	inside diameter of pipe in mm
$\rho$	density of transported media in kg/m <sup>3</sup> (1 g/cm <sup>3</sup> = 1000 kg/m <sup>3</sup> )
v	flow velocity in m/s

### Pressure loss in fittings

#### Coefficient of resistance

The pressure losses depend upon the type of fitting as well as on the flow in the fitting. The so-called  $\zeta$ -value is used for calculations.

Fitting type	Coefficient of resistance $\zeta$	
90 ° bend	bending radius R	$\zeta$ -value
	1.0 * d	0.51
	1.5 * d	0.41
	2.0 * d	0.34
45 ° bend	bending radius R	$\zeta$ -value
	1.0 * d	0.34
	1.5 * d	0.27
	2.0 * d	0.20
90 ° elbow	1.2	
	45 ° elbow	
Tee 90 ° "		1.3
Reduction (Contraction)		0.5
Reduction (Extension)		1.0
Connection (Flange, union, welding between two pipes)		d >90 mm: 0.1 20 ≤ d ≤ 90 mm: 1.0 to 0.1:  d20: 1.0      d50: 0.6 d25: 0.9      d63: 0.4 d32: 0.8      d75: 0.3 d40: 0.7      d90: 0.1

\*) For a more detailed view differentiate between coalescence and separation. Values for  $\zeta$  up to a maximum of 1.3 can be found in the respective literature. Usually the part of a tee in the overall pressure loss is very small, therefore in most cases  $\zeta = 1.3$  can be used.

#### Calculation of the pressure loss

To calculate the total pressure loss in all fittings in a pipeline take the sum of the individual losses, i. e. the sum of all the  $\zeta$ -values. The pressure loss can then be calculated according to the following formula:

$$\Delta p_{Fi} = \Sigma \zeta \frac{v^2}{2 \cdot 10^5} \rho$$

where :

$\Delta p_{Fi}$	pressure loss in all fittings in bar
$\Sigma \zeta$	sum of the individual losses
v	flow velocity in m/s
$\rho$	density of the transported medium in kg/m <sup>3</sup> (1 g/cm <sup>3</sup> = 1000 kg/m <sup>3</sup> )

### Pressure loss in valves

The  $k_v$  factor is a convenient means of calculating the hydraulic flow rates for valves. It allows for all internal resistances and for practical purposes is regarded as reliable.

The  $k_v$  factor is defined as the flow rate of water in litres per minute with a pressure drop of 1 bar across the valve.

The technical datasheets for valves supplied by GF contain the so-called  $k_v$  values as well as pressure loss diagram. The latter make it possible to read off the pressure loss directly. But the pressure loss can also be calculated from the  $k_v$  value according to the following formula:

$$\Delta p_{Ar} = \left( \frac{Q}{k_v} \right)^2 \cdot \frac{\rho}{1000}$$

where:

$\Delta p_{Ar}$	pressure loss of the valve in bar
Q	flow rate in m <sup>3</sup> /h
$\rho$	density of the medium transported in kg/ m <sup>3</sup> (1 g/cm <sup>3</sup> = 1000 kg/m <sup>3</sup> )
$k_v$	valve flow characteristic in m <sup>3</sup> /h.

## Pressure difference caused by static pressure

Compensation for a geodetic pressure difference may be necessary when a pipeline is vertically installed. The pressure difference can be calculated with the following formula:

$$\Delta p_{\text{geod}} = \Delta H_{\text{geod}} \cdot \rho \cdot 10^{-4}$$

where:

$\Delta p_{\text{geod}}$	geodetic pressure difference in bar
$\Delta H_{\text{geod}}$	difference in elevation of the pipeline in m
$\rho$	density of media kg/m <sup>3</sup> (1 g/cm <sup>3</sup> = 1000 kg/m <sup>3</sup> )

## Sum of pressure losses

The sum of all the pressure losses in the pipeline is then given by

$$\Sigma \Delta p = \Delta p_R + \Delta p_{Fi} + \Delta p_{Ar} + \Delta p_{\text{geo}}$$

## Example for pressure loss calculation

The following example shows the calculation to determine the pressure loss of a pipeline:  
 PVDF-pipeline d40, SDR 21 with a quantity of flow of 1.5 l/sec, medium stannous chloride, density 1.9 g/cm<sup>3</sup>  
 Length of strait pipes: 15 m  
 Amount of fittings:  
 12 elbows 90°  
 4 elbows 45°  
 3 tees  
 3 unions  
 2 flange adapters  
 1 diaphragm valve, 30 % opened  
 Height difference 2.0 m

The **wall thickness** of this pipeline can be calculated with the SDR:

$$e = \frac{d}{\text{SDR}} = \frac{40\text{mm}}{21} = 1.9\text{mm}$$

The **inside diameter** of the pipeline is as follows:

$$d_i = d - 2 \cdot e = d - \frac{2 \cdot d}{\text{SDR}} = 36.2\text{mm}$$

With the required quantity of flow of 1.5 l/sec the **flow velocity** is as follows:

$$v = 1275 \cdot \frac{Q_2}{d_i^2} = 1275 \cdot \frac{1.5}{36.2^2} \frac{\text{m}}{\text{sec}} = 1.46 \frac{\text{m}}{\text{sec}}$$

## Calculation of pressure losses

Pressure loss of strait **pipes**:

$$\Delta p_R = 0.02 \frac{15}{36.2} \frac{1900}{2 \cdot 10^2} 1.46^2 [\text{bar}] = 0.17\text{bar}$$

Pressure loss of **fittings** and **connections**:

$$\Sigma \zeta = (12 \cdot 1.2) + (4 \cdot 0.3) + (3 \cdot 1.3) + (5 \cdot 0.7) = 23$$

$$\Delta p_{Fi} = 23 \frac{1.46^2}{2 \cdot 10^5} 1900 [\text{bar}] = 0.47\text{bar}$$

Pressure loss of the **valve**, 30 % opened. With the flow characteristics diagram, type 314, and 30% lift a percentile kv-value of 50 % can be read out, that means 50 % of kv100 values: 0.5 \* 21.2 m<sup>3</sup>/h (quantity of flow 1.5 l/sec = 5.4 m<sup>3</sup>/h):

$$\Delta p_{Ar} = \left( \frac{5.4}{0.5 \cdot 21.2} \right)^2 \frac{1900}{1000} [\text{bar}] = 0.49\text{bar}$$

Pressure loss of **height difference**:

$$\Delta p_{\text{geod}} = 2.0 \cdot 1900 \cdot 10^{-4} [\text{bar}] = 0.38\text{bar}$$

**Total** pressure loss of the pipeline:

$$\Sigma \Delta p = 0.17 \text{ bar} + 0.47 \text{ bar} + 0.49 \text{ bar} + 0.38 \text{ bar}$$

$$\Sigma \Delta p = 1.51 \text{ bar}$$



# Change in length and flexible sections

## Introduction

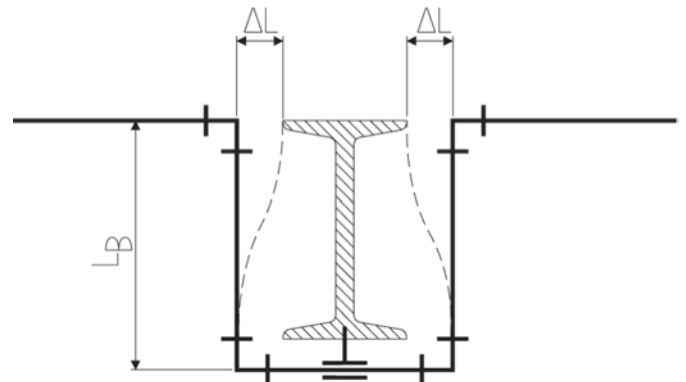
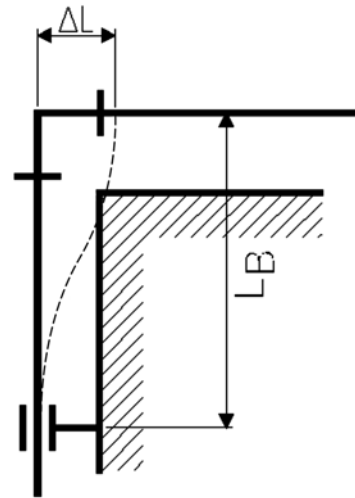
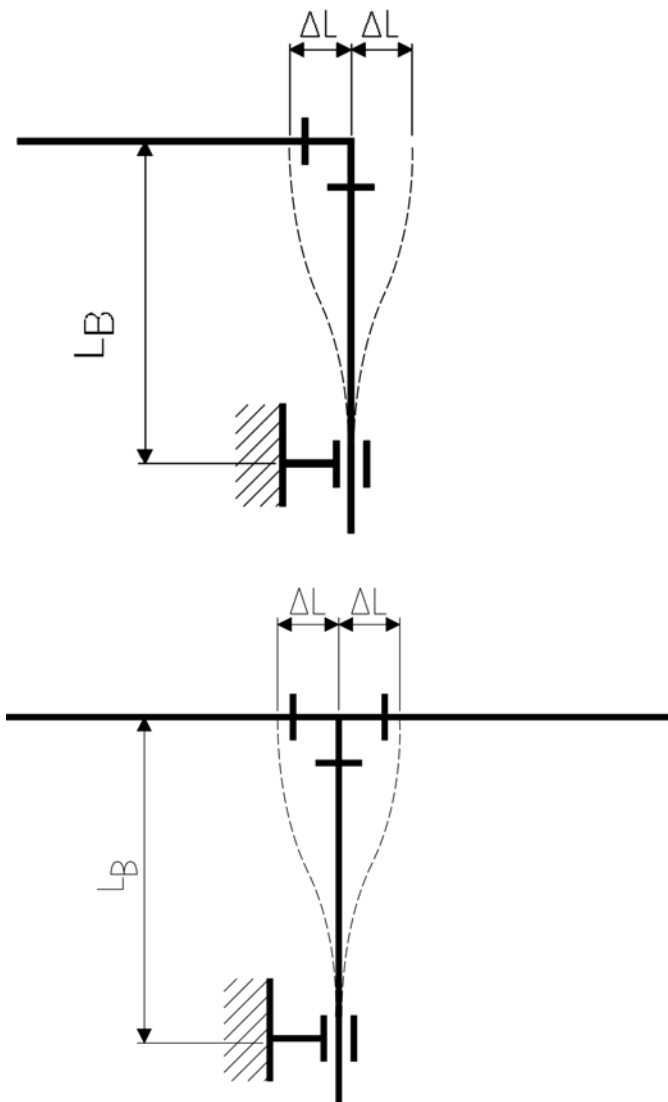
### General

Thermoplastics are subject to greater thermal expansion and contraction than metals. Pipes installed above ground, against walls or in ducts, especially those exposed to temperature variations, require changes in length to be taken up in order to prevent extra strain on the pipes. Length changes can be taken up by:

- a) flexible sections
- b) compensators

Flexible sections are the most common solution, being the simplest and the most economical. The calculations for and the positioning of flexible sections are therefore described in detail.

Flexible sections arise naturally at any branching or change in direction of the pipeline. The movement  $L_B$  of the flexible section as a result of a change  $\Delta L$  in the length must not be restrained by fixed pipe brackets, protrusions wall, girders or the like.



### Calculation of change in length

The change in length caused by temperature can be calculated using the following formula:

$$\Delta L = L \Delta T \alpha$$

with:

- $\Delta L$  = temperature-related change in length (mm)
- $L$  = length of the pipe section (m)
- $\Delta T$  = difference of temperature (K)
- $\alpha$  = coefficient of linear expansion (mm / m K)

### Fundamentals

The low modulus of elasticity of thermoplastics allows changes in length to be taken up by special pipe sections, where pipe supports are positioned so that they can take advantage of the natural flexibility of the material. The length of such sections is determined by the diameter of the pipeline and the extent of the thermal expansion to be compensated.

## Coefficients of linear expansion of polymers:

Material	$\alpha$ in mm/m K
ABS	0.10
pre-insulated ABS	0.02 - 0.08*
PA	0.10
PB	0.13
PE	0.15 - 0.20
PP	0.16 - 0.18
PPS	0.15
PVC-U	0.07 - 0.08
PVC-C	0.06 - 0.07
PVDF	0.12 - 0.18

\* Exact values can be calculated using GF's online tool or ask your local GF representative.



**Tip:** If the operating temperature is higher than the installation temperature, then the pipe expands. If, on the other hand, the operating temperature is lower than the installation temperature, then the pipe contracts in length.

The installation temperature must therefore be incorporated into the calculations as well as the **maximum** and **minimum** operating temperatures.

It is preferable to use "+" to indicate expansion of the pipe and "-" to indicate contraction.

The larger change in length is the one to be used for determining the required length of the flexible section.



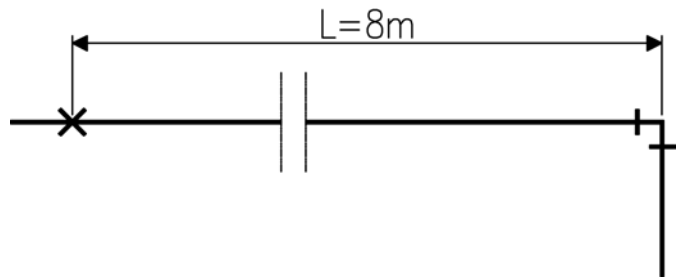
### Example: Determining the required flexible section

#### Calculating the relevant change in length

The example of an ABS process pipe serves to illustrate the procedure:

Length of piping from the fixed point to the branch point where the change in length is to be taken up:

- $L = 8$  m.
- Installation temperature:  $T_M = 20$  °C
- Max. working temperature:  $T_1 = 35$  °C
- Min. working temperature:  $T_2 = -20$  °C



Expansion of the section during heating  
 $+\Delta L_1 = L \cdot \Delta T_1 \cdot \alpha = 8 \cdot 15 \cdot 0.10 = 12$  mm

Contraction during cooling  
 $-\Delta L_2 = L \cdot \Delta T_2 \cdot \alpha = 8 \cdot 40 \cdot 0.10 = 32$  mm

Temperature differences

$$\Delta T_1 = T_1 - T_M = 15$$
 °C

$$\Delta T_2 = T_2 - T_M = -40$$
 °C

Maximum change in temperature chosen

$$\Delta T = 40$$
 °C

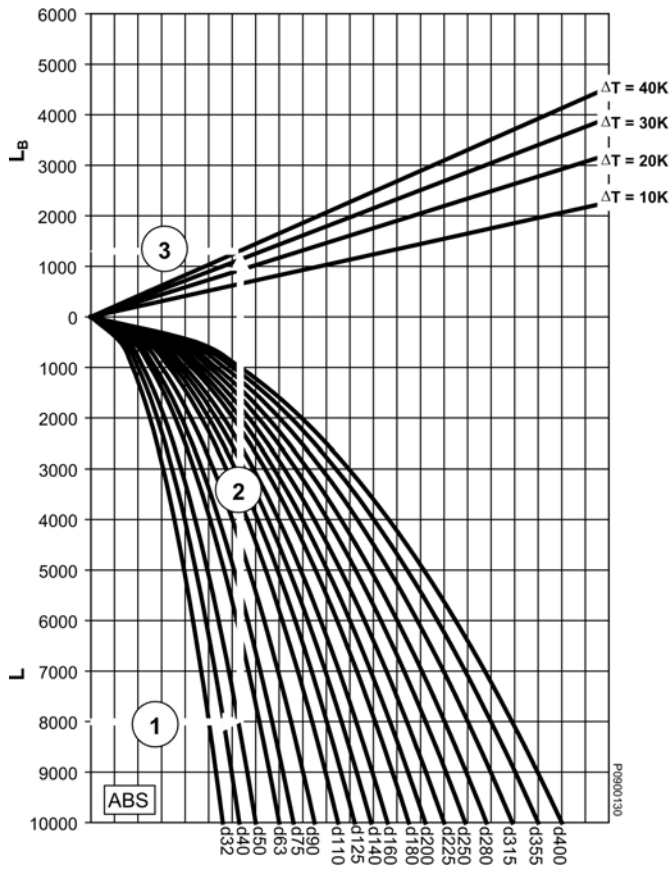
#### Determining the length of the flexible section for ABS

The values needed to determine the necessary length are:

- The maximum change in temperature from the 0-position (i. e. from the position in which the pipe was installed). But remember that the pipe could just as well contract as expand.
- The pipe diameter  $d$ .
- The length of the pipe section  $L$ .

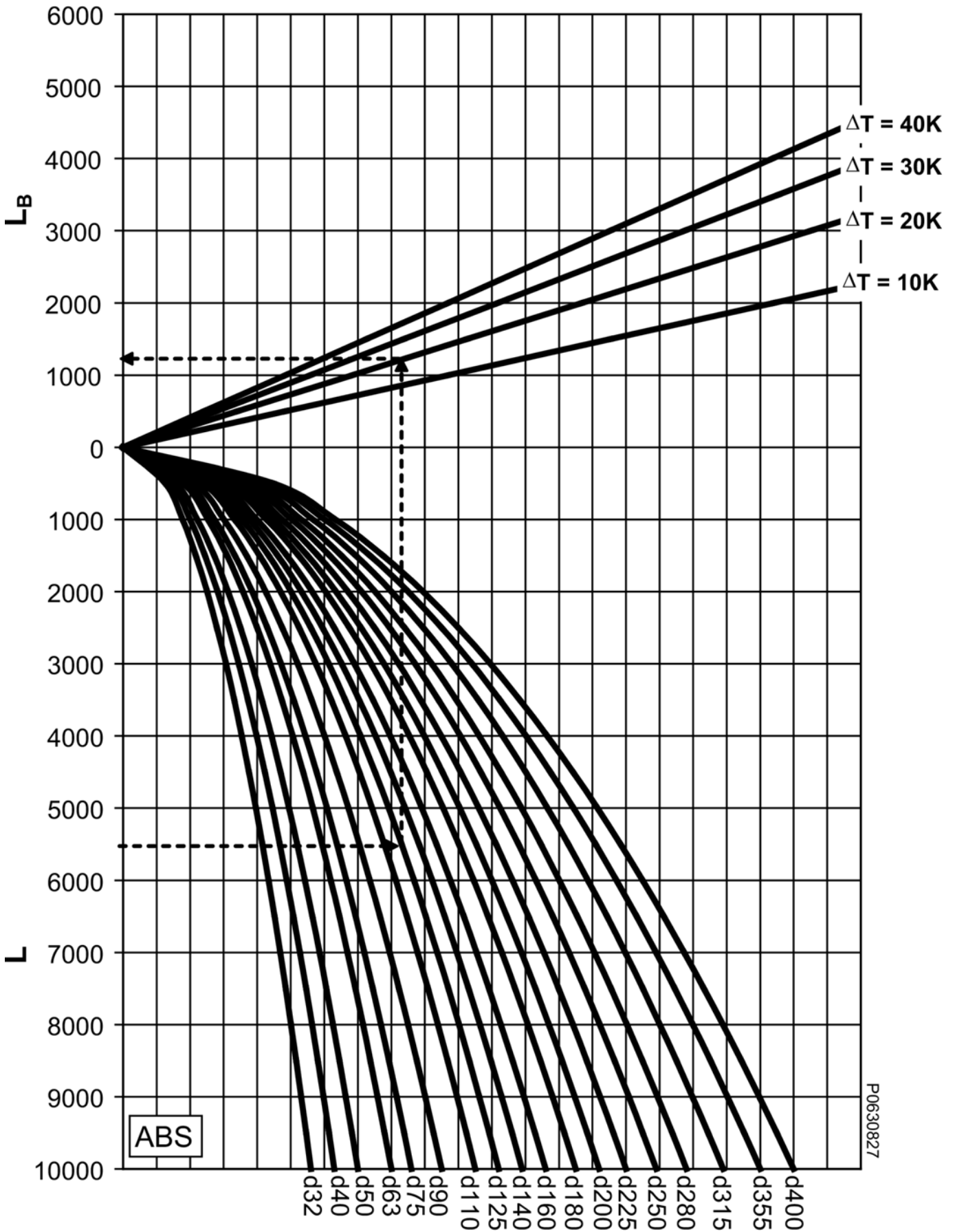
With these values the required length of the flexible section can be read off from the diagram for ABS.

Continuing with the example introduced before and supposing that an ABS pipe with  $d = 50$  mm is installed, the maximum change in temperature being  $\Delta T = 40$  °C, the required length of the flexible section is seen directly from the diagram to be  $L_B = 1300$  mm.

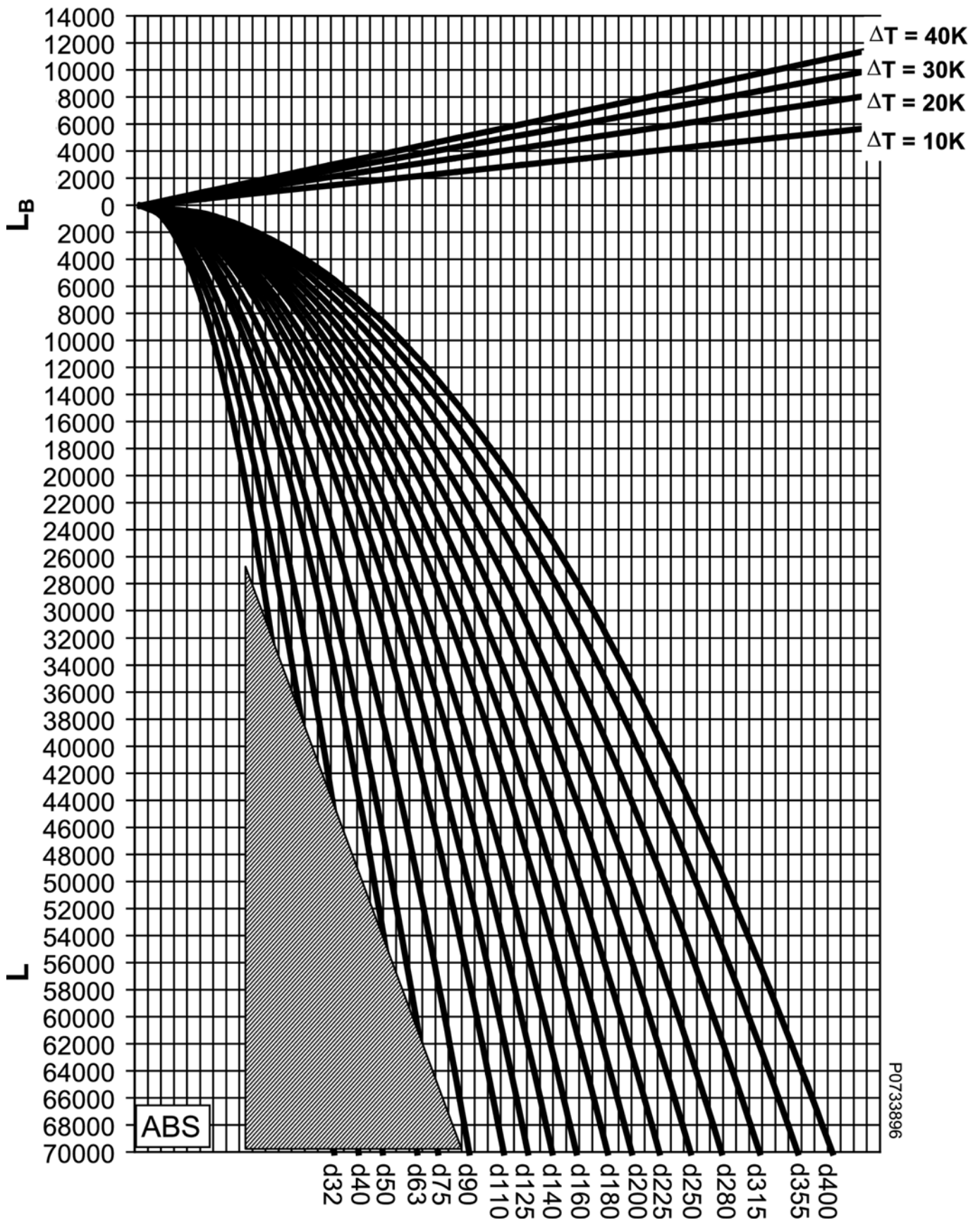


The diagram can be used also the other way around, if a maximum flexible section caused by the building construction is given. Then the maximum straight length of the pipe can be determined.

# Flexible sections of ABS pipelines



L Length of the pipe section in mm  
 $L_B$  Required length of flexible section in mm



L Length of the pipe section in mm

$L_B$  Required length of flexible section in mm

Remark: Please observe the explanations to the hatched area in the clause boundary conditions

### Flexible length for pre-insulated ABS

For calculation the change in length  $\Delta L$  of pre-insulated ABS pipes the following temperatures are needed:

- Installation temperature

- Minimum media temperature
- Maximum media temperature
- Minimum ambient temperature
- Maximum ambient temperature

Please use our online-tool to calculate the applicable change in length out of these temperatures:

[www.cool-fit.georgfischer.com](http://www.cool-fit.georgfischer.com)

The  $L_B$  value for a given  $\Delta L$  and dimension can be read from the table below,  $\Delta L$  and  $L_B$  values are in mm.

COOL-FIT ABS d/D	$\Delta L$				
	10	20	30	40	50
25/90	800	1100	1350	1550	1750
32/90	800	1100	1350	1550	1750
40/110	850	1200	1500	1700	1950
50/110	850	1200	1500	1700	1950
63/125	900	1300	1600	1850	2050
75/140	950	1400	1700	1950	2200
90/160	1050	1450	1800	2100	2350
110/180	1100	1550	1900	2200	2450
140/225	1250	1750	2150	2450	2750
160/250	1300	1850	2250	2600	2900
200/280	1450	2050	2550	2900	3250
225/315	1550	2200	2700	3100	3450
250/355	1650	2300	2850	3250	3650
280/400	1750	2450	3000	3450	3850
315/450	1850	2600	3200	3650	4100

COOL-FIT ABS d/D	$\Delta L$			
	100	150	200	300
25/90	2450	3000	3500	4250
32/90	2450	3000	3500	4250
40/110	2750	3350	3850	4700
50/110	2750	3350	3850	4700
63/125	2900	3550	4100	5050
75/140	3100	3750	4350	5350
90/160	3300	4050	4650	5700
110/180	3500	4250	4950	6050
140/225	3900	4800	5500	6750
160/250	4150	5050	5850	7150
200/280	4600	5650	6550	8000
225/315	4900	6000	6950	8500
250/355	5150	6350	7300	8950
280/400	5450	6700	7750	9500
315/450	5800	7100	8200	10050

# Pipe bracket spacing and support of pipelines

## General

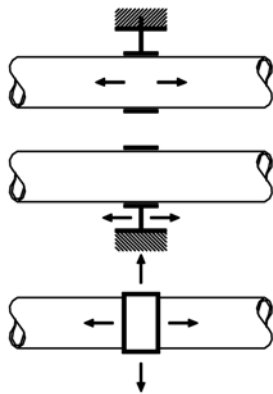
### Pipe support for plastics pipes

Plastic pipe systems should be installed using supports designed for use with plastics and should then be installed taking care not to damage or over stress the pipe.

### Arranging Loose Brackets

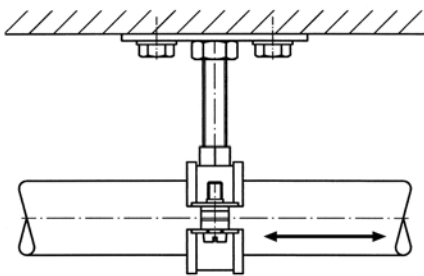
#### What is a loose pipe bracket?

A loose pipe bracket is a bracket which allows axial movement of the pipe, to allow stress free compensation of temperature changes and compensation of any other operating condition changes.



The inner diameter of the bracket should be larger than the outside diameter of the pipe to allow free movement of the pipe. The inner edges of the brackets should be free from any sharp contours which could damage the plastic. If the brackets' inside diameter is not larger than the pipe then the bracket should not be fully tightened, thus allowing the pipe to move.

Another method is to use brackets with spacers which also avoids clamping the bracket on the pipe.



Spacer to avoid clamping

Axial movement of the pipeline must not be prevented by fittings placed next to pipe brackets or by any other component affecting the diameter of the pipe.

Sliding brackets and hanging brackets permit the pipe to move in different directions. Attaching a sliding block to the base of the pipe bracket permits free movement of the pipe along a flat supporting surface. Sliding and hanging brackets are needed in situations where the pipeline changes direction and free movement of the pipe must be allowed.

## Arranging fixed points

### What is a fixed point?

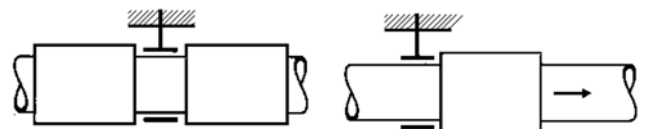
A fixed pipe bracket is a bracket which prevents the pipe from moving in any direction. The aim of which is to control system stresses caused by temperature changes.

## NOTICE

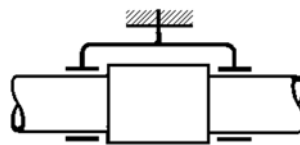
### Construction of fixpoint

This should not be done by simply clamping the bracket onto the outside of the pipe! This can cause deformation and physical damage to the pipe, damage that sometimes only later becomes visible.

- It should be done either by using pipe brackets located between two fittings or a double bracket must be used. (double-sided fixed point).
- Placing a pipe bracket immediately adjacent to a fitting restricts movement due to changes in length to one direction (one-sided fixed point).



one-sided fixed point



double-sided fixed point

### Information:

Pipe brackets must be robust and mounted firmly to be able to take up the forces arising from changes in length in the pipeline. Hanging brackets or KLIP-IT pipe brackets are unsuitable for use as fixed points.

### KLIP-IT pipe brackets

These robust plastic pipe brackets can be used not only under rigorous operating conditions, but also where the pipework is subject to aggressive media or atmospheric conditions. They may be used for all materials of pipes. Don't use KLIP-IT pipe brackets as fixed points!



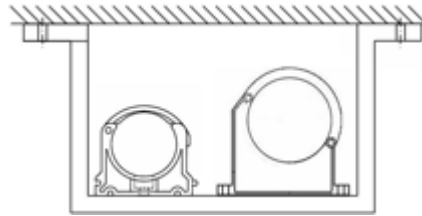
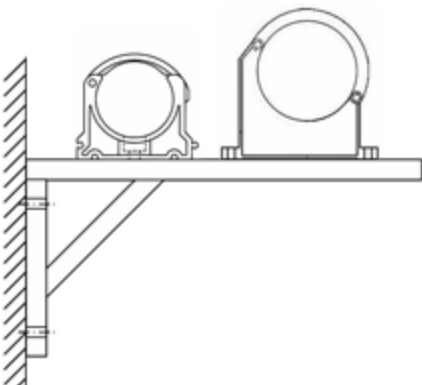
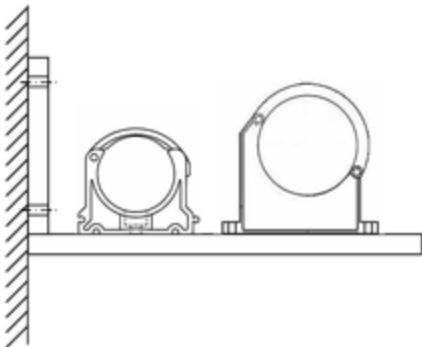
d 16 to d32

d 40 to d 160

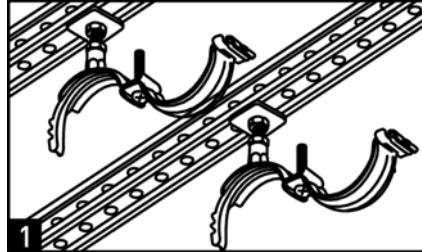


d 90 to d 400

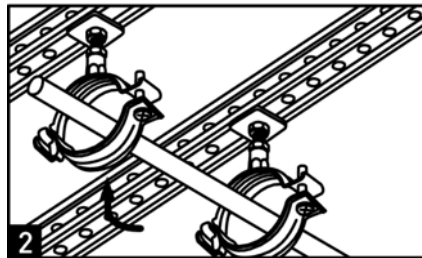
Starting from the dimension d90 the KLIP-IT brackets must be installed standing, like shown in the assembly examples. The support distances given in the following, specified for the KLIP-IT tubing clamps, apply only to this mounting method.



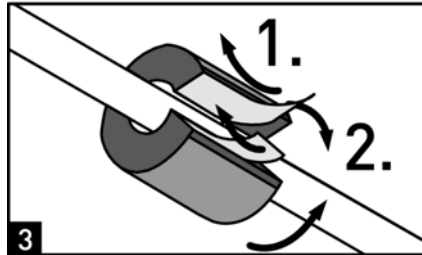
### Pipe brackets for cold insulation (MIP)



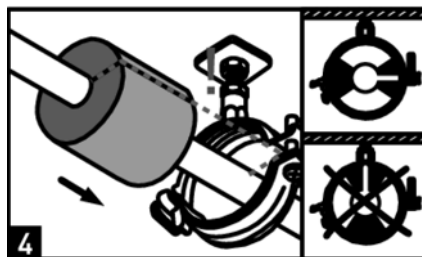
Open handle



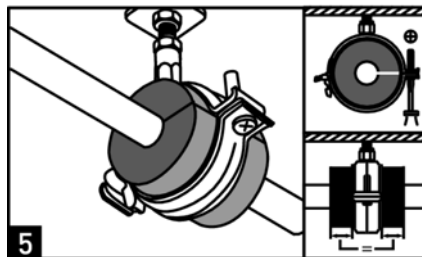
Insert pipe  
Close handle with quick-action clamp



Assemble insulation  
1. Take off foil  
2. Press area of contact

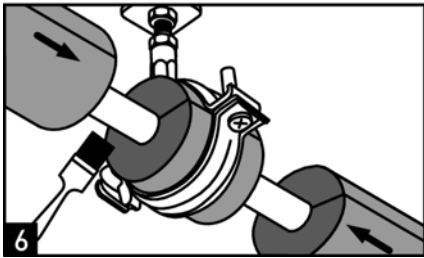


Move insulation into the bracket. Attention! Make sure the insulator is positioned correctly.



Tighten the screw





Coat areas of contact with adhesive and bond them

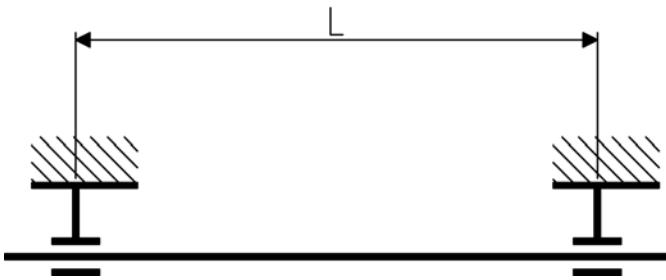
### Using the tables for pipe bracket spacing

Plastic pipelines need to be supported at certain intervals depending on several factors: the material, the average pipe wall temperature, the density of the medium transported and the size and wall thickness of the pipe. Determining the spacing between pipe brackets is based on the permissible deflection of the pipe between consecutive brackets.

#### Information:

The values given in the tables apply only to pipelines which are freely movable in the axial direction.

Pipelines which are fastened tightly in the axial direction (fixed installations) must be checked for buckling. In most cases, this leads to a reduction of the maximum inner pressure and shorter distances between the support brackets. Furthermore, the forces that act on the fixed points must also be taken into consideration. For assistance, please contact your nearest GF representative.



### Pipe bracket spacing for ABS pipes

#### Liquids with a density of 1 g/cm<sup>3</sup>

d mm	DN inch	Pipe bracket intervals L for pipes PN10 / SDR17 / S8 or class C in mm at pipe wall temperature:				
		≤ 20 °C	30 °C	40 °C	50 °C	60 °C
16	3/8	700	650	600	550	450
20	1/2	800	700	650	600	500
25	3/4	850	800	750	650	600
32	1	1000	900	850	750	650
40	1¼	1100	1000	950	850	750
50	1½	1150	1100	1000	900	800
63	2	1300	1200	1100	1000	850
75	2½	1500	1350	1200	1100	950
90	3	1600	1450	1350	1200	1050
110	4	1800	1650	1550	1350	1200
140	5	2050	1800	1700	1400	1250
160	6	2200	1850	1750	1450	1300
200	7	2300	2050	1850	1550	1350
225	8	2400	2200	1900	1600	1450
250	9	2500	2300	2000	1650	1500
280	10	2650	2400	2100	1700	1600
315	12	2800	2500	2200	1800	1650

For other SDR / PN values or classes multiply the values given in the table with the following factor.

SDR11 / PN16 1.08

Class B 0.90

Class D 1.05

Class E 1.09

The pipe bracket spacing given in the table may be increased by 30 % in the case of vertical pipe runs, i. e. multiply the values given by 1.3.

#### Fluids of a density other than 1 g/cm<sup>3</sup>

If the liquid to be transported has a density not equal 1 g/cm<sup>3</sup>, then the bracket spacings in the table above should be multiplied by the factor given in the following table.

Density of the fluid in g/cm <sup>3</sup>	Type of fluid	Factor for pipe bracket spacing
1.00	Water	1.00
1.25	Other	0.96
1.50		0.92
1.75		0.88
2.00		0.84
≤ 0.01	Gaseous	1.30

#### Pre-insulated ABS COOL-FIT

Pipe diameter mm	Pipe bracket intervals L for pre-insulated ABS COOL-FIT mm
25	1550
32	1550
40	1650
50	1650
63	1750
75	1900
90	2050
110	2200
140	2550
160	2750
200	3050
225	3300
250	3300
280	3600
315	3800

## Installation

### COOL-FIT fixed point

Fixed points are created using the special COOL-FIT fix point. The product consists of two components namely a welding band and a pipe bracket. Electro-fusion welded band as permanent connection to transmit the forces that occur in the pipe to the fixed point. The delivered pipe brackets are needed to deliver welding pressure during installation and give stability during operation. For welding, use an MSA 250, 300, 350, 400 or commercially available 220 V fusion machines. If you use an MSA fusion machine from GF Piping Systems, use the 799 350 339 adapter. Please take note of the maximum allowed forces for this version in the table below.

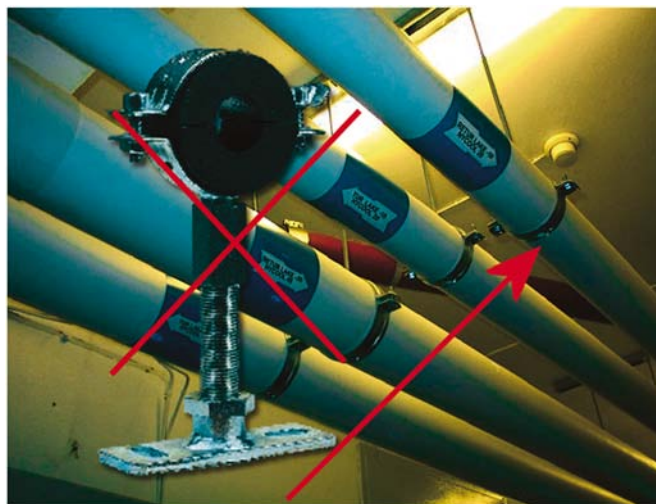
Outside diameter D (mm)	Maximum force F (kN)
90	1.5
110	2.0
125	3.5
140	5.5
160	9.0
180	10.0
225	10.0
250	10.0
280	10.0
315	10.0

**Remark:** Fixed point brackets and cross braces have to be calculated and obtained by the installer. They are not included in the fixed point set from GF.



### No need for pipe brackets for cold insulation

Due to the excellent characteristics of the pre-insulated ABS pipes no special pipe brackets for cold insulation are needed.



Use only simple pipe brackets

### Plastic to Metal Connections

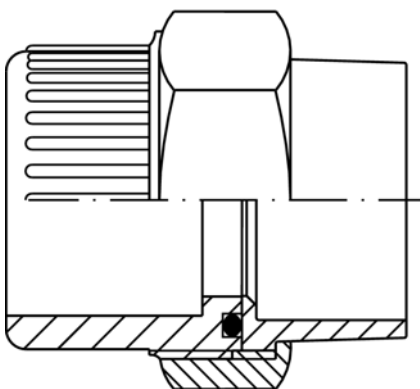
Fundamentally three options are available for plastic to metal connections, namely; threads, flanged connection and unions.

GF Piping Systems recommends that wherever possible mechanical connections are used (unions and flanges) together with a located gasket such as O-Ring.

#### Union Connections

This is the most reliable and cost effective method to connect metal to plastic.

GF Piping Systems has a whole range of transition unions with O-Rings specially designed to compensate for the changes in length which can occur in ABS and COOLFIT ABS due to temperature fluctuations. See ABS product range for details of the copper, brass, stainless steel and malleable iron transition unions available.



ABS                      Located O-ring                      Copper

#### Flange connections

Metal to ABS and also ABS to ABS connections using flange adaptors is possible up to DN300. For bolt torques, tightening sequences etc please refer to standard the GF Piping Systems Plastics Technical Handbook.

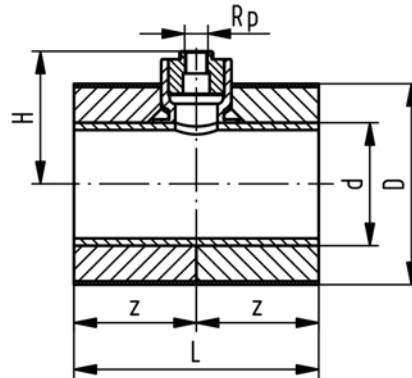
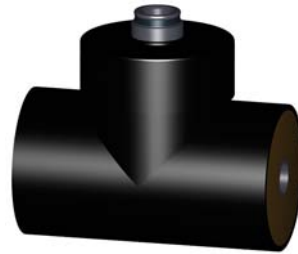
GF Piping Systems's new revolutionary PN16 PP-V flange is light weight, with location stubs to aid installation and is designed to avoid high stresses during tightening. GF Piping Systems recommends this type of flange for use with plastic flange connections.

All mechanical connections including flanges should be retightened after commissioning if the working temperature is lower than the temperature during installation.

### Threaded Connections

GF Piping Systems recommends avoiding threaded connections for plastic wherever possible, solvent cementing is a very reliable and speedy method of jointing and should be preferred to threaded connections. Mechanical wrenches should not be used to tighten the joint. Namely strap type wrenches prevent damage to the plastic components.

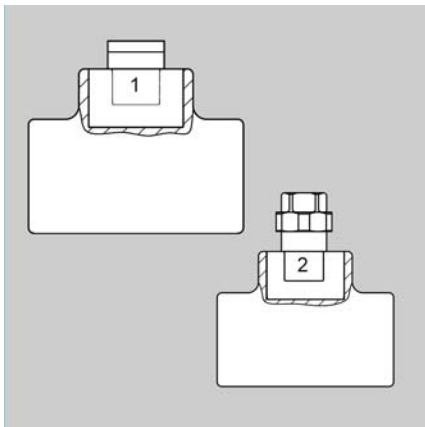
For sealing threaded joints the mating parts should always be parallel to tapered. In the ABS range only the plastic female thread with reinforced ring should be used for connection to metal threads. For sealing we recommend PTFE tape. 2 layers of tape applied in a clockwise direction, the components should then be joined carefully to avoid damage to the plastic thread. Alternatively also thread sealing cord Henkel Tangit Uni-Lock or Loctite 55 and/or thread sealing paste Loctite 5331 can be used. Please consider the appropriate installation guidelines of the manufacturer. If other sealing materials are used, compatibility with the plastics to be used must be checked first.



### Measuring Equipment in an ABS System

#### Tee 90° reduced in ABS

Standard ABS tees can be fitted with a short reducer and then a threaded nipple or a piece of pipe with a transition union to install equipment, this should be planned in in the design stage of the plant. We recommend use of a transition union rather than a threaded connection.



- 1 ABS nipple in an ABS reducing tee 90°
- 2 Transition union with ABS pipe

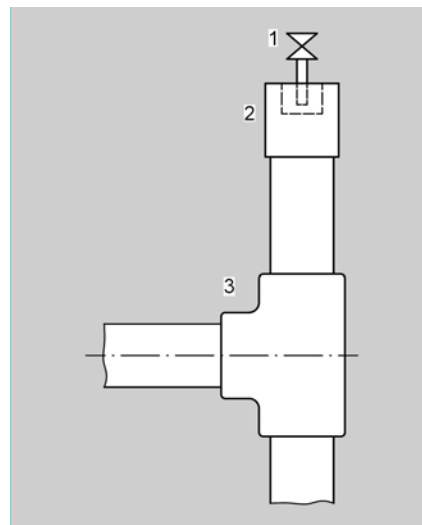
#### Measuring Equipment in COOL-FIT ABS

As with the ABS system Tee 90° reducers are available in COOLFIT ABS. These then need to be planned into the system during the design phase of the plant. At present it is not possible to install equipment into an already existing COOLFIT ABS pipe, other than cutting the pipe and placing a Tee in the pipe.

### De-Venting or De-aeration

It is always important to remove air from any piping system, for salt solutions this is particularly important due to their corrosive nature. Summary of Deaeration process,

- always fill the system slowly from the bottom up
- induce a vacuum in the system before filling
- install manual and/or automatic deaerators at the highest points in the system
- long horizontal runs should be installed at a slight gradient
- avoid low points i.e. Uconfigurations where air can be trapped
- install deaerators with a buffer zone of fluid below them, see sketch below
- always observe the medium manufacturers specific recommendation for filling, mixing etc as secondary fluids differ in their composition

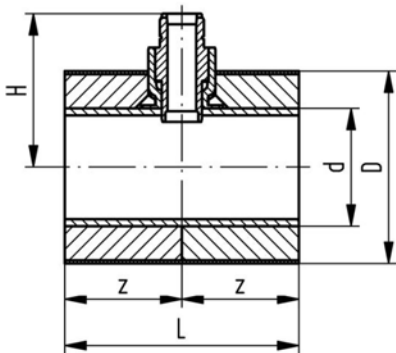
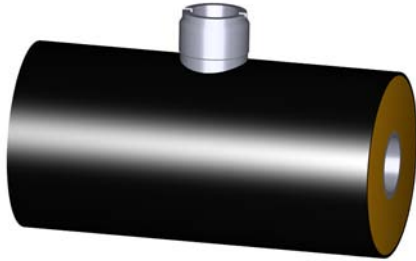


- 1 Air release valve
- 2 ABS reduced
- 3 ABS tee 90°

## SIGNET Flow Measuring Equipment

GF Piping Systems Signet offer paddle wheel flow measuring equipment which can be used to very cost effectively measure the flow of your medium, with digital and analogue display devices including cabinet housings for installation in display units.

These SIGNET flow sensors can be installed using specially designed installation fittings, ask GF Piping Systems for installation fittings details.



## Other installation topics

### Foaming ABS with PUR On-Site

There are various types of PUR on the market using different types of activators to initiate the foaming process. All are however an exothermic reaction, i.e. generate heat, usually reaching temperatures of about 120 °C, which can be dangerous for thermoplastics. ABS has a vicat point, softening point of 98 °C, this means that any temperatures reached above this have a detrimental effect on the ABS. Also usually the foaming onsite takes place in an enclosed volume which then causes external pressures on the component.



For these reasons we recommend that ABS fittings and pipe are not insulated using PUR foaming onsite.

COOLFIT ABS is foamed under controlled conditions ensuring that the quality of the ABS is not affected by the PUR foaming process.

### Insulating ABS

ABS is not chemically resistant to solvents. Solvents are used in the jointing process to soften and swell the ABS to create a weld. This use of solvent takes place under controlled conditions and uses double wall thickness by inserting pipe in fitting.

Any other contact of solvents with ABS should be avoided. Some insulation materials on the market use solvent based glues to position the insulation, as per manufacturers' instructions only the insulation itself should be glued together.

Any excess glue which may come into contact directly with the ABS should be removed with a cloth. If insulation has been glued directly to the pipe this does not mean that the system is now dangerous. It can however only be determined on a case to case basis if the situation will have a detrimental effect on the performance of the pipe. Contact GF Piping Systems if you require more information on this subject.

### Insulation to avoid Dew on ABS

To calculate the necessary thickness of insulation required on ABS to avoid Dew or Condensation can be done via GF Piping Systems's online cooling calculation program, see [www.coolfit.georgfischer.com](http://www.coolfit.georgfischer.com) Under the button «condensation» you will be asked to input the system parameters and type of insulation. The results are guideline values based on tradename published data and general physical data regarding types of insulation. We recommend the user consults the insulation manufacturer for detailed specific advice regarding the insulation when not using COOLFIT ABS.

### COOL-FIT ABS: Condensation, Yes or No?

COOLFIT ABS has set thicknesses of insulation, once again via [www.coolfit.georgfischer.com](http://www.coolfit.georgfischer.com) the user can input his system parameters and the program will identify whether using COOLFIT ABS dew will appear on the outside of the pipe or not.

PUR has a thermal conductivity of 0.026 W/m.K and the thickness is +/-35mm for all dimensions so the system parameters need to be extreme for dew to appear on the outside of COOLFIT ABS.

For example:

Medium temperature:	-50 °C
Temperature of the surrounding	+20 °C
Relative atmospheric humidity	75%
Wind velocity:	1 m/s

Under the above circumstance there will be no condensation on the pipes.

### De-Frosting

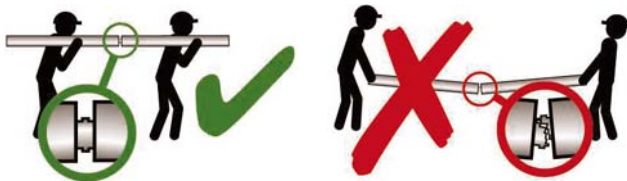
Many secondary refrigeration loops are not only used for normal and low temperature cooling but are also used for defrosting. GF Piping Systems has many years of good experience with the use of ABS in such dual defrost / cooling systems without any detrimental effects to the system.

## Heat transfer coefficient of pipes: Pre-insulated ABS

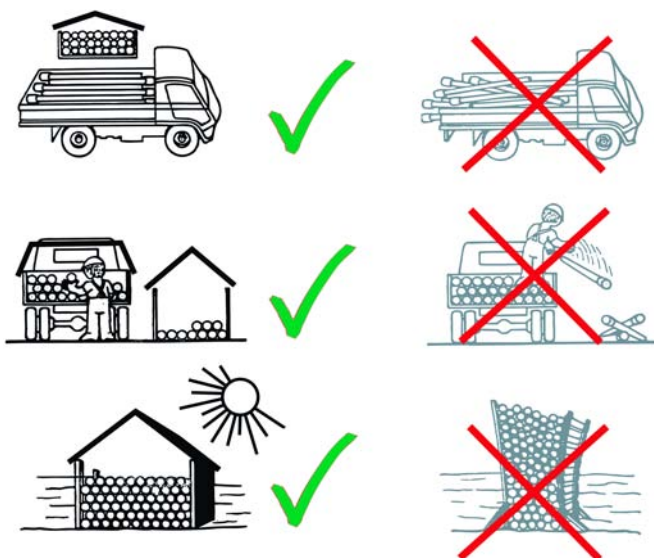
Pipe diameter mm	U-Value pre-insulated ABS W/m K	R-Value pre-insulated ABS m K/W
25	0.13	7.7
32	0.16	6.3
40	0.17	5.9
50	0.21	4.8
63	0.25	4.0
75	0.27	3.7
90	0.29	3.4
110	0.34	2.9
140	0.35	2.9
160	0.37	2.7
200	0.50	2.0
225	0.50	2.0
250	0.49	2.1
280	0.48	2.1
315	0.48	2.1

## Handling

How to carry COOL-FIT pipes after connection with ABS nipples:



Pipes must be kept straight!



## Storage

All plastic pipes including preinsulated plastic pipes, i.e. COOL-FIT ABS should be stacked on a flat surface free from sharp edges, such as stones or building debris for instance. During handling care should be taken to avoid

damage to the outside surface of the pipe, for instance no dragging along the ground. Avoid pipe overhangs when stored as this will cause the pipe to bend.

## UV Resistance

Most plastics suffer some loss of physical properties when exposed to UV light, only PE Black, used also for the outer jacket of the COOL-FIT ABS black, is UV resistant.

The impact strength of ABS reduces under UV light over a time period of approximately one year, after which the oxidised layer on the outside surface of the ABS acts as a barrier and the impact strength does not deteriorate further.

Although the ABS impact strength is reduced under UV light it still remains at a very high level.

## Under-Ground Installation

Preinsulated ABS can be used underground. Standard guidelines for installation of plastic pipe systems should be followed. Please pay attention to local regulations. In general, trenches should not be less than 1 meter deep. To avoid frost damage trenches can be deeper.

The pipe should be laid in a sand bed, all large pieces of rock and sharp objects must be removed. Compressed sand should be used to pack the pipe. We recommend use of the long shrink sleeves from the COOL-FIT product range (265 mm) for the pipe to pipe connections.

Pre-insulated ABS pipes have a higher stiffness and weight than standard ABS. It is therefore recommended to perform jointing in the trench itself wherever possible to avoid unnecessary stressing of the joints.

It should not be necessary to use any mechanical expansion elbows in the system design underground. Please consult GF for technical advice.

## The Environment

ABS and COOL-FIT ABS are halogen free. The materials used in COOL-FIT ABS namely ABS, PE and PUR are all recyclable materials. GF Piping Systems as a company aims to understand and meet customer requirements regarding the environment. We design products and develop our processes taking into account the environment and its needs. TEWI, ODP and GWP values and reports exist for COOL-FIT preinsulated pipe, please see [www.coolfit.georgfischer.com](http://www.coolfit.georgfischer.com)



## Certificate

SQS herewith certifies that the company named below has a management system which meets the requirements of the normative bases specified below.

**Georg Fischer Piping Systems Ltd.  
CH-8201 Schaffhausen**

### Certified area

Georg Fischer Piping Systems Ltd., Schaffhausen  
Georg Fischer Rohrleitungssysteme (Schweiz) AG,  
Sales Company  
Georg Fischer Wavin Ltd., Schaffhausen and  
Subingen  
Georg Fischer Building Technology Ltd., Schaffhausen  
Georg Fischer Fluorpolymer Products GmbH,  
Ettenheim

### Field of activity

The Piping Systems Group develops, manufactures and distributes plastic or metal components and systems for conducting, pumping, controlling, measuring and regulating liquids and gases and to this end provides comprehensive engineering and related services

### Normative bases

**ISO 9001:2008** Quality Management System  
**ISO 14001:2004** Environmental Management System

Swiss Association for Quality and  
Management Systems SQS  
Bernstrasse 103, CH-3052 Zollikofen  
Issue date: May 28, 2009

This SQS Certificate is valid up to  
and including May 27, 2012  
Scope number 14  
Registration number 10684

  
X. Edelmann, President SQS

  
T. Zahner, Managing Director SQS



## Flammability

According to UL94, ABS has an HB (Horizontal Burning) flammability coefficient and falls into building material class B2 (conventional inflammable, nondripping) according to DIN 41021. Fundamentally, toxic substance are released by all burning process. Carbon monoxide is generally the most important. When ABS burns, primarily carbon dioxide, carbon monoxide and water are formed. Tests have shown that the relative toxicity of the products of combustion are similar or even lower than those of natural products such as wood, wool and cotton. ABS combustion gases are not corrosive. That the burning nevertheless forms soot, smoke develops during combustion. Suitable firefighting agents are water, foam and carbon dioxide.

## PE Flammability

The following classifications in accordance with differing combustion standards: According to UL94, PE is classified as HB (Horizontal Burning) and according to DIN 534381 as K2. According to DIN 4102 part 1 and ÖNORM B3800 part 1, PE is listed as B2 (normally flammable). In the French classification of building materials, polyethylene corresponds to M3 (of average flammable rating). The self ignition temperature is 350 °C. Suitable firefighting agents are water, foam, carbon dioxide or powder.

## PUR Flammability

Rigid polyurethanebased foams are effective insulation materials commonly used in the construction industry. Polyurethane foam will burn if exposed to flames. The combustibility characteristics vary with chemical composition. Unlike expanded polystyrene (eps), polyurethane does not melt. It flashes into flames

between 800 °F and 850 °F, and only chars rather than melts at temperatures below that range. The charring may in fact help protect the adjacent foam. Some studies have indicated that Douglas Fir was more toxic than polyurethane foam. In a paper presented at the 1985 Society of the Plastics Industry, annual meeting on polyurethane foam. Please consult GF Piping Systems for further details.

## Fire Wall Penetrations



To seal a combustible pipe penetrating a fire wall it is necessary to use locally approved sealing systems to preserve the integrity of the fire wall. There are various international and local companies offering solutions for plain combustible pipe (e.g. plastic pipe). ABS – for sealing plain ABS please consult locally approved fire wall penetration products for standard combustible pipe. ABS + Insulation – as per plain ABS, solutions exist tested and approved on combustible pipe with various different types of insulation. COOL-FIT – is a pre-insulated combustible pipe. The company Kuhn have tested their product series ROKU® R AWM II to the EN1366-3 (European Standard for “Fire resistance tests for service installations – Part 3 Penetration seals) on COOL-FIT pipe at the IBMB Institute in Braunschweig, Germany. The COOL-FIT tested passed the requirements as outlined in this standard to EI 90 / EI 120. The system has a national technical approval in Germany and is listed under Z-19.17-1194. In Austria it is listed under test report No. 06112903-2a, and in Switzerland under the number of Z 10933 respectively 10339. Test data is available from the company Kuhn which can be extrapolated by local test authorities to show the integrity of the solution.

For product information see [www.kuhn-brandschutz.com](http://www.kuhn-brandschutz.com)  
KUHNS Brandschutz Systems  
Solutions for building services

## Comparison pipe diameter

DN, plastics/metal, mm/inch

Plastics					Metal		Chrome steel CN
da mm	di ABS Cool-Fit mm	di PE100, SDR11 mm	di PB mm	DN	Inch	da mm	da mm
10	-	-	-	6	1/8"	10.2	-
12	-	-	-	8	1/4"	13.5	-
16	12.4	-	11.6	10	3/8"	17.2	15
20	15.4	16.0	14.4	15	1/2"	21.3	18
25	20.4	20.4	20.4	20	3/4"	26.9	22
32	28.2	26.2	26.2	25	1"	33.7	28
40	35.2	32.6	32.6	32	1 1/4"	42.4	35
50	44.0	40.8	40.8	40	1 1/2"	48.3	42
63	55.4	51.4	51.4	50	2"	60.3	54
75	65.8	61.4	61.4	65	2 1/2"	75.3	76.1
90	79.2	73.6	73.6	80	3"	88.9	88.9
110	96.8	90.0	90.0	100	4"	114.3	108
125	-	102.2	-	100	-	-	-
140	121.6	114.6	-	125	5"	140.3	-
160	139.0	130.8	-	150	6"	168.3	-
180	-	147.2	-	150	-	-	-
200	173.8	163.6	-	200	7"	193.7	-
225	195.4	184.0	-	200	8"	219.1	-
250	230.8	204.6	-	250	9"	244.5	-
280	258.6	229.2	-	250	10"	273.0	-
315	290.8	257.8	-	300	12"	323.9	-

## Solvent cement jointing

### Instructions for Tangit solvent cement jointing of ABS dimension d16 to d225

#### General

Solvent cement jointing calls for adequate technical know-how, which can be acquired in the appropriate training courses. Your GF representative will gladly provide you with information about training possibilities.

The dimensions of GF pipes, fittings and valves conform generally to the various national standards as well as to ISO 727-1 concerning dimensions of sockets. Our fittings and valves can be used with any ABS pipes whose outside diameter tolerance conforms to ISO 11922-1.

According to ISO 727-1 the following minimal cement lengths are as shown in the table:

Pipe outside diameter / socket inside diameter d (mm)	Minimal cement length L (mm)
16	13.0
20	15.0
25	17.5
32	21.0
40	25.0
50	30.0
63	36.5
75	42.5
90	50.0
110	60.0
125	67.5
140	75.0
160	85.0
200	105.0
225	117.5

## Tools and equipment

<b>Pipe cutter</b> Type KRA	d10 - 63 d50 - 110 d110 - 160	790 109 001 790 109 002 790 109 003
<b>Pipe cutter type</b> KS 355	230 V / 50 - 60 Hz	790 202 001
<b>Chamfering tool</b>	d16-75 d32-200	799 495 145 799 495 146
<b>Cleaner</b>	1 litre tin	799 298 010
<b>Tangit ABS solvent cement</b>	0.65 kg tin	799 298 022
<b>Brush sizes</b>		
Pipe outside diameter in mm	Brush	
16-32	Round brush ø8 mm	799 299 002
40-63	Flat brush 1" 25 x 3 mm	799 299 003
75-225	Flat brush 2" 50 x 5 mm	799 299 004
<b>Tin lid</b>		799 298 028
<b>White absorbent paper</b>	commercially available	
<b>Solvent resistant protecting gloves</b>	commercially available	



Cutting the pipe to length



Chamfering the pipe





Solvent cementing equipment

### ABS Tangit and cleaner: Amounts required

Pipe diameter d (mm)	ABS Tangit amount per 100 joints (kg)	ABS Tangit number of joints per tin 0.650 kg
16	0.25	260
20	0.35	186
25	0.40	163
32	0.45	144
40	0.60	108
50	0.90	72
63	1.10	59
75	1.25	52
90	1.70	38
110	2.50	26
140	5.00	13
160	6.50	10
200	10.0	6
225	12.5	5

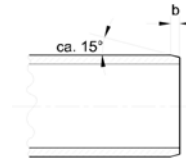
Pipe diameter d (mm)	Tangit cleaner amount per 100 joints (litre)	Tangit cleaner number of joints per tin 1 litre
16	0.2	500
20	0.3	333
25	0.4	250
32	0.5	200
40	0.7	143
50	0.9	111
63	1.1	91
75	1.3	77
90	1.4	71
110	1.7	59
140	2.1	48
160	2.5	40
200	3.5	29
225	4.5	22

**Note:** The quantities specified above are to be understood as practice-orientated maximum values. In principle the quantities depend on gap dimensions, temperatures, working technique.

### Preparations

The pipe must be cut off at right angles. Remove the inside edges and chamfer the outside ones as illustrated in the sketch. Only then is an optimal solvent cemented joint possible.

**Important:** Well-chamfered pipe ends prevent the layer of cement from being removed as the pipe is inserted into the fitting.



Pipe outside diameter	b
16 mm	1 - 2 mm
20 - 50 mm	2 - 3 mm
≥ 63 mm	3 - 6 mm



Marking the jointing length

Wipe the outside of the pipe and the inside of the socket with a clean cloth to remove obvious dirt. Marking the jointing length on the pipe end makes it possible to check afterwards whether the pipe has been inserted to the full extent of the socket.

**Note:** If the outside diameter of the pipe and the inside diameter of the socket are at opposite extremes of their tolerances, then the pipe cannot be inserted dry into the fitting socket. This will only become possible once the cement has been applied.



Checking the cement

The Tangit ABS cement is supplied ready for use. Stir thoroughly before using! Cement of the correct consistency will run evenly from a wooden spatula held at a slant. Cement which no longer runs smoothly is unusable. The cement must not be thinned.

For more information please consult the safety datasheets under the following link: <https://www.sdb.henkel.de/index.cfm>

Cement and cleaner should be stored in a cool, dry place (5–35 °C)! Under these conditions the cement and cleaner are durable for 24 months starting from the date of filling (imprinted on the tin).

### Cementing

Clean the outside of the pipe end and the inside of the socket **thoroughly** with ABS cleaner and absorbent paper.

Use a fresh piece of paper for each component. If the surfaces are free from grease, cleaning with absorbent paper and Tangit cleaner is not absolutely necessary for ABS.

But remove any condensation which may have formed on the parts.

**Important:** Pipe end and fitting socket must be dry and free from grease and dirt and must not be touched after cleaning.



Cleaning the pipe and socket

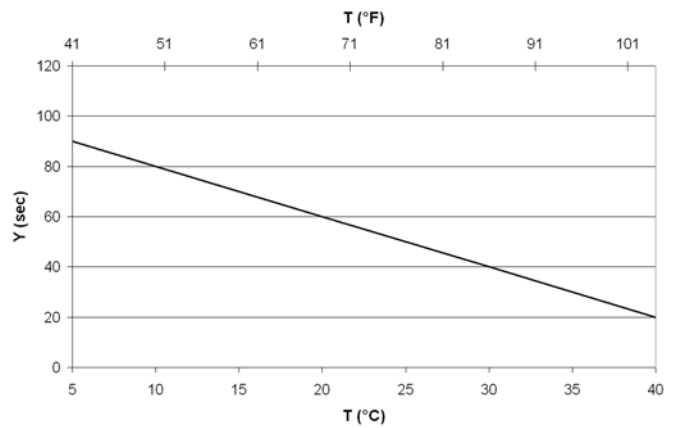
ABS pipes should be cemented at temperatures between +5 °C and +40 °C. Take the following protective measures if the temperatures deviate from the above:

Installation at low temperatures requires utmost care. Since Tangit ABS cures physically by evaporation, hardening may be slowed down considerably. Special installation techniques are therefore required at temperatures below +5°C.

Cement and cleaner should be stored at room temperature. To remove condensation or ice water which may have formed, pipe ends and sockets to be bonded are warmed to +25 to +30°C by means of a suitable hot-air blower (explosion proof) and then bonding is done as described. The finished joint must be kept at +25 to +30°C according to the waiting times mentioned in the following before the next cementing.

Avoid uneven overheating (→ shorten the opening time) when cementing at higher temperatures by protecting the jointing area from direct sunlight.

The quick curing time of the cement necessitates that the joint is made within the opening time after application of the cement has started. The opening time of the ABS cement varies with the ambient temperature and the thickness of the cement applied:



T Temperature in °C / °F

Y Opening time [sec]

Begin by applying a normal layer of cement to the fitting and then a thicker one to the pipe end with firm brush pressure. **Work in well.** The brush strokes should always be in an axial direction.

To ensure that both jointing surfaces are completely covered with a smooth, even layer of cement, the brush should be generously loaded with cement.



Applying the cement

The joints can be made single-handed for pipes with diameters up to d63 mm.

For d75 mm and larger pipes, two people are needed to apply the cement to the pipe end and fitting socket simultaneously in order to avoid exceeding the maximum opening time of the cement.

After the cement has been applied, insert the pipe to the full depth of the socket immediately without twisting and bring them into the correct alignment. Ensure that the outlet of the fitting is in the correct position. Hold them in this position to allow the cement to set.

Up to the dimension **d140** wait at least 10 minutes before the next joint, extend the waiting time at temperatures under 10 °C to 15 minutes.

For the dimensions **d160 to d225** wait at least 30 minutes before the next joint, extend the waiting time at temperatures under 10 °C to 60 minutes. In order to avoid any forces on the cemented components by the weight of the piping system a support of the pipeline is necessary.

Remove any surplus cement immediately, using absorbent paper.

A bead of excess solvent cement around the complete external circumference of the joint and a slightly smaller bead again around the complete internal circumference show that the joint has been performed correctly.

After use, clean the brush of excess cement with dry absorbent paper and then clean thoroughly using TANGIT cleaner. Brushes must be dry before being re-used (shake out).



Replace the lid of the cement tin during work breaks

Replace the lid of the cement tin after use to prevent the solvent evaporating. Using the conical lid allows leaving the brush in the cement tin during breaks.

Solvent cement dissolves ABS. Pipes and fittings must therefore not be laid on or allowed to come into contact with spilled cement or paper containing cement residues.



Do not close off cement pipelines during the drying process. This is particularly important at temperatures below + 5 °C, when there is otherwise a danger of damaging the material.

After the drying process (see waiting times in the following table) the pipelines can be filled. It is recommended to flush the pipeline before use, and leave it filled with water if it is not directly used.

To ensure the traceability (if necessary) of the used Tangit ABS batch, place the batch marking on the test report. This batch marking is attached to each dispatch unit. If several batches are used in one project, place one marking from each batch on the test report.

**Tangit ABS**



Charge/Batch-No.: \_\_\_\_\_

Abfülldatum/Filling date: \_\_\_\_\_

Diese Chargenkennzeichnung ist auf dem Prüf-/Abnahmeprotokoll anzubringen. / Put this product identification on the final test report.

## Drying period and pressure testing of ABS piping systems d16 - d225

The length of the drying period before the joint may be subjected to testing or operating pressure depends on the ambient temperature, the dimension and the tolerances. The following tables shows the different waiting times.

**Remark:** For temperatures above 20 °C the test pressure must be reduced according to the requirements given in the chapter "Final testing and commissioning".



**Attention:** Care should be taken, if the medium has a large temperature difference to the installation temperature. Please consult your local GF Representative.

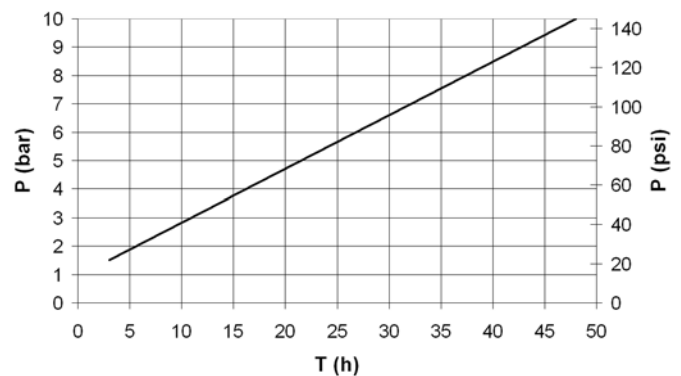
### Internal pressure test with water

This pressure test shall be carried out according to the information given in the chapter "Internal pressure test with water or a similar incompressible fluid". The waiting time after the last joint until the pressure test is shown in the following table:

Ambient Temperature	Waiting time
10 ° to 30 °C	min. 24 hours
- below 10 °C - above 30 °C	min. 48 hours

### Internal pressure test or leak tightness test with gas/air

Due to the risk of a pressure test with a compressible test medium this pressure test shall be carried out only in exceptional cases! Please consult also the safety precautions given in the chapter "Internal pressure test of ABS pipelines". The following diagram shows the waiting time depending on the test pressure for a ambient temperature between 10 to 30 °C:



Ambient temperature between 10 to 30 °C

P Test pressure in bar, psi

T Waiting time after last joint in hour

### Repair works

If the pipeline is only subjected to the operating pressure with fluids, e. g. after adaptation or repair works, the following rule of thumb for the waiting time applies, which is depending on the diameter:

### Dimension d16 up to d140

Ambient Temperature	Waiting time for testing with fluids (non compressible)
10 ° to 30 °C	1-hour waiting time per 1 bar operating pressure.
- below 10 °C - above 30 °C	2-hour waiting time per 1 bar operating pressure.

### Dimension d160 up to d225

Ambient Temperature	Waiting time for testing with fluids (non compressible)
10 ° to 30 °C	2-hour waiting time per 1 bar operating pressure.
- below 10 °C - above 30 °C	4-hour waiting time per 1 bar operating pressure.

### Safety precautions

Tangit cement and cleaner contain highly volatile solvents. This makes good ventilation or adequate fume extraction essential in closed spaces. Since the solvent fumes are heavier than air, extraction must occur at floor level, or at least below the working level. Place paper which has been used for cleaning or for the removal of surplus cement into closed containers to minimise the amount of solvent fumes in the air.

Cement and cleaner are inflammable. Extinguish open fires before commencing work. Switch off unprotected electrical apparatus, electric heaters, etc. Do not smoke! Discontinue any welding operations. Furthermore, observe all instructions issued by the solvent cement manufacturer (e. g. label of the tin and any supplementary documentation).

Protect pipes and fittings from spilled solvent cement, cleaner and absorbent paper which has been used to wipe off cement. Do not dispose of surplus solvent cement or cleaner in drainage systems.

The use of protective gloves is recommended to avoid contact with skin. If the cement or the cleaner get in contact with eyes, rinse immediately with water. Consult a doctor! Immediately change clothes that have solvent cement on them.

Always obey the safety regulations issued by the authorities responsible.



Adequate ventilation of the workplace



No open flames when cementing. No smoking.

## Instructions for Tangit solvent cement jointing of COOL-FIT ABS dimension d20 to d225

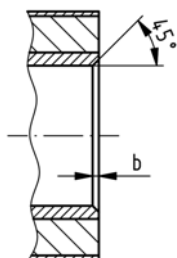
### Instruction solvent cementing

The jointing technique for COOL-FIT ABS internal jointing follows the same tried and tested technique as that for standard ABS using exactly the same tooling and Tangit cement.

Following is a summary of ABS solvent cement jointing for COOL-FIT ABS. Please refer to the standard ABS solvent cementing jointing instructions for exact curing times, handling instructions, health and safety advice and commissioning procedure.



Chamfer to  $\approx 45^\circ$  with a width according to the following table the internal diameter of the ABS pipe.



Pipe diameter d	Chamfered width b
25 - 50 mm	1 mm
63 - 90 mm	2 mm
$\geq 110$ mm	3 mm

The outside surface of the COOL-FIT ABS nipple and the inner surfaces of the COOL-FIT ABS pipe, must always be cleaned using Tangit cleaner with clean absorbent paper.



Mark the inside diameter of the pipe to the minimum socket depth required. Socket depth is always  $d/2 + 5$  (mm), for example socket length for  $d90 = 50$  mm ( $90/2 + 5$ ).



Check the consistency of the ABS Tangit cement. The cement should run smoothly and before jointing check that all tools required are readily to hand.



Apply a normal layer of ABS Solvent cement to the inside surface of the COOL-FIT ABS pipe. Apply the cement to the depth marked, axially, smoothly in one action, in an even layer. Use a firm pressure on the brush when applying the cement to work the cement into the pipe.



Apply a thicker layer, approximately 1 mm, of ABS cement to the outside of the COOL-FIT ABS nipple, using the same technique as with the pipes.

Insert the COOL-FIT ABS nipple axially into the pipe being careful not to rotate the parts. Remove all excess cement using absorbent paper.

The installer should take note of the Tangit ABS opening time and safety precautions written on the Tangit tin and in standard ABS jointing instructions.

**Instruction for pipe preparation - Calibration only required for d140 and above**

Please read the operating instructions prior to using the Calibration Tool



- 1 Cut pipe at right angles, 90°.

For ABS dimensions below d140 calibration of the pipe is not required, please follow cementing instructions.



- 2 For dimensions d140 and above the internal diameter of the pipe needs to be calibrated using the COOLFIT ABS calibration tool.



- 3 Assemble the COOLFIT ABS calibration tool using the relevant parts for the required dimension. Detailed instructions are delivered with the tool.



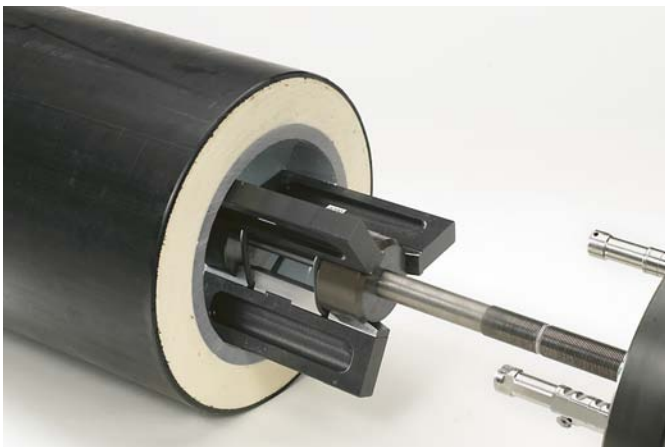
- 6 Windout the jaws of the tool until the tool is firmly located.



- 4 Always ensure that the pipe has been chamfered before inserting the calibration tool.



- 7 Windin cutting head checking that the cutting knife and the other 2 locating heads are assembled in the correct location.



- 5 Insert the tool into the pipe to the depth indicated on the spindle. For short lengths of pipe see instructions packed with the tool.



- 8 Please note that the tool calibrates the pipe and therefore may not always remove material and may remove different amounts of material as it cuts.



9 The cutting knife can be rotated to cut with a fresh edge if the knife becomes blunt or if it is damaged.



12 It is recommended that the installer checks the diameter of the calibrated pipe using the enclosed gauge. The internal diameters required are also listed in the COOLFIT ABS catalogue and in the tooling instructions.



10 Wind-in the cutting head until it butts up to the end of the pipe.



11 Wind-in the locating jaws until the tool is loose then carefully retract the tool taking care not to damage the pipe.



13 After the calibration process the pipe must be chamfered again!

**Instruction for insulating the gap**

Please take care that the «shrink sleeve, short» has been placed over the pipe before jointing.





If it is not possible to use the shrink sleeve or the sleeve is damaged GF Piping Systems has a «sealing wrap», effectively a highduty tape available on demand. It is also possible to use other heavyduty insulating tapes instead of the shrink sleeve. For the lifespan and sealing properties of these tapes please consult the individual manufacturers.



Place the shrink sleeve over the middle of the gap. Fittings of the latest generation do have indicators that help to position the shrink sleeve correctly. Locate the sleeve by pressing it onto the double sided sticky tape.



Wrap the «gap insulator» into the gap between the COOLFIT ABS components taking care to ensure that the gap is completely filled.



Using an open flame apply heat to the sleeve, taking care to keep the flame moving to avoid the sleeve melting. To avoid the sleeve distorting apply the heat to the middle of the sleeve, not from the side. The sleeve will now shrink to the outside diameter of the jacket pipe.

**Note:** hot air can be used to shrink the sleeve but is not recommended due to the high amount of energy required to activate shrinking.



Apply the double sided sealing tape around the complete circumference of the outer pipe.

## Retrofit of adapter fittings into an existing ABS, PVC-U or PVC-C pipeline

### Existing situation:

Occasionally there is the need to install measuring devices, venting devices or similar into an existing piping system without using additional installation fittings.

### Solution:

At the section of the piping system with greatest wall thickness (in the middle of the joint) a hole is drilled for the spigot of the adapter fitting. Then a suitable adapter fitting is solvent cemented into the hole which acts as socket.

### Installation steps in detail:

1. The hole is drilled into a drained pipe section.
2. The hole is drilled at a right angle to the pipe axis.
3. The hole diameters and tolerances given in the attached table correspond to socket dimensions according to ISO 727-1 and are to be observed.
4. The dimension X in the attached table indicates the distance from the entrance of the socket to the middle of the hole to be drilled in order to place it in the middle of the joint.
5. Use a suitable deburring tool to deburr the edges of hole.
6. Shavings should be removed from the pipe.
7. Allowed combinations of pipe and adapter fitting are indicated in the attached table with yes .  
The selection is such that the spigot of the adapter fitting does not reach into the medium-filled pipe for more than 1 mm as well as fully covering the hole drilled into the joint.
8. The spigot is solvent cemented into the drilled hole according to the instructions for solvent cement jointing given in our Planning Fundamentals.
9. Attend to waiting times before refilling and applying pressure to the system.

When correctly installed the above joint is good for PN10 at 20 °C with water as the medium.

### Allowed combinations of pipe and adapter dimensions

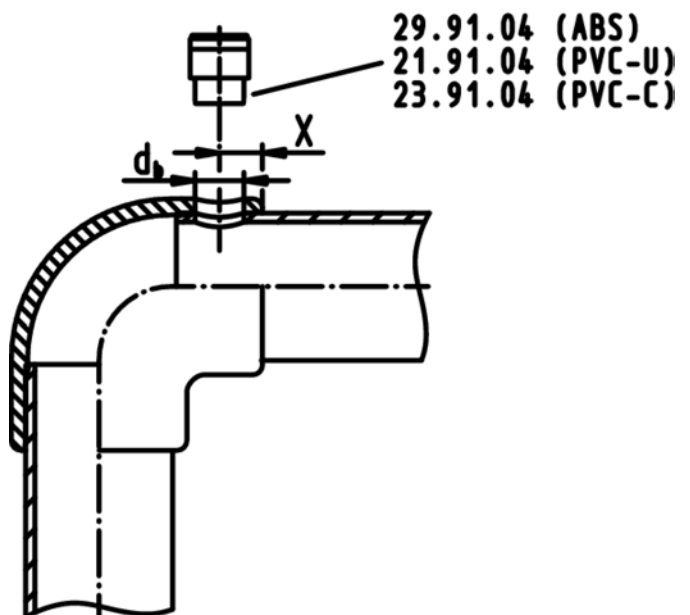
ABS PN10		Wall thickness, e	Adapter dimensions			
pipe diameter			20	25	32	40
		S8, SDR17				
75	x	4.5	Yes	Yes	No	No
90	x	5.4	Yes	Yes	No	No
110	x	6.6	Yes	Yes	No	No
125	x	7.4	Yes	Yes	No	No
140	x	8.3	Yes	Yes	No	No
160	x	9.5	Yes	Yes	No	No
180	x	10.7	Yes	Yes	Yes	No
200	x	11.9	Yes	Yes	Yes	No
225	x	13.4	Yes	Yes	Yes	Yes

ABS PN6		Wall thickness, e	Adapter dimensions			
pipe diameter			20	25	32	40
		S12.5, SDR26				
250	x	9.6	No	Yes	Yes	No
280	x	10.7	No	Yes	Yes	Yes
315	x	12.1	No	No	Yes	Yes

PVC-U PN10		Wall thickness, e	Adapter dimensions			
pipe diameter			20	25	32	40
		S10, SDR21				
125	x	6.0	No	No	No	No
140	x	6.7	Yes	No	No	No
160	x	7.7	Yes	Yes	No	No
180	x	8.6	Yes	Yes	No	No
200	x	9.6	Yes	Yes	Yes	No
225	x	10.8	Yes	Yes	Yes	Yes
250	x	11.9	No	Yes	Yes	Yes
280	x	13.4	No	Yes	Yes	Yes
315	x	15.0	No	No	Yes	Yes
400	x	19.1	No	No	Yes	Yes

PVC-U PN16		Wall thickness, e	Adapter dimensions			
pipe diameter			20	25	32	40
		S6.3, SDR13.6				
125	x	9.2	Yes	No	No	No
140	x	10.3	Yes	Yes	No	No
160	x	11.8	Yes	Yes	Yes	No

### Dimensions of hole to be drilled



<b>Adapter dimension</b>	<b>Hole diameter, d<sub>b</sub> in mm</b>
20	20.2
25	25.2
32	32.2
40	40.2
Tolerance	± 0.1 mm

<b>Pipe dimension</b>	<b>Drill position X in mm</b>
75	22
90	26
110	31
125	34
140	38
160	43
180	48
200	53
225	59
250	66
280	73
315	82
400	103
Tolerance	± 1 mm

# Internal pressure test and leak test

## Introduction to pressure testing

### Overview of the different testing methods

Testing method	Internal pressure test			Leak test	
Medium	Water	Gas *	Compressed air *	Gas/air (oil free)	Gas/air (oil free)
Art	incompressible	compressible	compressible	compressible	compressible
Test pressure (overpressure)	$p_{p(perm)}$ resp. $0.85 \times p_{p(perm)}$	Operating pressure + 2 bar	Operating pressure + 2 bar	0.5 bar	1.5 bar
Endangerment during pressure test	small	high	high	small	middle
Material	all plastics	ABS	PB, PE	all plastics	ABS
Informative value	High: Proof of resistance to pressure including tightness against test medium	High: Proof of resistance to pressure including tightness against test medium	High: Proof of resistance to pressure including tightness against test medium	small	middle

\* Please consider the applicable safety precautions  
More information is available in DVS 2210-1 Suppl. 2.

A lot of international and national standards and guidelines are available for leak and pressure tests. Therefore often it is not easy to find the applicable test procedure or for example the test pressure.

The purpose of a pressure test is,

- first to ensure the resistance to pressure of the pipeline and
- in addition to show the leak tightness against the test media.

Usually the pressure test is done as a **water pressure test** and only in exceptional cases (with consideration to special safety precautions) as a gas pressure test with air or nitrogen.

The following comparison should point out the difference between water and air as a test medium:

- Water is an incompressible medium, which means, setting for example a 1m PVDF pipe d160 under a pressure of 3 bar results in an energy of ca. 1 Joule.
- In contrast air is a compressible medium; the same pipe has with 3 bar pressure an energy of already 5000 Joule.
- If there were a failure during the pressure test, the waterfilled pipe would fly 0.02 m "high", the airfilled pipe 110 m! And this with a test pressure of only 3 bar.

#### Fracture behaviour of thermoplastics

In case of failures thermoplastic materials show different behaviours. PE and PB (to a lesser degree ABS) have a ductile behaviour, that means brittle fracture cannot occur.

Nevertheless, the following safety precautions must be taken into consideration during the internal pressure test. As mentioned before the pressure test is the first loading placed on the pipeline and uncover any existing processing faults (e.g. insufficient welding).

**Remark:** Gas leak tightness cannot be demonstrated by a water pressure test, also not with increased test pressure!

### Internal pressure test with water or a similar incompressible test fluid

#### General

The internal pressure test is done when installation work has been completed and necessitates an operational pipeline or operational test sections. The test pressure load should furnish experimental proof of operational safety. The test pressure is not based on the working pressure, but rather on the internal pressure load capacity, derived from the pipe wall thickness.

Supplement 2 of DVS 2210-1 forms the basis for the following information. This replaces the data in DVS 2210-1 entirely. The modifications became necessary because

- the reference value "nominal pressure (PN)" is being used less and less to determine the test pressure (1.5 x PN, or 1.3 x PN) and is being replaced by SDR,
- a short-term overload or even a reduction in the service life can occur if in the course of the internal pressure test based on the nominal pressure the pipe wall temperature  $T_R = 20 \text{ °C}$  is exceeded by more than 5 °C.

Test pressures are therefore determined in relation to SDR and the pipe wall temperature. The 100-h value from the long-term behaviour diagram is used for the test clamping.

#### Test Parameters

The following table indicates recommended methods of testing the internal pressure.

Object	Pre-test	Main test
<b>Test pressure <math>p_p</math></b> (depends on the pipe wall temperature or the permissible test pressure of the built-in components, see clause "Determining the test pressure")	$\leq p_{p(\text{perm})}$	$\leq 0.85 p_{p(\text{perm})}$
<b>Test duration</b> (depends on the length of the pipeline, respectively the sections)	$L \leq 100$ m: 3 h $100 \text{ m} < L \leq 500$ m: 6 h	$L \leq 100$ m: 3 h $100 \text{ m} < L \leq 500$ m: 6 h
<b>Checks</b> during the testing (test pressure and temperature progression should be recorded)	At least 3 checks, distributed over the test duration <b>with</b> restoring the test pressure	At least 2 checks, distributed over the test duration <b>without</b> restoring the test pressure

### Pre-test

The pre-test serves to prepare the piping system for the actual test (main test). In the course of pre-testing, a tension-expansion equilibrium in relation to an increase in volume will develop in the piping system. A material-related drop in pressure will occur which will require repeated pumping to restore the test pressure and also frequently a re-tightening of the flange connection screws.

The guidelines for an expansion-related pressure decrease in pipes are:

Material	Pressure drop
PVC-U	0.5 bar/h
PVC-C	0.5 bar/h
ABS	0.6 bar/h
PP	0.8 bar/h
PE	1.2 bar/h
PB	1.4 bar/h
PVDF	0.8 bar/h

### Main test

In the context of the main test, a much smaller drop in pressure can be expected at constant pipe wall temperatures so that it is not necessary to pump again. The checks can focus primarily on leak detection at the flange joints and any position changes of the pipe.

### Observe if using compensators

If the pipeline to be tested contains compensators, this has an influence on the expected axial forces of the pipeline. Because the test pressure is higher than the working pressure, the axial forces on the fixed points become higher. This has to be taken into account when designing the fixed points.

### Observe if using valves

When using a valve at the end of a pipeline (end or final valve), the valve and the pipe end should be closed by a dummy flange or cap. This prevents inadvertent opening of the valve or any pollution of the inside of the valve.

### Filling the pipeline

Before starting with the internal pressure test, the following points must be checked:

- Was installation done according to the available plans?
- All pressure relief devices and flap traps mounted in the flow direction?
- All end valves shut?
- Valves in front of other devices are shut to protect against pressure.
- Visual inspection of all joints, pumps, measurement devices and tanks.
- Has the waiting period after the last fusion / cementing been observed?

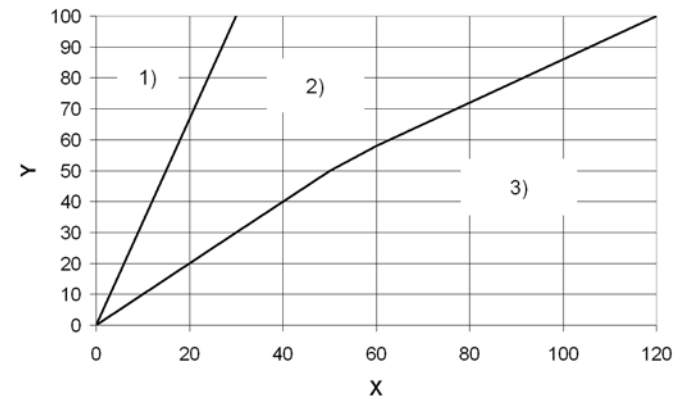
Now the pipeline can be filled from the geodetic lowest point. Special attention should be given to the air vent. If possible, vents should be provided at all the high points of the pipeline and these should be open when filling the system. Flushing velocity should be at least 1 m/sec.

Reference values for the filling volume are given in the table below.

DN	V (l/sec)	DN	V (l/sec)
$\leq 80$	0.15	250	2.0
100	0.3	300	3.0
150	0.7	400	6.0
200	1.5	500	>9.0

Adequate time should be allowed between filling and testing the pipeline, so that the air contained in the piping system can escape via the vents: ca. 6 - 12 h, depending on the nominal diameter.

### Applying the test pressure



The test pressure is applied according to the diagram. Here it is important that the pressure increase rate does not cause any water hammer !

### Definitions

Y = test pressure in %

X = time for pressure increase in min

1) = pressure increase rate up to DN 100

2) = range of pressure increase rates >DN 100 - 400

3) = reference values for pressure increase rate DN 500 and greater is:  $500 / \text{DN}$  [bar/10 min]

### Determining the test pressure

The allowable test pressure is calculated according to the following formula:

$$P_{p(\text{perm})} = \frac{1}{\text{SDR}} \frac{20 \sigma_{v(T,100h)}}{S_p A_G}$$

with

$\sigma_{v(T,100h)}$  Long-term creep strength for the pipe wall temperature  $T_R$  (at  $t = 100$  h)

$S_p$  Minimum safety factor for long-term creep strength

$A_G$  Processing or geometrical specific factor that reduces the allowable test pressure

$T_R$  Pipe wall temperature: average value of test medium temperature and pipe surface temperature

## NOTICE

### Diaphragm valves, types 314-319

Don't overload diaphragm valves!

- If the piping system contains diaphragm valves the maximum allowable test pressure is limited to the nominal pressure.

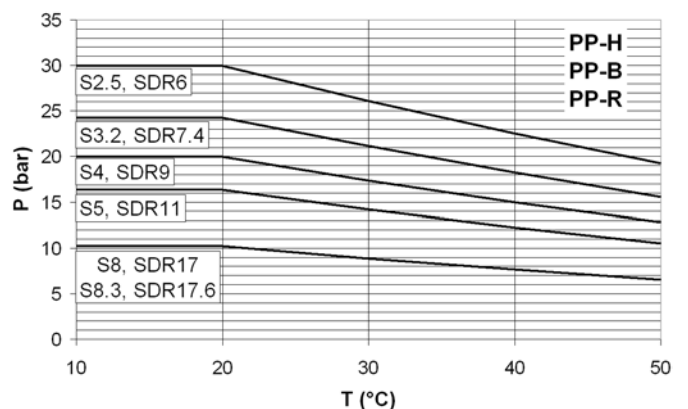
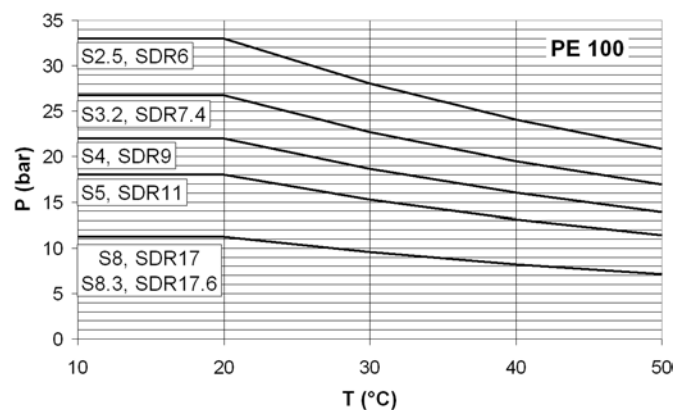
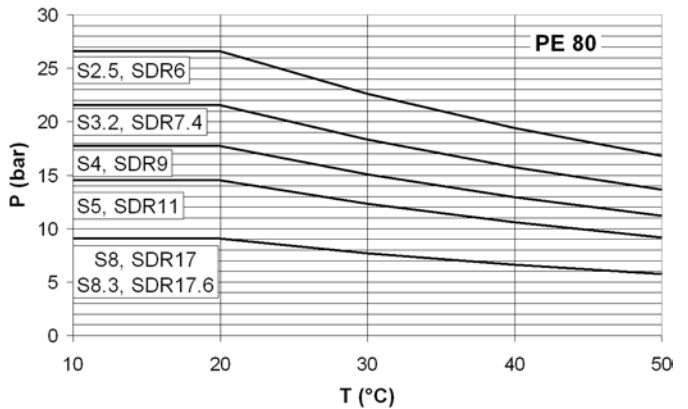
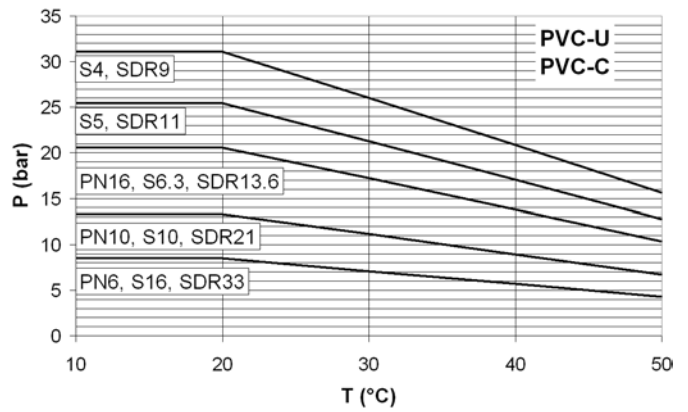
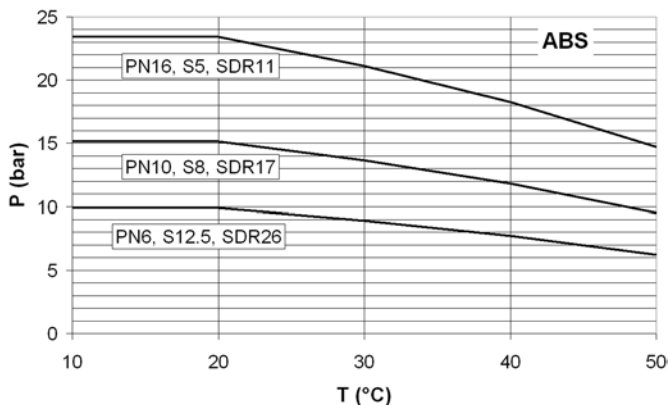
Material	$S_p$ Minimum safety factor
ABS	1.6
PE80, PE100	1.25
PP-H	1.8
PP-R	1.4
PVC-U, PVC-C	2.5
PVDF	1.4

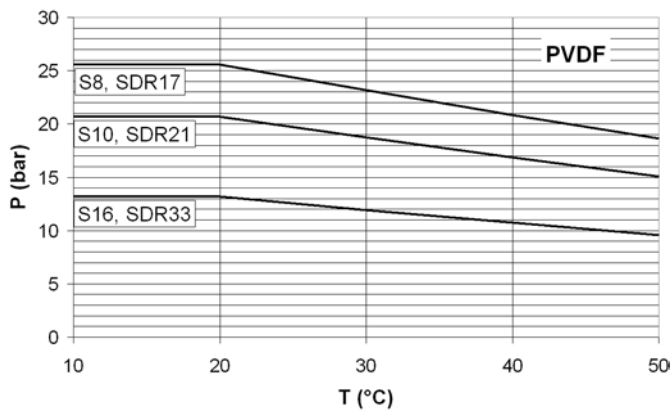
To make things easier, the permissible test pressures can be taken directly from the following diagrams.

Definitions:

$P$  = permissible test pressure in bar

$T$  = pipe wall temperature in °C





### Checks during testing

The following measurement values must be recorded consistently during testing:

- Internal pressure at the absolute low point of the pipeline
- Medium and ambient temperature
- Water volume input
- Water volume output
- Pressure drop rates

### Internal pressure test and leak tightness test of ABS pipelines with gas/air as test fluid (compressible medium)

#### Introduction

Usually the pressure test is done as a **water pressure test** and only in exceptional cases (with consideration of special safety precautions) as a gas pressure test with air or nitrogen (please consider also the general chapter "Introduction into pressure testing").

#### Safety precautions



#### WARNING

##### Compressible media like gas, air or nitrogen under internal pressure.

In case of failure danger to life during the internal pressure testing by explosively exhaust of medium.

- The area around the pipeline under test pressure is to be clearly restricted for access only by persons assigned with the testing.
- Necessary control equipment is to be placed at a safe distance.
- The testing should be timed so that there are as few persons as possible in the immediate area.
- In particular at the entrances to the endangered area additional signs are to be set up (Entry prohibited, Attention! Gas pressure tests!). If necessary persons in neighbouring buildings are to be informed.

### Observe if using compensators

If the pipeline to be tested contains compensators, this has an influence on the expected axial forces of the pipeline. Because the test pressure is higher than the working pressure, the axial forces on the fixed points become higher. This has to be taken into account when designing the fixed points.

### Observe if using valves

When using a valve at the end of a pipeline (end or final valve), the valve and the pipe end should be closed by a dummy flange or cap. This prevents inadvertent opening of the valve or any pollution of the inside of the valve.

### Minimum waiting times for the internal pressure test

Before carrying out the pressure test, observe the minimum waiting times after the last cementing given in the following table:

Ambient Temperature	Waiting time
10 to 30 °C	min. 48 hours

### Testing procedure of the internal pressure test

The test pressure shall be least 2 bar higher than the operating pressure but with a maximum pressure of nominal pressure PN of the installed piping system. Any components with a lower PN than the rest of the piping systems shall be considered. The test temperature shall be between 10 to 30 °C.

The pipelines must be free from any grease or paint.

Only oil free air or inert gases such as nitrogen should be used as the test medium. No refrigerant gases, such as R22, may be used.

Once the pressure in the system has stabilised hold the pipeline under the test pressure for at least 15 minutes. If a drop in pressure is observed and inspection of the joints is necessary this can be done using a foam-building agent. Using a soap solution which can be removed simply with water after the test is recommended.

#### NOTICE

##### Leak detection sprays

Commercial leak detection sprays can cause stress cracks in plastics.

- Using these sprays remove any residues after testing.

#### Information:

For valves leak tightness using a gas is not representative of the valves leak tightness with a fluid. Therefore if a GF valve shows a leakage under internal pressure test with a gas it is recommended to reduce the pressure to 1.5 bar and re-inspect the valves.

#### Leak tightness test with gas/air

For checking the leak tightness shortly after installation a test pressure of up to 1.5 bar with a minimum waiting time of 3 hours applies.

# ABS Product Range

## Background Information to the ABS Product Range from GF Piping Systems



COOL-FIT has been developed closely with the market to fulfil all the essential requirements of a secondary refrigeration piping system, namely:

- complete reliability
- lowest possible energy gains
- low maintenance long life-span
- simple cost effective installation

COOL-FIT combines pre-insulated pipe and fittings with normal standard plastic piping with a complete range of the necessary valves for manual or automatic actuation. The complete system is designed to optimise the efficiency, installation costs and life-span of the secondary piping system.




Examples of application areas are in commercial as well as industrial refrigeration, air-conditioning and industrial cooling water.

Examples of end-user markets are: supermarkets, breweries, cold stores and numerous types of food manufacturing plants, as well as hospitals and pharmaceutical plants.





# COOL-FIT

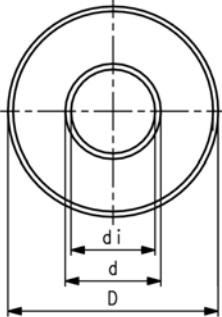
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	Accessories	67

# Pipes

## Pipe pre-insulated ABS metric

### Model:

- insulated length: 5m
- Outer jacket impact resistant. Color: black
- Insulation made from PUR



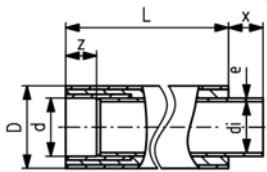
d [mm]	D [mm]	PN	Code	kg/m	di [mm]	closest inch	Refrigeration Size [inch]
25	90	10	<b>169 017 682</b>	1.300	20.4	¾	7/8
32	90	10	<b>169 017 683</b>	1.500	28.2	1	1 1/8
40	110	10	<b>169 017 684</b>	1.900	35.2	1 ¼	1 3/8
50	110	10	<b>169 017 685</b>	2.100	44.0	1 ½	1 5/8
63	125	10	<b>169 017 686</b>	2.700	55.4	2	2 1/8
75	140	10	<b>169 017 687</b>	3.500	66.0	2 ½	2 5/8
90	160	10	<b>169 017 688</b>	4.400	79.2	3	3 1/8
110	180	10	<b>169 017 689</b>	5.500	96.8	4	4 1/8
140	225	10	<b>169 017 691</b>	8.500	123.8	5	
160	250	10	<b>169 017 692</b>	10.500	140.2	6	6
200	280	10	<b>169 017 693</b>	13.500	175.4	8	
225	315	10	<b>169 017 694</b>	18.500	197.2	8	

PF 2 33 372 001

## Pipe pre-insulated ABS metric

### Model:

- insulated length: 6m (as an option: available in 5m)
- Outer jacket impact resistant. Color: black
- Insulation made from PUR
- ready for connection with free pipe end and integrated socket



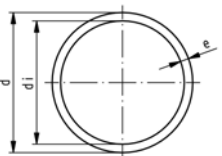
d [mm]	D [mm]	PN	Code	kg/m	x [mm]	L [mm]	closest inch	e [mm]	di [mm]
250	355	6	<b>169 017 665</b>	14.900	140	6000	9	9.6	230.8
280	400	6	<b>169 017 666</b>	18.700	155	6000	11	10.7	258.6
315	450	6	<b>169 017 667</b>	23.700	168	6000	12	12.1	290.8

PF 2 33 372 001

## Pipe 1m length ABS metric

### Model:

- Colour: RAL 7001, gravel grey
- Length: 1m
- PN 10 (10 bar) / PN 16 (16 bar) at 20°C

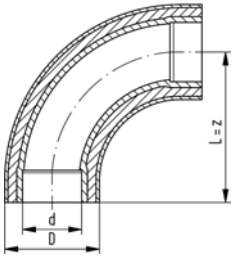


d [mm]	PN	Code	kg/m	e [mm]	di [mm]	Length [m]
16	16	<b>700 262 080</b>	0.095	1.8	12.4	1.00
20	16	<b>700 262 081</b>	0.148	2.3	15.4	1.00
25	16	<b>700 262 082</b>	0.191	2.3	20.4	1.00
32	10	<b>700 262 083</b>	0.213	1.9	28.2	1.00
40	10	<b>700 262 084</b>	0.336	2.4	35.2	1.00
50	10	<b>700 262 085</b>	0.516	3.0	44.0	1.00
63	10	<b>700 262 086</b>	0.819	3.8	55.4	1.00
75	10	<b>700 262 087</b>	1.154	4.5	66.0	1.00
90	10	<b>700 262 088</b>	1.657	5.4	79.2	1.00
110	10	<b>700 262 089</b>	2.495	6.6	96.8	1.00
140	10	<b>700 262 091</b>	4.083	8.6	122.8	1.00
160	10	<b>700 262 092</b>	5.397	9.9	140.2	1.00
200	10	<b>700 262 093</b>	8.307	12.3	175.4	1.00
225	10	<b>700 262 094</b>	10.522	13.9	197.2	1.00

PF 2 33 198 007

# Fittings

## Bend 90° pre-insulated ABS metric



### Model:

- Insulation made from PUR
- Outer jacket impact resistant. Color: black

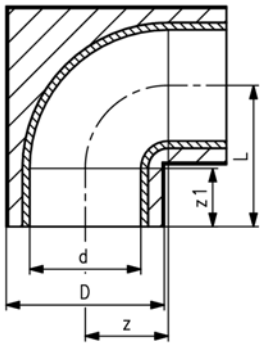
Connecting dimensions = Pipe outer diameter

\* Available as long as our stock will last

d [mm]	D [mm]	PN	Code	kg	z [mm]	L [mm]	required Nipple	closest inch
25	90	10	<b>738 001 107</b>	0.183	69	69	738901607	¾
32	90	10	<b>738 001 108</b>	0.234	86	86	738901608	1
40	110	10	<b>738 001 109</b>	0.442	109	109	738901609	1 ¼
50	110	10	<b>738 001 110</b>	0.520	131	131	738901610	1 ½
63	125	10	<b>738 001 111</b>	0.826	164	164	738901611	2
75	140	10	<b>738 001 112</b>	1.188	194	194	738901612	2 ½
90	160	10	<b>738 001 113</b>	1.000	231	231	738901613	3
110	180	10	<b>738 001 114</b>	2.500	281	281	738901614	4
140	225	10	<b>738 001 116</b>	6.000	356	356	738901616	5
* 160	250	10	<b>738 001 117</b>	6.000	406	406	738901617	6
225	315	10	<b>738 001 120</b>	8.000	287	287	738901620	9

PF 2 33 372 020

## Bend 90° short pattern pre-insulated ABS metric



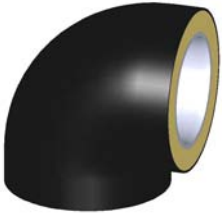
### Model:

- Insulation made from PUR
- Outer jacket impact resistant. Color: black
- Compact design

Connecting dimensions = Pipe outer diameter

d [mm]	D [mm]	PN* [bar]	Code	kg	z [mm]	L [mm]	closest inch
250	355	6	<b>738 101 121</b>	10.000	131	263	9
280	400	6	<b>738 001 122</b>	18.000	210	357	11
315	450	6	<b>738 001 123</b>	24.000	237	401	12

PF 2 33 372 020

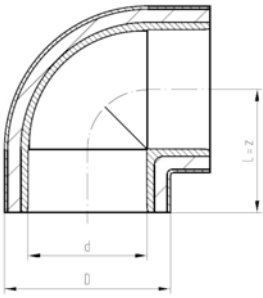


## Elbow 90° pre-insulated ABS metric

### Model:

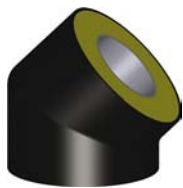
- Insulation made from PUR
- Outer jacket impact resistant. Color: black
- Compact design

Connecting dimensions = Pipe outer diameter



d [mm]	D [mm]	PN	Code	kg	z [mm]	L [mm]	required Nipple	closest inch
160	250	10	<b>738 101 117</b>	2.600	166	166	738901617	6
200	280	10	<b>738 101 119</b>	3.700	207	207	738901619	8

PF 2 33 372 020

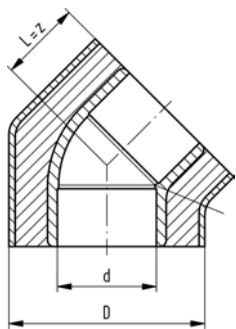


## Elbow 45° pre-insulated ABS metric

### Model:

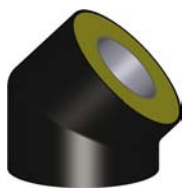
- Insulation made from PUR
- Outer jacket impact resistant. Color: black

Connecting dimensions = Pipe outer diameter



d [mm]	D [mm]	PN	Code	kg	z [mm]	L [mm]	required Nipple	closest inch
25	90	10	<b>738 151 107</b>	0.079	25	25	738901607	¾
32	90	10	<b>738 151 108</b>	0.094	30	30	738901608	1
40	110	10	<b>738 151 109</b>	0.167	36	36	738901609	1 ¼
50	110	10	<b>738 151 110</b>	0.198	43	43	738901610	1 ½
63	125	10	<b>738 151 111</b>	0.321	52	52	738901611	2
75	140	10	<b>738 151 112</b>	0.452	61	61	738901612	2 ½
90	160	10	<b>738 151 113</b>	0.700	71	71	738901613	3
110	180	10	<b>738 151 114</b>	0.980	89	89	738901614	4
140	225	10	<b>738 151 116</b>	1.900	108	108	738901616	5
160	250	10	<b>738 151 117</b>	2.570	122	122	738901617	6
200	280	10	<b>738 151 119</b>	3.600	149	149	738901619	8
225	315	10	<b>738 151 120</b>	4.620	168	168	738901620	9

PF 2 33 372 020

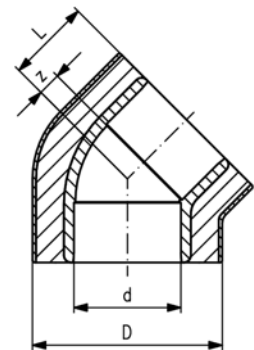


## Elbow 45° pre-insulated ABS metric

### Model:

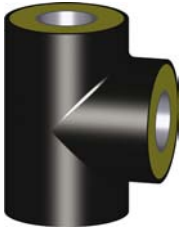
- Insulation made from PUR
- Outer jacket impact resistant. Color: black
- Compact design

Connecting dimensions = Pipe outer diameter



d [mm]	D [mm]	PN* [bar]	Code	kg	z [mm]	L [mm]	closest inch
250	355	6	<b>738 151 121</b>	9.000	60	192	9
280	400	6	<b>738 151 122</b>	13.000	66	213	11
315	450	6	<b>738 151 123</b>	17.000	74	239	12

PF 2 33 372 020

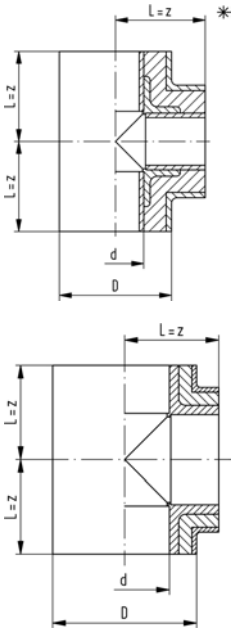


## Tee 90° pre-insulated ABS metric

### Model:

- Insulation made from PUR
- Outer jacket impact resistant. Color: black

\* Connecting dimensions = Pipe inner diameter



d [mm]	D [mm]	PN	Code	kg	z [mm]	L [mm]	required Nipple	closest inch
* 25	90	10	<b>738 201 107</b>	0.100	80	80	738901107	¾
* 32	90	10	<b>738 201 108</b>	0.100	80	80	738901108	1
* 40	110	10	<b>738 201 109</b>	0.545	90	90	738901109	1 ¼
* 50	110	10	<b>738 201 110</b>	0.200	90	90	738901110	1 ½
63	125	10	<b>738 201 011</b>	0.788	100	100	738901611	2
75	140	10	<b>738 201 012</b>	1.290	125	125	738901612	2 ½
90	160	10	<b>738 201 013</b>	1.600	140	140	738901613	3
110	180	10	<b>738 201 114</b>	2.265	122	122	738901614	4
140	225	10	<b>738 201 116</b>	3.000	147	147	738901616	5
160	250	10	<b>738 201 117</b>	5.100	167	167	738901617	6
200	280	10	<b>738 201 119</b>	6.800	207	207	738901619	8
225	315	10	<b>738 201 120</b>	9.050	233	233	738901620	9

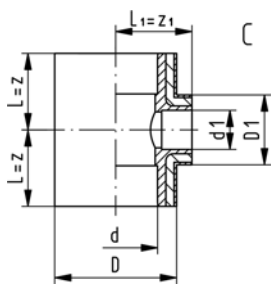
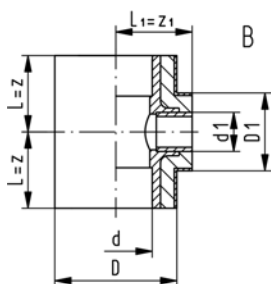
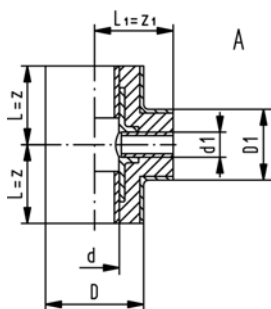
PF 2 33 372 020



## Tee 90° reduced pre-insulated ABS metric

### Model:

- Insulation made from PUR
- Outer jacket impact resistant. Color: black



d [mm]	d1 [mm]	D [mm]	D1 [mm]	Type	PN	Code
32	25	90	90	A	10	<b>738 201 138</b>
40	25	110	90	A	10	<b>738 201 151</b>
40	32	110	90	A	10	<b>738 201 147</b>
50	25	110	90	A	10	<b>738 201 192</b>
50	32	110	90	A	10	<b>738 201 164</b>
63	25	125	90	A	10	<b>738 201 193</b>
63	32	125	90	A	10	<b>738 201 178</b>
63	50	125	110	A	10	<b>738 201 170</b>
75	40	140	110	A	10	<b>738 201 182</b>
90	32	160	90	B	10	<b>738 201 143</b>
90	63	160	125	B	10	<b>738 201 146</b>
110	32	180	90	B	10	<b>738 201 144</b>
110	50	180	110	B	10	<b>738 201 136</b>
140	50	225	110	B	10	<b>738 201 148</b>
140	75	225	140	B	10	<b>738 201 149</b>
160	90	250	160	B	10	<b>738 201 158</b>
200	110	280	180	C	10	<b>738 201 153</b>
225	110	315	180	C	10	<b>738 201 156</b>
225	160	315	250	C	10	<b>738 201 157</b>

d [mm]	d1 [mm]	z [mm]	z1 [mm]	required Nipple	Closest inch
32	25	80	80	1x738901107; 2x738901108	1 - 3/4
40	25	90	90	1x738901107; 2x738901109	1 1/4 - 3/4
40	32	90	90	1x738901108; 2x738901109	1 1/4 - 1
50	25	90	90	1x738901107; 2x738901110	1 1/2 - 3/4
50	32	90	90	1x738901108; 2x738901110	1 1/2 - 1
63	25	100	100	1x738901107; 2x738901111	2 - 3/4
63	32	100	100	1x738901108; 2x738901111	2 - 1
63	50	100	100	1x738901110; 2x738901111	2 - 1 1/2
75	40	115	110	1x738901109; 2x738901112	2 1/2 - 1 1/4
90	32	97	120	1x738901108; 2x738901613	3 - 1
90	63	97	120	1x738901111; 2x738901613	3 - 2
110	32	117	130	1x738901108; 2x738901614	4 - 1
110	50	117	130	1x738901110; 2x738901614	4 - 1 1/2
140	50	147	153	1x738901110; 2x738901616	5 - 1 1/2
140	75	147	153	1x738901112; 2x738901616	5 - 2 1/2
160	90	167	165	1x738901113; 2x738901617	6 - 3
200	110	213	193	1x738901614; 2x738901619	8 - 4
225	110	239	206	1x738901614; 2x738901620	8 - 4
225	160	239	206	1x738901617; 2x738901620	8 - 6

PF 2 33 372 020



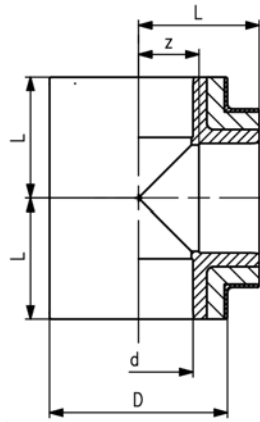
## Tee 90° pre-insulated ABS metric



### Model:

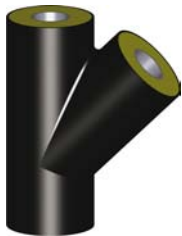
- Insulation made from PUR
- Outer jacket impact resistant. Color: black
- Compact design

Connecting dimensions = Pipe outer diameter



d [mm]	D [mm]	PN* [bar]	Code	kg	z [mm]	L [mm]	closest inch
250	355	6	<b>738 201 121</b>	15.000	132	263	9
280	400	6	<b>738 201 122</b>	21.000	152	298	11
315	450	6	<b>738 201 123</b>	27.000	160	332	12

PF 2 33 372 020

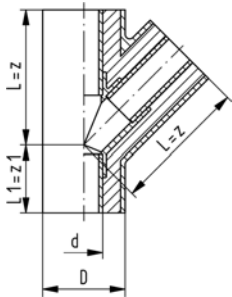


## Tee 45° pre-insulated ABS metric

### Model:

- Insulation made from PUR
- Outer jacket impact resistant. Color: black

\* Connecting dimensions = Pipe inner diameter



d [mm]	D [mm]	PN	Code	kg	L [mm]	z [mm]	L1 [mm]	z1 [mm]	required Nipple	closest inch
* 25	90	10	<b>738 251 107</b>	0.100	160	160	80	80	738901107	¾
* 32	90	10	<b>738 251 108</b>	0.200	160	160	80	80	738901108	1
* 40	110	10	<b>738 251 109</b>	0.200	180	180	90	90	738901109	1 ¼
* 50	110	10	<b>738 251 110</b>	0.300	180	180	90	90	738901110	1 ½
* 63	125	10	<b>738 251 111</b>	0.500	200	200	100	100	738901111	2
* 75	140	10	<b>738 251 112</b>	0.800	240	240	120	120	738901112	2 ½
* 90	160	10	<b>738 251 113</b>	1.200	250	250	125	125	738901113	3
* 110	180	10	<b>738 251 114</b>	2.200	300	300	150	150	738901114	4

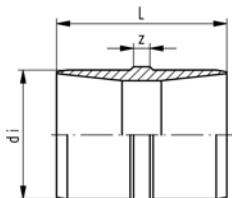
PF 2 33 372 020



## Barrel nipple di-di ABS

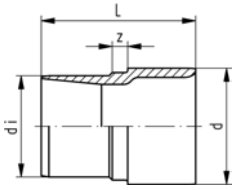
### Model:

- To connect pipe inner diameters di



d [mm]	PN	Code	kg	di [mm]	L [mm]	z [mm]	closest inch
25	10	<b>738 901 107</b>	0.008	20	52	10	¾
32	10	<b>738 901 108</b>	0.014	28	58	10	1
40	10	<b>738 901 109</b>	0.022	35	66	10	1 ¼
50	10	<b>738 901 110</b>	0.035	44	76	10	1 ½
63	10	<b>738 901 111</b>	0.060	55	90	10	2
75	10	<b>738 901 112</b>	0.090	65	102	10	2 ½
90	10	<b>738 901 113</b>	0.127	79	104	10	3
110	10	<b>738 901 114</b>	0.208	96	122	10	4
140	10	<b>738 901 116</b>	0.422	123	150	10	5
160	10	<b>738 901 117</b>	0.596	141	166	10	6
200	10	<b>738 901 119</b>	1.086	176	202	10	8
225	10	<b>738 901 120</b>	1.502	198	224	10	9

PF 2 33 372 020



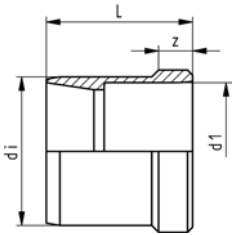
## Adaptor nipple d-di ABS

### Model:

- To connect d to pipe inner diameter di
- \* Can also be used as a reducer di 160 to di 140

d [mm]	PN	Code	kg	di [mm]	L [mm]	z [mm]	closest inch
25	10	<b>738 901 607</b>	0.009	20	50	10	¾
32	10	<b>738 901 608</b>	0.016	28	56	10	1
40	10	<b>738 901 609</b>	0.026	35	64	10	1 ¼
50	10	<b>738 901 610</b>	0.044	44	74	10	1 ½
63	10	<b>738 901 611</b>	0.080	55	88	10	2
75	10	<b>738 901 612</b>	0.114	65	100	10	2 ½
90	10	<b>738 901 613</b>	0.179	79	108	10	3
110	10	<b>738 901 614</b>	0.321	96	127	10	4
* 140	10	<b>738 901 616</b>	0.510	123	156	10	5
160	10	<b>738 901 617</b>	0.780	141	174	10	6
200	10	<b>738 901 619</b>	1.869	176	212	10	8
225	10	<b>738 901 620</b>	1.930	198	236	10	8

PF 2 33 372 020



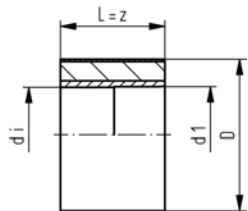
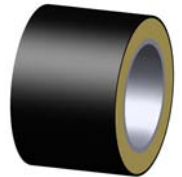
## Reducing nipple di-dred ABS

### Model:

- To connect pipe inner diameter di to reduced dred

d [mm]	d1 [mm]	PN	Code	kg	di [mm]	L [mm]	z [mm]	closest inch
32	25	10	<b>738 911 341</b>	0.006	28	34	10	1
40	32	10	<b>738 911 346</b>	0.009	35	38	10	1 ¼
50	40	10	<b>738 911 352</b>	0.014	44	43	10	1 ½
63	50	10	<b>738 911 358</b>	0.025	55	50	10	2
75	63	10	<b>738 911 364</b>	0.022	65	56	10	2 ½
90	75	10	<b>738 911 370</b>	0.033	79	57	10	3
110	90	10	<b>738 911 376</b>	0.073	96	66	10	4
140	110	10	<b>738 911 385</b>	0.198	123	80	10	5
200	160	10	<b>738 911 392</b>	0.453	176	106	10	8

PF 2 33 372 020



## Reducing bush pre-insulated ABS metric

### Model:

- To connect di 225 to d 200
- Insulation made from PUR
- Outer jacket impact resistant. Color: black

d [mm]	d1 [mm]	PN	Code	kg	di [mm]	L [mm]	z [mm]	closest inch
225	200	10	<b>738 911 396</b>	3.924	198	220	220	9

PF 2 33 372 020



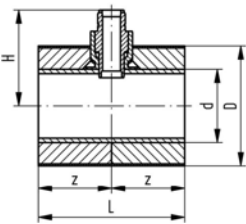
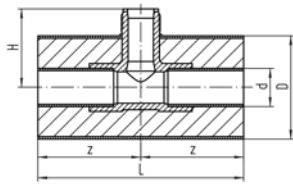
38 31 01

## Installation fitting type 310 pre-insulated ABS metric

Type A



Type B



### Model:

- Threaded outlet 1 ¼" NPSM
- Insulation made from PUR
- Outer jacket impact resistant. Color: black

### Range of use:

- compatible signet flow sensors: type 2551, 2537, 515, 8510, 2536, 8512
- compatible signet pH/ORP sensors: type 2724, 2725, 2726

### Attention:

- sensor length depends on installation fitting

Connecting dimensions = Pipe inner diameter

d [mm]	DN [mm]	PN	schwarz Code	kg
25	20	10	<b>738 310 107</b>	0.340
32	25	10	<b>738 310 108</b>	0.380
40	32	10	<b>738 310 109</b>	0.480
50	40	10	<b>738 310 110</b>	0.550
63	50	10	<b>738 310 111</b>	0.700
75	65	10	<b>738 310 112</b>	0.824
90	80	10	<b>738 310 113</b>	1.011
110	100	10	<b>738 310 114</b>	1.256
140	125	10	<b>738 310 116</b>	1.926
160	150	10	<b>738 310 117</b>	2.385
200	200	10	<b>738 310 119</b>	3.693
225	200	10	<b>738 310 120</b>	5.154

d [mm]	D [mm]	L [mm]	H [mm]	z [mm]	Sensor Type	required Nipple	closest inch	Type
25	90	220	78	110	flow X0, pH XX	738901107	¾	A
32	90	220	81	110	flow X0, pH XX	738901108	1	A
40	110	220	85	110	flow X0, pH XX	738901109	1	A
50	110	220	89	110	flow X0, pH XX	738901110	1 ½	A
63	125	220	95	110	flow X0, pH XX	738901111	2	A
75	140	220	161	110	flow X1	738901112	2 ½	B
90	160	220	171	110	flow X1	738901113	3	B
110	180	220	181	110	flow X1	738901114	4	B
140	225	220	193	110	flow X1	738901116	5	B
160	250	220	202	110	flow X1	738901117	6	B
200	280	250	211	125	flow X1	738901119	8	B
225	315	280	225	140	flow X1	738901120	8	B

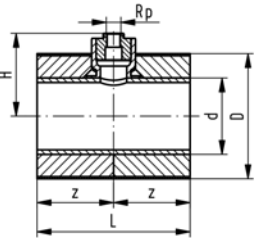
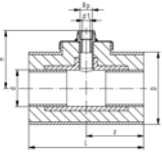
PF 2 98 930 002

38 31 31

Type A



Type B



## Installation fitting type 313 pre-insulated ABS metric

### Model:

- With 1/2 " Rp threaded branch for sensors (i.e. pressure)
- Insulation made from PUR
- Outer jacket impact resistant. Color: black

### Range of use:

- compatible signet pressure sensors: type 2450-1 /-2 /-5

Connecting dimensions = Pipe inner diameter

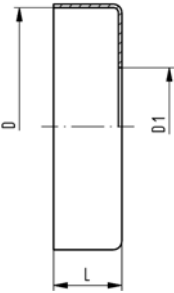
d [mm]	DN [mm]	PN	schwarz Code	kg
25	20	10	<b>738 313 107</b>	0.330
32	25	10	<b>738 313 108</b>	0.400
40	32	10	<b>738 313 109</b>	0.500
50	40	10	<b>738 313 110</b>	0.570
63	50	10	<b>738 313 111</b>	0.890
75	65	10	<b>738 313 112</b>	0.794
90	80	10	<b>738 313 113</b>	0.981
110	100	10	<b>738 313 114</b>	1.226
140	125	10	<b>738 313 116</b>	1.898
160	150	10	<b>738 313 117</b>	2.360
200	200	10	<b>738 313 119</b>	3.681
225	200	10	<b>738 313 120</b>	5.151

d [mm]	D [mm]	d1 [mm]	Rp [inch]	L [mm]	H [mm]	z [mm]	required Nipple	closest inch	Type
25	90	12	½	160	100	80	738901107	¾	A
32	90	14	½	160	100	80	738901108	1	A
40	110	14	½	180	100	90	738901109	1 ¼	A
50	110	14	½	180	100	90	738901110	1 ½	A
63	125	12	½	200	100	100	738901111	2	A
75	140		½	220	101	110	738901112	2 ½	B
90	160		½	220	109	110	738901113	3	B
110	180		½	220	119	110	738901114	4	B
140	225		½	220	134	110	738901116	5	B
160	250		½	220	145	110	738901117	6	B
200	280		½	250	165	125	738901119	8	B
225	315		½	280	178	140	738901120	9	B

PF 2 98 931 002

# Accessories

## Cap PE black



### Model:

- to seal the end of a COOL-FIT pipe to ABS

D [mm]	D1 [mm]	d	Code	kg	L [mm]	closest inch
90	24	25	<b>733 960 171</b>	0.032	35	¾
90	32	32	<b>733 960 172</b>	0.030	35	1
110	39	40	<b>733 960 173</b>	0.041	35	1 ¼
110	48	50	<b>733 960 174</b>	0.040	35	1 ½
125	59	63	<b>733 960 175</b>	0.045	35	2
140	70	75	<b>733 960 176</b>	0.054	35	2 ½
160	83	90	<b>733 960 177</b>	0.064	35	3
180	100	110	<b>733 960 178</b>	0.075	35	4
225	127	140	<b>733 960 180</b>	0.102	35	5
250	144	160	<b>733 960 181</b>	0.118	35	6
280	187	200	<b>733 960 183</b>	0.128	35	8
315	210	225	<b>733 960 184</b>	0.153	35	9

PF 2 33 372 030



## Silicon glue

### Model:

- For sealing and glueing caps
- Tube à 50 ml
- Cartridge à 290 ml

	Code	kg
50 ml	<b>738 011 102</b>	0.100
290 ml	<b>738 011 103</b>	0.400

PF 2 33 372 999



## Gap filler

- 13 x 13mm, 2.5 m on a roll
- To insulate inspection gap at joints

Price listed per 2,5m roll

D [mm]	d-d [mm]	Code	kg
90 - 450	25 - 315	<b>738 011 150</b>	0.050

PF 2 33 372 030



## Shrink sleeve long PE black

### Model:

- To provide a water tight seal in combination with sealing tape
- For straight connections only
- D-D1 connections can be realized with the sleeves listed in the table below
- Length: 265 mm

D [mm]	Code	kg	L [mm]	Closest inch
110 - 160	<b>738 011 167</b>	0.210	265	4 - 6
180 - 225	<b>738 011 170</b>	0.300	265	7 - 8
280 - 315	<b>738 011 173</b>	0.420	265	10 - 12

Table black

	D 110	D 125	D 140	D 160	D 180	D 225	D 250	D 280	D 315
D1 90	738.011.167	738.011.167	738.011.167	738.011.167					
D1 110		738.011.167	738.011.167	738.011.167					
D1 125			738.011.167	738.011.167					
D1 140				738.011.167	738.011.170	738.011.170			
D1 160					738.011.170	738.011.170			
D1 180						738.011.170	738.011.173	738.011.173	
D1 225							738.011.173	738.011.173	738.011.173
D1 250								738.011.173	738.011.173
D1 280									738.011.173

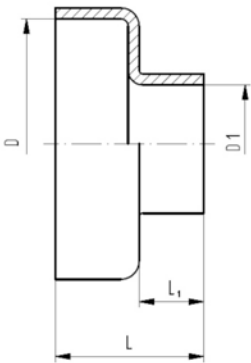
PF 2 33 372 999



## Shrink cap PE black

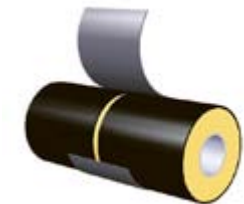
### Model:

- To seal dimension reductions on PE
- Can also be used for T 90° reducers
- No sealing tape required (In cap included)
- Attention: Do not shrink onto ABS



D [mm]	D1 [mm]	Code	kg	L [mm]	L1 [mm]	Closest inch
225 - 160	140 - 90	<b>733 960 135</b>	0.550	137	61	8 - 6
315 - 225	250 - 125	<b>733 960 140</b>	0.900	143	43	12 - 8

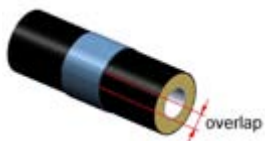
PF 2 33 372 030



## Shrink tape PE black

### Model:

- For indoor use only
- For later closing of gaps
- Mastic backed
- Width (L) available in 100mm or 300mm
- 10 m on a roll
- Shrink with a burner or hot air gun



D [mm]	d-d [mm]	Code	kg	L [mm]	Closest inch
90 - 450	25 - 315	<b>738 011 105</b>	1.000	100	3/4 - 8
90 - 450	25 - 315	<b>738 011 106</b>	3.000	300	3/4 - 8

PF 2 33 372 030



PF 2 33 372 030

## Repairing tape PE black

### Model:

- For later closing of gaps instead of shrink sleeve
- 1150mmx150mm, black

D [mm]	d-d [mm]	Code	kg	Closest inch
90 - 450	25 - 315	<b>738 011 104</b>	1.500	¾ - 8



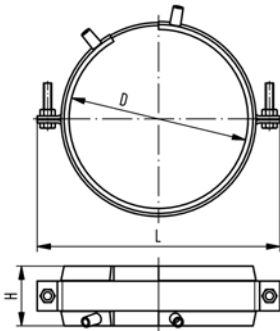
PF 2 33 372 050

## COOL-FIT chamfering tool

### Model:

- To calibrate pipe inner diameters of COOL-FIT pipes
- including transportation case

d-d [mm]	Code	kg	Closest inch
140 - 225	<b>790 205 001</b>	19.500	5 - 8



## COOL-FIT fixed point

- The product consists of two components namely a welding band and a pipe bracket.
- Electro-fusion welded band as permanent connection to transmit the forces that occur in the pipe to the fixed point.
- The delivered pipe brackets are needed to deliver welding pressure during installation and give stability during operation.
- For welding, use an MSA 250, 300, 350, 400 or commercially available 220 V fusion machines.
- If you use an MSA fusion machine from GF Piping Systems, use the 799 350 339 adapter.
- Please take note of the maximum allowed forces for this version in the table below.
- **Fixed point brackets and cross braces have to be calculated and obtained by the installer. They are not included in the fixed point set from GF.**

D [mm]	d [mm]	Code	kg	L [mm]	H [mm]	max. Force [kN]	Closest inch
90	25 / 32	<b>738 912 013</b>	0.780	140	60	1.5	¾ - 1
110	40 / 50	<b>738 912 014</b>	0.904	170	60	2.0	1 ¼ - 1 ½
125	63	<b>738 912 015</b>	0.994	185	60	3.5	2
140	75	<b>738 912 016</b>	1.193	210	60	5.5	2 ½
160	90	<b>738 912 017</b>	1.246	220	60	9.0	3
180	110	<b>738 912 018</b>	1.488	244	60	10.0	4
225	140	<b>738 912 020</b>	1.762	295	60	10.0	5
250	160	<b>738 912 021</b>	1.922	320	60	10.0	6
280	200	<b>738 912 022</b>	2.062	350	60	10.0	8
315	225	<b>738 912 023</b>	2.388	385	60	10.0	8

Scope of delivery:					
Code	Outside diameter PE pipe	Pipe brackets (for electro welding tape) [pieces]	Electro welding tape [pieces]	Barcode-Card [pieces]	Assembly instructions
738 912 013	D90	2 x d90	2 x d90	1 x d90	1
738 912 014	D110	2 x d110	2 x d110	1 x d110	1
738 912 015	D125	2 x d125	2 x d125	1 x d125	1
738 912 016	D140	2 x d140	2 x d63; 2 x d75	1 x d63; 1 x d75	1
738 912 017	D160	2 x d160	2 x d160	1 x d160	1
738 912 018	D180	2 x d180	4 x d90	1 x d90	1
738 912 020	D225	2 x d225	4 x d110	1 x d110	1
738 912 021	D250	2 x d250	4 x d125	1 x d125	1
738 912 022	D280	2 x d280	4 x d125	1 x d125	1
738 912 023	D315	2 x d315	4 x d160	1 x d160	1

PF 2 33 372 040











PF 2 33 372 999

## Adaptor

- MSA electrofusion adaptor for COOL-Fit Fixed point

Code	kg	
799 350 339	0.023	

# ABS metric Fittings

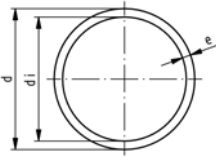
		Page
	Metric pipe	72
	Pipe fittings for solvent cement jointing	74
	Adaptor fittings	81
	Threaded fittings	85
	Installation fittings	86
	Unions and Adaptor Unions	87
	Union spare parts	90
	Flange adaptor	94

# Metric pipe

## Pipe 1m length ABS metric

### Model:

- Colour: RAL 7001, gravel grey
- Length: 1m
- PN 10 (10 bar) / PN 16 (16 bar) at 20°C



d [mm]	PN	Code	kg/m	e [mm]	di [mm]	Length [m]
16	16	<b>700 262 080</b>	0.095	1.8	12.4	1.00
20	16	<b>700 262 081</b>	0.148	2.3	15.4	1.00
25	16	<b>700 262 082</b>	0.191	2.3	20.4	1.00
32	10	<b>700 262 083</b>	0.213	1.9	28.2	1.00
40	10	<b>700 262 084</b>	0.336	2.4	35.2	1.00
50	10	<b>700 262 085</b>	0.516	3.0	44.0	1.00
63	10	<b>700 262 086</b>	0.819	3.8	55.4	1.00
75	10	<b>700 262 087</b>	1.154	4.5	66.0	1.00
90	10	<b>700 262 088</b>	1.657	5.4	79.2	1.00
110	10	<b>700 262 089</b>	2.495	6.6	96.8	1.00
140	10	<b>700 262 091</b>	4.083	8.6	122.8	1.00
160	10	<b>700 262 092</b>	5.397	9.9	140.2	1.00
200	10	<b>700 262 093</b>	8.307	12.3	175.4	1.00
225	10	<b>700 262 094</b>	10.522	13.9	197.2	1.00

PF 2 33 198 007

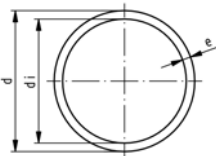
69 01 70

## Pipe ABS metric

### Nominal pressure PN16 (at 20°C)

### Model:

- Colour: RAL 7001, gravel grey
- Pipe length: 5m, with plain ends
- Minimum order quantity: 1 length



d [mm]	PN	Code	kg/m	e [mm]	di [mm]	closest inch	Copper size
16	16	<b>169 017 080</b>	0.095	1.8	12.4	3/8	1/2
20	16	<b>169 017 081</b>	0.148	2.3	15.4	1/2	5/8
25	16	<b>169 017 082</b>	0.191	2.3	20.4	3/4	7/8

PF 2 33 472 001

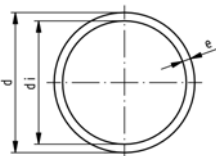
69 01 70

## Pipe ABS metric

### Nominal pressure PN10 (at 20°C)

### Model:

- Colour: RAL 7001, gravel grey
- Pipe length: 5m, with plain ends
- Minimum order quantity: 1 length

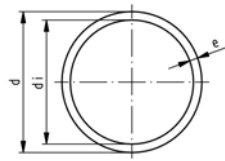


d [mm]	PN	d [inch]	Code	kg/m	e [mm]	di [mm]	closest inch	Copper size
32	10		<b>169 017 083</b>	0.213	1.9	28.2	1	1 1/8
40	10		<b>169 017 084</b>	0.336	2.4	35.2	1 1/4	1 3/8
50	10		<b>169 017 085</b>	0.516	3.0	44.0	1 1/2	1 5/8
63	10		<b>169 017 086</b>	0.819	3.8	55.4	2	2 1/8
75	10	2 1/2	<b>169 017 087</b>	1.154	4.5	66.0	2 1/2	2 3/8
90	10		<b>169 017 088</b>	1.657	5.4	79.2	3	3 1/8
110	10		<b>169 017 089</b>	2.495	6.6	96.8	4	4 1/8
140	10	5	<b>169 017 091</b>	4.083	8.6	122.8	5	
160	10		<b>169 017 092</b>	5.397	9.9	140.2	6	6
200	10		<b>169 017 093</b>	8.307	12.3	175.4	8	
225	10		<b>169 017 094</b>	10.522	13.9	197.2	9	

PF 2 33 472 001



69 01 70



PF 2 33 472 001

## Pipe ABS metric Nominal pressure PN6 (at 20°C)

### Model:

- Colour: RAL 7001, gravel grey
- Pipe length: 5m, with plain ends
- Minimum order quantity: 1 length

d [mm]	PN	Code	kg/m	e [mm]	di [mm]	closest inch	
250	6	<b>169 017 095</b>	8.299	9.6	230.8	10	
280	6	<b>169 017 096</b>	10.346	10.7	258.6	11	
315	6	<b>169 017 097</b>	13.173	12.1	290.8	12	

# Pipe fittings for solvent cement jointing

29 00 01

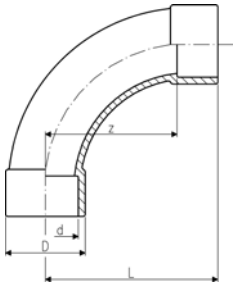
## Bend 90° ABS metric

- Radius = 2 d

\* Available as long as our stock will last



$r = 2d$



d [mm]	d [inch]	PN	Code	SP	kg	z [mm]	D [mm]	L [mm]	closest inch
20		16	<b>729 000 106</b>	10	0.027	40	27	58	½
25		16	<b>729 000 107</b>	10	0.038	50	35	69	¾
32		10	<b>729 000 108</b>	10	0.051	64	38	86	1
40		10	<b>729 000 109</b>	30	0.102	80	54	109	1 ¼
50		10	<b>729 000 110</b>	10	0.206	100	61	131	1 ½
63		10	<b>729 000 111</b>	5	0.387	126	76	164	2
75	2 ½	10	<b>729 000 112</b>	5	0.585	150	90	194	2 ½
90		10	<b>729 000 113</b>	5	0.750	180	113	231	3
110		10	<b>729 000 114</b>	5	2.030	220	137	281	4
140		10	<b>729 000 116</b>	1	4.100	280	168	356	5
* 160		10	<b>729 000 117</b>	1	5.600	320	191	406	6

PF 2 33 197 001

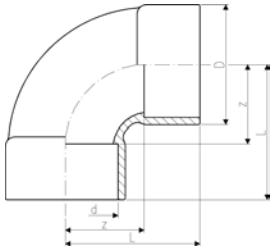
29 01 01

## Bend 90° short pattern ABS metric

- >d225 - maximum operating temperature: +40°C



$r = 0,75 d$



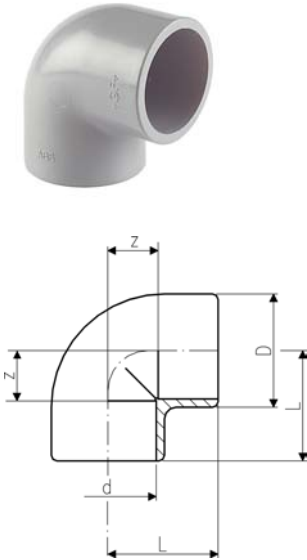
d [mm]	PN	Code	SP	kg	z [mm]	D [mm]	L [mm]	closest inch
225	10	<b>729 010 120</b>	1	5.650	168	256	287	9
280	6	<b>729 010 122</b>	-	16.000	210	318	357	11
315	6	<b>729 010 123</b>	-	21.000	237	356	401	12

PF 2 33 197 001

29 10 01

### Elbow 90° ABS metric

• >d225 - maximum operating temperature: +40°C



d [mm]	d [inch]	PN	Code	SP	kg	z [mm]	D [mm]	L [mm]	closest inch
16		16	<b>729 100 105</b>	10	0.007	9	21	23	3/8
20		16	<b>729 100 106</b>	10	0.010	11	26	27	1/2
25		16	<b>729 100 107</b>	10	0.017	14	31	33	3/4
32		10	<b>729 100 108</b>	10	0.032	17	40	39	1
40		10	<b>729 100 109</b>	10	0.051	21	49	47	1 1/4
50		10	<b>729 100 110</b>	10	0.103	26	61	57	1 1/2
63		10	<b>729 100 111</b>	10	0.196	33	76	72	2
75	2 1/2	10	<b>729 100 112</b>	5	0.308	40	90	84	2 1/2
90		10	<b>729 100 113</b>	5	0.429	46	110	97	3
110		10	<b>729 100 114</b>	4	0.786	55	136	116	4
140	5	10	<b>729 100 116</b>	4	1.470	70	162	146	5
160		10	<b>729 100 117</b>	1	2.150	80	185	166	6
200		10	<b>729 100 119</b>	1	3.372	101	225	207	8
250		6	<b>729 100 121</b>	-	8.200	131	282	263	9

PF 2 33 197 003

29 15 01

### Elbow 45° ABS metric

• >d225 - maximum operating temperature: +40°C



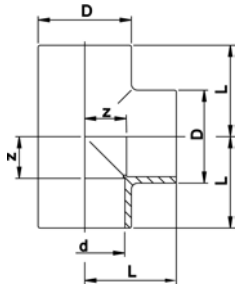
d [mm]	d [inch]	PN	Code	SP	kg	z [mm]	D [mm]	L [mm]	closest inch
20		16	<b>729 150 106</b>	10	0.008	5	25	21	1/2
25		16	<b>729 150 107</b>	10	0.013	6	31	25	3/4
32		10	<b>729 150 108</b>	10	0.046	8	40	30	1
40		10	<b>729 150 109</b>	10	0.082	10	49	36	1 1/4
50		10	<b>729 150 110</b>	5	0.121	12	61	43	1 1/2
63		10	<b>729 150 111</b>	10	0.144	14	76	52	2
75	2 1/2	10	<b>729 150 112</b>	5	0.228	17	89	61	2 1/2
90		10	<b>729 150 113</b>	5	0.362	20	107	71	3
110		10	<b>729 150 114</b>	10	0.775	28	131	89	4
140	5	10	<b>729 150 116</b>	1	1.190	32	162	108	5
160		10	<b>729 150 117</b>	4	1.680	36	185	122	6
200		10	<b>729 150 119</b>	1	2.506	43	225	149	8
225		10	<b>729 150 120</b>	1	3.100	49	250	168	8
250		6	<b>729 150 121</b>	-	7.200	60	282	192	9
280		6	<b>729 150 122</b>	-	10.500	66	318	213	10
315		6	<b>729 150 123</b>	-	14.600	74	356	239	12

PF 2 33 197 004

29 20 01

**Tee 90° ABS metric**

• >d225 - maximum operating temperature: +40°C

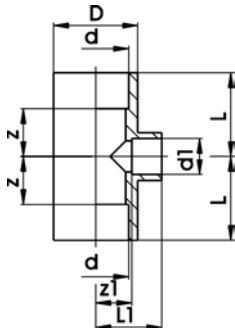


PF 2 33 197 005

d [mm]	d [inch]	PN	Code	SP	kg	z [mm]	D [mm]	L [mm]	closest inch
16		16	<b>729 200 105</b>	10	0.010	9	21	23	¾
20		16	<b>729 200 106</b>	10	0.014	11	25	27	½
25		16	<b>729 200 107</b>	10	0.024	14	31	33	¾
32		10	<b>729 200 108</b>	10	0.042	17	40	39	1
40		10	<b>729 200 109</b>	10	0.074	21	49	47	1 ¼
50		10	<b>729 200 110</b>	5	0.131	26	61	57	1 ½
63		10	<b>729 200 111</b>	5	0.250	34	76	72	2
75	2 ½	10	<b>729 200 112</b>	5	0.421	40	90	84	2 ½
90		10	<b>729 200 113</b>	5	0.687	47	107	98	3
110		10	<b>729 200 114</b>	2	1.020	55	133	116	4
140	5	10	<b>729 200 116</b>	1	2.500	71	169	147	5
160		10	<b>729 200 117</b>	1	3.700	81	193	167	6
200		10	<b>729 200 119</b>	1	4.430	101	225	207	8
225		10	<b>729 200 120</b>	1	6.850	114	256	233	8
250		6	<b>729 200 121</b>	-	12.400	132	282	263	9
280		6	<b>729 200 122</b>	-	17.300	152	318	298	10
315		6	<b>729 200 123</b>	-	24.100	168	356	332	11

29 20 01

**Tee 90° reducing ABS metric**



PF 2 33 197 010

d [mm]	d1 [mm]	PN	Code	SP	kg	z [mm]	z1 [mm]	D [mm]	L [mm]	L1 [mm]	Closest inch run-branch- run
25	20	16	<b>729 200 134</b>	10	0.029	14	14	33	33	30	¾ - ½ - ¾
32	25	10	<b>729 200 138</b>	10	0.048	17	17	41	39	36	1 - ¾ - 1
40	25	10	<b>729 200 151</b>	10	0.081	23	23	50	49	42	1 ¼ - ¾ - 1 ¼
40	32	10	<b>729 200 147</b>	10	0.085	23	23	50	49	45	1 ¼ - 1 - 1 ¼
50	25	10	<b>729 200 010</b>	5	0.135	28	28	62	59	47	1 ½ - ¾ - 1 ½
50	32	10	<b>729 200 164</b>	5	0.200	28	28	62	59	50	1 ½ - 1 - 1 ½
63	25	10	<b>729 200 011</b>	10	0.245	34	34	77	73	53	2 - ¾ - 2
63	32	10	<b>729 200 178</b>	5	0.249	35	34	77	73	56	2 - 1 - 2
63	50	10	<b>729 200 170</b>	5	0.265	35	34	77	73	65	2 - 1 ½ - 2
75	40	10	<b>729 200 182</b>	9	0.500	40	41	92	84	66	2 ½ - 1 ¼ - 2 ½
90	32	10	<b>729 200 143</b>	6	1.000	46	55	110	97	93	3 - 1 - 3
90	63	10	<b>729 200 146</b>	5	0.900	46	55	110	97	93	3 - 2 - 3
110	32	10	<b>729 200 144</b>	3	2.000	56	67	133	117	89	4 - 1 - 4
110	50	10	<b>729 200 136</b>	3	1.900	56	67	133	117	98	4 - 1 ½ - 4
140	50	10	<b>729 200 148</b>	1	1.899	72	82	172	148	113	5 - 1 ½ - 5
140	75	10	<b>729 200 149</b>	1	2.500	72	78	172	148	122	5 - 2 ½ - 5
160	90	10	<b>729 200 158</b>	1	2.800	81	91	192	167	142	6 - 3 - 6
200	110	10	<b>729 200 153</b>	1	6.110	106	131	232	213	192	7 - 4 - 7
225	110	10	<b>729 200 156</b>	1	7.500	119	143	257	239	204	8 - 4 - 8
225	160	10	<b>729 200 157</b>	1	7.900	119	119	257	239	205	8 - 6 - 8

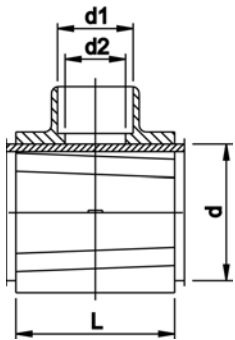
69 11 00



## Branch saddle ABS metric

### Model:

- For ABS-pipes
- Top saddle (ABS) for solvent cementing
- Bottom part and wedges made from PVC-U
- Outlet with solvent cement socket metric
- PN 10

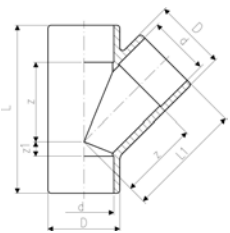


d [mm]	PN* [bar]	Code	kg	d1 [mm]	d2 [mm]	Tapping-Ø [mm]	L [mm]
90	10	<b>169 110 056</b>	0.786	50	40	39	105
110	10	<b>169 110 066</b>	0.864	50	40	39	105
160	10	<b>169 110 097</b>	1.185	63	49	48	120
225	10	<b>169 110 117</b>	1.483	63	49	48	120

PF 2 33 198 008

29 25 01

## Tee 45° ABS metric

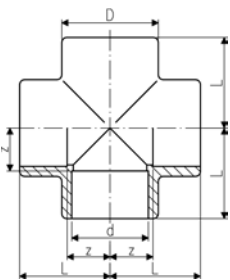


d [mm]	d [inch]	PN	Code	SP	kg	z [mm]	z1 [mm]	D [mm]	L [mm]	L1 [mm]	closest inch
20		10	<b>729 250 106</b>	10	0.027	30	6	28	68	46	½
25		10	<b>729 250 107</b>	10	0.043	36	9	33	83	55	¾
32		10	<b>729 250 108</b>	10	0.073	45	10	41	99	67	1
40		10	<b>729 250 109</b>	-	0.119	56	10	50	118	82	1 ¼
50		10	<b>729 250 110</b>	10	0.202	66	12	60	140	97	1 ½
63		10	<b>729 250 111</b>	5	0.325	85	14	74	175	123	2
75	2 ½	6	<b>729 250 112</b>	5	0.637	101	18	91	207	145	2 ½
90		6	<b>729 250 113</b>	1	0.940	122	20	107	245	173	3
110		6	<b>729 250 114</b>	3	1.870	149	27	134	298	210	4
140		6	<b>729 250 116</b>	1	4.315	190	34	168	376	266	5

PF 2 33 197 013

29 30 01

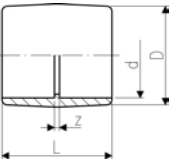
## Cross ABS metric



d [mm]	PN	Code	kg	z [mm]	D [mm]	L [mm]	closest inch
32	10	<b>729 300 108</b>	0.070	17	43	39	1
63	10	<b>729 300 111</b>	0.361	34	79	72	2

PF 2 33 197 015

## 29 91 01



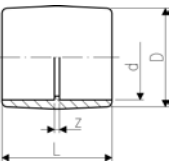
## Socket ABS metric

- >d225 - maximum operating temperature: +40°C

d [mm]	d [inch]	PN	Code	SP	kg	z [mm]	D [mm]	L [mm]	closest inch
16		16	<b>729 910 105</b>	10	0.005	3	22	31	3/8
20		16	<b>729 910 106</b>	10	0.007	3	26	35	1/2
25		16	<b>729 910 107</b>	10	0.011	3	32	41	3/4
32		10	<b>729 910 108</b>	10	0.020	3	40	47	1
40		10	<b>729 910 109</b>	10	0.034	3	49	55	1 1/4
50		10	<b>729 910 110</b>	10	0.060	3	61	65	1 1/2
63		10	<b>729 910 111</b>	10	0.107	3	76	79	2
75	2 1/2	10	<b>729 910 112</b>	10	0.140	4	87	92	2 1/2
90		10	<b>729 910 113</b>	10	0.242	5	104	107	3
110		10	<b>729 910 114</b>	5	0.570	5	131	132	4
140	5	10	<b>729 910 116</b>	2	0.760	7	162	159	5
160		10	<b>729 910 117</b>	1	1.176	8	183	180	6
200		10	<b>729 910 119</b>	1	1.480	9	221	221	8
225		10	<b>729 910 120</b>	1	2.500	10	253	248	8
250		6	<b>729 910 121</b>	-	5.400	16	284	284	9
280		6	<b>729 910 122</b>	-	6.600	16	321	314	10
315		6	<b>729 910 123</b>	-	8.100	16	356	348	12

PF 2 33 197 008

## 29 91 31



## Adaptor socket ABS metric/Inch BS

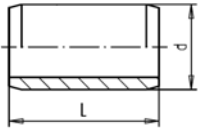
### Model:

- with BS Inch and metric solvent cement sockets

d [mm]	d [inch]	PN	Code	SP	kg	z [mm]	L [mm]	D [mm]
16	3/8	10	<b>729 913 105</b>	-	0.007	5	35	23
20	1/2	10	<b>729 913 106</b>	-	0.010	5	38	27
25	3/4	10	<b>729 913 107</b>	-	0.016	5	45	33
32	1	10	<b>729 913 108</b>	-	0.025	5	51	41
40	1 1/4	10	<b>729 913 109</b>	-	0.045	5	60	51
50	1 1/2	10	<b>729 913 110</b>	-	0.070	4	65	59
63	2	10	<b>729 913 111</b>	-	0.130	5	79	75
75	2 1/2	10	<b>729 910 112</b>	10	0.140	4	92	87
90	3	10	<b>729 913 113</b>	-	0.365	6	108	104
110	4	10	<b>729 913 115</b>	-	0.630	7	135	134

PF 2 33 172 001

29 90 09



## Barrel nipple ABS metric

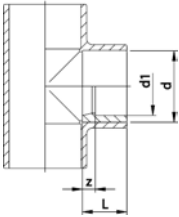
**Model:**

- With solvent cement spigots on both sides
- For quick connections between fittings
- For the shortest possible distance between fittings
- Overall length L = 2 x socket length

d [mm]	d [inch]	PN	Code	kg	L [mm]	closest inch
16		16	<b>729 900 905</b>	0.003	28	3/8
20		16	<b>729 900 906</b>	0.004	32	1/2
25		16	<b>729 900 907</b>	0.007	38	3/4
32		10	<b>729 900 908</b>	0.009	44	1
40		10	<b>729 900 909</b>	0.017	52	1 1/4
50		10	<b>729 900 910</b>	0.032	62	1 1/2
63		10	<b>729 900 911</b>	0.063	76	2
75	2 1/2	10	<b>729 900 912</b>	0.102	88	2 1/2
90		10	<b>729 900 913</b>	0.173	102	3
110		10	<b>729 900 914</b>	0.309	122	4

PF 2 33 198 007

29 90 03



## Reducing bush ABS metric

**Model:**

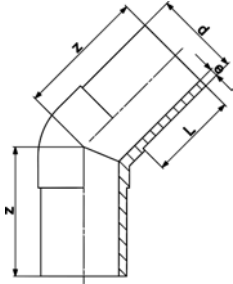
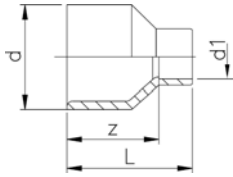
- With solvent cement spigot and socket metric

d [mm]	d1 [mm]	PN	Code	SP	kg	z [mm]	L [mm]	Closest inch
20	16	16	<b>729 900 334</b>	10	0.003	2	16	1/2 - 3/8
25	20	16	<b>729 900 337</b>	10	0.005	3	19	3/4 - 1/2
32	20	10	<b>729 900 342</b>	10	0.012	6	22	1 - 1/2
32	25	10	<b>729 900 341</b>	10	0.009	4	22	1 - 3/4
40	20	10	<b>729 900 348</b>	10	0.016	10	26	1 1/4 - 1/2
40	25	10	<b>729 900 347</b>	10	0.016	7	26	1 1/2 - 3/4
40	32	10	<b>729 900 346</b>	10	0.012	4	26	1 1/4 - 1
50	20	10	<b>729 900 355</b>	10	0.024	15	31	1 1/2 - 1/2
50	25	10	<b>729 900 354</b>	10	0.025	12	31	1 1/2 - 3/4
50	32	10	<b>729 900 353</b>	10	0.035	9	31	1 1/2 - 1
50	40	10	<b>729 900 352</b>	10	0.038	5	31	1 1/2 - 1 1/4
63	32	10	<b>729 900 360</b>	10	0.060	16	38	2 - 1
63	40	10	<b>729 900 359</b>	10	0.067	12	38	2 - 1 1/4
63	50	10	<b>729 900 358</b>	10	0.044	7	36	2 - 1 1/2
75	50	10	<b>729 900 365</b>	10	0.105	13	44	2 1/2 - 1 1/2
75	63	10	<b>729 900 364</b>	10	0.076	7	44	2 1/2 - 2
90	50	10	<b>729 900 372</b>	10	0.136	20	51	3 - 1 1/2
90	63	10	<b>729 900 371</b>	10	0.130	14	51	3 - 2
90	75	10	<b>729 900 370</b>	10	0.133	7	51	3 - 2 1/2
110	63	10	<b>729 900 378</b>	5	0.238	24	61	4 - 2
110	90	10	<b>729 900 376</b>	5	0.196	10	61	4 - 3
125	110	10	<b>700 244 660</b>	10	0.356	8	69	- 4
140	110	10	<b>729 900 385</b>	5	0.454	15	76	5 - 4
160	110	10	<b>729 900 390</b>	5	0.666	25	86	6 - 4
160	140	10	<b>729 900 388</b>	5	0.416	10	86	6 - 5
200	160	10	<b>729 900 392</b>	1	0.818	20	106	8 - 6
225	160	10	<b>729 900 396</b>	2	1.640	33	119	8 - 6
225	200	10	<b>729 900 181</b>	-	1.440	13	119	8 - 8
250	225	6	<b>729 900 303</b>	-	1.000	12	131	9 - 8
280	250	6	<b>729 900 306</b>	-	2.500	15	146	10 - 9
315	280	6	<b>729 900 312</b>	1	3.350	17	164	12 - 10

PF 2 33 197 006

## 29 91 03

## Reducing bush long ABS metric

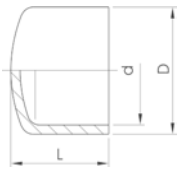


PF 2 33 197 002

d [mm]	d1 [mm]	PN	Code	SP	kg	z [mm]	L [mm]	Closest inch
32	20	10	<b>729 910 342</b>	10	0.016	30	46	1 - ½
40	25	10	<b>729 910 347</b>	10	0.026	36	55	1 ¼ - ¾
50	25	10	<b>729 910 354</b>	10	0.041	44	63	1 ⅓ - ¾
63	32	10	<b>729 910 360</b>	5	0.077	54	76	2 - 1
75	40	10	<b>729 910 366</b>	5	0.115	62	88	2 ½ - 1 ¼
90	63	10	<b>729 910 371</b>	5	0.218	74	112	3 - 2

## 29 96 01

## Cap ABS metric

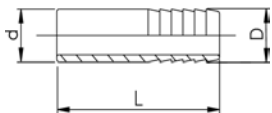


PF 2 33 197 009

d [mm]	PN	Code	SP	kg	D [mm]	L [mm]	closest inch
16	16	<b>729 960 105</b>	10	0.006	26	24	¾
20	16	<b>729 960 106</b>	10	0.008	30	25	½
25	16	<b>729 960 107</b>	10	0.013	37	30	¾
32	10	<b>729 960 108</b>	10	0.020	44	34	1
40	10	<b>729 960 109</b>	10	0.034	55	41	1 ¼
50	10	<b>729 960 110</b>	10	0.034	64	44	1 ½
63	10	<b>729 960 111</b>	5	0.086	80	54	2
75	10	<b>729 960 112</b>	5	0.115	87	65	2 ½
90	10	<b>729 960 113</b>	5	0.215	112	77	3
110	10	<b>729 960 114</b>	5	0.480	145	101	4
140	10	<b>729 960 116</b>	10	0.880	163	114	5
160	10	<b>729 960 117</b>	2	1.130	188	130	6

## 29 96 04

## Hose connector ABS metric



PF 2 33 197 012

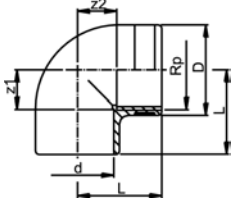
d [mm]	PN	Code	SP	kg	D [mm]	L [mm]	closest inch
16	10	<b>729 960 405</b>	10	0.007	16	57	¾
20	10	<b>729 960 406</b>	10	0.011	20	73	½
25	10	<b>729 960 407</b>	10	0.016	25	79	¾
32	10	<b>729 960 408</b>	10	0.026	30	89	1



# Adaptor fittings

29 10 02

## Elbow 90° ABS metric Rp



PF 2 33 198 002

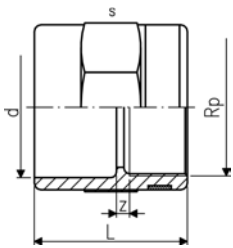
### Model:

- With solvent cement socket metric and parallel female thread Rp
- Reinforcing ring stainless (A2)
- Connection to plastic or metal threads
- Do not use thread sealing pastes that are harmful to ABS
- Install with low mechanical stress and avoid large cyclic temperature changes

d [mm]	Rp [inch]	PN	Code	SP	kg	z1 [mm]	z2 [mm]	D [mm]	L [mm]
20	½	10	<b>729 100 206</b>	10	0.018	11	14	30	27
25	¾	10	<b>729 100 207</b>	10	0.028	14	17	35	33
32	1	10	<b>729 100 208</b>	10	0.047	17	22	45	39
40	1 ¼	10	<b>729 100 209</b>	10	0.088	23	27	55	50
50	1 ½	10	<b>729 100 210</b>	5	0.128	27	36	62	58
63	2	10	<b>729 100 211</b>	5	0.233	33	46	75	73

29 91 02

## Socket ABS metric Rp



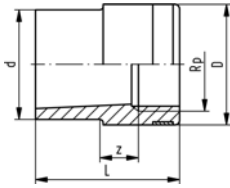
PF 2 33 198 003

### Model:

- With solvent cement socket metric and parallel female thread Rp
- Reinforcing ring stainless (A2)
- Connection to plastic or metal threads
- Do not use thread sealing pastes that are harmful to ABS
- Install with low mechanical stress and avoid large cyclic temperature changes

d [mm]	Rp [inch]	PN	Code	SP	kg	z [mm]	L [mm]	s [mm]	closest inch
20	½	10	<b>729 910 206</b>	10	0.020	4	35	32	½
25	¾	10	<b>729 910 207</b>	10	0.030	3	40	36	¾
32	1	10	<b>729 910 208</b>	10	0.040	3	45	46	1
40	1 ¼	10	<b>729 910 209</b>	10	0.069	5	51	55	1 ¼
50	1 ½	10	<b>729 910 210</b>	10	0.100	7	59	65	1 ½
63	2	10	<b>729 910 211</b>	5	0.162	7	69	80	2

29 91 04



PF 2 33 198 020

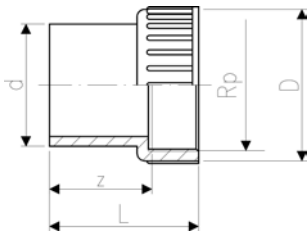
## Reducing bush ABS metric Rp

### Model:

- With solvent cement spigot metric and parallel female thread Rp
- Reinforcing ring stainless (A2)
- Connection to plastic or metal threads
- Do not use thread sealing pastes that are harmful to ABS
- Install with low mechanical stress and avoid large cyclic temperature changes

d [mm]	Rp [inch]	PN	Code	SP	kg	z [mm]	D [mm]	L [mm]
20	3/8	10	729 910 434	10	0.012	7	25	35
25	1/2	10	729 910 437	10	0.018	7	30	41
32	3/4	10	729 910 441	10	0.027	15	35	48
40	1	10	729 910 446	10	0.048	20	45	56
50	1 1/4	10	729 910 452	10	0.073	20	55	66
63	1 1/2	10	729 910 458	5	0.106	10	62	77

29 90 04



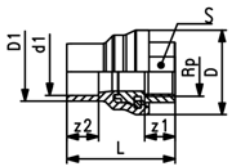
PF 2 33 198 004

## Adaptor ABS metric Rp

### Model:

- With solvent cement spigot metric and parallel female thread Rp
- Connection to plastic threads only
- Do not use thread sealing pastes that are harmful to ABS
- Install with low mechanical stress and avoid large cyclic temperature changes

d [mm]	Rp [inch]	PN	Code	SP	kg	z [mm]	L [mm]	D [mm]
20	1/2	10	729 900 406	10	0.009	21	37	28
25	3/4	10	729 900 407	10	0.014	23	41	33
32	1	10	729 900 408	10	0.026	27	48	42
40	1 1/4	10	729 900 409	10	0.046	33	56	52
50	1 1/2	10	729 900 410	10	0.073	38	61	62
63	2	10	729 900 411	5	0.127	47	74	77



PF 2 33 198 001

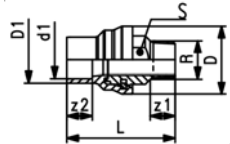
## Transition fitting ABS/brass Rp

### Model:

- Transition fitting ABS
- Brass with parallel female thread Rp
- Transition fitting equally suitable as socket and spigot
- Gasket: O-ring EPDM No. 48 41 01



d1 [mm]	PN	Rp [inch]	Code	SP	kg	z1 [mm]	z2 [mm]	D [mm]	D1 [mm]	L [mm]	S [mm]
20	10	1/2	729 950 106	10	0.124	17.0	16.5	40	25	54.5	25
25	10	3/4	729 950 107	10	0.180	18.5	19.0	50	32	65.2	30
32	10	1	729 950 108	10	0.277	21.5	22.5	59	40	76.5	36



PF 2 33 198 001

## Transition fitting ABS/brass R

### Model:

- Transition fitting ABS
- Transition fitting equally suitable as socket and spigot
- Brass with taper male thread R
- Gasket: O-ring EPDM No. 48 41 01



d1 [mm]	PN	R [inch]	Code	SP	kg	z1 [mm]	z2 [mm]	D [mm]	D1 [mm]	L [mm]	S [mm]
20	10	1/2	729 950 606	10	0.129	17.0	16.5	40	25	69.5	25
25	10	3/4	729 950 607	10	0.230	19.0	19.0	50	32	83.2	30
32	10	1	729 950 608	10	0.347	22.0	22.5	59	40	95.5	36

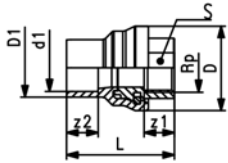


## Transition fitting ABS/stainless steel Rp



### Model:

- Transition fitting ABS
- Transition fitting equally suitable as socket and spigot
- Stainless steel with parallel female thread Rp
- Gasket: O-ring EPDM No. 48 41 01



d1 [mm]	PN	Rp [inch]	Code	SP	kg	z1 [mm]	z2 [mm]	D [mm]	D1 [mm]	L [mm]	S [mm]
20	10	1/2	<b>729 940 106</b>	10	0.124	17.0	16.5	40	25	54.5	25
25	10	3/4	<b>729 940 107</b>	10	0.180	18.5	19.0	50	32	65.2	30
32	10	1	<b>729 940 108</b>	10	0.277	21.5	22.5	59	40	76.5	36

PF 2 33 198 001

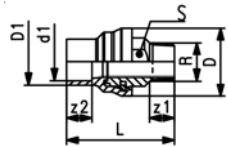


## Transition fitting ABS/stainless steel R



### Model:

- Transition fitting ABS
- Transition fitting equally suitable as socket and spigot
- Stainless steel with taper male thread R
- Gasket: O-ring EPDM No. 48 41 01



d1 [mm]	PN	R [inch]	Code	SP	kg	z1 [mm]	z2 [mm]	D [mm]	D1 [mm]	L [mm]	S [mm]
20	10	1/2	<b>729 940 606</b>	10	0.129	17.0	16.5	40	25	69.5	25
25	10	3/4	<b>729 940 607</b>	10	0.230	19.0	19.0	50	32	83.2	30
32	10	1	<b>729 940 608</b>	10	0.347	22.0	22.5	59	40	95.5	36

PF 2 33 198 001

29 91 15

## Threaded nipple R ABS

### Model:

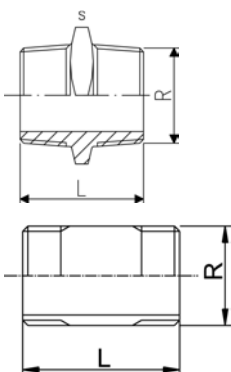
- BSP taper male threads (R)
- Connection to plastic threads only
- Do not use thread sealing pastes that are harmful to ABS
- Install with low mechanical stress and avoid large cyclic temperature changes



A



B



R [inch]	PN	Type	S [mm]	Code	kg	L [mm]
3/8	10	B		<b>729 911 505</b>	0.014	43
1/2	10	A	22	<b>729 911 906</b>	0.009	45
3/4	10	A	27	<b>729 911 907</b>	0.014	49
1	10	A	36	<b>729 911 908</b>	0.026	57
1 1/4	10	B		<b>729 911 509</b>	0.053	75
1 1/2	10	B		<b>729 911 510</b>	0.031	88
2	10	B		<b>729 911 511</b>	0.135	88
3	10	B		<b>729 911 513</b>	0.196	128
4	10	B		<b>729 911 515</b>	0.357	153

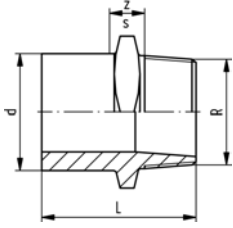
PF 2 33 172 016

29 91 05

## Adaptor spigot nipple ABS metric R

### Model:

- With solvent cement spigot metric and taper male thread R
- Connection to plastic threads only
- Do not use thread sealing pastes that are harmful to ABS
- Install with low mechanical stress and avoid large cyclic temperature changes



PF 2 33 198 004

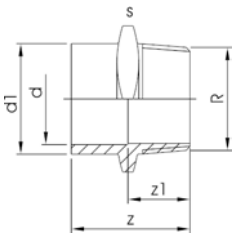
d [mm]	R [inch]	PN	Code	SP	kg	z [mm]	s [mm]	closest inch
16	3/8	10	<b>729 910 505</b>	10	0.009	35	27	3/8

29 91 05

## Adaptor socket nipple ABS metric R

### Model:

- With solvent cement spigot/socket metric and taper male thread R
- Connection for plastic threads
- Do not use thread sealing pastes that are harmful to ABS

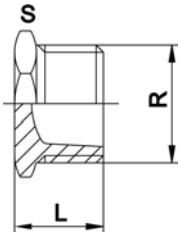


PF 2 33 198 001

d [mm]	d1 [mm]	R [inch]	PN	Code	SP	kg	z [mm]	z1 [mm]	s [mm]	closest inch
16	20	1/2	10	<b>729 910 556</b>	10	0.012	42	28	32	3/8
20	25	3/4	10	<b>729 910 557</b>	10	0.020	47	31	36	1/2
25	32	1	10	<b>729 910 558</b>	10	0.031	54	35	46	3/4
32	40	1 1/4	10	<b>729 910 559</b>	10	0.050	60	38	55	1
40	50	1 1/2	10	<b>729 910 560</b>	10	0.070	66	40	65	1 1/4
50	63	2	10	<b>729 910 561</b>	5	0.123	78	47	80	1 1/2

# Threaded fittings

29 96 19



PF 2 33 172 018

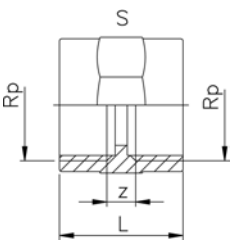
## Plug ABS R

### Model:

- With taper male thread R
- Connection to plastic threads only
- Do not use thread sealing pastes that are harmful to ABS

R [inch]	PN	Code	SP	kg	s [mm]	L [mm]
1/2	10	<b>729 961 906</b>	10	0.008	27	25
3/4	10	<b>729 961 907</b>	10	0.014	36	29
1	10	<b>729 961 908</b>	10	0.022	41	32

29 91 06



PF 2 33 172 001

## Threaded socket ABS Rp

### Model:

- With parallel female thread Rp
- Connection to plastic threads only
- Do not use thread sealing pastes that are harmful to ABS
- Install with low mechanical stress and avoid large cyclic temperature changes

Rp [inch]	PN	Code	SP	kg	z [mm]	L [mm]	s [mm]
1/2	10	<b>729 910 606</b>	10	0.019	9	35	32
3/4	10	<b>729 910 607</b>	10	0.022	9	39	36
1	10	<b>729 910 608</b>	10	0.041	11	45	46

# Installation fittings

29 31 00



## Installation fitting type 310 ABS metric

**Model:**

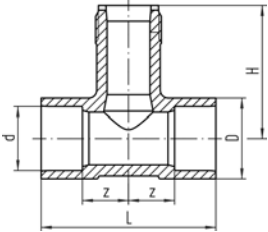
- Material: ABS
- Threaded outlet 1 ¼" NPSM
- With solvent cement socket metric

**Range of use:**

- compatible signet flow sensors: type 2551, 2537, 515, 8510, 2536, 8512
- compatible signet pH/ORP sensors: type 2724, 2725, 2726

**Attention:**

- sensor length depends on installation fitting



PF 2 98 930 001

d [mm]	DN [mm]	PN	Code	kg	D [mm]	L [mm]	H [mm]	z [mm]	closest inch	Sensor Type
25	20	10	<b>729 310 007</b>	0.107	35	100	78	32	¾	flow X0, pH XX
32	25	10	<b>729 310 008</b>	0.141	44	110	81	33	1	flow X0, pH XX
40	32	10	<b>729 310 009</b>	0.143	51	110	85	29	1 ¼	flow X0, pH XX
50	40	10	<b>729 310 010</b>	0.192	63	120	89	29	1 ½	flow X0, pH XX
63	50	10	<b>729 310 011</b>	0.273	78	130	95	28	2	flow X0, pH XX

29 31 20



## Installation fitting type 312 ABS metric

**Model:**

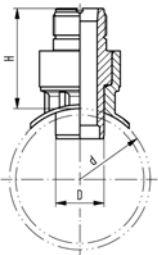
- Material: ABS
- Saddle with threaded outlet 1 ¼" NPSM
- Top saddle for solvent cement bonding

**Range of use:**

- compatible signet flow sensors: type 2551, 2537, 515, 8510, 2536, 8512

**Attention:**

- sensor length depends on installation fitting



PF 2 98 931 001

d [mm]	DN [mm]	PN	Code	kg	D [mm]	H [mm]	closest inch	Sensor Type
75	65	10	<b>729 312 012</b>	0.165	38	91	2 ½	flow X1
90	80	10	<b>729 312 013</b>	0.170	38	91	3	flow X1
110	100	10	<b>729 312 014</b>	0.169	38	91	4	flow X1
140	125	10	<b>729 312 016</b>	0.165	38	81	5	flow X1
160	150	10	<b>729 312 017</b>	0.163	38	77	6	flow X1
200	200	10	<b>729 312 019</b>	0.149	38	71	8	flow X1
225	200	10	<b>729 312 020</b>	0.143	38	67	8	flow X1

# Unions and Adaptor Unions

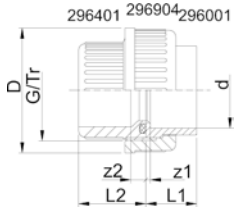
29 51 01

## Union ABS metric



### Model:

- Union End: Solvent cement socket metric
- Union bush: Solvent cement socket metric
- Gasket: O-ring EPDM No. 48 41 00



d [mm]	d [inch]	PN	Code	SP	kg	z1 [mm]	z2 [mm]	D [mm]	L1 [mm]	L2 [mm]	G/Tr	closest inch
16		10	<b>729 510 105</b>	10	0.025	5	10	35	19	24	3/4	3/8
20		10	<b>729 510 106</b>	10	0.035	4	10	43	21	26	1	1/2
25		10	<b>729 510 107</b>	10	0.050	5	10	53	24	29	1 1/4	3/4
32		10	<b>729 510 108</b>	10	0.070	5	10	60	27	33	1 1/2	1
40		10	<b>729 510 109</b>	10	0.130	3	12	74	31	39	2	1 1/4
50		10	<b>729 510 110</b>	5	0.170	3	14	83	33	46	2 1/4	1 1/2
63		10	<b>729 510 111</b>	10	0.340	3	18	103	40	58	2 3/4	2
75	2 1/2	10	<b>729 510 112</b>	2	0.461	3	18	135	47	62	Tr 108x5	2 1/2
90		10	<b>729 510 313</b>	2	0.694	5	18	158	56	69	Tr 128x5	3
110		10	<b>729 510 114</b>	1	1.069	5	11	158	66	72	Tr 154x5	4

PF 2 33 198 008

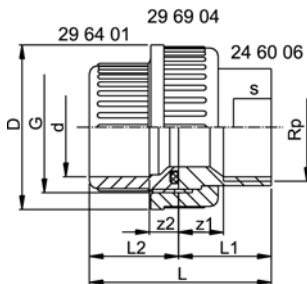
29 54 02

## Adaptor union ABS/stainless steel metric Rp



### Model:

- Union End: Stainless Steel WN 1.4404 (316L), parallel female thread Rp
- Union Bush: Solvent cement socket ABS metric
- Union Nut: ABS
- Gasket: O-ring EPDM No. 48 41 00



d [mm]	Rp [inch]	PN	EPDM Code	kg	z1 [mm]	z2 [mm]	D [mm]	L [mm]	L1 [mm]	L2 [mm]	G [inch]	s [mm]
16	3/8	10	<b>729 540 205</b>	0.053	9	10	35	43	19	24	3/4	19
20	1/2	10	<b>729 540 206</b>	0.096	11	10	43	50	24	26	1	24
25	3/4	10	<b>729 540 207</b>	0.154	11	10	51	55	26	29	1 1/4	29
32	1	10	<b>729 540 208</b>	0.212	12	10	58	61	29	33	1 1/2	36
40	1 1/4	10	<b>729 540 209</b>	0.356	14	12	74	71	33	39	2	45
50	1 1/2	10	<b>729 540 210</b>	0.455	15	14	83	79	34	46	2 1/4	54
63	2	10	<b>729 540 211</b>	0.721	15	18	100	95	39	58	2 3/4	63

PF 2 33 198 021

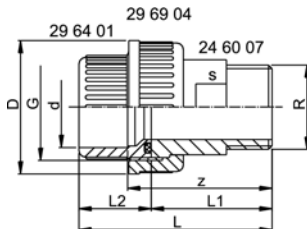
29 54 07

## Adaptor union ABS/stainless steel metric R



### Model:

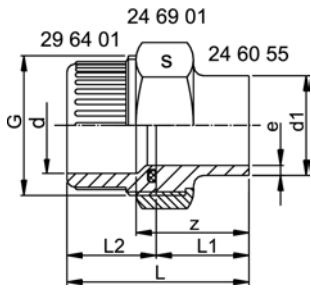
- Union End: Stainless Steel WN 1.4404 (316L), taper male thread R
- Union Bush: Solvent cement socket ABS metric
- Union Nut: ABS
- Gasket: O-ring EPDM No. 48 41 00



d [mm]	R [inch]	PN	EPDM Code	kg	z [mm]	D [mm]	L [mm]	L1 [mm]	L2 [mm]	G [inch]	s [mm]
16	3/8	10	<b>729 540 705</b>	0.073	40	35	54	30	24	3/4	19
20	1/2	10	<b>729 540 706</b>	0.126	44	43	60	34	26	1	24
25	3/4	10	<b>729 540 707</b>	0.174	46	51	65	36	29	1 1/4	32
32	1	10	<b>729 540 708</b>	0.262	50	58	72	40	33	1 1/2	37
40	1 1/4	10	<b>729 540 709</b>	0.476	58	74	84	46	39	2	48
50	1 1/2	10	<b>729 540 710</b>	0.535	62	83	93	48	46	2 1/4	54
63	2	10	<b>729 540 711</b>	0.931	73	100	111	55	58	2 3/4	69

PF 2 33 198 021

29 54 55



PF 2 33 198 021

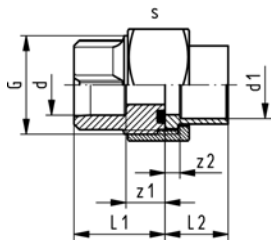
## Adaptor union ABS/stainless steel metric Welding end

### Model:

- Union End: Stainless Steel WN 1.4404 (316L) with welding end
- Union Bush: Solvent cement socket ABS metric
- Union Nut: Stainless Steel WN 1.4404 (316L)
- Gasket: O-ring EPDM No. 48 41 00

d [mm]	d1 [mm]	PN	EPDM Code	kg	z [mm]	L [mm]	L1 [mm]	L2 [mm]	e [mm]	G [inch]	s [mm]
16	17	10	729 545 505	0.101	28	42	18	24	1.6	3/4	32
20	21	10	729 545 506	0.176	32	48	22	26	2.0	1	41
25	27	10	729 545 507	0.204	33	52	23	29	2.0	1 1/4	46
32	34	10	729 545 508	0.313	36	58	26	33	2.0	1 1/2	55
40	42	10	729 545 509	0.493	38	64	26	39	2.0	2	68
50	48	10	729 545 510	0.566	42	73	28	46	2.0	2 1/4	74
63	60	10	729 545 511	0.902	50	88	32	58	2.6	2 3/4	88

20 51 01



PF 2 33 198 005

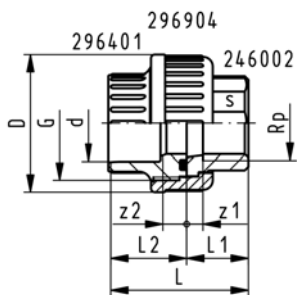
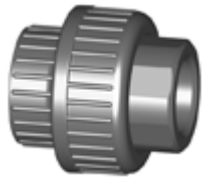
## Adaptor union ABS/copper for soldering metric

### Model:

- Union End: Copper
- Union Bush: Solvent cement socket ABS metric
- Union Nut: brass
- Gasket: O-ring EPDM No. 48 41 00

d [mm]	d1 [mm]	PN	Code	kg	L1 [mm]	L2 [mm]	z1 [mm]	z2 [mm]	G [inch]	s [mm]
16	18	10	720 510 105	0.079	25	17	11	4	3/4	32
20	22	10	720 510 106	0.140	26	19	9	3	1	40
25	28	10	720 510 107	0.269	29	28	9	6	1 1/4	50
32	35	10	720 510 108	0.198	33	27	10	5	1 1/2	52
40	42	10	720 510 109	0.350	39	35	12	6	2	66
50	54	10	720 510 110	0.438	46	46	14	3	2 1/4	72

29 53 03



PF 2 33 198 012

## Adaptor union ABS/malleable iron metric Rp

### Model:

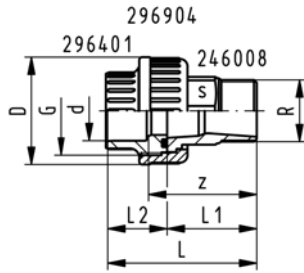
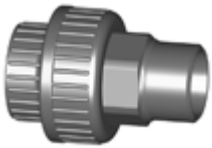
- Union Nut: ABS
- Union Bush: Solvent cement socket ABS metric
- Union End: malleable iron with parallel female thread Rp
- Gasket: O-Ring EPDM No. 48 41 00



d [mm]	Rp [inch]	PN* [bar]	Code	SP	kg	D [mm]	L [mm]	L1 [mm]	L2 [mm]	z1 [mm]	z2 [mm]	G [inch]	s [mm]
20	1/2	10	729 530 306	10	0.064	43	48	22	26	9	10	1	25
25	3/4	10	729 530 307	5	0.095	51	51	22	29	7	10	1 1/4	31
32	1	10	729 530 308	5	0.139	58	58	26	33	9	10	1 1/2	38
40	1 1/4	10	729 530 309	2	0.240	72	69	31	39	12	12	2	48
50	1 1/2	10	729 530 310	2	0.339	83	78	33	46	14	14	2 1/4	54
63	2	10	729 530 311	5	0.516	100	91	35	58	11	18	2 3/4	67



29 53 08



## Adaptor union ABS/malleable iron metric R



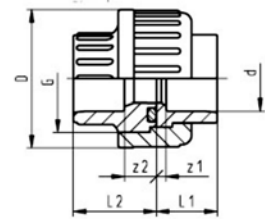
### Model:

- Union Nut: ABS
- Union Bush: Solvent cement socket ABS metric
- Union End: Malleable iron with taper male thread R
- Gasket: O-Ring EPDM No. 48 41 00

d	R	PN*	Code	SP	kg	D	L	L1	L2	z	G	s
[mm]	[inch]	[bar]				[mm]	[mm]	[mm]	[mm]	[mm]	[inch]	[mm]
20	½	10	729 530 806	10	0.100	43	66	40	26	50	1	25
25	¾	10	729 530 807	5	0.147	51	72	43	29	53	1 1/4	31
32	1	10	729 530 808	5	0.198	58	80	48	33	58	1 1/2	38
40	1 ¼	10	729 530 809	2	0.400	72	95	57	39	69	2	48
50	1 ½	10	729 530 810	2	0.490	83	104	59	46	73	2 1/4	54
63	2	10	729 530 811	8	0.675	100	118	62	58	80	2 3/4	67

PF 2 33 198 013

29 55 05



## Adaptor union ABS/brass metric Rp



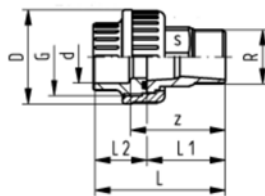
### Model:

- Union Nut: ABS
- Union Bush: Solvent cement socket ABS metric
- Union End: Brass with parallel female thread Rp
- Gasket: O-Ring EPDM No. 48 41 00

d	Rp	PN	Code	SP	kg	D	L	L1	L2	z1	z2	G	s
[mm]	[inch]					[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[inch]	[mm]
20	½	10	729 550 506	10	0.084	43	48	22	26	7	10	1	25
25	¾	10	729 550 507	5	0.134	51	54	25	29	9	11	1 1/4	30
32	1	10	729 550 508	5	0.179	58	60	27	33	8	11	1 1/2	36
40	1 ¼	10	729 550 509	2	0.327	72	70	31	39	10	13	2	48
50	1 ½	10	729 550 510	2	0.452	83	81	35	46	14	21	2 1/4	55
63	2	10	729 550 511	5	0.722	100	98	40	58	14	21	2 3/4	65

PF 2 33 198 015

29 55 09



## Adaptor union ABS/brass metric R



### Model:

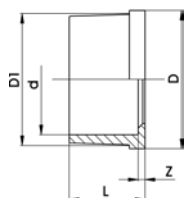
- Union Nut: ABS
- Union Bush: Solvent cement socket ABS metric
- Union End: Brass with taper male thread R
- Gasket: O-Ring EPDM No. 48 41 00

d	R	PN	Code	SP	kg	D	L	L1	L2	z	G	s
[mm]	[inch]					[mm]	[mm]	[mm]	[mm]	[mm]	[inch]	[mm]
20	½	10	729 550 906	10	0.123	43	63	37	26	47	1	25
25	½	10	729 550 957	5	0.185	51	66	37	29	48	1 1/4	30
25	¾	10	729 550 907	5	0.293	51	71	42	29	52	1 1/4	30
25	1	10	729 550 967	5	0.293	51	75	46	29	57	1 1/4	30
32	½	10	729 550 958	5	0.283	58	70	37	33	48	1 1/2	36
32	¾	10	729 550 968	5	0.283	58	75	42	33	53	1 1/2	36
32	1	10	729 550 908	5	0.374	58	79	46	33	57	1 1/2	36
40	1 ¼	10	729 550 909	2	0.503	72	91	52	39	65	2	46
50	2 ½	10	729 550 910	2	0.666	83	102	56	46	71	2 1/4	55
63	2	10	729 550 911	8	1.071	100	125	67	58	87	2 3/4	65

PF 2 33 198 016

# Union spare parts

29 60 01



## Union end ABS metric

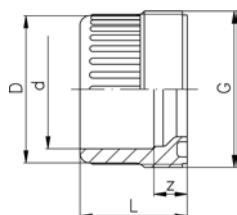
### Model:

- Solvent cement socket metric
- For adaptor unions 29 53 02, 29 53 07, 29 55 02, 29 55 07
- For union 29 51 01

d [mm]	PN	Code	kg	z [mm]	L [mm]	D [mm]	D1 [mm]	closest inch
16	10	<b>729 600 105</b>	0.004	5	19	24	22	¾
20	10	<b>729 600 106</b>	0.007	4	21	30	28	½
25	10	<b>729 600 107</b>	0.012	5	24	39	36	¾
32	10	<b>729 600 108</b>	0.016	5	27	44	41	1
40	10	<b>729 600 109</b>	0.042	3	31	57	53	1 ¼
50	10	<b>729 600 110</b>	0.045	3	34	63	59	1 ½
63	10	<b>729 600 111</b>	0.084	3	41	78	74	2
75	10	<b>729 600 162</b>	0.109	3	47	101	91	2 ½
90	10	<b>729 600 163</b>	0.178	5	56	121	108	3
110	10	<b>729 600 164</b>	0.295	5	66	146	131	4

PF 2 33 198 999

29 64 01



## Union bush ABS metric

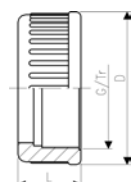
### Model:

- Solvent cement socket metric
- For union 29 51 01
- Jointing face: With O-Ring groove

d [mm]	PN	Code	kg	z [mm]	D [mm]	L [mm]	G/Tr	closest inch
16	10	<b>729 640 105</b>	0.008	10	24	24	3/4	¾
20	10	<b>729 640 106</b>	0.011	10	28	26	1	½
25	10	<b>729 640 107</b>	0.016	10	33	29	1 1/4	¾
32	10	<b>729 640 108</b>	0.027	10	41	33	1 1/2	1
40	10	<b>729 640 109</b>	0.046	12	50	39	2	1 ¼
50	10	<b>729 640 110</b>	0.058	14	62	46	2 1/4	1 ½
63	10	<b>729 640 111</b>	0.111	18	77	58	2 3/4	2
75	10	<b>729 640 112</b>	0.160	18	93	62	Tr108x5	2 ½
90	10	<b>729 640 123</b>	0.274	18	110	69	Tr128x5	3
110	10	<b>729 640 114</b>	0.330	11	133	72	Tr154x6	4

PF 2 33 198 999

29 69 04



## Union nut ABS

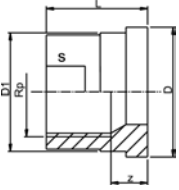
### Model:

- For union 23 51 01

d [mm]	PN	Code	SP	kg	D [mm]	L [mm]	d [mm]	G/Tr	closest inch
16	10	<b>729 690 405</b>	1	0.009	35	21		3/4	¾
20	10	<b>729 690 406</b>	-	0.014	43	23		1	½
25	10	<b>729 690 407</b>	-	0.018	53	25		1 1/4	¾
32	10	<b>729 690 408</b>	-	0.024	60	27		1 1/2	1
40	10	<b>729 690 409</b>	-	0.049	74	30		2	1 ¼
50	10	<b>729 690 410</b>	-	0.070	83	34		2 1/4	1 ½
63	10	<b>729 690 411</b>	-	0.101	103	38		2 3/4	2
75	10	<b>729 690 012</b>	-	0.188	135	40		Tr108x5	2 ½
90	10	<b>729 690 013</b>	-	0.267	158	43		Tr128x5	3
110	10	<b>729 690 014</b>	-	0.423	188	48		Tr154x6	4

PF 2 33 172 999

24 60 06



PF 2 30 153 999

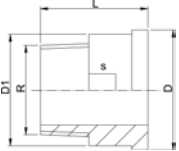
## Union end stainless steel Rp

### Model:

- Material: Stainless Steel 1.4404 (316L)
- Parallel female thread Rp

Rp [inch]	PN	Code	SP	kg	z [mm]	D [mm]	D1 [mm]	L [mm]	s [mm]
3/8	16	<b>724 600 655</b>	-	0.030	9	24	22	19	19
1/2	16	<b>724 600 656</b>	-	0.060	11	30	28	24	24
3/4	16	<b>724 600 657</b>	1	0.100	11	39	36	26	29
1	16	<b>724 600 658</b>	1	0.140	12	45	42	29	36
1 1/4	16	<b>724 600 659</b>	-	0.230	14	57	53	33	45
1 1/2	16	<b>724 600 660</b>	-	0.320	15	63	59	34	54
2	16	<b>724 600 661</b>	-	0.450	15	78	74	39	63

24 60 07



PF 2 30 153 999

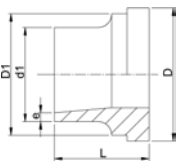
## Union end stainless steel R

### Model:

- Material: Stainless Steel 1.4404 (316L)
- Taper male thread R

R [inch]	PN	Code	SP	kg	D [mm]	D1 [mm]	L [mm]	s [mm]
3/8	16	<b>724 600 705</b>	-	0.050	24	22	30	19
1/2	16	<b>724 600 706</b>	-	0.090	30	28	34	24
3/4	16	<b>724 600 707</b>	-	0.120	39	36	36	32
1	16	<b>724 600 708</b>	-	0.190	45	42	40	37
1 1/4	16	<b>724 600 709</b>	-	0.350	57	53	46	48
1 1/2	16	<b>724 600 710</b>	-	0.400	63	59	48	54
2	16	<b>724 600 711</b>	-	0.660	78	74	55	69

24 60 55



PF 2 30 153 999

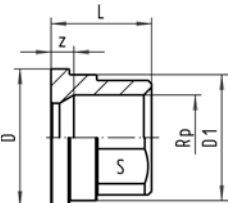
## Union end stainless steel Welding end

### Model:

- Material: Stainless Steel 1.4404 (316L)

d [mm]	d1 [mm]	PN	Code	SP	kg	D [mm]	D1 [mm]	L [mm]	e [mm]
16	17	16	<b>724 605 505</b>	-	0.030	24	22	18	1.6
20	21	16	<b>724 605 506</b>	-	0.050	30	28	22	2.0
25	26	16	<b>724 605 507</b>	-	0.080	39	36	23	2.0
32	33	16	<b>724 605 508</b>	-	0.110	45	42	26	2.0
40	42	16	<b>724 605 509</b>	-	0.190	57	53	26	2.0
50	48	16	<b>724 605 510</b>	-	0.220	63	59	28	2.0
63	60	16	<b>724 605 511</b>	-	0.370	78	74	32	2.6

20 60 02



PF 2 30 153 999

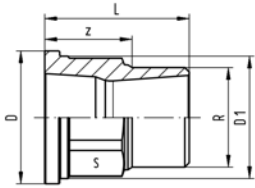
## Union end brass Rp

### Model:

- Union End: Brass with parallel female thread Rp

d [mm]	Rp [inch]	Code	SP	kg	D [mm]	D1 [mm]	z [mm]	L [mm]	s [mm]
20	1/2	<b>720 600 236</b>	1	0.059	30	28	5	22	25
25	3/4	<b>720 600 237</b>	1	0.100	39	36	6	25	30
32	1	<b>720 600 238</b>	1	0.128	45	42	6	27	36
40	1 1/4	<b>720 600 239</b>	1	0.232	56	53	7	31	46
50	1 1/2	<b>720 600 240</b>	1	0.324	62	59	7	35	55
63	2	<b>720 600 241</b>	1	0.510	78	74	8	40	65
75	2 1/2	<b>720 600 242</b>	1	0.941	100	92	10	47	85
90	3	<b>720 600 243</b>	1	1.395	121	110	11	52	95

## 20 60 02



PF 2 30 153 999

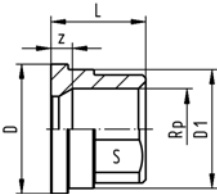
## Union end brass R

### Model:

- Union End: Brass with taper male thread R

d [mm]	R [inch]	Code	SP	kg	D [mm]	D1 [mm]	L [mm]	z [mm]	s [mm]
20	1/2	<b>720 600 246</b>	1	0.098	30	28	37	22	25
25	3/4	<b>720 600 247</b>	1	0.151	39	36	42	25	30
25	1/2	<b>720 600 257</b>	1	0.151	39	36	42	27	30
32	1	<b>720 600 248</b>	1	0.232	45	42	46	28	36
32	1/2	<b>720 600 258</b>	1	0.232	45	42	46	31	36
32	3/4	<b>720 600 268</b>	1	0.232	45	42	46	30	36
40	1 1/4	<b>720 600 249</b>	1	0.408	56	53	52	32	46
50	1 1/2	<b>720 600 250</b>	1	0.538	62	59	56	36	55
63	2	<b>720 600 251</b>	1	0.859	78	74	67	42	65
75	2 1/2	<b>720 600 252</b>	1	1.446	100	92	77	49	85
90	3	<b>720 600 253</b>	1	2.063	121	110	86	54	95

## 24 60 02



PF 2 30 153 999

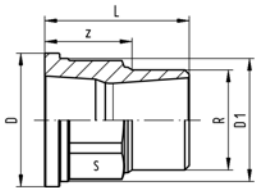
## Union end malleable iron galvanized Rp

### Model:

- Union End: malleable iron with parallel female thread Rp

d [mm]	Rp [inch]	PN	Code	SP	kg	D [mm]	D1 [mm]	L [mm]	z [mm]	s [mm]
20	1/2	16	<b>724 600 206</b>	100	0.058	30	27	22	9	25
25	3/4	16	<b>724 600 207</b>	-	0.096	39	36	22	7	31
32	1	16	<b>724 600 208</b>	120	0.127	44	41	26	9	38
32	1 1/4	16	<b>724 600 209</b>	-	0.204	56	52	31	12	48
50	1 1/2	16	<b>724 600 210</b>	1	0.268	62	58	33	14	54
63	2	16	<b>724 600 211</b>	-	0.443	78	73	35	11	67
75	2 1/2	16	<b>724 600 212</b>	35	0.737	100	92	39	12	85
90	3	16	<b>724 600 213</b>	-	0.913	121	110	45	15	96

## 24 60 08



PF 2 30 153 999

## Union end malleable iron galvanized R

### Model:

- Union End: Malleable iron with taper male thread R

d [mm]	R [inch]	Code	SP	kg	D [mm]	D1 [mm]	L [mm]	z [mm]	s [mm]
20	1/2	<b>724 600 806</b>	200	0.085	30	27	40	25	23
25	3/4	<b>724 600 807</b>	120	0.147	39	36	43	27	30
32	1	<b>724 600 808</b>	-	0.210	44	41	48	29	36
40	1 1/4	<b>724 600 809</b>	-	0.315	56	52	57	36	48
50	1 1/2	<b>724 600 810</b>	-	0.411	62	58	59	37	54
63	2	<b>724 600 811</b>	15	0.665	78	73	62	36	66
75	2 1/2	<b>724 600 812</b>	-	0.897	100	92	75	45	85
90	3	<b>724 600 813</b>	-	1.146	121	110	80	47	95

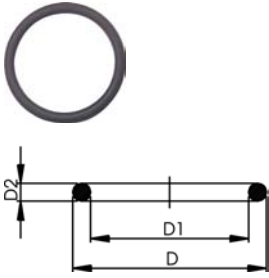
EPDM 48 41 00  
FPM 49 41 00

## O-Ring gasket

### Model:

- For unions and adaptor unions
- Hardness approx. 65° Shore
- EPDM minimum temperature -40°C
- FPM minimum temperature -15°C

\* for unions PVC-U, PVC-C and ABS: 21 51 01, 21 51 11, 21 53 03, 21 53 08, 21 55 04, 21 55 13, 21 55 18, 23 51 01 and 29 51 01 only



d [mm]	DN [mm]	EPDM Code	FPM Code	SP	kg	D [mm]	D1 [mm]	D2 [mm]	closest inch
10 - 12	8	<b>748 410 004</b>	<b>749 410 004</b>	-	0.002	18	12	2.62	¼
16	10	<b>748 410 005</b>	<b>749 410 005</b>	-	0.002	21	16	2.62	⅜
20	15	<b>748 410 006</b>	<b>749 410 006</b>	-	0.002	27	20	3.53	½
25	20	<b>748 410 007</b>	<b>749 410 007</b>	100	0.002	35	28	3.53	¾
32	25	<b>748 410 008</b>	<b>749 410 008</b>	100	0.002	40	33	3.53	1
40	32	<b>748 410 009</b>	<b>749 410 009</b>	-	0.006	51	41	5.34	1 ¼
50	40	<b>748 410 010</b>	<b>749 410 010</b>	-	0.007	58	47	5.34	1 ½
63	50	<b>748 410 011</b>	<b>749 410 011</b>	100	0.010	70	60	5.34	2
75	65	<b>748 410 014</b>	<b>749 410 014</b>	100	0.012	93	82	5.34	2 ½
90	80	<b>748 410 015</b>	<b>749 410 015</b>	100	0.015	112	101	5.34	3
* 90	80	<b>748 410 248</b>	<b>749 410 248</b>	1	0.020	105	95	5.34	3
110	100	<b>748 410 016</b>	<b>749 410 016</b>	50	0.031	134	120	6.99	4

PF 2 31 800 999

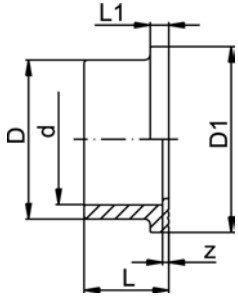
# Flange adaptor

29 79 01

## Flange adaptor ABS metric

**Model:**

- Flat sealing faces/serrated
- Counter part: Same flange adaptor
- Gasket: Profile flange gasket EPDM No. 48 44 07, FPM No. 49 44 07
- Gasket: Flat gasket EPDM No. 48 40 03
- >d225 - maximum operating temperature: +40°C



d [mm]	DN [mm]	d [inch]	PN	Code	SP	kg	z [mm]	D [mm]	D1 [mm]	L [mm]	L1 [mm]	closest inch
20	15		10	<b>729 790 106</b>	10	0.008	3	27	34	21	6	½
25	20		10	<b>729 790 107</b>	10	0.012	3	33	41	24	7	¾
32	25		10	<b>729 790 108</b>	10	0.020	3	41	50	27	7	1
40	32		10	<b>729 790 109</b>	10	0.058	3	50	61	30	8	1 ¼
50	40		10	<b>729 790 110</b>	10	0.058	3	61	73	34	8	1 ½
63	50		10	<b>729 790 111</b>	10	0.074	3	76	90	41	9	2
75	65	2 ½	10	<b>729 790 112</b>	10	0.118	3	91	106	47	10	2 ½
90	80		10	<b>729 790 113</b>	10	0.187	5	108	125	56	11	3
110	100		10	<b>729 790 114</b>	10	0.300	5	131	150	66	12	4
140	125	5	10	<b>729 790 116</b>	6	0.567	5	165	188	81	14	5
160	150		10	<b>729 790 117</b>	2	0.800	5	188	213	91	16	6
200	200		10	<b>729 790 119</b>	2	1.120	6	224	250	112	24	8
225	200		10	<b>729 790 120</b>	2	1.300	6	248	274	125	25	8
250	250		6	<b>729 790 121</b>	-	1.000	9	274	303	140	23	9
280	250		6	<b>729 790 122</b>	1	2.161	5	307	329	151	23	10
315	300		6	<b>729 790 123</b>	1	3.321	8	346	379	172	27	12

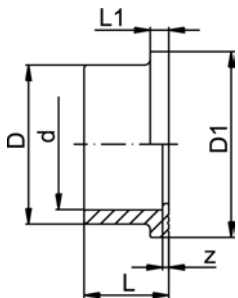
PF 2 33 198 019

29 79 11

## Flange adaptor ABS Combined jointing face flat and serrated Inch BS

**Model:**














- Gasket: Flange Gasket EPDM No. 48 40 01, FPM No. 49 40 01









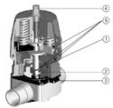







d [inch]	PN	Code	SP	kg	D1 [mm]	D [mm]	L [mm]	L1 [mm]	z [mm]
½	15	<b>729 791 106</b>	10	0.007	34	27	21	6	3
¾	15	<b>729 791 107</b>	-	0.011	41	33	24	7	3
1	15	<b>729 791 108</b>	-	0.018	50	41	27	7	3
1 ¼	15	<b>729 791 109</b>	10	0.027	61	50	32	8	3
1 ½	15	<b>729 791 110</b>	10	0.050	73	61	33	8	3
2	15	<b>729 791 111</b>	5	0.078	90	77	40	9	3
2 ½	10	<b>729 790 112</b>	10	0.118	106	91	47	10	3
3	15	<b>729 791 113</b>	10	0.187	125	108	56	11	5
4	15	<b>729 791 115</b>	10	0.309	155	136	69	12	5
5	10	<b>729 790 116</b>	6	0.567	188	165	81	14	5
6	12	<b>729 791 117</b>	2	0.912	217	198	96	16	5
8	9	<b>729 791 120</b>	2	1.449	274	248	122	20	6




PF 2 33 172 012

# ABS metric Valves

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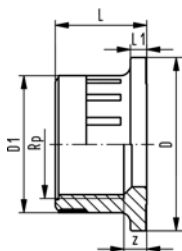
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# Valve ends ball valve type 546 and 543

## Valve end 546 and 543 ABS (G23) With threaded socket Rp reinforced



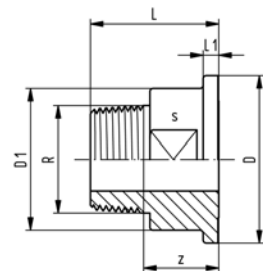
PF 2 33 542 999

### Model:

- Connection to plastic or metal threads
- Reinforcing ring stainless (A2)
- Do not use thread sealing pastes that are harmful to ABS

Rp [inch]	PN	Code	kg	D [mm]	D1 [mm]	L [mm]	L1 [mm]	z [mm]
3/8	16	<b>169 480 925</b>	0.008	38	24	20	4	7
1/2	16	<b>169 480 926</b>	0.010	38	28	22	4	6
3/4	16	<b>169 480 927</b>	0.014	44	34	25	5	7
1	16	<b>169 480 928</b>	0.023	53	42	28	5	7
1 1/4	16	<b>169 480 929</b>	0.035	65	52	30	5	7
1 1/2	16	<b>169 480 930</b>	0.060	77	63	32	6	9
2	16	<b>169 480 931</b>	0.110	99	78	38	7	10

## Valve end 546 and 543 brass With threaded spigot R



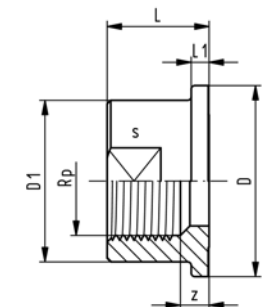
PF 2 33 542 999

### Model:

- Connection to metal threads

Inch	Code	kg	D [mm]	D1 [mm]	D2 [mm]	z [mm]	L [mm]	L1 [mm]	s [mm]
1/2	<b>161 486 640</b>	0.160	38	32	13	23	36	4	30
3/4	<b>161 486 641</b>	0.220	44	38	16	22	36	5	36
1	<b>161 486 642</b>	0.350	53	45	20	24	41	5	41

## Valve end 546 and 543 brass With threaded socket Rp



PF 2 33 542 999

### Model:

- Connection to metal threads

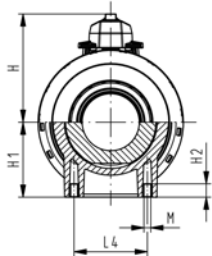
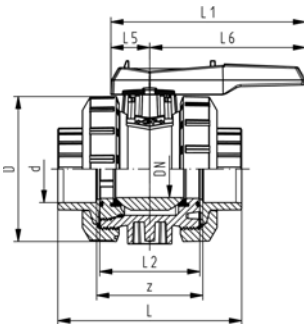
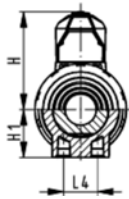
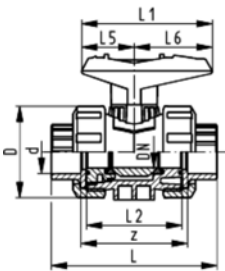
Inch	Code	kg	D [mm]	D1 [mm]	D2 [mm]	z [mm]	L [mm]	L1 [mm]	s [mm]
1/2	<b>161 486 651</b>	0.100	38	32	15	5	20	4	30
3/4	<b>161 486 652</b>	0.160	44	38	20	8	25	5	36
1	<b>161 486 653</b>	0.250	53	45	25	10	29	5	41

# Ball valves

## Ball valve type 546 ABS With solvent cement sockets metric



DN10/15 - 50



### Model:

- For easy installation and removal
- z-dimension, valve end and union nut are **not compatible** with type 346 (DN10/15-50) resp. type 370 (DN65-100)
- Ball seals PTFE
- Without mounting inserts

### Option:

- Individual configuration of the valve (see diagram)
- Multifunctional module with integrated limit switches
- Pneumatic or electric actuators from +GF+

d [mm]	DN [mm]	PN	kv-value ( $\Delta p=1$ bar) [l/min]	EPDM Code	kg
16	10	10	71	<b>169 546 001</b>	0.112
20	15	10	185	<b>169 546 002</b>	0.114
25	20	10	350	<b>169 546 003</b>	0.178
32	25	10	700	<b>169 546 004</b>	0.258
40	32	10	1000	<b>169 546 005</b>	0.457
50	40	10	1600	<b>169 546 006</b>	0.642
63	50	10	3100	<b>169 546 007</b>	1.175
75	65	10	5000	<b>169 546 008</b>	3.900
90	80	10	7000	<b>169 546 009</b>	5.700
110	100	10	11000	<b>169 546 010</b>	9.100

d [mm]	D [mm]	H [mm]	H1 [mm]	L [mm]	L1 [mm]	L2 [mm]	L4 [mm]	L5 [mm]	L6 [mm]	z [mm]	closest inch
16	50	57	27	92	77	56	25	32	45	64	3/8
20	50	57	27	95	77	56	25	32	45	64	1/2
25	58	67	30	110	97	65	25	39	58	72	3/4
32	68	73	36	123	97	71	25	39	58	79	1
40	84	90	44	146	128	85	45	54	74	94	1 1/4
50	97	97	51	157	128	89	45	54	74	95	1 1/2
63	124	116	64	183	152	101	45	66	87	107	2
75	166	149	85	233	270	136	70	64	206	144	2 1/2
90	200	161	105	254	270	141	70	64	206	151	3
110	238	178	123	301	320	164	120	64	256	174	4

PF 2 33 542 801



DN10/15 - 50



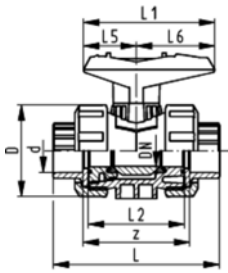
## Ball valve type 546 ABS With mounting inserts With solvent cement sockets metric

### Model:

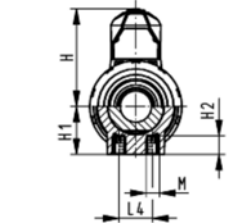
- For easy installation and removal
- Ball seals PTFE
- Integrated stainless steel mounting inserts
- z-dimension, valve end and union nut are **not compatible** with type 346 (DN10/15-50) resp. type 370 (DN65-100)

### Option:

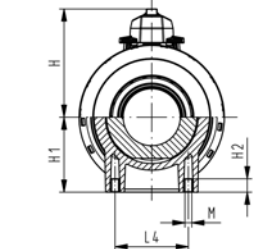
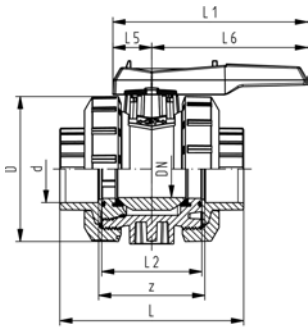
- Individual configuration of the valve (see diagram)
- Multifunctional module with integrated limit switches
- Pneumatic or electric actuators from +GF+



d [mm]	DN [mm]	PN	kv-value ( $\Delta p=1$ bar) [l/min]	EPDM Code	kg
16	10	10	71	<b>169 546 061</b>	0.112
20	15	10	185	<b>169 546 062</b>	0.114
25	20	10	350	<b>169 546 063</b>	0.178
32	25	10	700	<b>169 546 064</b>	0.258
40	32	10	1000	<b>169 546 065</b>	0.457
50	40	10	1600	<b>169 546 066</b>	0.642
63	50	10	3100	<b>169 546 067</b>	1.175
75	65	10	5000	<b>169 546 068</b>	3.900
90	80	10	7000	<b>169 546 069</b>	5.700
110	100	10	11000	<b>169 546 070</b>	9.100



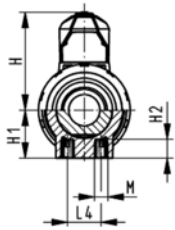
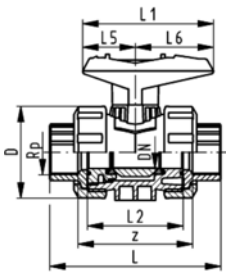
d [mm]	D [mm]	H [mm]	H1 [mm]	H2 [mm]	L [mm]	L1 [mm]	L2 [mm]	L4 [mm]	L5 [mm]	L6 [mm]	M	z [mm]	closest inch
16	50	57	27	12	92	77	56	25	32	45	M6	64	3/4
20	50	57	27	12	95	77	56	25	32	45	M6	64	1/2
25	58	67	30	12	110	97	65	25	39	58	M6	72	3/4
32	68	73	36	12	123	97	71	25	39	58	M6	79	1
40	84	90	44	15	146	128	85	45	54	74	M8	94	1 1/4
50	97	97	51	15	157	128	89	45	54	74	M8	95	1 1/2
63	124	116	64	15	183	152	101	45	66	87	M8	107	2
75	166	149	85	15	233	270	136	70	64	206	M8	144	2 1/2
90	200	161	105	15	254	270	141	70	64	206	M8	151	3
110	238	178	123	22	301	320	164	120	64	256	M12	174	4



PF 2 33 542 801



DN10/15 - 50



## Ball valve type 546 ABS With mounting inserts With threaded sockets Rp

### Model:

- For easy installation and removal
- Ball seals PTFE
- Integrated stainless steel mounting inserts
- z-dimension, valve end and union nut are not compatible with type 346

### Option:

- Individual configuration of the valve (see diagram)
- Multifunctional module with integrated limit switches
- Pneumatic or electric actuators from +GF+

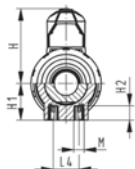
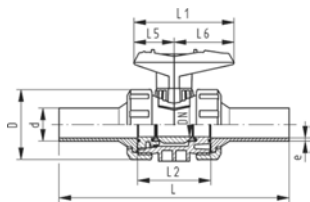
Rp [inch]	DN [mm]	PN	kv-value ( $\Delta p=1$ bar) [l/min]	EPDM Code	kg
3/8	10	10	71	<b>169 546 021</b>	0.112
1/2	15	10	185	<b>169 546 022</b>	0.114
3/4	20	10	350	<b>169 546 023</b>	0.178
1	25	10	700	<b>169 546 024</b>	0.258
1 1/4	32	10	1000	<b>169 546 025</b>	0.457
1 1/2	40	10	1600	<b>169 546 026</b>	0.642
2	50	10	3100	<b>169 546 027</b>	1.175

Rp [inch]	D [mm]	H [mm]	H1 [mm]	H2 [mm]	L [mm]	L1 [mm]	L2 [mm]	L4 [mm]	L5 [mm]	L6 [mm]	M	z [mm]
3/8	50	57	27	12	95	77	56	25	32	45	M6	69
1/2	50	57	27	12	100	77	56	25	32	45	M6	67
3/4	58	67	30	12	114	97	65	25	39	58	M6	78
1	68	73	36	12	127	97	71	25	39	58	M6	85
1 1/4	84	90	44	15	146	128	85	45	54	74	M8	100
1 1/2	97	97	51	15	152	128	89	45	54	74	M8	106
2	124	116	64	15	177	152	101	45	66	87	M8	121

PF 2 33 542 801



DN10/15 - 50



## Ball valve type 546 ABS With mounting inserts With butt fusion spigots long PE100 SDR11 metric

### Model:

- For easy installation and removal
- Ball seals PTFE
- Integrated stainless steel mounting inserts
- z-dimension, valve end and union nut are **not compatible** with type 346 (DN10/15-50) resp. type 370 (DN65-100)

### Option:

- Individual configuration of the valve (see diagram)
- Multifunctional module with integrated limit switches
- Pneumatic or electric actuators from +GF+

d [mm]	DN [mm]	PN	kv-value ( $\Delta p=1$ bar) [l/min]	EPDM Code	kg
20	15	10	185	<b>800 024 832</b>	0.150
25	20	10	350	<b>800 024 834</b>	0.220
32	25	10	700	<b>800 015 141</b>	0.310
40	32	10	1000	<b>800 015 142</b>	0.530
50	40	10	1600	<b>800 015 179</b>	0.740
63	50	10	3100	<b>800 015 143</b>	1.370

d [mm]	D [mm]	H [mm]	H1 [mm]	H2 [mm]	L [mm]	L1 [mm]	L2 [mm]	L4 [mm]	L5 [mm]	L6 [mm]	M	e [mm]	closest inch
20	50	57	27	12	193	77	56	25	32	45	M6	2,25	1/2
25	58	67	30	12	216	97	65	25	39	58	M6	2,3	3/4
32	68	73	36	12	223	97	71	25	39	58	M6	2,9	1
40	84	90	44	15	249	128	85	45	54	74	M8	3,7	1 1/4
50	97	97	51	15	271	128	89	45	54	74	M8	4,6	1 1/2
63	124	116	64	15	321	152	101	45	66	87	M8	5,8	2

PF 2 33 542 604



DN10/15 - 50



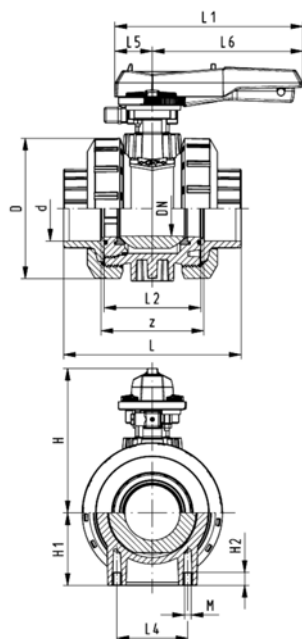
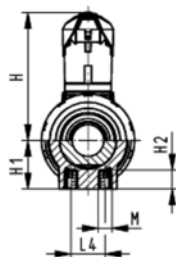
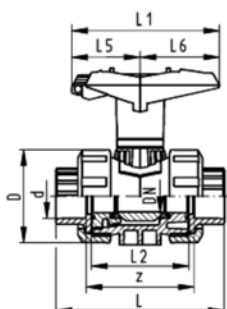
## Ball valve type 546 ABS With lockable handle With solvent cement sockets metric

### Model:

- For easy installation and removal
- Ball seals PTFE
- Integrated stainless steel mounting inserts
- z-dimension, valve end and union nut are **not compatible** with type 346 (DN10/15-50) resp. type 370 (DN65-100)
- Lockable hand lever with ratchet settings

### Option:

- Individual configuration of the valve (see diagram)
- Multifunctional module with integrated limit switches
- Pneumatic or electric actuators from +GF+



d [mm]	DN [mm]	PN	kv-value ( $\Delta p=1$ bar) [l/min]	EPDM Code	kg
16	10	10	71	169 546 081	0.121
20	15	10	185	169 546 082	0.123
25	20	10	350	169 546 083	0.193
32	25	10	700	169 546 084	0.273
40	32	10	1000	169 546 085	0.480
50	40	10	1600	169 546 086	0.665
63	50	10	3100	169 546 087	1.205
75	65	10	5000	169 546 088	4.200
90	80	10	7000	169 546 089	6.100
110	100	10	11000	169 546 090	9.400

d [mm]	D [mm]	H [mm]	H1 [mm]	H2 [mm]	L [mm]	L1 [mm]	L2 [mm]	L4 [mm]	L5 [mm]	L6 [mm]	M	z [mm]	closest inch
16	50	79	27	12	92	87	56	25	42	45	M6	64	3/8
20	50	79	27	12	95	87	56	25	42	45	M6	64	1/2
25	58	88	30	12	110	108	65	25	50	58	M6	72	3/4
32	68	94	36	12	123	108	71	25	50	58	M6	79	1
40	84	113	44	15	146	140	85	45	66	75	M8	94	1 1/4
50	97	119	51	15	157	140	89	45	66	75	M8	95	1 1/2
63	124	141	64	15	183	165	101	45	78	87	M8	107	2
75	166	224	85	15	233	270	136	70	64	206	M8	144	2 1/2
90	200	235	105	15	254	270	141	70	64	206	M8	151	3
110	238	245	123	22	301	320	164	120	64	256	M12	174	4

PF 2 33 542 801

# Butterfly valves

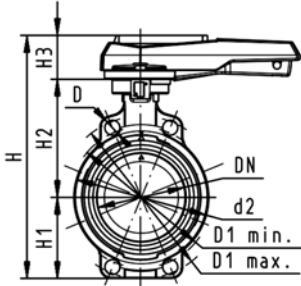
## Butterfly valve type 567 ABS Hand lever with ratchet settings



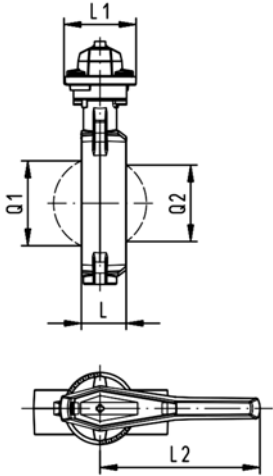
### Model:

- Connecting dimension: ISO 7005 PN 10, EN 1092 PN 10, DIN 2501 PN 10, ANSI/ASME B 16.5 Class 150, BS 1560: 1989, BS 4504, JIS B 2220
- Overall length according to EN 558, ISO 5752

d [mm]	DN [mm]	PN	kv-value ( $\Delta p=1$ bar) [l/min]	EPDM Code	kg
63	50	10	1470	<b>169 567 002</b>	1.400
75	65	10	2200	<b>169 567 003</b>	1.150
90	80	10	3000	<b>169 567 004</b>	1.221
110	100	10	6500	<b>169 567 005</b>	1.805
140	125	10	11500	<b>169 567 006</b>	2.536
160	150	10	16600	<b>169 567 007</b>	3.128
225	200	10	39600	<b>169 567 008</b>	4.936



d [mm]	D [mm]	D1 min. [mm]	D1 max. [mm]	d2 [mm]	H [mm]	H1 [mm]	H2 [mm]	H3 [mm]	L [mm]	L1 [mm]	L2 [mm]	Q1 [mm]	Q2 [mm]	closest inch
63	19	120.0	125.0	104	264	77	134	54	45	106	205	40		2
75	19	139.7	145.0	115	277	83	140	54	46	106	205	54	35	2 ½
90	19	150.0	160.0	131	289	89	146	54	49	106	205	67	50	3
110	19	175.0	190.5	161	325	104	167	55	56	106	255	88	74	4
140	23	210.0	215.9	187	352	117	181	55	64	106	255	113	97	5
160	24	241.3	241.3	215	373	130	189	55	72	106	255	139	123	6
225	23	290.0	295.0	267	435	158	210	67	73	140	408	178	169	8



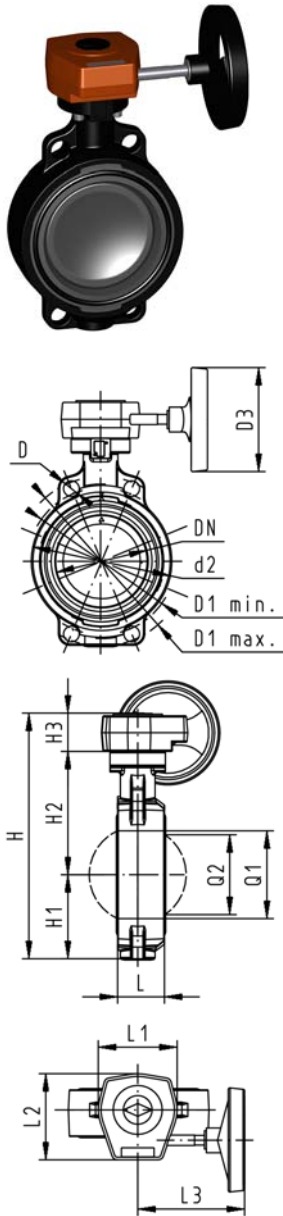
PF 2 33 564 001



# Butterfly valve type 567 ABS Reduction gear with handwheel

## Model:

- Connecting dimension: ISO 7005 PN 10, EN 1092 PN 10, DIN 2501 PN 10, ANSI/ASME B 16.5 Class 150, BS 1560: 1989, BS 4504, JIS B 2220
- Overall length according to EN 558, ISO 5752



d [mm]	DN [mm]	PN	kv-value ( $\Delta p=1$ bar) [l/min]	EPDM Code	kg
63	50	10	1470	<b>169 567 022</b>	3.078
75	65	10	2200	<b>169 567 023</b>	3.201
90	80	10	3000	<b>169 567 024</b>	3.259
110	100	10	6500	<b>169 567 025</b>	3.795
140	125	10	11500	<b>169 567 026</b>	4.526
160	150	10	16600	<b>169 567 027</b>	5.118
225	200	10	39600	<b>169 567 028</b>	6.389

d [mm]	D [mm]	D1 min. [mm]	D1 max. [mm]	d2 [mm]	D3 [mm]	H [mm]	H1 [mm]	H2 [mm]	H3 [mm]	L [mm]	L1 [mm]	L2 [mm]	L3 [mm]	Q1 [mm]
63	19	120.0	125.0	104	150	278	77	134	50	45	110	120	155	40
75	19	139.7	145.0	115	150	291	83	140	50	46	110	120	155	54
90	19	150.0	160.0	131	150	303	89	146	50	49	110	120	155	67
110	19	175.0	190.5	160	150	339	104	167	50	56	110	120	155	88
140	23	210.0	215.9	187	150	365	117	181	50	64	110	120	155	113
160	24	241.3	241.3	215	150	387	130	189	50	72	110	120	155	139
225	23	290.0	295.0	267	150	436	158	210	50	73	110	120	155	178

d [mm]	Q2 [mm]	closest inch
63		2
75	35	2 ½
90	50	3
110	74	4
140	97	5
160	123	6
225	169	8

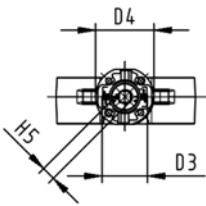
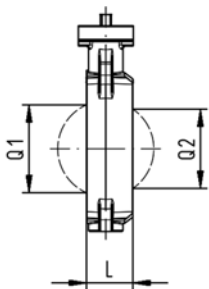
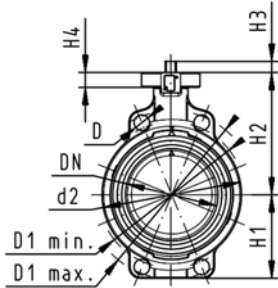
PF 2 33 564 003



## Butterfly valve type 567 ABS Bare shaft

### Model:

- Connecting dimension: ISO 7005 PN 10, EN 1092 PN 10, DIN 2501 PN 10, ANSI/ASME B 16.5 Class 150, BS 1560: 1989, BS 4504, JIS B 2220
- Overall length according to EN 558, ISO 5752
- Interface F07 according to DIN/ISO 5211



d [mm]	DN [mm]	PN	kv-value ( $\Delta p=1$ bar) [l/min]	EPDM Code	kg
63	50	10	1470	<b>169 567 802</b>	0.763
75	65	10	2200	<b>169 567 803</b>	0.859
90	80	10	3000	<b>169 567 804</b>	0.999
110	100	10	6500	<b>169 567 805</b>	1.535
140	125	10	11500	<b>169 567 806</b>	2.018
160	150	10	16600	<b>169 567 807</b>	2.858
225	200	10	39600	<b>169 567 808</b>	4.129

d [mm]	D [mm]	D1 min. [mm]	D1 max. [mm]	d2 [mm]	D3 [mm]	D4 [mm]	H [mm]	H1 [mm]	H2 [mm]	H3 [mm]	H4 [mm]	H5 [mm]	L [mm]	Q1 [mm]	Q2 [mm]
63	19	120.0	125.0	104	70	90	222	77	134	27	23	11	45	40	
75	19	139.7	145.0	115	70	90	235	83	140	27	23	11	46	54	35
90	19	150.0	160.0	131	70	90	247	89	146	27	23	11	49	67	50
110	19	175.0	190.5	161	70	90	287	104	167	16	23	14	56	88	74
140	23	210.0	215.9	187	70	90	313	117	181	16	23	14	64	113	97
160	24	241.3	241.3	215	70	90	335	130	189	19	23	17	72	139	123
225	23	290.0	295.0	267	70	90	387	158	210	19	23	17	73	178	169

d [mm]	closest inch
63	2
75	2 ½
90	3
110	4
140	5
160	6
225	8

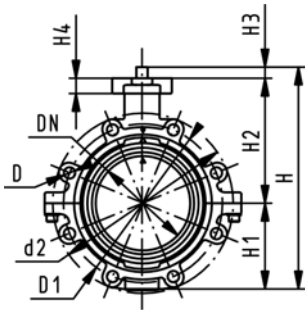
PF 2 33 564 998

# Lugstyle butterfly valve type 568 ABS Bare shaft

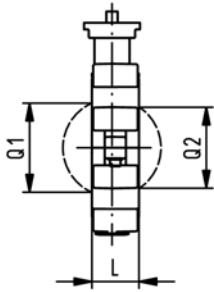


## Model:

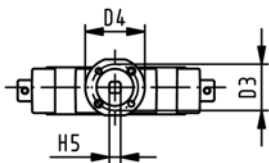
- Outer body in GGG-40.3 epoxy-coated
- Connecting dimension: ISO 7005 PN10, EN 1092 PN10, DIN 2501 PN10
- Overall length according to EN 558, ISO 5752
- Interface F07 according to DIN/ISO 5211



d [mm]	DN [mm]	PN	kv-value ( $\Delta p=1$ bar) [l/min]	EPDM Code	kg
63	50	10	1470	<b>169 568 802</b>	2.853
75	65	10	2200	<b>169 568 803</b>	3.200
90	80	10	3000	<b>169 568 804</b>	4.217
110	100	10	6500	<b>169 568 805</b>	5.633
140	125	10	11500	<b>169 568 806</b>	7.502
160	150	10	16600	<b>169 568 807</b>	9.341
225	200	10	39600	<b>169 568 808</b>	14.105



d [mm]	d2 [mm]	D	D1 [mm]	D3 [mm]	D4 [mm]	H [mm]	H1 [mm]	H2 [mm]	H3 [mm]	H4 [mm]	L [mm]	Q1 [mm]	Q2 [mm]	closest inch
63	150	M16	125	70	90	222	77	134	27	23	45	40		2
75	170	M16	145	70	90	235	83	140	27	23	46	54	35	2 1/2
90	184	M16	160	70	90	247	89	146	27	23	49	67	50	3
110	216	M16	180	70	90	287	104	167	16	23	56	88	74	4
140	246	M16	210	70	90	313	117	181	16	23	64	113	97	5
160	273	M20	240	70	90	335	130	189	19	23	72	139	123	6
225	334	M20	295	70	90	387	158	210	19	23	73	178	169	8



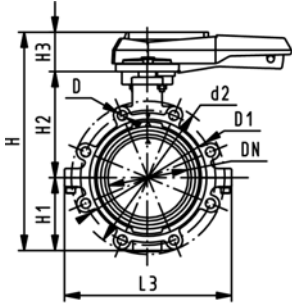
PF 2 33 565 998



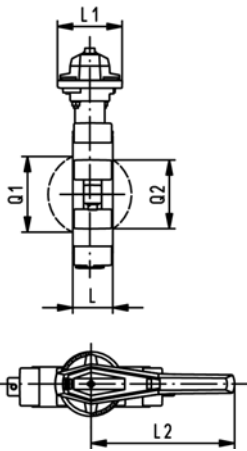
## Lugstyle butterfly valve type 568 ABS Hand lever with ratchet settings

### Model:

- Outer body in GGG-40.3 epoxy-coated
- Connecting dimension: ISO 7005 PN10, EN 1092 PN10, DIN 2501 PN10
- Overall length according to EN 558, ISO 5752



d [mm]	DN [mm]	PN	kv-value ( $\Delta p=1$ bar) [l/min]	EPDM Code	kg
63	50	10	1470	<b>169 568 002</b>	3.075
75	65	10	2200	<b>169 568 003</b>	3.422
90	80	10	3000	<b>169 568 004</b>	4.439
110	100	10	6500	<b>169 568 005</b>	5.903
140	125	10	11500	<b>169 568 006</b>	7.772
160	150	10	16600	<b>169 568 007</b>	9.611
225	200	10	39600	<b>169 568 008</b>	14.912



d [mm]	d2 [mm]	D	D1 [mm]	H [mm]	H1 [mm]	H2 [mm]	H3 [mm]	L [mm]	L1 [mm]	L2 [mm]	L3 [mm]	Q1 [mm]	Q2 [mm]	closest inch
63	150	M16	125	265	77	134	54	45	106	205	150	40		2
75	170	M16	145	277	83	140	54	46	106	205	160	54	35	2 1/2
90	184	M16	160	289	89	146	54	49	106	205	205	67	50	3
110	216	M16	180	326	104	167	55	56	106	255	244	88	74	4
140	246	M16	210	353	117	181	55	64	106	255	272	113	97	5
160	273	M20	240	374	130	189	55	72	106	255	297	139	123	6
225	334	M20	295	435	158	210	67	73	140	408	360	178	169	8

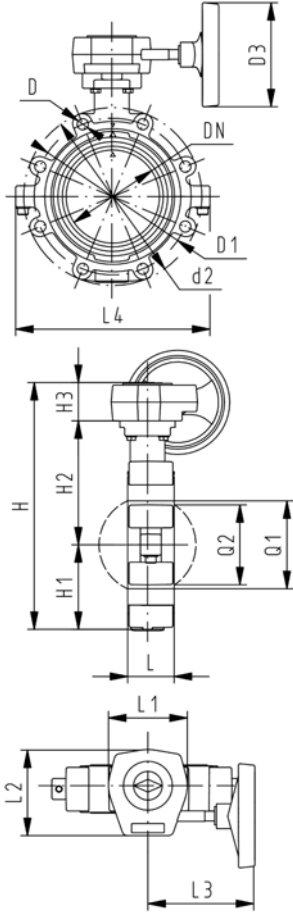
PF 2 33 565 001

# Lugstyle butterfly valve type 568 ABS

## Reduction gear with handwheel

### Model:

- Outer body in GGG-40.3 epoxy-coated
- Connecting dimension: ISO 7005 PN10, EN 1092 PN10, DIN 2501 PN10
- Overall length according to EN 558, ISO 5752



d [mm]	DN [mm]	PN	kv-value ( $\Delta p=1$ bar) [l/min]	EPDM Code	kg
63	50	10	1470	<b>169 568 022</b>	5.113
75	65	10	2200	<b>169 568 023</b>	5.460
90	80	10	3000	<b>169 568 024</b>	6.477
110	100	10	6500	<b>169 568 025</b>	7.893
140	125	10	11500	<b>169 568 026</b>	9.762
160	150	10	16600	<b>169 568 027</b>	11.601
225	200	10	39600	<b>169 568 028</b>	16.365

d [mm]	d2 [mm]	D	D1 [mm]	D3 [mm]	H [mm]	H1 [mm]	H2 [mm]	H3 [mm]	L [mm]	L1 [mm]	L2 [mm]	L3 [mm]	L4 [mm]	Q1 [mm]
63	150	M16	125	150	279	77	134	50	45	110	120	155	150	40
75	170	M16	145	150	291	83	140	50	46	110	120	155	160	54
90	184	M16	160	150	303	89	146	50	49	110	120	155	205	67
110	216	M16	180	150	339	104	167	50	56	110	120	155	244	88
140	246	M16	210	150	366	117	181	50	64	110	120	155	272	113
160	273	M20	240	150	387	130	189	50	72	110	120	155	297	139
225	334	M20	295	150	436	158	210	50	73	110	120	155	360	178

d [mm]	Q2 [mm]	closest inch
63		2
75	35	2 ½
90	50	3
110	74	4
140	97	5
160	123	6
225	169	8

PF 2 33 565 003





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## Diaphragm valve type 317 ABS With flanges metric

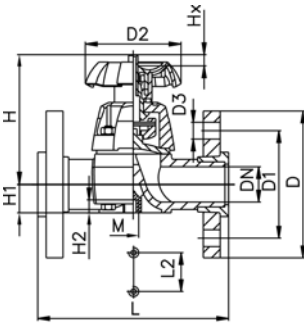
### Model:

- Overall length according to EN 558
- Flat sealing faces
- Other dimensions available on request
- DN 80-150 with fixed flange
- Minimum temperature: - 30°C

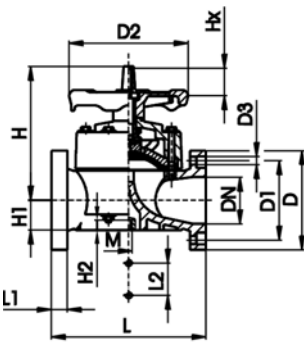
### Option:

- Handwheel lockable DN15-65 (basic version not lockable)

### \* DN80 and DN150 fixed flanges metric and Inch ANSI B16.5



DN 15-65



DN 80-100

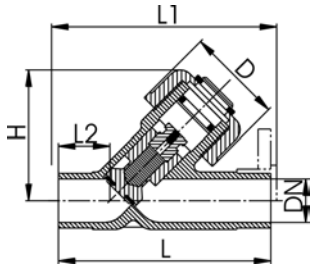
PF 2 33 174 008

d [mm]	DN [mm]	PN	kv-value ( $\Delta p=1$ bar) [l/min]	EPDM Code	PTFE/EPDM Code	kg	
75	65	10	992	<b>169 317 423</b>	<b>169 317 038</b>	5.000	
* 90	80	10	1700	<b>169 317 024</b>	<b>169 317 039</b>	8.350	
110	100	10	2700	<b>169 317 025</b>	<b>169 317 040</b>	11.600	

d [mm]	D [mm]	D1 [mm]	D2 [mm]	D3 [mm]	L [mm]	L1 [mm]	L2 [mm]	H [mm]	H1 [mm]	H2 [mm]	M	AL	Lift = Hx [mm]	closest inch
75	185	145	152	18	290		70	201	46	15	M8	4	30	2 ½
* 90	200	160	270	18	310	35	120	265	57	23	M12	8	40	3
110	225	180	270	18	350	35	120	304	69	23	M12	8	50	4

# Angle seat check valves

## Angle seat check valve type 303 ABS With solvent cement spigots metric



PF 2 33 199 005

### Model:

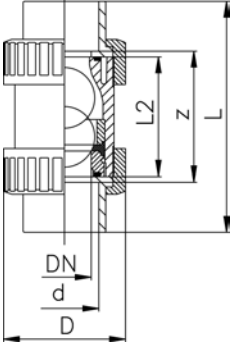
- For horizontal or vertical installation
- Leakproof from: EPDM 2m, FPM 3m water column
- Specific gravity of piston approx. 2 kg/dm<sup>3</sup>
- Overall length EN 558

d [mm]	DN [mm]	PN	kv-value ( $\Delta p=1$ bar) [l/min]	EPDM Code	kg	D [mm]	L [mm]	L1 [mm]	L2 [mm]	H [mm]	closest inch
20	15	10	95	<b>169 303 006</b>	0.090	43	124	130	28	65	½
25	20	10	180	<b>169 303 007</b>	0.137	47	144	150	37	75	¾
32	25	10	327	<b>169 303 008</b>	0.228	56	154	160	37	90	1
40	32	10	484	<b>169 303 009</b>	0.348	64	174	180	44	102	1 ¼
50	40	10	725	<b>169 303 010</b>	0.624	82	194	200	48	123	1 ½
63	50	10	1130	<b>169 303 011</b>	1.108	95	224	230	60	144	2



# Ball check (non-return) valve

## Ball check (non-return) valve type 360 ABS With solvent cement sockets metric



### Model:

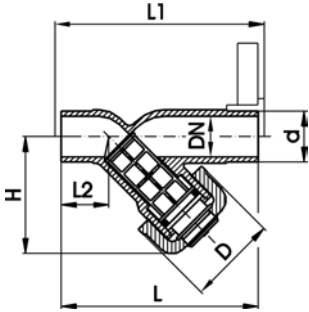
- For easy installation and removal
- The ball seals at a minimum water column of 2 m
- Vibration free even at high flow velocity
- Minimum temperature: - 40°C
- For horizontal or vertical installation

d [mm]	DN [mm]	PN	kv-value ( $\Delta p=1$ bar) [l/min]	EPDM Code	kg	z [mm]	D [mm]	L [mm]	L2 [mm]	closest inch
16	10	10	170	<b>169 360 401</b>	0.105	71	45	99	63	3/8
20	15	10	150	<b>169 360 402</b>	0.105	70	45	102	63	1/2
25	20	10	330	<b>169 360 403</b>	0.175	82	56	120	75	3/4
32	25	10	390	<b>169 360 404</b>	0.271	87	67	131	79	1
40	32	10	710	<b>169 360 405</b>	0.445	98	82	150	89	1 1/4
50	40	10	900	<b>169 360 406</b>	0.715	101	92	163	95	1 1/2
63	50	10	1390	<b>169 360 407</b>	1.271	121	120	197	115	2

PF 2 33 199 001

# Strainers

## Line strainer type 305 ABS With solvent cement spigots metric



### Model:

- Protects valves, pumps, etc. from becoming soiled
- Easy dismantling for cleaning the screens
- Cylindrical screen must be ordered separately
- Overall length EN 558
- Screen in stainless steel operable temperature range up  $-40^{\circ}\text{C}$  to  $+60^{\circ}\text{C}$
- Screen in PVC-U operable temperature range up  $0^{\circ}\text{C}$  to  $+60^{\circ}\text{C}$

d [mm]	DN [mm]	PN	EPDM Code	kg	D [mm]	L [mm]	L1 [mm]	L2 [mm]	H [mm]	closest inch
20	15	10	<b>169 305 302</b>	0.080	48	124	130	28	65	1/2
25	20	10	<b>169 305 303</b>	0.120	54	144	150	37	76	3/4
32	25	10	<b>169 305 304</b>	0.180	62	154	160	37	90	1
40	32	10	<b>169 305 305</b>	0.280	71	174	180	44	104	1 1/4
50	40	10	<b>169 305 306</b>	0.470	88	194	200	48	124	1 1/2
63	50	10	<b>169 305 307</b>	0.780	103	224	230	60	148	2

PF 2 33 199 005

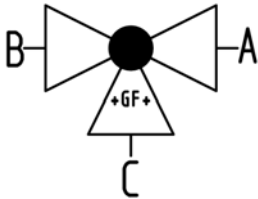
# Ball valves electric

## 3-Way ball valve type 185 ABS

### Horizontal/L-port 100-230V

### With manual emergency override

### With solvent cement sockets metric



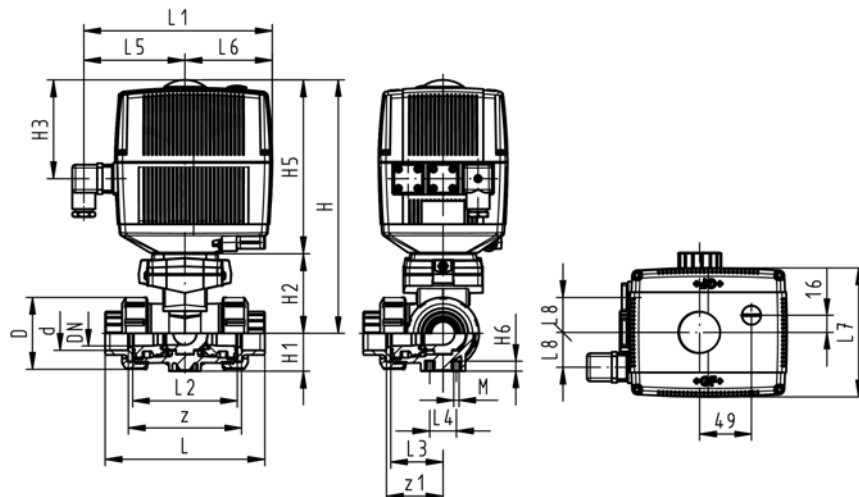
#### Model:

- Built on with electric actuator EA21
- Voltage 100-230 V, 50-60 Hz
- Control range 90°<
- Basic position A-C opened, activated position B-C opened, see flow scheme
- Other positions possible by adjusting the limit switches
- Control time 5 s/90°<
- For easy installation and removal
- Integrated stainless steel mounting inserts

d [mm]	DN [mm]	PN	kv-value ( $\Delta p=1$ bar) [l/min]	EPDM Code	kg
16	10	10	50	<b>199 185 162</b>	2.065
20	15	10	75	<b>199 185 163</b>	2.069
25	20	10	150	<b>199 185 164</b>	2.171
32	25	10	280	<b>199 185 165</b>	2.316
40	32	10	480	<b>199 185 166</b>	2.649
50	40	10	620	<b>199 185 167</b>	2.993
63	50	10	1230	<b>199 185 168</b>	4.042

d [mm]	D [mm]	H [mm]	H1 [mm]	H2 [mm]	H3 [mm]	H5 [mm]	H6 [mm]	L [mm]	L1 [mm]	L2 [mm]	L3 [mm]	L4 [mm]	L5 [mm]	L6 [mm]	L7 [mm]
16	50	231	28	64	94	167	8	109	180	73	36	25	97	83	122
20	50	231	28	64	94	167	8	112	180	73	36	25	97	83	122
25	58	240	32	73	94	167	8	131	180	86	43	25	97	83	122
32	68	240	36	73	94	167	8	151	180	99	50	25	97	83	122
40	84	251	45	84	94	167	9	181	180	120	60	45	97	83	122
50	97	251	51	84	94	167	9	205	180	137	69	45	97	83	122
63	124	273	65	106	94	167	9	261	180	179	89	45	97	83	122

d [mm]	L8 [mm]	M	z [mm]	z1 [mm]	closest inch
16	33	6	81	40	$\frac{3}{8}$
20	33	6	81	40	$\frac{1}{2}$
25	33	6	94	47	$\frac{3}{4}$
32	33	6	107	54	1
40	33	8	130	65	$1 \frac{1}{4}$
50	33	8	143	72	$1 \frac{1}{2}$
63	33	8	185	92	2



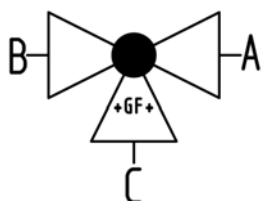
PF 3 39 980 033



## 3-Way ball valve type 185 ABS Horizontal/L-port 24V With manual emergency override With solvent cement sockets metric

### Model:

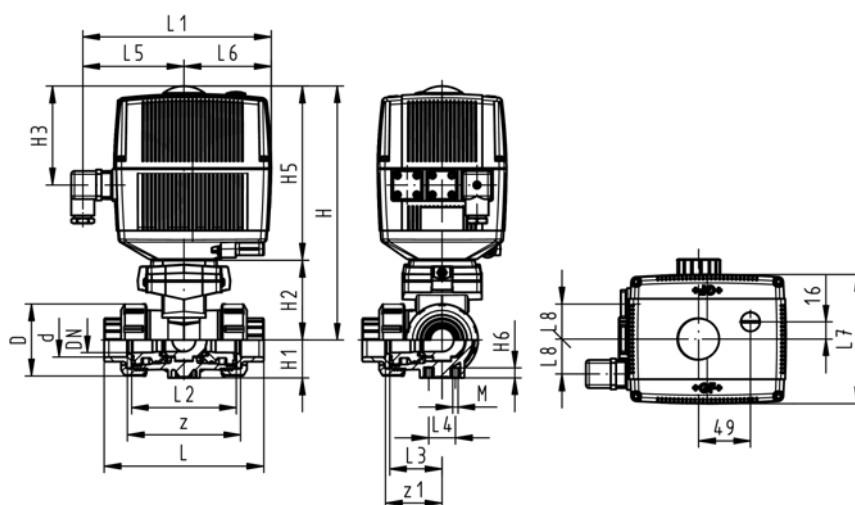
- Built on with electric actuator EA21
- Voltage 24 V AC/DC
- Control range 90°<
- Basic position A-C opened, activated position B-C opened, see flow scheme
- Other positions possible by adjusting the limit switches
- Control time 5 s/90°<
- For easy installation and removal
- Integrated stainless steel mounting inserts



d [mm]	DN [mm]	PN	kv-value ( $\Delta p=1$ bar) [l/min]	EPDM Code	kg
16	10	10	50	<b>199 185 342</b>	2.065
20	15	10	75	<b>199 185 343</b>	2.069
25	20	10	150	<b>199 185 344</b>	2.171
32	25	10	280	<b>199 185 345</b>	2.316
40	32	10	480	<b>199 185 346</b>	2.649
50	40	10	620	<b>199 185 347</b>	2.993
63	50	10	1230	<b>199 185 348</b>	4.042

d [mm]	D [mm]	H [mm]	H1 [mm]	H2 [mm]	H3 [mm]	H5 [mm]	H6 [mm]	L [mm]	L1 [mm]	L2 [mm]	L3 [mm]	L4 [mm]	L5 [mm]	L6 [mm]	L7 [mm]
16	50	231	28	64	94	167	8	109	180	73	36	25	97	83	122
20	50	231	28	64	94	167	8	112	180	73	36	25	97	83	122
25	58	240	32	73	94	167	8	131	180	86	43	25	97	83	122
32	68	240	36	73	94	167	8	151	180	99	50	25	97	83	122
40	84	251	45	84	94	167	9	181	180	120	60	45	97	83	122
50	97	251	51	84	94	167	9	205	180	137	69	45	97	83	122
63	124	273	65	106	94	167	9	261	180	179	89	45	97	83	122

d [mm]	L8 [mm]	M	z [mm]	z1 [mm]	closest inch
16	33	6	81	40	3/8
20	33	6	81	40	1/2
25	33	6	94	47	3/4
32	33	6	107	54	1
40	33	8	130	65	1 1/4
50	33	8	143	72	1 1/2
63	33	8	185	92	2



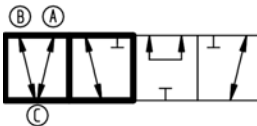
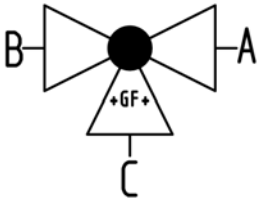
PF 3 39 980 033



### 3-Way ball valve type 185 ABS Horizontal/T-port 100-230V With manual emergency override With solvent cement sockets metric

#### Model:

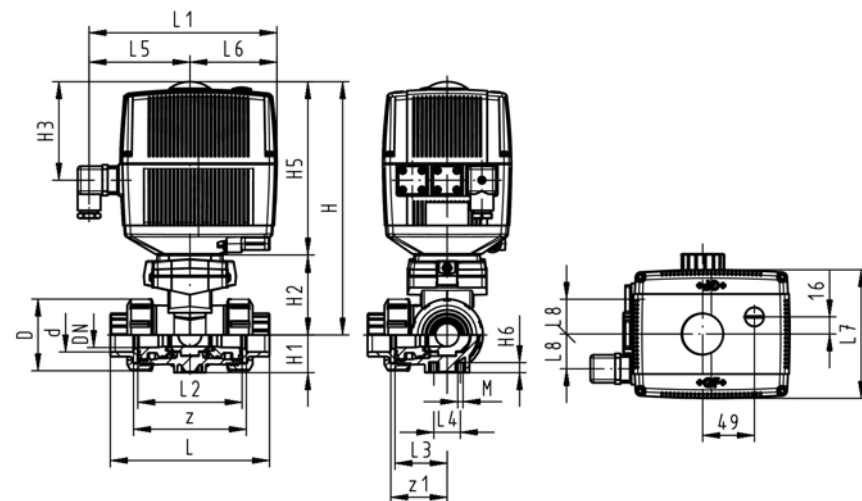
- Built on with electric actuator EA21
- Voltage 100-230 V, 50-60 Hz
- Control range 90°<
- Basic position A-B-C opened, activated position B-C opened, see flow scheme
- Other positions possible by adjusting the limit switches
- Control time 5 s/90°<
- For easy installation and removal
- Integrated stainless steel mounting inserts



d [mm]	DN [mm]	PN	kv-value (Δp=1 bar) [l/min]	EPDM Code	kg
16	10	10	140	<b>199 185 172</b>	2.064
20	15	10	200	<b>199 185 173</b>	2.068
25	20	10	470	<b>199 185 174</b>	2.169
32	25	10	793	<b>199 185 175</b>	2.311
40	32	10	1290	<b>199 185 176</b>	2.640
50	40	10	1910	<b>199 185 177</b>	2.977
63	50	10	3100	<b>199 185 178</b>	4.008

d [mm]	D [mm]	H [mm]	H1 [mm]	H2 [mm]	H3 [mm]	H5 [mm]	H6 [mm]	L [mm]	L1 [mm]	L2 [mm]	L3 [mm]	L4 [mm]	L5 [mm]	L6 [mm]	L7 [mm]
16	50	231	28	64	94	167	8	109	180	73	36	25	97	83	122
20	50	231	28	64	94	167	8	112	180	73	36	25	97	83	122
25	58	240	32	73	94	167	8	131	180	86	43	25	97	83	122
32	68	240	36	73	94	167	8	151	180	99	50	25	97	83	122
40	84	251	45	84	94	167	9	181	180	120	60	45	97	83	122
50	97	251	51	84	94	167	9	205	180	137	69	45	97	83	122
63	124	273	65	106	94	167	9	261	180	179	89	45	97	83	122

d [mm]	L8 [mm]	M	z [mm]	z1 [mm]	closest inch
16	33	6	81	40	3/8
20	33	6	81	40	1/2
25	33	6	94	47	3/4
32	33	6	107	54	1
40	33	8	130	65	1 1/4
50	33	8	143	72	1 1/2
63	33	8	185	92	2



PF 3 39 980 033



## 3-Way ball valve type 185 ABS

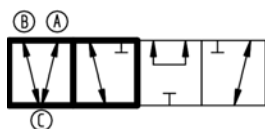
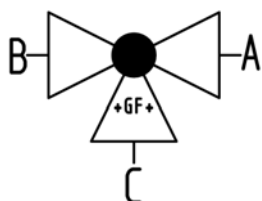
### Horizontal/T-port 24V

### With manual emergency override

### With solvent cement sockets metric

#### Model:

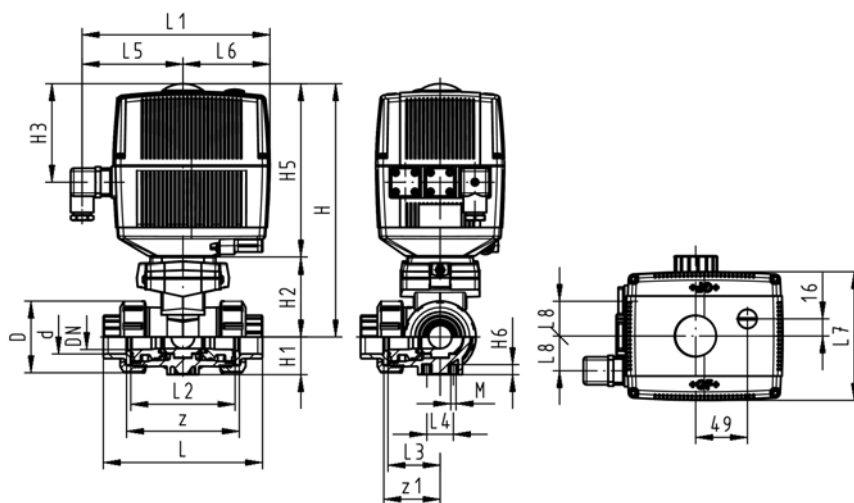
- Built on with electric actuator EA21
- Voltage 24 V AC/DC
- Control range 90°<
- Basic position A-B-C opened, activated position B-C opened, see flow scheme
- Other positions possible by adjusting the limit switches
- Control time 5 s/90°<
- For easy installation and removal
- Integrated stainless steel mounting inserts



d [mm]	DN [mm]	PN	kv-value ( $\Delta p=1$ bar) [l/min]	EPDM Code	kg
16	10	10	140	<b>199 185 352</b>	2.064
20	15	10	200	<b>199 185 353</b>	2.068
25	20	10	470	<b>199 185 354</b>	2.169
32	25	10	793	<b>199 185 355</b>	2.311
40	32	10	1290	<b>199 185 356</b>	2.640
50	40	10	1910	<b>199 185 357</b>	2.977
63	50	10	3100	<b>199 185 358</b>	4.008

d [mm]	D [mm]	H [mm]	H1 [mm]	H2 [mm]	H3 [mm]	H5 [mm]	H6 [mm]	L [mm]	L1 [mm]	L2 [mm]	L3 [mm]	L4 [mm]	L5 [mm]	L6 [mm]	L7 [mm]
16	50	231	28	64	94	167	8	109	180	73	36	25	97	83	122
20	50	231	28	64	94	167	8	112	180	73	36	25	97	83	122
25	58	240	32	73	94	167	8	131	180	86	43	25	97	83	122
32	68	240	36	73	94	167	8	151	180	99	50	25	97	83	122
40	84	251	45	84	94	167	9	181	180	120	60	45	97	83	122
50	97	251	51	84	94	167	9	205	180	137	69	45	97	83	122
63	124	273	65	106	94	167	9	261	180	179	89	45	97	83	122

d [mm]	L8 [mm]	M	z [mm]	z1 [mm]	closest inch
16	33	6	81	40	3/8
20	33	6	81	40	1/2
25	33	6	94	47	3/4
32	33	6	107	54	1
40	33	8	130	65	1 1/4
50	33	8	143	72	1 1/2
63	33	8	185	92	2



PF 3 39 980 033

# Ball valves pneumatic

## Ball valve type 230 ABS FC (Fail safe to close)

### With manual override

### With solvent cement sockets metric



DN10/15 - 50

#### Model:

- Built on with pneumatic actuator PA11 (DN10/15-25), PA21 (DN32-50)
- Control time 90° < 1-2 s
- For easy installation and removal
- Integrated stainless steel mounting inserts

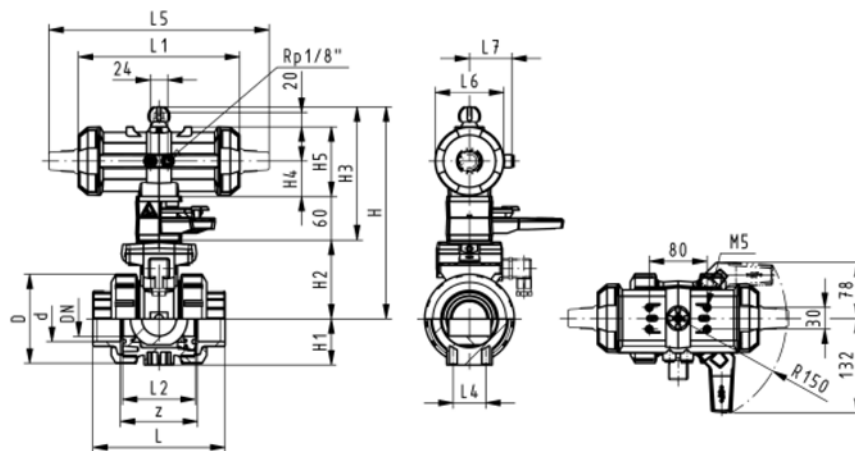
#### Option:

- Individual configuration of the valve (see diagram)

d [mm]	DN [mm]	PN	kv-value ( $\Delta p=1$ bar) [l/min]	EPDM Code	kg
16	10	10	70	<b>199 230 702</b>	1.459
20	15	10	185	<b>199 230 703</b>	1.459
25	20	10	350	<b>199 230 704</b>	1.576
32	25	10	700	<b>199 230 705</b>	1.700
40	32	10	1000	<b>199 230 706</b>	2.751
50	40	10	1600	<b>199 230 707</b>	3.073
63	50	10	3100	<b>199 230 708</b>	3.931

d [mm]	D [mm]	H [mm]	H1 [mm]	H2 [mm]	H3 [mm]	H4 [mm]	H5 [mm]	L [mm]	L1 [mm]	L2 [mm]	L4 [mm]	L5 [mm]	L6 [mm]	L7 [mm]	z [mm]
16	50	230	27	62	168	40	77	92	194	56	25	261	76	48	64
20	50	230	27	62	168	40	77	95	194	56	25	261	76	48	64
25	58	239	30	71	168	40	77	110	194	65	25	261	76	48	72
32	68	239	36	71	168	40	77	123	194	71	25	261	76	48	79
40	84	271	44	84	187	51	99	146	224	85	45	305	95	59	94
50	97	271	51	84	187	51	99	157	224	89	45	305	95	59	95
63	124	293	64	106	187	51	99	183	224	101	45	305	95	59	107

d [mm]	closest inch
16	3/8
20	1/2
25	3/4
32	1
40	1 1/4
50	1 1/2
63	2



PF 3 39 696 033



DN10/15 - 50

## Ball valve type 230 ABS FC (Fail safe to close) With manual override With threaded sockets Rp

### Model:

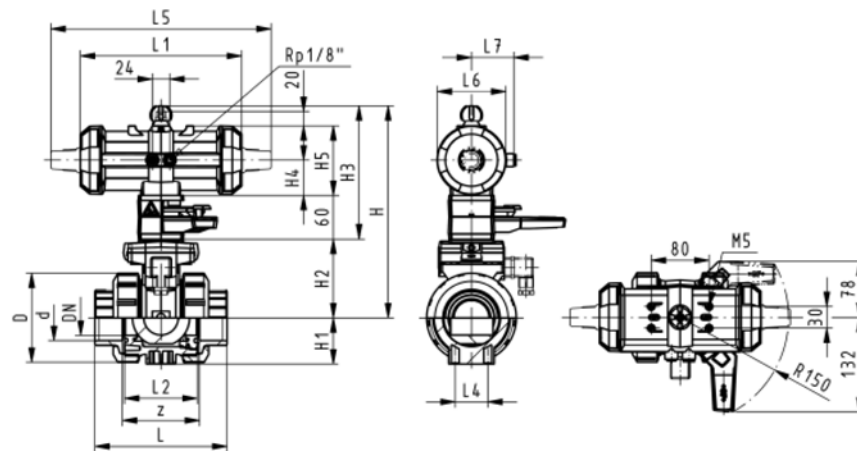
- Built on with pneumatic actuator PA11 (DN10/15-25), PA21 (DN32-50)
- Control time  $90^\circ <$  1-2 s
- For easy installation and removal
- Integrated stainless steel mounting inserts

### Option:

- Individual configuration of the valve (see diagram)

Rp [inch]	DN [mm]	PN	kv-value ( $\Delta p=1$ bar) [l/min]	EPDM Code	kg
$\frac{3}{8}$	10	10	70	<b>199 230 722</b>	1.459
$\frac{1}{2}$	15	10	185	<b>199 230 723</b>	1.459
$\frac{3}{4}$	20	10	350	<b>199 230 724</b>	1.576
1	25	10	700	<b>199 230 725</b>	1.700
1 $\frac{1}{4}$	32	10	1000	<b>199 230 726</b>	2.751
1 $\frac{1}{2}$	40	10	1600	<b>199 230 727</b>	3.073
2	50	10	3100	<b>199 230 728</b>	3.931

Rp [inch]	D [mm]	H [mm]	H1 [mm]	H2 [mm]	H3 [mm]	H4 [mm]	H5 [mm]	L [mm]	L1 [mm]	L2 [mm]	L4 [mm]	L5 [mm]	L6 [mm]	L7 [mm]	z [mm]
$\frac{3}{8}$	50	159	27	62	168	40	77	92	194	56	25	261	76	48	64
$\frac{1}{2}$	50	159	27	62	168	40	77	95	194	56	25	261	76	48	64
$\frac{3}{4}$	58	168	30	71	168	40	77	110	194	65	25	261	76	48	72
1	68	168	36	71	168	40	77	123	194	71	25	261	76	48	79
1 $\frac{1}{4}$	84	202	44	84	187	51	99	146	224	85	45	305	95	59	94
1 $\frac{1}{2}$	97	202	51	84	187	51	99	157	224	89	45	305	95	59	95
2	124	225	64	106	187	51	99	183	224	101	45	305	95	59	107



PF 3 39 696 033





DN10/15 - 50

## Ball valve type 230 ABS FO (Fail safe to open) With manual override With solvent cement sockets metric

### Model:

- Built on with pneumatic actuator PA11 (DN10/15-25), PA21 (DN32-50)
- Control time  $90^\circ <$  1-2 s
- For easy installation and removal
- Integrated stainless steel mounting inserts

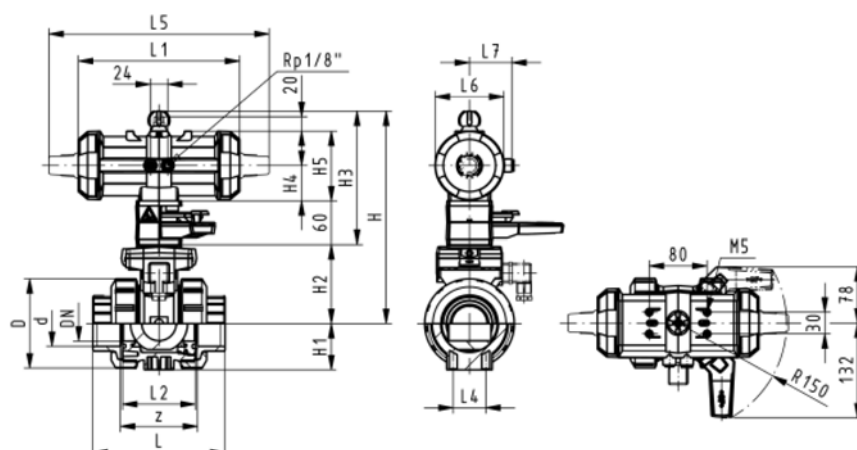
### Option:

- Individual configuration of the valve (see diagram)

d [mm]	DN [mm]	PN	kv-value ( $\Delta p=1$ bar) [l/min]	EPDM Code	kg
16	10	10	70	<b>199 230 742</b>	1.459
20	15	10	185	<b>199 230 743</b>	1.459
25	20	10	350	<b>199 230 744</b>	1.576
32	25	10	700	<b>199 230 745</b>	1.700
40	32	10	1000	<b>199 230 746</b>	2.751
50	40	10	1600	<b>199 230 747</b>	3.073
63	50	10	3100	<b>199 230 748</b>	3.931

d [mm]	D [mm]	H [mm]	H1 [mm]	H2 [mm]	H3 [mm]	H4 [mm]	H5 [mm]	L [mm]	L1 [mm]	L2 [mm]	L4 [mm]	L5 [mm]	L6 [mm]	L7 [mm]	z [mm]
16	50	230	27	62	168	40	77	92	194	56	25	261	76	48	64
20	50	230	27	62	168	40	77	95	194	56	25	261	76	48	64
25	58	239	30	71	168	40	77	110	194	65	25	261	76	48	72
32	68	239	36	71	168	40	77	123	194	71	25	261	76	48	79
40	84	271	44	84	187	51	99	146	224	85	45	305	95	59	94
50	97	271	51	84	187	51	99	157	224	89	45	305	95	59	95
63	124	293	64	106	187	51	99	183	224	101	45	305	95	59	107

d [mm]	closest inch
16	$\frac{3}{8}$
20	$\frac{1}{2}$
25	$\frac{3}{4}$
32	1
40	$1 \frac{1}{4}$
50	$1 \frac{1}{2}$
63	2



PF 3 39 696 033



DN10/15 - 50

## Ball valve type 230 ABS FO (Fail safe to open) With manual override With threaded sockets Rp

### Model:

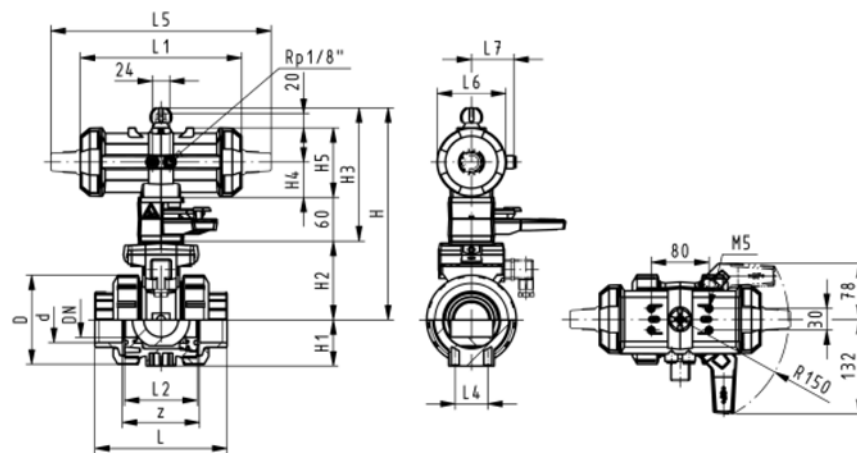
- Built on with pneumatic actuator PA11 (DN10/15-25), PA21 (DN32-50)
- Control time  $90^\circ <$  1-2 s
- For easy installation and removal
- Integrated stainless steel mounting inserts

### Option:

- Individual configuration of the valve (see diagram)

Rp [inch]	DN [mm]	PN	kv-value ( $\Delta p=1$ bar) [l/min]	EPDM Code	kg
$\frac{3}{8}$	10	10	70	<b>199 230 762</b>	1.459
$\frac{1}{2}$	15	10	185	<b>199 230 763</b>	1.459
$\frac{3}{4}$	20	10	350	<b>199 230 764</b>	1.576
1	25	10	700	<b>199 230 765</b>	1.700
1 $\frac{1}{4}$	32	10	1000	<b>199 230 766</b>	2.751
1 $\frac{1}{2}$	40	10	1600	<b>199 230 767</b>	3.073
2	50	10	3100	<b>199 230 768</b>	3.931

Rp [inch]	D [mm]	H [mm]	H1 [mm]	H2 [mm]	H3 [mm]	H4 [mm]	H5 [mm]	L [mm]	L1 [mm]	L2 [mm]	L4 [mm]	L5 [mm]	L6 [mm]	L7 [mm]	z [mm]
$\frac{3}{8}$	50	159	27	62	168	40	77	92	194	56	25	261	76	48	64
$\frac{1}{2}$	50	159	27	62	168	40	77	95	194	56	25	261	76	48	64
$\frac{3}{4}$	58	168	30	71	168	40	77	110	194	65	25	261	76	48	72
1	68	168	36	71	168	40	77	123	194	71	25	261	76	48	79
1 $\frac{1}{4}$	84	202	44	84	187	51	99	146	224	85	45	305	95	59	94
1 $\frac{1}{2}$	97	202	51	84	187	51	99	157	224	89	45	305	95	59	95
2	124	225	64	106	187	51	99	183	224	101	45	305	95	59	107



PF 3 39 696 033



DN10/15 - 50

## Ball valve type 230 ABS DA (Double acting) With manual override With solvent cement sockets metric

### Model:

- Built on with pneumatic actuator PA11 (DN10/15-25), PA21 (DN32-50)
- Control time  $90^\circ <$  1-2 s
- For easy installation and removal
- Integrated stainless steel mounting inserts

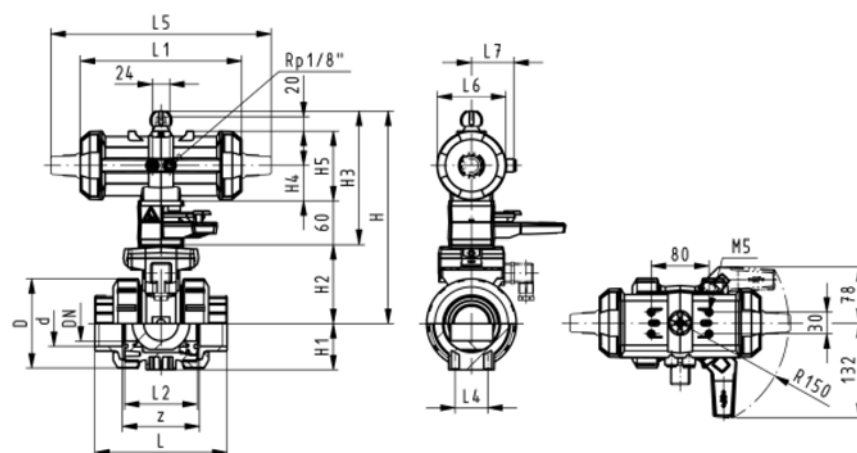
### Option:

- Individual configuration of the valve (see diagram)

d [mm]	DN [mm]	PN	kv-value ( $\Delta p=1$ bar) [l/min]	EPDM Code	kg
16	10	10	70	<b>199 230 782</b>	1.459
20	15	10	185	<b>199 230 783</b>	1.459
25	20	10	350	<b>199 230 784</b>	1.576
32	25	10	700	<b>199 230 785</b>	1.700
40	32	10	1000	<b>199 230 786</b>	2.751
50	40	10	1600	<b>199 230 787</b>	3.073
63	50	10	3100	<b>199 230 788</b>	3.931

d [mm]	D [mm]	H [mm]	H1 [mm]	H2 [mm]	H3 [mm]	H4 [mm]	H5 [mm]	L [mm]	L1 [mm]	L2 [mm]	L4 [mm]	L5 [mm]	L6 [mm]	L7 [mm]	z [mm]
16	50	230	27	62	168	40	77	92	194	56	25	261	76	48	64
20	50	230	27	62	168	40	77	95	194	56	25	261	76	48	64
25	58	239	30	71	168	40	77	110	194	65	25	261	76	48	72
32	68	239	36	71	168	40	77	123	194	71	25	261	76	48	79
40	84	271	44	84	187	51	99	146	224	85	45	305	95	59	94
50	97	271	51	84	187	51	99	157	224	89	45	305	95	59	95
63	124	293	64	106	187	51	99	183	224	101	45	305	95	59	107

d [mm]	closest inch
16	$\frac{3}{8}$
20	$\frac{1}{2}$
25	$\frac{3}{4}$
32	1
40	$1 \frac{1}{4}$
50	$1 \frac{1}{2}$
63	2



PF 3 39 696 033



DN10/15 - 50

## Ball valve type 230 ABS DA (Double acting) With manual override With threaded sockets Rp

### Model:

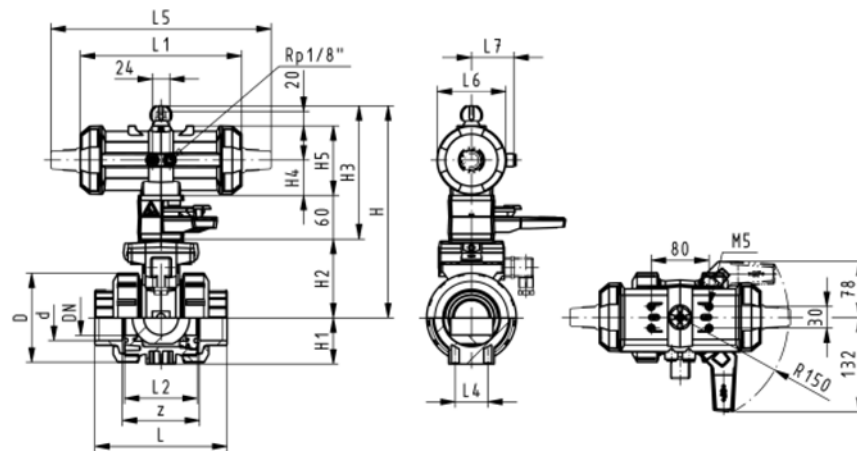
- Built on with pneumatic actuator PA11 (DN10/15-25), PA21 (DN32-50)
- Control time  $90^\circ <$  1-2 s
- For easy installation and removal
- Integrated stainless steel mounting inserts

### Option:

- Individual configuration of the valve (see diagram)

Rp [inch]	DN [mm]	PN	kv-value ( $\Delta p=1$ bar) [l/min]	EPDM Code	kg
$\frac{3}{8}$	10	10	70	<b>199 230 802</b>	1.459
$\frac{1}{2}$	15	10	185	<b>199 230 803</b>	1.459
$\frac{3}{4}$	20	10	350	<b>199 230 804</b>	1.576
1	25	10	700	<b>199 230 805</b>	1.700
1 $\frac{1}{4}$	32	10	1000	<b>199 230 806</b>	2.751
1 $\frac{1}{2}$	40	10	1600	<b>199 230 807</b>	3.073
2	50	10	3100	<b>199 230 808</b>	3.931

Rp [inch]	D [mm]	H [mm]	H1 [mm]	H2 [mm]	H3 [mm]	H4 [mm]	H5 [mm]	L [mm]	L1 [mm]	L2 [mm]	L4 [mm]	L5 [mm]	L6 [mm]	L7 [mm]	z [mm]
$\frac{3}{8}$	50	159	27	62	168	40	77	92	194	56	25	261	76	48	64
$\frac{1}{2}$	50	159	27	62	168	40	77	95	194	56	25	261	76	48	64
$\frac{3}{4}$	58	168	30	71	168	40	77	110	194	65	25	261	76	48	72
1	68	168	36	71	168	40	77	123	194	71	25	261	76	48	79
1 $\frac{1}{4}$	84	202	44	84	187	51	99	146	224	85	45	305	95	59	94
1 $\frac{1}{2}$	97	202	51	84	187	51	99	157	224	89	45	305	95	59	95
2	124	225	64	106	187	51	99	183	224	101	45	305	95	59	107



PF 3 39 696 033



DN10/15 - 50



## Ball valve type 230 ABS FC (Fail safe to close) Without manual override With solvent cement sockets metric

### Model:

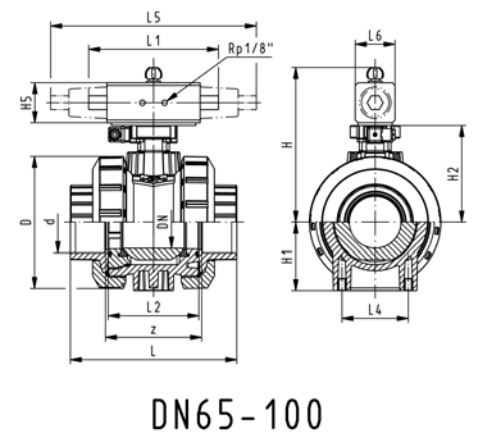
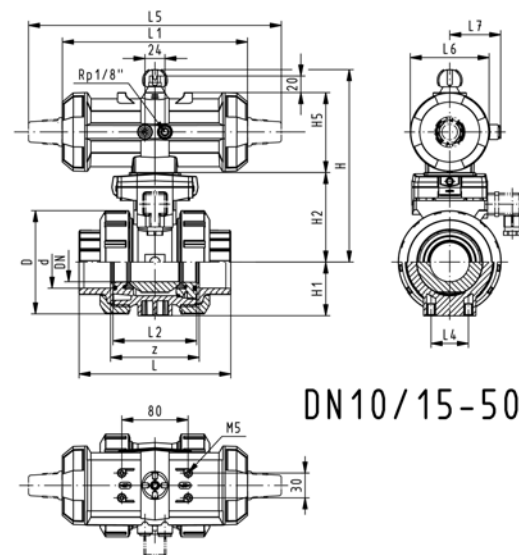
- For easy installation and removal
- Integrated stainless steel mounting inserts
- Control time  $90^\circ <$  1-2 s
- Assignment of actuators: PA11 (DN10/15-25), PA21 (DN32-50), PA30 (DN65), PA40 (DN80), PA40 (DN100)

### Option:

- Individual configuration of the valve (see diagram)

d [mm]	DN [mm]	PN	kv-value ( $\Delta p=1$ bar) [l/min]	EPDM Code	kg
16	10	10	70	<b>199 230 822</b>	1.459
20	15	10	185	<b>199 230 823</b>	1.459
25	20	10	350	<b>199 230 824</b>	1.576
32	25	10	700	<b>199 230 825</b>	1.700
40	32	10	1000	<b>199 230 826</b>	2.751
50	40	10	1600	<b>199 230 827</b>	3.073
63	50	10	3100	<b>199 230 828</b>	3.931
75	65	10	5000	<b>199 230 829</b>	6.700
90	80	10	7000	<b>199 230 830</b>	8.600
110	100	10	11000	<b>199 230 831</b>	12.900

d [mm]	D [mm]	H [mm]	H1 [mm]	H2 [mm]	H5 [mm]	L [mm]	L1 [mm]	L2 [mm]	L4 [mm]	L5 [mm]	L6 [mm]	L7 [mm]	z [mm]	closest inch
16	50	159	27	62	77	92	194	56	25	261	76	48	64	3/8
20	50	159	27	62	77	95	194	56	25	261	76	48	64	1/2
25	58	168	30	71	77	110	194	65	25	261	76	48	72	3/4
32	68	168	36	71	77	123	194	71	25	261	76	48	79	1
40	84	202	44	84	99	146	224	85	45	305	95	59	94	1 1/4
50	97	202	51	84	99	157	224	89	45	305	95	59	95	1 1/2
63	124	225	64	106	99	183	224	101	45	305	95	59	107	2
75	166	262	85	156	70	233		136	70	276	65		144	2 1/2
90	200	281	105	168	78	254		141	70	341	72		151	3
110	238	292	123	175	86	301		164	120	369	80		174	4



PF 3 39 696 633



DN10/15 - 50

## Ball valve type 230 ABS FC (Fail safe to close) Without manual override With threaded sockets Rp

### Model:

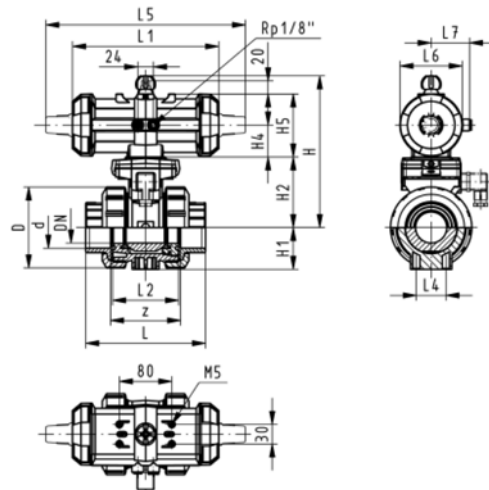
- For easy installation and removal
- Integrated stainless steel mounting inserts
- Control time  $90^\circ <$  1-2 s
- Built on with pneumatic actuator PA11 (DN10/15-25), PA21 (DN32-50)

### Option:

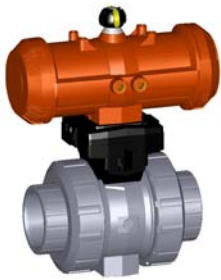
- Individual configuration of the valve (see diagram)

Rp [inch]	DN [mm]	PN	kv-value ( $\Delta p=1$ bar) [l/min]	EPDM Code	kg
3/8	10	10	70	<b>199 230 842</b>	1.200
1/2	15	10	185	<b>199 230 843</b>	1.200
3/4	20	10	350	<b>199 230 844</b>	1.300
1	25	10	700	<b>199 230 845</b>	1.400
1 1/4	32	10	1000	<b>199 230 846</b>	2.500
1 1/2	40	10	1600	<b>199 230 847</b>	2.800
2	50	10	3100	<b>199 230 848</b>	3.700

Rp [inch]	D [mm]	H [mm]	H1 [mm]	H2 [mm]	H4 [mm]	H5 [mm]	L [mm]	L1 [mm]	L2 [mm]	L4 [mm]	L5 [mm]	L6 [mm]	L7 [mm]	z [mm]
3/8	50	159	27	62	40	77	92	194	56	25	261	76	48	64
1/2	50	159	27	62	40	77	95	194	56	25	261	76	48	64
3/4	58	168	30	71	40	77	110	194	65	25	261	76	48	72
1	68	168	36	71	40	77	123	194	71	25	261	76	48	79
1 1/4	84	202	44	84	51	99	146	224	85	45	305	95	59	94
1 1/2	97	202	51	84	51	99	157	224	89	45	305	95	59	95
2	124	225	64	106	51	99	183	224	101	45	305	95	59	107



PF 3 39 696 033



DN10/15 - 50



## Ball valve type 230 ABS FO (Fail safe to open) Without manual override With solvent cement sockets metric

### Model:

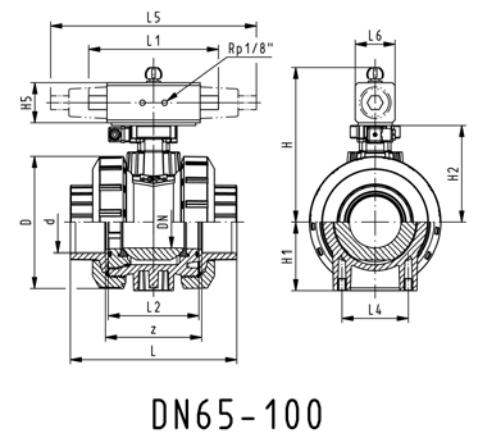
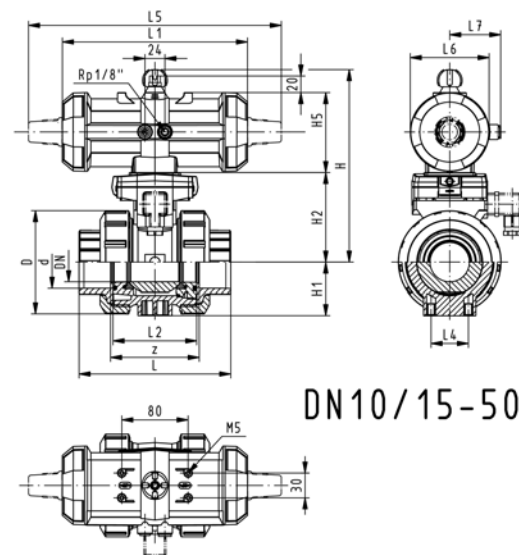
- For easy installation and removal
- Integrated stainless steel mounting inserts
- Control time  $90^\circ <$  1-2 s
- Assignment of actuators: PA11 (DN10/15-25), PA21 (DN32-50), PA30 (DN65), PA40 (DN80), PA40 (DN100)

### Option:

- Individual configuration of the valve (see diagram)

d [mm]	DN [mm]	PN	kv-value ( $\Delta p=1$ bar) [l/min]	EPDM Code	kg
16	10	10	70	<b>199 230 862</b>	1.459
20	15	10	185	<b>199 230 863</b>	1.459
25	20	10	350	<b>199 230 864</b>	1.576
32	25	10	700	<b>199 230 865</b>	1.700
40	32	10	1000	<b>199 230 866</b>	2.751
50	40	10	1600	<b>199 230 867</b>	3.073
63	50	10	3100	<b>199 230 868</b>	3.931
75	65	10	5000	<b>199 230 869</b>	6.700
90	80	10	7000	<b>199 230 870</b>	8.600
110	100	10	11000	<b>199 230 871</b>	12.900

d [mm]	D [mm]	H [mm]	H1 [mm]	H2 [mm]	H5 [mm]	L [mm]	L1 [mm]	L2 [mm]	L4 [mm]	L5 [mm]	L6 [mm]	L7 [mm]	z [mm]	closest inch
16	50	159	27	62	77	92	194	56	25	261	76	48	64	3/8
20	50	159	27	62	77	95	194	56	25	261	76	48	64	1/2
25	58	168	30	71	77	110	194	65	25	261	76	48	72	3/4
32	68	168	36	71	77	123	194	71	25	261	76	48	79	1
40	84	202	44	84	99	146	224	85	45	305	95	59	94	1 1/4
50	97	202	51	84	99	157	224	89	45	305	95	59	95	1 1/2
63	124	225	64	106	99	183	224	101	45	305	95	59	107	2
75	166	262	85	156	70	233		136	70	276	65		144	2 1/2
90	200	281	105	168	78	254		141	70	341	72		151	3
110	238	292	123	175	86	301		164	120	369	80		174	4



PF 3 39 696 633



DN10/15 - 50

## Ball valve type 230 ABS FO (Fail safe to open) Without manual override With threaded sockets Rp

### Model:

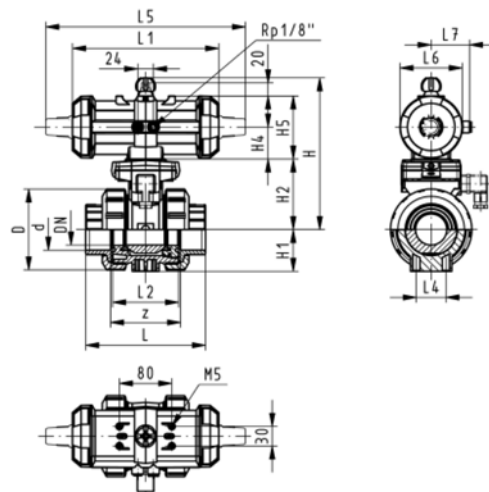
- For easy installation and removal
- Integrated stainless steel mounting inserts
- Control time  $90^\circ <$  1-2 s
- Built on with pneumatic actuator PA11 (DN10/15-25), PA21 (DN32-50)

### Option:

- Individual configuration of the valve (see diagram)

Rp [inch]	DN [mm]	PN	kv-value ( $\Delta p=1$ bar) [l/min]	EPDM Code	kg
$\frac{3}{8}$	10	10	70	<b>199 230 882</b>	1.200
$\frac{1}{2}$	15	10	185	<b>199 230 883</b>	1.200
$\frac{3}{4}$	20	10	350	<b>199 230 884</b>	1.300
1	25	10	700	<b>199 230 885</b>	1.400
1 $\frac{1}{4}$	32	10	1000	<b>199 230 886</b>	2.500
1 $\frac{1}{2}$	40	10	1600	<b>199 230 887</b>	2.800
2	50	10	3100	<b>199 230 888</b>	3.700

Rp [inch]	D [mm]	H [mm]	H1 [mm]	H2 [mm]	H4 [mm]	H5 [mm]	L [mm]	L1 [mm]	L2 [mm]	L4 [mm]	L5 [mm]	L6 [mm]	L7 [mm]	z [mm]
$\frac{3}{8}$	50	159	27	62	40	77	92	194	56	25	261	76	48	64
$\frac{1}{2}$	50	159	27	62	40	77	95	194	56	25	261	76	48	64
$\frac{3}{4}$	58	168	30	71	40	77	110	194	65	25	261	76	48	72
1	68	168	36	71	40	77	123	194	71	25	261	76	48	79
1 $\frac{1}{4}$	84	202	44	84	51	99	146	224	85	45	305	95	59	94
1 $\frac{1}{2}$	97	202	51	84	51	99	157	224	89	45	305	95	59	95
2	124	225	64	106	51	99	183	224	101	45	305	95	59	107



PF 3 39 696 033





DN10/15 - 50



## Ball valve type 230 ABS DA (Double acting) Without manual override With solvent cement sockets metric

### Model:

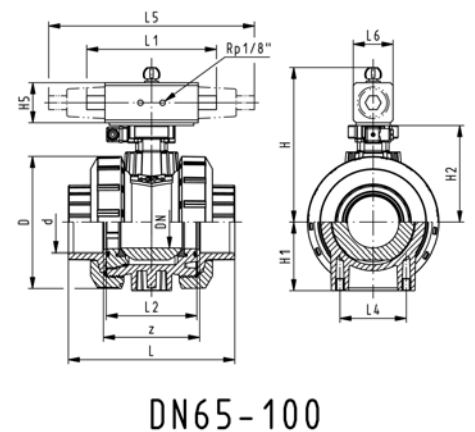
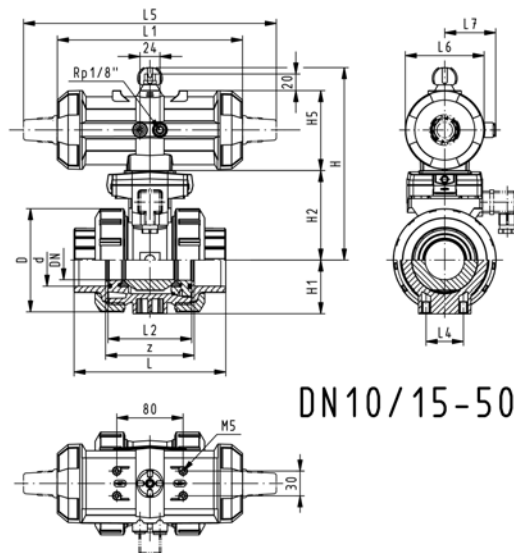
- For easy installation and removal
- Integrated stainless steel mounting inserts
- Control time  $90^\circ <$  1-2 s
- Assignment of actuators: PA11 (DN10/15-25), PA21 (DN32-50), PA35 (DN65), PA40 (DN80), PA45 (DN100)

### Option:

- Individual configuration of the valve (see diagram)

d [mm]	DN [mm]	PN	kv-value ( $\Delta p=1$ bar) [l/min]	EPDM Code	kg
16	10	10	70	<b>199 230 902</b>	1.459
20	15	10	185	<b>199 230 903</b>	1.459
25	20	10	350	<b>199 230 904</b>	1.576
32	25	10	700	<b>199 230 905</b>	1.700
40	32	10	1000	<b>199 230 906</b>	2.751
50	40	10	1600	<b>199 230 907</b>	3.073
63	50	10	3100	<b>199 230 908</b>	3.931
75	65	10	5000	<b>199 230 909</b>	5.600
90	80	10	7000	<b>199 230 910</b>	7.900
110	100	10	11000	<b>199 230 911</b>	11.200

d [mm]	D [mm]	H [mm]	H1 [mm]	H2 [mm]	H5 [mm]	L [mm]	L1 [mm]	L2 [mm]	L4 [mm]	L5 [mm]	L6 [mm]	L7 [mm]	z [mm]	closest inch
16	50	159	27	62	77	92	194	56	25	261	76	48	64	3/8
20	50	159	27	62	77	95	194	56	25	261	76	48	64	1/2
25	58	168	30	71	77	110	194	65	25	261	76	48	72	3/4
32	68	168	36	71	77	123	194	71	25	261	76	48	79	1
40	84	202	44	84	99	146	224	85	45	305	95	59	94	1 1/4
50	97	202	51	84	99	157	224	89	45	305	95	59	95	1 1/2
63	124	225	64	106	99	183	224	101	45	305	95	59	107	2
75	166	257	85	156	66	233	144	136	70		60		144	2 1/2
90	200	274	105	168	70	254	152	141	70		65		151	3
110	238	273	123	175	78	301	169	164	120		72		174	4



PF 3 39 696 633



DN10/15 - 50

## Ball valve type 230 ABS DA (Double acting) Without manual override With threaded sockets Rp

### Model:

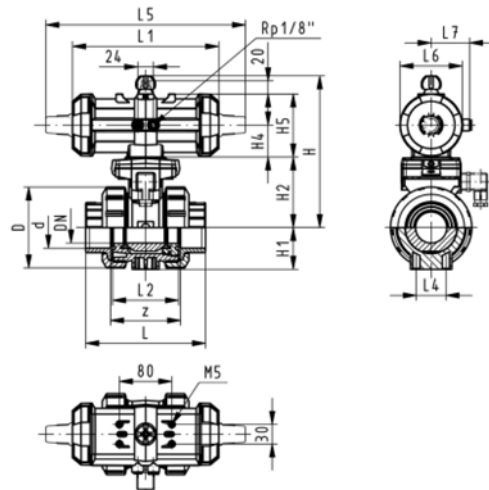
- For easy installation and removal
- Integrated stainless steel mounting inserts
- Control time  $90^\circ <$  1-2 s
- Built on with pneumatic actuator PA11 (DN10/15-25), PA21 (DN32-50)

### Option:

- Individual configuration of the valve (see diagram)

Rp [inch]	DN [mm]	PN	kv-value ( $\Delta p=1$ bar) [l/min]	EPDM Code	kg
3/8	10	10	70	<b>199 230 922</b>	1.200
1/2	15	10	185	<b>199 230 923</b>	1.200
3/4	20	10	350	<b>199 230 924</b>	1.300
1	25	10	700	<b>199 230 925</b>	1.400
1 1/4	32	10	1000	<b>199 230 926</b>	2.500
1 1/2	40	10	1600	<b>199 230 927</b>	2.800
2	50	10	3100	<b>199 230 928</b>	3.700

Rp [inch]	D [mm]	H [mm]	H1 [mm]	H2 [mm]	H4 [mm]	H5 [mm]	L [mm]	L1 [mm]	L2 [mm]	L4 [mm]	L5 [mm]	L6 [mm]	L7 [mm]	z [mm]
3/8	50	159	27	62	40	77	92	194	56	25	261	76	48	64
1/2	50	159	27	62	40	77	95	194	56	25	261	76	48	64
3/4	58	168	30	71	40	77	110	194	65	25	261	76	48	72
1	68	168	36	71	40	77	123	194	71	25	261	76	48	79
1 1/4	84	202	44	84	51	99	146	224	85	45	305	95	59	94
1 1/2	97	202	51	84	51	99	157	224	89	45	305	95	59	95
2	124	225	64	106	51	99	183	224	101	45	305	95	59	107



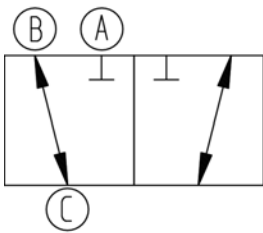
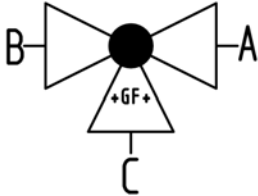
PF 3 39 696 033



### 3-Way ball valve type 285 ABS Horizontal/L-port Without manual override With solvent cement sockets metric

#### Model:

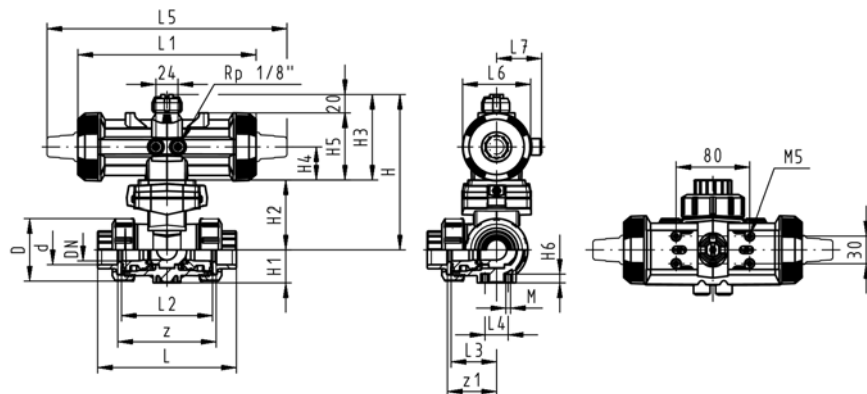
- Built on with pneumatic actuator PA11 (DN10/15-25), PA21 (DN32-50)
- Actuator fails safe to the closed position FC
- Basic position B-C opened, activated position A-C opened, see flow scheme
- Control time  $90^\circ <$  1-3 s
- For easy installation and removal
- Integrated stainless steel mounting inserts



d [mm]	DN [mm]	PN	kv-value ( $\Delta p=1$ bar) [l/min]	EPDM Code	kg
16	10	10	50	<b>199 285 162</b>	1.058
20	15	10	75	<b>199 285 163</b>	1.062
25	20	10	150	<b>199 285 164</b>	1.164
32	25	10	280	<b>199 285 165</b>	1.309
40	32	10	480	<b>199 285 166</b>	2.318
50	40	10	620	<b>199 285 167</b>	2.662
63	50	10	1230	<b>199 285 168</b>	3.711

d [mm]	D [mm]	H [mm]	H1 [mm]	H2 [mm]	H3 [mm]	H4 [mm]	H5 [mm]	H6 [mm]	L [mm]	L1 [mm]	L2 [mm]	L3 [mm]	L4 [mm]	L5 [mm]	L6 [mm]
16	50	159	28	62	97	40	77	8	109	194	73	36	25	261	76
20	50	159	28	62	97	40	77	8	112	194	73	36	25	261	76
25	58	168	32	71	97	40	77	8	131	194	86	43	25	261	76
32	68	168	36	71	97	40	77	8	151	194	99	50	25	261	76
40	84	203	45	84	119	51	99	9	181	224	120	60	45	305	95
50	97	203	51	84	119	51	99	9	205	224	137	69	45	305	95
63	124	225	65	106	119	51	99	9	261	224	179	89	45	305	95

d [mm]	L7 [mm]	M	z [mm]	z1 [mm]	closest inch
16	48	6	81	40	$\frac{3}{8}$
20	48	6	81	40	$\frac{1}{2}$
25	48	6	94	47	$\frac{3}{4}$
32	48	6	107	54	1
40	59	8	130	65	$1 \frac{1}{4}$
50	59	8	143	72	$1 \frac{1}{2}$
63	59	8	185	92	2



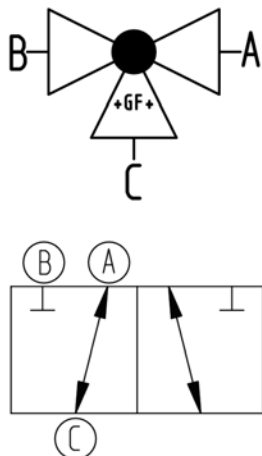
PF 3 39 981 033



## 3-Way ball valve type 285 ABS Horizontal/L-port DA (Double acting) Without manual override With solvent cement sockets metric

### Model:

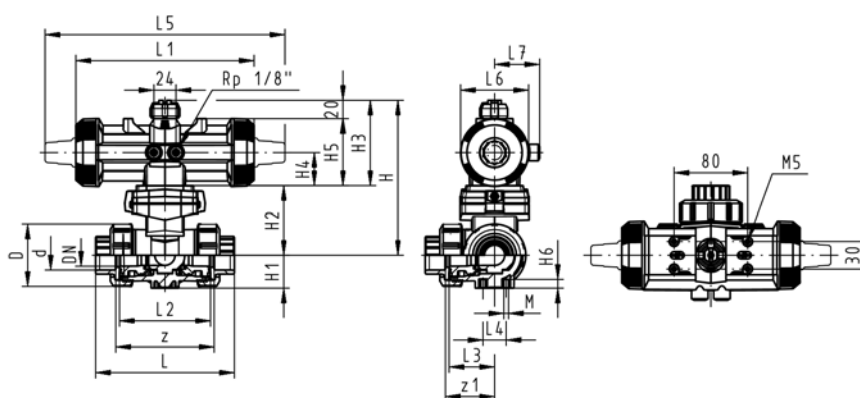
- Built on with pneumatic actuator PA11 (DN10/15-25), PA21 (DN32-50)
- Basic position A-C opened, activated position B-C opened, see flow scheme
- Control time 90°< 1-3 s
- For easy installation and removal
- Integrated stainless steel mounting inserts



d [mm]	DN [mm]	PN	kv-value ( $\Delta p=1$ bar) [l/min]	EPDM Code	kg
16	10	10	50	<b>199 285 342</b>	0.867
20	15	10	75	<b>199 285 343</b>	0.872
25	20	10	150	<b>199 285 344</b>	0.974
32	25	10	280	<b>199 285 345</b>	1.119
40	32	10	480	<b>199 285 346</b>	1.894
50	40	10	620	<b>199 285 347</b>	2.238
63	50	10	1230	<b>199 285 348</b>	3.287

d [mm]	D [mm]	H [mm]	H1 [mm]	H2 [mm]	H3 [mm]	H4 [mm]	H5 [mm]	H6 [mm]	L [mm]	L1 [mm]	L2 [mm]	L3 [mm]	L4 [mm]	L5 [mm]	L6 [mm]
16	50	159	28	62	97	40	77	8	109	194	73	36	25	261	76
20	50	159	28	62	97	40	77	8	112	194	73	36	25	261	76
25	58	168	32	71	97	40	77	8	131	194	86	43	25	261	76
32	68	168	36	71	97	40	77	8	151	194	99	50	25	261	76
40	84	203	45	84	119	51	99	9	181	224	120	60	45	305	95
50	97	203	51	84	119	51	99	9	205	224	137	69	45	305	95
63	124	225	65	106	119	51	99	9	261	224	179	89	45	305	95

d [mm]	L7 [mm]	M	z [mm]	z1 [mm]	closest inch
16	48	6	81	40	$\frac{3}{8}$
20	48	6	81	40	$\frac{1}{2}$
25	48	6	94	47	$\frac{3}{4}$
32	48	6	107	54	1
40	59	8	130	65	$1 \frac{1}{4}$
50	59	8	143	72	$1 \frac{1}{2}$
63	59	8	185	92	2



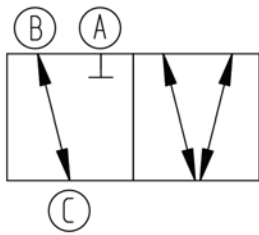
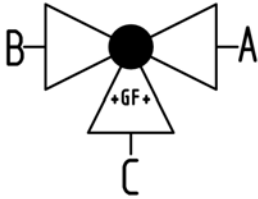
PF 3 39 981 033



### 3-Way ball valve type 285 ABS Horizontal/T-port Without manual override With solvent cement sockets metric

**Model:**

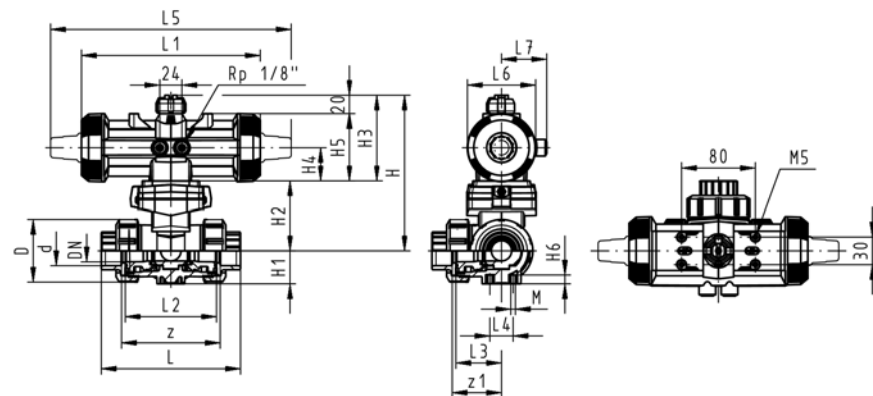
- Built on with pneumatic actuator PA11 (DN10/15-25), PA21 (DN32-50)
- Actuator fails safe to the closed position FC
- Basic position B-C opened, activated position A-B-C opened, see flow scheme
- Control time 90°< 1-3 s
- For easy installation and removal
- Integrated stainless steel mounting inserts



d [mm]	DN [mm]	PN	kv-value (Δp=1 bar) [l/min]	EPDM Code	kg
16	10	10	140	<b>199 285 172</b>	1.057
20	15	10	200	<b>199 285 173</b>	1.061
25	20	10	470	<b>199 285 174</b>	1.162
32	25	10	793	<b>199 285 175</b>	1.304
40	32	10	1290	<b>199 285 176</b>	2.309
50	40	10	1910	<b>199 285 177</b>	2.646
63	50	10	3100	<b>199 285 178</b>	3.677

d [mm]	D [mm]	H [mm]	H1 [mm]	H2 [mm]	H3 [mm]	H4 [mm]	H5 [mm]	H6 [mm]	L [mm]	L1 [mm]	L2 [mm]	L3 [mm]	L4 [mm]	L5 [mm]	L6 [mm]
16	50	159	28	62	97	40	77	8	109	194	73	36	25	261	76
20	50	159	28	62	97	40	77	8	112	194	73	36	25	261	76
25	58	168	32	71	97	40	77	8	131	194	86	43	25	261	76
32	68	168	36	71	97	40	77	8	151	194	99	50	25	261	76
40	84	203	45	84	119	51	99	9	181	224	120	60	45	305	95
50	97	203	51	84	119	51	99	9	205	224	137	69	45	305	95
63	124	225	65	106	119	51	99	9	261	224	179	89	45	305	95

d [mm]	L7 [mm]	M [mm]	z [mm]	z1 [mm]	closest inch
16	48	6	81	40	3/8
20	48	6	81	40	1/2
25	48	6	94	47	3/4
32	48	6	107	54	1
40	59	8	130	65	1 1/4
50	59	8	143	72	1 1/2
63	59	8	185	92	2



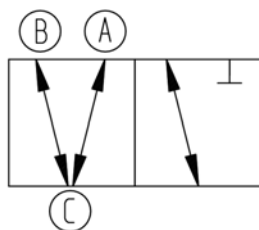
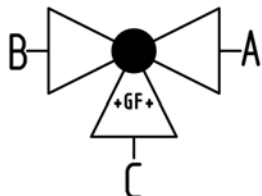
PF 3 39 981 033



## 3-Way ball valve type 285 ABS Horizontal/T-port DA (Double acting) Without manual override With solvent cement sockets metric

### Model:

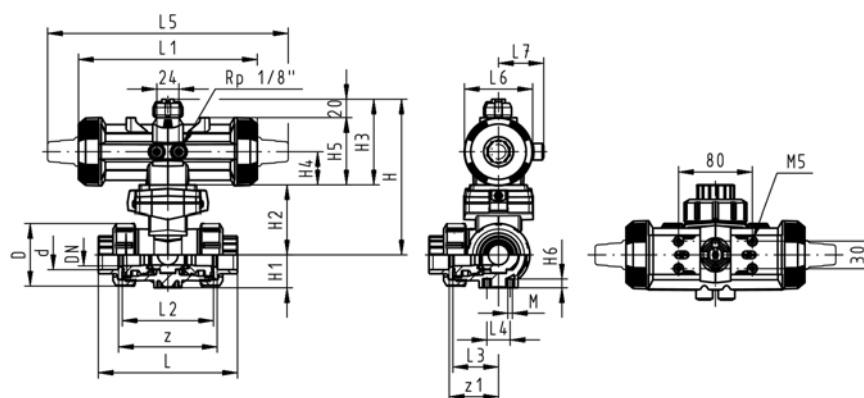
- Built on with pneumatic actuator PA11 (DN10/15-25), PA21 (DN32-50)
- Basic position A-B-C opened, activated position B-C opened, see flow scheme
- Control time 90°< 1-3 s
- For easy installation and removal
- Integrated stainless steel mounting inserts



d [mm]	DN [mm]	PN	kv-value ( $\Delta p=1$ bar) [l/min]	EPDM Code	kg
16	10	10	140	<b>199 285 352</b>	0.866
20	15	10	200	<b>199 285 353</b>	0.871
25	20	10	470	<b>199 285 354</b>	0.972
32	25	10	793	<b>199 285 355</b>	1.114
40	32	10	1290	<b>199 285 356</b>	1.885
50	40	10	1910	<b>199 285 357</b>	2.222
63	50	10	3100	<b>199 285 358</b>	3.253

d [mm]	D [mm]	H [mm]	H1 [mm]	H2 [mm]	H3 [mm]	H4 [mm]	H5 [mm]	H6 [mm]	L [mm]	L1 [mm]	L2 [mm]	L3 [mm]	L4 [mm]	L5 [mm]	L6 [mm]
16	50	159	28	62	97	40	77	8	109	194	73	36	25	261	76
20	50	159	28	62	97	40	77	8	112	194	73	36	25	261	76
25	58	168	32	71	97	40	77	8	131	194	86	43	25	261	76
32	68	168	36	71	97	40	77	8	151	194	99	50	25	261	76
40	84	203	45	84	119	51	99	9	181	224	120	60	45	305	95
50	97	203	51	84	119	51	99	9	205	224	137	69	45	305	95
63	124	225	65	106	119	51	99	9	261	224	179	89	45	305	95

d [mm]	L7 [mm]	M	z [mm]	z1 [mm]	closest inch
16	48	6	81	40	$\frac{3}{8}$
20	48	6	81	40	$\frac{1}{2}$
25	48	6	94	47	$\frac{3}{4}$
32	48	6	107	54	1
40	59	8	130	65	$1 \frac{1}{4}$
50	59	8	143	72	$1 \frac{1}{2}$
63	59	8	185	92	2



PF 3 39 981 033

# Butterfly valves electric

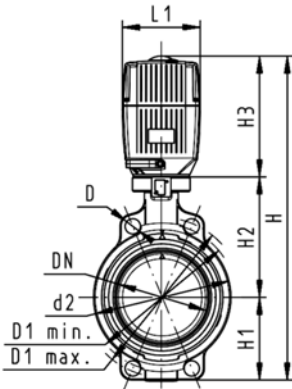
## Butterfly valve type 140 ABS 100-230V Without manual override



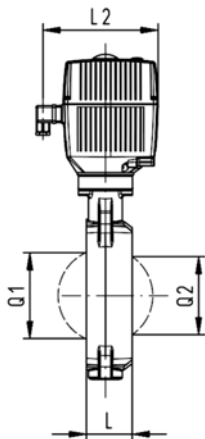
### Model:

- Connecting dimension: ISO 7005 PN 10, EN 1092 PN 10, DIN 2501 PN 10, ANSI/ASME B 16.5 Class 150, BS 1560: 1989, BS 4504, JIS B 2220
- Overall length according to EN 558, ISO 5752
- Voltage 100-230 V, 50-60 Hz
- Control time 15 s/90°<) EA31
- Control time 25s/90°<) EA42
- Control range 90°<)
- Actuator with integrated emergency manual override standard

d [mm]	DN [mm]	PN	kv-value ( $\Delta p=1$ bar) [l/min]	EPDM Code	kg
63	50	10	1470	<b>199 140 502</b>	3.121
75	65	10	2200	<b>199 140 503</b>	4.281
90	80	10	3000	<b>199 140 504</b>	4.359
110	100	10	6500	<b>199 140 505</b>	4.895
140	125	10	11500	<b>199 140 506</b>	4.376
160	150	10	16600	<b>199 140 507</b>	6.218
225	200	10	39600	<b>199 140 508</b>	12.029



d [mm]	Actuator unit type	D [mm]	D1 min. [mm]	D1 max. [mm]	d2 [mm]	H [mm]	H1 [mm]	H2 [mm]	H3 [mm]	L [mm]	L1 [mm]	L2 [mm]	Q1 [mm]
63	EA-31	19	120.0	125.0	104	400	77	134	188	45	122	180	40
75	EA-31	19	139.7	145.0	115	413	83	140	188	46	122	180	54
90	EA-31	19	150.0	160.0	131	428	89	146	188	49	122	180	67
110	EA-31	19	175.0	190.5	161	460	104	167	188	56	122	180	88
140	EA-31	23	210.0	215.9	187	487	117	181	188	64	122	180	113
160	EA-31	24	241.3	241.3	215	508	130	189	188	72	122	180	139
225	EA-42	23	290.0	295.0	267	575	158	210	208	73	122	180	178



d [mm]	Q2 [mm]	closest inch
63		2
75	35	2 ½
90	50	3
110	74	4
140	97	5
160	123	6
225	169	8

PF 3 39 643 035

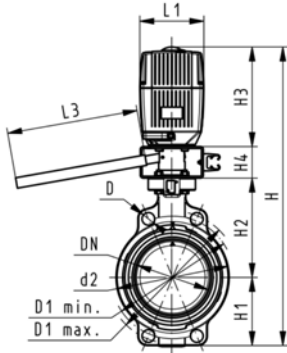


## Butterfly valve type 140 ABS 100-230V With manual override

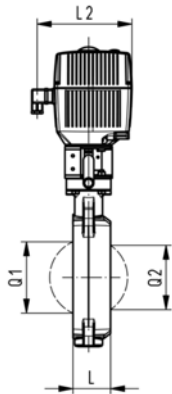
### Model:

- Connecting dimension: ISO 7005 PN 10, EN 1092 PN 10, DIN 2501 PN 10, ANSI/ASME B 16.5 Class 150, BS 1560: 1989, BS 4504, JIS B 2220
- Overall length according to EN 558, ISO 5752
- Voltage 100-230 V, 50-60 Hz
- Control time 15 s/90°<) EA31
- Control time 25s/90°<) EA42
- Control range 90°<)
- Actuator with integrated emergency manual override standard

d [mm]	DN [mm]	PN	kv-value ( $\Delta p=1$ bar) [l/min]	EPDM Code	kg
63	50	10	1470	<b>199 140 482</b>	5.678
75	65	10	2200	<b>199 140 483</b>	5.781
90	80	10	3000	<b>199 140 484</b>	5.859
110	100	10	6500	<b>199 140 485</b>	6.395
140	125	10	11500	<b>199 140 486</b>	5.389
160	150	10	16600	<b>199 140 487</b>	7.718
225	200	10	39600	<b>199 140 488</b>	13.529



d [mm]	Actuator unit type	D [mm]	D1 min. [mm]	D1 max. [mm]	d2 [mm]	H [mm]	H1 [mm]	H2 [mm]	H3 [mm]	H4 [mm]	L [mm]	L1 [mm]	L2 [mm]
63	EA-31	19	120.0	125.0	104	460	77	134	188	60	45	122	180
75	EA-31	19	139.7	145.0	115	473	83	140	188	60	46	122	180
90	EA-31	19	150.0	160.0	131	488	89	146	188	60	49	122	180
110	EA-31	19	175.0	190.5	161	520	104	167	188	60	56	122	180
140	EA-31	23	210.0	215.9	187	547	117	181	188	60	64	122	180
160	EA-31	24	241.3	241.3	215	568	130	189	188	60	72	122	180
225	EA-42	23	290.0	295.0	267	635	158	210	208	60	73	122	180



d [mm]	L3 [mm]	Q1 [mm]	Q2 [mm]	closest inch
63	250	40		2
75	250	54	35	2 ½
90	250	67	50	3
110	250	88	74	4
140	250	113	97	5
160	250	139	123	6
225	250	178	169	8

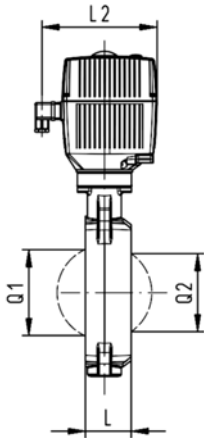
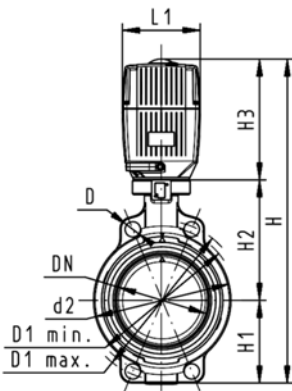
PF 3 39 643 035



# Butterfly valve type 140 ABS 24V Without manual override

## Model:

- Connecting dimension: ISO 7005 PN 10, EN 1092 PN 10, DIN 2501 PN 10, ANSI/ASME B 16.5 Class 150, BS 1560: 1989, BS 4504, JIS B 2220
- Overall length according to EN 558, ISO 5752
- Voltage 24 V AC/DC
- Control time 15 s/90°<) EA31
- Control time 25s/90°<) EA42
- Control range 90°<)
- Actuator with integrated emergency manual override standard



d [mm]	DN [mm]	PN	kv-value (Δp=1 bar) [l/min]	EPDM Code	kg
63	50	10	1470	<b>199 140 542</b>	4.178
75	65	10	2200	<b>199 140 543</b>	3.217
90	80	10	3000	<b>199 140 544</b>	4.359
110	100	10	6500	<b>199 140 545</b>	4.895
140	125	10	11500	<b>199 140 546</b>	4.376
160	150	10	16600	<b>199 140 547</b>	6.218
225	200	10	39600	<b>199 140 548</b>	12.029

d [mm]	Actuator unit type	D [mm]	D1 min. [mm]	D1 max. [mm]	d2 [mm]	H [mm]	H1 [mm]	H2 [mm]	H3 [mm]	L [mm]	L1 [mm]	L2 [mm]	Q1 [mm]
63	EA-31	19	120.0	125.0	104	400	77	134	188	45	122	180	40
75	EA-31	19	139.7	145.0	115	413	83	140	188	46	122	180	54
90	EA-31	19	150.0	160.0	131	428	89	146	188	49	122	180	67
110	EA-31	19	175.0	190.5	161	460	104	167	188	56	122	180	88
140	EA-31	23	210.0	215.9	187	487	117	181	188	64	122	180	113
160	EA-31	24	241.3	241.3	215	508	130	189	188	72	122	180	139
225	EA-42	23	290.0	295.0	267	575	158	210	208	73	122	180	178

d [mm]	Q2 [mm]	closest inch
63		2
75	35	2 ½
90	50	3
110	74	4
140	97	5
160	123	6
225	169	8

PF 3 39 643 035

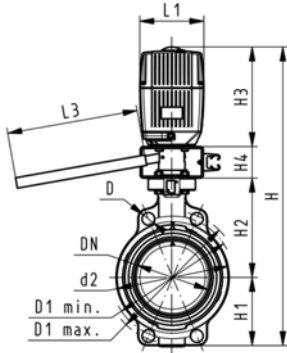


## Butterfly valve type 140 ABS 24V With manual override

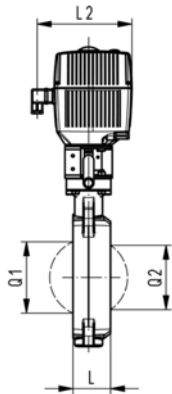
### Model:

- Connecting dimension: ISO 7005 PN 10, EN 1092 PN 10, DIN 2501 PN 10, ANSI/ASME B 16.5 Class 150, BS 1560: 1989, BS 4504, JIS B 2220
- Overall length according to EN 558, ISO 5752
- Voltage 24 V AC/DC
- Control time 15 s/90°<) EA31
- Control time 25s/90°<) EA42
- Control range 90°<)
- Actuator with integrated emergency manual override standard

d [mm]	DN [mm]	PN	kv-value ( $\Delta p=1$ bar) [l/min]	EPDM Code	kg
63	50	10	1470	<b>199 140 522</b>	4.161
75	65	10	2200	<b>199 140 523</b>	4.257
90	80	10	3000	<b>199 140 524</b>	5.859
110	100	10	6500	<b>199 140 525</b>	6.395
140	125	10	11500	<b>199 140 526</b>	5.389
160	150	10	16600	<b>199 140 527</b>	7.718
225	200	10	39600	<b>199 140 528</b>	13.529



d [mm]	Actuator unit type	D [mm]	D1 min. [mm]	D1 max. [mm]	d2 [mm]	H [mm]	H1 [mm]	H2 [mm]	H3 [mm]	H4 [mm]	L [mm]	L1 [mm]	L2 [mm]
63	EA-31	19	120.0	125.0	104	460	77	134	188	60	45	122	180
75	EA-31	19	139.7	145.0	115	473	83	140	188	60	46	122	180
90	EA-31	19	150.0	160.0	131	488	89	146	188	60	49	122	180
110	EA-31	19	175.0	190.5	161	520	104	167	188	60	56	122	180
140	EA-31	23	210.0	215.9	187	547	117	181	188	60	64	122	180
160	EA-31	24	241.3	241.3	215	568	130	189	188	60	72	122	180
225	EA-42	23	290.0	295.0	267	635	158	210	208	60	73	122	180



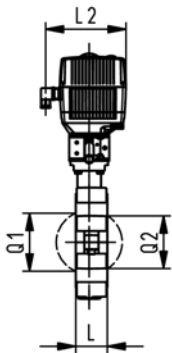
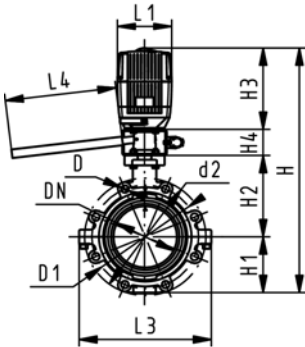
d [mm]	L3 [mm]	Q1 [mm]	Q2 [mm]	closest inch
63	250	40		2
75	250	54	35	2 ½
90	250	67	50	3
110	250	88	74	4
140	250	113	97	5
160	250	139	123	6
225	250	178	169	8

PF 3 39 643 035

# Lugstyle butterfly valve type 141 ABS 100-230V With manual override

## Model:

- Outer body in GGG-40.3 epoxy-coated
- Connecting dimension: ISO 7005 PN10, EN 1092 PN10, DIN 2501 PN10
- Overall length according to EN 558, ISO 5752
- Voltage 100-230 V, 50-60 Hz
- Control time 15 s/90°<) EA31
- Control time 25s/90°<) EA42
- Control range 90°<)
- Actuator with integrated emergency manual override standard



d [mm]	DN [mm]	PN	kv-value ( $\Delta p=1$ bar) [l/min]	EPDM Code	kg
63	50	10	1470	<b>199 141 482</b>	7.713
75	65	10	2200	<b>199 141 483</b>	8.060
90	80	10	3000	<b>199 141 484</b>	9.077
110	100	10	6500	<b>199 141 485</b>	10.493
140	125	10	11500	<b>199 141 486</b>	12.362
160	150	10	16600	<b>199 141 487</b>	14.201
225	200	10	39600	<b>199 141 488</b>	23.505

d [mm]	Actuator unit type	D	D1 [mm]	d2 [mm]	H [mm]	H1 [mm]	H2 [mm]	H3 [mm]	H4 [mm]	L [mm]	L1 [mm]	L2 [mm]	L3 [mm]
63	EA-31	M16	125	150	459	77	134	188	60	45	122	180	150
75	EA-31	M16	145	170	471	83	140	188	60	46	122	180	160
90	EA-31	M16	160	184	483	89	146	188	60	49	122	180	205
110	EA-31	M16	180	216	519	104	167	188	60	56	122	180	244
140	EA-31	M16	210	246	546	117	181	188	60	64	122	180	272
160	EA-31	M20	240	273	567	130	189	188	60	72	122	180	297
225	EA-42	M20	295	334	636	158	210	208	60	73	122	180	360

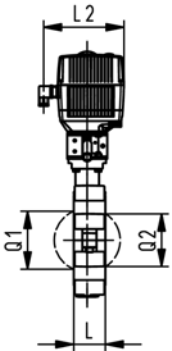
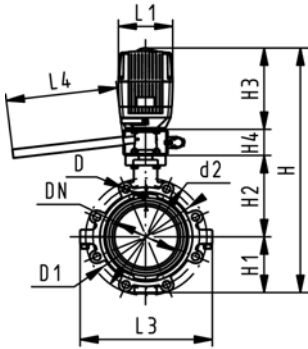
d [mm]	L4 [mm]	Q1 [mm]	Q2 [mm]	closest inch
63	200	40		2
75	200	54	35	2 ½
90	200	67	50	3
110	250	88	74	4
140	250	113	97	5
160	250	139	123	6
225	250	178	169	8

PF 3 39 643 036

## Lugstyle butterfly valve type 141 ABS 24V With manual override

### Model:

- Outer body in GGG-40.3 epoxy-coated
- Connecting dimension: ISO 7005 PN10, EN 1092 PN10, DIN 2501 PN10
- Overall length according to EN 558, ISO 5752
- Voltage 24 V AC/DC
- Control time 15 s/90°<) EA31
- Control time 25s/90°<) EA42
- Control range 90°<)
- Actuator with integrated emergency manual override standard



d [mm]	DN [mm]	PN	kv-value ( $\Delta p=1$ bar) [l/min]	EPDM Code	kg
63	50	10	1470	<b>199 141 522</b>	7.713
75	65	10	2200	<b>199 141 523</b>	8.060
90	80	10	3000	<b>199 141 524</b>	9.077
110	100	10	6500	<b>199 141 525</b>	10.493
140	125	10	11500	<b>199 141 526</b>	12.362
160	150	10	16600	<b>199 141 527</b>	14.201
225	200	10	39600	<b>199 141 528</b>	23.505

d [mm]	Actuator unit type	D	D1 [mm]	d2 [mm]	H [mm]	H1 [mm]	H2 [mm]	H3 [mm]	H4 [mm]	L [mm]	L1 [mm]	L2 [mm]	L3 [mm]
63	EA-31	M16	125	150	459	77	134	188	60	45	122	180	150
75	EA-31	M16	145	170	471	83	140	188	60	46	122	180	160
90	EA-31	M16	160	184	483	89	146	188	60	49	122	180	205
110	EA-31	M16	180	216	519	104	167	188	60	56	122	180	244
140	EA-31	M16	210	246	546	117	181	188	60	64	122	180	272
160	EA-31	M20	240	273	567	130	189	188	60	72	122	180	297
225	EA-42	M20	295	334	636	158	210	208	60	73	122	180	360

d [mm]	L4 [mm]	Q1 [mm]	Q2 [mm]	closest inch
63	200	40		2
75	200	54	35	2 ½
90	200	67	50	3
110	250	88	74	4
140	250	113	97	5
160	250	139	123	6
225	250	178	169	8

PF 3 39 643 036

# Butterfly valves pneumatic

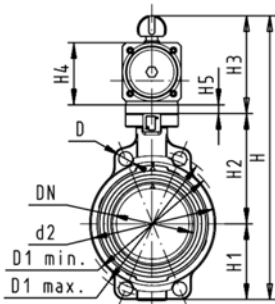
## Butterfly valve type 240 ABS FC (Fail safe to close) Without manual override



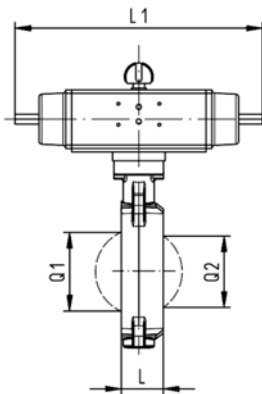
### Model:

- Connecting dimension: ISO 7005 PN 10, EN 1092 PN 10, DIN 2501 PN 10, ANSI/ASME B 16.5 Class 150, BS 1560: 1989, BS 4504, JIS B 2220
- Overall length according to EN 558, ISO 5752
- Control range 90°<

d [mm]	DN [mm]	PN	kv-value ( $\Delta p=1$ bar) [l/min]	EPDM Code	kg
63	50	10	1470	<b>199 240 402</b>	3.371
75	65	10	2200	<b>199 240 403</b>	3.100
90	80	10	3000	<b>199 240 404</b>	3.399
110	100	10	6500	<b>199 240 405</b>	5.133
140	125	10	11500	<b>199 240 406</b>	6.826
160	150	10	16600	<b>199 240 407</b>	9.779
225	200	10	39600	<b>199 240 408</b>	13.529



d [mm]	Actuator unit type	D [mm]	D1 min. [mm]	D1 max. [mm]	d2 [mm]	H [mm]	H1 [mm]	H2 [mm]	H3 [mm]	H4 [mm]	H5 [mm]	L [mm]	L1 [mm]
63	PA-30 FC	19	120.0	125.0	104	327	77	134	117	70	15	45	276
75	PA-30 FC	19	139.7	145.0	115	340	83	140	117	70	15	46	276
90	PA-35 FC	19	150.0	160.0	131	361	89	146	126	78	15	49	326
110	PA-40 FC	19	175.0	190.5	161	400	104	167	129	86		56	370
140	PA-45 FC	23	210.0	215.9	187	436	117	181	139	96		64	411
160	PA-50 FC	24	241.3	241.3	215	468	130	189	149	106		72	423
225	PA-55 FC	23	290.0	295.0	267	529	158	210	161	118		73	452



d [mm]	L2 [mm]	Q1 [mm]	Q2 [mm]	closest inch
63	65	40		2
75	65	54	35	2 ½
90	72	67	50	3
110	80	88	74	4
140	90	113	97	5
160	100	139	123	6
225	112	178	169	8

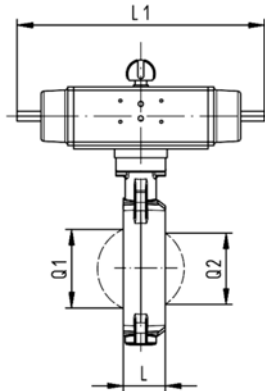
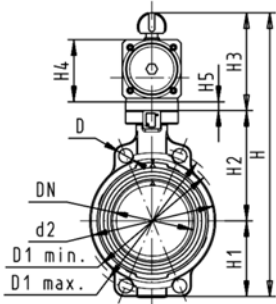
PF 3 39 644 035



## Butterfly valve type 240 ABS FO (Fail safe to open) Without manual override

### Model:

- Connecting dimension: ISO 7005 PN 10, EN 1092 PN 10, DIN 2501 PN 10, ANSI/ASME B 16.5 Class 150, BS 1560: 1989, BS 4504, JIS B 2220
- Overall length according to EN 558, ISO 5752
- Control range 90°<



d [mm]	DN [mm]	PN	kv-value ( $\Delta p=1$ bar) [l/min]	EPDM Code	kg
63	50	10	1470	<b>199 240 422</b>	3.371
75	65	10	2200	<b>199 240 423</b>	3.467
90	80	10	3000	<b>199 240 424</b>	3.399
110	100	10	6500	<b>199 240 425</b>	5.133
140	125	10	11500	<b>199 240 426</b>	6.826
160	150	10	16600	<b>199 240 427</b>	9.779
225	200	10	39600	<b>199 240 428</b>	13.529

d [mm]	Actuator unit type	D [mm]	D1 min. [mm]	D1 max. [mm]	d2 [mm]	H [mm]	H1 [mm]	H2 [mm]	H3 [mm]	H4 [mm]	H5 [mm]	L [mm]	L1 [mm]
63	PA-30 FO	19	120.0	125.0	104	327	77	134	117	70	15	45	276
75	PA-30 FO	19	139.7	145.0	115	340	83	140	117	70	15	46	276
90	PA-35 FO	19	150.0	160.0	131	361	89	146	126	78	15	49	326
110	PA-40 FO	19	175.0	190.5	161	400	104	167	129	86		56	370
140	PA-45 FO	23	210.0	215.9	187	436	117	181	139	96		64	411
160	PA-50 FO	24	241.3	241.3	215	468	130	189	149	106		72	423
225	PA-55 FO	23	290.0	295.0	267	529	158	210	161	118		73	452

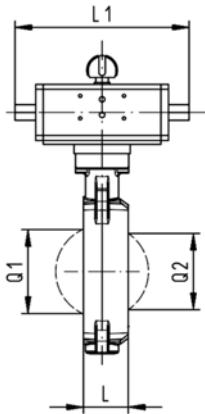
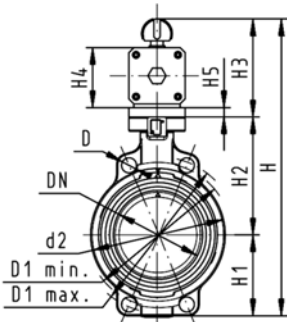
d [mm]	L2 [mm]	Q1 [mm]	Q2 [mm]	closest inch
63	65	40		2
75	65	54	35	2 ½
90	72	67	50	3
110	80	88	74	4
140	90	113	97	5
160	100	139	123	6
225	112	178	169	8

PF 3 39 644 035

# Butterfly valve type 240 ABS DA (Double acting) Without manual override

## Model:

- Connecting dimension: ISO 7005 PN 10, EN 1092 PN 10, DIN 2501 PN 10, ANSI/ASME B 16.5 Class 150, BS 1560: 1989, BS 4504, JIS B 2220
- Overall length according to EN 558, ISO 5752
- Control range 90°<



d [mm]	DN [mm]	PN	kv-value (Δp=1 bar) [l/min]	EPDM Code	kg
63	50	10	1470	<b>199 240 442</b>	2.221
75	65	10	2200	<b>199 240 443</b>	2.317
90	80	10	3000	<b>199 240 444</b>	2.730
110	100	10	6500	<b>199 240 445</b>	3.385
140	125	10	11500	<b>199 240 446</b>	4.076
160	150	10	16600	<b>199 240 447</b>	6.258
225	200	10	39600	<b>199 240 448</b>	7.529

d [mm]	Actuator unit type	D [mm]	D1 min. [mm]	D1 max. [mm]	d2 [mm]	H [mm]	H1 [mm]	H2 [mm]	H3 [mm]	H4 [mm]	H5 [mm]	L [mm]	L1 [mm]
63	PA-35 DA	19	120.0	125.0	104	317	77	134	107	60	15	45	177
75	PA-35 DA	19	139.7	145.0	115	330	83	140	107	60	15	46	177
90	PA-40 DA	19	150.0	160.0	131	348	89	146	113	66	15	49	190
110	PA-45 DA	19	175.0	190.5	161	372	104	167	102	71		56	235
140	PA-45 DA	23	210.0	215.9	187	408	117	181	111	78		64	235
160	PA-55 DA	24	241.3	241.3	215	448	130	189	129	86		72	279
225	PA-55 DA	23	290.0	295.0	267	507	158	210	139	96		73	279

d [mm]	L2 [mm]	Q1 [mm]	Q2 [mm]	closest inch
63	55	40		2
75	55	54	35	2 ½
90	60	67	50	3
110	65	88	74	4
140	72	113	97	5
160	80	139	123	6
225	90	178	169	8

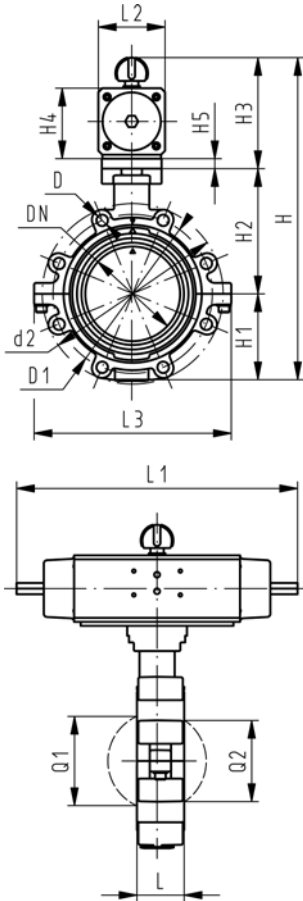
PF 3 39 644 035



# Lugstyle butterfly valve type 241 ABS FO (Fail safe to open) Without manual override

## Model:

- Outer body in GGG-40.3 epoxy-coated
- Connecting dimension: ISO 7005 PN10, EN 1092 PN10, DIN 2501 PN10
- Overall length according to EN 558, ISO 5752
- Control range 90°<



d [mm]	DN [mm]	PN	kv-value ( $\Delta p=1$ bar) [l/min]	EPDM Code	kg
63	50	10	1470	<b>199 241 422</b>	5.253
75	65	10	2200	<b>199 241 423</b>	5.600
90	80	10	3000	<b>199 241 424</b>	6.617
110	100	10	6500	<b>199 241 425</b>	5.231
140	125	10	11500	<b>199 241 426</b>	12.102
160	150	10	16600	<b>199 241 427</b>	16.262
225	200	10	39600	<b>199 241 428</b>	23.505

d [mm]	Actuator unit type	D	D1 [mm]	d2 [mm]	H [mm]	H1 [mm]	H2 [mm]	H3 [mm]	H4 [mm]	H5 [mm]	L [mm]	L1 [mm]	L2 [mm]
63	PA-30 FO	M16	125	150	328	77	134	117	70	15	45	276	65
75	PA-30 FO	M16	145	170	340	83	140	117	70	15	46	276	65
90	PA-35 FO	M16	160	184	361	89	146	126	78	15	49	326	72
110	PA-40 FO	M16	180	216	400	104	167	129	86		56	370	80
140	PA-45 FO	M16	210	246	437	117	181	139	96		64	411	90
160	PA-50 FO	M20	240	273	468	130	189	149	106		72	423	100
225	PA-55 FO	M20	295	334	529	158	210	161	118		73	452	112

d [mm]	L3 [mm]	Q1 [mm]	Q2 [mm]	closest inch
63	150	40		2
75	160	54	35	2 ½
90	205	67	50	3
110	244	88	74	4
140	272	113	97	5
160	297	139	123	6
225	360	178	169	8

PF 3 39 644 036

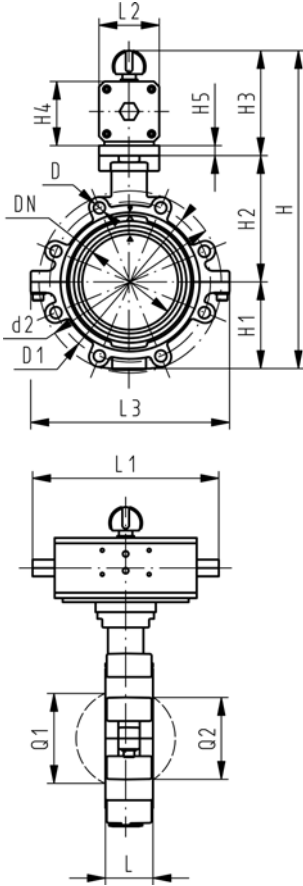




# Lugstyle butterfly valve type 241 ABS DA (Double acting) Without manual override

## Model:

- Outer body in GGG-40.3 epoxy-coated
- Connecting dimension: ISO 7005 PN10, EN 1092 PN10, DIN 2501 PN10
- Overall length according to EN 558, ISO 5752
- Control range 90°<



d [mm]	DN [mm]	PN	kv-value ( $\Delta p=1$ bar) [l/min]	EPDM Code	kg
63	50	10	1470	<b>199 241 442</b>	4.103
75	65	10	2200	<b>199 241 443</b>	4.450
90	80	10	3000	<b>199 241 444</b>	5.948
110	100	10	6500	<b>199 241 445</b>	7.483
140	125	10	11500	<b>199 241 446</b>	9.352
160	150	10	16600	<b>199 241 447</b>	12.741
225	200	10	39600	<b>199 241 448</b>	17.505

d [mm]	Actuator unit type	D	D1 [mm]	d2 [mm]	H [mm]	H1 [mm]	H2 [mm]	H3 [mm]	H4 [mm]	H5 [mm]	L [mm]	L1 [mm]	L2 [mm]
63	PA-35 DA	M16	125	150	318	77	134	107	60	15	45	177	55
75	PA-35 DA	M16	145	170	330	83	140	107	60	15	46	177	55
90	PA-40 DA	M16	160	184	348	89	146	113	66	15	49	190	60
110	PA-45 DA	M16	180	216	373	104	167	102	71		56	235	65
140	PA-45 DA	M16	210	246	409	117	181	111	78		64	235	72
160	PA-55 DA	M20	240	273	448	130	189	129	86		72	279	80
225	PA-55 DA	M20	295	334	507	158	210	139	96		73	279	90

d [mm]	L3 [mm]	Q1 [mm]	Q2 [mm]	closest inch
63	150	40		2
75	160	54	35	2 ½
90	205	67	50	3
110	244	88	74	4
140	272	113	97	5
160	297	139	123	6
225	360	178	169	8

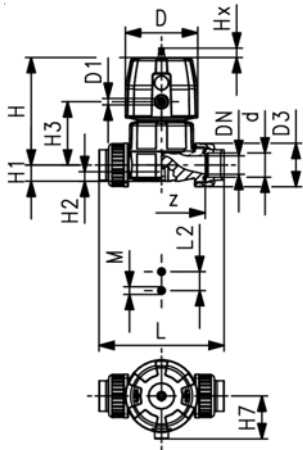
PF 3 39 644 036

# Diaphragm valves pneumatic

## Diaphragm valve DIASTAR Six ABS

FC (Fail safe to close)

Unions with solvent cement sockets metric



### Model:

- Double flow rate compared to predecessor
- One housing nut replaces four screws
- Rotating air connection at 90° intervals
- For easy installation and removal
- Short overall length

### Option:

- Individual configuration of the valve (see diagram)

d [mm]	DN [mm]	PN	kv-value ( $\Delta p=1$ bar) [l/min]	EPDM Code	kg
20	15	6	125	<b>169 614 012</b>	0.523
25	20	6	271	<b>169 614 013</b>	0.986
32	25	6	481	<b>169 614 014</b>	1.175
40	32	6	759	<b>169 614 015</b>	1.977
50	40	6	960	<b>169 614 016</b>	2.495
63	50	6	1181	<b>169 614 017</b>	3.460

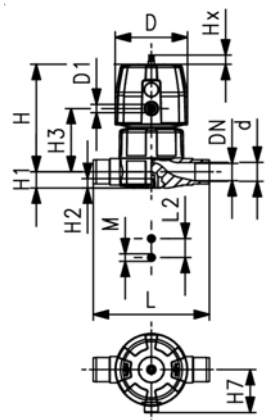
d [mm]	D [mm]	D1_G [inch]	L [mm]	L2 [mm]	H [mm]	H1 [mm]	H2 [mm]	H3 [mm]	H7 [mm]	M	z [mm]	Lift = Hx [mm]	closest inch
20	68	1/8	128	25	101	14	12	60	43	M6	96	7	1/2
25	96	1/8	152	25	132	18	12	73	57	M6	114	10	3/4
32	96	1/8	166	25	143	22	12	84	57	M6	122	13	1
40	120	1/8	192	45	173	26	15	99	69	M8	140	14	1 1/4
50	120	1/8	222	45	193	32	15	119	69	M8	160	16	1 1/2
63	120	1/8	266	45	205	39	15	132	69	M8	190	16	2

PF 3 39 772 220

## Diaphragm valve DIASTAR Six ABS

FC (Fail safe to close)

With solvent cement spigots metric



### Model:

- Double flow rate compared to predecessor
- One housing nut replaces four screws
- Rotating air connection at 90° intervals
- Overall length EN 558

### Option:

- Individual configuration of the valve (see diagram)

d [mm]	DN [mm]	PN	kv-value ( $\Delta p=1$ bar) [l/min]	EPDM Code	kg
20	15	6	125	<b>169 615 012</b>	0.476
25	20	6	271	<b>169 615 013</b>	0.919
32	25	6	481	<b>169 615 014</b>	1.086
40	32	6	759	<b>169 615 015</b>	1.782
50	40	6	960	<b>169 615 016</b>	2.262
63	50	6	1181	<b>169 615 017</b>	3.075

d [mm]	D [mm]	D1_G [inch]	L [mm]	L2 [mm]	H [mm]	H1 [mm]	H2 [mm]	H3 [mm]	H7 [mm]	M	Lift = Hx [mm]	closest inch
20	68	1/8	124	25	101	14	12	60	43	M6	7	1/2
25	96	1/8	144	25	132	18	12	73	57	M6	10	3/4
32	96	1/8	154	25	143	22	12	84	57	M6	13	1
40	120	1/8	174	45	173	26	15	99	69	M8	14	1 1/4
50	120	1/8	194	45	193	32	15	119	69	M8	16	1 1/2
63	120	1/8	224	45	205	39	15	132	69	M8	16	2

PF 3 39 772 210



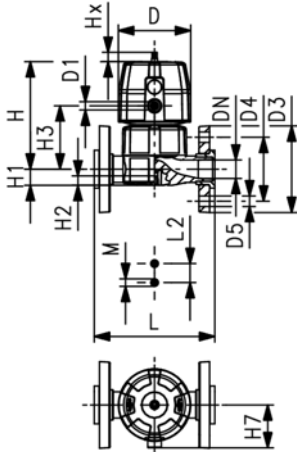
## Diaphragm valve DIASTAR Six ABS FC (Fail safe to close) With backing flanges PP-V metric/BS

### Model:

- Double flow rate compared to predecessor
- One housing nut replaces four screws
- Rotating air connection at 90° intervals
- Flat sealing faces
- Overall length EN 558
- Connecting dimension: ISO 7005 PN 10, EN 1092 PN 10, DIN 2501 PN 10, BS 4504 PN 10

### Option:

- Individual configuration of the valve (see diagram)



d [mm]	DN [mm]	PN	kv-value ( $\Delta p=1$ bar) [l/min]	EPDM Code	kg
20	15	6	125	<b>169 617 112</b>	0.652
25	20	6	271	<b>169 617 113</b>	1.144
32	25	6	481	<b>169 617 114</b>	1.406
40	32	6	759	<b>169 617 115</b>	2.280
50	40	6	960	<b>169 617 116</b>	2.798
63	50	6	1181	<b>169 617 117</b>	3.983

d [mm]	D [mm]	D1_G [inch]	D3 [mm]	D4 [mm]	D5 [mm]	L [mm]	L2 [mm]	H [mm]	H1 [mm]	H2 [mm]	H3 [mm]	H7 [mm]	M	Lift = Hx [mm]
20	68	1/8	95	65	14	130	25	101	14	12	60	43	M6	7
25	96	1/8	105	75	14	150	25	132	18	12	73	57	M6	10
32	96	1/8	115	85	14	160	25	143	22	12	84	57	M6	13
40	120	1/8	140	100	18	180	45	173	26	15	99	69	M8	14
50	120	1/8	150	110	18	200	45	193	32	15	119	69	M8	16
63	120	1/8	165	125	18	230	45	205	39	15	132	69	M8	16

d [mm]	closest inch
20	1/2
25	3/4
32	1
40	1 1/4
50	1 1/2
63	2

PF 3 39 772 230



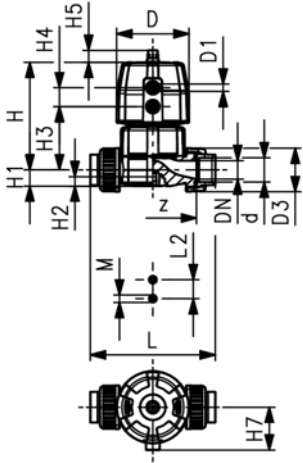
## Diaphragm valve DIASTAR Ten ABS FC (Fail safe to close) Unions with solvent cement sockets metric

### Model:

- Double flow rate compared to predecessor
- One housing nut replaces four screws
- Rotating air connection at 90° intervals
- For easy installation and removal
- Short overall length

### Option:

- Individual configuration of the valve (see diagram)
- Comprehensive range of accessories available



d [mm]	DN [mm]	PN	kv-value ( $\Delta p=1$ bar) [l/min]	EPDM Code	kg
20	15	10	125	<b>169 624 012</b>	0.549
25	20	10	271	<b>169 624 013</b>	1.061
32	25	10	481	<b>169 624 014</b>	1.247
40	32	10	759	<b>169 624 015</b>	2.127
50	40	10	1263	<b>169 624 016</b>	3.633
63	50	10	1728	<b>169 624 017</b>	4.381

d [mm]	D [mm]	D1_G [inch]	L [mm]	L2 [mm]	H [mm]	H1 [mm]	H2 [mm]	H3 [mm]	H4 [mm]	H5 [mm]	H7 [mm]	M	z [mm]	Lift = Hx [mm]
20	68	1/8	128	25	101	14	12	60	24	16	43	M6	96	7
25	96	1/8	152	25	132	18	12	73	25	16	57	M6	114	10
32	96	1/8	166	25	143	22	12	84	25	16	57	M6	122	13
40	120	1/8	192	45	173	26	15	99	26	26	69	M8	140	15
50	150	1/4	222	45	214	32	15	119	36	26	88	M8	160	19
63	150	1/4	266	45	226	39	15	132	36	26	88	M8	190	23

d [mm]	closest inch
20	1/2
25	3/4
32	1
40	1 1/4
50	1 1/2
63	2

PF 3 39 772 220



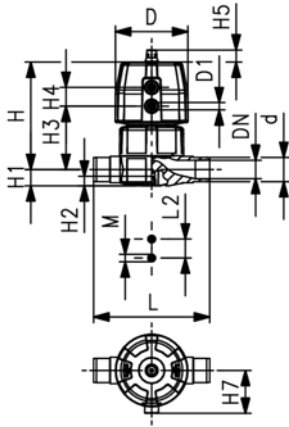
## Diaphragm valve DIASTAR Ten ABS FC (Fail safe to close) With solvent cement spigots metric

### Model:

- Double flow rate compared to predecessor
- One housing nut replaces four screws
- Rotating air connection at 90° intervals
- Overall length EN 558

### Option:

- Individual configuration of the valve (see diagram)
- Comprehensive range of accessories available



d [mm]	DN [mm]	PN	kv-value ( $\Delta p=1$ bar) [l/min]	EPDM Code	kg
20	15	10	125	<b>169 625 012</b>	0.502
25	20	10	271	<b>169 625 013</b>	0.994
32	25	10	481	<b>169 625 014</b>	1.158
40	32	10	759	<b>169 625 015</b>	1.932
50	40	10	1263	<b>169 625 016</b>	3.400
63	50	10	1728	<b>169 625 017</b>	3.996

d [mm]	D [mm]	D1_G [inch]	L [mm]	L2 [mm]	H [mm]	H1 [mm]	H2 [mm]	H3 [mm]	H4 [mm]	H5 [mm]	H7 [mm]	M	Lift = Hx [mm]	closest inch
20	68	1/8	124	25	101	14	12	60	24	16	43	M6	7	1/2
25	96	1/8	144	25	132	18	12	73	25	16	57	M6	10	3/4
32	96	1/8	154	25	143	22	12	84	25	16	57	M6	13	1
40	120	1/8	174	45	173	26	15	99	26	26	69	M8	15	1 1/4
50	150	1/4	194	45	214	32	15	119	36	26	88	M8	19	1 1/2
63	150	1/4	224	45	226	39	15	132	36	26	88	M8	23	2

PF 3 39 772 210



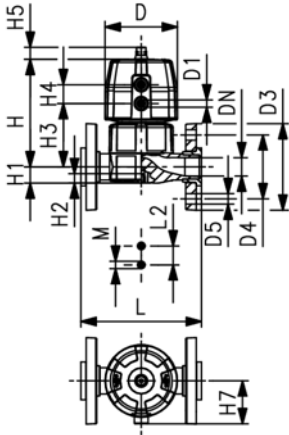
## Diaphragm valve DIASTAR Ten ABS FC (Fail safe to close) With backing flanges PP-V metric/BS

### Model:

- Double flow rate compared to predecessor
- One housing nut replaces four screws
- Rotating air connection at 90° intervals
- Flat sealing faces
- Overall length EN 558
- Connecting dimension: ISO 7005 PN 10, EN 1092 PN 10, DIN 2501 PN 10, BS 4504 PN 10

### Option:

- Individual configuration of the valve (see diagram)
- Comprehensive range of accessories available



d [mm]	DN [mm]	PN	kv-value ( $\Delta p=1$ bar) [l/min]	EPDM Code	kg
20	15	10	125	<b>169 627 112</b>	0.678
25	20	10	271	<b>169 627 113</b>	1.219
32	25	10	481	<b>169 627 114</b>	1.478
40	32	10	759	<b>169 627 115</b>	2.430
50	40	10	1263	<b>169 627 116</b>	3.936
63	50	10	1728	<b>169 627 117</b>	4.904

d [mm]	D [mm]	D1_G [inch]	D3 [mm]	D4 [mm]	D5 [mm]	L [mm]	L2 [mm]	H [mm]	H1 [mm]	H2 [mm]	H3 [mm]	H4 [mm]	H5 [mm]	H7 [mm]	M
20	68	1/8	95	65	14	130	25	101	14	12	60	24	16	43	M6
25	96	1/8	105	75	14	150	25	132	18	12	73	25	16	57	M6
32	96	1/8	115	85	14	160	25	143	22	12	84	25	16	57	M6
40	120	1/8	140	100	18	180	45	173	26	15	99	26	26	69	M8
50	150	1/4	150	110	18	200	45	193	32	15	119	36	26	88	M8
63	150	1/4	165	125	18	230	45	205	39	15	132	36	26	88	M8

d [mm]	Lift = Hx [mm]	closest inch
20	7	1/2
25	10	3/4
32	13	1
40	15	1 1/4
50	19	1 1/2
63	23	2

PF 3 39 772 230



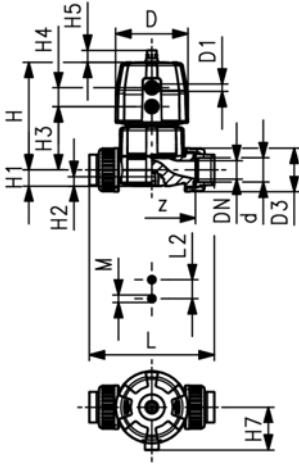
## Diaphragm valve DIASTAR Ten ABS FO (Fail safe to open) Unions with solvent cement sockets metric

### Model:

- Double flow rate compared to predecessor
- One housing nut replaces four screws
- Rotating air connection at 90° intervals
- For easy installation and removal
- Short overall length

### Option:

- Individual configuration of the valve (see diagram)
- Comprehensive range of accessories available



d [mm]	DN [mm]	PN	kv-value ( $\Delta p=1$ bar) [l/min]	EPDM Code	kg
20	15	10	125	<b>169 644 012</b>	0.499
25	20	10	271	<b>169 644 013</b>	0.887
32	25	10	481	<b>169 644 014</b>	1.067
40	32	10	759	<b>169 644 015</b>	1.767
50	40	10	1263	<b>169 644 016</b>	3.543
63	50	10	1728	<b>169 644 017</b>	4.291

d [mm]	D [mm]	D1_G [inch]	L [mm]	L2 [mm]	H [mm]	H1 [mm]	H2 [mm]	H3 [mm]	H4 [mm]	H5 [mm]	H7 [mm]	M	z [mm]	Lift = Hx [mm]
20	68	1/8	128	25	101	14	12	60	24	16	43	M6	96	7
25	96	1/8	152	25	132	18	12	73	25	16	57	M6	114	10
32	96	1/8	166	25	143	22	12	84	25	16	57	M6	122	13
40	120	1/8	192	45	173	26	15	99	26	26	69	M8	140	15
50	150	1/4	222	45	214	32	15	119	36	26	88	M8	160	19
63	150	1/4	266	45	226	39	15	132	36	26	88	M8	190	23

d [mm]	closest inch
20	1/2
25	3/4
32	1
40	1 1/4
50	1 1/2
63	2

PF 3 39 772 220



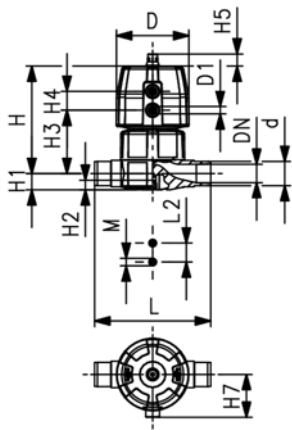
## Diaphragm valve DIASTAR Ten ABS FO (Fail safe to open) With solvent cement spigots metric

### Model:

- Double flow rate compared to predecessor
- One housing nut replaces four screws
- Rotating air connection at 90° intervals
- Overall length EN 558

### Option:

- Individual configuration of the valve (see diagram)
- Comprehensive range of accessories available



d [mm]	DN [mm]	PN	kv-value ( $\Delta p=1$ bar) [l/min]	EPDM Code	kg
20	15	10	125	<b>169 645 012</b>	0.452
25	20	10	271	<b>169 645 013</b>	0.820
32	25	10	481	<b>169 645 014</b>	0.977
40	32	10	759	<b>169 645 015</b>	1.572
50	40	10	1263	<b>169 645 016</b>	3.310
63	50	10	1728	<b>169 645 017</b>	3.906

d [mm]	D [mm]	D1_G [inch]	L [mm]	L2 [mm]	H [mm]	H1 [mm]	H2 [mm]	H3 [mm]	H4 [mm]	H5 [mm]	H7 [mm]	M	Lift = Hx [mm]	closest inch
20	68	1/8	124	25	101	14	12	60	24	16	43	M6	7	1/2
25	96	1/8	144	25	132	18	12	73	25	16	57	M6	10	3/4
32	96	1/8	154	25	143	22	12	84	25	16	57	M6	13	1
40	120	1/8	174	45	173	26	15	99	26	26	69	M8	15	1 1/4
50	150	1/4	194	45	214	32	15	119	36	26	88	M8	19	1 1/2
63	150	1/4	224	45	226	39	15	132	36	26	88	M8	23	2

PF 3 39 772 210





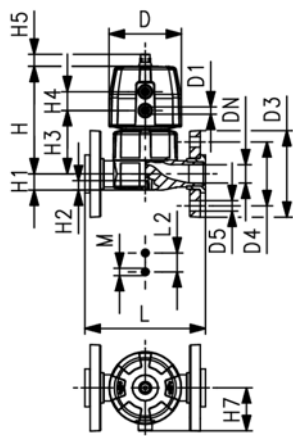
## Diaphragm valve DIASTAR Ten ABS FO (Fail safe to open) With backing flanges PP-V metric/BS

### Model:

- Double flow rate compared to predecessor
- One housing nut replaces four screws
- Rotating air connection at 90° intervals
- Flat sealing faces
- Overall length EN 558
- Connecting dimension: ISO 7005 PN 10, EN 1092 PN 10, DIN 2501 PN 10, BS 4504 PN 10

### Option:

- Individual configuration of the valve (see diagram)
- Comprehensive range of accessories available



d [mm]	DN [mm]	PN	kv-value ( $\Delta p=1$ bar) [l/min]	EPDM Code	kg
20	15	10	125	<b>169 647 112</b>	0.628
25	20	10	271	<b>169 647 113</b>	1.045
32	25	10	481	<b>169 647 114</b>	1.298
40	32	10	759	<b>169 647 115</b>	2.070
50	40	10	1263	<b>169 647 116</b>	3.846
63	50	10	1728	<b>169 647 117</b>	4.814

d [mm]	D [mm]	D1_G [inch]	D3 [mm]	D4 [mm]	D5 [mm]	L [mm]	L2 [mm]	H [mm]	H1 [mm]	H2 [mm]	H3 [mm]	H4 [mm]	H5 [mm]	H7 [mm]	M
20	68	1/8	95	65	14	130	25	101	14	12	60	24	16	43	M6
25	96	1/8	105	75	14	150	25	132	18	12	73	25	16	57	M6
32	96	1/8	115	85	14	160	25	143	22	12	84	25	16	57	M6
40	120	1/8	140	100	18	180	45	173	26	15	99	26	26	69	M8
50	150	1/4	150	110	18	200	45	214	32	15	119	36	26	88	M8
63	150	1/4	165	125	18	230	45	226	39	15	132	36	26	88	M8

d [mm]	Lift = Hx [mm]	closest inch
20	7	1/2
25	10	3/4
32	13	1
40	15	1 1/4
50	19	1 1/2
63	23	2

PF 3 39 772 230



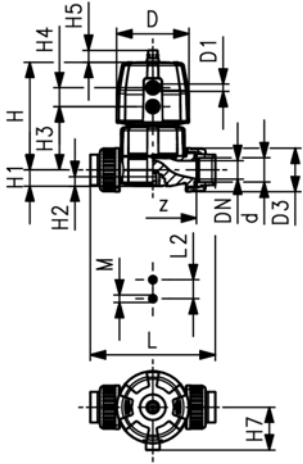
# Diaphragm valve DIASTAR Ten ABS DA (Double acting) Unions with solvent cement sockets metric

## Model:

- Double flow rate compared to predecessor
- One housing nut replaces four screws
- Rotating air connection at 90° intervals
- For easy installation and removal
- Short overall length

## Option:

- Individual configuration of the valve (see diagram)
- Comprehensive range of accessories available



d [mm]	DN [mm]	PN	kv-value ( $\Delta p=1$ bar) [l/min]	EPDM Code	kg
20	15	10	125	<b>169 654 012</b>	0.483
25	20	10	271	<b>169 654 013</b>	0.851
32	25	10	481	<b>169 654 014</b>	1.037
40	32	10	759	<b>169 654 015</b>	1.707
50	40	10	1263	<b>169 654 016</b>	2.793
63	50	10	1728	<b>169 654 017</b>	3.541

d [mm]	D [mm]	D1_G [inch]	L [mm]	L2 [mm]	H [mm]	H1 [mm]	H2 [mm]	H3 [mm]	H4 [mm]	H5 [mm]	H7 [mm]	M	z [mm]	Lift = Hx [mm]
20	68	1/8	128	25	101	14	12	60	24	16	43	M6	96	7
25	96	1/8	152	25	132	18	12	73	25	16	57	M6	114	10
32	96	1/8	166	25	143	22	12	84	25	16	57	M6	122	13
40	120	1/8	192	45	173	26	15	99	26	26	69	M8	140	15
50	150	1/4	222	45	214	32	15	119	36	26	88	M8	160	19
63	150	1/4	266	45	226	39	15	132	36	26	88	M8	190	23

d [mm]	closest inch
20	1/2
25	3/4
32	1
40	1 1/4
50	1 1/2
63	2

PF 3 39 772 220

# Diaphragm valve DIASTAR Ten ABS DA (Double acting) With solvent cement spigots metric

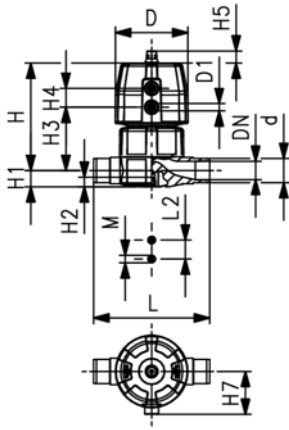


## Model:

- Double flow rate compared to predecessor
- One housing nut replaces four screws
- Rotating air connection at 90° intervals
- Overall length EN 558

## Option:

- Individual configuration of the valve (see diagram)
- Comprehensive range of accessories available



d [mm]	DN [mm]	PN	kv-value ( $\Delta p=1$ bar) [l/min]	EPDM Code	kg
20	15	10	125	<b>169 655 012</b>	0.436
25	20	10	271	<b>169 655 013</b>	0.784
32	25	10	481	<b>169 655 014</b>	0.947
40	32	10	759	<b>169 655 015</b>	1.512
50	40	10	1263	<b>169 655 016</b>	2.560
63	50	10	1728	<b>169 655 017</b>	3.156

d [mm]	D [mm]	D1_G [inch]	L [mm]	L2 [mm]	H [mm]	H1 [mm]	H2 [mm]	H3 [mm]	H4 [mm]	H5 [mm]	H7 [mm]	M	Lift = Hx [mm]	closest inch
20	68	1/8	124	25	101	14	12	60	24	16	43	M6	7	1/2
25	96	1/8	144	25	132	18	12	73	25	16	57	M6	10	3/4
32	96	1/8	154	25	143	22	12	84	25	16	57	M6	13	1
40	120	1/8	174	45	173	26	15	99	26	26	69	M8	15	1 1/4
50	150	1/4	194	45	214	32	15	119	36	26	88	M8	19	1 1/2
63	150	1/4	224	45	226	39	15	132	36	26	88	M8	23	2

PF 3 39 772 210



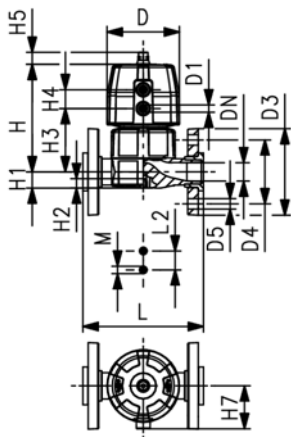
## Diaphragm valve DIASTAR Ten ABS DA (Double acting) With backing flanges PP-V metric/BS

### Model:

- Double flow rate compared to predecessor
- One housing nut replaces four screws
- Rotating air connection at 90° intervals
- Flat sealing faces
- Overall length EN 558
- Connecting dimension: ISO 7005 PN 10, EN 1092 PN 10, DIN 2501 PN 10, BS 4504 PN 10

### Option:

- Individual configuration of the valve (see diagram)
- Comprehensive range of accessories available



d [mm]	DN [mm]	PN	kv-value ( $\Delta p=1$ bar) [l/min]	EPDM Code	kg
20	15	10	125	<b>169 657 112</b>	0.612
25	20	10	271	<b>169 657 113</b>	1.009
32	25	10	481	<b>169 657 114</b>	1.268
40	32	10	759	<b>169 657 115</b>	2.010
50	40	10	1263	<b>169 657 116</b>	3.096
63	50	10	1728	<b>169 657 117</b>	4.064

d [mm]	D [mm]	D1_G [inch]	D3 [mm]	D4 [mm]	D5 [mm]	L [mm]	L2 [mm]	H [mm]	H1 [mm]	H2 [mm]	H3 [mm]	H4 [mm]	H5 [mm]	H7 [mm]	M
20	68	1/8	95	65	14	130	25	101	14	12	60	24	16	43	M6
25	96	1/8	105	75	14	150	25	132	18	12	73	25	16	57	M6
32	96	1/8	115	85	14	160	25	143	22	12	84	25	16	57	M6
40	120	1/8	140	100	18	180	45	173	26	15	99	26	26	69	M8
50	150	1/4	150	110	18	200	45	214	32	15	119	36	26	88	M8
63	150	1/4	165	125	18	230	45	226	39	15	132	36	26	88	M8

d [mm]	Lift = Hx [mm]	closest inch
20	7	1/2
25	10	3/4
32	13	1
40	15	1 1/4
50	19	1 1/2
63	23	2

PF 3 39 772 230



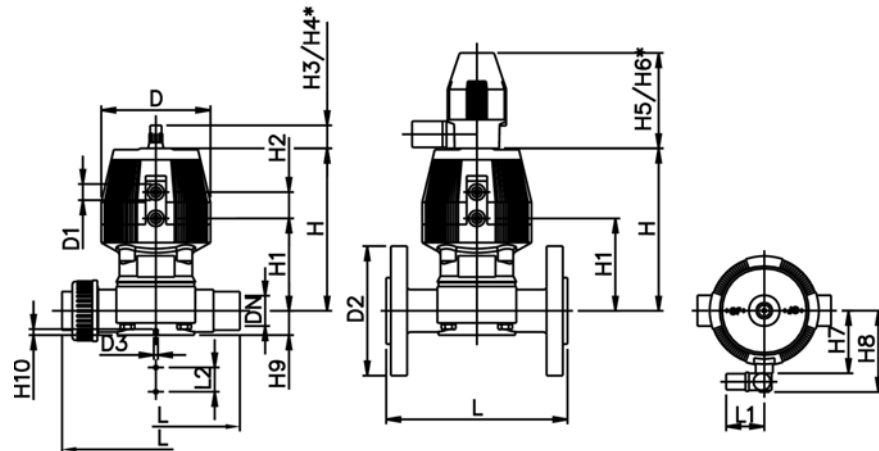
## Diaphragm valve type DIASTAR ABS Series 025 FC (Fail safe to close) With solvent cement spigots metric

- With position indicator / Working pressure: **both sides**

d [mm]	DN [mm]	PN	kv-value ( $\Delta p=1$ bar) [l/min]	EPDM Code	kg
20	15	10	72	<b>199 025 941</b>	0.607
25	20	10	120	<b>199 025 942</b>	0.766
32	25	10	238	<b>199 025 943</b>	1.320
40	32	10	341	<b>199 025 944</b>	2.562
50	40	10	460	<b>199 025 945</b>	3.500
63	50	10	685	<b>199 025 946</b>	4.351

d [mm]	D [mm]	D1_G [inch]	D3[M] [mm]	L [mm]	L1 [mm]	L2 [mm]	H [mm]	H1 [mm]	H2 [mm]	H3 [mm]	H4 [mm]	H5 [mm]	H6 [mm]	H7 [mm]
20	96	1/8	6	124	60	25	128	69	25	23	44	100	155	56
25	96	1/8	6	144	60	25	130	71	25	23	44	100	155	56
32	120	1/8	6	154	60	25	166	93	26	36	64	100	155	68
40	150	1/4	8	174	60	45	201	106	36	36	64	100	160	85
50	180	1/4	8	194	60	45	233	119	37	36	64	100	170	101
63	180	1/4	8	224	60	45	247	133	37	36	64	100	170	101

d [mm]	H8 [mm]	H9 [mm]	H10 [mm]	Lift = Hx [mm]	closest inch
20	86	14	12	8	1/2
25	88	18	12	10	3/4
32	100	21	12	12	1
40	117	26	15	14	1 1/4
50	133	33	15	18	1 1/2
63	133	39	15	22	2



PF 3 39 212 051



## Diaphragm valve type DIASTAR ABS Series 025 FC (Fail safe to close) With fixed flanges ABS metric

### Model:

- Connecting dimensions: ISO 7005 / EN 1092 / DIN 2501 PN10 / BS4504
- With position indicator / Working pressure: **one side**

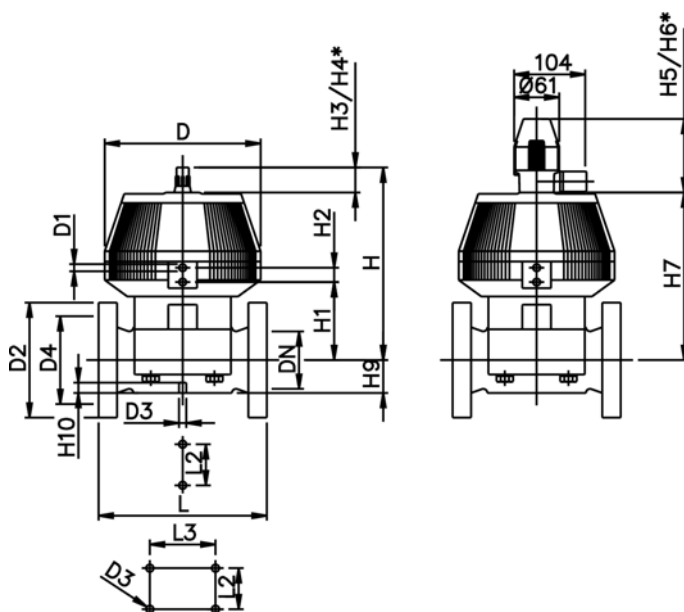
\* with backing flanges PP-V metric

\*\* Connecting dimensions DN80 and DN150 metric and Inch ANSI B16.5

d [mm]	DN [mm]	Inch	PN	kv-value ( $\Delta p=1$ bar) [l/min]	EPDM Code	kg
* 75	65	2 ½	10	992	<b>199 025 947</b>	13.600
** 90	80	3	10	1700	<b>199 025 948</b>	17.400
110	100	4	6	2700	<b>199 025 949</b>	24.700

d [mm]	D [mm]	D1_G [inch]	D2 [mm]	D3[M] [mm]	D4 [mm]	L [mm]	L2 [mm]	H [mm]	H1 [mm]	H2 [mm]	H3 [mm]	H4 [mm]	H5 [mm]	H6 [mm]
* 75	280	¼	185	8	145	290	70	344	148	24	46	100	129	195
** 90	280	¼	200	12	160	310	120	348	150	24	46	100	129	195
110	335	¼	225	12	180	350	120	395	176	24	46	100	129	195

d [mm]	H7 [mm]	H9 [mm]	H10 [mm]
* 75	298	46	15
** 90	302	57	15
110	349	69	20



PF 3 39 212 127



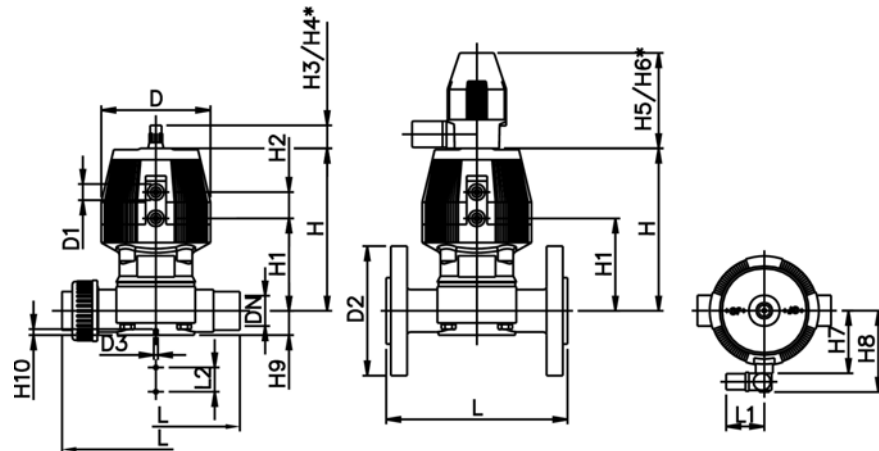
## Diaphragm valve type DIASTAR ABS Series 025 FO (Fail safe to open) With solvent cement spigots metric

- With position indicator / Working pressure: **both sides**

d [mm]	DN [mm]	PN	kv-value ( $\Delta p=1$ bar) [l/min]	EPDM Code	kg
20	15	10	72	<b>199 025 951</b>	0.404
25	20	10	120	<b>199 025 952</b>	0.690
32	25	10	238	<b>199 025 953</b>	0.980
40	32	10	341	<b>199 025 954</b>	1.230
50	40	10	460	<b>199 025 955</b>	2.210
63	50	10	685	<b>199 025 956</b>	4.360

d [mm]	D [mm]	D1_G [inch]	D3[M] [mm]	L [mm]	L1 [mm]	L2 [mm]	H [mm]	H1 [mm]	H2 [mm]	H3 [mm]	H4 [mm]	H5 [mm]	H6 [mm]	H7 [mm]
20	68	1/8	6	124	60	25	99	59	24	23	44	100	155	44
25	96	1/8	6	144	60	25	130	71	25	23	44	100	155	56
32	96	1/8	6	154	60	25	143	85	25	23	44	100	155	56
40	120	1/8	8	174	60	45	170	97	26	36	64	100	160	68
50	150	1/4	8	194	60	45	203	108	36	36	64	100	170	85
63	150	1/4	8	224	60	45	220	126	36	36	64	100	170	85

d [mm]	H8 [mm]	H9 [mm]	H10 [mm]	Lift = Hx [mm]	closest inch
20	76	14	12	8	1/2
25	88	18	12	10	3/4
32	88	21	12	12	1
40	100	26	15	14	1 1/4
50	117	33	15	18	1 1/2
63	117	39	15	22	2



PF 3 39 212 053



## Diaphragm valve type DIASTAR ABS Series 025 FO (Fail safe to open) With fixed flanges ABS metric

### Model:

- Connecting dimensions: ISO 7005 / EN 1092 / DIN 2501 PN10 / BS4504
- With position indicator / Working pressure: **one side**

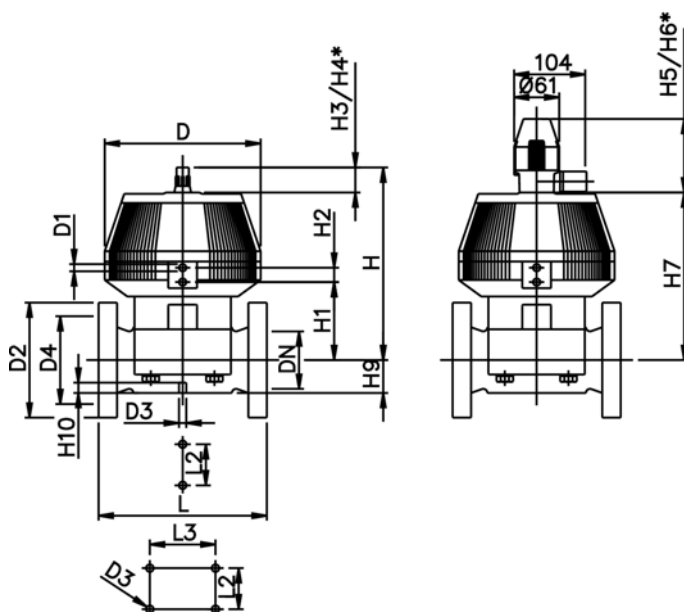
\* with backing flanges PP-V metric

\*\* Connecting dimensions DN80 and DN150 metric and Inch ANSI B16.5

d [mm]	DN [mm]	Inch	PN	kv-value ( $\Delta p=1$ bar) [l/min]	EPDM Code	kg
* 75	65	2 ½	10	992	<b>199 025 957</b>	13.600
** 90	80	3	10	1700	<b>199 025 958</b>	13.800
110	100	4	6	2700	<b>199 025 959</b>	

d [mm]	D [mm]	D1_G [inch]	D2 [mm]	D3[M] [mm]	D4 [mm]	L [mm]	L2 [mm]	H [mm]	H1 [mm]	H2 [mm]	H3 [mm]	H4 [mm]	H5 [mm]	H6 [mm]
* 75	280	¼	185	8	145	290	70	344	148	24	46	100	129	195
** 90	280	¼	200	12	160	310	120	348	150	24	46	100	129	195
110	335	¼	225	12	180	350	120	395	176	24	46	100	129	195

d [mm]	H7 [mm]	H9 [mm]	H10 [mm]
* 75	298	46	15
** 90	302	57	15
110	349	69	20



PF 3 39 212 053





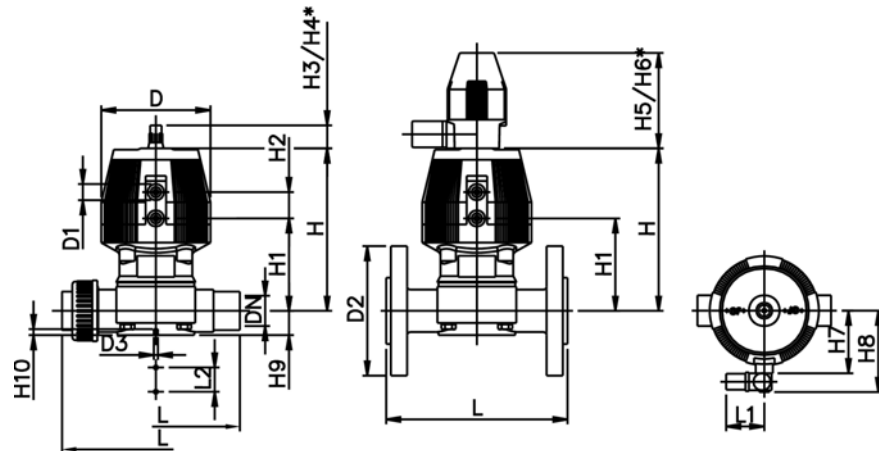
## Diaphragm valve type DIASTAR ABS Series 025 DA (Double acting) With solvent cement spigots metric

- With position indicator / Working pressure: **both sides**

d [mm]	DN [mm]	PN	kv-value ( $\Delta p=1$ bar) [l/min]	EPDM Code	kg
20	15	10	72	<b>199 025 961</b>	0.404
25	20	10	120	<b>199 025 962</b>	0.690
32	25	10	238	<b>199 025 963</b>	1.260
40	32	10	341	<b>199 025 964</b>	1.230
50	40	10	460	<b>199 025 965</b>	2.210
63	50	10	685	<b>199 025 966</b>	4.360

d [mm]	D [mm]	D1_G [inch]	D3[M] [mm]	L [mm]	L1 [mm]	L2 [mm]	H [mm]	H1 [mm]	H2 [mm]	H3 [mm]	H4 [mm]	H5 [mm]	H6 [mm]	H7 [mm]
20	68	1/8	6	124	60	25	99	59	24	23	44	100	155	44
25	96	1/8	6	144	60	25	130	71	25	23	44	100	155	56
32	96	1/8	6	154	60	25	143	85	25	23	44	100	155	56
40	120	1/8	8	174	60	45	170	97	26	36	64	100	160	68
50	150	1/4	8	194	60	45	203	108	36	36	64	100	170	85
63	150	1/4	8	224	60	45	220	126	36	36	64	100	170	85

d [mm]	H8 [mm]	H9 [mm]	H10 [mm]	Lift = Hx [mm]	closest inch
20	76	14	12	8	1/2
25	88	18	12	10	3/4
32	88	21	12	12	1
40	100	26	15	14	1 1/4
50	117	33	15	18	1 1/2
63	117	39	15	22	2



PF 3 39 212 055



## Diaphragm valve type DIASTAR ABS Series 025 DA (Double acting) With fixed flanges ABS metric

### Model:

- Connecting dimensions: ISO 7005 / EN 1092 / DIN 2501 PN10 / BS4504
- With position indicator / Working pressure: **one side**

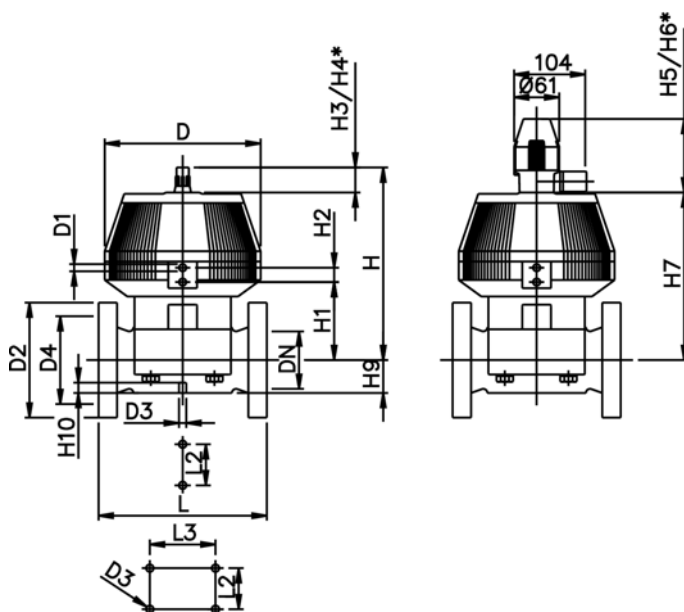
\* with backing flanges PP-V metric

\*\* Connecting dimensions DN80 and DN150 metric and Inch ANSI B16.5

d [mm]	DN [mm]	Inch	PN	kv-value ( $\Delta p=1$ bar) [l/min]	EPDM Code	kg
* 75	65	2 ½	10	992	<b>199 025 967</b>	
** 90	80	3	10	1700	<b>199 025 968</b>	17.400
110	100	4	6	2700	<b>199 025 969</b>	24.700

d [mm]	D [mm]	D1_G [inch]	D2 [mm]	D3[M] [mm]	D4 [mm]	L [mm]	L2 [mm]	H [mm]	H1 [mm]	H2 [mm]	H3 [mm]	H4 [mm]	H5 [mm]	H6 [mm]
* 75	280	¼	185	8	145	290	70	344	148	24	46	100	129	195
** 90	280	¼	200	12	160	310	120	348	150	24	46	100	129	195
110	335	¼	225	12	180	350	120	395	176	24	46	100	129	195

d [mm]	H7 [mm]	H9 [mm]	H10 [mm]
* 75	298	46	15
** 90	302	57	15
110	349	69	20



PF 3 39 212 129

# Backing flanges PP-V

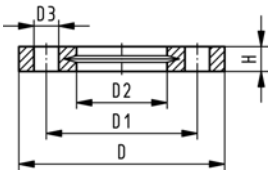
27 70 04  
27 70 05

## Backing flange PP-V For socket systems metric

### Model:

- Modern full-plastic flange PP-GF (30 % glass-fibre reinforced)
- With V-groove which applies force evenly on collar
- With integrated bolt retainers as an assembly aid
- UV-resistant. Applicable for outside applications
- Connecting dimension: ISO 7005, EN 1092, BS 4504, DIN 2501
- **Bolt circle PN 10**

AL: number of holes



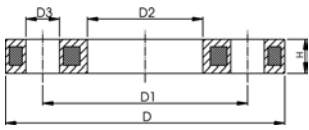
d [mm]	Inch	DN [mm]	PN	Code	SP	kg	D [mm]	D1 [mm]	D2 [mm]	D3 [mm]	H [mm]	AL	SC
20		15	16	<b>727 700 406</b>	56	0.080	95	65.0	28	14	16	4	M12
25		20	16	<b>727 700 407</b>	38	0.100	105	75.0	34	14	17	4	M12
32		25	16	<b>727 700 408</b>	80	0.140	115	85.0	42	14	18	4	M12
40		32	16	<b>727 700 409</b>	40	0.220	140	100.0	51	18	20	4	M16
50		40	16	<b>727 700 410</b>	30	0.210	150	110.0	62	18	22	4	M16
63		50	16	<b>727 700 411</b>	25	0.380	165	125.0	78	18	24	4	M16
75		65	16	<b>727 700 412</b>	19	0.480	185	145.0	92	18	26	4	M16
90		80	16	<b>727 700 413</b>	15	0.520	200	160.0	110	18	27	8	M16
110		100	16	<b>727 700 414</b>	13	0.680	220	180.0	133	18	28	8	M16
140		125	16	<b>727 700 416</b>	10	0.800	250	210.0	167	18	30	8	M16
160	6	150	16	<b>727 700 417</b>	-	1.200	285	241.0	190	22	32	8	M20
200		200	16	<b>727 700 419</b>	-	1.500	340	296.0	226	22	34	8	M20
225	8	200	16	<b>727 700 420</b>	-	1.400	340	295.0	250	22	34	8	M20
250		250	16	<b>727 700 421</b>	-	1.700	395	350.0	277	22	38	12	M20
280		250	16	<b>727 700 422</b>	-	1.700	395	350.0	310	22	38	12	M20
315		300	16	<b>727 700 423</b>	-	2.400	445	400.0	348	22	42	12	M20
355		350	10	<b>727 700 424</b>	-	3.000	515	460.0	388	22	46	16	M20
400		400	10	<b>727 700 425</b>	-	3.500	574	515.0	442	26	50	16	M24

PF 2 34 238 030

# Backing flanges PP-Steel

27 70 02

## Backing flange PP-Steel For socket systems metric



### Model:

- PP-GF (30% glass-fibre reinforced) with steel ring
- UV-resistant. Applicable for outside applications
- Connecting dimension: ISO 7005, EN 1092, BS 4504, DIN 2501
- **Bolt circle PN 10**

<sup>1</sup> Connecting dimension: ISO 2536, bolt circle acc. DN125, suitable for flange adaptor d125/DN100

<sup>2</sup> Connecting dimension: ISO 2536, bolt circle acc. DN225, suitable for flange adaptor d250/DN250

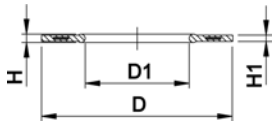
AL: number of holes

d [mm]	d [inch]	DN [mm]	PN	Code	kg	D [mm]	D1 [mm]	D2 [mm]	D3 [mm]	H [mm]	AL	SC
20		15	16	<b>727 700 206</b>	0.220	95	65	28	14	12	4	M12
25		20	16	<b>727 700 207</b>	0.260	105	75	34	14	12	4	M12
32		25	16	<b>727 700 208</b>	0.430	115	85	42	14	16	4	M12
40		32	16	<b>727 700 209</b>	0.650	140	100	51	18	16	4	M16
50		40	16	<b>727 700 210</b>	0.820	150	110	62	18	20	4	M16
63		50	16	<b>727 700 211</b>	0.940	165	125	78	18	20	4	M16
75		65	16	<b>727 700 212</b>	1.300	185	145	92	18	20	4	M16
90		80	16	<b>727 700 213</b>	1.400	200	160	110	18	20	8	M16
110		100	16	<b>727 700 214</b>	1.560	220	180	133	18	20	8	M16
<sup>1</sup> 125		125	16	<b>727 700 215</b>	2.590	250	210	150	18	24	8	M16
140		125	16	<b>727 700 216</b>	2.120	250	210	167	18	24	8	M16
160		150	16	<b>727 700 217</b>	3.390	285	240	190	22	24	8	M20
200		200	16	<b>727 700 219</b>	5.850	340	295	226	22	27	8	M20
225		200	16	<b>727 700 220</b>	4.410	340	295	250	22	27	8	M20
250		250	16	<b>727 700 021</b>	8.340	395	350	277	22	30	12	M20
<sup>2</sup> 250		225	16	<b>727 700 221</b>	8.340	395	325	277	22	30	8	M20
280		250	16	<b>727 700 222</b>	5.520	395	350	310	22	30	12	M20
315		300	16	<b>727 700 223</b>	7.600	445	400	348	22	34	12	M20
355		350	16	<b>727 700 224</b>	13.960	515	460	388	23	40	16	M20
400		400	16	<b>727 700 225</b>	17.380	574	515	442	26	40	16	M24

PF 2 34 238 020

# Seals

EPDM 48 44 07  
FPM 49 44 07



## Profile flange gasket metric

### Model:

- For all metric GF Flange Adaptors
- Profile Gasket with steel insert (type G-ST-P/K)
- Hardness: 70° Shore **EPDM**, 75° Shore **FPM**
- **EPDM**: approved acc. to DVGW W 270, KTW recommendation
- Centering on the inner diameter of the screw crown
- material steel insert: carbon steel

di FA are the suitable inner diameters of flange adaptors

d [mm]	DN [mm]	PN	EPDM Code	FPM Code	kg
16	10	16	<b>748 440 705</b>	<b>749 440 705</b>	0.007
20	15	16	<b>748 440 706</b>	<b>749 440 706</b>	0.008
25	20	16	<b>748 440 707</b>	<b>749 440 707</b>	0.011
32	25	16	<b>748 440 708</b>	<b>749 440 708</b>	0.014
40	32	16	<b>748 440 709</b>	<b>749 440 709</b>	0.021
50	40	16	<b>748 440 710</b>	<b>749 440 710</b>	0.022
63	50	16	<b>748 440 711</b>	<b>749 440 711</b>	0.041
75	65	16	<b>748 440 712</b>	<b>749 440 712</b>	0.055
90	80	16	<b>748 440 713</b>	<b>749 440 713</b>	0.062
110	100	16	<b>748 440 714</b>	<b>749 440 714</b>	0.085
125	100	16	<b>748 440 715</b>	<b>749 440 715</b>	0.158
140	125	16	<b>748 440 716</b>	<b>749 440 716</b>	0.118
160 / 180	150	16	<b>748 440 717</b>	<b>749 440 717</b>	0.153
200	200	16	<b>748 440 719</b>	<b>749 440 719</b>	0.263
225	200	16	<b>748 440 720</b>	<b>749 440 720</b>	0.181
250	250	16	<b>748 440 721</b>	<b>749 440 721</b>	0.410
280	250	16	<b>748 440 722</b>	<b>749 440 722</b>	0.226
315	300	16	<b>748 440 723</b>	<b>749 440 723</b>	0.334

d [mm]	DN [mm]	D [mm]	D1 [mm]	H [mm]	H1 [mm]	di FA [mm]	Closest inch
16	10	46	16	4	3	6 - 16	
20	15	51	20	4	3	10 - 20	
25	20	61	22	4	3	12 - 22	
32	25	71	28	4	3	18 - 28	
40	32	82	40	4	3	30 - 40	
50	40	92	46	4	3	36 - 46	
63	50	107	58	5	4	48 - 58	
75	65	127	69	5	4	59 - 69	
90	80	142	84	5	4	73 - 84	
110	100	162	104	6	5	94 - 104	
125	100	162	123	6	5	113 - 123	
140	125	192	137	6	5	127 - 137	
160 / 180	150	218	160	8	6	150 - 160	6
200	200	273	203	8	6	192 - 203	
225	200	273	220	8	6	207 - 220	8 - 9
250	250	328	252	8	6	238 - 252	
280	250	328	274	8	6	264 - 274	
315	300	378	306	8	6	296 - 306	

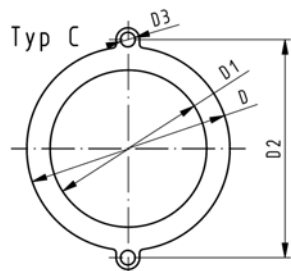
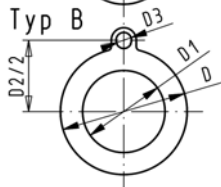
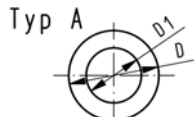
PF 2 30 162 038

# Flat gasket

**Model:**

- For all metric GF Flange Adaptors
- Hardness approx. 65° Shore
- Integrated fixation aids from d110
- Centering on the inner diameter of the screw crown

di FA are the suitable inner diameters of flange adaptors



d [mm]	DN [mm]	PN	Type	EPDM Code	kg	D [mm]	D1 [mm]	D2 [mm]	D3 [mm]	H [mm]	di FA [mm]
16	10	10	A	<b>748 400 305</b>	0.005	46	16			2	6 - 26
20	15	10	A	<b>748 400 306</b>	0.010	51	20			2	10 - 30
25	20	10	A	<b>748 400 307</b>	0.020	61	25			2	15 - 35
32	25	10	A	<b>748 400 308</b>	0.025	71	32			2	22 - 42
40	32	10	A	<b>748 400 309</b>	0.030	82	40			3	30 - 50
50	40	10	A	<b>748 400 310</b>	0.035	92	50			3	40 - 60
63	50	10	A	<b>748 400 311</b>	0.040	107	63			3	53 - 73
75	65	10	A	<b>748 400 312</b>	0.045	127	71			3	61 - 81
90	80	10	A	<b>748 400 313</b>	0.050	142	84			3	74 - 94
110	100	10	B	<b>748 400 314</b>	0.032	162	104	180	18	4	94 - 114
125	100	10	B	<b>748 400 315</b>	0.058	162	119	180	18	4	109 - 129
140	125	10	B	<b>748 400 316</b>	0.062	192	134	210	18	4	124 - 144
160 / 180	150	10	B	<b>748 400 317</b>	0.068	218	155	241	22	4	145 - 165
200	200	6	C	<b>748 400 319</b>	0.075	273	195	295	22	5	185 - 205
225	200	6	C	<b>748 400 320</b>	0.079	273	216	295	22	5	206 - 226
250	250	6	C	<b>748 400 321</b>	0.103	328	250	350	22	5	240 - 260
280	250	6	C	<b>748 400 322</b>	0.150	328	273	350	22	5	263 - 283
315	300	6	C	<b>748 400 323</b>	0.230	378	305	400	22	5	295 - 315

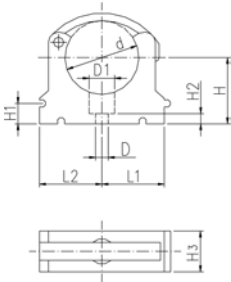
PF 2 30 162 003

# Pipe clips metric

## KLIP-IT pipe clip type 061 PP metric

### Model:

- Material: Clip and safety clip PP black, UV resistant, bolts galvanized
- d16 - d63: Height designed for Ball Valve Type 546 and 543
- **Minimum order quantity: standard packagings SP**



d	d	Code	SP	kg
[mm]	[inch]			
* 10		<b>167 061 003</b>	10	0.003
* 12		<b>167 061 004</b>	10	0.003
* 16		<b>167 061 035</b>	200	0.006
* 20		<b>167 061 036</b>	200	0.008
* 25		<b>167 061 037</b>	10	0.009
* 32		<b>167 061 038</b>	10	0.012
40		<b>167 061 039</b>	10	0.027
50		<b>167 061 040</b>	10	0.031
63		<b>167 061 041</b>	10	0.054
75	2 ½	<b>167 061 012</b>	10	0.058
90	3	<b>167 061 013</b>	10	0.090
110	4	<b>167 061 014</b>	10	0.114
125		<b>167 061 015</b>	10	0.174
140	5	<b>167 061 016</b>	10	0.217
160		<b>167 061 017</b>	10	0.237

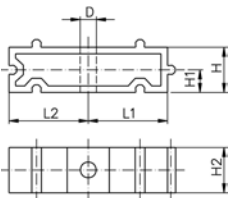
d	D	D1	L1	L2	H	H1	H2	H3	SC	closest
[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]		inch
* 10	5	8	11	14	20	10	6	12	M4	¼
* 12	5	8	11	14	21	10	6	12	M5	¼
* 16	6	11	14	17	27	10	6	16	M5	⅜
* 20	6	11	17	19	27	10	6	16	M5	½
* 25	6	11	19	22	30	10	6	16	M5	¾
* 32	6	11	24	27	36	10	6	16	M5	1
40	7	14	34	34	44	10	7	22	M6	1 ¼
50	7	14	37	37	51	10	7	22	M6	1 ½
63	9	17	45	45	64	10	10	25	M8	2
75	9	17	52	52	58	10	10	25	M8	2 ½
90	9	17	65	65	65	10	10	28	M8	3
110	9	17	79	79	75	10	10	28	M8	4
125	9	17	88	88	90	10	10	32	M8	
140	9	17	98	98	110	10	10	32	M8	5
160	9	17	109	109	108	10	10	32	M8	6

PF 2 30 162 023

## KLIP-IT spacer type 061 PP

### Model:

- For pipe clips Type 061/061H, PP black, UV resistant
- **Minimum order quantity: standard packaging SP**



d	Inch	Code	SP	kg	D	L1	L2	H	H1	H2	SC
[mm]	[inch]				[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	
10 - 12	¼ - ¼	<b>167 061 153</b>	10	0.003	5	11	14	20	10	12	M4
16	⅜	<b>167 061 155</b>	10	0.006	6	14	17	20	10	16	M5
20	½	<b>167 061 156</b>	10	0.006	6	17	19	20	10	16	M5
25	¾	<b>167 061 157</b>	10	0.007	6	19	22	20	10	16	M5
32	1	<b>167 061 158</b>	10	0.008	6	24	27	20	10	16	M5
40	1 ¼	<b>167 061 159</b>	10	0.016	7	34	34	20	10	22	M6
50	1 ½	<b>167 061 160</b>	10	0.017	7	37	37	20	10	22	M6
63	2	<b>167 061 161</b>	10	0.024	9	45	45	20	10	25	M8
75	2 ½	<b>167 061 162</b>	10	0.027	9	52	52	20	10	25	M8
90	3	<b>167 061 163</b>	10	0.040	9	65	65	20	10	28	M8
110	4	<b>167 061 164</b>	10	0.048	9	79	79	20	10	28	M8
125	4 ½	<b>167 061 165</b>	10	0.059	9	88	88	20	10	32	M8
140	5	<b>167 061 166</b>	10	0.065	9	98	98	20	10	32	M8
160	6	<b>167 061 167</b>	10	0.074	9	109	109	20	10	32	M8

PF 2 30 162 023

# Solvent Cement and Tools

99 29 80

## Tangit ABS solvent cement

- 0,65 kg can (net)



Code	kg	Description
799 298 022	0.751	tin: 0.65 kg

PF 2 28 473 005

99 29 80

## Tangit cleaner

**Model:**

- For PVC-U, PVC-C, ABS
- 1 litre tin



Code	kg
799 298 010	0.868

PF 2 28 473 002

99 29 80

## Cap for cement

- Cap prevents the evaporation of the solvent whilst using the Tangit cement



Code	kg
799 298 028	0.030

PF 2 28 473 009

99 29 90

## Round brush



d-d [mm]		Code	kg	Closest inch
6 - 10	4 mm (for Fittings 6-10mm)	799 299 001	0.005	- 1/8
12 - 32	8 mm (for Fittings 12-32mm)	799 299 002	0.009	1/4 - 1

PF 2 30 217 004

99 29 90

## Flat brush



d-d [mm]		Code	kg	Closest inch
40 - 63	25x3 mm (for Fittings 40-63mm)	799 299 003	0.015	1 1/4 - 2
75 - 225	50x5 mm (for Fittings 75-225mm)	799 299 004	0.026	2 1/2 - 8
250 - 400	75x6 mm (for Fittings 250-400mm)	799 299 005	0.045	9 - 16

PF 2 30 217 005

## Chamfering tool



Size	d-d [mm]	Code	kg	Closest inch
1	16 - 75	799 495 145	0.720	3/8 - 2 1/2
2	32 - 200	799 495 146	0.992	1 - 8

PF 2 35 268 001



90 10 90



PF 3 25 117 309

## PPC Plastic pipe cutter

- For cutting plastic pipes d10 - d160

d-d [mm]	Article	Code	kg	Closest inch	
10 - 63	PPC 63, s max. = 7.2mm	<b>790 109 001</b>	0.710	1/8 - 2	
50 - 110	PPC 110, s max. = 12.7mm	<b>790 109 002</b>	1.400	1 1/2 - 4	
110 - 160	PPC 160, s max. = 19.0mm	<b>790 109 003</b>	1.880	4 - 6	

# Pneumatic rotary actuators PA

## Pneumatic actuator type PA11/PA21

### Fail safe to close (FC)



PF 3 46 254 998

Type	DN-DN [mm]	Inch [inch]	Code	kg	
PA 11 FC	10 - 25	$\frac{3}{8}$ - 1	<b>198 150 127</b>	0.743	
PA 21 FC	32 - 50	1 $\frac{1}{4}$ - 2	<b>198 150 130</b>	1.419	

### Fail safe to open (FO)



PF 3 46 254 998

Type	DN-DN [mm]	Inch [inch]	Code	kg	
PA 11 FO	10 - 25	$\frac{3}{8}$ - 1	<b>198 150 128</b>	0.743	
PA 21 FO	32 - 50	1 $\frac{1}{4}$ - 2	<b>198 150 131</b>	1.419	

### Double action (DA)



PF 3 46 254 998

Type	DN-DN [mm]	Inch [inch]	Code	kg	
PA 11 DA	10 - 25	$\frac{3}{8}$ - 1	<b>198 150 129</b>	0.553	
PA 21 DA	32 - 50	1 $\frac{1}{4}$ - 2	<b>198 150 132</b>	0.995	

### Fail safe to close (FC) with stroke limiter



PF 3 46 254 998

Type	DN-DN [mm]	Inch [inch]	Code	kg	
PA 11 FC	10 - 25	$\frac{3}{8}$ - 1	<b>198 150 144</b>	0.837	
PA 21 FC	32 - 50	1 $\frac{1}{4}$ - 2	<b>198 150 147</b>	1.609	

### Fail safe to open (FO) with stroke limiter



PF 3 46 254 998

Type	DN-DN [mm]	Inch [inch]	Code	kg	
PA 11 FO	10 - 25	$\frac{3}{8}$ - 1	<b>198 150 145</b>	0.837	
PA 21 FO	32 - 50	1 $\frac{1}{4}$ - 2	<b>198 150 148</b>	1.609	

### Double action (DA) with stroke limiter



PF 3 46 254 998

Type	DN-DN [mm]	Inch [inch]	Code	kg	
PA 11 DA	10 - 25	$\frac{3}{8}$ - 1	<b>198 150 146</b>	0.647	
PA 21 DA	32 - 50	1 $\frac{1}{4}$ - 2	<b>198 150 149</b>	1.185	

# Pneumatic actuator type PA30 PA90

## Fail safe to close/fail safe to open (FC/FO)



\* Only valid for butterfly valve type 240, 241, 242 and ball valve type 230 - 235

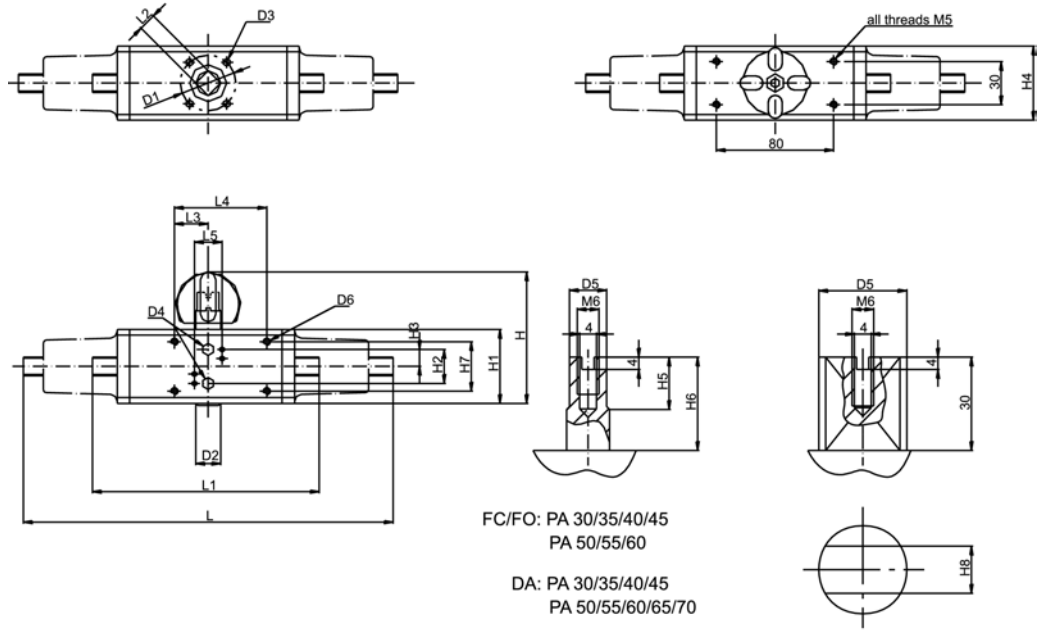
Type	hard anodized Code	nickel plated Code	hard anodized with stroke limiter Code	epoxy coated Code
PA 30 FC/FO	<b>198 800 757</b>	<b>198 800 034</b>	-	<b>198 811 194</b>
* PA 30 FO	<b>198 811 025</b>	-	-	-
PA 35 FC/FO	<b>198 800 037</b>	<b>198 800 052</b>	-	<b>198 800 029</b>
* PA 35 FO	<b>198 811 026</b>	-	-	-
PA 40 FC/FO	<b>198 800 728</b>	<b>198 800 004</b>	<b>198 800 017</b>	<b>198 800 025</b>
* PA 40 FO	<b>198 811 027</b>	-	-	-
PA 45 FC/FO	<b>198 800 039</b>	<b>198 800 054</b>	-	-
* PA45 FO	<b>198 811 028</b>	-	-	-
PA 50 FC/FO	<b>198 800 729</b>	<b>198 800 005</b>	<b>198 800 018</b>	<b>198 800 026</b>
* PA50 FO	<b>198 811 029</b>	-	-	-
PA 55 FC/FO	<b>198 800 041</b>	<b>198 800 056</b>	-	<b>198 811 190</b>
* PA 55 FO	<b>198 811 030</b>	-	-	-
PA 60 FC/FO	<b>198 800 730</b>	<b>198 800 006</b>	<b>198 800 019</b>	-
PA 65 FC/FO	<b>198 800 043</b>	<b>198 800 058</b>	-	-
PA 70 FC/FO	<b>198 800 731</b>	<b>198 800 007</b>	<b>198 800 020</b>	<b>198 800 028</b>
PA 70 FO	<b>198 811 198</b>	-	-	-
PA 75 FC/FO	<b>198 800 045</b>	<b>198 800 060</b>	-	-
PA 80 FC/FO	<b>198 800 047</b>	<b>198 800 062</b>	-	-

Type		D1 [mm]	D2 [mm]	D3[M] [mm]	D4 [inch]	D5 [mm]	L [mm]	L2 [mm]	L3 [mm]	L4 [mm]	L5 [mm]	H [mm]	H1 [mm]
PA 30 FC/FO	F04	42	30	M5x9		10	276	11	35	70	32	102	70
* PA 30 FO	F04	42	30	M5x9	1/8	10	276	11	35	70	32	102	70
PA 35 FC/FO	F05	50	35	M6x11		12	326	14	35	70	32	111	78
* PA 35 FO	F05	50	35	M6x11	1/8	12	326	14	35	70	32	111	78
PA 40 FC/FO	F05	50	35	M6x11		12	370	14	35	70	32	129	86
* PA 40 FO	F05	50	35	M6x11	1/8	12	370	14	35	70	32	129	86
PA 45 FC/FO	F07	70	55	M8x15	1/8	15	411	17	35	70	32	139	96
* PA45 FO	F07	70	55	M8x15	1/8	15	411	17	35	70	32	139	96
PA 50 FC/FO	F07	70	55	M8x15		15	423	17	35	70	32	149	106
* PA50 FO	F07	70	55	M8x15	1/8	15	423	17	35	70	32	149	106
PA 55 FC/FO	F10	102	70	M10x17		19	452	22	35	70	32	161	118
* PA 55 FO	F10	102	70	M10x17	1/8	19	452	22	35	70	32	161	118
PA 60 FC/FO	F10	102	70	M10x17	1/8	19	503	22	35	70	32	173	130
PA 65 FC/FO	F12	125	85	M12x21	1/4		648	27			32	191	148
PA 70 FC/FO	F12	125	85	M12x21			663	27			32	196	153
PA 70 FO	F12	125	85	M12x21	1/4		663	27			32	196	153
PA 75 FC/FO	F14	140	100	M16x25	1/4		824	36			32	229	186
PA 80 FC/FO	F14	140	100	M16x25	1/4		918	36			32	241	198

Type	H2 [mm]	H3 [mm]	H4 [mm]	H5 [mm]	H6 [mm]	H7 [mm]	H8 [mm]
PA 30 FC/FO	21	18	65	13	20	36	
* PA 30 FO	21	18	65	13	20	36	
PA 35 FC/FO	21	18	72	13	20	36	
* PA 35 FO	21	18	72	13	20	36	
PA 40 FC/FO	25	21	80	13	30	36	
* PA 40 FO	25	21	80	13	30	36	
PA 45 FC/FO	25	21	90	16	30	36	
* PA45 FO	25	21	90	16	30	36	
PA 50 FC/FO	25	26	100	17	30	36	
* PA50 FO	25	26	100	17	30	36	
PA 55 FC/FO	25	25	112	19	30	36	
* PA 55 FO	25	25	112	19	30	36	
PA 60 FC/FO	25	32	124	19	30	36	
PA 65 FC/FO	24	34	137				22
PA 70 FC/FO	24	38	145				24

table continued next page

Type	H2 [mm]	H3 [mm]	H4 [mm]	H5 [mm]	H6 [mm]	H7 [mm]	H8 [mm]
PA 70 FO	24	38	145				24
PA 75 FC/FO	24	43	166				27
PA 80 FC/FO	24	44	180				32



FC/FO: PA 65/70/75/80  
DA: PA 75/80/85/90

PF 3 46 253 005



## Double acting (DA)

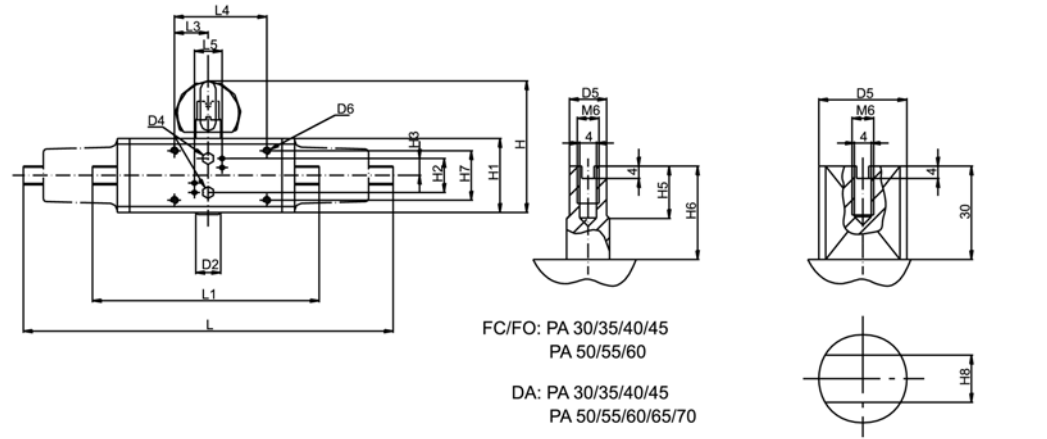
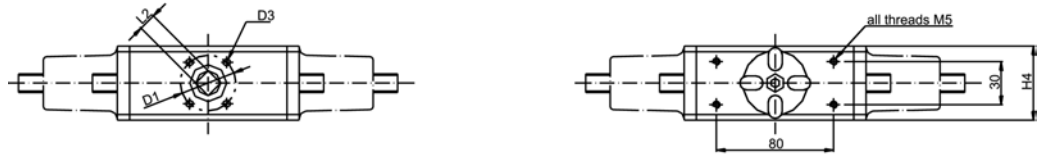
Type	hard anodized Code	kg
PA 30 DA	<b>198 800 737</b>	2.400
PA 35 DA	<b>198 800 758</b>	1.250
PA 40 DA	<b>198 800 759</b>	1.731
PA 45 DA	<b>198 800 040</b>	1.850
PA 50 DA	<b>198 800 733</b>	2.984
PA 55 DA	<b>198 800 042</b>	3.400
PA 60 DA	<b>198 800 734</b>	6.040
PA 65 DA	<b>198 800 044</b>	7.200
PA 70 DA	<b>198 800 735</b>	10.300
PA 75 DA	<b>198 800 046</b>	12.000
PA 80 DA	<b>198 800 048</b>	14.000
PA 85 DA	<b>198 800 050</b>	19.700
PA 90 DA	<b>198 800 051</b>	25.400

Type		D1 [mm]	D2 [mm]	D3[M] [mm]	D4 [inch]	D5 [mm]	L1 [mm]	L2 [mm]	L3 [mm]	L4 [mm]	L5 [mm]	H [mm]	H1 [mm]
PA 30 DA	F03	36	25	M5x9	1/8	9	177	9	35	70		92	60
PA 35 DA	F03	42	30	M5x9	1/8	10	190	11	35	70		98	66
PA 40 DA	F05	42	30	M5x9	1/8	10	198	11	35	70		102	70
PA 45 DA	F05	50	35	M6x11	1/8	12	235	14	35	70		111	78
PA 50 DA	F05	50	35	M6x11	1/8	12	250	14	35	70		129	86
PA 55 DA	F07	70	55	M8x15	1/8	15	279	17	35	70		139	96
PA 60 DA	F07	70	55	M8x15	1/8	15	341	17	35	70		149	106
PA 65 DA	F10	102	70	M10x17	1/8	19	350	22	35	70		161	118
PA 70 DA	F10	102	70	M10x17	1/8	19	381	22	35	70		173	130
PA 75 DA	F12	125	85	M12x21	1/4		416	27			32	191	148
PA 80 DA	F12	125	85	M12x21	1/4		466	27			32	197	153
PA 85 DA	F14	140	100	M16x25	1/4		555	36			32	229	186
PA 90 DA	F14	140	100	M16x25	1/4		581	36			32	241	198

Type	H2 [mm]	H3 [mm]	H4 [mm]	H5 [mm]	H6 [mm]	H7 [mm]	H8 [mm]
PA 30 DA	25	12	55	10	20	36	
PA 35 DA	25	13	60	13	20	36	
PA 40 DA	21	18	65	13	20	36	
PA 45 DA	21	18	72	13	20	36	
PA 50 DA	25	21	80	13	30	36	
PA 55 DA	25	21	90	16	30	36	
PA 60 DA	25	26	100	17	30	36	
PA 65 DA	25	25	112	19	30	36	
PA 70 DA	25	32	124	19	30	36	
PA 75 DA	24	34	137				22

table continued next page

Type	H2 [mm]	H3 [mm]	H4 [mm]	H5 [mm]	H6 [mm]	H7 [mm]	H8 [mm]
PA 80 DA	24	38	145				24
PA 85 DA	24	43	166				27
PA 90 DA	24	44	180				32



FC/FO: PA 30/35/40/45  
 PA 50/55/60  
 DA: PA 30/35/40/45  
 PA 50/55/60/65/70

FC/FO: PA 65/70/75/80  
 DA: PA 75/80/85/90

PF 3 46 253 004

# Accessories for pneumatic rotary actuators

For pneumatic actuators type PA11 - PA90

## Namur mounting flange



PF 3 46 253 998

No	Code	kg
3	199 190 281	0.312

For pneumatic actuators type PA30-PA55 and PA11/21

## Namur connecting plate

- PA30 - PA55 FC/FO, PA30 - PA65 DA



PF 3 46 253 998

DN [mm]	Series PA11/21 Code	Series PA30-55 Code	kg
15	199 190 378	199 190 275	0.100
20	199 190 378	199 190 275	0.100
25	199 190 378	199 190 275	0.100
32	199 190 378	199 190 275	0.100
40	199 190 378	199 190 275	0.100
50	199 190 378	199 190 275	0.100

# Electric actuators

## Electric actuator type EA11



PF 3 46 251 008

**Note:**

F05 (WS11/14) per EN ISO 5211 with adapter 198.000.587

Voltage	Code	kg
100-230 V~	<b>198 150 180</b>	1.500
24 V= / ~	<b>198 150 181</b>	1.500

## Electric actuator type EA21



PF 3 46 251 001

**Note:**

F05 (WS11/14) per EN ISO 5211 with adapter 198.000.587

Voltage	Code	kg
100-230 V~	<b>198 150 182</b>	1.750
24 V= / ~	<b>198 150 183</b>	1.750

## Electric actuator type EA31



PF 3 46 251 001

**Note:**

F07 (WS 17) per EN ISO 5211

Voltage	Code	kg
100-230 V~	<b>198 150 184</b>	2.150
24 V= / ~	<b>198 150 185</b>	2.150

## Electric actuator type EA42



PF 3 46 251 001

**Note:**

F07 (WS 22) per EN ISO 5211

Voltage	Code	kg
100-230 V~	<b>198 150 186</b>	2.150
24 V= / ~	<b>198 150 187</b>	2.150



# Accessories for electric actuators

For electric actuators  
Type EA11/EA21/EA31/EA42

## Heating element



PF 3 46 251 997

Voltage	Code	kg	
24 V=	199 190 086	0.200	

## Fail safe return incl. battery kit



PF 3 46 251 997

Voltage	Code	kg	
24 V=	199 190 085	0.885	

## Heating element + fail safe return incl. battery kit



PF 3 46 251 997

Voltage	Code	kg	
24 V=	199 190 087	0.200	

## Battery kit (spare)



PF 3 46 251 997

Voltage	Code	kg	
24 V=	198 151 317	0.250	

## Limit switch kit with mechanical limit switches AgNi



PF 3 46 251 997

Voltage	Code	kg	
250 V ~6 A	199 190 092	0.200	

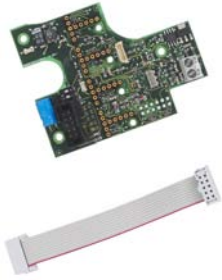
**For electric actuators  
Type EA21/EA31/EA42  
Testing adapter kit**



PF 3 46 251 997

Code	kg	
198 151 426	0.100	

**Monitoring print**



PF 3 46 251 997

Code	kg	
199 190 099	0.020	

**Cycle time extension**

**Model:**

- Monitoring print required



PF 3 46 251 997

Code	kg	
199 190 080	0.020	

**Cycle time monitoring**

**Model:**

- Monitoring print required



PF 3 46 251 997

Code	kg	
199 190 082	0.020	

**Cycle counter**

**Model:**

- Monitoring print required



PF 3 46 251 997

Code	kg	
199 190 083	0.020	

**Motor current monitoring**

**Model:**

- Monitoring print required



PF 3 46 251 997

Code	kg	
199 190 081	0.020	



## Position signalization

### Model:

- Enables a 4... 20mA feedback signal
- Must be used with either the PE25 positioner or the monitoring print

Code	kg	
199 190 084	0.020	

PF 3 46 251 997



## Positioner PE25

### Model:

- Positioner must use position signalization
- \*\* galvanic isolated set value inputs
- \* not galvanic isolated set value inputs

Voltage	Code	kg	
* 24 V=	199 190 100	0.200	
** 24 V=	199 190 101	0.200	

PF 3 46 251 007



## Limit switch kit with gold contacts Au

Voltage	Code	kg	
30 V=, 100mA	199 190 093	0.200	

PF 3 46 251 997



## Limit switch kit with inductive switches PNP

Voltage	Code	kg	
5-30 V= 0,1 A	199 190 095	0.200	

PF 3 46 251 997



## Assembly kit for 4 limit switches

### Model:

- Limit switches need to be ordered separately

Code	kg	
199 190 097	0.200	

PF 3 46 251 007



## Limit switch kit with inductive switches NPN

Voltage	Code	kg	
5-30 V= 0,1 A	199 190 096	0.200	

PF 3 46 251 997



## Limit switch kit with mechanical limit switches Middle position

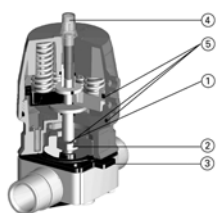
Voltage	Code	kg	
4-30 V= 1-100 mA	<b>199 190 094</b>	0.200	

PF 3 46 251 997

# Pneumatic stroke actuators

## Accessories and spare parts for DIASTAR

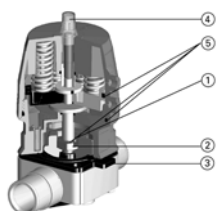
### Indicator cap for DIASTAR



Pos	d [mm]	DN [mm]	Serie 028 FC Code	Serie 025 FC Code	Serie 025 FO Code	Serie 025 DA Code	kg
4	20	15	198 806 639	198 806 639	198 806 639	198 806 639	0.002
4	25	20	198 806 639	198 806 639	198 806 639	198 806 639	0.002
4	32	25	198 806 639	198 806 640	198 806 639	198 806 639	0.002
4	40	32	198 806 640	198 806 640	198 806 640	198 806 640	0.004
4	50	40	198 806 640	198 806 640	198 806 640	198 806 640	0.004
4	63	50	198 806 640	198 806 640	198 806 640	198 806 640	0.004
4	75	65		198 806 376	198 806 376	198 806 376	0.020
4	90	80		198 806 376	198 806 376	198 806 376	0.020
4	110	100		198 806 376	198 806 376	198 806 376	0.020
4	160	150		198 806 376	198 806 376	198 806 376	0.020

PF 3 39 212 999

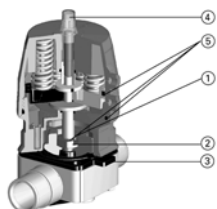
### Compression set complete Consisting of compressor and diaphragm holder



d [mm]	Inch	DN [mm]	EPDM Code	PTFE/EPDM Code	kg
20	1/2	15	198 000 320	198 000 326	0.045
25	3/4	20	198 000 321	198 000 327	0.048
32	1	25	198 000 322	198 000 328	0.047
40	1 1/4	32	198 000 323	198 000 329	0.055
50	1 1/2	40	198 000 324	198 000 330	0.072
63	2	50	198 000 325	198 000 331	0.064
75	2 1/2	65	198 000 268	198 000 269	0.135
90	3	80	198 000 270	198 000 271	0.350
110	4	100	198 000 272	198 000 273	0.500
160	6	150	198 000 274	198 000 275	1.466

PF 3 39 212 998

### Diaphragms for DIASTAR

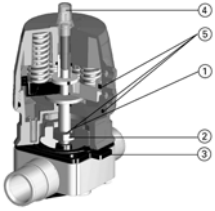


d [mm]	DN [mm]	EPDM Code	FPM Code	NBR Code	CSM Code	PTFE/EPDM Code
20	15	161 481 022	161 481 092	161 311 710	161 311 728	161 311 698
25	20	161 481 023	161 481 093	161 311 711	161 311 729	161 311 699
32	25	161 481 024	161 481 094	161 311 712	161 311 730	161 311 700
40	32	161 481 025	161 481 095	161 311 713	161 311 731	161 311 701
50	40	161 481 026	161 481 096	161 311 714	161 311 732	161 311 702
63	50	161 481 027	161 481 097	161 311 715	161 311 733	161 311 703
75	65	161 481 028	161 481 098	161 480 231	161 480 237	161 480 240
90	80	161 481 029	161 481 099	161 480 232	161 480 238	161 480 241
110	100	161 481 030	161 481 100	161 480 233	161 480 239	161 480 242
160	150	161 482 754	161 481 102	161 482 751	161 482 757	161 482 760

d [mm]	DN [mm]	PTFE/FPM Code	PTFE/EPDM HP Code	kg
20	15	161 481 926	161 484 452	0.025
25	20	161 481 927	161 484 453	0.035
32	25	161 481 928	161 484 454	0.060
40	32	161 481 929	161 484 455	0.083
50	40	161 481 930	161 484 456	0.106
63	50	161 481 931	161 484 457	0.150
75	65	161 481 932	161 484 458	0.252
90	80		161 484 459	0.390
110	100		161 484 460	0.630
160	150		161 482 760	1.421

PF 2 31 158 998



## Seal set complete

Pos	DN [mm]	Serie 028 FC Serie 025 FO/DA Code	Serie 025 FC Code	kg
5	15	<b>198 000 332</b>	<b>198 000 333</b>	0.006
5	20	<b>198 000 333</b>	<b>198 000 333</b>	0.006
5	25	<b>198 000 333</b>	<b>198 000 334</b>	0.005
5	32	<b>198 000 334</b>	<b>198 000 335</b>	0.004
5	40	<b>198 000 335</b>	<b>198 000 336</b>	0.005
5	50	<b>198 000 335</b>	<b>198 000 336</b>	0.005

PF 3 39 212 998

## Pneumatic actuator DIASTAR

### Series 028 FC



d [mm]	DN [mm]	Inch	Size	for EPDM Code	for PTFE/EPDM Code	kg
20	15	½	1	<b>198 150 091</b>	<b>198 150 097</b>	0.252
25	20	¾	2	<b>198 150 126</b>	<b>198 150 126</b>	1.000
32	25	1	2	<b>198 150 093</b>	<b>198 150 098</b>	1.000
40	32	1 ¼	3	<b>198 150 094</b>	<b>198 150 124</b>	1.380
50	40	1 ½	4	<b>198 150 095</b>	<b>198 150 099</b>	2.100
63	50	2	4	<b>198 150 125</b>	<b>198 150 125</b>	3.000

PF 3 46 254 001

### Series 025 FC



d [mm]	DN [mm]	Inch	Size	for EPDM Code	for PTFE/EPDM Code	kg
20	15	½	2	<b>198 150 087</b>	<b>198 150 962</b>	1.298
25	20	¾	2	<b>198 150 963</b>	<b>198 150 963</b>	0.676
32	25	1	3	<b>198 150 088</b>	<b>198 150 964</b>	1.995
40	32	1 ¼	4	<b>198 150 965</b>	<b>198 150 965</b>	2.100
50	40	1 ½	5	<b>198 150 089</b>	<b>198 150 966</b>	3.790
63	50	2	5	<b>198 150 090</b>	<b>198 150 967</b>	4.040
75	65	2 ½		<b>198 150 736</b>	<b>198 150 736</b>	3.700
90	80	3		<b>198 150 737</b>	<b>198 150 737</b>	3.700
110	100	4		<b>198 150 738</b>	<b>198 150 738</b>	21.000
160	150	6		<b>198 150 739</b>	<b>198 150 739</b>	21.500

PF 3 46 254 001

### Series 025 FO



d [mm]	DN [mm]	Inch	Size	for PTFE/EPDM and EPDM Code	kg
20	15	½	1	<b>198 150 105</b>	0.900
25	20	¾	2	<b>198 150 969</b>	0.492
32	25	1	2	<b>198 150 106</b>	0.652
40	32	1 ¼	3	<b>198 150 107</b>	1.380
50	40	1 ½	4	<b>198 150 108</b>	2.300
63	50	2	4	<b>198 150 109</b>	2.100
75	65	2 ½		<b>198 150 746</b>	3.700
90	80	3		<b>198 150 747</b>	3.700
110	100	4		<b>198 150 748</b>	3.700
160	150	6		<b>198 150 749</b>	3.700

PF 3 46 254 002



PF 3 46 254 003

## Series 025 DA

d [mm]	DN [mm]	Inch	Size	for EPDM Code	for PTFE/EPDM Code	kg
20	15	½	1	198 150 100	198 150 100	0.252
25	20	¾	2	198 150 975	198 150 975	0.406
32	25	1	2	198 150 101	198 150 101	0.652
40	32	1 ¼	3	198 150 102	198 150 102	1.380
50	40	1 ½	4	198 150 103	198 150 103	2.000
63	50	2	4	198 150 104	198 150 104	2.100
75	65	2 ½		198 150 756	198 150 756	10.000
90	80	3		198 150 757	198 150 757	3.700
110	100	4		198 150 758	198 150 758	3.700
160	150	6		198 150 759	198 150 759	3.700

## Diaseptic DIASTAR

### Type 025 full plastic actuator PPS GF40



PF 3 49 548 060

DN [mm]	FC Code	FO Code	DA Code	kg
15	198 151 126	198 151 136	198 151 142	0.286
20	198 151 127	198 151 137	198 151 143	0.590
25	198 151 128	198 151 138		0.680
32	198 151 129	198 151 139	198 151 145	1.160
40	198 151 130	198 151 140	198 151 146	2.103
50	198 151 131	198 151 141	198 151 147	2.119

### Type 025 with stainless steel intermediate part



PF 3 49 548 090

DN [mm]	FC size 1 Code	FC size 2 Code	FO Code	DA Code	kg
8	198 151 148		198 151 156	198 151 163	0.484
15	198 151 149	198 151 150	198 151 157	198 151 164	0.545
20	198 151 151		198 151 158	198 151 165	1.148
25	198 151 152		198 151 159	198 151 166	2.138
40	198 151 154		198 151 161	198 151 168	5.560
50	198 151 155		198 151 162	198 151 169	6.353

### Diaseptic type 028 plastic acuator PPS GF40



PF 3 49 548 040

DN [mm]	FC Code	kg
15	198 151 120	0.352
20	198 151 121	0.730
25	198 151 122	0.837
32	198 151 123	1.580
40	198 151 124	2.663
50	198 151 125	2.959

# Accessories for pneumatic stroke actuators

## For diaphragm valve type DIASTAR

### Min./max. stroke limiter/manual override



PF 3 39 212 998

DN-DN [mm]	Ten/028 FC Code	Sixteen/025 FC Code	Ten/025 FO/DA Code	kg
- 15	199 190 381	199 190 382	199 190 381	0.053
- 20	199 190 382	199 190 382	199 190 382	0.068
- 25	199 190 382	199 190 383	199 190 382	0.068
- 32	199 190 383	199 190 384	199 190 383	0.120
- 40	199 190 384	199 190 385	199 190 384	0.150
- 50	199 190 384	199 190 385	199 190 384	0.150
65 - 80		199 190 318	199 190 318	0.500
* 100 - 150		199 190 319	199 190 319	0.500

### NAMUR connector plate for DIASTAR DN15-50



PF 3 39 212 998

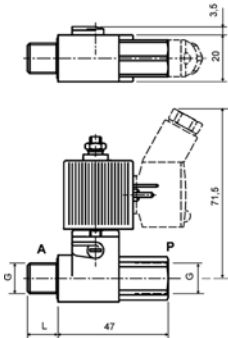
Pos	DN [mm]	Ten/028 FC Code	Sixteen/025 FC Code	Ten/025 FO/DA Code	kg
2	15	199 190 378	199 190 378	199 190 378	0.111
2	20	199 190 378	199 190 378	199 190 378	0.111
2	25	199 190 378	199 190 378	199 190 378	0.111
2	32	199 190 378	199 190 379	199 190 378	0.111
2	40	199 190 379	199 190 379	199 190 379	0.354
2	50	199 190 379	199 190 379	199 190 379	0.354



# Pilot valves

## Solenoid pilot valve type PV94

### Pilot valve 3/2-ways



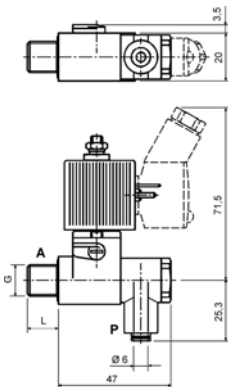
PF 3 46 248 010

#### Model:

- For direct installation (including valve body and hollow screw)
- Port P compressed air connection G 1/8
- Port A actuator connection G 1/8
- With connector plug form C
- With adapter G1/8 to G1/4
- To pneumatic actuators FC/FO (single acting)
- Circuit function C: de-energized closed
- Valve material polyamid / brass

Voltage	DN [mm]	Compressed air connection P	Actuator connection	PN	kv-value ( $\Delta p=1$ bar) [l/min]	NBR Code	kg
24 V=	1.2	G 1/8	G 1/8	10	48	<b>199 190 498</b>	0.177
24 V, 50-60 Hz	1.2	G 1/8	G 1/8	10	48	<b>199 190 499</b>	0.135
110 V, 50-60 Hz	1.2	G 1/8	G 1/8	10	48	<b>199 190 500</b>	0.135
230 V, 50-60 Hz	1.2	G 1/8	G 1/8	10	48	<b>199 190 501</b>	0.135

### Pilot valve 3/2-ways



PF 3 46 248 010

#### Model:

- For direct installation (including valve body and hollow screw)
- Port P compressed air connection tube push-in 6mm
- Port A actuator connection G 1/8
- With connector plug form C
- With adapter G1/8 to G1/4
- To pneumatic actuators FC/FO (single acting)
- Circuit function C: de-energized closed
- Valve material polyamid / brass

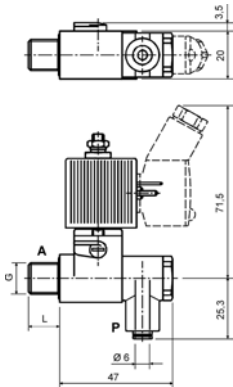
Voltage	DN [mm]	Compressed air connection P	Actuator connection	PN	kv-value ( $\Delta p=1$ bar) [l/min]	NBR Code	kg
24 V=	1.2	push-in	G 1/8	10	48	<b>199 190 510</b>	0.135
24 V, 50-60 Hz	1.2	push-in	G 1/8	10	48	<b>199 190 511</b>	0.135
110 V, 50-60 Hz	1.2	push-in	G 1/8	10	48	<b>199 190 512</b>	0.135
230 V, 50-60 Hz	1.2	push-in	G 1/8	10	48	<b>199 190 513</b>	0.135



## Pilot valve 3/2-ways

### Model:

- For direct installation (including valve body and hollow screw)
- Port P compressed air connection NPT 1/8
- Port A actuator connection G 1/8
- With connector plug form C
- With adapter G1/8 to G1/4
- To pneumatic actuators FC/FO (single acting)
- Circuit function C: de-energized closed
- Valve material polyamid / brass



PF 3 46 248 010

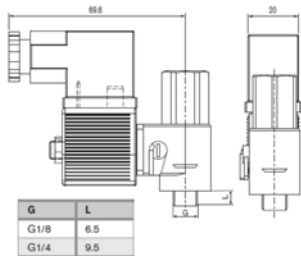
Voltage	DN [mm]	Compressed air connection P	Actuator connection	PN	kv-value ( $\Delta p=1$ bar) [l/min]	NBR Code	kg
24 V=	1.2	NPT 1/8	G 1/8	10	48	<b>199 190 546</b>	0.135
24 V AC	1.2	NPT 1/8	G 1/8	10	48	<b>199 190 561</b>	0.135
110 V, 50-60 Hz	1.2	NPT 1/8	G 1/8	10	48	<b>199 190 547</b>	0.135



## Pilot valve 3/2-ways

### Model:

- For direct installation (including valve body and hollow screw)
- Port P compressed air connection G 1/8
- Port A actuator connection G 1/8
- With connector plug form B
- With adapter G1/8 to G1/4
- To pneumatic actuators FC/FO (single acting)
- Circuit function C: de-energized closed
- Valve material polyamid / brass



PF 3 46 248 010

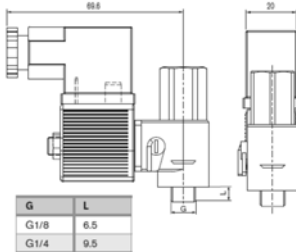
Voltage	DN [mm]	Compressed air connection P	Actuator connection	PN	kv-value ( $\Delta p=1$ bar) [l/min]	NBR Code	kg
24 V=	1.2	G 1/8	G 1/8	10	48	<b>199 190 574</b>	0.135
230 V, 50-60 Hz	1.2	G 1/8	G 1/8	10	48	<b>199 190 572</b>	0.135



## Pilot valve 3/2-ways

### Model:

- For direct installation (including valve body and hollow screw)
- Port P compressed air connection tube push-in 6mm
- Port A actuator connection G 1/8
- With connector plug form B
- With adapter G1/8 to G1/4
- To pneumatic actuators FC/FO (single acting)
- Circuit function C: de-energized closed
- Valve material polyamid / brass



Voltage	DN [mm]	Compressed air connection P	Actuator connection	PN	kv-value ( $\Delta p=1$ bar) [l/min]	NBR Code	kg
24 V=	1.2	push-in	G 1/8	10	48	<b>199 190 573</b>	0.135
230 V, 50-60 Hz	1.2	push-in	G 1/8	10	48	<b>199 190 571</b>	0.135

PF 3 46 248 010

## Accessory

### Model:

- Cable plug to DIN EN 175301-803 (DIN 43 650) form C



Voltage	Version	NBR Code	kg
0-250 V	no circuitry	<b>199 190 518</b>	0.020
0-24 V	with LED	<b>199 190 519</b>	0.020
0-24 V	with LED and varistor	<b>199 190 520</b>	0.020
0-24 V	with rectifier LED and varistor	<b>199 190 521</b>	0.020
200-240 V	with LED	<b>199 190 522</b>	0.020
200-240 V	with LED and varistor	<b>199 190 523</b>	0.020

PF 3 46 248 998

## Accessory

### Model:

- Cable plug, form B industrial standard

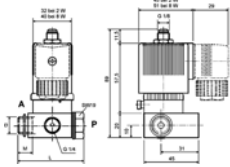


Voltage	Version	NBR Code	kg
0-250 V	no circuitry	<b>199 190 578</b>	0.020
0-24 V	with LED	<b>199 190 579</b>	0.020
0-250 V	with LED	<b>199 190 580</b>	0.020
0-24 V	with rectifier LED	<b>199 190 581</b>	0.020

PF 3 46 248 998

## Solenoid pilot valve type PV95

### Pilot valve 3/2-ways



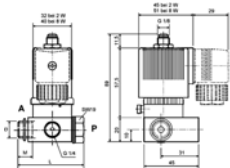
#### Model:

- For direct installation (including valve body and hollow screw)
- Port P compressed air connection G 1/4
- Port A actuator connection G 1/8
- With connector plug form A
- With adapter G1/8 to G1/4
- To pneumatic actuators FC/FO (single acting)
- Circuit function C: de-energized closed
- Valve material: brass
- Power consumption: 24VA at AC inrush; 17VA/8W at AC hold; 8W at DC

Voltage	DN [mm]	Compressed air connection P	Actuator connection	PN	kv-value ( $\Delta p=1$ bar) [l/min]	NBR Code	kg
24 V=	2.0	G 1/4	G 1/8	10	120	<b>199 190 532</b>	0.420
24 V, 50-60 Hz	2.0	G 1/4	G 1/8	10	120	<b>199 190 533</b>	0.420
110 V, 50-60 Hz	2.0	G 1/4	G 1/8	10	120	<b>199 190 534</b>	0.420
230 V, 50-60 Hz	2.0	G 1/4	G 1/8	10	120	<b>199 190 535</b>	0.420

PF 3 46 248 008

### Pilot valve 3/2-ways



#### Model:

- For direct installation (including valve body and hollow screw)
- Port P compressed air connection NPT 1/8
- Port A actuator connection G 1/4
- With connector plug form A
- With adapter G1/8 to G1/4
- To pneumatic actuators FC/FO (single acting)
- Circuit function C: de-energized closed
- Valve material: brass
- Power consumption: 24VA at AC inrush; 17VA/8W at AC hold; 8W at DC

Voltage	DN [mm]	Compressed air connection P	Actuator connection	PN	kv-value ( $\Delta p=1$ bar) [l/min]	NBR Code	kg
24 V=	1.5	NPT 1/8	G 1/4	10	120	<b>199 190 554</b>	0.135
110 V, 50-60 Hz	1.5	NPT 1/8	G 1/4	10	120	<b>199 190 555</b>	0.135

PF 3 46 248 010

## Accessory

#### Model:

- Cable plug to DIN EN 175301-803 (DIN 43 650) form A

Voltage	Version	NBR Code	kg
0-250 V	no circuitry	<b>199 190 540</b>	0.020
0-24 V	with LED	<b>199 190 541</b>	0.020
0-24 V	with LED and varistor	<b>199 190 542</b>	0.020
0-24 V	with rectifier LED and varistor	<b>199 190 543</b>	0.020
200-240 V	with LED	<b>199 190 544</b>	0.020
200-240 V	with LED and varistor	<b>199 190 545</b>	0.020

PF 3 46 248 998

## Pilot valve type 5470

- to pneumatic actuators DA (Double acting)
- Version with NAMUR connection
- Circuit function: 4/2-way valve, in rest position pressure inlet 1 connected to outlet 2, outlet 4 exhausted
- Valve material: polyamid
- Electrical connection: cable plug

## Pilot valve 4/2-ways

- For AC 50-60 Hz and DC



PF 3 46 248 008

Voltage	DN [mm]	NBR Code	kg
230 V, AC/DC	4	<b>199 190 302</b>	0.270
115 V, AC/DC	4	<b>199 190 303</b>	0.270
24 V, AC/DC	4	<b>199 190 304</b>	0.140

## Pilot valve type MNL532

### Model:

- With NAMUR connection and two silencers/throttle screws

### Mode of action:

- 3/2-way valve, in rest position pressure inlet 1 closed, outlet 3 exhausted
- 5/2-way valve, in rest position pressure inlet 1 connected to outlet 4, outlet 3 exhausted
- Material of body: Aluminum
- to pneumatic actuators
- Electrical connection: cable plug

## Pilot valve 3/2-5/2-ways



PF 3 46 248 008

Voltage	DN [mm]	Inch	NBR Code	kg
230 V, AC	5	1/8	<b>199 190 360</b>	0.270
110 V, AC	5	1/8	<b>199 190 359</b>	0.270
48 V, AC	5	1/8	<b>199 190 361</b>	0.270
24 V, AC	5	1/8	<b>199 190 358</b>	0.270
24 V, DC	5	1/8	<b>199 190 357</b>	0.270

## Accessories to type 5470 and type MNL532

### NAMUR connector plate

### For DIASTAR DN15-50/PA11/21/PA30-55



Pos	DN [mm]	Series PA11/21 Code	Series PA30-55 Code	Ten/028 FC Code	Sixteen/025 FC Code
2	15	<b>199 190 378</b>	<b>199 190 275</b>	<b>199 190 378</b>	<b>199 190 378</b>
2	20	<b>199 190 378</b>	<b>199 190 275</b>	<b>199 190 378</b>	<b>199 190 378</b>
2	25	<b>199 190 378</b>	<b>199 190 275</b>	<b>199 190 378</b>	<b>199 190 378</b>
2	32	<b>199 190 378</b>	<b>199 190 275</b>	<b>199 190 378</b>	<b>199 190 379</b>
2	40	<b>199 190 378</b>	<b>199 190 275</b>	<b>199 190 379</b>	<b>199 190 379</b>
2	50	<b>199 190 378</b>	<b>199 190 275</b>	<b>199 190 379</b>	<b>199 190 379</b>

table continued next page

Pos	DN [mm]	Ten/025 FO/DA Code	kg
2	15	<b>199 190 378</b>	0.111
2	20	<b>199 190 378</b>	0.111
2	25	<b>199 190 378</b>	0.111
2	32	<b>199 190 378</b>	0.111
2	40	<b>199 190 379</b>	0.354
2	50	<b>199 190 379</b>	0.354

PF 3 46 253 998

## Solenoid pilot valve type PV2000

- Version for 3/2-way and 5/2-way valves
- Electrical control over multiple and field bus connector

### 2 x 3/2-way valve

#### Model:

- lockable manual override



PF 3 46 248 009

No	Voltage	Code	kg
1	24V/DC 100%	<b>199 190 435</b>	0.110

### 1 x 5/2-way valve



PF 3 46 248 009

No	Voltage	Code	kg
2	24 V/DC 100%	<b>199 190 436</b>	0.105

## Connection module with D-sub connector



PF 3 46 248 009

No	Code	kg
3	<b>199 190 424</b>	0.156

## End module



PF 3 46 248 009

No	Code	kg
4	<b>199 190 426</b>	0.102

## Connection module AS-interface



PF 3 46 248 009

No	Code	kg
1	<b>199 190 430</b>	0.200

## Connection module profibus



PF 3 46 248 009

No	Code	kg
1	<b>199 190 431</b>	0.200



## Connection module with bus interface

No	Code	kg	
2	<b>199 190 425</b>	0.156	

PF 3 46 248 009

## Accessories to type PV2000

### Silencer 8mm

Code	kg	
<b>199 190 427</b>	0.020	

PF 3 46 248 009

### Plug (white)

d [mm]	Code	kg	
8	<b>199 190 428</b>	0.010	
6	<b>199 190 429</b>	0.010	

PF 3 46 248 009

## D-Sub connector 25 poles With connection cable

Cable length [m]	Code	kg	
1.50	<b>199 190 432</b>	0.500	
3.00	<b>199 190 433</b>	0.500	
5.00	<b>199 190 434</b>	0.500	

PF 3 46 248 009

## Position indicator

For butterfly valve type 037M/038M  
With electric position indicator

- Limit switch box and hand lever included

### Limit switch box with 2 auxiliary switches

- Solution for PNP, NPN, NAMUR on request



PF 3 39 213 998

d-d [mm]	DN-DN [mm]	Inch	Code	kg
63 - 90	50 - 80	2-3	<b>198 151 341</b>	0.372
110 - 110	100 - 100	4	<b>198 151 342</b>	0.372
140 - 140	125 - 125	5	<b>198 151 343</b>	
160 - 225	150 - 200	6-8	<b>198 151 344</b>	0.500

For actuator units pneumatic type PA11 - PA90  
Namur mounting flange

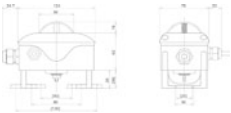


PF 3 46 253 998

No	Code	kg
3	<b>199 190 281</b>	0.312

### Limit switch box with 2 auxiliary switches

- Including namur mounting flange

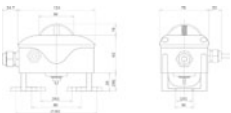


PF 3 46 253 998

Voltage	Code	kg
250 V ~/10 A	<b>199 190 282</b>	0.530

### Limit switch box with 2 inductive auxiliary switches NPN With luminous diode

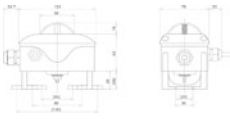
- Including namur mounting flange



PF 3 46 253 998

Voltage	Code	kg
10...30 V/ 0.1 A	<b>199 190 283</b>	0.530



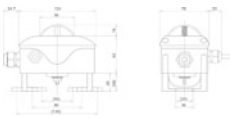


PF 3 46 253 998

## Limit switch box with 2 inductive auxiliary switches PNP With luminous diode

- Including namur mounting flange

Voltage	Code	kg
10...30 V/ 0.1 A	<b>199 190 284</b>	0.530

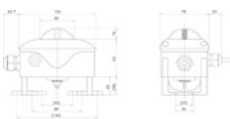


PF 3 46 253 998

## Limit switch box with 2 inductive auxiliary switches Namur Eexi (intrinsically safe)

- Including namur mounting flange

Voltage	Code	kg
5-15 V	<b>199 190 285</b>	0.530

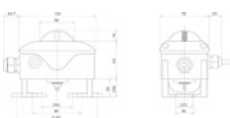


PF 3 46 253 998

## Limit switch box with 2 auxiliary switches Eexd

- Including namur mounting flange

Voltage	Code	kg
250 V ~/5 A	<b>199 190 286</b>	0.600



PF 3 46 253 998

## Limit switch box with 2 auxiliary switches With gold contact

- Including namur mounting flange

Voltage	Code	kg
30 V =/ 1-100 mA	<b>199 190 287</b>	0.530



PF 3 39 216 003

## For diaphragm valve type DIASTAR

## Electric position indicator with 2 auxiliary switches Ag Ni

- Connection: Plug

DN-DN [mm]	Inch [inch]	Type	Voltage	Code	kg
15 - 50	½ - 2	ER 52-1	250 V~ 6 A	<b>199 190 305</b>	0.300
65 - 150	2 ½ - 6	ER 53-1	250 V~ 6 A	<b>199 190 293</b>	0.650



## Electric position indicator with 2 auxiliary switches With gold contact

- Connection: Plug

DN-DN [mm]	Inch [inch]	Type	Voltage	Code	kg
15 - 50	½ - 2	ER 52-2	4-30 V= 1-100 mA	<b>199 190 306</b>	0.300
65 - 150	2 ½ - 6	ER 53-2	4-30 V= 1-100 mA	<b>199 190 297</b>	0.650

PF 3 39 216 003



## Electric position indicator with 2 inductive switches NPN

- Connection: Plug

DN-DN [mm]	Inch [inch]	Type	Voltage	Code	kg
15 - 50	½ - 2	ER 52-3	5-30 V= 100 mA	<b>199 190 307</b>	0.396
65 - 150	2 ½ - 6	ER 53-3	10-30 V= 100 mA	<b>199 190 294</b>	0.650

PF 3 39 216 003



## Electric position indicator with 2 inductive switches PNP

- Connection: Plug

DN-DN [mm]	Inch [inch]	Type	Voltage	Code	kg
15 - 50	½ - 2	ER 52-4	5-30 V= 100 mA	<b>199 190 308</b>	0.396
65 - 150	2 ½ - 6	ER 53-4	10-30 V= 100 mA	<b>199 190 295</b>	0.650

PF 3 39 216 003



## Electric position indicator with 2 inductive switches Namur Eexi (intrinsically safe)

- Connection: Plug

DN-DN [mm]	Inch [inch]	Type	Voltage	Code	kg
15 - 50	½ - 2	ER 52-5	8 V=	<b>199 190 309</b>	0.496
65 - 150	2 ½ - 6	ER 53-5	8 V=	<b>199 190 296</b>	0.650

PF 3 39 216 003



## Electric position indicator with 2 auxiliary switches Eexd

- Connection: Cable, 2 m

DN-DN [mm]	Inch [inch]	Type	Voltage	Code	kg
15 - 50	½ - 2	ER 52-6	250 V ~ 5 A	<b>199 190 405</b>	0.650
65 - 150	2 ½ - 6	ER 53-6	250 V ~ 5 A	<b>199 190 298</b>	0.650

PF 3 39 216 003

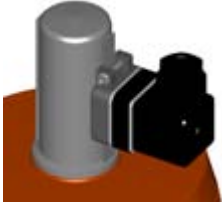


## Adapter complete

- For combination Electric Position Indicator / Lift limiter / Manual override

DN-DN [mm]	Type	Ten/028 FC Code	Sixteen/025 FC Code	Ten/025 FO/DA Code	kg
- 15	ER 52	<b>199 190 387</b>	<b>199 190 387</b>	<b>199 190 387</b>	0.062
- 20	ER 52	<b>199 190 387</b>	<b>199 190 387</b>	<b>199 190 387</b>	0.062
- 25	ER 52	<b>199 190 387</b>	<b>199 190 388</b>	<b>199 190 387</b>	0.062
- 32	ER 52	<b>199 190 388</b>	<b>199 190 389</b>	<b>199 190 388</b>	0.061
- 40	ER 52	<b>199 190 389</b>	<b>199 190 389</b>	<b>199 190 389</b>	0.068
- 50	ER 52	<b>199 190 389</b>	<b>199 190 389</b>	<b>199 190 389</b>	0.068
65 - 150	ER 53		<b>199 190 310</b>	<b>199 190 310</b>	0.160

PF 3 39 212 998



## Electric position indicator with reed contact Type ER-55 for Diastar DN 15-150

For one position open or closed

Furder position indicator with limit contact (198 804 875)

Connection: plug

Voltage: 250V ~ 200 mA

DN [mm]	Type	Ten/028 FC Code	Ten/Sixteen/025 FC/FO/DA Code	kg
15	ER 55-1	<b>199 190 462</b>	<b>199 190 462</b>	0.124
20	ER 55-1	<b>199 190 462</b>	<b>199 190 462</b>	0.124
25	ER 55-1	<b>199 190 462</b>	<b>199 190 462</b>	0.124
32	ER 55-1	<b>199 190 462</b>	<b>199 190 462</b>	0.124
40	ER 55-1	<b>199 190 462</b>	<b>199 190 462</b>	0.124
50	ER 55-1	<b>199 190 462</b>	<b>199 190 462</b>	0.124
65	ER 55-2		<b>199 190 464</b>	0.130
80	ER 55-2		<b>199 190 464</b>	0.130
100	ER 55-2		<b>199 190 464</b>	0.130
150	ER 55-2		<b>199 190 464</b>	0.130

PF 3 39 216 002

## Limit contact to ER55



Code	kg
<b>198 804 875</b>	0.046

PF 3 48 227 003



## Accessories for digital electro-pneumatic positioner

### Attachment kit to type DSR 500-1

#### With optical position indicator for Diastar DN 15-50



PF 3 45 245 998

Pos	DN [mm]	Ten/028 FC Code	Sixteen/025 FC Code	Ten/025 FO Code	kg
2	15		199 190 417		0.200
2	20	199 190 417	199 190 417	199 190 417	0.200
2	25	199 190 417	199 190 418	199 190 417	0.200
2	32	199 190 418	199 190 418	199 190 418	0.210
2	40	199 190 418	199 190 418	199 190 418	0.210
2	50	199 190 418	199 190 418	199 190 418	0.210



PF 3 45 245 998

### Attachment kit to type DSR 500-1

#### Without optical position indicator for Diastar DN 15-50

No	DN [mm]	Ten/028 FC Code	Sixteen/025 FC Code	Ten/025 FO Code	kg
3	15		199 190 414		0.120
3	20	199 190 414	199 190 414	199 190 414	0.120
3	25	199 190 414	199 190 415	199 190 414	0.120
3	32	199 190 415	199 190 415	199 190 415	0.127
3	40	199 190 415	199 190 415	199 190 415	0.127
3	50	199 190 415	199 190 415	199 190 415	0.127



PF 3 45 245 998

### Attachment kit to type DSR 500-2 For Diastar DN 65-150

Part No.	with optical position indicator Code	without optical position indicator Code	kg
2	199 190 419		0.225
3		199 190 416	0.101



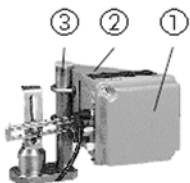
PF 3 46 253 998

### Attachement kit to type DSR 500-3 For rotary actuators

Code	kg
199 190 281	0.312

## Electro-pneumatic positioner

### Positioner type Eckardt SRI 986



PF 3 45 245 003

No	single acting (FC/ FO) Code	double acting (DA) Code	kg
1	199 190 348	199 190 349	1.900

## Accessories for electro-pneumatic positioner Attachment kit for type Eckardt SRI 986



PF 3 45 245 998

No	Typ DIASTAR DN 15-150 Code	Type PA 30 - PA 90 Code	Electr. pos. transformer with 4-20mA output Code	kg
2	199 190 350	199 190 351	199 190 395	0.200



PF 3 39 212 998

## Positioner mounting flange for type DIASTAR

No	DN-DN [mm]	Ten/028 FC Code	Sixteen/025 FC Code	Ten/025 FO Code	kg
3	- 15		199 190 372	199 190 372	0.839
3	- 20	199 190 372	199 190 372	199 190 372	0.839
3	- 25	199 190 372	199 190 373	199 190 373	0.876
3	- 32	199 190 373	199 190 373	199 190 373	0.876
3	- 40	199 190 373	199 190 373	199 190 373	0.876
3	- 50	199 190 373	199 190 373	199 190 373	0.876
3	65 - 150		199 190 311	199 190 311	1.000

## Industrial controller type PE70

### For single loop only

#### Model:

- 1 sensor input
- Continuous control
- 3-point control
- L/W/H: 128/48/96



PF 3 45 243 004

Type	Voltage	Code	kg
PE70-3	90..250 V ~	199 192 162	0.300
PE70-4	24 V ~/ 18..30 V=	199 192 163	0.300

### For ratio and single loop control

#### Model:

- 2 sensor inputs
- Ratio control
- Continuous control
- 3-point control
- L/W/H: 128/48/96



PF 3 45 243 004

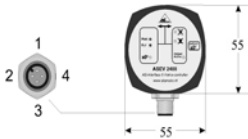
Type	Voltage	Code	kg
PE70-1	90..250 V ~	199 192 160	0.300
PE70-2	24 V ~/ 18..30 V=	199 192 161	0.300

# AS-Interface

## AS-Interface type ASEV 2400

### For electric rotary actuators

- Without accessories



PF 3 39 216 998

Code	kg
199 190 562	0.300

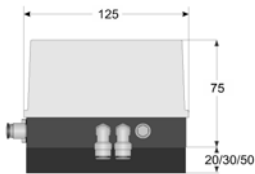
## AS-Interface set type ASVC 2300

### For pneumatic rotary actuators

Ohne Zubehör

\* für 20mm Welle: PA11/21; PA30-45 DA; PA30/35 FC/FO

\*\* für 30mm Welle: PA >45 DA; PA >35 FC/FO



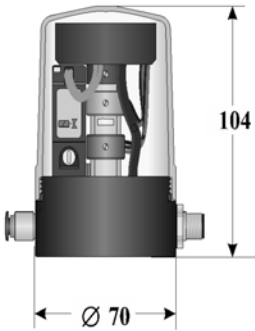
PF 3 39 216 998

Type of actuator	Code	kg
PA11/21 (FC/FO); PA30/35 (FC/FO)	199 190 560	0.300
PA >35 (FC/FO)	199 190 565	0.300
PA11/21 (DA); PA30-45 (DA)	199 190 566	0.300
PA >45 (DA)	199 190 567	0.300

## AS-Interface set type Topmatic For Diastar

- Without accessories

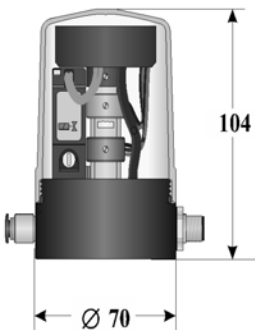
### Series Ten/028 FC/025 FO



PF 3 39 216 998

DN-DN [mm]	Code	kg	
15 - 25	<b>199 190 456</b>	0.400	
32 - 50	<b>199 190 457</b>	0.400	

### Series Sixteen/025-FC

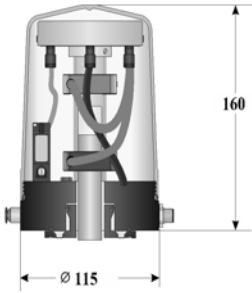


PF 3 39 216 998

DN-DN [mm]	Code	kg	
15 - 20	<b>199 190 456</b>	0.400	
25 - 32	<b>199 190 467</b>	0.400	
40 - 50	<b>199 190 468</b>	0.400	



## Series 025 FC/FO



PF 3 39 216 998

DN-DN [mm]	Code	kg	
65 - 150	<b>199 190 458</b>	0.400	

## AS-Interface type ASIM 2010

- Without accessories

### For manual valves with integrated feedback



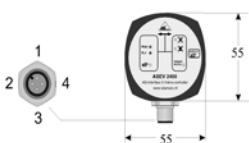
PF 3 39 216 998

Code	kg	
<b>199 190 568</b>	0.300	

## AS-Interface type ASIM 2400

- Without accessories

### For sensors with switching-output



PF 3 39 216 998

Code	kg	
<b>199 190 569</b>	0.300	

# Accessories for butterfly valves

## Butterfly valve type 367 with short shaft to type 035/036

Phase out product will be replaced with type 567 for dimension DN65-200

### Model:

- Type 035 will be replaced by type 140
- Type 036 will be replaced by type 240

d [mm]	DN [mm]	Inch	PVC-U EPDM Code	PVC-U FPM Code	PP-H EPDM Code	PP-H FPM Code	kg
75	65	2 1/2	<b>161 367 625</b>	<b>161 367 635</b>	<b>167 367 625</b>	<b>167 367 635</b>	0.950
90	80	3	<b>161 367 626</b>	<b>161 367 636</b>	<b>167 367 626</b>	<b>167 367 636</b>	1.400
110	100	4	<b>161 367 627</b>	<b>161 367 637</b>	<b>167 367 627</b>	<b>167 367 637</b>	1.750
140	125	5	<b>161 367 628</b>	<b>161 367 638</b>	<b>167 367 628</b>	<b>167 367 638</b>	2.550
160	150	6	<b>161 367 629</b>	<b>161 367 639</b>	<b>167 367 629</b>	<b>167 367 639</b>	3.450
225	200	8	<b>161 367 630</b>	<b>161 367 640</b>	<b>167 367 630</b>	<b>167 367 640</b>	5.550
280	250	10	<b>161 367 051</b>	<b>161 367 071</b>	<b>167 367 051</b>	<b>167 367 071</b>	10.500
315	300	12	<b>161 367 052</b>	<b>161 367 072</b>	<b>167 367 052</b>	<b>167 367 072</b>	16.300

PF 2 31 159 997

# Assembly parts for butterfly valves

## Hand lever kit for type 037M/038M



d-d [mm]	DN-DN [mm]	Inch	Code	kg	
63 - 90	50 - 80	2-3	<b>198 803 049</b>	0.700	
110 - 110	100 - 100	4-5	<b>198 803 050</b>	0.700	
140 - 140	125 - 125	6	<b>198 803 051</b>	0.800	
160 - 225	150 - 200	8	<b>198 803 052</b>	0.800	
280 - 315	250 - 300	10-12	<b>198 803 645</b>		

PF 3 39 226 998

## Intermediate element

### Pneumatic type 240 / 241 / 242 Without manual override

d [mm]	DN [mm]	Type of actuator	Code	kg	
63	50	PA30 FC/FO	<b>198 000 595</b>	0.300	
63	50	PA35 DA	<b>198 000 595</b>	0.300	
75	65	PA30 FC/FO	<b>198 000 595</b>	0.300	
75	65	PA35 DA	<b>198 000 595</b>	0.300	
90	80	PA40 DA	<b>198 000 595</b>	0.300	
90	80	PA35 FC/FO	<b>198 000 595</b>	0.300	
110	100	PA40 FC/FO	<b>198 000 600</b>	0.100	
110	100	PA45 DA	<b>198 000 600</b>	0.100	
140	125	PA45 DA	<b>198 000 600</b>	0.100	
140	125	PA45 FC/FO	<b>198 000 597</b>	0.150	
160	150	PA55 DA	<b>198 000 600</b>	0.100	
160	150	PA50 FC	<b>198 000 599</b>	0.100	
225	200	PA55 FC/FO	<b>198 000 598</b>	0.150	
225	200	PA55 DA	<b>198 000 600</b>	0.100	
280	250	PA65 FC/FO	<b>198 000 730</b>	0.300	
280	250	PA65 DA	<b>198 000 731</b>	0.300	
315	300	PA70 FC/FO	<b>198 000 730</b>	0.300	
315	300	PA70 DA	<b>198 000 731</b>	0.300	

PF 3 39 644 998

### Electric type 140 / 141 / 142 Without manual override

d [mm]	DN [mm]	Type of actuator	Code	kg	
63	50	EA31	<b>198 000 601</b>	0.150	
75	65	EA31	<b>198 000 601</b>	0.150	
90	80	EA31	<b>198 000 601</b>	0.150	
110	100	EA31	<b>198 000 602</b>	0.150	
140	125	EA31	<b>198 000 602</b>	0.150	
160	150	EA31	<b>198 000 599</b>	0.100	
225	200	EA42	<b>198 000 603</b>	0.150	
280	250	EA42	<b>198 000 732</b>	0.750	
315	300	EA42	<b>198 000 732</b>	0.750	

PF 3 39 643 998

### Electric type 140 / 141 / 142 With manual override

d-d [mm]	DN-DN [mm]	Type of actuator	Code	kg	
63 - 90	50 - 80	EA31	<b>198 000 623</b>	1.700	
110 - 140	100 - 125	EA31	<b>198 000 624</b>	1.700	
160 -	150 -	EA31	<b>198 000 625</b>	1.700	
225 -	200 -	EA42	<b>198 000 627</b>	1.700	

PF 3 39 644 998

## Gear operated with handwheel 567 / 568

d [mm]	DN [mm]	Code	kg
63	50	<b>198 000 621</b>	0.150
75	65	<b>198 000 621</b>	0.150
90	80	<b>198 000 621</b>	0.150
110	100	<b>198 000 622</b>	0.150
140	125	<b>198 000 622</b>	0.150
160	150	<b>198 000 599</b>	0.100
225	200	<b>198 000 599</b>	0.100
280	250	<b>198 000 880</b>	0.750
315	300	<b>198 000 880</b>	0.750

PF 3 39 643 998

## Hand lever kit with fine adjustment For type 037M/038M



d-d [mm]	DN-DN [mm]	Inch	Code	kg
63 - 90	50 - 80	2-3	<b>198 803 384</b>	0.700
110 - 110	100 - 100	4	<b>198 803 385</b>	0.700
140 - 140	125 - 125	5	<b>198 803 386</b>	0.800
160 - 225	150 - 200	6-8	<b>198 803 387</b>	0.800

PF 3 39 226 998

## Reduction gear with handwheel for type 037G/038G

- Including assembly kit



d-d [mm]	DN-DN [mm]	Inch	Code	kg
63 - 90	50 - 80	2-3	<b>198 806 690</b>	2.260
110 - 140	100 - 125	4-5	<b>198 806 691</b>	2.260
160 - 225	150 - 200	6-8	<b>198 806 692</b>	2.260
225 - 315	200 - 300	8-12	<b>198 806 693</b>	2.850

PF 3 39 226 998

## Intermediate element to type 037E/038E

### Without manual override

d-d [mm]	DN-DN [mm]	Inch	Type	Code	kg
63 - 90	50 - 80	2-3	EA 31	<b>198 000 411</b>	0.113
110 - 140	100 - 125	4-5	EA 31	<b>198 000 412</b>	0.113
160 - 225	150 - 200	6-8	EA 42	<b>198 000 415</b>	2.435
- 280	- 250	10	EA 42	<b>198 000 416</b>	2.778

PF 3 39 226 998

### With manual override

#### Model:

- EA30/41 no longer available, replacement by EA31/42
- EA50 will soon be phased out

d-d [mm]	DN-DN [mm]	Inch	Type	Code	kg
63 - 90	50 - 80	2-3	EA 31	<b>198 000 338</b>	2.200
110 - 140	100 - 125	4-5	EA 42	<b>198 000 339</b>	1.735
160 - 225	150 - 200	6-8	EA 42	<b>198 000 340</b>	2.456
- 280	- 250	10	EA 50	-	

PF 3 39 226 998

## Intermediate element to type 037P/038P

### Without manual override

d [mm]	DN [mm]	Inch	Type of actuator	Code	kg
63	50	2	PA30 FC/FO	<b>198 000 382</b>	0.303
63	50	2	PA35 DA	<b>198 000 382</b>	0.303
75	65	2 ½	PA30 FC/FO	<b>198 000 382</b>	0.303
75	65	2 ½	PA35 DA	<b>198 000 382</b>	0.303
90	80	3	PA35 FC/FO	<b>198 000 383</b>	0.225
90	80	3	PA35 DA	<b>198 000 384</b>	0.303
110	100	4	PA40 FC/FO	<b>198 000 385</b>	0.208
110	100	4	PA45 DA	<b>198 000 385</b>	0.208
140	125	5	PA45 FC/FO	<b>198 000 386</b>	0.228
140	125	5	PA45 DA	<b>198 000 387</b>	0.208
160	150	6	PA50 FC/FO	<b>198 000 388</b>	0.208
160	150	6	PA55 DA	<b>198 000 388</b>	0.208
225	200	8	PA60 FC/FO	<b>198 000 389</b>	0.213
225	200	8	PA60 DA	<b>198 000 390</b>	0.208
280	250	10	PA60 FC/FO	<b>198 000 391</b>	0.711
280	250	10	PA65 DA	<b>198 000 391</b>	0.711
315	300	12	PA70 FC/FO	<b>198 000 392</b>	0.727
315	300	12	PA70 DA	<b>198 000 393</b>	0.711

PF 3 39 226 998

## Intermediate element to type 035

### Without manual override

#### Model:

- EA30/41 no longer available, replacement by EA31/42
- EA50 will soon be phased out
- Type 035 will be replaced by type 140

**Phase out product will be replaced with type 567 for dimension DN65-200**

d [mm]	DN [mm]	Inch	Type	Code	kg
↻ 75	65	2 1/2	EA 30	<b>198 000 126</b>	0.885
↻ 90	80	3	EA 30	<b>198 000 127</b>	0.479
↻ 110	100	4	EA 41	<b>198 000 128</b>	0.730
↻ 140	125	5	EA 41	<b>198 000 129</b>	1.005
↻ 160	150	6	EA 41	<b>198 000 130</b>	1.040
↻ 225	200	8	EA 41	<b>198 000 131</b>	2.850
↻ 280	250	10	EA 50	<b>198 000 209</b>	6.960

PF 3 39 213 998

## Intermediate element to type 036

### Without manual override

d [mm]	DN [mm]	Inch	Type of actuator	Code	kg
↻ 75	65	2 ½	PA35 FC/FO	<b>198 000 394</b>	0.449
↻ 75	65	2 ½	PA35 DA	<b>198 000 395</b>	0.454
↻ 90	80	3	PA40 FC/FO	<b>198 000 396</b>	0.524
↻ 90	80	3	PA45 DA	<b>198 000 396</b>	0.524
↻ 110	100	4	PA45 FC/FO	<b>198 000 397</b>	0.855
↻ 110	100	4	PA45 DA	<b>198 000 398</b>	0.878
↻ 140	125	5	PA50 FC/FO	<b>198 000 399</b>	1.349
↻ 140	125	5	PA50 DA	<b>198 000 400</b>	1.362
↻ 160	150	6	PA55 FC/FO	<b>198 000 401</b>	1.076
↻ 160	150	6	PA55 DA	<b>198 000 402</b>	1.095
↻ 225	200	8	PA60 FC/FO	<b>198 000 403</b>	1.918
225	200	8	PA60 DA	<b>198 000 404</b>	1.937
280	250	10	PA65 FC/FO	<b>198 000 354</b>	5.500
280	250	10	PA65 DA	<b>198 000 355</b>	5.500
315	300	12	PA70 FC/FO	<b>198 000 354</b>	5.500
315	300	12	PA70 DA	<b>198 000 355</b>	5.500

PF 3 39 213 998

## With manual override

d [mm]	DN [mm]	Inch	Type of actuator	Code	kg
75	65	2 ½	PA35 FC/FO	<b>198 000 413</b>	2.343
75	65	2 ½	PA35 DA	<b>198 000 414</b>	2.658
90	80	3	PA40 FC/FO	<b>198 000 415</b>	2.435
90	80	3	PA45 DA	<b>198 000 415</b>	2.435
110	100	4	PA45 FC/FO	<b>198 000 416</b>	2.778
110	100	4	PA45 DA	<b>198 000 417</b>	2.765
140	125	5	PA50 FC/FO	<b>198 000 418</b>	3.235
140	125	5	PA50 DA	<b>198 000 419</b>	3.222
160	150	6	PA55 FC/FO	<b>198 000 420</b>	3.016
160	150	6	PA55 DA	<b>198 000 421</b>	2.954
225	200	8	PA60 FC/FO	<b>198 000 422</b>	3.855
225	200	8	PA60 DA	<b>198 000 423</b>	3.808

PF 3 39 213 998

# Assembly parts for ball valves

## Retrofit ball valve bracket

### For EA11/21 PA11/21 to ball valve 346

Type of actuator	d-d [mm]	Inch [inch]	DN-DN [mm]	Master gauge	Code	kg
PA11	- 20	½	- 15	F04	<b>198 000 608</b>	0.398
PA11 / EA11/21	16 - 20	¾ - ½	10 - 15	F05	<b>198 000 580</b>	0.398
PA11	- 25	¾	- 20	F04	<b>198 000 609</b>	0.418
EA11/21	- 25	¾	- 20	F05	<b>198 000 604</b>	0.418
PA11	- 32	1	- 25	F04	<b>198 000 610</b>	0.430
PA11 / EA11/21	- 32	1	- 25	F05	<b>198 000 582</b>	0.430
PA21 EA11/21	- 40	1 ¼	- 32	F05	<b>198 000 605</b>	0.455
PA21 EA11/21	- 50	1 ½	- 40	F05	<b>198 000 606</b>	0.295
PA21 EA11/21	- 63	2	- 50	F05	<b>198 000 607</b>	0.346

PF 3 39 749 997

## Ball valve bracket type 175-7/275-7

### Model:

- For EA21 and PA11/21 to ball valve 343

Type of actuator	d-d [mm]	Inch [inch]	DN-DN [mm]	Master gauge	EPDM Code	kg
EA21 / PA11	16 - 20	¾ - ½	10 - 15	F04 / F05	<b>198 000 570</b>	0.169
EA21 / PA11	- 25	¾	- 20	F04 / F05	<b>198 000 571</b>	0.178
EA21 / PA11	- 32	1	- 25	F04 / F05	<b>198 000 572</b>	0.212
EA21 / PA21	- 40	1 ¼	- 32	F05	<b>198 000 573</b>	0.217
EA21 / PA21	- 50	1 ½	- 40	F05	<b>198 000 574</b>	0.238
EA21 / PA21	- 63	2	- 50	F05	<b>198 000 575</b>	0.342

PF 3 39 749 997

## Ball valve bracket type 178/278

### Model:

- For EA21 and PA11/21 to ball valve 343 vertical
- 3-way ball valve only with EA21

Type of actuator	d-d [mm]	Inch [inch]	DN-DN [mm]	Master gauge	EPDM Code	kg
PA11 / EA11/21	16 - 20	¾ - ½	10 - 15	F05	<b>198 000 580</b>	0.398
PA11 / EA21	- 25	¾	- 20	F05	<b>198 000 581</b>	0.418
PA11 / EA11/21	- 32	1	- 25	F05	<b>198 000 582</b>	0.430
PA21 / EA21	- 40	1 ¼	- 32	F05	<b>198 000 583</b>	0.455
PA21 / EA21	- 50	1 ½	- 40	F05	<b>198 000 584</b>	0.295
PA21 / EA21	- 63	2	- 50	F05	<b>198 000 585</b>	0.346

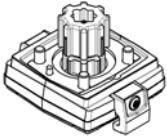
PF 3 39 749 997

## Intermediate element to type 230-235 with manual override



DN-DN [mm]	Inch [inch]	Code	kg
10 - 25	¾ - 1	<b>198 000 500</b>	0.240
32 - 50	1 ¼ - 2	<b>198 000 501</b>	0.260

PF 3 39 696 998



## Adapter plate incl. coupling

For actuator units electric type EA11/EA21  
Pneumatic type PA11/PA21  
To type 546

d-d [mm]	Inch [inch]	DN-DN [mm]	Code	kg
16 - 20	3/8 - 1/2	10 - 15	<b>198 150 556</b>	0.098
25 - 32	3/4 - 1	20 - 25	<b>198 150 557</b>	0.114
40 - 50	1 1/4 - 1 1/2	32 - 40	<b>198 150 558</b>	0.154
- 63	- 2	- 50	<b>198 150 559</b>	0.184

PF 3 39 211 998

## Intermediate element (screws/distance pieces/reducing bush)

For actuator units pneumatic PA30-45  
To type 546

d [mm]	DN [mm]	Type of actuator	Code	kg
75	65	PA30 FC/FO	<b>198 000 595</b>	0.300
75	65	PA35 DA	<b>198 000 595</b>	0.300
90	80	PA35 FC/FO	<b>198 000 596</b>	0.300
90	80	PA40 DA	<b>198 000 595</b>	0.300
110	100	PA40 FC/FO	<b>198 000 599</b>	0.100
110	100	PA45 DA	<b>198 000 599</b>	0.100

PF 3 39 644 998

## Intermediate element (screws/distance pieces/reducing bush)

For actuator unit EA31  
To type 546

d-d [mm]	DN-DN [mm]	Code	kg
75 - 90	65 - 80	<b>198 000 601</b>	0.150
- 110	- 100	<b>198 000 602</b>	0.150

PF 3 39 644 998

## Intermediate element to type 108 With manual override

d [mm]	d-d [mm]	DN [mm]	DN-DN [mm]	Inch	Type	Code	kg
75	-	65	-	2 1/2	EA 31	<b>198 000 132</b>	2.395
90	-	80	-	3	EA 31	<b>198 000 133</b>	2.870
	110 - 160		100 - 150	4 / 6	EA 31 / EA 41	<b>198 000 134</b>	2.870

PF 3 39 211 998

## Intermediate element to type 208 Without manual override (with flanges)

d [mm]	DN [mm]	Inch [inch]	Type	Code	kg
75	65	2 1/2	PA 40 FC/FO	<b>198 000 236</b>	1.000
75	65	2 1/2	PA 40 DA	<b>198 000 237</b>	1.000
90	80	3	PA 50 FC/FO	<b>198 000 238</b>	1.600
90	80	3	PA 50 DA	<b>198 000 239</b>	1.600
110 - 160	100 - 150	4 - 6	PA 50 FC/FO	<b>198 000 240</b>	2.300
110 - 160	100 - 150	4 - 6	PA 50 DA	<b>198 000 241</b>	2.300

PF 3 39 211 998



## Without manual override (with unions)

d [mm]	DN [mm]	Inch	Type	Code	kg	
75	65	2 1/2	PA 40 FC/FO	<b>198 000 276</b>	1.000	
75	65	2 1/2	PA 40 DA	<b>198 000 277</b>	1.000	
90	80	3	PA 50 FC/FO	<b>198 000 278</b>	1.000	
90	80	3	PA 50 DA	<b>198 000 279</b>	1.000	
110	100	4	PA 50 FC/FO	<b>198 000 280</b>	1.000	
110	100	4	PA 50 DA	<b>198 000 281</b>	1.000	

PF 3 39 211 998

# Assembly parts for actuators

## Adapter set for PA11

### F04 (WS11) per EN ISO 5211

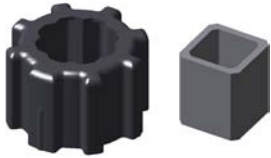


PF 3 46 251 997

Code	kg	
198 000 586	0.006	

## Adapter set for PA21 EA11 EA21

### F05 (WS11/14) per EN ISO 5211



PF 3 46 251 997

Code	kg	
198 000 587	0.018	

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161 367 052	202	161 486 653	98	169 017 684	58
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161 367 072	202	167 061 004	167	169 017 686	58
161 367 625	202	167 061 012	167	169 017 687	58
161 367 626	202	167 061 013	167	169 017 688	58
161 367 627	202	167 061 014	167	169 017 689	58
161 367 628	202	167 061 015	167	169 017 691	58
161 367 629	202	167 061 016	167	169 017 692	58
161 367 630	202	167 061 017	167	169 017 693	58
161 367 635	202	167 061 035	167	169 017 694	58
161 367 636	202	167 061 036	167	169 110 056	77
161 367 637	202	167 061 037	167	169 110 066	77
161 367 638	202	167 061 038	167	169 110 097	77
161 367 639	202	167 061 039	167	169 110 117	77
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198 800 734	173	199 140 504	135	199 190 085	177
198 800 735	173	199 140 505	135	199 190 086	177
198 800 737	173	199 140 506	135	199 190 087	177
198 800 757	171	199 140 507	135	199 190 092	177
198 800 758	173	199 140 508	135	199 190 093	179
198 800 759	173	199 140 522	138	199 190 094	180
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198 803 050	203	199 140 524	138	199 190 096	179
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# General Condition of Supply of Georg Fischer Piping Systems Limited, Schaffhausen

## 1 General

- 1.1 These General Conditions shall apply to all Products supplied by Georg Fischer to the Purchaser. They shall also apply to all future business even when no express reference is made to them.
- 1.2 Any deviating or supplementary conditions especially Purchaser's general conditions of purchase and verbal agreements shall only be applicable if accepted in writing by Georg Fischer.
- 1.3 The written form shall be deemed to be fulfilled by all forms of transmission, evidenced in the form of text, such as telefax, e-mail, etc.

## 2 Tenders

- Tenders shall only be binding if they contain a specifically stated period for acceptance.

## 3 Scope of Delivery

- 3.1 Georg Fischer's product range is subject to change.
- 3.2 The confirmation of order shall govern the scope and execution of the contract.

## 4 Data and Documents

- 4.1 Technical documents such as drawings, descriptions, illustrations and data on dimensions, performance and weight as well as the reference to standards are for information purposes only. They are not warranted characteristics and are subject to change.
- 4.2 All technical documents shall remain the exclusive property of Georg Fischer and may only be used for the agreed purposes or as Georg Fischer may consent.

## 5 Confidentiality, Protection of Personal Data

- 5.1 Each party shall keep in strict confidence all commercial or technical information relating to the business of the other party, of which it has gained knowledge in the course of its dealing with the other party. Such information shall neither be disclosed to third parties nor used for other purposes than those for which the information has been supplied.
- 5.2 In the context of the contractual relation with the Purchaser personal data may be processed. The Purchaser agrees to the disclosure of said data to third parties such as foreign subcontractors and suppliers etc.

## 6 Local Laws and Regulations, Export Controls

- 6.1 The Purchaser shall bring to the attention of Georg Fischer all local laws and regulations at the place of destination which bear connection with the execution of the contract and the adherence to relevant safety regulations and approval procedures.
- 6.2 In case of re-exports, Purchaser shall be responsible for compliance with pertinent export control regulations.

## 7 Price

- 7.1 Unless agreed otherwise, the prices shall be deemed quoted net ex works [according to Incoterms 2010 of the ICC, or latest version] including standard packing. All supplementary costs such as the cost of carriage, insurance, export-, transit- and import- licences etc. shall be borne by the Purchaser. The Purchaser shall also bear the costs of all taxes, fees, duties etc. connected with the contract.
- 7.2 If the costs of packing, carriage, insurance, fees and other supplementary costs are included in the tender price or contract price or are referred to specifically in the tender or confirmation of order, Georg Fischer reserve the right to revise their prices accordingly should any change occur in the relevant tariffs.

## 8 Terms of Payment

- 8.1 The Purchaser shall make payment in the manner agreed by the parties without any deductions such as discounts, costs, taxes or dues.
- 8.2 The Purchaser may only withhold or off-set payments due against counter claims which are either expressly acknowledged by Georg Fischer or finally awarded to the Purchaser. In particular, payment shall still be made when unessential items are still outstanding provided that the Products already delivered are not rendered unusable as a result.

## 9 Retention of Title

- 9.1 The Products shall remain the property of Georg Fischer until the Purchaser shall have settled all claims, present and future, which Georg Fischer may have against him.
- 9.2 Should the Purchaser resell Products to which title is reserved, in the ordinary course of business, he shall hereby be deemed to have tacitly assigned to Georg Fischer the proceeds deriving from their sale together with all collateral rights, securities and reservations of title until all claims held by Georg Fischer shall have been settled. Until revoked by Georg Fischer, this assignment shall not preclude Purchaser's right to collect the assigned receivables.
- 9.3 To the extent the value of the Products to which title is reserved together with collateral securities exceeds Georg Fischer's claims against the Purchaser by more than 20%, Georg Fischer shall re-assign the above proceeds to Purchaser at his request.

## 10 Delivery

- 10.1 The term of delivery shall commence as soon as the contract has been entered into, all official formalities such as import and payment permits have been obtained and all essential technical issues have been settled. The term of delivery shall be deemed duly observed when, upon its expiry, the Products are ready for despatch.
- 10.2 Delivery is subject to the following conditions, i.e. the term of delivery shall be reasonably extended:
  - a) if Georg Fischer are not supplied in time with the information necessary for the execution of the contract or if subsequent changes causing delays are made by the Purchaser.
  - b) if Georg Fischer are prevented from performing the contract by force majeure. Force majeure shall equally be deemed to be any unforeseeable event beyond Georg Fischer's control which renders Georg Fischer's performance commercially unpractical or impossible, such as delayed or defective supplies from sub contractors labour disputes, governmental orders or regulations, shortages in materials or energy, serious disturbances in Georg Fischer's works, such as the total or partial destruction of plant and equipment or the breakdown of essential facilities, serious disruptions in transport facilities, e.g. impassable roads. Should the effect of force majeure exceed a period of six months, either party may cancel the contract forthwith. Georg Fischer shall not be liable for any damage or loss of any kind whatsoever resulting from the reform, any suspension or cancellation being without prejudice to Georg Fischer's right to recover all sums due in respect of consignments delivered and costs incurred to date.
  - c) if the Purchaser is in delay with the fulfilment of his obligations under the contract, in particular, if he does not adhere to the agreed conditions of payment or if he has failed to timely provide the agreed securities.
- 10.3 If for reasons attributable to Georg Fischer the agreed term of delivery or a reasonable extension thereof is exceeded, Georg Fischer shall not be deemed in default until the Purchaser has granted to Georg Fischer in writing a reasonable extension thereof of not less than one month which equally is not met. The Purchaser shall then be entitled to the remedies provided at law, it being however understood that, subject to limitations of Art. 16, damage claims shall be limited to max. 10% of the price of the delayed delivery.
- 10.4 Part shipments shall be allowed and Georg Fischer shall be entitled to invoice for such partial deliveries.
- 10.5 If the Purchaser fails to take delivery within a reasonable time of Products notified as ready for despatch, Georg Fischer shall be entitled to store the Products at the Purchaser's expense and risk and to invoice them as delivered. If Purchaser fails to effect payment, Georg Fischer shall be entitled to dispose of the Products.
- 10.6 Should Purchaser cancel an order without justification and should Georg Fischer not insist on the performance of the contract, Georg Fischer shall be entitled to a penalty amounting to 10% of the contract price, Georg Fischer's right to prove and claim higher damages remaining reserved. Purchaser shall be entitled to prove, that Georg Fischer has suffered no or a considerably lower damage than the penalty forfeited.

## 11 Packing

- If the Products are provided with additional packing over and above the standard packing, such packing shall be charged additionally.

## 12 Passing of Risk

- 12.1 The risk in the Products shall pass to the Purchaser as soon as they have left Georg Fischer's works [EX WORKS, Incoterms 2010 ICC, or latest version], even if delivery is made carriage-paid, under similar clauses or including installation or when carriage is organized and managed by Georg Fischer.
- 12.2 If delivery is delayed for reasons beyond Georg Fischer's control, the risk shall pass to the Purchaser when he is notified that the Products are ready for despatch.

## 13 Carriage and Insurance

- 13.1 Unless agreed otherwise, the Purchaser shall bear the cost of carriage.
- 13.2 The Purchaser shall be responsible for transport insurance against damage of whatever kind. Even when such insurance is arranged by Georg Fischer it shall be deemed taken out by the order of and for the account of the Purchaser and at his risk.
- 13.3 Special requests regarding carriage and insurance shall be communicated to Georg Fischer in due time. Otherwise carriage shall be arranged by Georg Fischer at their discretion, but without responsibility, by the quickest and cheapest method possible. In case of carriage-paid delivery transport arrangements shall be made by Georg Fischer. If the Purchaser specifies particular requirements, any extra costs involved shall be borne by him.
- 13.4 In the event of damage or loss of the Products during carriage the Purchaser shall mark the delivery documents accordingly and immediately have the damage ascertained by the carrier. Not readily ascertainable damages sustained during carriage shall be notified to the carrier within six days after receipt of the Products.

## 14 Inspection, Notification of Defects and Damages

- 14.1 The Products will be subject to normal inspection by Georg Fischer during manufacture. Additional tests required by the Purchaser shall be agreed upon in writing and shall be charged to the Purchaser.
- 14.2 It shall be a condition of Georg Fischer's obligation under the warranties stated hereinafter that Georg Fischer be notified in writing by the Purchaser of any purported defect immediately upon discovery. Notice concerning weight, numbers or apparent defects is to be given latest within 30 days from receipt of the Products, notice of other defects immediately latest within 7 working days after discovery, in any event within the agreed warranty period.
- 14.3 Purchaser shall not dispose of allegedly defective Products until all warranty and/or damage claims are finally settled. At its request, defective Products are to be placed at Georg Fischer's disposal.
- 14.4 At its request, Georg Fischer shall be given the opportunity to inspect the defect and/or damage, prior to commencement of remedial work, either itself or by third party experts.

## 15 Warranty

- 15.1 At the written request of the Purchaser, Georg Fischer undertakes to repair or replace at its discretion, as quickly as possible and free of charge, all Products supplied which demonstrably suffer from faulty design, materials or workmanship, from faulty operating or installation instructions or which become defective or unusable due to faulty advice. In order to protect employees from toxic or radioactive substances which may have been transported through defective parts returned to Georg Fischer's sales organisation, said parts must be accompanied by a Material Safety Disclosure Form. The form may be obtained from Georg Fischer's local sales company or via [www.piping.georgfischer.com](http://www.piping.georgfischer.com). Replaced parts shall become property of Georg Fischer, unless Georg Fischer waives such claim.
- 15.2 For Products which are manufactured to specifications, drawings or patterns supplied by the Purchaser, Georg Fischer's warranty shall be restricted to proper materials and workmanship.
- 15.3 The Purchaser shall be entitled to rescind the contract or to demand a reduction of the contract price if
  - the repair or replacement of the defective Product is impossible
  - the defective Product is not repaired or replaced within a reasonable period
  - Georg Fischer refuses the repair or replacement or if for reasons attributable to Georg Fischer the repair or replacement is delayed.
- 15.4 For Products or essential components manufactured by a third party and supplied by Georg Fischer under this contract, Georg Fischer's warranty is limited to the warranty provided by said third party.
- 15.5 This warranty shall not apply to damage resulting from normal wear and tear, improper storage and maintenance, failure to observe the operating instructions, overstressing or overloading, unsuitable operating media, unsuitable construction work or unsuitable building ground, improper repairs or alterations by the Purchaser or third parties, the use of other than original spare parts and other reasons beyond Georg Fischer's control.
- 15.6 No action or claim may be brought by the Purchaser on account of any alleged breach of warranty or any other obligation of Georg Fischer after the expiration of twelve (12) months from receipt of the Products by the end user or at the latest within eighteen (18) months of the Products being despatched by Georg Fischer.
- 15.7 In case of Products for use in domestic installations or in utilities
  - Georg Fischer will assume the costs of dismantling the defective Product and restoring the damaged object up to CHF 1'000'000 per occurrence.
  - warranty or damage claims - contrary to Section 15.6 - are time-barred 5 years from the date of installation or 10 years from the production date, whichever is earlier.

## 16 Limitation of Liability

- The rights and remedies of the customer shall be exclusively governed by these General Conditions of Supply and shall be in lieu of any remedies at law. All further claims for damages, reduction of the purchase price, termination of or rescission of the contract are excluded. In no case whatsoever shall the customer be entitled to claim damages other than compensation for costs of remedying defects in the supplies. This in particular refers, but shall not be limited, to loss of production, loss of use, loss of orders, loss of profit, third party recovery claims and other direct or indirect or consequential damages. This limitation of liability equally applies to the extent Georg Fischer is liable for acts or omissions of its employees or third parties engaged for the performance of its obligations. It does not apply in case of unlawful intent or gross negligence on the part of Georg Fischer's management and in case of Georg Fischer's statutory liability, in particular under applicable product liability laws.

## 17 Severability

- Should any term or clause of these General Conditions in whole or in part be found to be unenforceable or void, all other provisions shall remain in full force and effect and the unenforceable or void provision shall be replaced by a valid provision, which comes closest to the original intention of the unenforceable or invalid provision.

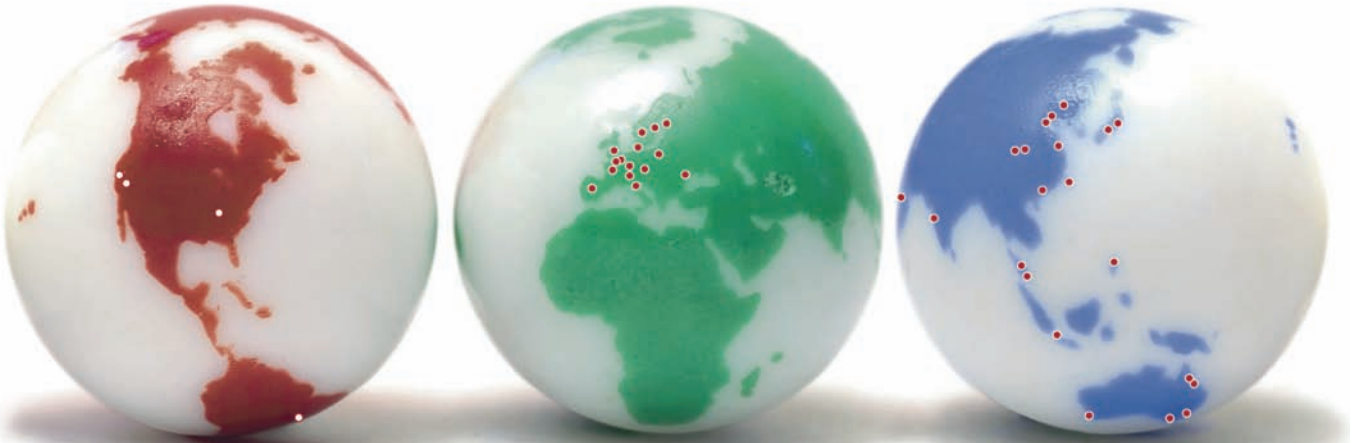
## 18 Place of Performance and Jurisdiction

- 18.1 Place of performance for the Products shall be the Georg Fischer works from which the Products are despatched.
- 18.2 The contract shall be governed by Swiss law without regard to conflict of law provisions that would require the application of another law.
- 18.3 Any civil action based upon any alleged breach of this contract shall be filed and prosecuted exclusively in the courts of Schaffhausen, Switzerland. Georg Fischer however reserves the right to file actions in any court having jurisdiction over controversies arising out of or in connection with the present contract.

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