Technical Information and Product Range 2013

COOL-FIT

Pipes, fittings, valves and accessories

+GF+

GEORG FISCHER
PIPING SYSTEMS

GF Piping Systems – The Best Choice

Products, systems and complete solutions from GF Piping Systems

Georg Fischer focuses on three core businesses: GF Piping Systems, GF Automotive and GF AgieCharmilles. The industrial corporation founded in 1802 headquarters in Switzerland and operates approximately 130 companies with 13000 employees in 30 countries.
GF Piping Systems is a leading supplier of plastic and metal piping systems with global market presence. For the treatment and distribution of water and chemicals, as well as the safe transport of liquids and gases in industry, we have the corresponding jointing technologies, fittings, valves, sensors and pipes in our product portfolio.

GF Piping Systems headquarters in Schaffhausen, Switzerland.

Our market segments
Being a strong implementation partner, GF Piping Systems supports its customers in every phase of the project - no matter which processes and applications are planned in the following market segments:
- Building Technology
- Chemical Process Industry
- Energy
- Food & Beverage/Cooling
- Microelectronics
- Shipbuilding
- Water & Gas Utilities
- Water Treatment

Global presence
Our global presence ensures customer proximity worldwide. Sales companies in over 25 countries and representatives in another 80 countries provide customer service around the clock. Fifty production sites in Europe, Asia and the USA are close to our customers and comply with local standards. A modern logistics concept with local distribution centres ensures that our products are always readily available. GF Piping Systems specialists are always close by.

Complete solutions provider
With over 40000 products, we offer individual and comprehensive system solutions for a wide variety of industrial applications.
Having the profitability of the projects in focus, we think in processes and applications that are integrated in the whole system. Continually setting standards in the market, we directly provide our customers with technologically achieved advantages. Due to our worldwide network our customers benefit personally from our 50+ years experience in plastics.

From start to finish, we stand beside our customers as a competent, reliable and experienced partner, actively contributing the expertise of an industrial company that has been successful in the market for over 200 years.

COOL-FIT

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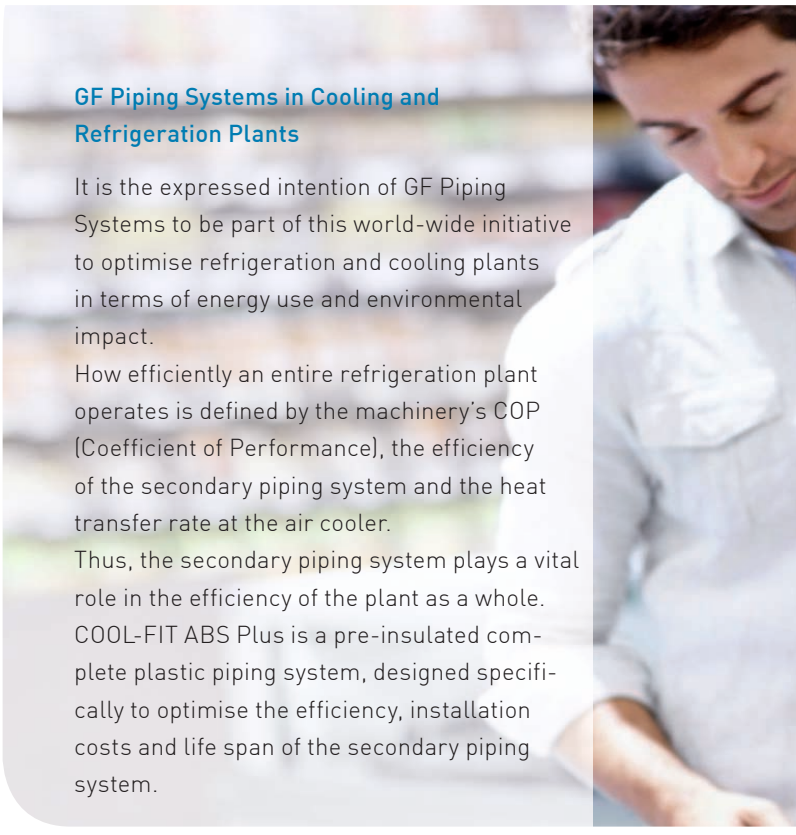
Introduction

GF Piping Systems and your Refrigeration / Cooling application

The origin of the artificial refrigeration process occurred not uncoincidentally at the same time as initial research into physics and thermodynamics. Linde, Carrier, Carre, Cullen and Harrison are prominent names in the history of refrigeration.

GF Piping Systems has been producing piping components since 1802, initially in malleable iron, nowadays with engineered system solutions for specific applications. One example is the high-purity, top-grade plastic piping systems developed by GF Piping Systems for the manufacture of semi-conductors.

Refrigeration systems place high demands on the piping system, which has a direct impact on the reliability, efficiency and life span of the plant.



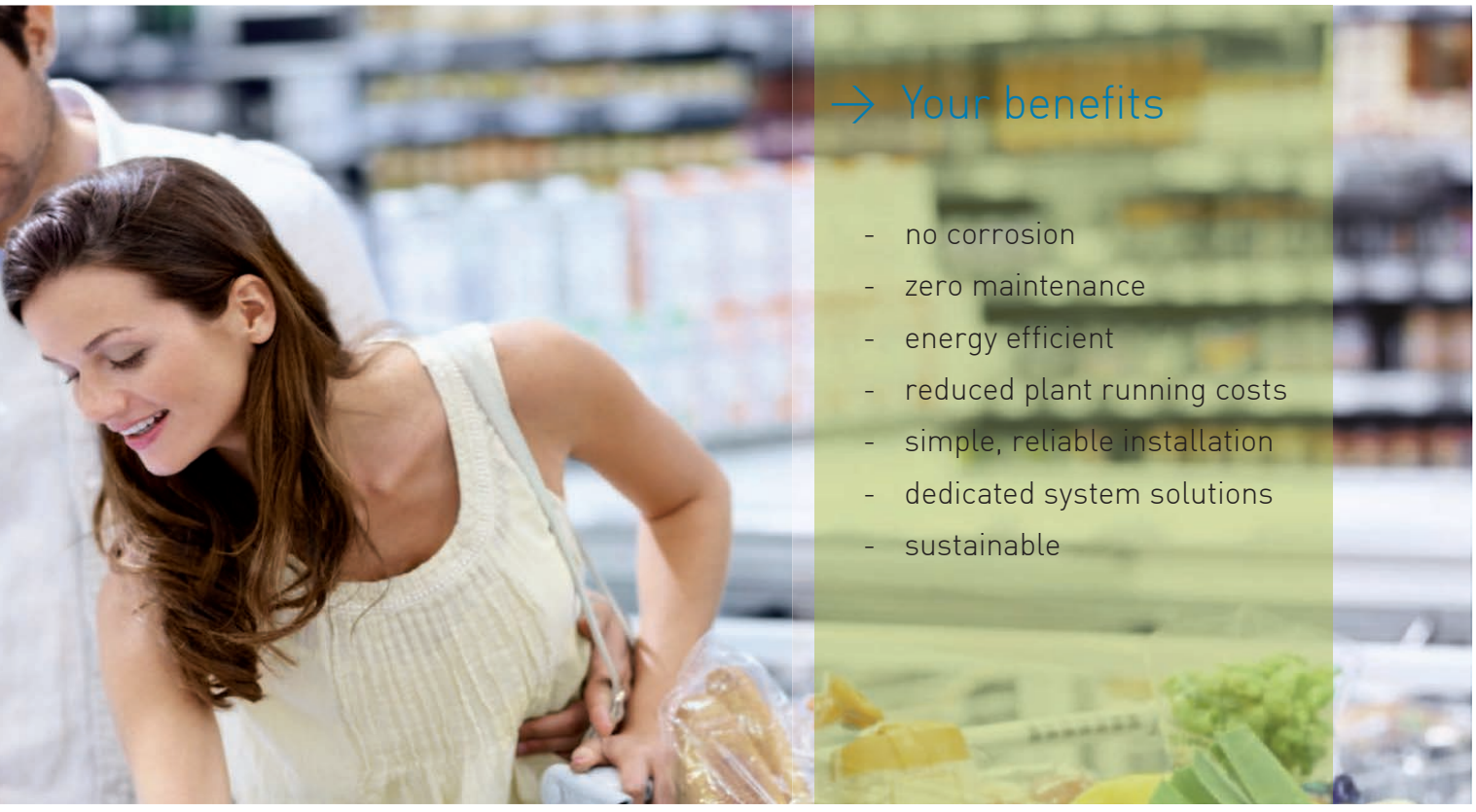
GF Piping Systems in Cooling and Refrigeration Plants

It is the expressed intention of GF Piping Systems to be part of this world-wide initiative to optimise refrigeration and cooling plants in terms of energy use and environmental impact.
How efficiently an entire refrigeration plant operates is defined by the machinery's COP (Coefficient of Performance), the efficiency of the secondary piping system and the heat transfer rate at the air cooler.
Thus, the secondary piping system plays a vital role in the efficiency of the plant as a whole.
COOL-FIT ABS Plus is a pre-insulated complete plastic piping system, designed specifically to optimise the efficiency, installation costs and life span of the secondary piping system.

Secondary Refrigeration

One of the consequences of national and international regulation to reduce and eliminate freons is an increase in the use of so-called secondary refrigeration systems. Such systems reduce the amount of environmentally unfriendly primary charge (freon gas) in a plant by about 80 %.
Leaks in standard refrigeration systems can be as high as 35 % of the original charge per year. This is not only immensely damaging to the environment, but also costs a great deal to refill the systems.

GF Piping Systems



→ Your benefits

- no corrosion
- zero maintenance
- energy efficient
- reduced plant running costs
- simple, reliable installation
- dedicated system solutions
- sustainable

Commonly used in larger industrial refrigeration installations where large charges of refrigerant gases can be a health and safety issue, secondary refrigeration plants have several advantages:

- higher safety
- lower refill costs
- higher temperature stability and control
- lower maintenance costs
- environmentally friendly.

Secondary systems also allow removal of refrigerant gases from the working or retail area into a separate machine room. This means that natural refrigerant gases such as ammonia or propane can be used to replace man-made freons with no danger to the personnel or public. The result is a 100 % sustainable plant with zero impact on the environment and with an improved efficiency.

The Environment

The Environment

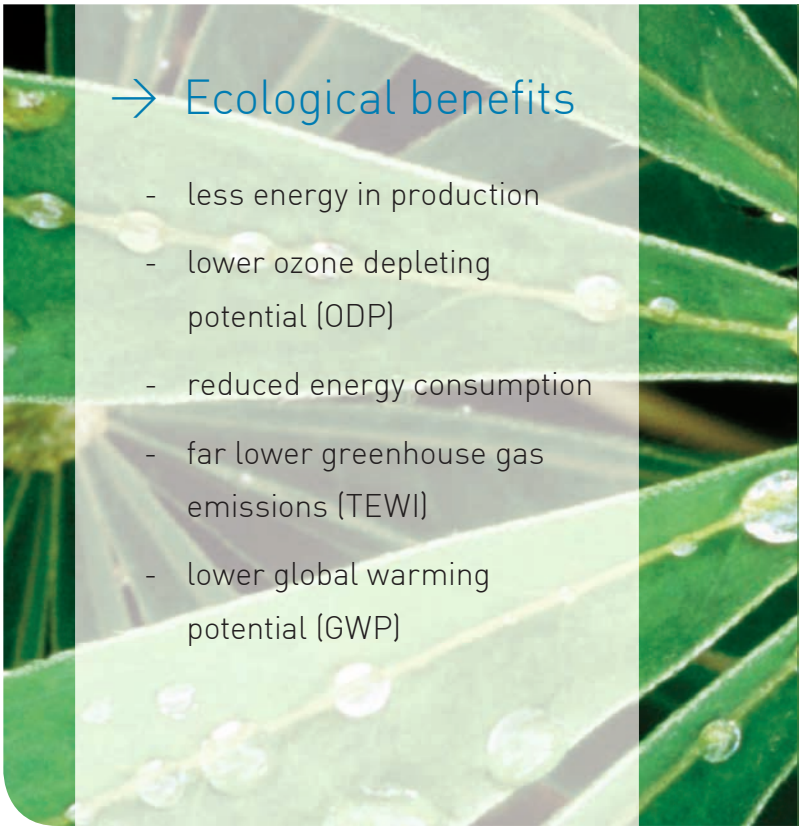
The "Montreal Protocol" in 1987 set the first internationally agreed timetable for the elimination of CFC gases. The Kyoto Protocol followed in 1997 with the intention of further accelerating the reduction of green-house gas emissions, including F-gases (fluorinated refrigerant).

The latest regulation in Europe is the EC Regulation No. 842/2006. The aim of which is to contain, prevent and thereby reduce emissions of fluorinated greenhouse gases, as outlined in the Kyoto Protocol.

Efficiency is the key

The cold chain and environmental climate control are integral parts of modern-day life. We simply expect fresh food twelve months of the year and of course the fresher the better. Climate control whether in hospitals or for medicines are determining factors in the quality of our lives. The generation of cold for a whole range of applications is part of day-to-day life.

Refrigeration plants are major users of energy and play a key role in environmental protection. In a supermarket, for example, 70 % of the daily energy costs are attributed to the cooling and refrigeration plant. Cold stores and food production facilities with cooling performance energy requirements of many megawatts are common. Any technology improvements which improve the efficiency of refrigeration and cooling plants have real ecological as well as economical benefits.



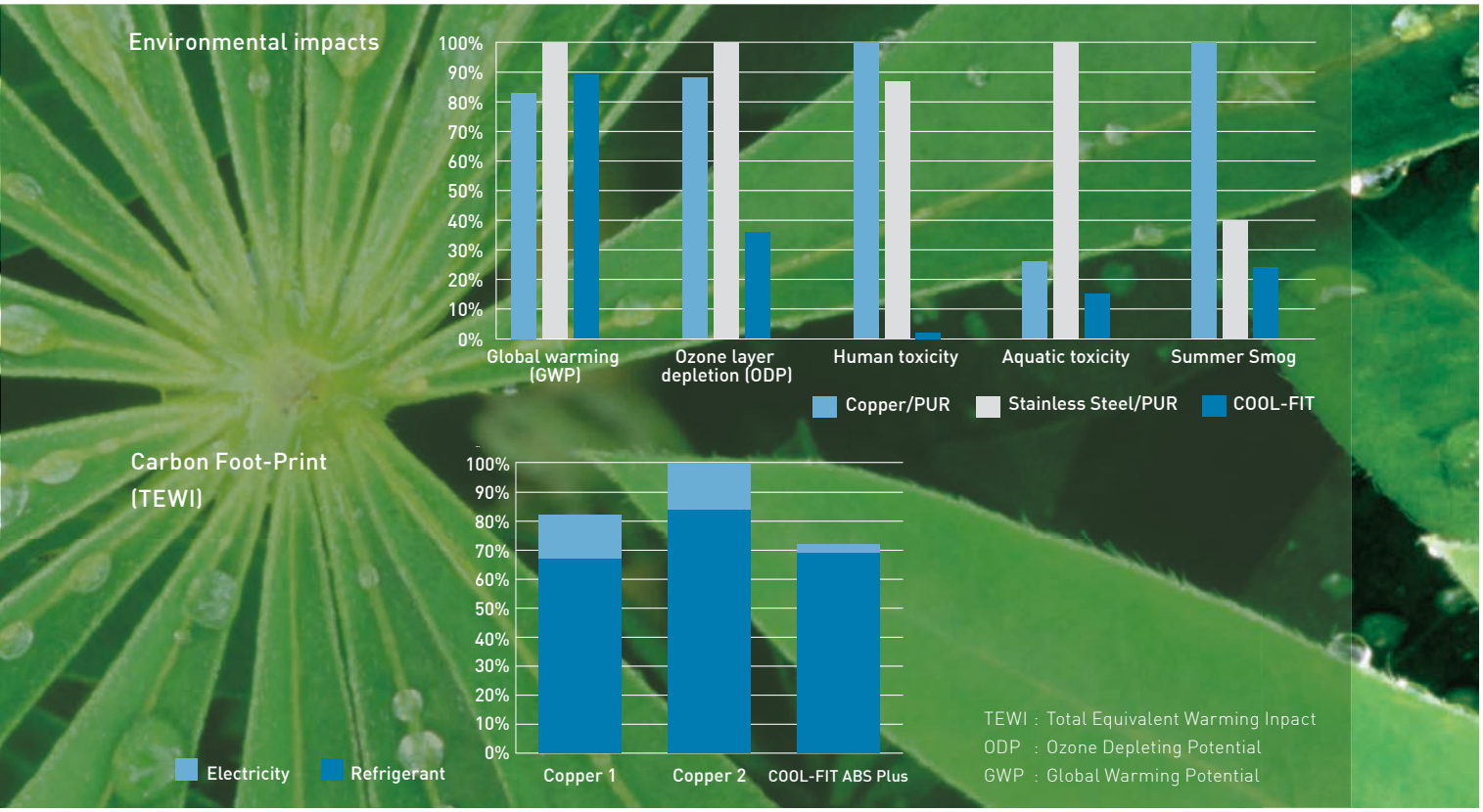
→ Ecological benefits

- less energy in production
- lower ozone depleting potential (ODP)
- reduced energy consumption
- far lower greenhouse gas emissions (TEWI)
- lower global warming potential (GWP)

COOL-FIT ABS Plus

Simplicity and efficiency were the driving forces behind one of the most significant innovations introduced by GF Piping Systems in recent years: COOL-FIT ABS Plus, a plastic piping system for cooling and refrigeration systems with a secondary cooling circuit.

GF Piping Systems



The system's advantages in terms of energy consumption and resource conservation as compared with traditional metal piping extend to all aspects of its life cycle – from the selection of materials and production to daily use in the plant. For example, the elaborate melting and processing involved in the production of copper releases significantly more CO_2 into the atmosphere than the production process for ABS plastic. And we are talking about considerable magnitudes. Take, for example, this sample calculation for a 500-metre- long piping system required for a Wal-Mart supermarket in the USA. The use of copper would have resulted in the release of 4600 kilograms of CO_2 at the material production stage alone.

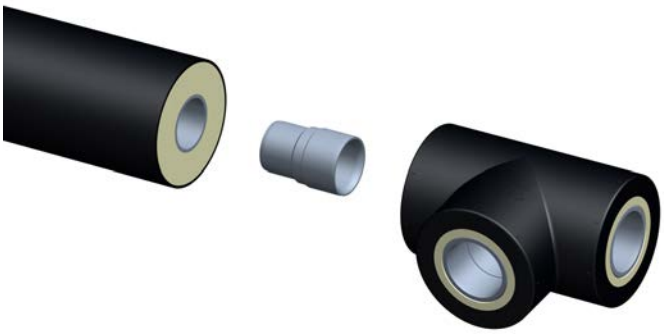
By using ABS, CO_2 emissions are reduced to just 2200 kilograms. And what's more, the latter process produces fewer toxic emissions than metal production.

COOL-FIT is used exclusively in "secondary refrigeration systems". This type of installation allows the required volume of refrigerant to be reduced by 80 to 90% compared to that used by conventional systems. COOL-FIT ABS Plus therefore undercuts existing systems in terms of its TEWI (Total Equivalent Warming Impact) value, which is based on energy and coolant requirements, by over 50% – with welcome effects not just for the environment, but also for reduced overall costs for the operator.

System COOL-FIT

General information

COOL-FIT is a complete plastic pipe system for secondary cooling and refrigeration systems operated with brine or water diluted glycols. The system is based on proven and cold-shock resistant ABS pipes and fittings. COOL-FIT is ideal for use in cold storage, in food and beverage production (e.g. breweries, dairies, slaughterhouses), in supermarkets as well as for process cooling in industrial cooling water systems or in data centers.



The COOL-FIT system is available in three different versions:

- COOL-FIT ABS: standard ABS (not insulated), post-insulation on-site possible
- COOL-FIT ABS Lite: pre-insulated ABS with Armacell insulation: fire classification: BL-s3,d0
- COOL-FIT ABS Plus: pre-insulated ABS with UV resistant and vapor tight jacket

Both pipes and fittings are delivered ready to install.

Typical working conditions

Working temperature range from:

- -50 °C (-58°F) to +60°C (140°F) COOL-FIT ABS
- -50 °C (-58°F) to +60°C (140°F) COOL-FIT ABS Lite
- -50 °C (-58°F) to +40°C (104°F) COOL-FIT ABS Plus

Typical mediums

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

- chilled water and general water
- Salt solutions
- Antifrogen KF
- Hycool
- Temper
- Freezium
- Zitrec

Glycol solutions

- Antifrogen L
- Antifrogen N
- Dowfrost
- Tyfocor

Alcohol solutions

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

Note:

COOL-FIT is not for use with primary gases such as:

- Ammonia, Propane, R407, R22 and also not for use for compressed air systems

Application Areas:

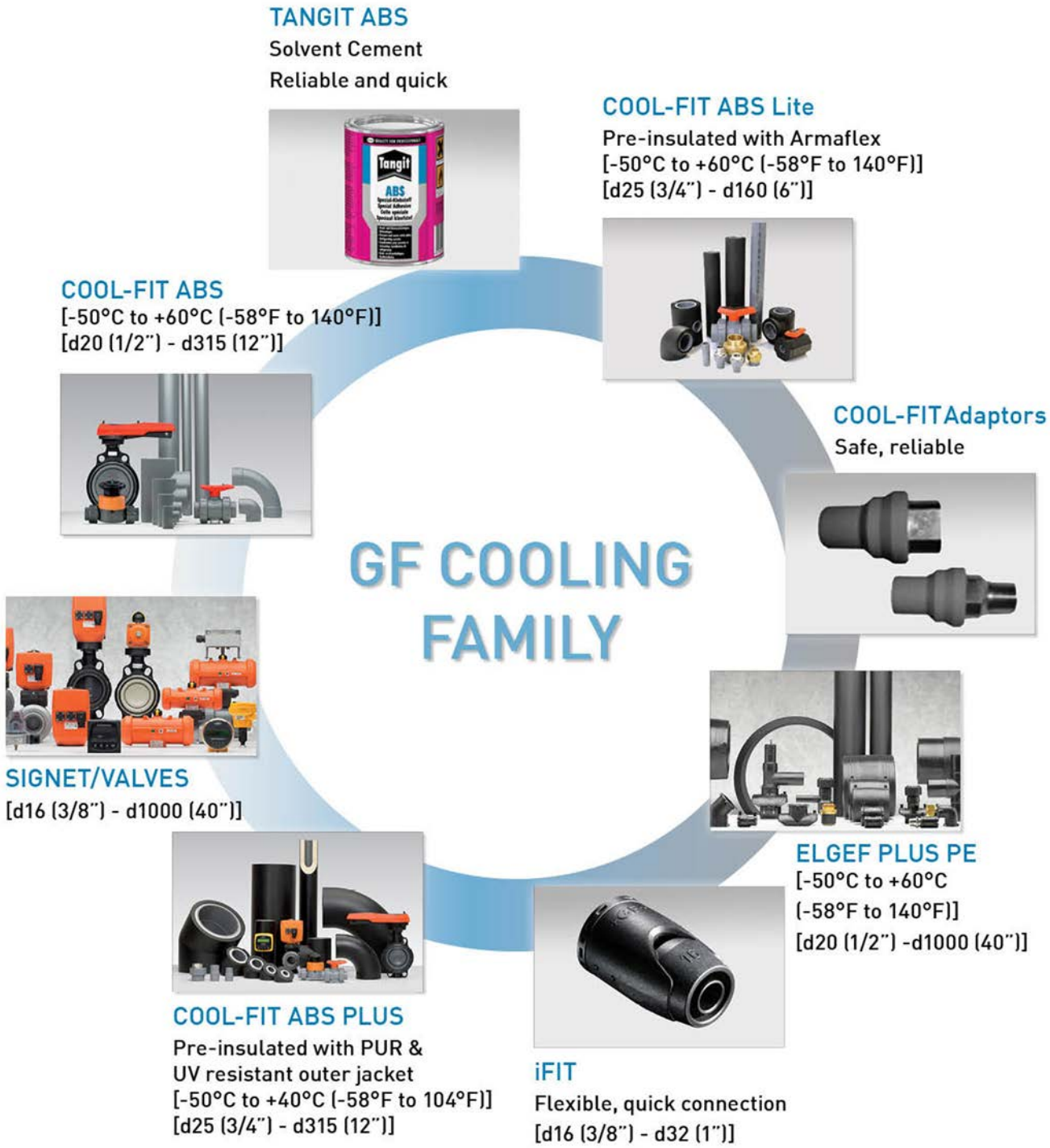
- Dairies
- Slaughter houses
- Meat processing
- Industrial cooling water
- Breweries
- Food production
- Fish industry
- Air conditioning

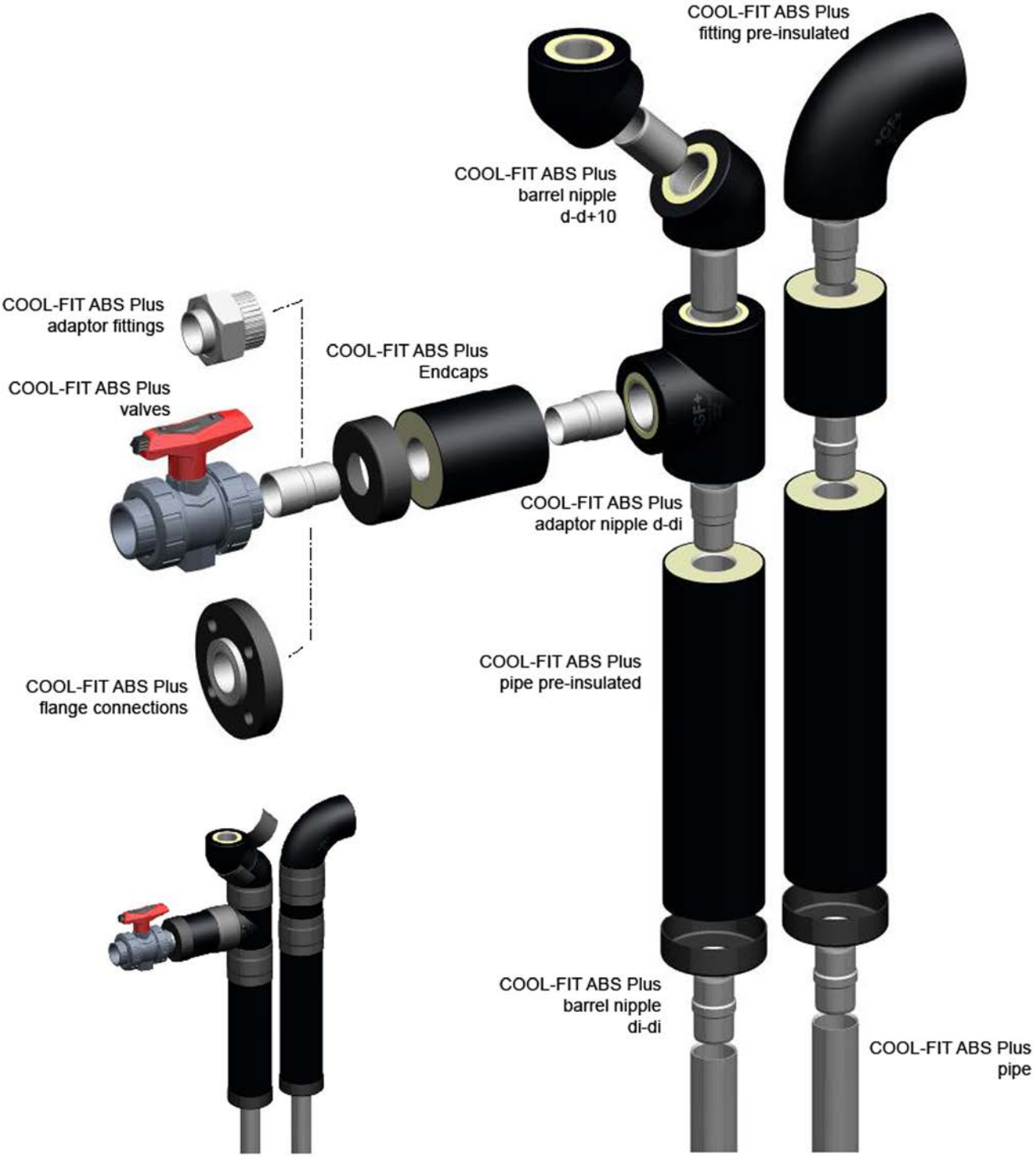
COOL-FIT technical information and installation details are available separately on request.

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

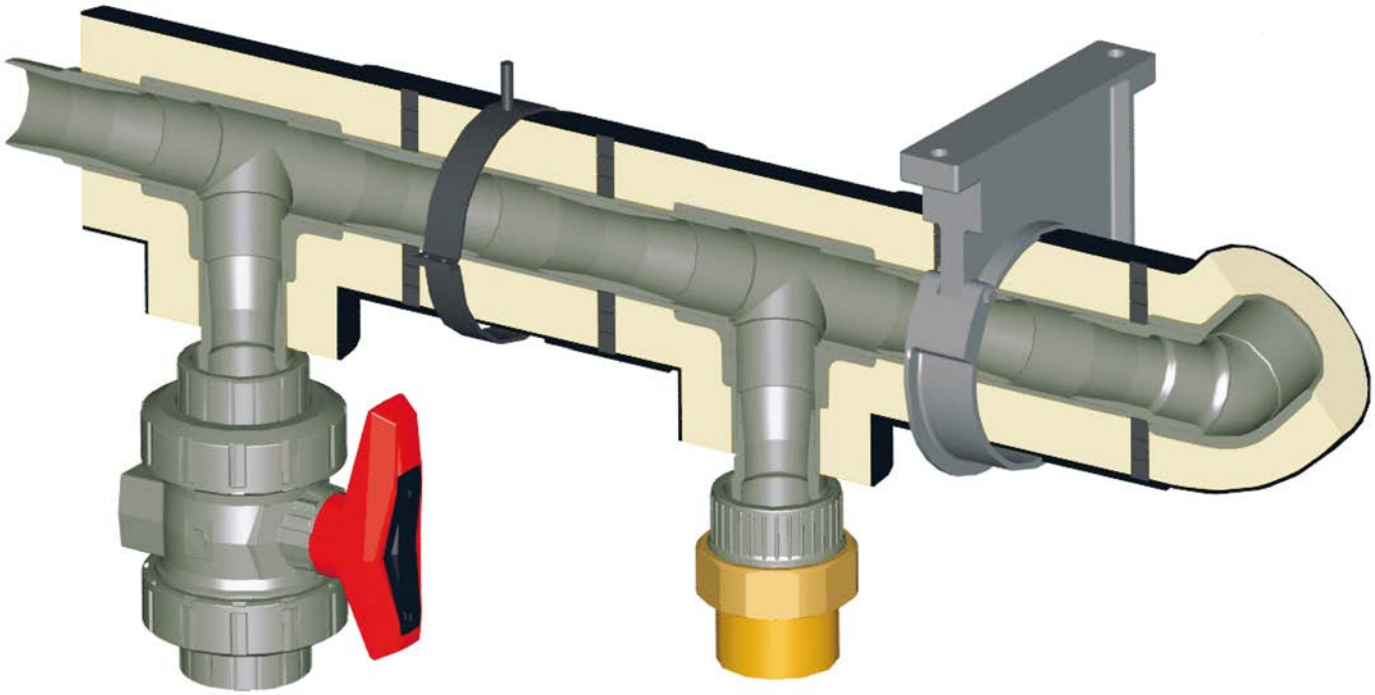
COOL-FIT Top quality

Minimum on site time




COOL-FIT ABS Plus
fitting pre-insulated
COOL-FIT ABS Plus
barrel nipple
d-d+10
COOL-FIT ABS Plus
adaptor fittings
COOL-FIT ABS Plus
Endcaps
COOL-FIT ABS Plus
valves
COOL-FIT ABS Plus
adaptor nipple d-di
COOL-FIT ABS Plus
pipe pre-insulated
COOL-FIT ABS Plus
flange connections
COOL-FIT ABS Plus
barrel nipple
di-di
COOL-FIT ABS Plus
pipe

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.

Top efficiency

Save energy, thermal conductivity 0.026 W/m K. PUR density ≥ 55 kg/m³ 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 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

COOL-FIT ABS

1 Material

1.1 Acrylonitrile Butadiene Styrene Material

GF Piping Systems COOL-FIT 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.

All COOL-FIT ABS pipes are metric sizes manufactured in accordance with the requirements of EN ISO 15493, supplied by GF Piping Systems.

All COOL-FIT ABS fittings are 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.

All COOL-FIT ABS valves are metric sizes manufactured by GF Piping Systems or equal in accordance with EN ISO 16135 to 16138.

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

COOL-FIT ABS Plus

1 Material

COOL-FIT ABS Plus consists of the following materials:

1.1 Carrier Pipe

Pipes and Fittings from GF Piping Systems are manufactures from acrylonitrile butadiene styrene. The material is designed for use with pressure bearing piping systems with long term properties in accordance with EN ISO 15493.

1.2 Insulation

The insulation material is a hard polyurethane foam (PUR) with a thermal conductivity of <0.023 W/mK and a density of ≥55kg/m3. The greenhouse warming potential (GWP) and the ozone depletion potential is zero.

1.3 Outer jacket

The outer jacket is a high density polyethylene in black. The jacket is UV resistant according to EN ISO 16871. It offers extremely good impact resistance and a good resistance to oil splashes and grease or other external contamination.

All the components are bonded together and guarantee one thermal coefficient .

2 Jointing

All components will be jointed with solvent cement according the GF Piping Systems Guideline

Technical Data

Thermal conductivity at 20°C:	≤ 0.026 W/m K
Axial shear strength:	≥ 0.12 N/mm²
Tensile strength:	≥ 0.2 N/mm²
Compressive strength:	≥ 0.3 N/mm²
Foam density:	≥ 55 kg/m³
Average cell sizes:	max. 0.5 mm
Expansion coefficient:	indoor: 0.04 mm/mK
	outdoor: 0.09 mm/mK

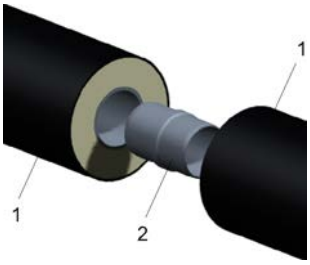
COOL-FIT ABS Plus technical details

COOL-FIT ABS Plus pipes

COOL-FIT ABS Plus pipe is produced with high grade ABS pressure piping raw material, in use for over 20 years together with a high grade low temperature PUR produced in high density to offer optimal insulating properties. The high density PE jacket pipe guarantees a vapor tight an UV resistant solution.

Connection

COOL-FIT ABS Plus pipe to pipe connections are achieved using the di-di COOL-FIT ABS Plus nipple. di is the designation for a joint which takes place in the internal diameter of the pipe. di25 for instance refers to the internal diameter of a d25 pipe.



1 COOL-FIT ABS Plus pipe
2 COOL-FIT ABS Plus nippel di-di

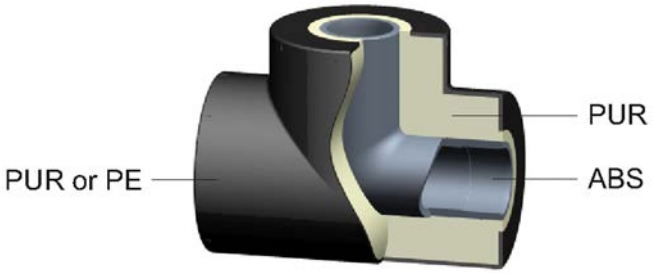
Note: Dimensions from d200 (incl.) must be calibrated using the COOL-FIT ABS Plus calibration tool.

Carrier pipe COOL-FIT ABS d x e	Carrier pipe COOL-FIT ABS d_i	Jacket pipe PE D x e1	Weight (PE + ABS + PUR) kg/m (lb/ft)	Volume l/m	Pipe support Distance m (ft)	Heat transfer coefficient [U] W/m K
25 x 2.3	20.4	90 x 3.0	1.3 (0.83)	0.36	1.55 (5.09)	0.13
32 x 1.9	28.2	90 x 3.0	1.5 (0.87)	0.61	1.55 (5.09)	0.16
40 x 2.4	35.2	110 x 3.0	1.9 (1.18)	0.95	1.65 (5.41)	0.17
50 x 3.0	44.0	110 x 3.0	2.1 (1.27)	1.49	1.65 (5.41)	0.21
63 x 3.8	55.4	125 x 3.0	2.7 (1.67)	2.34	1.75 (5.74)	0.25
75 x 4.5	66.0	140 x 3.0	3.5 (2.13)	3.36	1.90 (6.23)	0.27
90 x 5.4	79.2	160 x 3.0	4.4 (2.76)	4.80	2.05 (6.73)	0.29
110 x 6.6	96.8	180 x 3.0	5.5 (3.51)	7.21	2.20 (7.22)	0.34
140 x 8.3	123.4	225 x 3.4	8.5 (5.48)	11.69	2.55 (8.37)	0.35
160 x 9.5	141.0	250 x 3.6	10.5 (6.34)	15.22	2.75 (9.02)	0.37
200 x 12.3	175.4	280 x 3.9	13.5 (9.02)	24.50	3.05 (10.01)	0.50
225 x 13.9	197.2	315 x 4.1	18.5 (9.16)	30.05	3.30 (10.83)	0.50
250 x 9.6	230.8	355 x 5.6	14.9 (9.99)	41.84	3.3 (10.83)	0.49
280 x 10.7	258.6	400 x 4.8	18.7 (12.54)	52.50	3.6 (11.80)	0.48
315 x 12.1	290.8	450 x 5.2	23.7 (15.90)	66.42	3.8 (11.80)	0.48

- COOL-FIT ABS Plus support distances are the same from –50°C to +40 °C (-58°F to +104°F)
- d: nominal outside diameter of COOL-FIT ABS carrier pipe
- d_i: nominal inside diameter of COOL-FIT ABS carrier pipe
- D: nominal outside of PE jacket pipe
- e and e1: nominal wall thicknesses

COOL-FIT ABS Plus Fittings

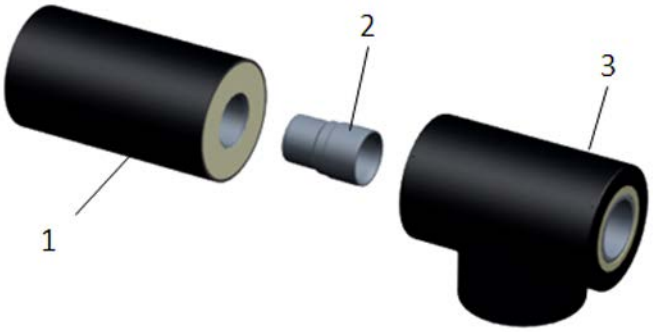
COOL-FIT ABS Plus Fittings are manufactured using the same raw materials as the pipe and are thus completely compatible with COOL-FIT ABS Plus pipes in terms of insulating properties and also jointing technique.



Connections

Pipe to Fitting

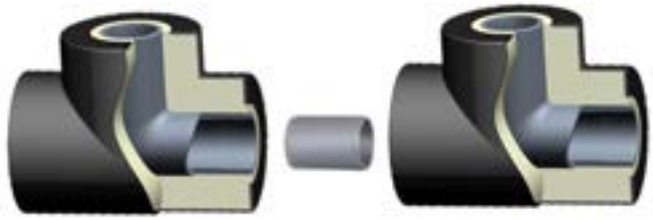
COOL-FIT ABS Plus pipe to fitting connections are achieved using the d-di COOL-FIT ABS Plus nipple. d is the designation for a normal socket solvent cemented joint as per the standard GF Piping Systems ABS range. di is the designation for a joint which takes place in the internal diameter of the pipe.



1 COOL-FIT ABS Plus pipe
2 COOL-FIT ABS Plus nipple d-di
3 COOL-FIT ABS Plus fitting

Fitting to Fitting

COOL-FIT ABS plus fitting to fitting connections are achieved using a d-d+10 COOL-FIT ABS Plus nipple.



The jointing material and technique for all variants are always the same, with the same cement and the same tooling.

Accessory Equipment

COOL-FIT ABS Plus Nipples

These nipples are necessary to connect the COOL-FIT ABS Plus System

di-di 

di-di for pipe to pipe and pipe to fitting connections, using the internal diameter of the pipes.

d-di 

d-di for pipe to fitting connections

d-d 

d-d +10 for fitting to fitting connections

d red-di 

d red – di to reduce diameter of the carrier pipe

(Note: for dimensions d200 and above the COOL-FIT ABS Plus calibration is required before joining the internal diameters of the pipe)

COOL-FIT ABS Plus calibration tool

It is necessary to calibrate pipe in dimension d200 + d225 to allow joining using the COOL-FIT ABS Plus nipple. This tool calibrates the inside diameter of the pipe to an exact dimension to allow internal joining.

Accessory equipment for solvent cement jointing

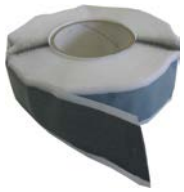
The solvent cementing equipment is exactly the same for internal di jointing as for standard d jointing..

Accessory for gap closing

COOL-FIT Plus Gap Insulator

Width 13 mm and a lamda / 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 Plus 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.

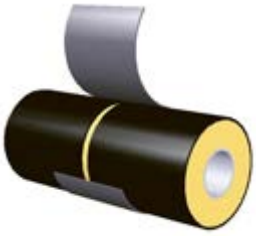
COOL-FIT Plus shrink sleeve, short

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 Plus 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 Plus cold and hot shrink sleeve



Used to vapor seal the control gap on the outer PE jacket. For indoor use only. The cold shrink sleeve shrinks without the application of heat and the hot shrink sleeve with the application of an open burner. The tape is 100 mm wide and can therefore only seal equal dimensioned PE jackets. It is applied firmly with an overlap of app. 10cm (4”). To ensure the proper functionality of the system, the tape must be used in conjunction with the gap insulator.

COOL-FIT Plus shrink tape for underground applications

This tape is specially made for underground applications. The integrated butyl surface guarantees a vapor- and watertight sealing.

COOL-FIT Plus shrink sleeve, long

This shrink sleeve is 285mm long and can be used to seal connections with different diameter on the outer jacket. The table below shows which dimension can be sealed using which long shrink sleeve. NOTE: the sealing tape should be applied to both outer diameters of the PE jacket pipe.

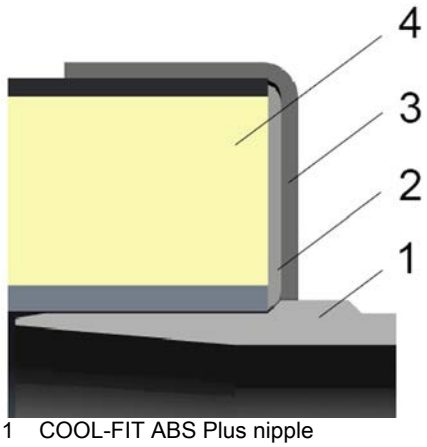
90	110	125	140	160	180	225	250	280	315
738.011.167									
					738.011.170				
							738.011.173		

COOL-FIT Plus shrink cap

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.

End cap

End caps are to be used for sealing the PUR against water ingress at the transition to COOL-FIT ABS.



1 COOL-FIT ABS Plus nipple
2 Sealing mass
3 End caps
4 COOL-FIT ABS Plus pipe

Sealing the PUR should be achieved using a chemically compatible sealing mass to COOL-FIT ABS. GF Piping Systems offers a sealing mass. If silicon products are prohibited then nonsolvent based glues can be used. Chemical compatability can also be checked by GF Piping Systems.

Valve insulation

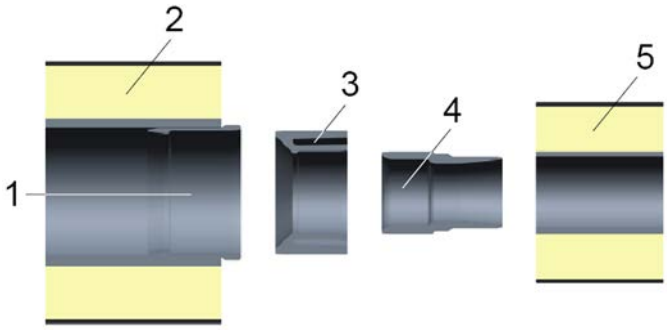
GF Piping System offers tailor made insulation sets for the ball valves type 546. The sets consist of UV resistant PE foam with a shrink tape jacket and are available from d25 up to d110mm.

Reducing diameters

Reducing with a COOL-FIT ABS Plus pipe

The example below shows how the carrier pipe dimension is reduced from COOL-FIT ABS Plus d90/D160 (3”/6”) to d50/D110 (1 1/2”/4”)

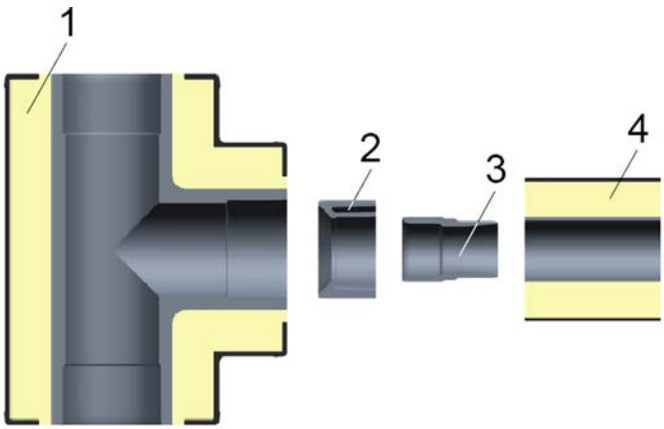
Note: the configurator below results in a gap twice as wide usual app. 20mm (0.8”) and therefore twice the amount of gap filler is required.



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

Reducing with a COOL-FIT ABS Plus Fitting to COOL-FIT ABS Plus pipe

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



1 COOL-FIT ABS Plus tee 90° equal, d75
2 COOL-FIT ABS short reducer d75-d50
3 COOL-FIT ABS Plus nipple d-di, d50-di50
4 COOL-FIT ABS Plus 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 CF is a 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.

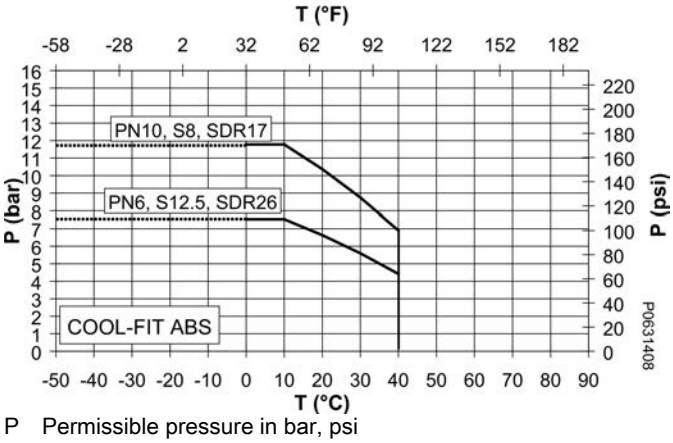
The following technical information covers the fundamental information required to ensure an economical and trouble free installation: Not all details however are published in this document, for more detailed information or if you have a specific question please ask your local GF Piping Systems company,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

COOL-FIT ABS Plus pressure-temperature diagram

Pressure ratings for thermoplastic pipe are always quoted for water at 20 °C/68°F. 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 COOL-FIT ABS Plus pipes and fittings the maximum permissible pressures at various temperatures up to the maximum allowable working temperature of +40 °C/104°F. The diagram is based on an ambient temperature of 20 °C/68°F 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 COOL-FIT ABS Plus 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

Chemical resistance

COOL-FIT 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 alcohol, petrol, acetic acid and vegetable oils.

For working temperature below 0°C/32°F, 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.

Derating factors

Inorganic salt solutions: F=1
Organic salt solutions: F=1.25
Diluted Glycols (max 50%): F=1.7
diluted alcohol (max 50%): F=1.7

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

Ice Slurry

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

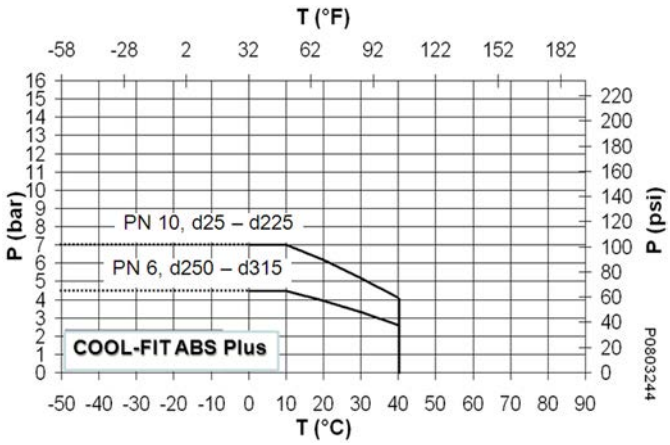
Glycol Solutions

COOL-FIT can be used with diluted glycol solutions (max. 50%), however a derating factor of 1.7applies to the standard water based pressure-temperature curve. The following coolants can be used with the COOL-FIT system regarding chemical resistance: ANTIFROGEN L,N, TYFOCOR, DOWFROST.

Example: water diluted glycol

For example if the medium is a waterdiluted glycol solutions ≤50% (max. concentration allowable for COOL-FIT ABS) then a derating factor of 0.6 applies to the standard pressure temperature curve. So at -10° C/150°F for a minimum lifespan of 25 years the maximum allowable working pressure is 0.6 x 11.8bar = 7.1bar

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

Organic Salt Solutions

These mediums are usually potassium formate or acetate water based solutions, with low viscosities at low temperatures. Trade name examples: HYCOOL, TEMPER, ANTIFROGEN KF, FREEZIUM, ZITREC. COOL-FIT can be used with these types of mediums; however, a derating factor of 1.25 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 manufacturer's 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
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.

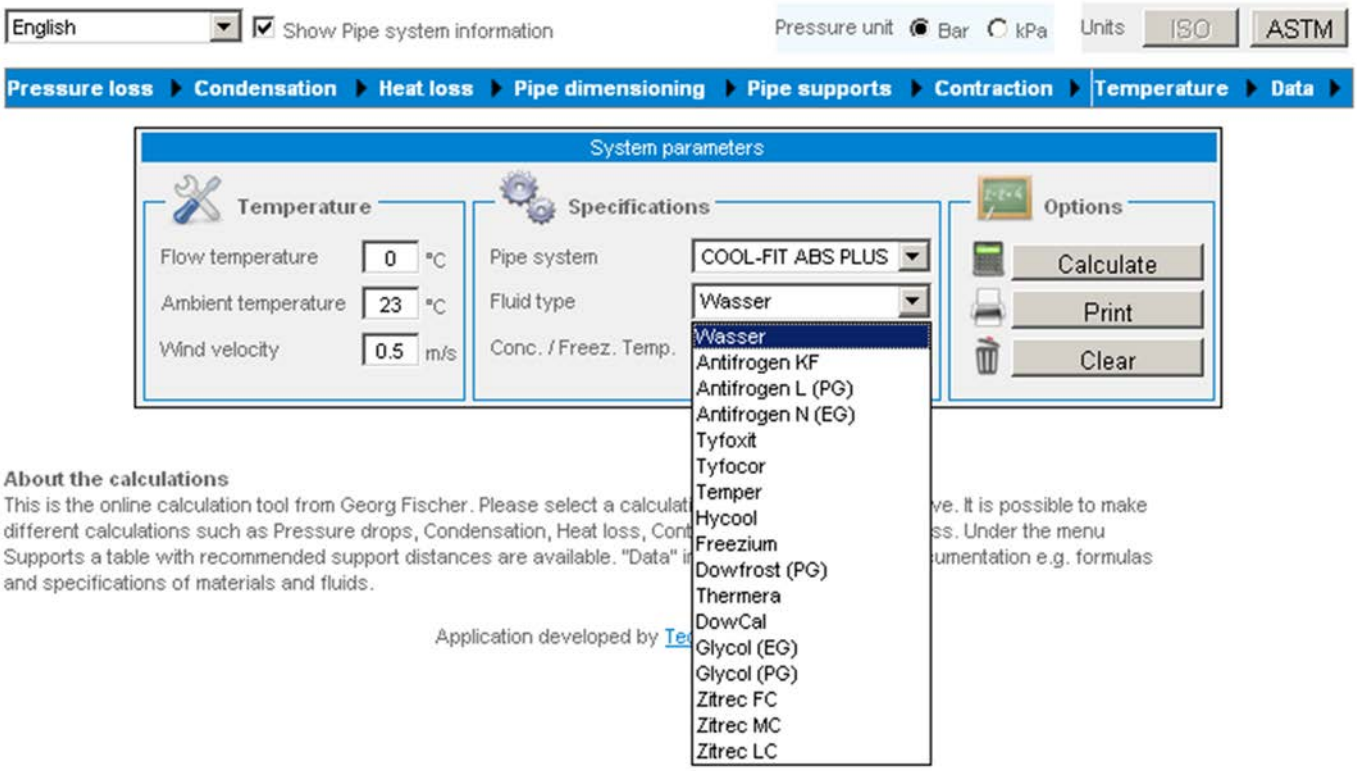
The planning engineer or consultant can thus calculate his core system parameters using this tool for COOL-FIT ensuring optimal dimensioning and design of the system.

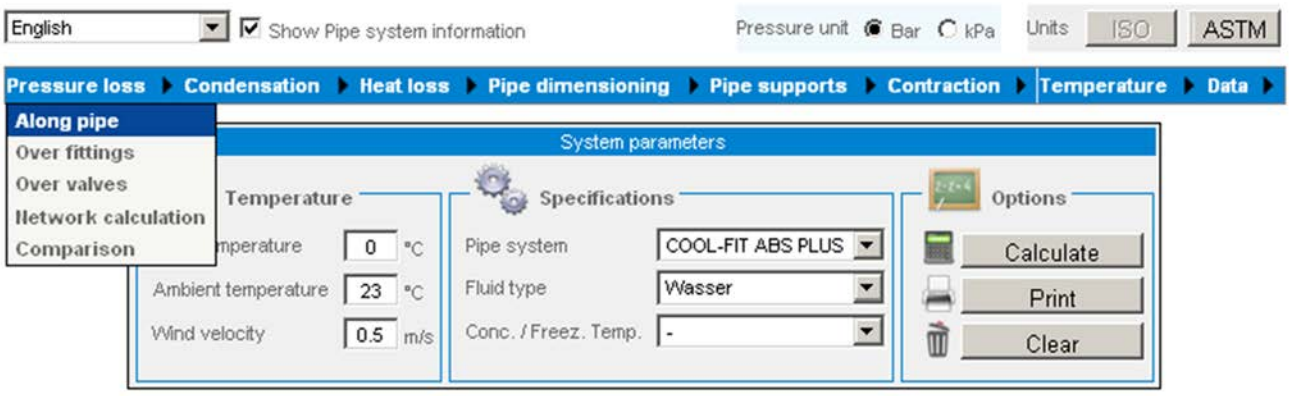
Core functions which can be calculated are shown at the top of the menu, once chosen then the various sub-functions appear below in a drop-down menu. The core functions are: pressure drop, condensation, heat loss, pipe dimensioning, pipe support distances, contraction and temperature.

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 loss - Along pipe

COOL-FIT ABS PLUS

Dim. [mm]	Flow [m³/h]	Length [m]	Dim. [mm]	Flow [m³/h]	Length [m]
16/-	0	0	110/180	0	0
20/-	0	0	140/225	0	0
25/90	0	0	160/250	0	0
32/90	0	0	200/280	0	0
40/110	0	0	225/315	0	0
50/110	0	0	250/355	0	0
63/125	0	0	280/400	0	0
75/140	0	0	315/450	0	0
90/160	0	0			

Results: Along pipe

Results: COOL-FIT ABS PLUS

Dim. [mm]	Velocity [m/s]	ΔP [Bar]	Dim. [mm]	Velocity [m/s]	ΔP [Bar]
16/-	0	0	110/180	0	0
20/-	0	0	140/225	0	0
25/90	0	0	160/250	0	0
32/90	0	0	200/280	0	0
40/110	0	0	225/315	0	0
50/110	0	0	250/355	0	0
63/125	0	0	280/400	0	0
75/140	0	0	315/450	0	0
90/160	0	0			

Total results

Total results

Pipe system [-]	Total pressure drop [Bar]
COOL-FIT ABS	0
COOL-FIT ABS Lite	0
COOL-FIT ABS PLUS	0
iFIT	0

The material acrylonitrile-butadiene-styrene (ABS)

ABS properties (reference values)

Characteristics	Value *)	Units	Test Standard
Density	≥ 1.035	g/cm³	ISO 1183-1
Yield stress at 23 °C	≥ 40	N/mm²	EN ISO 527-1
Tensile e-modulus at 23 °C	≥ 1600	N/mm²	EN ISO 527-1
Charpy notched impact strength at 23 °C	42	kJ/m²	EN ISO 179-1/1eA
Charpy notched impact strength at -40 °C	≥10	kJ/m²	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
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

*) Typical values measured on the material. These values should not be used for design purposes.

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_n = 20 mm) to 9 kg (d_n = 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 gener-

ally 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/-58°F and + 60 °C/140°F. 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 ABS Plus, a system specially dedicated to this market. COOL-FIT ABS Plus it 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/842°F. 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 3.5×10^{16} Ωcm and the specific surface resistance is 10^{13} Ω. 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 (KTW) 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_i	inside pipe diameter in mm
Q_1	flow rate in m³/h
Q_2	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

m³/h	l/min	l/s	m³/s
1.0	16.67	0.278	2.78×10^{-4}
0.06	1.0	0.017	1.67×10^{-5}
3.6	60	1.0	1.00×10^{-3}
3600	60000	1000	1.0

The following example shows how to utilise the formulas:

PP pipe SDR 11
Flow rate Q_2 = 8 l/sec
Flow velocity v = 1.5 m/sec
Inside pipe diameter ? mm

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

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:

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

or

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

v	flow velocity in m/s
d_i	inside pipe diameter in mm
Q_1	flow rate in m³/h
Q_2	flow rate in l/s
354	conversion factor for units
1275	conversion factor for units

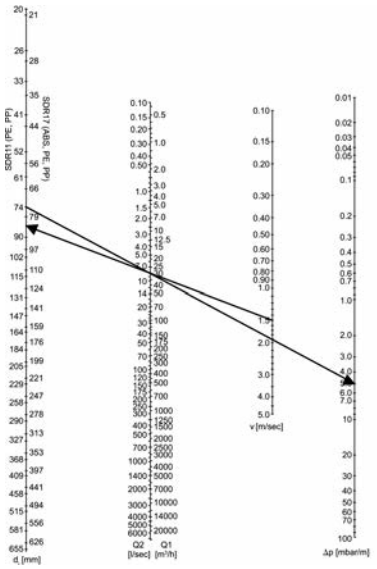
Nomogram for easy determination of diameter and pressure loss

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.

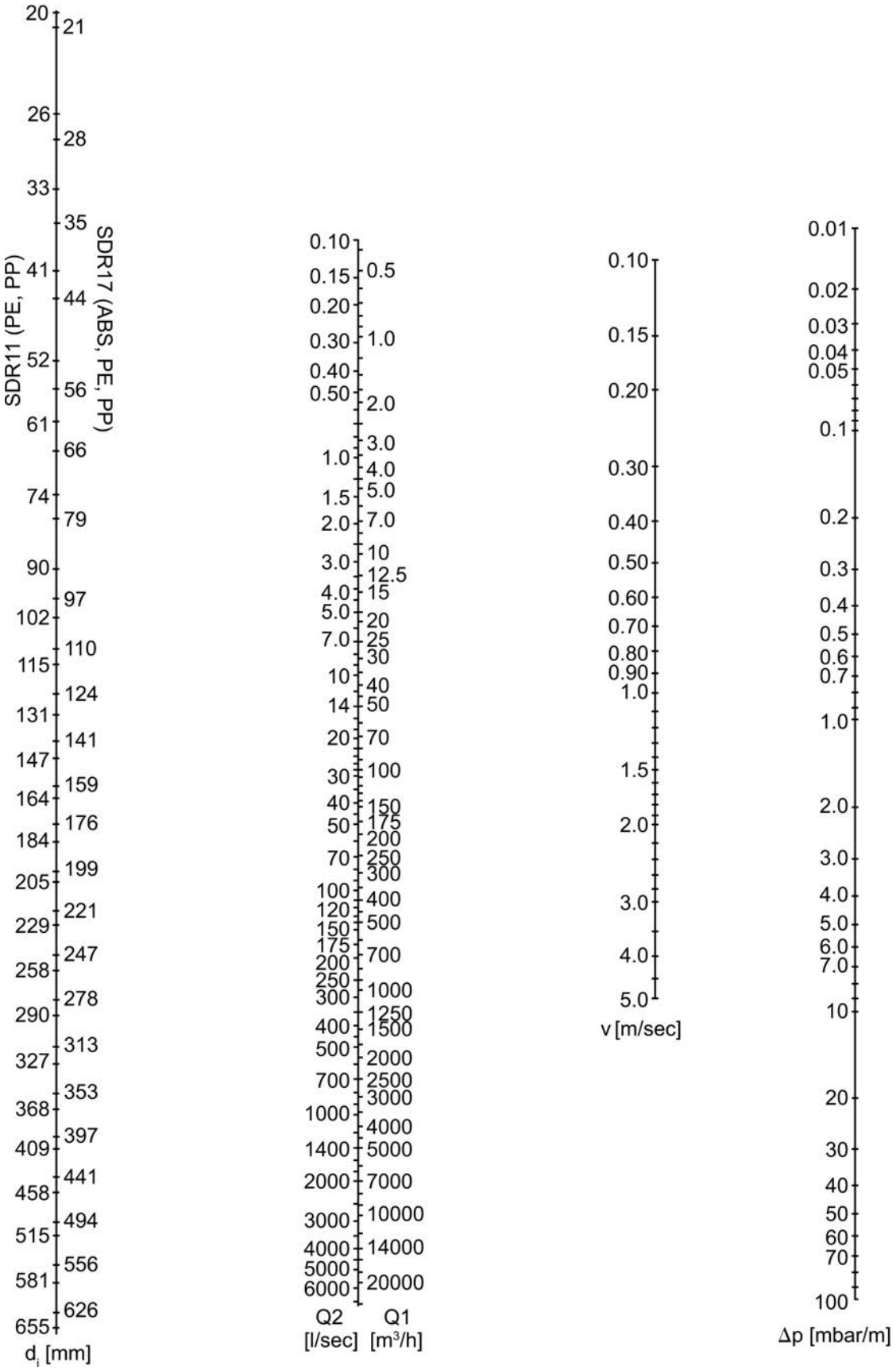
Remark: The determined pressure loss from the nomogram applies only to a density of the flow medium of 1000 kg/m³, e. g. for water. Further pressure losses of fittings, valves, etc. have to be considered as shown in the following.

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 m³/h) until you cut the axis of the inside diameter d_i (≈ 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:

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

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

where:

Δp_R	pressure loss in a straight length of pipe in bar
λ	pipe friction factor
L	length of the straight length of pipe in m
d_i	inside diameter of pipe in mm
ρ	density of transported media in kg/m³ (1 g/cm³ = 1000 kg/m³)
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 ζ-value is used for calculations.

Fitting type	Coefficient of resistance ζ	
90 ° bend	bending radius R	ζ-value
	1.0 * d	0.51
	1.5 * d	0.41
	2.0 * d	0.34
	4.0 * d	0.23
45 ° bend	bending radius R	ζ-value
	1.0 * d	0.34
	1.5 * d	0.27
	2.0 * d	0.20
	4.0 * d	0.15
90 ° elbow	1.2	
45 ° elbow	0.3	
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 ζ 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 ζ = 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 ζ-values. The pressure loss can then be calculated according to the following formula:

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

where

Δp_{Fi}	pressure loss in all fittings in bar
Σζ	sum of the individual losses
v	flow velocity in m/s
ρ	density of the transported medium in kg/m³ (1 g/cm³ = 1000 kg/m³)

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:

Δp_{Ar}	pressure loss of the valve in bar
Q	flow rate in m³/h
ρ	density of the medium transported in kg/m³ (1 g/cm³ = 1000 kg/m³)
k_v	valve flow characteristic in m³/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:

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

where:

Δp_{geod}	geodetic pressure difference in bar
ΔH_{geod}	difference in elevation of the pipeline in m
ρ	density of media kg/m³ (1 g/cm³ = 1000 kg/m³)

Sum of pressure losses

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

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

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/cm³
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:

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

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

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

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

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

Calculation of pressure losses

Pressure loss of strait **pipes**:

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

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

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

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

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 m³/h (quantity of flow 1.5 l/sec = 5.4 m³/h):

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

Pressure loss of **height difference**:

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

Total pressure loss of the pipeline:
ΣΔp = 0.17 bar +0.47 bar + 0.49 bar + 0.38 bar
ΣΔp = 1.51 bar

Change in length and flexible sections

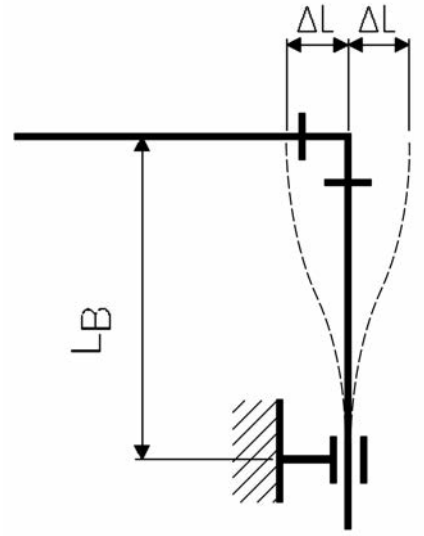
Introduction

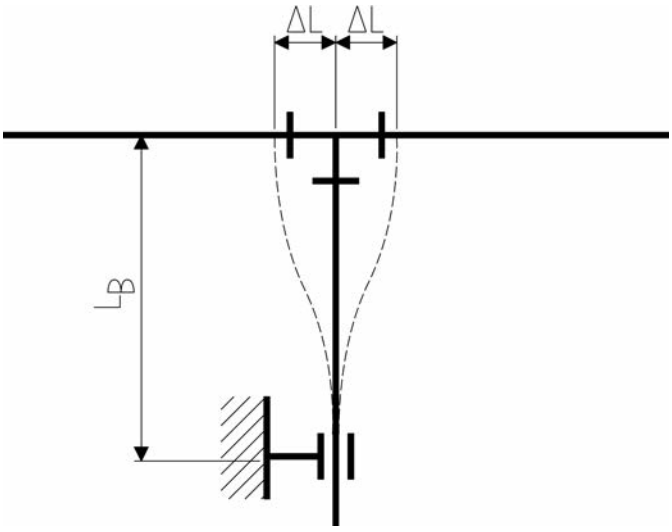
General

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.

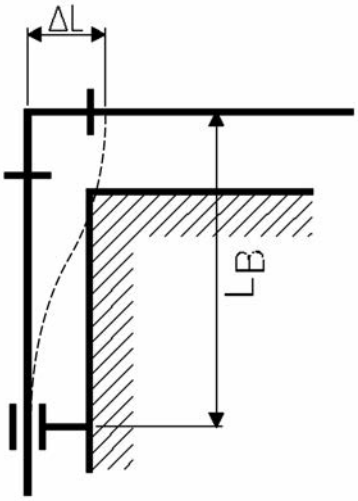


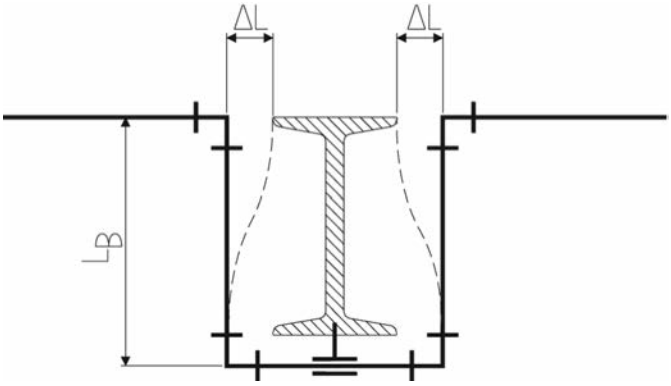


Fundamentals

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.

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 ΔL 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:

- ΔL = temperature-related change in length (mm)
- L = length of the pipe section (m)
- ΔT = difference of temperature (K)
- α = coefficient of linear expansion (mm / m K)

Coefficients of linear expansion of polymers:

Material	α in mm/m K
ABS	0.10
COOL-FIT ABS Plus	0.04 - 0.09*
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

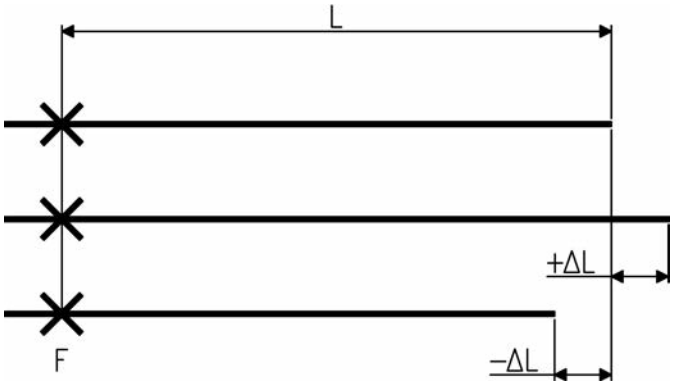
* Exact values can be calculated using GF's online tool (www.cool-fit.georgfischer.com) or ask your local GF representative.

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.

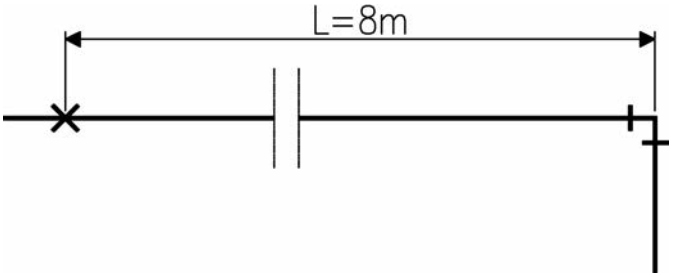


Example: Determining the required flexible section

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
$\Delta T_1 = T_1 - T_M = 15$ K
$\Delta T_2 = T_2 - T_M = -40$ K

Maximum change in temperature chosen
$\Delta T = 40$ K

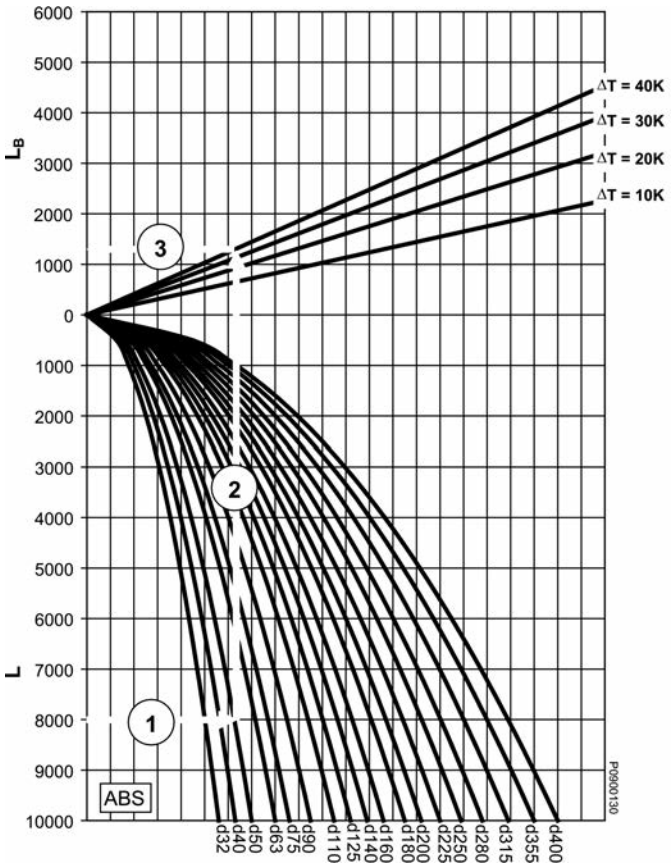
Determining the length of the flexible section for ABS

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.

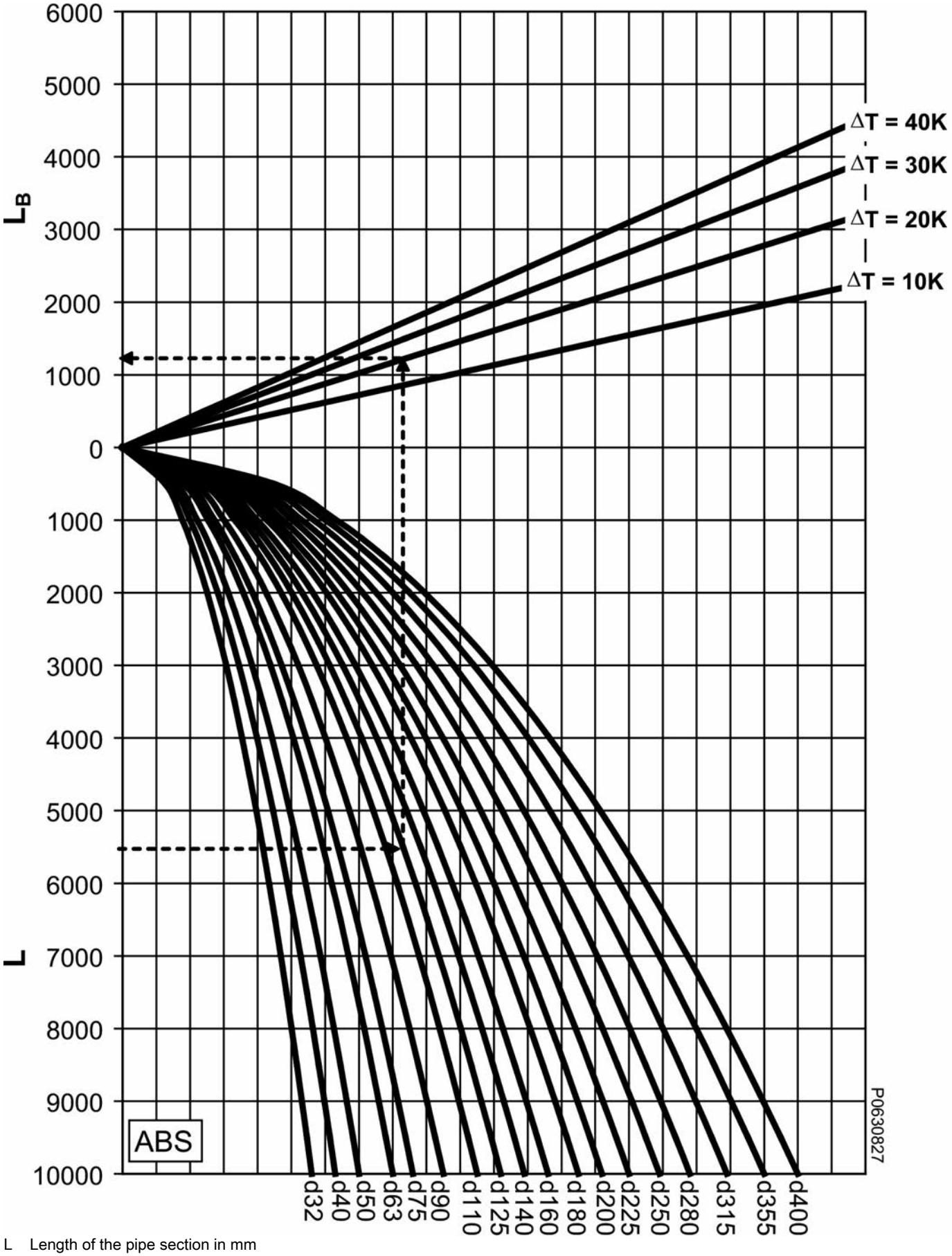
With these values the required length of the flexible section can be read off from the diagram for ABS.

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



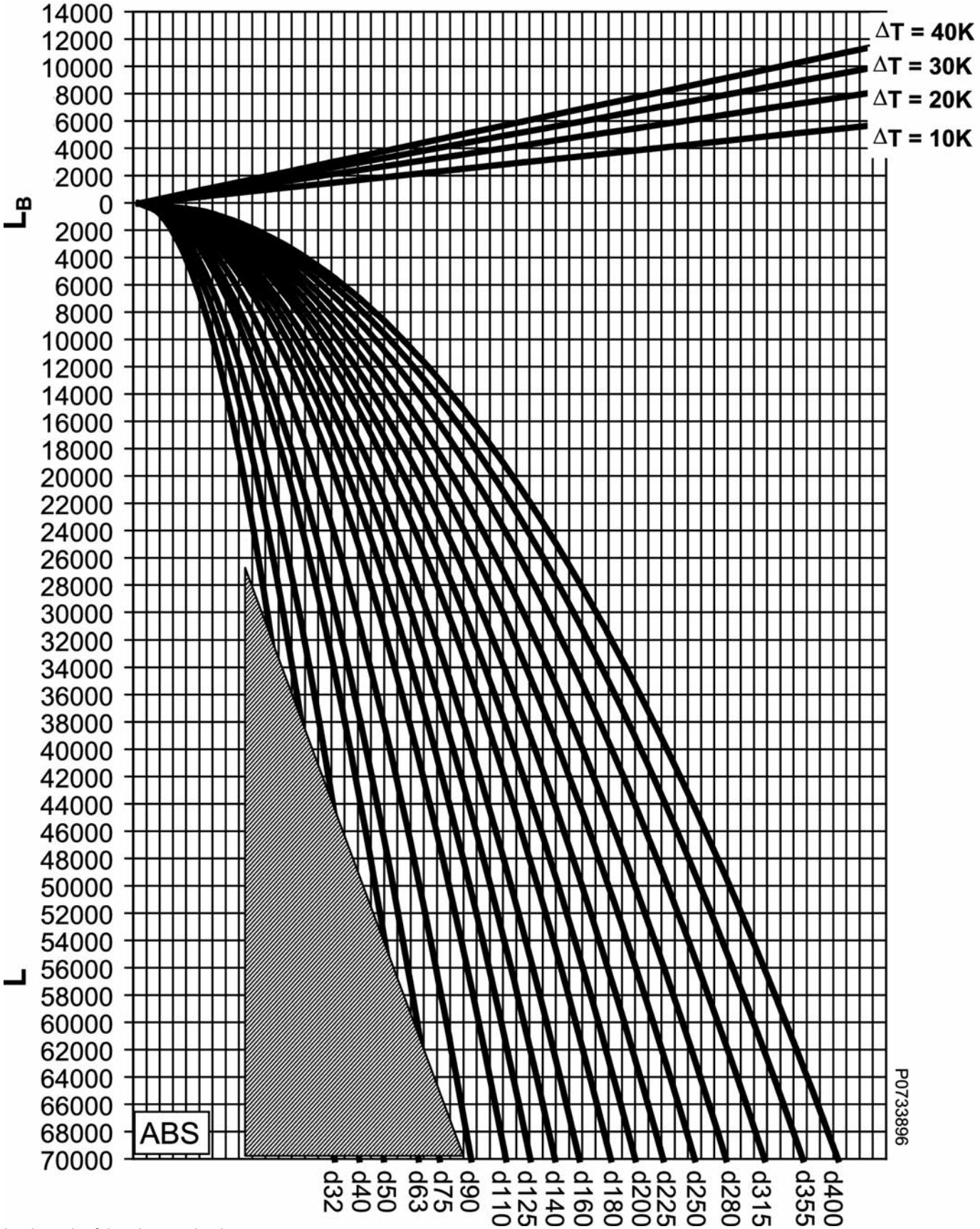
The diagram can be used also the other way around, if a maximum flexible section caused by the building construction is given. Then the maximum straight length of the pipe can be determined.

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

Determining of COOL-FIT ABS Plus changes in length

Table outside applications

α = 0.09mm/m K	**L = 25m**	**L = 50m**	**L = 100m**	**L = 150m**	**L = 200m**
ΔT [K]	ΔL [mm]	ΔL [mm]	ΔL [mm]	ΔL [mm]	ΔL [mm]
5	11	23	45	68	90
10	23	45	90	135	180
15	34	68	135	203	270
20	45	90	180	270	360
25	56	113	225	338	450
30	68	135	270	405	540
35	79	158	315	473	630
40	90	180	360	540	720
45	101	203	405	608	810
50	113	225	450	675	900

It is a recommended value. Exact values can be calculated using GF's online tool (www.cool-fit.georgfischer.com) or ask your local GF representative.

Table inside applications

α = 0.07mm/m K	**L = 25m**	**L = 50m**	**L = 100m**	**L = 150m**	**L = 200m**
ΔT [K]	ΔL [mm]	ΔL [mm]	ΔL [mm]	ΔL [mm]	ΔL [mm]
5	9	18	35	53	70
10	18	35	70	105	140
15	26	53	105	158	210
20	35	70	140	210	280
25	44	88	175	263	350
30	53	105	210	315	420
35	61	123	245	368	490
40	70	140	280	420	560
45	79	158	315	473	630
50	88	175	350	525	700

It is a recommended value. Exact values can be calculated using GF's online tool (www.cool-fit.georgfischer.com) or ask your local GF representative.

Flexible length for COOL-FIT ABS Plus

For calculation the change in length ΔL of COOL-FIT ABS Plus 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

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

COOL-FIT ABS Plus	ΔL				
d/D	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 Plus	ΔL			
d/D	60	70	80	90
25/90	1900	2050	2200	2340
32/90	1900	2050	2200	2340
40/110	2100	2300	2450	2600
50/110	2100	2300	2450	2600
63/125	2250	2450	2600	2750
75/140	2400	2500	2750	2900
90/160	2550	2750	2950	3100
110/180	2700	2900	3100	3300
140/225	3000	3250	3500	3700
160/250	3200	3450	3700	3900
200/280	3600	3850	4150	4400
225/315	3800	4100	4400	4650
250/355	4000	4300	4600	4900
280/400	4250	4600	4900	5200
315/450	4500	4850	5200	5500

COOL-FIT ABS Plus	ΔL			
d/D	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

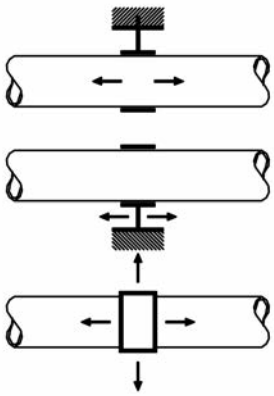
Pipe support for plastics pipes

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

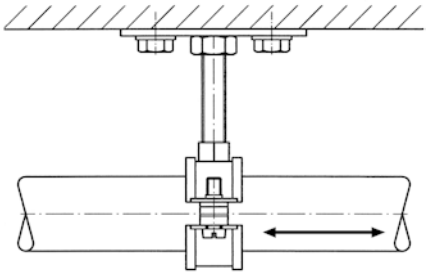
What is a loose pipe bracket?

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?

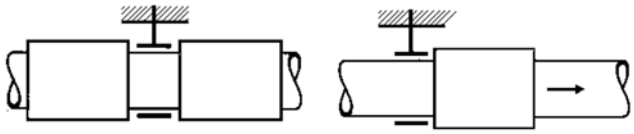
A fixed pipe bracket is a bracket which prevents the pipe from moving in any direction. The aim of which is to control system stresses caused by temperature changes.

NOTICE

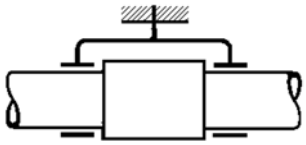
Construction of fixpoint

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

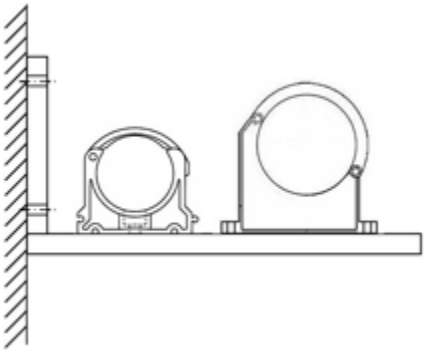
These robust plastic pipe brackets can be used not only under rigorous operating conditions, but also where the pipework is subject to aggressive media or atmospheric conditions. They may be used for all materials of pipes. Don't use KLIP-IT pipe brackets as fixed points!

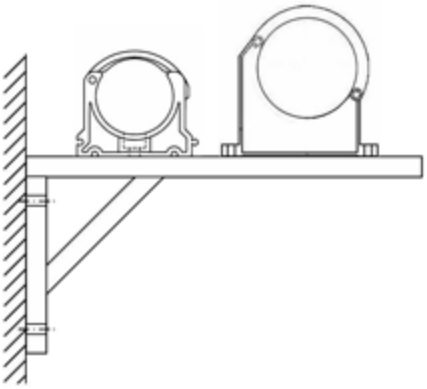
d 16 to d32

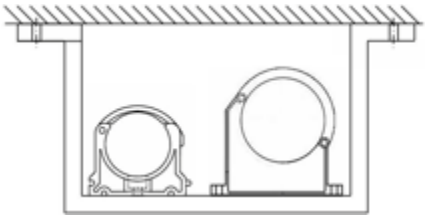
d 40 to d 160

d 90 to d 400

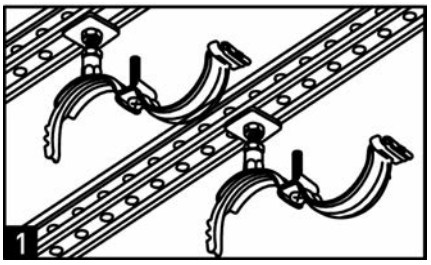
Starting from the dimension d90 the KLIP-IT brackets must be installed standing, like shown in the assembly examples. The support distances given in the following, specified for the KLIP-IT tubing clamps, apply only to this mounting method.



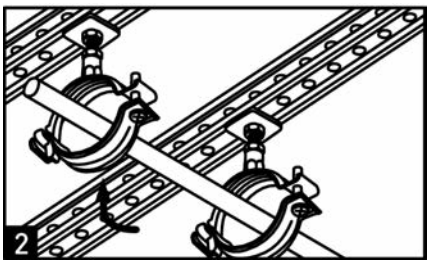




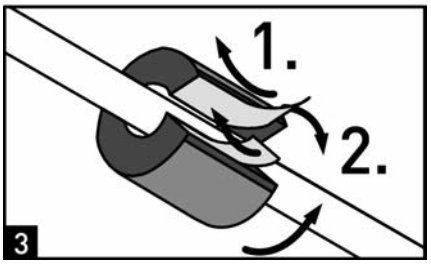
Pipe brackets for cold insulation (MIP)



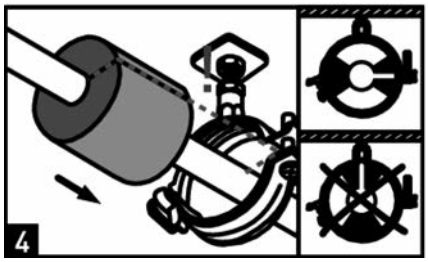
Open handle



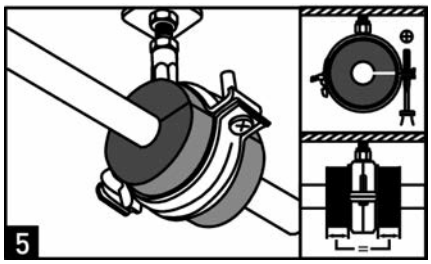
Insert pipe
Close handle with quick-action clamp



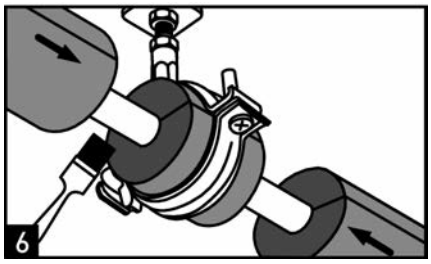
Assemble insulation
1. Take off foil
2. Press area of contact



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



Tighten the screw



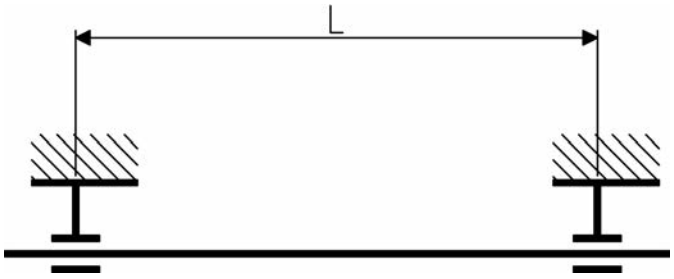
Coat areas of contact with adhesive and bond them

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 COOL-FIT ABS pipes

Liquids with a density of 1 g/cm³

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/cm³

If the liquid to be transported has a density not equal 1 g/cm³, 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/cm³	Type of fluid	Factor for pipe bracket spacing
1.00	Water	1.00
1.25 1.50 1.75 2.00	Other	0.96 0.92 0.88 0.84
≤ 0.01	Gaseous	1.30

COOL-FIT ABS Plus pipe

Pipe diameter mm	Pipe bracket intervals L for COOL-FIT ABS Plus mm (ft)
25	1550 (5.09)
32	1550 (5.09)
40	1650 (5.41)
50	1650 (5.41)
63	1750 (6.23)
75	1900 (6.23)
90	2050 (6.73)
110	2200 (7.22)
140	2550 (8.37)
160	2750 (9.02)
200	3050 (10.01)
225	3300 (10.83)
250	3300 (10.83)
280	3600 (11.80)
315	3800 (12.46)

Installation

COOL-FIT ABS Plus fixed point

Fixed points are created using the special COOL-FIT ABS Plus fix point. The product consists of two components namely a welding band and a pipe bracket. Electrofusion 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 availabe 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
355	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 COOL-FIT ABS Plus pipes no special pipe brackets for cold insulation are needed.

Plastic to Metal Connections

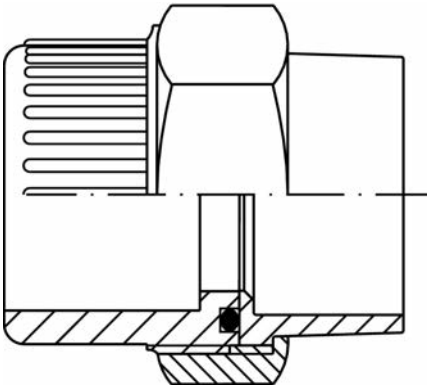
Fundamentally three options are available for plastic to metal connections, namely; threads, flanged connection and unions.
GF Piping Systems recommends that wherever possible mechanical connections are used (unions and flanges) together with a located gasket such as O-Ring.

Adaptor fittings

The adaptor fittings for connecting plastic piping systems and metal threading offer greatest possible flexibility for installation with the combined socket/spigot on the plastic end. The metal thread can be sealed either with hemp or PTFE-tape. The adaptor fitting is sealed with an EPDM O-ring. It serves also as protection against distrotion to avoid damaging the plastic during installation. Compared to the usual adaptor unions the special connecting technology with snap ring guarantees increased leaktightness also while temperature change and during vibration. In addition to the classic transition to metal pipes this fittings can also be used for connecting pressure gauges.
Note: To avoid electrochemical corrosion in transitions to non-ferrous metals, brass connections must be used.

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 due to temperature fluctuations. See COOL-FIT product range for details of the copper, brass, stainless steel and malleable iron transition unions available.



ABS Located O-ring Copper

Flange connections

Flange connections up to DN300 are also possible. 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 COOL-FIT 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 COOL-FIT ABS Plus System

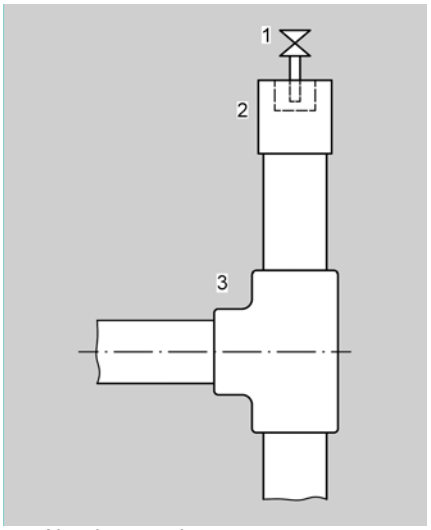
Measuring Equipment in an COOL-FIT ABS Plus Piping Systems

Special installation fittings are developed to connect different types of sensores. The branch with a ½" Rp female thread can be used for pressure and temperature sensors.

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/248°F, which can be dangerous for thermoplastics. COOL-FIT ABS has a vicat point, softening point of 98 °C/208°F, this means that any temperatures reached above this have a detrimental effect on the COOL-FIT 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 COOL-FIT ABS fittings and pipe are not insulated using PUR foaming onsite.

COOLFIT ABS Plus 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 COOL-FIT 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 COOL-FIT 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 COOL-FIT 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 COOL-FIT

To calculate the necessary thickness of insulation required on COOL-FIT ABS to avoid Dew or Condensation can be done via GF Piping Systems's online cooling calculation program, see
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 Plus.

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

COOLFIT ABS Plus has set thicknesses of insulation, once again via www.COOL-FIT.georgfischer.com the user can input his system parameters and the program will identify whether using COOLFIT ABS Plus 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/1.38" for all dimensions so the system parameters need to be extreme for dew to appear on the outside of COOLFIT ABS Plus.

For example:	
Medium temperature:	–50 °C/-58°F
Temperature of the surrounding	+20 °C/68°F
Relative atmospheric humidity	75%
Wind velocity:	1 m/s

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

De-Frosting

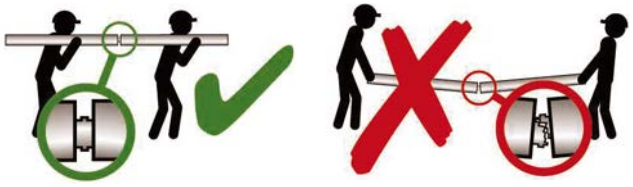
Many secondary refrigeration loops are not only used for normal and low temperature cooling but are also used for defrosting. GF Piping Systems has many years of good experience with the use of COOL-FIT in such dual defrost / cooling systems without any detrimental effects to the system.

Heat transfer coefficient of pipes: COOL-FIT ABS Plus

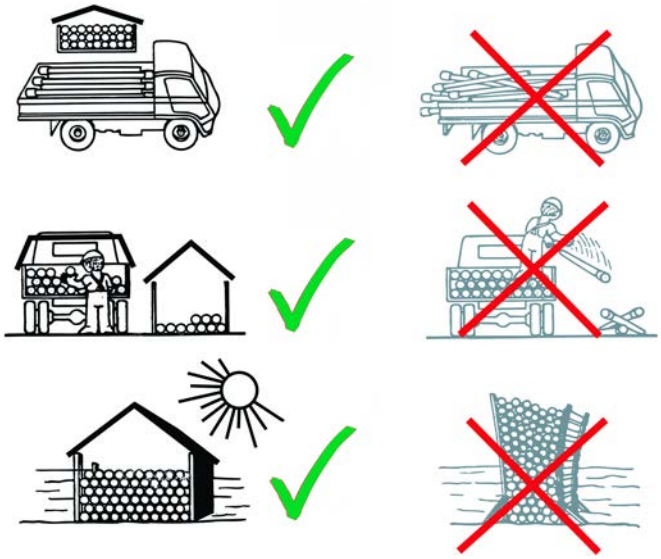
Pipe diameter mm	U-Value COOL-FIT ABS Plus W/m K	R-Value COOL-FIT ABS Plus m K/W
25	0.13	7.7
32	0.16	6.3
40	0.17	5.9
50	0.21	4.8
63	0.25	4.0
75	0.27	3.7
90	0.29	3.4
110	0.34	2.9
140	0.35	2.9
160	0.37	2.7
200	0.50	2.0
225	0.50	2.0
250	0.49	2.1
280	0.48	2.1
315	0.48	2.1

Handling

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



Pipes must be kept straight!



Storage

All plastic pipes including preinsulated plastic pipes, i.e. COOL-FIT ABS Plus 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.

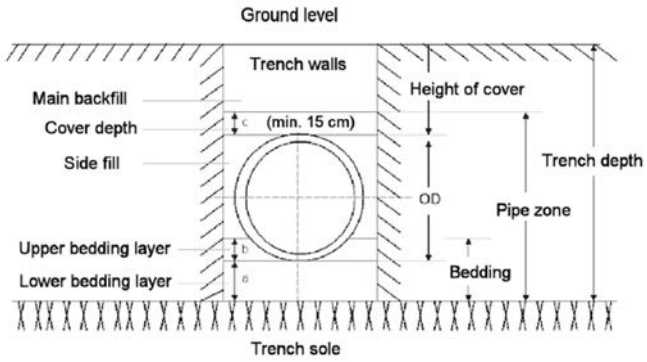
UV Resistance

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 Plus black, is UV resistant.

COOL-FIT ABS Plus underground installation.

COOL-FIT ABS Plus can be used underground. We recommend for closing the gap our shrink tape for underground applications. 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 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.



The pipe zone has to be designed according to planning fundamentals and static calculation. The area between trench sole and side fill is referred to as bedding. By exchanging ground a load carrying bedding has to be created. Usually, the minimum bedding is according to EN1610 a = 100mm, in case of bedrock or compacted underground a= 150mm. Further, there are demands concerning the filling material. Materials with elements bigger than:

- 22 mm at DN ≤ 200
- 40 mm at DN >200 until DN ≤ 600

should not be used

The upper bedding layer b is assessed from static calculations. It is important to assure no cavities below the pipe. The bedding dissipates all loads from the pipe evenly into the ground. For this reason the COOL-FIT ABS Plus pipe has to lay evenly on the bedding over its complete length. The upper end of the pipe zone is defined according to EN 1610 as 150mm above the pipe apex respectively 100mm above the pipe connection. When filling and compacting the cover depth and the main backfill one has to make sure not to damage the pipe.

COOL-FIT ABS Plus pipes have a higher stiffness and weight than COOL-FI ABS. It is therefore recommended to perform joining 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

COOL-FIT is halogen free. The materials used in COOL-FIT ABS Plus 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 ABS Plus, please see www.coolfit.georgfischer.com

SQS Certificate

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

+GF+ GEORG FISCHER PIPING SYSTEMS

Georg Fischer Piping Systems Ltd.
8201 Schaffhausen, Switzerland

Certified area

Georg Fischer Piping Systems Ltd., Schaffhausen
(ISO 9001:2008, ISO 14001:2004, OHSAS 18001:2007)
Georg Fischer Piping Systems (Switzerland) Ltd., Sales Company
(ISO 9001:2008)
Georg Fischer Wavin Ltd., Schaffhausen and Subingen
(ISO 9001:2008, ISO 14001:2004, OHSAS 18001:2007)
Georg Fischer JRG Ltd., Sissach
(ISO 9001:2008, ISO 14001:2004, OHSAS 18001:2007)
Georg Fischer Fluorpolymer Products GmbH, Ettenheim
(ISO 9001:2008, ISO 14001:2004, OHSAS 18001:2007)

Field of activity

GF Piping Systems is a leading supplier of plastic and metal pipe systems with a global market presence.
GF Piping Systems offers connection technology, fittings, fixtures, sensors and pipes and supplies leading innovative technical solutions for domestic engineering applications, industry and utilities.

Standards

ISO 9001:2008 Quality Management System
ISO 14001:2004 Environmental Management System
OHSAS 18001:2007 Occupational Health and Safety Management System

Swiss Association for Quality and Management Systems SQS
Bernerstrasse 103, CH-3052 Zollikofen
Issue date: Mai 28, 2012

This SQS Certificate is valid up to and including Mai 27, 2015
Scope number 14
Registration number 10684

Partner of TQNet

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. Fundamently, 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.

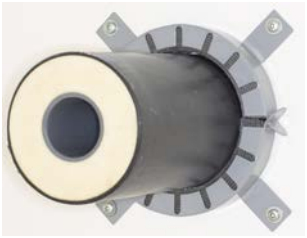
PE Flammability

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/662°F. 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 427°C/800 °F and 454°C/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). 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). 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 KUHN Brandschutz Systems Solutions for building services

Comparision pipe diameter

DN, plastics/metal, mm/inch

Plastics					Metal		Chrome steel CN
da mm	di 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 d20 to d315

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)
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
250	130.0
280	145.0
315	162.5

Recommendation for solvent cement jointing of ABS fittings of dimensions 250 - 315 mm

ABS solvent cement fittings d250 to d315 from GF are designed and tested for a nominal pressure of PN6 (6 bar).

Our experience and tests reveal that pipes above d250 can be slightly oval, which can produce a heightened cementing gap. GF therefore recommends that pipes from dimensions d250 should be operated at max. 6 bar working pressure.

Please note the special remarks for dimensions 250 - 315 in the following jointing instructions.

Tools and equipment

Pipe cutter Type KRA	d10 - 63 d50 - 110 d110 - 160	790 109 001 790 109 002 790 109 003
Pipe cutter type KS 355	230 V / 50 - 60 Hz	790 202 001
Chamfering tool	d16-75 d32-200	799 495 145 799 495 146
Cleaner	1 litre tin	799 298 010
Tangit ABS solvent cement	0.65 kg tin	799 298 022
Brush sizes		
Pipe outside diameter in mm	Brush	
20-32	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
250-315	Flat brush 3" 75 x 6 mm	799 298 005
Tin lid		799 298 028
White absorbent paper	commercially available	
Solvent resistant protecting gloves, Safety glasses	commercially available	

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
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
250	16.0	4
280	19.0	3
315	26.5	2

Pipe diameter d (mm)	Tangit cleaner amount per 100 joints (litre)	Tangit cleaner number of joints per tin 1 litre
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
250	5.5	18
280	6.5	15
315	10.2	10

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.

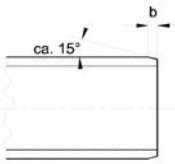
Preparations

Cutting the pipe to length

Chamfering the pipe

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
20 - 50 mm	2 - 3 mm
63 - 225 mm	3 - 6 mm
250 - 315 mm	6 - 8 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:
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.

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

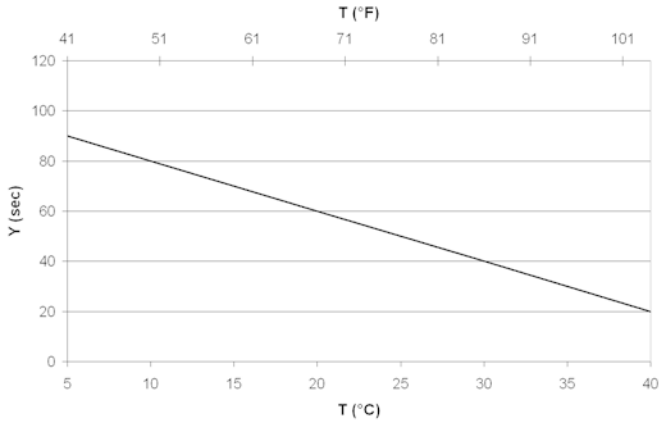
Cleaning the pipe and socket

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 +5ºC.
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 +30ºC 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 +30ºC 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

Range of dimension up to d63

Apply cement
The cement joints can be produced by one person.

Jointing
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 briefly in this position to allow the cement to set.

Waiting time between cementing
Wait at least 10 minutes before the next joint, extendthe waiting time at temperatures under 10 °C or above 30 °C to 15minutes.

Range of dimension d75 to d140

Apply cement
The fitting socket and end of pipe should be coated-with cement simultaneously by two persons, otherwis-ethe opening time of the cement cannot be observed.

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

Waiting time between cementing
Wait at least 10 minutes before the next joint, ex-tendthe waiting time at temperatures under 10 °C or above 30 °C to 15minutes.

Range of dimension d160 to d225

Apply cement
The fitting socket and end of pipe should be coated with cement simultaneously by two persons, otherwise the opening time of the cement cannot be observed.

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

Waiting time between cementing
Wait at least 30 minutes before the next joint, extend the waiting time at temperatures under 10 °C or above 30 °C to 60 minutes.

Range of dimension d250 to d315

Apply cement
Deviating from the usual method of application, pour the cement directly from the tin onto the middle of the cementing surface and distribute first radially and then axially all over with a flat brush. Make sure that the ce-ment layer is consistent and covers the entire surface as appropriate for the larger tolerances. Apply a thin-ner layer of Tangit in the fitting than on the pipe ends. The cementing of pipe work in this range of dimen-sions should be carried out by at least 2 persons. The minimum thickness of the cement layer for fittings is 1 mm, apply more generously on the pipe ends.

Jointing
After applying the cement, the pipe and fitting should be slowly pushed together to the stop or the mark without twisting by 3-4 persons and aligned. Ensure that the outlet end of the fitting is in the correct posi-tion. Hold the joint in this position for 1 minute.

Waiting time between cementing
A waiting time of 1 hours should be observed before further jointing; this time should be increased to 2 hours at temperatures below 10 °C or above 30 °C.

Replace the lid of the cement tin during work breaks

Remove any surplus cement immediately, using absorb-ent 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 ab-sorbent 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 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 pro-cess. This is particularly important at temperatures be-low + 5 °C, when there is otherwise a danger of dam-aging the material.

After the drying process (see waiting times in the follow-ing table) the pipelines can be filled. To remove extant solvent vapour, it is recommended to flush the pipeline before use.
For pipes that are not put into immediate use, it is re-commended, after careful cleaning, to fill them with wa-ter and flush regularly. Do not use compressed air for flushing.

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 Henkel

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

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".

Internal pressure test or leak tightness test with gas/air

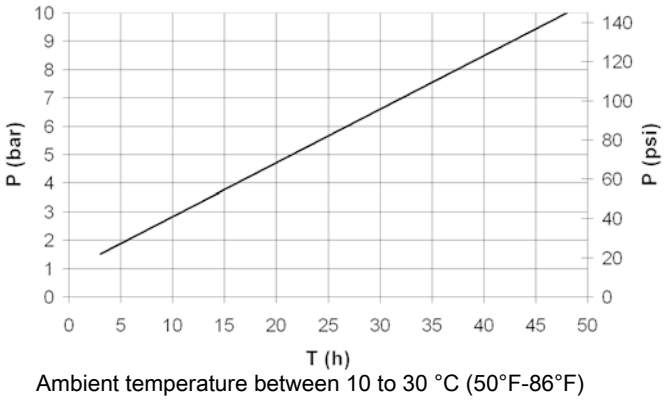
Due to the risk of a pressure test with a compressible test medium this pressure test shall be carried out only in exceptional cases! Please consult also the safety precautions given in the chapter "Internal pressure test of ABS pipelines". The following diagram shows the waiting time depending on the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

Range of dimension d20 to and including d225

Ambient Temperature	Waiting time
10 ° to 30 °C (50°-86°F)	at least 24 hours
- below 10 °C (50°F) - above 30 °C (86°F)	at least 48 hours

Range of dimension d250 to and including d315

Ambient Temperature	Waiting time
10 ° to 30 °C (50°-86°F)	at least 48 hours
- below 10 °C (50°F) - above 30 °C (86°F)	at least 72 hours



Ambient temperature between 10 to 30 °C (50°F-86°F)

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 d20 up to d140

Ambient Temperature	Waiting time for testing with fluids (non compressible)
10 ° to 30 °C (50°-86°F)	1-hour waiting time per 1 bar operating pressure.
- below 10 °C (50°F) - above 30 °C (86°F)	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 (50°-86°F)	2-hour waiting time per 1 bar operating pressure.
- below 10 °C (50°F) - above 30 °C (86°F)	4-hour waiting time per 1 bar operating pressure.

Dimension d250 up to d315

Ambient Temperature	Waiting time for testing with fluids (non compressible)
10 ° to 30 °C (50°-86°F)	4-hour waiting time per 1 bar operating pressure.
- below 10 °C (50°F) - above 30 °C (86°F)	8-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. Avoid static charge. 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.

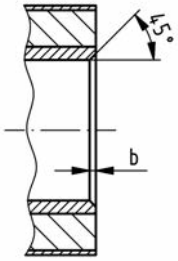
Instructions for Tangit solvent cement jointing of COOL-FIT ABS Plus dimension d25 to d225

Instruction solvent cementing COOL-FIT ABS Plus

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

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

Chamfer to ≈ 45° with a width according to the following table the internal diameter of the COOL-FIT ABS pipe.



Pipe diameter mm	Chamfered width mm
25-50 (¾"-1½")	1 (0.04")
63-90 (2"-3")	2 (0.08")
≥ 110 (≥4")	3 (0.12")

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.

The outside surface of the COOL-FIT ABS Plus nipple and the inner surfaces of the COOL-FIT ABS Plus 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).

Apply a normal layer of ABS Solvent cement to the inside surface of the COOL-FIT ABS Plus 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 (0.04"), of ABS cement to the outside of the COOL-FIT ABS Plus nipple, using the same technique as with the pipes.

Insert the COOL-FIT ABS Plus 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 d200 and above

Please read the operating instructions prior to using the Calibration Tool

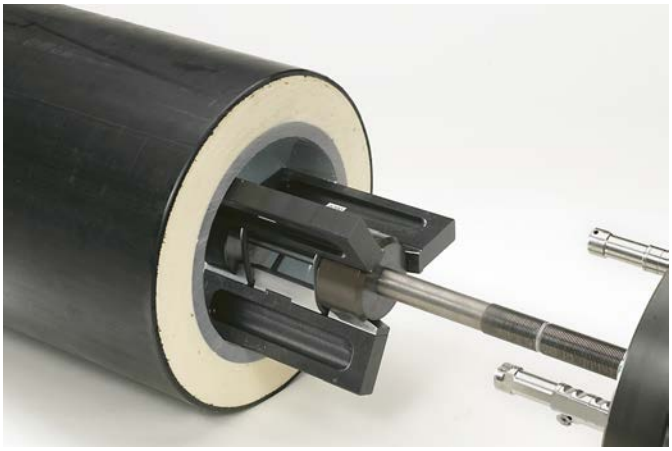
1 Cut pipe at right angles, 90°.

For COOL-FIT ABS Plus dimensions below d200 calibration of the pipe is not required, please follow cementing instructions.

2 For dimensions d200 + d225 the internal diameter of the pipe needs to be calibrated using the COOLFIT ABS Plus calibration tool.

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

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



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.

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

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

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.

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.

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 COOL-FIT catalogue and in the tooling instructions.

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.

Wrap the «gap insulator» into the gap between the COOL-FIT ABS Plus components taking care to ensure that the gap is completely filled.

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

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.

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.

Instructions for Peeling a COOL-FIT ABS Plus pipe in the dimension d250 – 315mm

COOL-FIT ABS Plus pipes in the large dimensions (d250 to d315) are supplied as socket-spigot or socket-socket versions in 5000 mm insulated lengths. The cementing procedure is similar to the existing COOL-FIT ABS jointing procedure in the dimensions d250 – 315. Please consult the chapter before.

Peeling of COOL-FIT ABS Plus pipes d250- 315

If short pipe sections are required for installation, the pipes must be shortened as squarely as possible. Then, in order to cement the pipes, the insulation must be properly removed.

Marking the peeling length

The peeling length depends on the diameter of the COOL-FIT ABS Plus pipe. To calculate: Divide the diameter by 2. Then add to that number 5 mm (d/2 +5 mm). To this figure another at least 20 mm are added for the control gap and as a tolerance for marking and peeling. We recommend marking around the entire circumference to enable a precise cut.

Cutting off the PE protective jacket

The inner COOL-FIT ABS pipe may in no way whatsoever be mechanically damaged during the entire cutting and peeling process!

Cut into the protective jacket along the marking around the entire circumference with a handsaw (or similar). Then cut axially to the marking. Fig. a).

Fig. a)

The protective jacket can now be removed by hand from the PUR insulation. Fig. b)

Fig. b)

Removing the PUR insulation

The PUR insulation is removed in two to three steps. First, carefully cut along the pipe axis back to the PE protective jacket with the saw and at a safe distance from the COOL-FIT ABS inner pipe. Fig. c) There may be a PE spacer (positions the inner pipe during the foaming process) in the peeling area. Fig. d). It is attached with a metal wire which must be removed (otherwise might damage the saw). The PE spacer can easily be sawed through and removed. Instead of a saw, a screw driver (no. 6 or larger) may also be used as a peeling tool.

Fig. c)

Fig. d)

In the next step, the remaining PUR is removed with a blunt object, e.g. a screw driver (no. 6 or larger). Usually the PUR insulation is easily lifted off from the COOL-FIT ABS surface. There may be a bit of residue on the COOL-FIT ABS surface. Fig. e)

Fig. e)

Peeling the COOL-FIT ABS pipe

To peel the COOL-FIT ABS pipe, a peeling tool RTC 315 (available from GF, Code 799 150 423) should be used. Fig. f). Clamp the peeling tool to the inner diameter and pretension the blade according to the enclosed instructions. Fig. g). Peel the COOL-FIT ABS pipe of the PUR insulation in the direction of the pipe end.

Fig. f)

Fig. g)

Attention:
Peel just once

After peeling, the surface is free of all PUR. Fig. h).

Fig. h)

Finally, the COOL-FIT ABS pipe needs to be chamfered at an angle of 15° and a length of at least 6-8 mm. A chamfering tool or file can be used for this. The pipe and fitting are cemented according to the enclosed cementing instructions for COOL-FIT ABS systems d250-315mm.

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

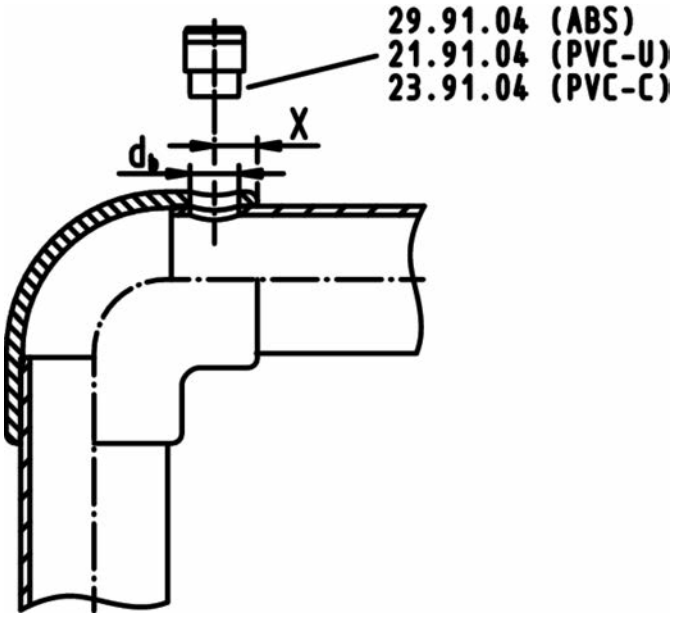
ABS PN10		**Wall thickness, e**	**Adapter dimensions**			
pipe diameter		S8, SDR17	20	25	32	40
75	x	4.5	Yes	Yes	No	No
90	x	5.4	Yes	Yes	No	No
110	x	6.6	Yes	Yes	No	No
125	x	7.4	Yes	Yes	No	No
140	x	8.3	Yes	Yes	No	No
160	x	9.5	Yes	Yes	No	No
180	x	10.7	Yes	Yes	Yes	No
200	x	11.9	Yes	Yes	Yes	No
225	x	13.4	Yes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

ABS PN6		**Wall thickness, e**	**Adapter dimensions**			
pipe diameter		S12.5, SDR26	20	25	32	40
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		S10, SDR21	20	25	32	40
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		S6.3, SDR13.6	20	25	32	40
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



Adapter dimension	Hole diameter, d_b in mm
20	20.2
25	25.2
32	32.2
40	40.2
Tolerance	± 0.1 mm

Pipe dimension	Drill position X in mm
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 x $p_{p(perm)}$	Operating pressure + 2 bar (29 psi)	Operating pressure + 2 bar (29 psi)	0.5 bar (7 psi)	1.5 bar (20 psi)
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 (44 psi) results in an energy of ca. 1 Joule.
- In contrast air is a compressible medium; the same pipe has with 3 bar (44 psi) pressure an energy of already 5000 Joule.
- If there were a failure during the pressure test, the waterfilled pipe would fly 0.02 m (¾") "high", the airfilled pipe 110 m (361ft)! And this with a test pressure of only 3 bar (44 psi).

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 °C (68°F) 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
Test pressure p $_p$ (depends on the pipe wall temperature or the permissible test pressure of the built-in components, see clause "Determining the test pressure")	$\leq p_{p(perm)}$	$\leq 0.85\ p_{p(perm)}$
Test duration (depends on the length of the pipeline, respectively the sections)	L ≤ 100 m: 3 h 100 m <L ≤ 500 m: 6 h	L ≤ 100 m: 3 h 100 m <L ≤ 500 m: 6 h
Checks during the testing (test pressure and temperature progression should be recorded)	At least 3 checks, distributed over the test duration **with** restoring the test pressure	At least 2 checks, distributed over the test duration **without** 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 (7 psi/h)
PVC-C	0.5 bar/h (7 psi/h)
ABS	0.6 bar/h (9 psi/h)
PP	0.8 bar/h (12 psi/h)
PE	1.2 bar/h (17 psi/h)
PB	1.4 bar/h (20 psi/h)
PVDF	0.8 bar/h (12 psi/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.

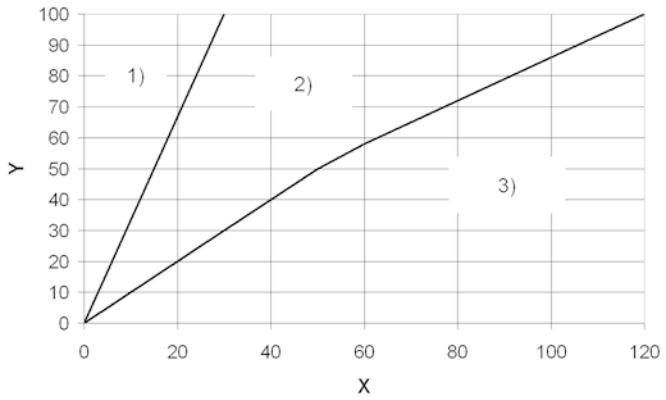
Reference values for the filling volume are given in the table below.

DN	V (l/sec)	DN	V (l/sec)
≤ 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 !



Y test pressure in %
X time for pressure increase in min
1) pressure increase rate up to DN100
2) range of pressure increase rates between DN100 - 400
3) values for pressure increase rate DN500 and greater is: 500 / DN [bar/10 min]

Determining the test pressure

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

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

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

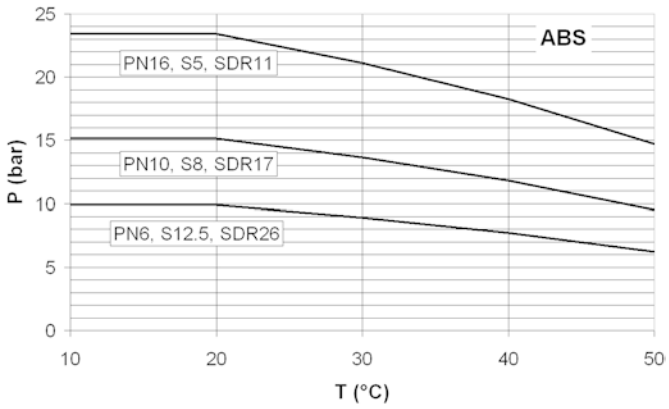
Don't overload diaphragm valves!

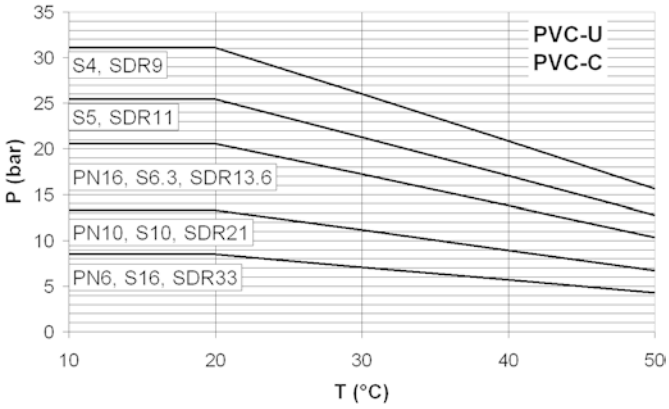
- If the piping system contains diaphragm valves the maximum allowable test pressure is limited to the nominal pressure.

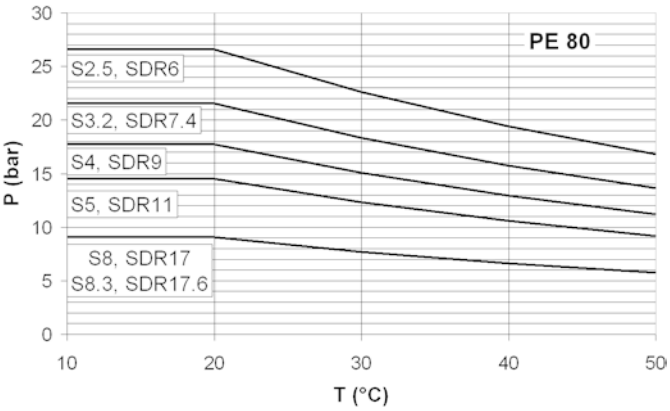
Material	S_p Minimum safety factor
ABS	1.6
PE80, PE100	1.25
PP-H	1.8
PP-R	1.4
PVC-U, PVC-C	2.5
PVDF	1.4

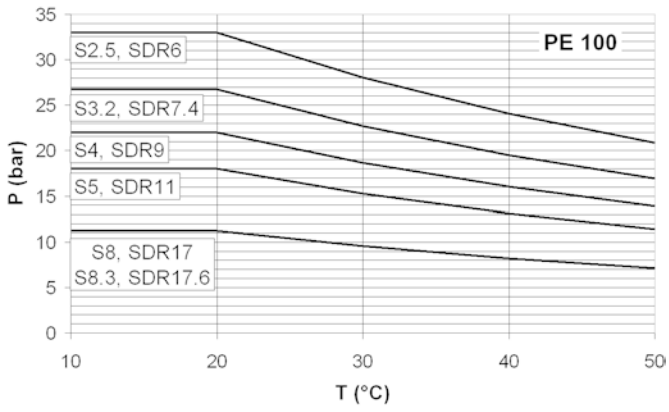
To make things easier, the permissible test pressures can be taken directly from the following diagrams.

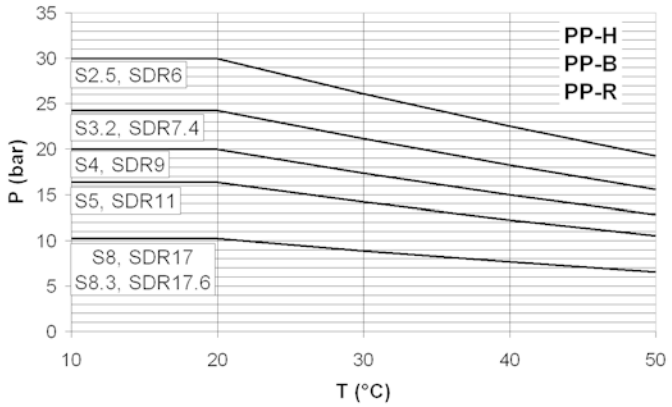
Definitions:
P = permissible test pressure in bar
T = pipe wall temperature in °C

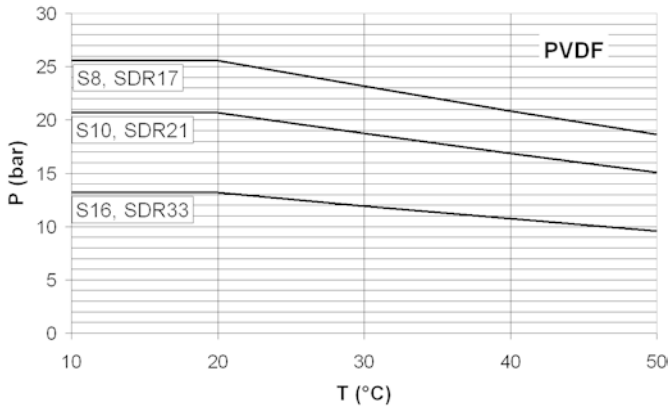












Checks during testing

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 equipement 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 (50 to 86°F)	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 (50 to 86°F).

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 (22 psi) 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 (22 psi) with a minimum waiting time of 3 hours applies.

COOL-FIT Product Range

Background Information to the COOL-FIT 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 ABS Plus 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 ABS Plus

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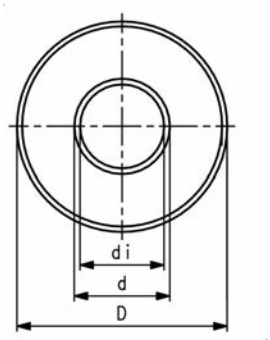
Pipes

COOL-FIT ABS Plus pipe PN10

Model:

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



PF 2 33 372 001

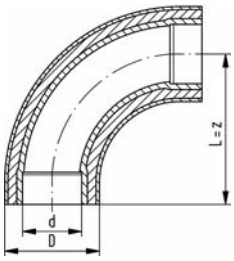
d [mm]	D [mm]	PN	Code	kg/m	di [mm]	closest inch	Refrigeration Size [inch]	
25	90	10	**169 017 682**	1.300	20.4	¾	⅞	
32	90	10	**169 017 683**	1.500	28.2	1	1 ⅛	
40	110	10	**169 017 684**	1.900	35.2	1 ¼	1 ⅜	
50	110	10	**169 017 685**	2.100	44.0	1 ½	1 ⅝	
63	125	10	**169 017 686**	2.700	55.4	2	2 ⅛	
75	140	10	**169 017 687**	3.500	66.0	2 ½	2 ⅝	
90	160	10	**169 017 688**	4.400	79.2	3	3 ⅛	
110	180	10	**169 017 689**	5.500	96.8	4	4 ⅛	
140	225	10	**169 017 691**	8.500	123.4	5		
160	250	10	**169 017 692**	10.500	141.0	6	6	
200	280	10	**169 017 693**	13.500	175.4	8		
225	315	10	**169 017 694**	18.500	197.2	8		

Fittings

COOL-FIT ABS Plus bend 90° PN10

Model:
- pre-insulated ABS metric
- Insulation made from PUR
- Outer jacket impact resistant. Color: black

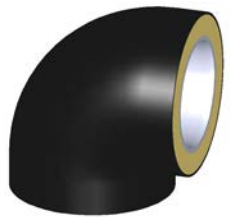
Connecting dimensions = Pipe outer diameter



PF 2 33 372 020

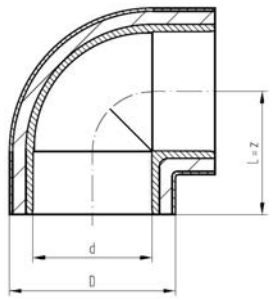
d [mm]	D [mm]	PN	Code	kg	z [mm]	L [mm]	required Nipple	closest inch
25	90	10	**738 001 107**	0.183	69	69	738901607	¾
32	90	10	**738 001 108**	0.220	86	86	738901608	1
40	110	10	**738 001 109**	0.363	109	109	738901609	1 ¼
50	110	10	**738 001 110**	0.498	131	131	738901610	1 ½
63	125	10	**738 001 111**	0.759	164	164	738901611	2
75	140	10	**738 001 112**	1.159	194	194	738901612	2 ½
90	160	10	**738 001 113**	1.885	231	231	738901613	3
110	180	10	**738 001 114**	3.235	281	281	738901614	4
140	225	10	**738 001 116**	6.909	356	356	738901616	5
225	315	10	**738 001 120**	8.176	287	287	738901620	8

COOL-FIT ABS Plus elbow 90° PN10



Model:
- pre-insulated ABS metric
- Insulation made from PUR
- Outer jacket impact resistant. Color: black
- Compact design

Connecting dimensions = Pipe outer diameter



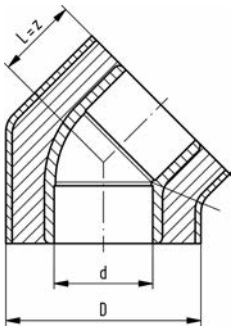
PF 2 33 372 020

d [mm]	D [mm]	PN	Code	kg	z [mm]	L [mm]	required Nipple	closest inch
160	250	10	**738 101 117**	2.600	166	166	738901617	6
200	280	10	**738 101 119**	5.003	207	207	738901619	8

COOL-FIT ABS Plus elbow 45° PN10

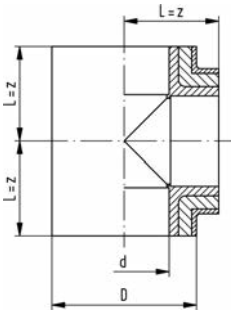
Model:
- pre-insulated ABS metric
- Insulation made from PUR
- Outer jacket impact resistant. Color: black

Connecting dimensions = Pipe outer diameter



PF 2 33 372 020

d [mm]	D [mm]	PN	Code	kg	z [mm]	L [mm]	required Nipple	closest inch
25	90	10	**738 151 107**	0.080	25	25	738901607	¾
32	90	10	**738 151 108**	0.103	30	30	738901608	1
40	110	10	**738 151 109**	0.166	36	36	738901609	1 ¼
50	110	10	**738 151 110**	0.193	43	43	738901610	1 ½
63	125	10	**738 151 111**	0.300	52	52	738901611	2
75	140	10	**738 151 112**	0.443	61	61	738901612	2 ½
90	160	10	**738 151 113**	0.692	71	71	738901613	3
110	180	10	**738 151 114**	0.967	89	89	738901614	4
140	225	10	**738 151 116**	1.900	108	108	738901616	5
160	250	10	**738 151 117**	2.904	122	122	738901617	6
200	280	10	**738 151 119**	3.687	149	149	738901619	8
225	315	10	**738 151 120**	4.620	168	168	738901620	8



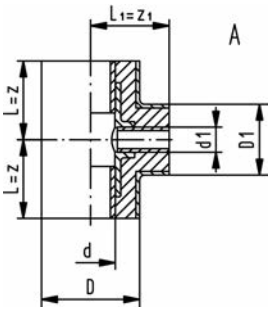
PF 2 33 372 020

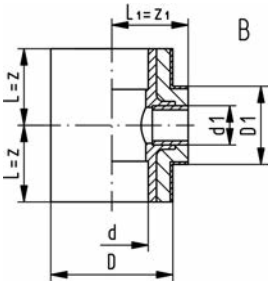
COOL-FIT ABS Plus tee 90° PN10

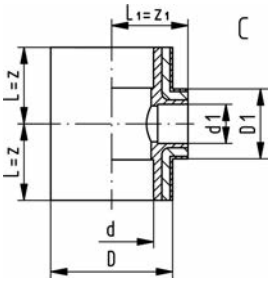
Model:

- pre-insulated ABS metric
- Insulation made from PUR
- Outer jacket impact resistant. Color: black

d [mm]	D [mm]	PN	Code	kg	z [mm]	L [mm]	required Nipple	closest inch
25	90	10	**738 201 007**	0.287	80	80	738901607	¾
32	90	10	**738 201 008**	0.292	80	80	738901608	1
40	110	10	**738 201 009**	0.470	90	90	738901609	1 ¼
50	110	10	**738 201 010**	0.517	90	90	738901610	1 ½
63	125	10	**738 201 011**	0.768	100	100	738901611	2
75	140	10	**738 201 012**	1.270	125	125	738901612	2 ½
90	160	10	**738 201 013**	1.600	140	140	738901613	3
110	180	10	**738 201 114**	2.309	122	122	738901614	4
140	225	10	**738 201 116**	3.639	147	147	738901616	5
160	250	10	**738 201 117**	5.106	167	167	738901617	6
200	280	10	**738 201 119**	6.800	207	207	738901619	8
225	315	10	**738 201 120**	10.200	233	233	738901620	8







COOL-FIT ABS Plus Tee 90° reduced PN10

Model:

- pre-insulated ABS metric
- Insulation made from PUR
- Outer jacket impact resistant. Color: black

* Available as long as our stock will last

d [mm]	d1 [mm]	D [mm]	D1 [mm]	Type	PN	Code
32	25	90	90	C	10	**738 201 038**
40	25	110	90	C	10	**738 201 051**
40	32	110	90	C	10	**738 201 047**
50	25	110	90	C	10	**738 201 092**
50	32	110	90	C	10	**738 201 064**
63	25	125	90	C	10	**738 201 093**
63	32	125	90	C	10	**738 201 078**
63	50	125	110	C	10	**738 201 070**
75	40	140	110	A	10	**738 201 182**
90	32	160	90	C	10	**738 201 043**
90	63	160	125	C	10	**738 201 046**
110	32	180	90	B	10	**738 201 144**
110	50	180	110	B	10	**738 201 136**
* 110	63	180	125	B	10	**700 262 541**
140	50	225	110	B	10	**738 201 148**
140	75	225	140	B	10	**738 201 149**
160	110	250	180	B	10	**738 201 152**
200	110	280	180	C	10	**738 201 153**
225	110	315	180	C	10	**738 201 156**
225	160	315	250	C	10	**738 201 157**
* 315	63	450	125	B	10	**700 262 539**

d [mm]	d1 [mm]	z [mm]	z1 [mm]	required Nipple	Closest inch
32	25	80	80	1x738901607; 2x738901608	1 - ¾
40	25	90	90	1x738901607; 2x738901609	1 ¼ - ¾
40	32	90	90	1x738901608; 2x738901608	1 ¼ - 1
50	25	90	90	1x738901607; 2x738901610	1 ½ - ¾
50	32	90	90	1x738901608; 2x738901610	1 ½ - 1
63	25	100	100	1x738901607; 2x738901611	2 - ¾
63	32	100	100	1x738901608; 2x738901611	2 - 1
63	50	100	100	1x738901610; 2x738901611	2 - 1 ½
75	40	115	110	1x738901109; 2x738901112	2 ½ - 1 ¼
90	32	140	140	1x738901608; 2x738901613	3 - 1
90	63	140	140	1x738901608; 2x738901613	3 - 2
110	32	117	130	1x738901108; 2x738901614	4 - 1
110	50	117	130	1x738901110; 2x738901614	4 - 1 ½

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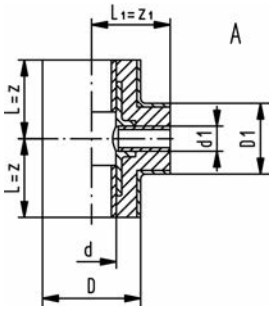
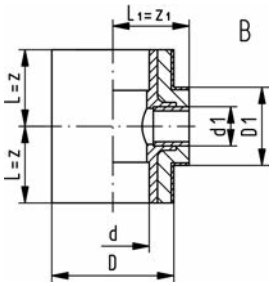
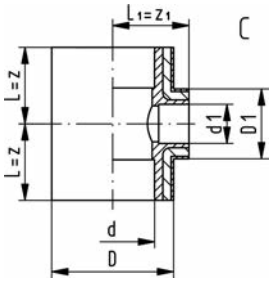




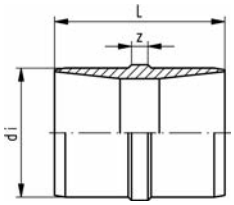


PF 2 33 372 020

d [mm]	d1 [mm]	z [mm]	z1 [mm]	required Nipple	Closest inch
* 110	63	177	222	1x738901611; 2x738901614	4 - 2
140	50	147	153	1x738901110; 2x738901616	5 - 1 ½
140	75	147	153	1x738901112; 2x738901616	5 - 2 ½
160	110	167	165	1x738901614; 2x738901617	6 - 4
200	110	213	193	1x738901614; 2x738901619	8 - 4
225	110	239	206	1x738901614; 2x738901620	8 - 4
225	160	239	206	1x738901617; 2x738901620	8 - 6
* 315	63	332	393	1x738901611	12 - 2

COOL-FIT ABS Plus barrel nipple di-di PN10

Model:
- Material: ABS metric
- To connect pipe inner diameters di



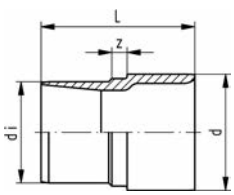
d [mm]	PN	Code	kg	di [mm]	L [mm]	z [mm]	closest inch
25	10	**738 901 107**	0.009	20	52	10	¾
32	10	**738 901 108**	0.014	28	58	10	1
40	10	**738 901 109**	0.021	35	66	10	1 ¼
50	10	**738 901 110**	0.035	44	76	10	1 ½
63	10	**738 901 111**	0.059	55	90	10	2
75	10	**738 901 112**	0.087	65	102	10	2 ½
90	10	**738 901 113**	0.127	79	104	10	3
110	10	**738 901 114**	0.204	96	122	10	4
140	10	**738 901 116**	0.416	123	150	10	5
160	10	**738 901 117**	0.582	141	166	10	6
200	10	**738 901 119**	1.019	176	202	10	8
225	10	**738 901 120**	1.392	198	224	10	8

PF 2 33 372 020

COOL-FIT ABS Plus adaptor nipple d-di PN10

Model:
- Material: ABS metric
- 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	**738 901 607**	0.008	20	50	10	¾
32	10	**738 901 608**	0.017	28	56	10	1
40	10	**738 901 609**	0.026	35	64	10	1 ¼
50	10	**738 901 610**	0.044	44	74	10	1 ½
63	10	**738 901 611**	0.082	55	88	10	2
75	10	**738 901 612**	0.127	65	100	10	2 ½

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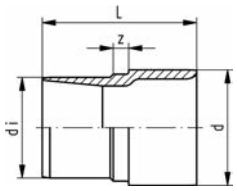

PF 2 33 372 020

d [mm]	PN	Code	kg	di [mm]	L [mm]	z [mm]	closest inch
90	10	**738 901 613**	0.179	79	108	10	3
110	10	**738 901 614**	0.319	96	127	10	4
* 140	10	**738 901 616**	0.505	123	156	10	5
160	10	**738 901 617**	0.818	141	174	10	6
200	10	**738 901 619**	1.855	176	212	10	8
225	10	**738 901 620**	1.921	198	236	10	8

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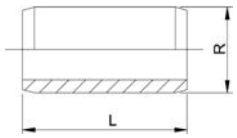
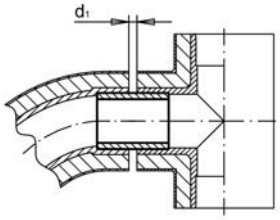
COOL-FIT ABS Plus barrel nipple d-d PN10





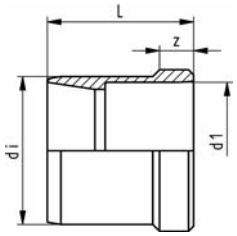
Model:
- Material: ABS metric
- For a quick jointing of COOL-FIT ABS Plus fittings for d - connecting dimensions
- For the shortest possible distance between COOL-FIT ABS Plus fittings
- Overall length L = 2 x socket length + 10 mm inspection gap

d [mm]	PN	Code	kg	L [mm]	d1 [mm]	closest inch
25	10	**738 901 907**	0.010	48	10	¾
32	10	**738 901 908**	0.011	54	10	1
40	10	**738 901 909**	0.021	62	10	1 ¼
50	10	**738 901 910**	0.036	72	10	1 ½
63	10	**738 901 911**	0.072	86	10	2
75	10	**738 901 912**	0.115	98	10	2 ½
90	10	**738 901 913**	0.190	112	10	3
110	10	**738 901 914**	0.310	132	10	4
140	10	**738 901 916**	0.727	162	10	5
160	10	**738 901 917**	0.946	182	10	6
200	10	**738 901 919**	1.790	222	10	8
225	10	**738 901 920**	2.525	248	10	8
250	6	**738 901 921**	2.525	272	10	10
280	6	**738 901 922**	2.525	302	10	10
315	6	**738 901 923**	2.525	332	10	12

PF 2 33 372 020

COOL-FIT ABS Plus reducing nipple di-dred PN10

Model:
- Material: ABS metric
- To connect pipe inner diameter di to reduced dred

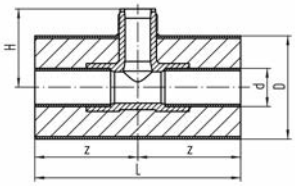


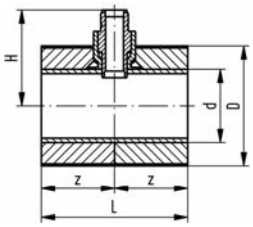
d [mm]	d1 [mm]	PN	Code	kg	di [mm]	L [mm]	z [mm]	closest inch
32	25	10	**738 911 341**	0.006	28	34	10	1
40	32	10	**738 911 346**	0.001	35	38	10	1 ¼
50	40	10	**738 911 352**	0.013	44	43	10	1 ½
63	50	10	**738 911 358**	0.025	55	50	10	2
75	63	10	**738 911 364**	0.022	65	56	10	2 ½
90	75	10	**738 911 370**	0.033	79	57	10	3
110	90	10	**738 911 376**	0.074	96	66	10	4
140	110	10	**738 911 385**	0.218	123	80	10	5
200	160	10	**738 911 392**	0.451	176	106	10	8

PF 2 33 372 020

38 31 01

COOL-FIT ABS Plus installation fitting type 310 PN10





Model:
- pre-insulated ABS metric
- 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	Code	kg
25	90	10	**738 310 107**	0.377
32	90	10	**738 310 108**	0.380
40	110	10	**738 310 109**	0.494
50	110	10	**738 310 110**	0.550
63	125	10	**738 310 111**	0.702
75	140	10	**738 310 112**	0.839
90	160	10	**738 310 113**	0.964
110	180	10	**738 310 114**	1.256
140	225	10	**738 310 116**	1.801
160	250	10	**738 310 117**	2.385
200	280	10	**738 310 119**	3.277
225	315	10	**738 310 120**	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

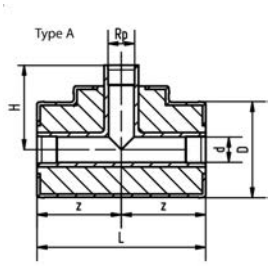
PF 2 98 930 002

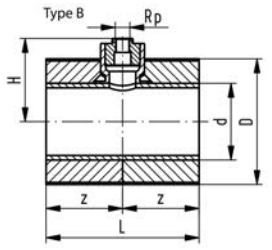
38 31 31

COOL-FIT ABS Plus installation fitting type 313 PN10

Type A

Type B





PF 2 98 931 002

Model:

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

Range of use:

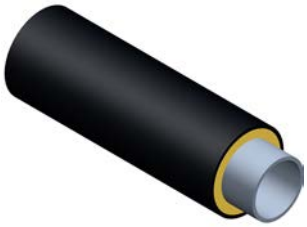
- compatible signet pressure sensors: type 2450-1 /-2 /-5

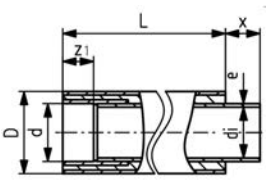
d [mm]	D [mm]	PN	Code	kg
25	90	10	**738 313 007**	0.330
32	90	10	**738 313 008**	0.400
40	110	10	**738 313 009**	0.500
50	110	10	**738 313 010**	0.570
63	125	10	**738 313 011**	0.890
75	140	10	**738 313 012**	0.767
90	160	10	**738 313 013**	0.961
110	180	10	**738 313 114**	1.178
140	225	10	**738 313 116**	1.731
160	250	10	**738 313 117**	2.228
200	280	10	**738 313 119**	3.609
225	315	10	**738 313 120**	4.645

d [mm]	D [mm]	Rp [inch]	L [mm]	H [mm]	z [mm]	required Nipple	closest inch	Type
25	90	½	160	112	80	2x738901607	¾	A
32	90	½	180	112	90	2x738901608	1	A
40	110	½	180	112	90	2x738901609	1 ¼	A
50	110	½	180	112	90	2x738901610	1 ½	A
63	125	½	200	100	100	2x738901611	2	A
75	140	½	250	147	125	2x738901612	2 ½	A
90	160	½	280	162	140	2x738901613	3	A
110	180	½	220	119	110	2x738901114	4	B
140	225	½	220	134	110	2x738901116	5	B
160	250	½	220	145	110	2x738901117	6	B
200	280	½	250	165	125	2x738901119	8	B
225	315	½	280	178	140	2x738901120	8	B

Pipes big dimension

COOL-FIT ABS Plus pipe PN6



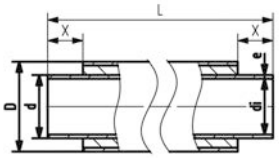


PF 2 33 372 001

Model:
- pre-insulated ABS metric
- insulated length: 5m (as an option available in 10m)
- 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]	Z1 [mm]
250	355	6	**169 017 695**	14.900	150	5000	10	9.6	230.8	130
280	400	6	**169 017 696**	18.700	165	5000	10	10.7	258.6	145
315	450	6	**169 017 697**	23.700	185	5000	12	12.1	290.8	165

COOL-FIT ABS Plus pipe PN6



PF 2 33 372 001

Model:
- pre-insulated ABS metric
- insulated length: 5m (as an option available in 10m)
- Outer jacket impact resistant. Color: black
- Insulation made from PUR
- ready for connection with two free pipe ends

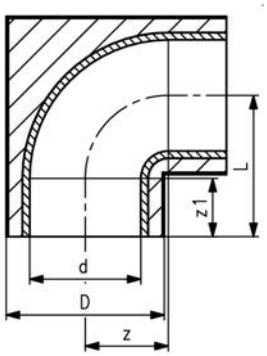
d [mm]	D [mm]	PN	Code	kg/m	x [mm]	L [mm]	e [mm]	di [mm]	closest inch
250	355	6	**169 017 698**	14.900	150	5000	9.6	230.8	10
280	400	6	**169 017 699**	18.700	165	5000	10.7	258.6	10
315	450	6	**169 017 700**	23.700	185	5000	12.1	290.8	12

Fittings big dimension

COOL-FIT ABS Plus bend 90° short pattern PN6

Model:
- pre-insulated ABS metric
- Insulation made from PUR
- Outer jacket impact resistant. Color: black
- Compact design

Connecting dimensions = Pipe outer diameter



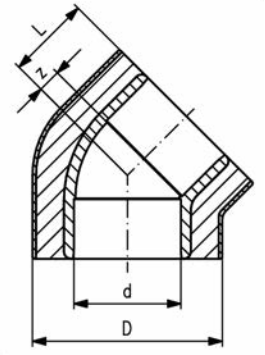
PF 2 33 372 020

d [mm]	D [mm]	PN	Code	kg	z [mm]	z1 [mm]	L [mm]	closest inch
250	355	6	**738 101 121**	10.000	131	130	263	10
280	400	6	**738 001 122**	18.000	210	145	357	10
315	450	6	**738 001 123**	24.000	237	165	401	12

COOL-FIT ABS Plus elbow 45° PN6

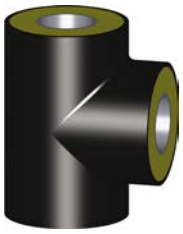
Model:
- pre-insulated ABS metric
- Insulation made from PUR
- Outer jacket impact resistant. Color: black
- Compact design

Connecting dimensions = Pipe outer diameter



PF 2 33 372 020

d [mm]	D [mm]	PN	Code	kg	z [mm]	L [mm]	closest inch
250	355	6	**738 151 121**	9.000	60	192	10
280	400	6	**738 151 122**	13.000	66	213	10
315	450	6	**738 151 123**	17.000	74	239	12

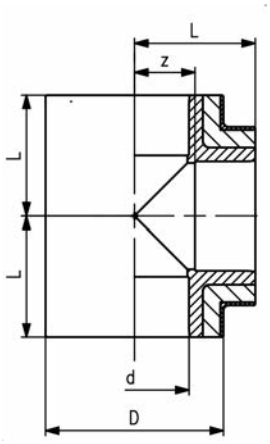


COOL-FIT ABS Plus Tee 90° PN6

Model:

- pre-insulated ABS metric
- Insulation made from PUR
- Outer jacket impact resistant. Color: black
- Compact design

Connecting dimensions = Pipe outer diameter



PF 2 33 372 020

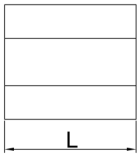
d [mm]	D [mm]	PN	Code	kg	z [mm]	L [mm]	closest inch	
250	355	6	**738 201 121**	14.654	132	263	10	
280	400	6	**738 201 122**	21.000	152	298	10	
315	450	6	**738 201 123**	27.000	160	332	12	

Accessories

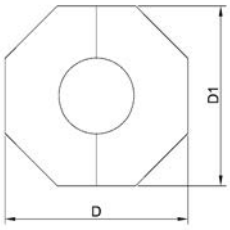
Valve insulation

Model:
- Insulation made from PE
- Outer jacket UV resistant
- For Ball Valve Type 546

* handle extension for ball valve recommended, d75/90 161.490.920, d110 161.490.921



d [mm]	DN [mm]	Code	kg	D [mm]	D1 [mm]	L [mm]	closest inch
25	20	**738 990 138**	0.100	89	87	108	¾
32	25	**738 990 139**	0.100	96	94	121	1
40	32	**738 990 140**	0.100	110	110	143	1 ¼
50	40	**738 990 141**	0.100	122	120	156	1 ½
63	50	**738 990 142**	0.100	150	147	181	2
* 75	65	**738 990 143**	0.100	190	185	235	2 ½
* 90	80	**738 990 144**	0.100	226	221	255	3
* 110	100	**738 990 145**	0.100	268	262	300	4



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	**738 011 150**	0.020

PF 2 33 372 030

38 01 13

Insulation set

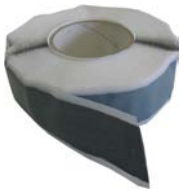
Model:
- To insulate inspection gaps of 10 mm width with the same outer diameter
- For inspection gaps of 20 mm width two Insulation Sets are required
- Scope of delivery:
  - Gap filler: 13 x 13 mm
  - Sealing tape: 40 mm width, butylene rubber-based

D [mm]	d [mm]	Code	kg
90	25 / 32	**738 011 313**	0.032
110	40 / 50	**738 011 314**	0.045
125	63	**738 011 315**	0.047
140	75	**738 011 316**	0.053
160	90	**738 011 317**	0.064
180	110	**738 011 318**	0.067
225	140	**738 011 320**	0.085
250	160	**738 011 321**	0.082
280	200	**738 011 322**	0.098
315	225	**738 011 323**	0.128

PF 2 33 372 999

38 01 11

Sealing tape



Model:
- For a water- and steam-tight sealing of inspection gaps in combination with shrink sleeves/ -sockets
- Sealing tape: 40 mm width, buthylene rubber-based
- 30 m on a roll

D [mm]	d-d [mm]	Code	kg	Closest inch	
90 - 450	25 - 315	**738 011 152**	2.134	¾ - 12	

PF 2 33 372 999

38 01 11

Shrink sleeve short PE

Model:
- For a water- and steam-tight sealing in combination with buthylene rubber-based sealing tape
- Length: 100 mm
- For connections of the same pipe outer diameter

D [mm]	d [mm]	Code	kg	
90	25 / 32	**738 011 113**	0.035	
110	40 / 50	**738 011 114**	0.052	
125	63	**738 011 115**	0.076	
140	75	**738 011 116**	0.073	
160	90	**738 011 117**	0.088	
180	110	**738 011 118**	0.087	
225	140	**738 011 120**	0.121	
250	160	**738 011 121**	0.130	
280	200	**738 011 122**	0.134	
315	225	**738 011 123**	0.130	

PF 2 33 372 999

38 01 10

Shrink socket PE

Model:
- For a water- and steam-tight sealing in combination with buthylene rubber-based sealing tape
- Length: 100 mm
- "Heavy duty" version for high end applications
- For connections of the same pipe outer diameter

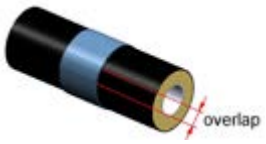
D [mm]	d [mm]	Code	kg	
90	25 / 32	**738 011 013**	0.100	
110	40 / 50	**738 011 014**	0.113	
125	63	**738 011 015**	0.133	
140	75	**738 011 016**	0.146	
160	90	**738 011 017**	0.165	
180	110	**738 011 018**	0.222	
225	140	**738 011 020**	0.280	
250	160	**738 011 021**	0.352	
280	200	**738 011 022**	0.371	
315	225	**738 011 023**	0.444	
355	250	**738 011 024**	0.900	
400	280	**738 011 025**	1.100	
455	315	**738 011 026**	1.900	

PF 2 33 372 999

Cold shrink tape PE black

Model:
- For indoor use only
- Shrinks without heat application
- Width (L) available in 100mm
- 15 m on a roll

D [mm]	d-d [mm]	Code	kg	Closest inch
90 - 450	25 - 315	**738 011 107**	1.723	¾ - 8

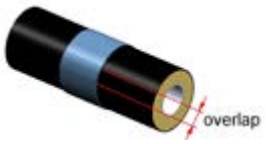


PF 2 33 372 999

Shrink tape PE black

Model:
- For indoor use only
- For later closing of gaps
- Mastic backed
- Width (L) available in 100mm
- 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	**738 011 105**	1.457	100	¾ - 8



PF 2 33 372 030

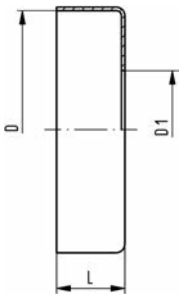
Shrink sleeve long PE black

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	**738 011 167**	0.288	265	4 - 6
180 - 225	**738 011 170**	0.098	265	7 - 8
250 - 315	**738 011 173**	0.680	265	10 - 12

	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



PF 2 33 372 030

COOL-FIT ABS Plus Cap PE black

Model:

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

D [mm]	D1 [mm]	d	Code	kg	L [mm]	closest inch
90	24	25	**733 960 171**	0.026	35	¾
90	32	32	**733 960 172**	0.014	35	1
110	39	40	**733 960 173**	0.036	35	1 ¼
110	48	50	**733 960 174**	0.024	35	1 ½
125	59	63	**733 960 175**	0.045	35	2
140	70	75	**733 960 176**	0.029	35	2 ½
160	83	90	**733 960 177**	0.031	35	3
180	100	110	**733 960 178**	0.055	35	4
225	127	140	**733 960 180**	0.081	35	5
250	144	160	**733 960 181**	0.066	35	6
280	187	200	**733 960 183**	0.146	35	8
315	210	225	**733 960 184**	0.125	35	8
355	265	250	**733 960 185**	0.155	35	10
400	300	280	**733 960 186**	0.185	35	10
450	335	315	**733 960 187**	0.225	35	12

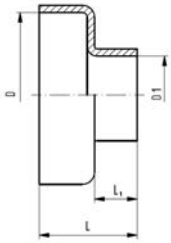
PF 2 33 372 999

Silicon glue

Model:

- For sealing and glueing caps to the COOL-FIT ABS Plus pipe
- Cartridge à 290 ml

	Code	kg
290 ml	**738 011 103**	0.473



PF 2 33 372 030

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	**733 960 135**	0.177	137	61	8 - 6
315 - 225	250 - 125	**733 960 140**	0.315	143	43	12 - 8

PF 2 33 372 050

COOL-FIT ABS Plus pipe calibration tool

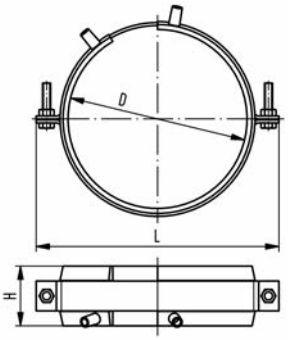
Model:

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

d-d [mm]	Code	kg	Closest inch
160 - 225	**790 205 001**	18.905	6 - 8

COOL-FIT ABS Plus 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 availabe 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	**738 912 013**	0.895	140	60	1.5	¾ - 1
110	40 / 50	**738 912 014**	0.904	170	60	2.0	1 ¼ - 1 ½
125	63	**738 912 015**	1.103	185	60	3.5	2
140	75	**738 912 016**	1.188	210	60	5.5	2 ½
160	90	**738 912 017**	1.177	220	60	9.0	3
180	110	**738 912 018**	1.530	244	60	10.0	4
225	140	**738 912 020**	1.813	295	60	10.0	5
250	160	**738 912 021**	1.957	320	60	10.0	6
280	200	**738 912 022**	2.001	350	60	10.0	8
315	225	**738 912 023**	2.388	385	60	10.0	8
355	250	**738 912 024**	2.388	420	60	10.0	10

PF 2 33 372 040

Adaptor

- MSA electrofusion adaptor for COOL-FIT ABS Plus fixed point

Code	kg
799 350 339	0.021

PF 2 33 372 999

ABS metric Fittings

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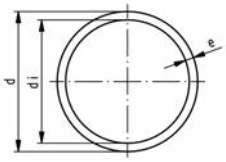
Metric pipes

69 01 70



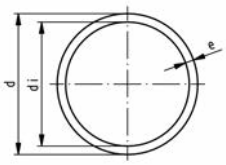
PF 2 33 472 001

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	**169 017 080**	0.095	1.8	12.4	⅜	½
20	16	**169 017 081**	0.148	2.3	15.4	½	⅝
25	16	**169 017 082**	0.191	2.3	20.4	¾	⅞

69 01 70



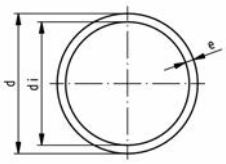
PF 2 33 472 001

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		**169 017 083**	0.213	1.9	28.2	1	1 ⅛
40	10		**169 017 084**	0.336	2.4	35.2	1 ¼	1 ⅜
50	10		**169 017 085**	0.516	3.0	44.0	1 ½	1 ⅝
63	10		**169 017 086**	0.819	3.8	55.4	2	2 ⅛
75	10	2 ½	**169 017 087**	1.154	4.5	66.0	2 ½	2 ⅝
90	10		**169 017 088**	1.657	5.4	79.2	3	3 ⅛
110	10		**169 017 089**	2.495	6.6	96.8	4	4 ⅛
140	10	5	**169 017 091**	4.083	8.3	123.4	5	
160	10		**169 017 092**	5.397	9.9	141.0	6	6
200	10		**169 017 093**	8.307	12.3	175.4	8	
225	10		**169 017 094**	10.522	13.9	197.2	9	

69 01 70



PF 2 33 472 001

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

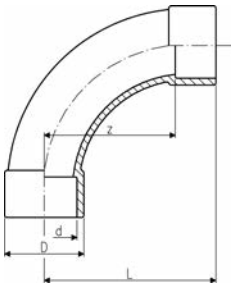
Model:
- Colour: RAL 7001, gravel grey
- Pipe length: 5m, with plain ends
- Minimum order quantity: 1 length

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

Pipe fittings for solvent cement jointing

29 00 01

Bend 90° ABS metric



PF 2 33 197 001

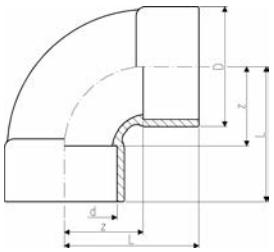
- Radius = 2 d

* Available as long as our stock will last

d [mm]	d [inch]	PN	Code	SP	kg	z [mm]	D [mm]	L [mm]	closest inch
20		16	**729 000 106**	10	0.027	40	27	58	½
25		16	**729 000 107**	10	0.039	50	35	69	¾
32		10	**729 000 108**	10	0.056	64	38	86	1
40		10	**729 000 109**	30	0.099	80	54	109	1 ¼
50		10	**729 000 110**	10	0.229	100	61	131	1 ½
63		10	**729 000 111**	5	0.391	126	76	164	2
75	2 ½	10	**729 000 112**	5	0.595	150	90	194	2 ½
90		10	**729 000 113**	5	1.044	180	113	231	3
110		10	**729 000 114**	5	2.101	220	137	281	4
140		10	**729 000 116**	1	3.996	280	168	356	5
* 160		10	**729 000 117**	1	5.600	320	191	406	6

29 01 01

Bend 90° short pattern ABS metric



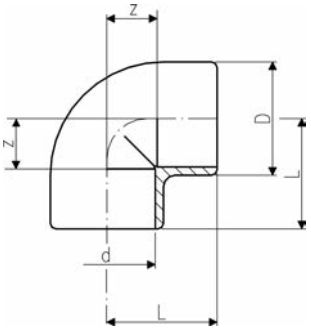
PF 2 33 197 001

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

d [mm]	PN	Code	SP	kg	z [mm]	D [mm]	L [mm]	closest inch
225	10	**729 010 120**	1	5.741	168	256	287	9
280	6	**729 010 122**	1	18.000	210	318	357	11
315	6	**729 010 123**	1	21.000	237	356	401	12

29 10 01

Elbow 90° ABS metric



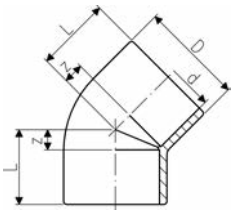
PF 2 33 197 003

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

d [mm]	d [inch]	PN	Code	SP	kg	z [mm]	D [mm]	L [mm]	closest inch
20		16	**729 100 106**	10	0.010	11	26	27	½
25		16	**729 100 107**	10	0.018	14	31	33	¾
32		10	**729 100 108**	10	0.033	17	40	39	1
40		10	**729 100 109**	10	0.055	21	49	47	1 ¼
50		10	**729 100 110**	10	0.098	26	61	57	1 ½
63		10	**729 100 111**	10	0.186	33	76	72	2
75	2 ½	10	**729 100 112**	5	0.300	40	90	84	2 ½
90		10	**729 100 113**	5	0.432	46	110	97	3
110		10	**729 100 114**	4	0.769	55	136	116	4
140	5	10	**729 100 116**	4	1.516	70	162	146	5
160		10	**729 100 117**	1	2.177	80	185	166	6
200		10	**729 100 119**	1	3.372	101	225	207	8
250		6	**729 100 121**	1	8.218	131	282	263	9

29 15 01

Elbow 45° ABS metric



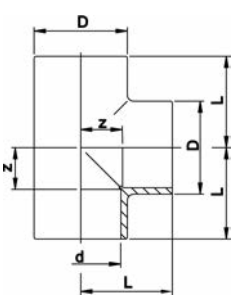
PF 2 33 197 004

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

d [mm]	d [inch]	PN	Code	SP	kg	z [mm]	D [mm]	L [mm]	closest inch
20		16	**729 150 106**	10	0.009	5	25	21	½
25		16	**729 150 107**	10	0.013	6	31	25	¾
32		10	**729 150 108**	10	0.026	8	40	30	1
40		10	**729 150 109**	10	0.044	10	49	36	1 ¼
50		10	**729 150 110**	5	0.079	12	61	43	1 ½
63		10	**729 150 111**	10	0.144	14	76	52	2
75	2 ½	10	**729 150 112**	5	0.225	17	89	61	2 ½
90		10	**729 150 113**	5	0.363	20	107	71	3
110		10	**729 150 114**	10	0.567	28	131	89	4
140	5	10	**729 150 116**	1	1.175	32	162	108	5
160		10	**729 150 117**	4	1.713	36	185	122	6
200		10	**729 150 119**	1	2.546	43	225	149	8
225		10	**729 150 120**	1	3.162	49	250	168	8
250		6	**729 150 121**	1	6.139	60	282	192	9
280		6	**729 150 122**	1	10.500	66	318	213	10
315		6	**729 150 123**	1	14.600	74	356	239	12

29 20 01

Tee 90° ABS metric



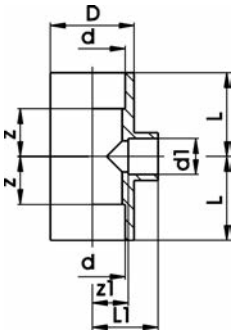
PF 2 33 197 005

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

d [mm]	d [inch]	PN	Code	SP	kg	z [mm]	D [mm]	L [mm]	closest inch
20		16	**729 200 106**	10	0.015	11	25	27	½
25		16	**729 200 107**	10	0.025	14	31	33	¾
32		10	**729 200 108**	10	0.042	17	40	39	1
40		10	**729 200 109**	10	0.078	21	49	47	1 ¼
50		10	**729 200 110**	5	0.134	26	61	57	1 ½
63		10	**729 200 111**	5	0.255	34	76	72	2
75	2 ½	10	**729 200 112**	5	0.404	40	90	84	2 ½
90		10	**729 200 113**	5	0.664	47	107	98	3
110		10	**729 200 114**	6	1.010	55	133	116	4
140	5	10	**729 200 116**	1	2.570	71	169	147	5
160		10	**729 200 117**	1	3.752	81	193	167	6
200		10	**729 200 119**	1	4.446	101	225	207	8
225		10	**729 200 120**	1	6.860	114	256	233	8
250		6	**729 200 121**	1	11.189	132	282	263	9
280		6	**729 200 122**	1	11.989	152	318	298	10
315		6	**729 200 123**	1	20.000	168	356	332	11

29 20 01

Tee 90° reducing ABS metric



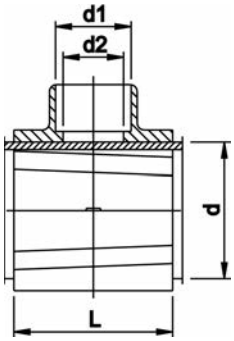
PF 2 33 197 010

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	**729 200 134**	10	0.030	14	14	33	33	30	¾ - ½ - ¾
32	25	10	**729 200 138**	10	0.049	17	17	41	39	36	1 - ¾ - 1
40	25	10	**729 200 151**	10	0.083	23	23	50	49	42	1 ¼ - ¾ - 1 ¼
40	32	10	**729 200 147**	10	0.085	23	23	50	49	45	1 ¼ - 1 - 1 ¼
50	25	10	**729 200 010**	5	0.138	28	28	62	59	47	1 ½ - ¾ - 1 ½
50	32	10	**729 200 164**	5	0.141	28	28	62	59	50	1 ½ - 1 - 1 ½
63	25	10	**729 200 011**	10	0.246	34	34	77	73	53	2 - ¾ - 2
63	32	10	**729 200 178**	5	0.256	35	34	77	73	56	2 - 1 - 2
63	50	10	**729 200 170**	5	0.270	35	34	77	73	65	2 - 1 ½ - 2
75	40	10	**729 200 182**	9	0.397	40	41	92	84	66	2 ½ - 1 ¼ - 2 ½
90	32	10	**729 200 143**	6	0.671	46	55	110	97	93	3 - 1 - 3
90	63	10	**729 200 146**	5	0.715	46	55	110	97	93	3 - 2 - 3
110	32	10	**729 200 144**	3	1.109	56	67	133	117	89	4 - 1 - 4
110	50	10	**729 200 136**	3	1.143	56	67	133	117	98	4 - 1 ½ - 4
140	50	10	**729 200 148**	1	2.452	72	82	172	148	113	5 - 1 ½ - 5
140	75	10	**729 200 149**	1	2.478	72	78	172	148	122	5 - 2 ½ - 5
160	110	10	**729 200 152**	1	4.305	81	91	192	167	142	6 - 3 - 6
200	110	10	**729 200 153**	1	6.688	106	131	232	213	192	7 - 4 - 7
225	110	10	**729 200 156**	1	8.096	119	143	257	239	204	8 - 4 - 8
225	160	10	**729 200 157**	1	7.485	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

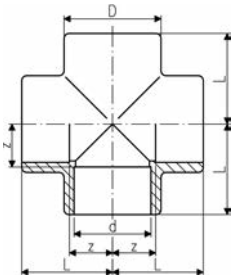


PF 2 33 198 008

d [mm]	PN* [bar]	Code	kg	d1 [mm]	d2 [mm]	Tapping-Ø [mm]	L [mm]
90	10	**169 110 056**	0.786	50	40	39	105
110	10	**169 110 066**	0.864	50	40	39	105
160	10	**169 110 097**	1.329	63	49	48	120
225	10	**169 110 117**	1.587	63	49	48	120

29 30 01

Cross ABS metric

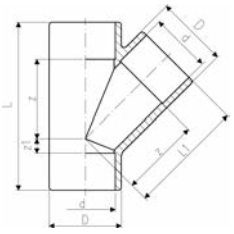


PF 2 33 197 015

d [mm]	PN	Code	kg	z [mm]	D [mm]	L [mm]	closest inch
32	10	**729 300 108**	0.070	17	43	39	1
63	10	**729 300 111**	0.359	34	79	72	2
90	10	**729 300 113**	0.937	48	106	97	3

29 25 01

Tee 45° ABS metric



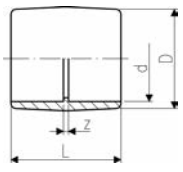
PF 2 33 197 013

d [mm]	d [inch]	PN	Code	SP	kg	z [mm]	z1 [mm]	D [mm]	L [mm]	L1 [mm]	closest inch
20		10	**729 250 106**	10	0.027	30	6	28	68	46	½
25		10	**729 250 107**	10	0.043	36	9	33	83	55	¾
32		10	**729 250 108**	10	0.073	45	10	41	99	67	1
40		10	**729 250 109**	10	0.123	56	10	50	118	82	1 ¼
50		10	**729 250 110**	10	0.202	66	12	60	140	97	1 ½
63		10	**729 250 111**	5	0.334	85	14	74	175	123	2
75	2 ½	6	**729 250 112**	5	0.605	101	18	91	207	145	2 ½
90		6	**729 250 113**	1	0.961	122	20	107	245	173	3
110		6	**729 250 114**	3	1.907	149	27	134	298	210	4
140	5	6	**729 250 116**	1	4.315	190	34	168	376	266	5

29 91 01

Socket ABS metric

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

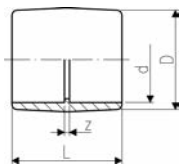


PF 2 33 197 008

d [mm]	d [inch]	PN	Code	SP	kg	z [mm]	D [mm]	L [mm]	closest inch
20		16	**729 910 106**	10	0.007	3	26	35	½
25		16	**729 910 107**	10	0.012	3	32	41	¾
32		10	**729 910 108**	10	0.020	3	40	47	1
40		10	**729 910 109**	10	0.035	3	49	55	1 ¼
50		10	**729 910 110**	10	0.060	3	61	65	1 ½
63		10	**729 910 111**	10	0.110	3	76	79	2
75	2 ½	10	**729 910 112**	10	0.145	4	87	92	2 ½
90		10	**729 910 113**	10	0.241	5	104	107	3
110		10	**729 910 114**	5	0.537	5	131	132	4
140	5	10	**729 910 116**	2	0.813	7	162	159	5
160		10	**729 910 117**	2	1.176	8	183	180	6
200		10	**729 910 119**	1	1.511	9	221	221	8
225		10	**729 910 120**	1	2.551	10	253	248	8
250		6	**729 910 121**	1	4.058	16	284	284	9
280		6	**729 910 122**	1	6.043	16	321	314	10
315		6	**729 910 123**	1	8.100	16	356	348	12

29 91 31

Adaptor socket ABS metric/Inch BS



PF 2 33 172 001

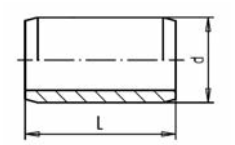
Model:

- with BS Inch and metric solvent cement sockets

d [mm]	d [inch]	PN	Code	SP	kg	z [mm]	L [mm]	D [mm]
20	½	10	**729 913 106**	1	0.010	5	38	27
25	¾	10	**729 913 107**	1	0.016	5	45	33
32	1	10	**729 913 108**	1	0.025	5	51	41
40	1 ¼	10	**729 913 109**	1	0.045	5	60	51
50	1 ½	10	**729 913 110**	1	0.070	4	65	59
63	2	10	**729 913 111**	1	0.130	5	79	75
75	2 ½	10	**729 910 112**	10	0.145	4	92	87
90	3	10	**729 913 113**	2	0.365	6	108	104
110	4	10	**729 913 115**	1	0.630	7	135	134

29 90 09

Barrel nipple ABS metric



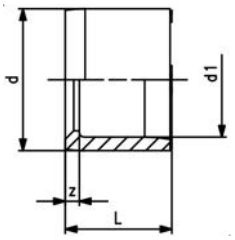
PF 2 33 198 007

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
20		16	**729 900 906**	0.008	32	½
25		16	**729 900 907**	0.008	38	¾
32		10	**729 900 908**	0.007	44	1
40		10	**729 900 909**	0.016	52	1 ¼
50		10	**729 900 910**	0.032	62	1 ½
63		10	**729 900 911**	0.059	76	2
75	2 ½	10	**729 900 912**	0.095	88	2 ½
90		10	**729 900 913**	0.161	102	3
110		10	**729 900 914**	0.282	122	4

29 90 03

Reducing bush ABS metric



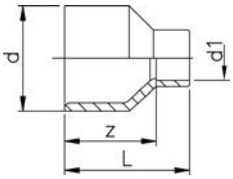
PF 2 33 197 006

Model:
- With solvent cement spigot and socket metric

d [mm]	d1 [mm]	PN	Code	SP	kg	z [mm]	L [mm]
25	20	16	**729 900 337**	10	0.005	3	19
32	20	10	**729 900 342**	10	0.011	6	22
32	25	10	**729 900 341**	10	0.008	4	22
40	20	10	**729 900 348**	10	0.016	10	26
40	25	10	**729 900 347**	10	0.016	7	26
40	32	10	**729 900 346**	10	0.012	4	26
50	20	10	**729 900 355**	10	0.026	15	31
50	25	10	**729 900 354**	10	0.011	12	31
50	32	10	**729 900 353**	10	0.035	9	31
50	40	10	**729 900 352**	10	0.022	5	31
63	32	10	**729 900 360**	10	0.060	16	38
63	40	10	**729 900 359**	10	0.051	12	38
63	50	10	**729 900 358**	10	0.043	7	36
75	50	10	**729 900 365**	10	0.082	13	44
75	63	10	**729 900 364**	10	0.061	7	44
90	50	10	**729 900 372**	10	0.143	20	51
90	63	10	**729 900 371**	10	0.129	14	51
90	75	10	**729 900 370**	10	0.100	7	51
110	63	10	**729 900 378**	5	0.231	24	61
110	90	10	**729 900 376**	5	0.196	10	61
125	110	10	**700 244 660**	10	0.356	8	69
140	110	10	**729 900 385**	5	0.459	15	76
160	110	10	**729 900 390**	5	0.662	25	86
160	140	10	**729 900 388**	5	0.410	10	86
200	160	10	**729 900 392**	1	0.820	20	106
225	160	10	**729 900 396**	2	1.651	33	119
225	200	10	**729 900 181**	-	1.018	13	119
250	225	6	**729 900 303**	-	1.294	12	131
280	250	6	**729 900 306**	1	2.500	15	146
315	280	6	**729 900 312**	1	2.852	17	164

29 91 03

Reducing bush long ABS metric

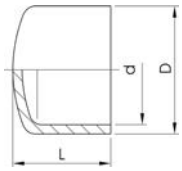


PF 2 33 197 002

d [mm]	d1 [mm]	PN	Code	SP	kg	z [mm]	L [mm]	Closest inch
32	20	10	**729 910 342**	10	0.014	30	46	1 - ½
40	25	10	**729 910 347**	10	0.026	36	55	1 ¼ - ¾
50	25	10	**729 910 354**	10	0.038	44	63	1 ⅓ - ¾
63	32	10	**729 910 360**	5	0.077	54	76	2 - 1
75	40	10	**729 910 366**	5	0.115	62	88	2 ½ - 1 ¼
90	63	10	**729 910 371**	5	0.215	74	112	3 - 2

29 96 01

Cap ABS metric

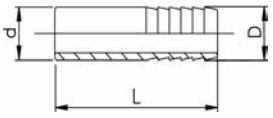


PF 2 33 197 009

d [mm]	PN	Code	SP	kg	D [mm]	L [mm]	closest inch
20	16	**729 960 106**	10	0.007	30	25	½
25	16	**729 960 107**	10	0.013	37	30	¾
32	10	**729 960 108**	10	0.019	44	34	1
40	10	**729 960 109**	10	0.034	55	41	1 ¼
50	10	**729 960 110**	10	0.046	64	44	1 ½
63	10	**729 960 111**	5	0.109	80	54	2
75	10	**729 960 112**	5	0.115	87	65	2 ½
90	10	**729 960 113**	5	0.218	112	77	3
110	10	**729 960 114**	5	0.499	145	101	4
140	10	**729 960 116**	10	0.880	163	114	5
160	10	**729 960 117**	2	1.140	188	130	6

29 96 04

Hose connector ABS metric



PF 2 33 197 012

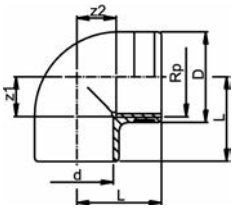
d [mm]	PN	Code	SP	kg	D [mm]	L [mm]	closest inch
20	10	**729 960 406**	10	0.012	20	73	½
25	10	**729 960 407**	10	0.015	25	79	¾
32	10	**729 960 408**	10	0.027	30	89	1
40	10	**729 960 409**	10	0.026	40	100	1 ¼

Adaptor fittings

29 10 02

Elbow 90° ABS metric Rp

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



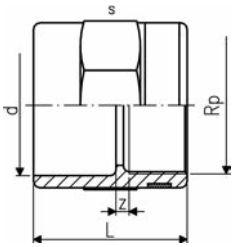
PF 2 33 198 002

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

29 91 02

Socket ABS metric Rp

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

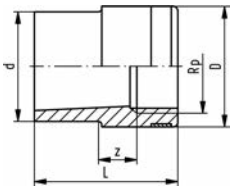


PF 2 33 198 003

d [mm]	Rp [inch]	PN	Code	SP	kg	z [mm]	L [mm]	s [mm]	closest inch	
20	½	10	**729 910 206**	10	0.020	4	35	32	½	
25	¾	10	**729 910 207**	10	0.025	3	40	36	¾	
32	1	10	**729 910 208**	10	0.045	3	45	46	1	
40	1 ¼	10	**729 910 209**	10	0.067	5	51	55	1 ¼	
50	1 ½	10	**729 910 210**	10	0.099	7	59	65	1 ½	
63	2	10	**729 910 211**	5	0.167	7	69	80	2	

29 91 04

Reducing bush ABS metric Rp



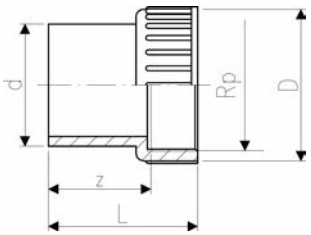
PF 2 33 198 020

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	⅜	10	**729 910 434**	10	0.012	7	25	35
25	½	10	**729 910 437**	10	0.017	7	30	41
32	¾	10	**729 910 441**	10	0.025	15	35	48
40	1	10	**729 910 446**	10	0.046	20	45	56
50	1 ¼	10	**729 910 452**	10	0.077	20	55	66
63	1 ½	10	**729 910 458**	5	0.120	10	62	77

29 90 04

Adaptor ABS metric Rp



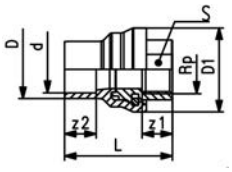
PF 2 33 198 004

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	½	10	**729 900 406**	10	0.008	21	37	28
25	¾	10	**729 900 407**	10	0.014	23	41	33
32	1	10	**729 900 408**	10	0.026	27	48	42
40	1 ¼	10	**729 900 409**	10	0.044	33	56	52
50	1 ½	10	**729 900 410**	10	0.076	38	61	62
63	2	10	**729 900 411**	5	0.127	47	74	77

29 95 01

Adaptor fitting ABS/brass Rp



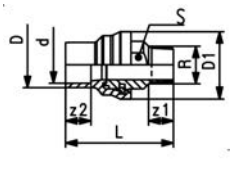
PF 2 33 198 001

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

d [mm]	D [mm]	PN	Rp [inch]	Code	SP	kg	z1 [mm]	z2 [mm]	D1 [mm]	L [mm]	S [mm]
20	25	10	½	**729 950 106**	10	0.098	17.0	16.5	40	54.5	25
25	32	10	¾	**729 950 107**	5	0.166	18.5	19.0	50	65.2	30
32	40	10	1	**729 950 108**	5	0.257	21.5	22.5	59	76.5	36

29 95 06

Adaptor fitting ABS/brass R



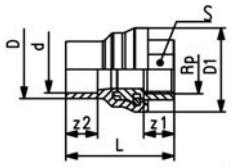
PF 2 33 198 001

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

d [mm]	D [mm]	PN	R [inch]	Code	SP	kg	z1 [mm]	z2 [mm]	D1 [mm]	L [mm]	S [mm]
20	25	10	½	**729 950 606**	10	0.124	17.0	16.5	40	69.5	25
25	32	10	¾	**729 950 607**	5	0.221	19.0	19.0	50	83.2	30
32	40	10	1	**729 950 608**	5	0.336	22.0	22.5	59	95.5	36

29 94 01

Adaptor fitting ABS/stainless steel Rp



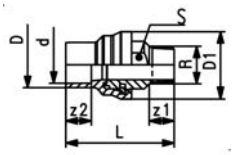
PF 2 33 198 001

Model:
- Adaptor fitting ABS
- Adaptor fitting equally suitable as socket and spigot
- Stainless steel WN 1.4404 (3162) with parallel female thread Rp
- Gasket: O-ring EPDM No. 48 41 01

d [mm]	D [mm]	PN	Rp [inch]	Code	SP	kg	z1 [mm]	z2 [mm]	D1 [mm]	L [mm]	S [mm]
20	25	10	½	**729 940 106**	10	0.094	17.0	16.5	40	54.5	25
25	32	10	¾	**729 940 107**	5	0.164	18.5	19.0	50	65.2	30
32	40	10	1	**729 940 108**	5	0.251	21.5	22.5	59	76.5	36

29 94 06

Adaptor fitting ABS/stainless steel R



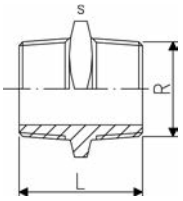
PF 2 33 198 001

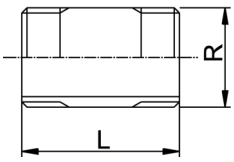
Model:
- Adaptor fitting ABS
- Adaptor fitting equally suitable as socket and spigot
- Stainless steel WN 1.4404 (3162) with taper male thread R
- Gasket: O-ring EPDM No. 48 41 01

d [mm]	D [mm]	PN	R [inch]	Code	SP	kg	z1 [mm]	z2 [mm]	D1 [mm]	L [mm]	S [mm]
20	25	10	½	**729 940 606**	10	0.119	17.0	16.5	40	69.5	25
25	32	10	¾	**729 940 607**	5	0.209	19.0	19.0	50	83.2	30
32	40	10	1	**729 940 608**	5	0.319	22.0	22.5	59	95.5	36

29 91 15

Threaded nipple R ABS





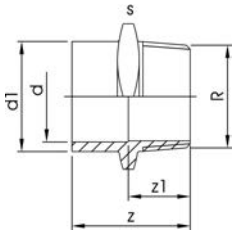
PF 2 33 172 016

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

R [inch]	PN	Type	S [mm]	Code	kg	L [mm]
⅜	10	B		**729 911 505**	0.014	43
½	10	A	22	**729 911 906**	0.009	45
¾	10	A	27	**729 911 907**	0.014	49
1	10	A	36	**729 911 908**	0.026	57
1 ¼	10	B		**729 911 509**	0.053	75
1 ½	10	B		**729 911 510**	0.063	88
2	10	B		**729 911 511**	0.135	88

29 91 05

Adaptor socket nipple ABS metric R



PF 2 33 198 001

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

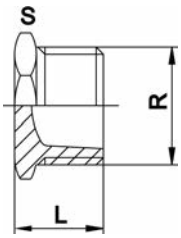
d [mm]	d1 [mm]	R [inch]	PN	Code	SP	kg	z [mm]	z1 [mm]	s [mm]	closest inch
16	20	½	10	**729 910 556**	10	0.012	42	28	32	⅜
20	25	¾	10	**729 910 557**	10	0.017	47	31	36	½
25	32	1	10	**729 910 558**	10	0.030	54	35	46	¾
32	40	1 ¼	10	**729 910 559**	10	0.046	60	38	55	1
40	50	1 ½	10	**729 910 560**	10	0.072	66	40	65	1 ¼
50	63	2	10	**729 910 561**	5	0.125	78	47	80	1 ½

Threaded fittings

29 96 19

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



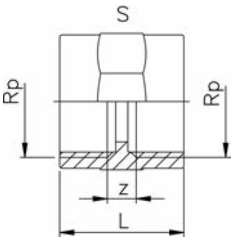
PF 2 33 172 018

R [inch]	PN	Code	SP	kg	s [mm]	L [mm]
½	10	**729 961 906**	10	0.008	27	25
¾	10	**729 961 907**	10	0.014	36	29
1	10	**729 961 908**	10	0.022	41	32

29 91 06

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



PF 2 33 172 001

Rp [inch]	PN	Code	SP	kg	z [mm]	L [mm]	s [mm]
½	10	**729 910 606**	10	0.019	9	35	32
¾	10	**729 910 607**	10	0.022	9	39	36
1	10	**729 910 608**	10	0.041	11	45	46

Installation fittings

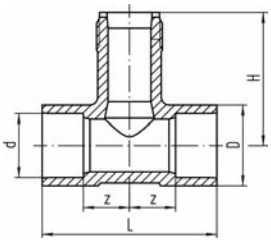
29 31 00

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	**729 310 007**	0.100	35	100	78	32	¾	flow X0, pH XX
32	25	10	**729 310 008**	0.143	44	110	81	33	1	flow X0, pH XX
40	32	10	**729 310 009**	0.140	51	110	85	29	1 ¼	flow X0, pH XX
50	40	10	**729 310 010**	0.187	63	120	89	29	1 ½	flow X0, pH XX
63	50	10	**729 310 011**	0.257	78	130	95	28	2	flow X0, pH XX

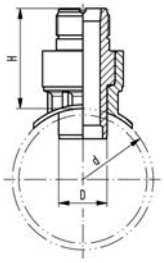
29 31 20

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



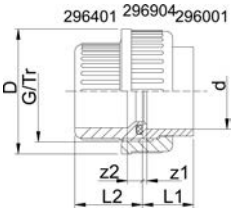
PF 2 98 931 001

d [mm]	DN [mm]	PN	Code	kg	D [mm]	H [mm]	closest inch	Sensor Type
75	65	10	**729 312 012**	0.170	38	91	2 ½	flow X1
90	80	10	**729 312 013**	0.176	38	91	3	flow X1
110	100	10	**729 312 014**	0.172	38	91	4	flow X1
140	125	10	**729 312 016**	0.166	38	81	5	flow X1
160	150	10	**729 312 017**	0.166	38	77	6	flow X1
200	200	10	**729 312 019**	0.152	38	71	8	flow X1
225	200	10	**729 312 020**	0.196	38	67	8	flow X1

Unions and Adaptor Unions

29 51 01

Union ABS metric



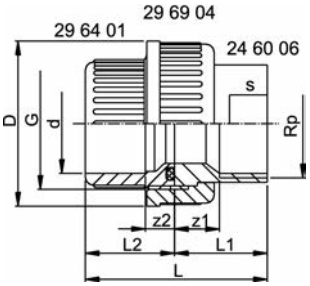
PF 2 33 198 008

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
20		10	**729 510 106**	10	0.035	4	10	43	21	26	1	½
25		10	**729 510 107**	10	0.044	5	10	53	24	29	1 1/4	¾
32		10	**729 510 108**	10	0.064	5	10	60	27	33	1 1/2	1
40		10	**729 510 109**	10	0.130	3	12	74	31	39	2	1 ¼
50		10	**729 510 110**	5	0.152	3	14	83	33	46	2 1/4	1 ½
63		10	**729 510 111**	10	0.258	3	18	103	40	58	2 3/4	2
75	2 ½	10	**729 510 112**	2	0.469	3	18	135	47	62	Tr 108x5	2 ½
90		10	**729 510 313**	2	0.701	5	18	158	56	69	Tr 128x5	3
110		10	**729 510 114**	1	1.069	5	11	158	66	72	Tr 154x5	4

29 54 02

Adaptor union ABS/stainless steel metric Rp



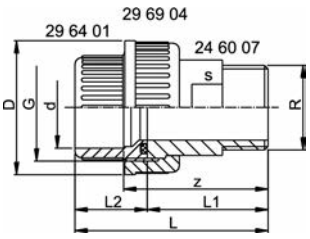
PF 2 33 198 021

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]
20	½	10	**729 540 206**	0.096	11	10	43	50	24	26	1	24
25	¾	10	**729 540 207**	0.154	11	10	51	55	26	29	1 1/4	29
32	1	10	**729 540 208**	0.212	12	10	58	61	29	33	1 1/2	36
40	1 ¼	10	**729 540 209**	0.356	14	12	74	71	33	39	2	45
50	1 ½	10	**729 540 210**	0.443	15	14	83	79	34	46	2 1/4	54
63	2	10	**729 540 211**	0.721	15	18	100	95	39	58	2 3/4	63

29 54 07

Adaptor union ABS/stainless steel metric R



PF 2 33 198 021

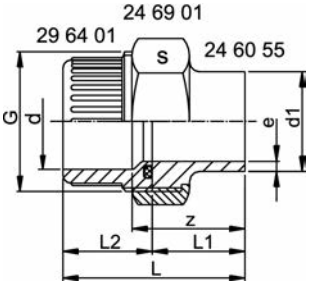
Model:
- Union End: Stainless Steel WN 1.4404 (316L), taper male thread R
- Union Bush: Solvent cement socket ABS metric
- Union Nut: ABS
- Gasket: O-ring EPDM No. 48 41 00

d [mm]	R [inch]	PN	EPDM Code	kg	z [mm]	D [mm]	L [mm]	L1 [mm]	L2 [mm]	G [inch]	s [mm]
20	½	10	**729 540 706**	0.126	44	43	60	34	26	1	24
25	¾	10	**729 540 707**	0.174	46	51	65	36	29	11/4	32
32	1	10	**729 540 708**	0.262	50	58	72	40	33	11/2	37
40	1 ¼	10	**729 540 709**	0.476	58	74	84	46	39	2	48
50	1 ½	10	**729 540 710**	0.535	62	83	93	48	46	21/4	54
63	2	10	**729 540 711**	0.861	73	100	111	55	58	23/4	69

29 54 55

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



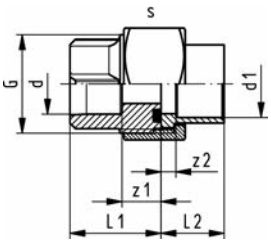
PF 2 33 198 021

d [mm]	d1 [mm]	PN	EPDM Code	kg	z [mm]	L [mm]	L1 [mm]	L2 [mm]	e [mm]	G [inch]	s [mm]
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

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



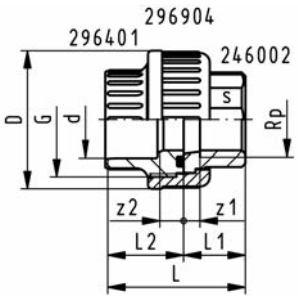
PF 2 33 198 005

d [mm]	d1 [mm]	PN	Code	kg	L1 [mm]	L2 [mm]	z1 [mm]	z2 [mm]	G [inch]	s [mm]
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

Adaptor union ABS/malleable iron galvanised 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



PF 2 33 198 012

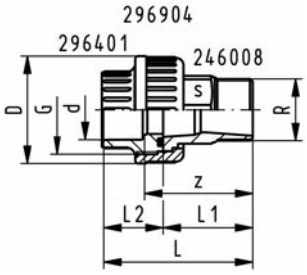
d [mm]	Rp [inch]	PN* [bar]	Code	SP	kg	D [mm]	L [mm]	L1 [mm]	L2 [mm]	z1 [mm]	z2 [mm]	G [inch]	s [mm]
20	½	10	**729 530 306**	10	0.064	43	48	22	26	9	10	1	25
25	¾	10	**729 530 307**	5	0.095	51	51	22	29	7	10	1 1/4	31
32	1	10	**729 530 308**	5	0.139	58	58	26	33	9	10	1 1/2	38
40	1 ¼	10	**729 530 309**	2	0.240	72	69	31	39	12	12	2	48
50	1 ½	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 galvanised 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



PF 2 33 198 013

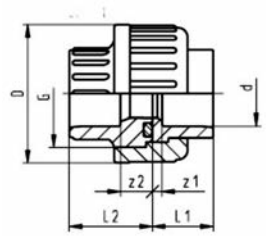
d [mm]	R [inch]	PN* [bar]	Code	SP	kg	D [mm]	L [mm]	L1 [mm]	L2 [mm]	z [mm]	G [inch]	s [mm]
20	½	10	**729 530 806**	10	0.100	43	66	40	26	50	1	25
25	¾	10	**729 530 807**	5	0.147	51	72	43	29	53	1 1/4	31
32	1	10	**729 530 808**	5	0.198	58	80	48	33	58	1 1/2	38
40	1 ¼	10	**729 530 809**	2	0.400	72	95	57	39	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

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



PF 2 33 198 015

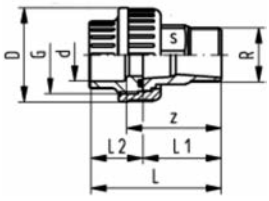
d [mm]	Rp [inch]	PN	Code	SP	kg	D [mm]	L [mm]	L1 [mm]	L2 [mm]	z1 [mm]	z2 [mm]	G [inch]	s [mm]
20	½	10	**729 550 506**	10	0.084	43	48	22	26	7	10	1	25
25	¾	10	**729 550 507**	5	0.134	51	54	25	29	9	11	1 1/4	30
32	1	10	**729 550 508**	5	0.179	58	60	27	33	8	11	1 1/2	36
40	1 ¼	10	**729 550 509**	2	0.327	72	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	0.674	100	98	40	58	14	21	2 3/4	65

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



PF 2 33 198 016

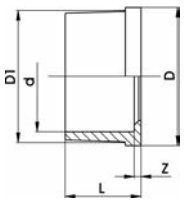
d [mm]	R [inch]	PN	Code	SP	kg	D [mm]	L [mm]	L1 [mm]	L2 [mm]	z [mm]	G [inch]	s [mm]
20	½	10	**729 550 906**	10	0.123	43	63	37	26	47	1	25
25	½	10	**729 550 957**	5	0.185	51	66	37	29	48	1 1/4	30
25	¾	10	**729 550 907**	5	0.175	51	71	42	29	52	1 1/4	30
25	1	10	**729 550 967**	5	0.293	51	75	46	29	57	1 1/4	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	1 ½	10	**729 550 910**	2	0.640	83	102	56	46	71	2 1/4	55
63	2	10	**729 550 911**	8	1.019	100	125	67	58	87	2 3/4	65

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



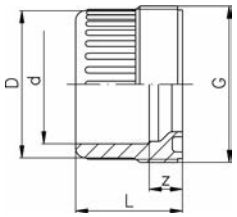
PF 2 33 198 999

d [mm]	PN	Code	kg	z [mm]	L [mm]	D [mm]	D1 [mm]	closest inch
20	10	**729 800 106**	0.007	4	21	30	28	½
25	10	**729 800 107**	0.012	5	24	39	36	¾
32	10	**729 800 108**	0.016	5	27	44	41	1
40	10	**729 800 109**	0.042	3	31	57	53	1 ¼
50	10	**729 800 110**	0.045	3	34	63	59	1 ½
63	10	**729 800 111**	0.084	3	41	78	74	2
75	10	**729 800 162**	0.109	3	47	101	91	2 ½
90	10	**729 800 163**	0.178	5	56	121	108	3
110	10	**729 800 164**	0.295	5	66	146	131	4

29 84 01

Union bush ABS metric

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



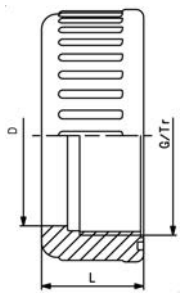
PF 2 33 198 999

d [mm]	PN	Code	kg	z [mm]	D [mm]	L [mm]	G/Tr	closest inch
16	10	**729 840 105**	0.008	10	24	24	3/4	⅜
20	10	**729 840 106**	0.011	10	28	26	1	½
25	10	**729 840 107**	0.016	10	33	29	1 1/4	¾
32	10	**729 840 108**	0.027	10	41	33	1 1/2	1
40	10	**729 840 109**	0.046	12	50	39	2	1 ¼
50	10	**729 840 110**	0.058	14	62	46	2 1/4	1 ½
63	10	**729 840 111**	0.110	18	77	58	2 3/4	2
75	10	**729 840 112**	0.160	18	93	62	Tr108x5	2 ½
90	10	**729 840 123**	0.274	18	110	69	Tr128x5	3
110	10	**729 840 114**	0.330	11	133	72	Tr154x6	4

29 69 04

Union nut ABS

Model:
- For union 23 51 01

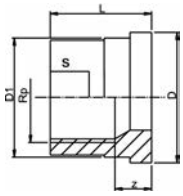


PF 2 33 172 999

d [mm]	PN	Code	SP	kg	L [mm]	G/Tr	D [mm]	closest inch
20	10	**729 890 406**	10	0.048	23	1	28	½
25	10	**729 890 407**	10	0.046	25	1 1/4	36	¾
32	10	**729 890 408**	10	0.025	27	1 1/2	42	1
40	10	**729 890 409**	10	0.060	30	2	53	1 ¼
50	10	**729 890 410**	10	0.100	34	2 1/4	59	1 ½
63	10	**729 890 411**	10	0.147	38	2 3/4	74	2
75	10	**729 690 012**	-	0.192	40	Tr108x5	92	2 ½
90	10	**729 690 013**	-	0.269	43	Tr128x5	110	3
110	10	**729 690 014**	-	0.416	48	Tr154x6	133	4

24 60 06

Union end stainless steel Rp



PF 2 30 153 999

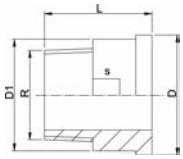
Model:

- 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]
⅜	16	**724 600 655**	10	0.030	9	24	22	19	19
½	16	**724 600 656**	10	0.060	11	30	28	24	24
¾	16	**724 600 657**	10	0.092	11	39	36	26	29
1	16	**724 600 658**	10	0.137	12	45	42	29	36
1 ¼	16	**724 600 659**	10	0.226	14	57	53	33	45
1 ½	16	**724 600 660**	10	0.314	15	63	59	34	54
2	16	**724 600 661**	45	0.438	15	78	74	39	63

24 60 07

Union end stainless steel R



PF 2 30 153 999

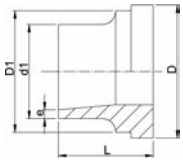
Model:

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

R [inch]	PN	Code	SP	kg	D [mm]	D1 [mm]	L [mm]	s [mm]
⅜	16	**724 600 705**	10	0.052	24	22	30	19
½	16	**724 600 706**	10	0.083	30	28	34	24
¾	16	**724 600 707**	10	0.125	39	36	36	32
1	16	**724 600 708**	10	0.189	45	42	40	37
1 ¼	16	**724 600 709**	10	0.356	57	53	46	48
1 ½	16	**724 600 710**	10	0.407	63	59	48	54
2	16	**724 600 711**	10	0.668	78	74	55	69

24 60 55

Union end stainless steel Welding end



PF 2 30 153 999

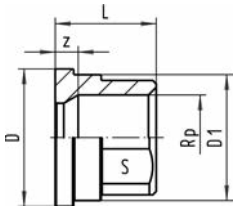
Model:

- 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	**724 605 505**	10	0.029	24	22	18	1.6
20	21	16	**724 605 506**	10	0.046	30	28	22	2.0
25	26	16	**724 605 507**	10	0.080	39	36	23	2.0
32	33	16	**724 605 508**	10	0.112	45	42	26	2.0
40	42	16	**724 605 509**	10	0.188	57	53	26	2.0
50	48	16	**724 605 510**	10	0.222	63	59	28	2.0
63	60	16	**724 605 511**	10	0.361	78	74	32	2.6

20 60 02

Union end brass Rp



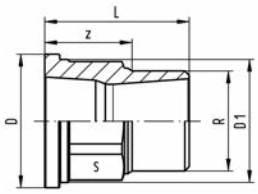
PF 2 30 153 999

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	½	**720 600 236**	1	0.059	30	28	5	22	25
25	¾	**720 600 237**	1	0.100	39	36	6	25	30
32	1	**720 600 238**	1	0.128	45	42	6	27	36
40	1 ¼	**720 600 239**	1	0.211	56	53	7	31	46
50	1 ½	**720 600 240**	1	0.324	62	59	7	35	55
63	2	**720 600 241**	1	0.510	78	74	8	40	65
75	2 ½	**720 600 242**	1	0.893	100	92	10	47	85
90	3	**720 600 243**	1	1.395	121	110	11	52	95

20 60 02



PF 2 30 153 999

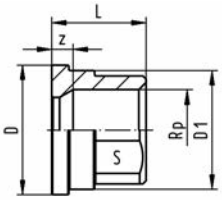
Union end brass R

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	½	**720 600 246**	1	0.092	30	28	37	22	25
25	¾	**720 600 247**	1	0.151	39	36	42	25	30
25	½	**720 600 257**	1	0.142	39	36	42	27	30
32	1	**720 600 248**	1	0.216	45	42	46	28	36
32	½	**720 600 258**	1	0.113	45	42	46	31	36
32	¾	**720 600 268**	1	0.206	45	42	46	30	36
40	1 ¼	**720 600 249**	1	0.408	56	53	52	32	46
50	1 ½	**720 600 250**	1	0.538	62	59	56	36	55
63	2	**720 600 251**	1	0.859	78	74	67	42	65
75	2 ½	**720 600 252**	1	1.446	100	92	77	49	85
90	3	**720 600 253**	1	2.063	121	110	86	54	95

24 60 02



PF 2 30 153 999

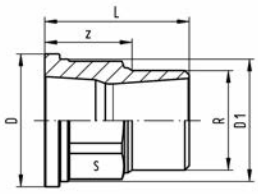
Union end malleable iron galvanized Rp

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	½	16	**724 600 206**	100	0.037	30.0	27	22	9	25
25	¾	16	**724 600 207**	-	0.072	39.0	36	22	7	31
32	1	16	**724 600 208**	120	0.088	44.0	41	26	9	38
40	1 ¼	16	**724 600 209**	-	0.172	56.0	52	31	12	48
50	1 ½	16	**724 600 210**	1	0.210	62.0	58	33	14	54
63	2	16	**724 600 211**	-	0.331	78.0	73	35	11	67
75	2 ½	16	**724 600 212**	35	0.557	97.0	92	39	12	85
90	3	16	**724 600 213**	-	0.650	109.6	110	45	15	96

24 60 08



PF 2 30 153 999

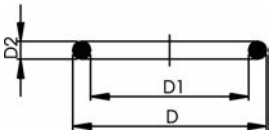
Union end malleable iron galvanized R

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	½	**724 600 806**	200	0.069	30	27	40	25	23
25	¾	**724 600 807**	120	0.115	39	36	43	27	30
32	1	**724 600 808**	-	0.161	44	41	48	29	36
40	1 ¼	**724 600 809**	-	0.294	56	52	57	36	48
50	1 ½	**724 600 810**	-	0.353	62	58	59	37	54
63	2	**724 600 811**	15	0.570	78	73	62	36	66
75	2 ½	**724 600 812**	-	0.980	100	92	75	45	85
90	3	**724 600 813**	-	1.217	121	110	80	47	95

EPDM 48 41 00
FPM 49 41 00



O-Ring gasket

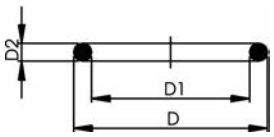
Model:

- 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	**748 410 004**	**749 410 004**	-	0.001	18	12	2.62	¼
16	10	**748 410 005**	**749 410 005**	-	0.001	21	16	2.62	⅜
20	15	**748 410 006**	**749 410 006**	-	0.001	27	20	3.53	½
25	20	**748 410 007**	**749 410 007**	100	0.002	35	28	3.53	¾
32	25	**748 410 008**	**749 410 008**	100	0.002	40	33	3.53	1

table continued next page



d [mm]	DN [mm]	EPDM Code	FPM Code	SP	kg	D [mm]	D1 [mm]	D2 [mm]	closest inch	
40	32	**748 410 009**	**749 410 009**	-	0.007	51	41	5.34	1 ¼	
50	40	**748 410 010**	**749 410 010**	-	0.060	58	47	5.34	1 ½	
63	50	**748 410 011**	**749 410 011**	100	0.003	70	60	5.34	2	
75	65	**748 410 014**	**749 410 014**	100	0.012	93	82	5.34	2 ½	
90	80	**748 410 015**	**749 410 015**	100	0.015	112	101	5.34	3	
* 90	80	**748 410 248**	**749 410 248**	1	0.020	105	95	5.34	3	
110	100	**748 410 016**	**749 410 016**	50	0.031	134	120	6.99	4	

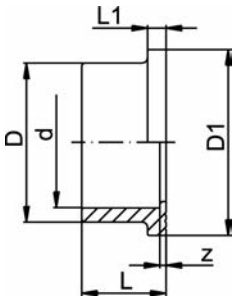
PF 2 31 800 999

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

Note:
* bevel on pipe may be needed if used with butterfly valve type 037/038/039

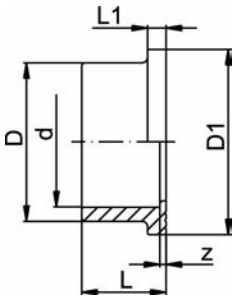


PF 2 33 198 019

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	**729 790 106**	10	0.007	3	27	34	21	6	½
25	20		10	**729 790 107**	10	0.015	3	33	41	24	7	¾
32	25		10	**729 790 108**	10	0.020	3	41	50	27	7	1
40	32		10	**729 790 109**	10	0.028	3	50	61	30	8	1 ¼
50	40		10	**729 790 110**	10	0.038	3	61	73	34	8	1 ½
63	50		10	**729 790 111**	10	0.068	3	76	90	41	9	2
75	65	2 ½	10	**729 790 112**	10	0.116	3	91	106	47	10	2 ½
90	80		10	**729 790 113**	10	0.185	5	108	125	56	11	3
110	100		10	**729 790 114**	10	0.305	5	131	150	66	12	4
140	125	5	10	**729 790 116**	6	0.535	5	165	188	81	14	5
* 160	150		10	**729 790 117**	2	0.821	5	188	213	91	16	6
* 200	200		10	**729 790 119**	2	1.123	6	224	250	112	24	8
225	200		10	**729 790 120**	2	1.330	6	248	274	125	25	8
250	250		6	**729 790 121**	-	1.699	9	274	303	140	23	9
280	250		6	**729 790 122**	1	2.183	5	307	329	151	23	10
315	300		6	**729 790 123**	1	3.321	8	346	379	172	27	12

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



PF 2 33 172 012

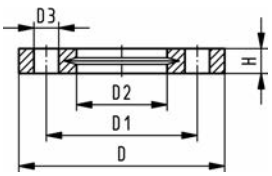
d [inch]	PN	Code	SP	kg	D1 [mm]	D [mm]	L [mm]	L1 [mm]	z [mm]
½	15	**729 791 106**	10	0.007	34	27	21	6	3
¾	15	**729 791 107**	-	0.011	41	33	24	7	3
1	15	**729 791 108**	10	0.018	50	41	27	7	3
1 ¼	15	**729 791 109**	10	0.027	61	50	32	8	3
1 ½	15	**729 791 110**	10	0.043	73	61	33	8	3
2	15	**729 791 111**	5	0.083	90	76	41	9	3
2 ½	10	**729 790 112**	10	0.116	106	91	47	10	3
3	15	**729 791 113**	10	0.187	125	108	56	11	5
4	15	**729 791 115**	20	0.309	155	136	69	12	5
5	10	**729 790 116**	6	0.535	188	165	81	14	5
6	12	**729 791 117**	10	0.912	217	198	96	16	5
8	9	**729 791 120**	2	1.470	274	248	122	20	6

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**



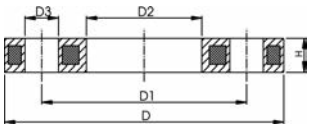
PF 2 34 238 030

* Combined version, metric-ANSI
AL: number of holes
[1]) Suitable for socket- and butt fusion systems (no pictograph on flange)

d [mm]	DN [mm]	PN	Code	SP	kg	D [mm]	D1 [mm]	D2 [mm]	D3 [mm]	H [mm]	AL	SC
[1]) 20	15	16	**727 700 406**	56	0.093	95	65.0	28	14	16	4	M12
[1]) 25	20	16	**727 700 407**	38	0.120	105	75.0	34	14	17	4	M12
[1]) 32	25	16	**727 700 408**	80	0.151	115	85.0	42	14	18	4	M12
[1]) 40	32	16	**727 700 409**	40	0.244	140	100.0	51	18	20	4	M16
[1]) 50	40	16	**727 700 410**	30	0.297	150	110.0	62	18	22	4	M16
[1]) 63	50	16	**727 700 411**	25	0.362	165	125.0	78	18	24	4	M16
[1]) 75	65	16	**727 700 412**	19	0.487	185	145.0	92	18	26	4	M16
90	80	16	**727 700 413**	15	0.550	200	160.0	110	18	27	8	M16
110	100	16	**727 700 414**	13	0.640	220	180.0	133	18	28	8	M16
140	125	16	**727 700 416**	10	0.781	250	210.0	167	18	30	8	M16
250	250	16	**727 700 421**	-	2.229	395	350.0	277	22	38	12	M20
280	250	16	**727 700 422**	-	1.651	395	350.0	310	22	38	12	M20
315	300	16	**727 700 423**	-	2.461	445	400.0	348	22	42	12	M20
355	350	10	**727 700 424**	-	3.000	515	460.0	388	22	46	16	M20
400	400	10	**727 700 425**	-	5.135	574	515.0	442	26	50	16	M24

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**

[1] Connecting dimension: ISO 2536, bolt circle acc. DN125, suitable for flange adaptor d125/DN100
[2] Connecting dimension: ISO 2536, bolt circle acc. DN225, suitable for flange adaptor d250/DN250
AL: number of holes

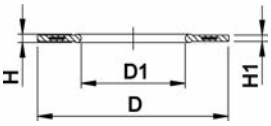
d [mm]	DN [mm]	PN	Code	kg	D [mm]	D1 [mm]	D2 [mm]	D3 [mm]	H [mm]	AL	SC
20	15	16	**727 700 206**	0.216	95	65	28	14	12	4	M12
25	20	16	**727 700 207**	0.279	105	75	34	14	12	4	M12
32	25	16	**727 700 208**	0.429	115	85	42	14	16	4	M12
40	32	16	**727 700 209**	0.621	140	100	51	18	16	4	M16
50	40	16	**727 700 210**	0.722	150	110	62	18	20	4	M16
63	50	16	**727 700 211**	1.084	165	125	78	18	20	4	M16
75	65	16	**727 700 212**	1.349	185	145	92	18	20	4	M16
90	80	16	**727 700 213**	1.369	200	160	110	18	20	8	M16
110	100	16	**727 700 214**	1.522	220	180	133	18	20	8	M16
[1] 125	125	16	**727 700 215**	2.475	250	210	150	18	24	8	M16
140	125	16	**727 700 216**	2.033	250	210	167	18	24	8	M16
200	200	16	**727 700 219**	6.143	340	295	226	22	27	8	M20
225	200	16	**727 700 220**	4.448	340	295	250	22	27	8	M20
250	250	16	**727 700 021**	7.179	395	350	277	22	30	12	M20
[2] 250	225	16	**727 700 221**	8.340	395	325	277	22	30	8	M20
280	250	16	**727 700 222**	5.547	395	350	310	22	30	12	M20
315	300	16	**727 700 223**	6.980	445	400	348	22	34	12	M20
355	350	16	**727 700 224**	12.465	515	460	388	23	40	16	M20
400	400	16	**727 700 225**	17.607	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	**748 440 705**	**749 440 705**	0.012
20	15	16	**748 440 706**	**749 440 706**	0.013
25	20	16	**748 440 707**	**749 440 707**	0.014
32	25	16	**748 440 708**	**749 440 708**	0.019
40	32	16	**748 440 709**	**749 440 709**	0.026
50	40	16	**748 440 710**	**749 440 710**	0.039
63	50	16	**748 440 711**	**749 440 711**	0.050
75	65	16	**748 440 712**	**749 440 712**	0.082
90	80	16	**748 440 713**	**749 440 713**	0.083
110	100	16	**748 440 714**	**749 440 714**	0.127
125	100	16	**748 440 715**	**749 440 715**	0.105
140	125	16	**748 440 716**	**749 440 716**	0.173
160 / 180	150	16	**748 440 717**	**749 440 717**	0.207
200	200	16	**748 440 719**	**749 440 719**	0.263
225	200	16	**748 440 720**	**749 440 720**	0.255
250	250	16	**748 440 721**	**749 440 721**	0.482
280	250	16	**748 440 722**	**749 440 722**	0.323
315	300	16	**748 440 723**	**749 440 723**	0.549

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	

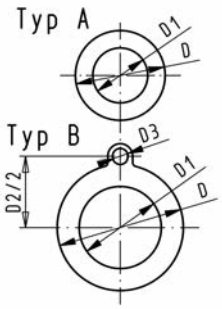
PF 2 30 162 037

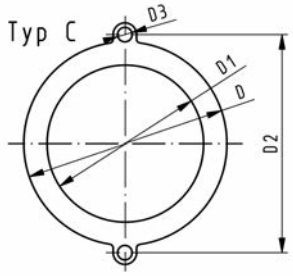
EPDM 48 40 03

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



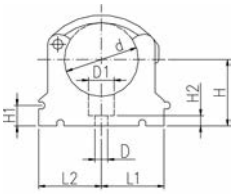


PF 2 30 162 003

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	**748 400 305**	0.004	46	16			2	6 - 26	
20	15	10	A	**748 400 306**	0.012	51	20			2	10 - 30	
25	20	10	A	**748 400 307**	0.004	61	25			2	15 - 35	
32	25	10	A	**748 400 308**	0.008	71	32			2	22 - 42	
40	32	10	A	**748 400 309**	0.013	82	40			3	30 - 50	
50	40	10	A	**748 400 310**	0.016	92	50			3	40 - 60	
63	50	10	A	**748 400 311**	0.018	107	63			3	53 - 73	
75	65	10	A	**748 400 312**	0.029	127	71			3	61 - 81	
90	80	10	A	**748 400 313**	0.035	142	84			3	74 - 94	
110	100	10	B	**748 400 314**	0.051	162	104	180	18	4	94 - 114	
125	100	10	B	**748 400 315**	0.044	162	119	180	18	4	109 - 129	
140	125	10	B	**748 400 316**	0.068	192	134	210	18	4	124 - 144	
160 / 180	150	10	B	**748 400 317**	0.090	218	155	241	22	4	145 - 165	
200	200	6	C	**748 400 319**	0.210	273	195	295	22	5	185 - 205	
225	200	6	C	**748 400 320**	0.140	273	216	295	22	5	206 - 226	
250	250	6	C	**748 400 321**	0.210	328	250	350	22	5	240 - 260	
280	250	6	C	**748 400 322**	0.151	328	273	350	22	5	263 - 283	
315	300	6	C	**748 400 323**	0.237	378	305	400	22	5	295 - 315	

Pipe clips metric

KLIP-IT pipe clip type 061 PP metric



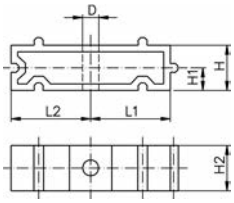
Model:
- Material: Clip and safety clip PP black, UV resistant, bolts galvanized
- d16 - d63: Height designed for Ball Valve Type 546 and 543
- **Minimum order quantity: standard packagings SP**

d [mm]	d [inch]	Code	SP	kg
* 10		**167 061 003**	10	0.003
* 12		**167 061 004**	10	0.003
* 16		**167 061 035**	1	0.007
* 20		**167 061 036**	1	0.007
* 25		**167 061 037**	10	0.009
* 32		**167 061 038**	10	0.012
40		**167 061 039**	10	0.027
50		**167 061 040**	10	0.031
63		**167 061 041**	10	0.052
75	2 ½	**167 061 012**	10	0.057
90	3	**167 061 013**	10	0.092
110	4	**167 061 014**	10	0.117
125		**167 061 015**	10	0.180
140	5	**167 061 016**	10	0.224
160		**167 061 017**	10	0.242

d [mm]	D [mm]	D1 [mm]	L1 [mm]	L2 [mm]	H [mm]	H1 [mm]	H2 [mm]	H3 [mm]	SC	closest inch
* 10	5	8	11	14	20	10	6	12	M4	⅛
* 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 [mm]	Inch [inch]	Code	SP	kg
10 - 12	⅛ - ¼	**167 061 153**	10	0.003
16	⅜	**167 061 155**	10	0.005
20	½	**167 061 156**	10	0.005
25	¾	**167 061 157**	10	0.007
32	1	**167 061 158**	10	0.006
40	1 ¼	**167 061 159**	10	0.015
50	1 ½	**167 061 160**	10	0.017
63	2	**167 061 161**	10	0.020
75	2 ½	**167 061 162**	10	0.027
90	3	**167 061 163**	10	0.039
110	4	**167 061 164**	10	0.048
125	4 ½	**167 061 165**	10	0.059
140	5	**167 061 166**	10	0.065
160	6	**167 061 167**	10	0.071

d [mm]	D [mm]	L1 [mm]	L2 [mm]	H [mm]	H1 [mm]	H2 [mm]	HoH +/- 2mm [mm]	SC
10 - 12	5	11	14	20	10	12	1.0	M4
16	6	14	17	20	10	16	17.0	M5
20	6	17	19	20	10	16	21.4	M5

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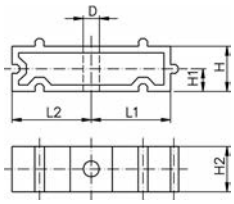


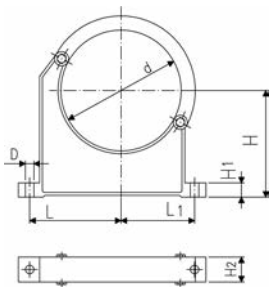
d [mm]	D [mm]	L1 [mm]	L2 [mm]	H [mm]	H1 [mm]	H2 [mm]	HoH +/- 2mm [mm]	SC
25	6	19	22	20	10	16	26.9	M5
32	6	24	27	20	10	16	36.7	M5
40	7	34	34	20	10	22	44.4	M6
50	7	37	37	20	10	22	52.3	M6
63	9	45	45	20	10	25	66.7	M8
75	9	52	52	20	10	25	81.2	M8
90	9	65	65	20	10	28	100.0	M8
110	9	79	79	20	10	28	127.3	M8
125	9	88	88	20	10	32	142.9	M8
140	9	98	98	20	10	32	161.4	M8
160	9	109	109	20	10	32	185.1	M8

PF 2 30 162 023

Pipe clip type 060 PP metric

Model:

- Material: Clip and safety clip PP black, UV resistant, bolts galvanized
- Accidental opening of the safety clip is not possible
- **Minimum order quantity: standard packaging SP or gross packaging GP**
- Clip and safety clip are not assembled in the packaging.
- Pipes with flanges can be installed directly



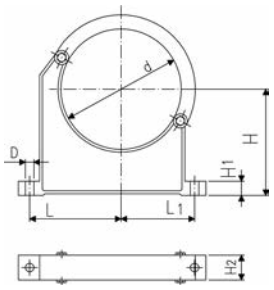
d [mm]	d [inch]	Code	SP	kg	D [mm]	L [mm]	L1 [mm]	H [mm]	H1 [mm]	H2 [mm]	SC
90	3	**167 060 038**	10	0.144	9	89	71	105	15	33	M 8
110		**167 060 039**	10	0.158	9	94	80	115	15	33	M 8
125		**167 060 040**	10	0.249	11	116	91	130	20	35	M10

PF 2 30 162 023

Pipe clip type 060 PP metric

Model:

- Material: Clip and safety clip PP black, UV resistant, bolts galvanized
- Accidental opening of the safety clip is not possible
- **Minimum order quantity: standard packaging SP or gross packaging GP**
- Clip and safety clip are not assembled in the packaging.
- Pipes with flanges can be installed directly



d [mm]	d [inch]	Code	SP	kg	D [mm]	L [mm]	L1 [mm]	H [mm]	H1 [mm]	H2 [mm]	SC
90	3	**167 060 038**	10	0.144	9	89	71	105	15	33	M 8
110		**167 060 039**	10	0.158	9	94	80	115	15	33	M 8
125		**167 060 040**	10	0.249	11	116	91	130	20	35	M10

PF 2 30 162 023

Solvent Cement and Tools

99 29 80

Tangit ABS solvent cement

PF 2 28 473 005

- 0,65 kg can (net)

Code	kg	Description	
799 298 022	0.751	tin: 0.65 kg	

99 29 80

Tangit PVC-U/PVC-C/ABS cleaner

PF 2 28 473 002

Model:
- For PVC-U, PVC-C, ABS
- 1 litre tin

Code	kg	
799 298 010	0.868	

99 29 80

Cap for cement

PF 2 28 473 009

- Cap prevents the evaporation of the solvent whilst using the Tangit cement

Code	kg	
799 298 028	0.030	

99 29 90

Round brush

PF 2 30 217 004

d-d [mm]		Code	kg	Closest inch	
6 - 10	4 mm (for Fittings 6-10mm)	**799 299 001**	0.004	- ⅛	
12 - 32	8 mm (for Fittings 12-32mm)	**799 299 002**	0.006	¼ - 1	

99 29 90

Flat brush

PF 2 30 217 005

d-d [mm]		Code	kg	Closest inch	
40 - 63	25x3 mm (for Fittings 40-63mm)	**799 299 003**	0.015	1 ¼ - 2	
75 - 225	50x5 mm (for Fittings 75-225mm)	**799 299 004**	0.035	2 ½ - 8	
250 - 400	75x6 mm (for Fittings 250-400mm)	**799 299 005**	0.053	9 - 16	

PF 2 35 268 001

Chamfering tool

Size	d-d [mm]	Code	kg	Closest inch	
1	16 - 75	**799 495 145**	0.720	⅜ - 2 ½	
2	32 - 200	**799 495 146**	0.992	1 - 8	

ABS metric Valves

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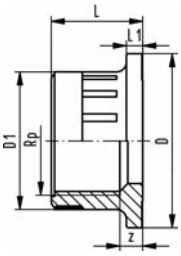
Valve ends ball valve type 546 and 543

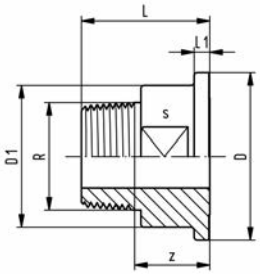


PF 2 33 542 999

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

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]
⅜	16	**169 480 925**	0.008	38	24	20	4	7
½	16	**169 480 926**	0.010	38	28	22	4	6
¾	16	**169 480 927**	0.014	44	34	25	5	7
1	16	**169 480 928**	0.023	53	42	28	5	7
1 ¼	16	**169 480 929**	0.035	65	52	30	5	7
1 ½	16	**169 480 930**	0.077	77	63	32	6	9
2	16	**169 480 931**	0.130	99	78	38	7	10

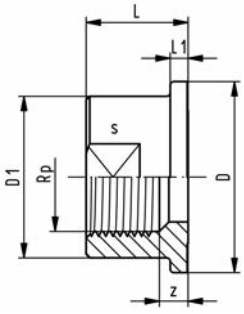


PF 2 33 542 999

Valve end 546 and 543 brass With threaded spigot R

Model:
- Connection to metal threads

Inch	Code	kg	D [mm]	D1 [mm]	D2 [mm]	z [mm]	L [mm]	L1 [mm]	s [mm]
½	**161 486 640**	0.144	38	32	13	23	36	4	30
¾	**161 486 641**	0.201	44	38	16	22	36	5	36
1	**161 486 642**	0.326	53	45	20	24	41	5	41



PF 2 33 542 999

Valve end 546 and 543 brass With threaded socket Rp

Model:
- Connection to metal threads

Inch	Code	kg	D [mm]	D1 [mm]	D2 [mm]	z [mm]	L [mm]	L1 [mm]	s [mm]
½	**161 486 651**	0.091	38	32	15	5	20	4	30
¾	**161 486 652**	0.149	44	38	20	8	25	5	36
1	**161 486 653**	0.224	53	45	25	10	29	5	41

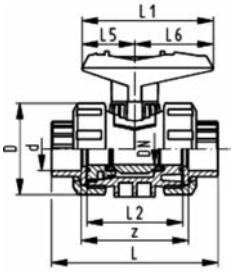
Ball valves

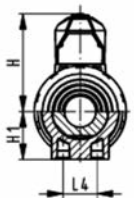
DN10/15 - 50

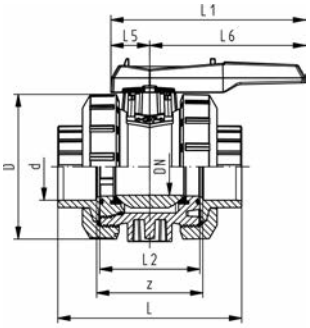
Ball valve type 546 ABS
With solvent cement sockets metric

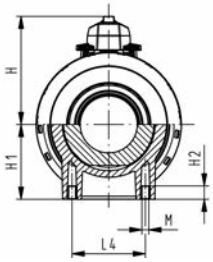
Model:
- For easy installation and removal
- z-dimension, valve end and union nut are **not compatible** with type 346 (DN10/15-50) resp. type 370 (DN65-100)
- Ball seals PTFE
- Without mounting inserts

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







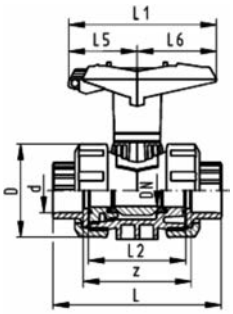


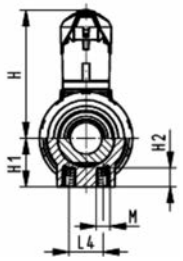
PF 2 33 542 601

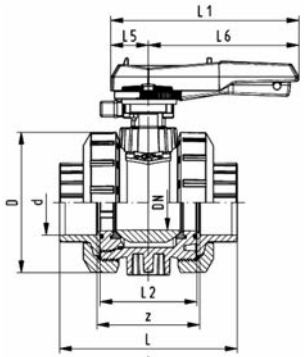
d [mm]	DN [mm]	PN	kv-value (Δp=1 bar) [l/min]	EPDM Code	kg
16	10	10	71	**169 546 001**	0.112
20	15	10	185	**169 546 002**	0.119
25	20	10	350	**169 546 003**	0.184
32	25	10	700	**169 546 004**	0.265
40	32	10	1000	**169 546 005**	0.470
50	40	10	1600	**169 546 006**	0.647
63	50	10	3100	**169 546 007**	1.190
75	65	10	5000	**169 546 008**	2.936
90	80	10	7000	**169 546 009**	4.973
110	100	10	11000	**169 546 010**	6.930

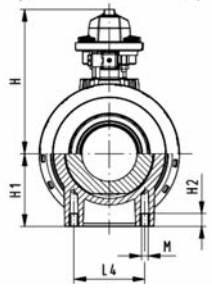
d [mm]	D [mm]	H [mm]	H1 [mm]	L [mm]	L1 [mm]	L2 [mm]	L4 [mm]	L5 [mm]	L6 [mm]	z [mm]	closest inch
16	50	57	27	92	77	56	25	32	45	64	⅜
20	50	57	27	95	77	56	25	32	45	64	½
25	58	67	30	110	97	65	25	39	58	72	¾
32	68	73	36	123	97	71	25	39	58	79	1
40	84	90	44	146	128	85	45	54	74	94	1 ¼
50	97	97	51	157	128	89	45	54	74	95	1 ½
63	124	116	64	183	152	101	45	66	87	107	2
75	166	149	85	233	270	136	70	64	206	144	2 ½
90	200	161	105	254	270	141	70	64	206	151	3
110	238	178	123	301	320	164	120	64	256	174	4

DN10/15 - 50









PF 2 33 542 601

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 (Δp=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

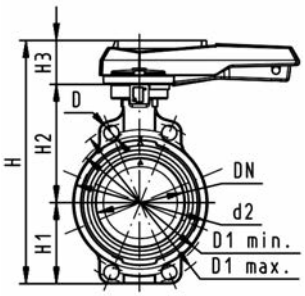
d [mm]	**D** [mm]	**H** [mm]	**H1** [mm]	**H2** [mm]	**L** [mm]	**L1** [mm]	**L2** [mm]	**L4** [mm]	**L5** [mm]	**L6** [mm]	**M**	**z** [mm]	**closest inch**
16	50	79	27	12	92	87	56	25	42	45	M6	64	⅜
20	50	79	27	12	95	87	56	25	42	45	M6	64	½
25	58	88	30	12	110	108	65	25	50	58	M6	72	¾
32	68	94	36	12	123	108	71	25	50	58	M6	79	1
40	84	113	44	15	146	140	85	45	66	75	M8	94	1 ¼
50	97	119	51	15	157	140	89	45	66	75	M8	95	1 ½
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 ½
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

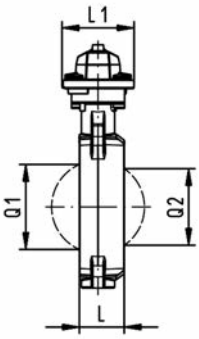
Butterfly valves

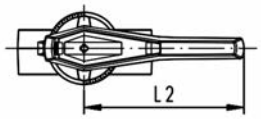
Butterfly valve type 567 ABS
Hand lever with ratchet settings

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







PF 2 33 564 001

d [mm]	DN [mm]	PN	kv-value (Δp=1 bar) [l/min]	EPDM Code	kg
63	50	10	1470	**169 567 002**	1.187
75	65	10	2200	**169 567 003**	1.282
90	80	10	3000	**169 567 004**	1.420
110	100	10	6500	**169 567 005**	2.020
140	125	10	11500	**169 567 006**	2.536
160	150	10	16600	**169 567 007**	3.337
225	200	10	39600	**169 567 008**	5.808

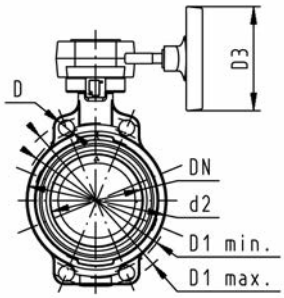
d [mm]	D [mm]	D1 min. [mm]	D1 max. [mm]	d2 [mm]	H [mm]	H1 [mm]	H2 [mm]	H3 [mm]	L [mm]	L1 [mm]	L2 [mm]	Q1 [mm]	Q2 [mm]	closest inch
63	19	120.0	125.0	104	264	77	134	54	45	106	205	40		2
75	19	139.7	145.0	115	277	83	140	54	46	106	205	54	35	2 ½
90	19	150.0	160.0	131	289	89	146	54	49	106	205	67	50	3
110	19	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

Butterfly valve type 567 ABS
Reduction gear with handwheel

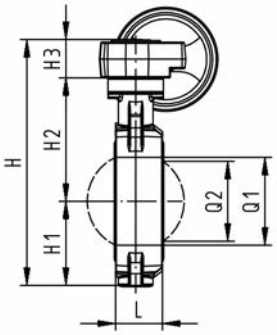
Model:

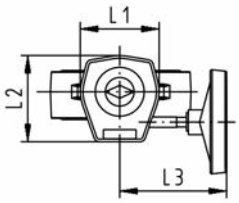
- Connecting dimension: ISO 7005 PN 10, EN 1092 PN 10, DIN 2501 PN 10, ANSI/ASME B 16.5 Class 150, BS 1560: 1989, BS 4504, JIS B 2220
- Overall length according to EN 558, ISO 5752

d [mm]	DN [mm]	PN	kv-value (Δp=1 bar) [l/min]	EPDM Code	kg
63	50	10	1470	**169 567 022**	3.078
75	65	10	2200	**169 567 023**	3.201
90	80	10	3000	**169 567 024**	3.259
110	100	10	6500	**169 567 025**	3.493
140	125	10	11500	**169 567 026**	4.526
160	150	10	16600	**169 567 027**	5.118
225	200	10	39600	**169 567 028**	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





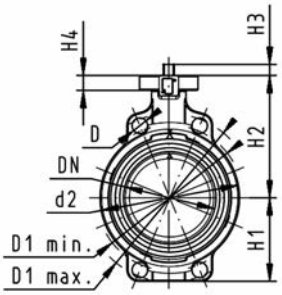
d [mm]	Q2 [mm]	closest inch
63		2
75	35	2 ½
90	50	3
110	74	4
140	97	5
160	123	6
225	169	8

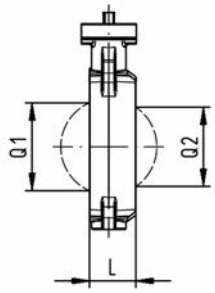
PF 2 33 564 003

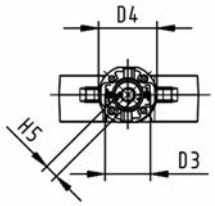
Butterfly valve type 567 ABS
Bare shaft

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 (Δp=1 bar) [l/min]	EPDM Code	kg
63	50	10	1470	**169 567 802**	0.763
75	65	10	2200	**169 567 803**	0.859
90	80	10	3000	**169 567 804**	0.999
110	100	10	6500	**169 567 805**	1.535
140	125	10	11500	**169 567 806**	2.018
160	150	10	16600	**169 567 807**	2.858
225	200	10	39600	**169 567 808**	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

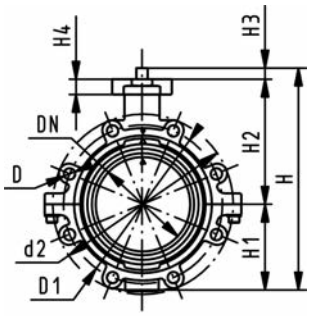
d [mm]	closest inch
63	2
75	2 ½
90	3
110	4
140	5
160	6
225	8

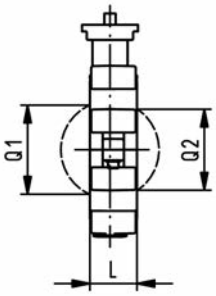
PF 2 33 564 998

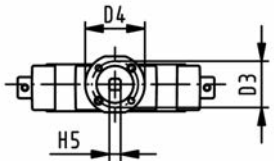
Lugstyle butterfly valve type 568 ABS
Bare shaft

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







PF 2 33 565 998

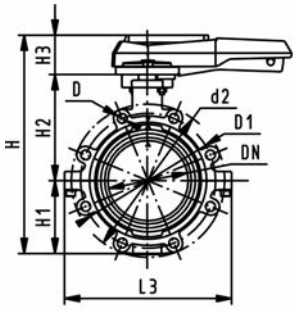
d [mm]	DN [mm]	PN	kv-value (Δp=1 bar) [l/min]	EPDM Code	kg
63	50	10	1470	**169 568 802**	2.853
75	65	10	2200	**169 568 803**	3.200
90	80	10	3000	**169 568 804**	4.217
110	100	10	6500	**169 568 805**	5.633
140	125	10	11500	**169 568 806**	7.502
160	150	10	16600	**169 568 807**	9.341
225	200	10	39600	**169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

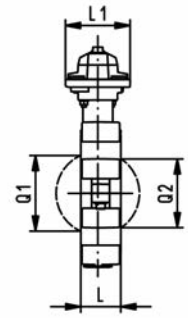
d [mm]	d2 [mm]	D	D1 [mm]	D3 [mm]	D4 [mm]	H [mm]	H1 [mm]	H2 [mm]	H3 [mm]	H4 [mm]	L [mm]	Q1 [mm]	Q2 [mm]	closest inch
63	150	M16	125	70	90	222	77	134	27	23	45	40		2
75	170	M16	145	70	90	235	83	140	27	23	46	54	35	2 ½
90	184	M16	160	70	90	247	89	146	27	23	49	67	50	3
110	216	M16	180	70	90	287	104	167	16	23	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

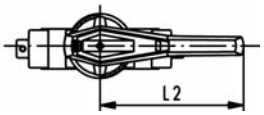
Lugstyle butterfly valve type 568 ABS
Hand lever with ratchet settings

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







PF 2 33 565 001

d [mm]	DN [mm]	PN	kv-value (Δp=1 bar) [l/min]	EPDM Code	kg
63	50	10	1470	**169 568 002**	3.832
75	65	10	2200	**169 568 003**	3.422
90	80	10	3000	**169 568 004**	4.676
110	100	10	6500	**169 568 005**	6.561
140	125	10	11500	**169 568 006**	7.772
160	150	10	16600	**169 568 007**	9.611
225	200	10	39600	**169 568 008**	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 ½
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

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 (Δp=1 bar) [l/min]	EPDM Code	kg
63	50	10	1470	**169 568 022**	5.113
75	65	10	2200	**169 568 023**	5.460
90	80	10	3000	**169 568 024**	6.477
110	100	10	6500	**169 568 025**	7.893
140	125	10	11500	**169 568 026**	9.762
160	150	10	16600	**169 568 027**	11.601
225	200	10	39600	**169 568 028**	18.661

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]	Q2 [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	35
90	184	M16	160	150	303	89	146	50	49	110	120	155	205	67	50
110	216	M16	180	150	339	104	167	50	56	110	120	155	244	88	74
140	246	M16	210	150	366	117	181	50	64	110	120	155	272	113	97
160	273	M20	240	150	387	130	189	50	72	110	120	155	297	139	123
225	334	M20	295	150	436	158	210	50	73	110	120	155	360	178	169

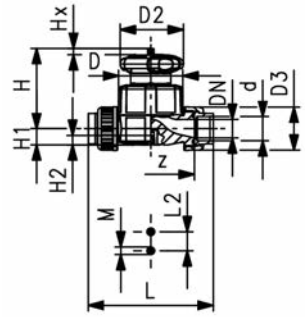
d [mm]	closest inch
63	2
75	2 ½
90	3
110	4
140	5
160	6
225	8

PF 2 33 565 003

Diaphragm valves new generation

Diaphragm valve type 514 ABS
With solvent cement sockets metric

Model:
- Double flow rate compared to predecessor
- One housing nut replaces four screws
- Handwheel with built-in locking mechanism
- For easy installation and removal
- Short overall length



Option:
- Individual configuration of the valve (see diagram)
- Self adjusting multifunctional module with integrated limit switches

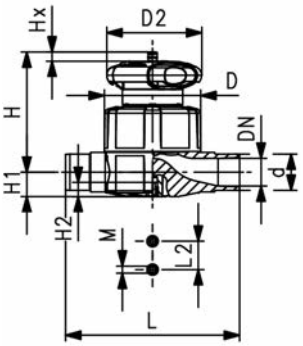
d [mm]	DN [mm]	PN	kv-value (Δp=1 bar) [l/min]	EPDM Code	PTFE/EPDM Code	kg
20	15	10	125	**169 514 012**	**169 514 032**	0.364
25	20	10	271	**169 514 013**	**169 514 033**	0.478
32	25	10	481	**169 514 014**	**169 514 034**	1.081
40	32	10	759	**169 514 015**	**169 514 035**	1.357
50	40	10	1263	**169 514 016**	**169 514 036**	2.374
63	50	10	1728	**169 514 017**	**169 514 037**	3.111

d [mm]	D [mm]	D2 [mm]	D3 [mm]	L [mm]	L2 [mm]	H [mm]	H1 [mm]	H2 [mm]	M	z [mm]	Lift = Hx [mm]	closest inch
20	65	65	43	128	25	73	14	12	M6	96	7	½
25	80	65	51	152	25	81	18	12	M6	114	10	¾
32	88	87	58	166	25	107	22	12	M6	122	13	1
40	101	87	72	192	45	115	26	15	M8	140	15	1 ¼
50	117	135	83	222	45	148	32	15	M8	160	19	1 ½
63	144	135	100	266	45	166	39	15	M8	190	25	2

PF 2 33 778 020

Diaphragm valve type 515 ABS
With solvent cement spigots metric

Model:
- Double flow rate compared to predecessor
- One housing nut replaces four screws
- Handwheel with built-in locking mechanism
- Overall length EN 558



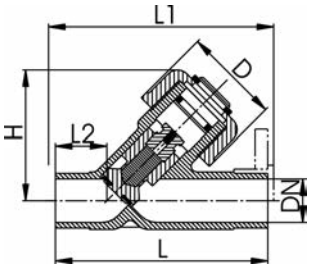
Option:
- Individual configuration of the valve (see diagram)
- Self adjusting multifunctional module with integrated limit switches

d [mm]	DN [mm]	PN	kv-value (Δp=1 bar) [l/min]	EPDM Code	PTFE/EPDM Code	kg
20	15	10	125	**169 515 012**	**169 515 032**	0.318
25	20	10	271	**169 515 013**	**169 515 033**	0.412
32	25	10	481	**169 515 014**	**169 515 034**	0.992
40	32	10	759	**169 515 015**	**169 515 035**	1.164
50	40	10	1263	**169 515 016**	**169 515 036**	2.141
63	50	10	1728	**169 515 017**	**169 515 037**	2.726

d [mm]	D [mm]	D2 [mm]	L [mm]	L2 [mm]	H [mm]	H1 [mm]	H2 [mm]	M	Lift = Hx [mm]	closest inch
20	65	65	124	25	73	14	12	M6	7	½
25	80	65	144	25	81	18	12	M6	10	¾
32	88	87	154	25	107	22	12	M6	13	1
40	101	87	174	45	115	26	15	M8	15	1 ¼
50	117	135	194	45	148	32	15	M8	19	1 ½
63	144	135	224	45	166	39	15	M8	25	2

PF 2 33 778 010

Angle seat check valves



PF 2 33 199 005

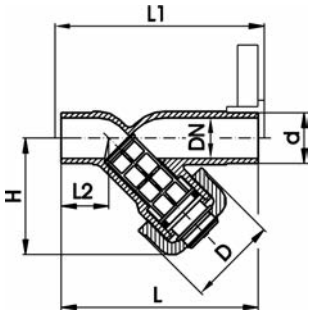
Angle seat check valve type 303 ABS
With solvent cement spigots metric

Model:

- For horizontal or vertical installation
- Leakproof from: EPDM 2m, FPM 3m water column
- Specific gravity of piston approx. 2 kg/dm³
- Overall length EN 558

d [mm]	DN [mm]	PN	kv-value (Δp=1 bar) [l/min]	EPDM Code	kg	D [mm]	L [mm]	L1 [mm]	L2 [mm]	H [mm]	closest inch	
20	15	10	95	**169 303 006**	0.092	43	124	130	28	65	½	
25	20	10	180	**169 303 007**	0.133	47	144	150	37	75	¾	
32	25	10	327	**169 303 008**	0.219	56	154	160	37	90	1	
40	32	10	484	**169 303 009**	0.348	64	174	180	44	102	1 ¼	
50	40	10	725	**169 303 010**	0.615	82	194	200	48	123	1 ½	
63	50	10	1130	**169 303 011**	1.059	95	224	230	60	144	2	

Strainers



PF 2 33 199 005

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°C to +60°C
- Screen in PVC-U operable temperature range up 0°C to +60°C

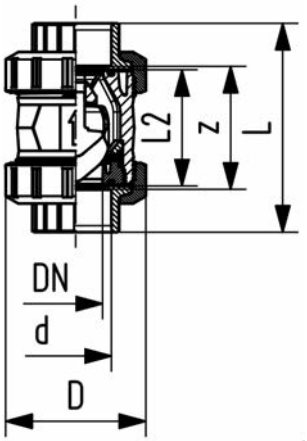
d [mm]	**DN** [mm]	**PN**	**EPDM Code**	**kg**	**D** [mm]	**L** [mm]	**L1** [mm]	**L2** [mm]	**H** [mm]	**closest inch**
20	15	10	**169 305 302**	0.081	48	124	130	28	65	½
25	20	10	**169 305 303**	0.120	54	144	150	37	76	¾
32	25	10	**169 305 304**	0.180	62	154	160	37	90	1
40	32	10	**169 305 305**	0.284	71	174	180	44	104	1 ¼
50	40	10	**169 305 306**	0.484	88	194	200	48	124	1 ½
63	50	10	**169 305 307**	0.780	103	224	230	60	148	2

Cone check valves

Check valve type 562 ABS
With solvent cement sockets metric

Model:

- Spring loaded, spring made of stainless steel (1.4310)
- Spring available in other materials, see spare parts
- Designed for easy installation and removal
- Vibration free even at high flow velocity
- Flow-optimized return cone, double guided
- For horizontal or vertical installation
- Compact installation length, same as ball valve type 546
- Z-length, end connectors and union nuts **not** compatible with type 360



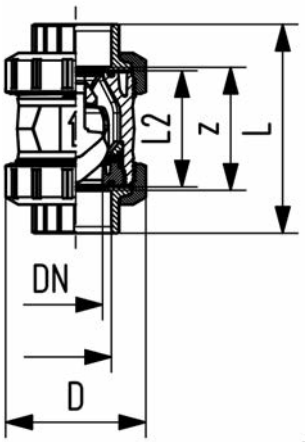
PF 2 33 988 111

d [mm]	DN [mm]	PN	kv-value (Δp=1 bar) [l/min]	EPDM Code	kg	D [mm]	L [mm]	L2 [mm]	z [mm]	closest inch
16	10	10	190	**169 562 001**	0.090	50	92	56	64	⅜
20	15	10	180	**169 562 002**	0.090	50	95	56	64	½
25	20	10	380	**169 562 003**	0.190	58	110	65	72	¾
32	25	10	460	**169 562 004**	0.220	68	123	71	79	1
40	32	10	850	**169 562 005**	0.380	84	146	85	94	1 ¼
50	40	10	1080	**169 562 006**	0.560	97	157	89	95	1 ½
63	50	10	1670	**169 562 007**	0.990	124	183	101	107	2
75	65	10	2950	**169 562 008**	2.420	166	233	136	144	2 ½
90	80	10	3600	**169 562 009**	3.870	200	254	141	151	3
110	100	10	4150	**169 562 010**	6.240	238	301	164	174	4

Check valve type 562 ABS
With threaded sockets Rp

Model:

- Spring loaded, spring made of stainless steel (1.4310)
- Spring available in other materials, see spare parts
- Designed for easy installation and removal
- Vibration free even at high flow velocity
- Flow-optimized return cone, double guided
- For horizontal or vertical installation
- Compact installation length, same as ball valve type 546
- Z-length, end connectors and union nuts **not** compatible with type 360



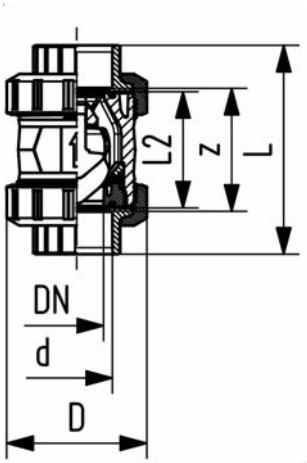
PF 2 33 988 111

Rp [inch]	DN [mm]	PN	kv-value (Δp=1 bar) [l/min]	EPDM Code	kg	D [mm]	L [mm]	L2 [mm]	z [mm]
⅜	10	10	190	**169 562 021**	0.090	50	95	56	69
½	15	10	180	**169 562 022**	0.100	50	100	56	67
¾	20	10	380	**169 562 023**	0.200	58	114	65	78
1	25	10	460	**169 562 024**	0.220	68	127	71	85
1 ¼	32	10	850	**169 562 025**	0.380	84	146	85	100
1 ½	40	10	1080	**169 562 026**	0.580	97	152	89	106
2	50	10	1670	**169 562 027**	1.040	124	177	101	121

Check valve type 561 ABS
With solvent cement sockets metric

Model:

- Designed for easy installation and removal
- Vibration free even at high flow velocity
- Flow-optimized return cone, double guided
- For vertical installation
- Compact installation length, same as ball valve type 546
- Z-length, end connectors and union nuts **not** compatible with type 360



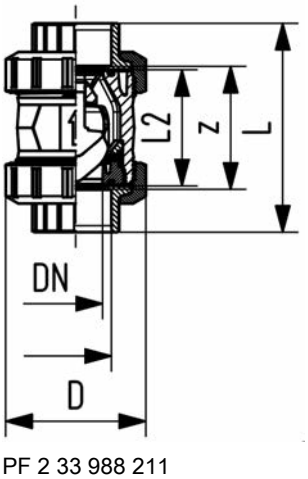
PF 2 33 988 211

d [mm]	DN [mm]	PN	kv-value (Δp=1 bar) [l/min]	EPDM Code	kg	D [mm]	L [mm]	L2 [mm]	z [mm]	closest inch
16	10	10	190	**169 561 001**	0.090	50	92	56	64	⅜
20	15	10	180	**169 561 002**	0.090	50	95	56	64	½
25	20	10	380	**169 561 003**	0.190	58	110	65	72	¾
32	25	10	460	**169 561 004**	0.220	68	123	71	79	1
40	32	10	850	**169 561 005**	0.380	84	146	85	94	1 ¼
50	40	10	1080	**169 561 006**	0.560	97	157	89	95	1 ½
63	50	10	1670	**169 561 007**	0.990	124	183	101	107	2
75	65	10	2950	**169 561 008**	2.420	166	233	136	144	2 ½
90	80	10	3600	**169 561 009**	3.870	200	254	141	151	3
110	100	10	4150	**169 561 010**	6.240	238	301	164	174	4

Check valve type 561 ABS
With threaded sockets Rp

Model:

- Designed for easy installation and removal
- Vibration free even at high flow velocity
- Flow-optimized return cone, double guided
- For vertical installation
- Compact installation length, same as ball valve type 546
- Z-length, end connectors and union nuts **not** compatible with type 360



PF 2 33 988 211

Rp [inch]	DN [mm]	PN	kv-value (Δp=1 bar) [l/min]	EPDM Code	kg	D [mm]	L [mm]	L2 [mm]	z [mm]
⅜	10	10	190	**169 561 021**	0.090	50	95	56	69
½	15	10	180	**169 561 022**	0.100	50	100	56	67
¾	20	10	380	**169 561 023**	0.200	58	114	65	78
1	25	10	460	**169 561 024**	0.220	68	127	71	85
1 ¼	32	10	850	**169 561 025**	0.380	84	146	85	100
1 ½	40	10	1080	**169 561 026**	0.580	97	152	89	106
2	50	10	1670	**169 561 027**	1.040	124	177	101	121

Ball valves electric

DN10/15 - 50

Ball valve type 107 ABS 100-230V
With manual emergency override
With solvent cement sockets metric

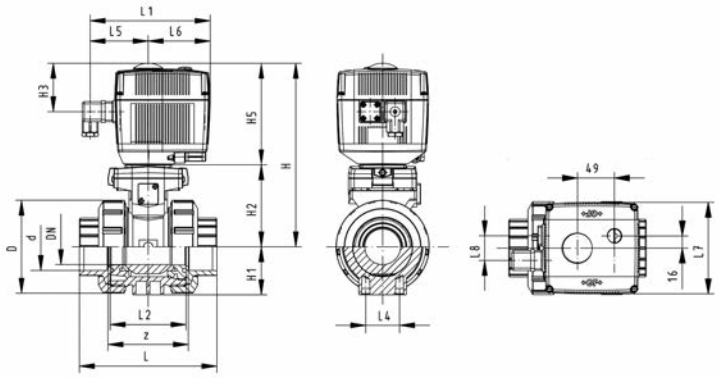
Model:
- Built on with electric actuator EA11
- Voltage 100-230 V, 50-60 Hz
- Control range 90°<)
- Control time 5 s/90°<)
- For easy installation and removal
- Integrated stainless steel mounting inserts

Option:
- Individual configuration of the valve (see diagram)

d [mm]	DN [mm]	PN	kv-value (Δp=1 bar) [l/min]	EPDM Code	kg
16	10	10	70	**199 107 082**	2.072
20	15	10	185	**199 107 083**	2.072
25	20	10	350	**199 107 084**	2.189
32	25	10	700	**199 107 085**	2.261
40	32	10	1000	**199 107 086**	2.465
50	40	10	1600	**199 107 087**	2.648
63	50	10	3100	**199 107 088**	3.222

d [mm]	D [mm]	H [mm]	H1 [mm]	H2 [mm]	H3 [mm]	H5 [mm]	L [mm]	L1 [mm]	L2 [mm]	L4 [mm]	L5 [mm]	L6 [mm]	L7 [mm]	L8 [mm]	z [mm]
16	50	200	27	64	64	137	92	161	56	25	77	83	122	33	64
20	50	200	27	64	64	137	95	161	56	25	77	83	122	33	64
25	58	209	30	73	64	137	110	161	65	25	77	83	122	33	72
32	68	209	36	73	64	137	123	161	71	25	77	83	122	33	79
40	84	220	44	84	64	137	146	161	85	45	77	83	122	33	94
50	97	220	51	84	64	137	157	161	89	45	77	83	122	33	95
63	124	243	64	106	64	137	183	161	101	45	77	83	122	33	107

d [mm]	closest inch
16	⅜
20	½
25	¾
32	1
40	1 ¼
50	1 ½
63	2



PF 3 39 695 033

DN10/15 - 50

Ball valve type 107 ABS 100-230V
With manual emergency override
With threaded sockets Rp

Model:

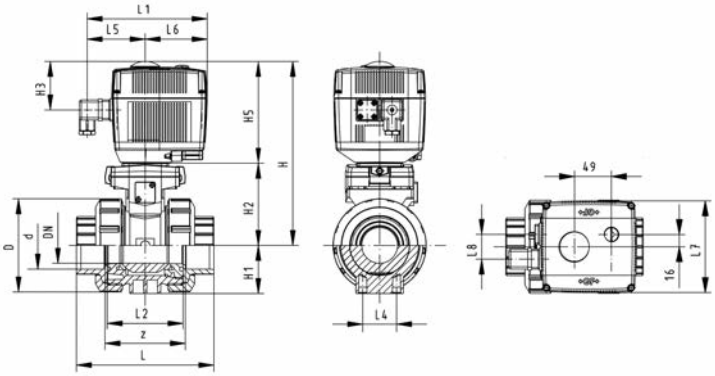
- Built on with electric actuator EA11
- Voltage 100-230 V, 50-60 Hz
- Control range 90°<)
- Control time 5 s/90°<)
- For easy installation and removal
- Integrated stainless steel mounting inserts

Option:

- Individual configuration of the valve (see diagram)

Rp [inch]	DN [mm]	PN	kv-value (Δp=1 bar) [l/min]	EPDM Code	kg
⅜	10	10	70	**199 107 682**	2.100
½	15	10	185	**199 107 683**	2.100
¾	20	10	350	**199 107 684**	2.200
1	25	10	700	**199 107 685**	2.300
1 ¼	32	10	1000	**199 107 686**	2.600
1 ½	40	10	1600	**199 107 687**	3.000
2	50	10	3100	**199 107 688**	3.800

Rp [inch]	D [mm]	H [mm]	H1 [mm]	H2 [mm]	H3 [mm]	H5 [mm]	L [mm]	L1 [mm]	L2 [mm]	L4 [mm]	L5 [mm]	L6 [mm]	L7 [mm]	L8 [mm]	z [mm]
⅜	50	200	27	64	64	137	92	161	56	25	77	83	122	33	64
½	50	200	27	64	64	137	95	161	56	25	77	83	122	33	64
¾	58	209	30	73	64	137	110	161	65	25	77	83	122	33	72
1	68	209	36	73	64	137	123	161	71	25	77	83	122	33	79
1 ¼	84	220	44	84	64	137	146	161	85	45	77	83	122	33	94
1 ½	97	220	51	84	64	137	157	161	89	45	77	83	122	33	95
2	124	243	64	106	64	137	183	161	101	45	77	83	122	33	107



PF 3 39 695 033

DN10/15 - 50

Ball valve type 107 ABS 24V
With manual emergency override
With solvent cement sockets metric

Model:

- Built on with electric actuator EA11
- For easy installation and removal
- Integrated stainless steel mounting inserts
- Voltage 24 V AC/DC
- Control range 90°<)
- Control time 5 s/90°<)

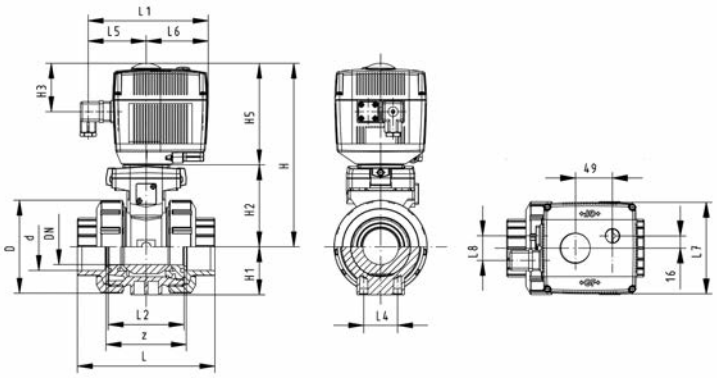
Option:

- Individual configuration of the valve (see diagram)

d [mm]	DN [mm]	PN	kv-value (Δp=1 bar) [l/min]	EPDM Code	kg
16	10	10	70	**199 107 092**	2.072
20	15	10	185	**199 107 093**	2.097
25	20	10	350	**199 107 094**	2.189
32	25	10	700	**199 107 095**	2.253
40	32	10	1000	**199 107 096**	2.592
50	40	10	1600	**199 107 097**	2.914
63	50	10	3100	**199 107 098**	3.209

d [mm]	D [mm]	H [mm]	H1 [mm]	H2 [mm]	H3 [mm]	H5 [mm]	L [mm]	L1 [mm]	L2 [mm]	L4 [mm]	L5 [mm]	L6 [mm]	L7 [mm]	L8 [mm]	z [mm]
16	50	200	27	64	64	137	92	161	56	25	77	83	122	33	64
20	50	200	27	64	64	137	95	161	56	25	77	83	122	33	64
25	58	209	30	73	64	137	110	161	65	25	77	83	122	33	72
32	68	209	36	73	64	137	123	161	71	25	77	83	122	33	79
40	84	220	44	84	64	137	146	161	85	45	77	83	122	33	94
50	97	220	51	84	64	137	157	161	89	45	77	83	122	33	95
63	124	243	64	106	64	137	183	161	101	45	77	83	122	33	107

d [mm]	closest inch
16	⅜
20	½
25	¾
32	1
40	1 ¼
50	1 ½
63	2



PF 3 39 695 033

DN10/15 - 50

Ball valve type 107 ABS 24V
With manual emergency override
With threaded sockets Rp

Model:

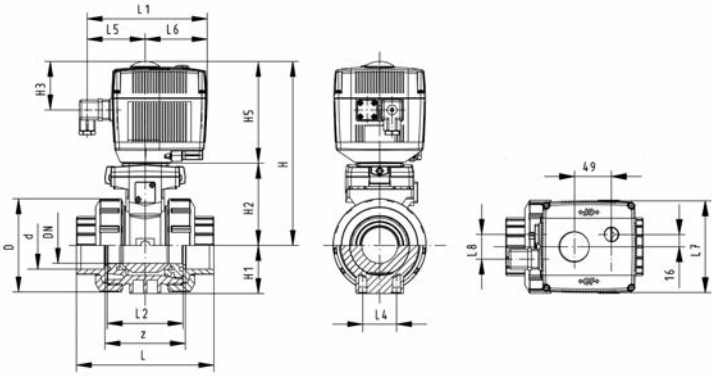
- Built on with electric actuator EA11
- For easy installation and removal
- Integrated stainless steel mounting inserts
- Voltage 24 V AC/DC
- Control range 90°<)
- Control time 5 s/90°<)

Option:

- Individual configuration of the valve (see diagram)

Rp [inch]	DN [mm]	PN	kv-value (Δp=1 bar) [l/min]	EPDM Code	kg
⅜	10	10	70	**199 107 692**	2.100
½	15	10	185	**199 107 693**	2.100
¾	20	10	350	**199 107 694**	2.200
1	25	10	700	**199 107 695**	2.300
1 ¼	32	10	1000	**199 107 696**	2.600
1 ½	40	10	1600	**199 107 697**	3.000
2	50	10	3100	**199 107 698**	3.800

Rp [inch]	D [mm]	H [mm]	H1 [mm]	H2 [mm]	H3 [mm]	H5 [mm]	L [mm]	L1 [mm]	L2 [mm]	L4 [mm]	L5 [mm]	L6 [mm]	L7 [mm]	L8 [mm]	z [mm]
⅜	50	200	27	64	64	137	92	161	56	25	77	83	122	33	64
½	50	200	27	64	64	137	95	161	56	25	77	83	122	33	64
¾	58	209	30	73	64	137	110	161	65	25	77	83	122	33	72
1	68	209	36	73	64	137	123	161	71	25	77	83	122	33	79
1 ¼	84	220	44	84	64	137	146	161	85	45	77	83	122	33	94
1 ½	97	220	51	84	64	137	157	161	89	45	77	83	122	33	95
2	124	243	64	106	64	137	183	161	101	45	77	83	122	33	107



PF 3 39 695 033

DN10/15 - 50

Ball valve type 130 ABS 100-230V
With manual emergency override
With solvent cement sockets metric

Model:

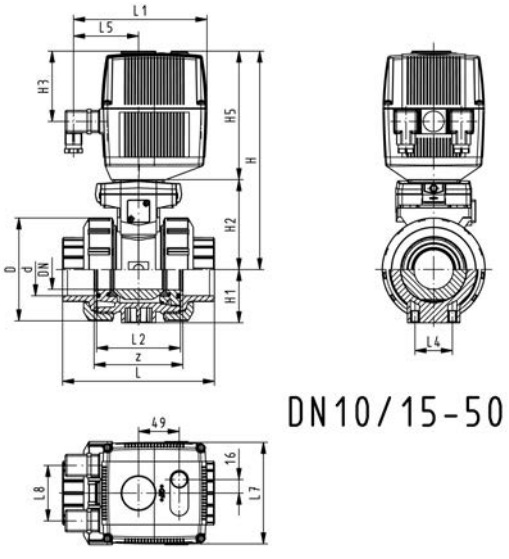
- For easy installation and removal
- Integrated stainless steel mounting inserts
- Voltage 100-230 V, 50-60 Hz
- Control range 90°<)
- Assignment of actuators: EA21 (DN10/15-50), EA31 (DN65-100)
- Control time: EA21: 5s/90°<), EA31: 15s/90°<)

Option:

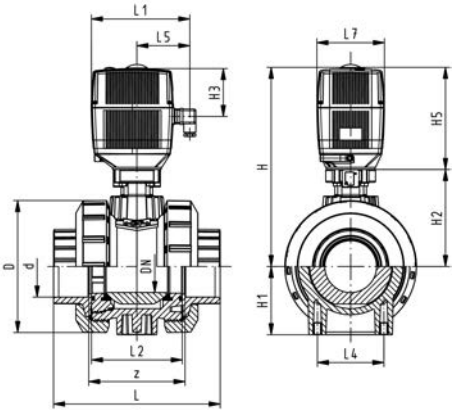
- Individual configuration of the valve (see diagram)

d [mm]	DN [mm]	PN	kv-value (Δp=1 bar) [l/min]	EPDM Code	kg
16	10	10	70	**199 130 702**	2.100
20	15	10	185	**199 130 703**	2.100
25	20	10	350	**199 130 704**	2.200
32	25	10	700	**199 130 705**	2.300
40	32	10	1000	**199 130 706**	2.600
50	40	10	1600	**199 130 707**	3.000
63	50	10	3100	**199 130 708**	3.555
75	65	10	5000	**199 130 709**	6.300
90	80	10	7000	**199 130 710**	8.200
110	100	10	11000	**199 130 711**	11.500

d [mm]	D [mm]	H [mm]	H1 [mm]	H2 [mm]	H3 [mm]	H5 [mm]	L [mm]	L1 [mm]	L2 [mm]	L4 [mm]	L5 [mm]	L7 [mm]	z [mm]	closest inch
16	50	231	27	64	94	167	92	180	56	25	97	122	64	⅜
20	50	231	27	64	94	167	95	180	56	25	97	122	64	½
25	58	240	30	73	94	167	110	180	65	25	97	122	72	¾
32	68	240	36	73	94	167	123	180	71	25	97	122	79	1
40	84	251	44	84	94	167	146	180	85	45	97	122	94	1 ¼
50	97	251	51	84	94	167	157	180	89	45	97	122	95	1 ½
63	124	273	64	106	94	167	183	180	101	45	97	122	107	2
75	166	346	85	156	94	190	233	180	136	70	98	122	144	2 ½
90	200	358	105	168	94	190	254	180	141	70	98	122	151	3
110	238	365	123	175	94	190	301	180	164	120	98	122	174	4



DN10/15-50



DN65-100

PF 3 39 696 033

DN10/15 - 50

Ball valve type 130 ABS 100-230V
With manual emergency override
With threaded sockets Rp

Model:

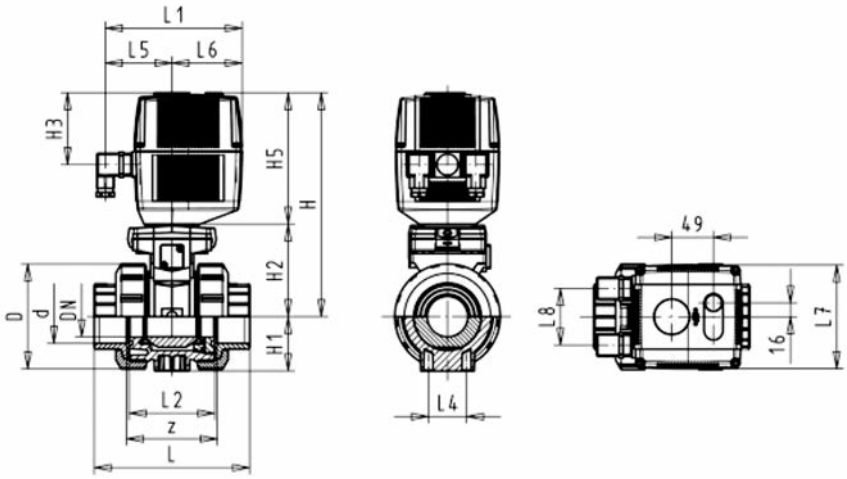
- For easy installation and removal
- Integrated stainless steel mounting inserts
- Voltage 100-230 V, 50-60 Hz
- Control range 90°<)
- Built on with electric actuator EA21
- Control time 5 s/90°<)

Option:

- Individual configuration of the valve (see diagram)

Rp [inch]	DN [mm]	PN	kv-value (Δp=1 bar) [l/min]	EPDM Code	kg
⅜	10	10	70	**199 130 722**	2.100
½	15	10	185	**199 130 723**	2.100
¾	20	10	350	**199 130 724**	2.200
1	25	10	700	**199 130 725**	2.300
1 ¼	32	10	1000	**199 130 726**	2.600
1 ½	40	10	1600	**199 130 727**	3.000
2	50	10	3100	**199 130 728**	3.800

Rp [inch]	D [mm]	H [mm]	H1 [mm]	H2 [mm]	H3 [mm]	H5 [mm]	L [mm]	L1 [mm]	L2 [mm]	L4 [mm]	L5 [mm]	L6 [mm]	L7 [mm]	L8 [mm]	z [mm]
⅜	50	231	27	64	94	167	92	180	56	25	97	83	122	66	64
½	50	231	27	64	94	167	95	180	56	25	97	83	122	66	64
¾	58	240	30	73	94	167	110	180	65	25	97	83	122	66	72
1	68	240	36	73	94	167	123	180	71	25	97	83	122	66	79
1 ¼	84	251	44	84	94	167	146	180	85	45	97	83	122	66	94
1 ½	97	251	51	84	94	167	157	180	89	45	97	83	122	66	95
2	124	273	64	106	94	167	183	180	101	45	97	83	122	66	107



PF 3 39 696 033

DN10/15 - 50

Ball valve type 130 ABS 24V
With manual emergency override
With solvent cement sockets metric

Model:

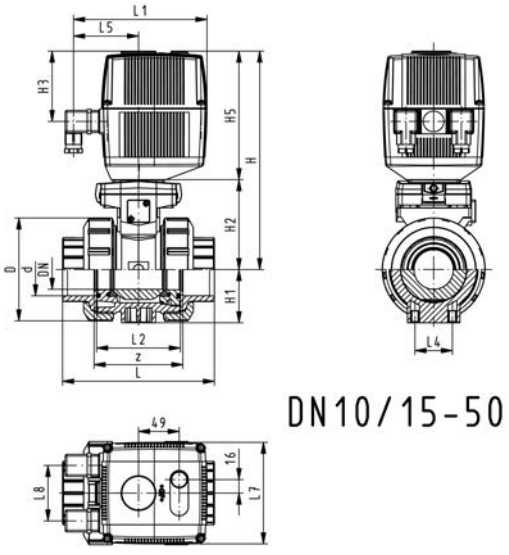
- For easy installation and removal
- Integrated stainless steel mounting inserts
- Voltage 24 V AC/DC
- Control range 90°<)
- Assignment of actuators: EA21 (DN10/15-50), EA31 (DN65-100)
- Control time: EA21: 5s/90°<), EA31: 15s/90°<)

Option:

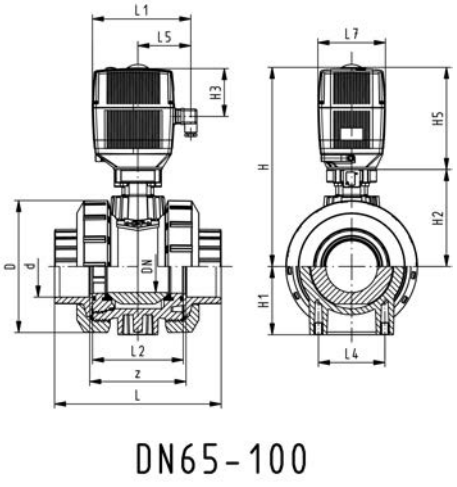
- Individual configuration of the valve (see diagram)

d [mm]	DN [mm]	PN	kv-value (Δp=1 bar) [l/min]	EPDM Code	kg
16	10	10	70	**199 130 742**	2.100
20	15	10	185	**199 130 743**	2.100
25	20	10	350	**199 130 744**	2.200
32	25	10	700	**199 130 745**	2.300
40	32	10	1000	**199 130 746**	2.600
50	40	10	1600	**199 130 747**	3.000
63	50	10	3100	**199 130 748**	3.535
75	65	10	5000	**199 130 749**	6.300
90	80	10	7000	**199 130 750**	8.200
110	100	10	11000	**199 130 751**	11.500

d [mm]	D [mm]	H [mm]	H1 [mm]	H2 [mm]	H3 [mm]	H5 [mm]	L [mm]	L1 [mm]	L2 [mm]	L4 [mm]	L5 [mm]	L7 [mm]	z [mm]	closest inch
16	50	231	27	64	94	167	92	180	56	25	97	122	64	⅜
20	50	231	27	64	94	167	95	180	56	25	97	122	64	½
25	58	240	30	73	94	167	110	180	65	25	97	122	72	¾
32	68	240	36	73	94	167	123	180	71	25	97	122	79	1
40	84	251	44	84	94	167	146	180	85	45	97	122	94	1 ¼
50	97	251	51	84	94	167	157	180	89	45	97	122	95	1 ½
63	124	273	64	106	94	167	183	180	101	45	97	122	107	2
75	166	346	85	156	94	190	233	180	136	70	98	122	144	2 ½
90	200	358	105	168	94	190	254	180	141	70	98	122	151	3
110	238	365	123	175	94	190	301	180	164	120	98	122	174	4



DN10/15-50



DN65-100

PF 3 39 696 033

DN10/15 - 50

Ball valve type 130 ABS 24V
With manual emergency override
With threaded sockets Rp

Model:

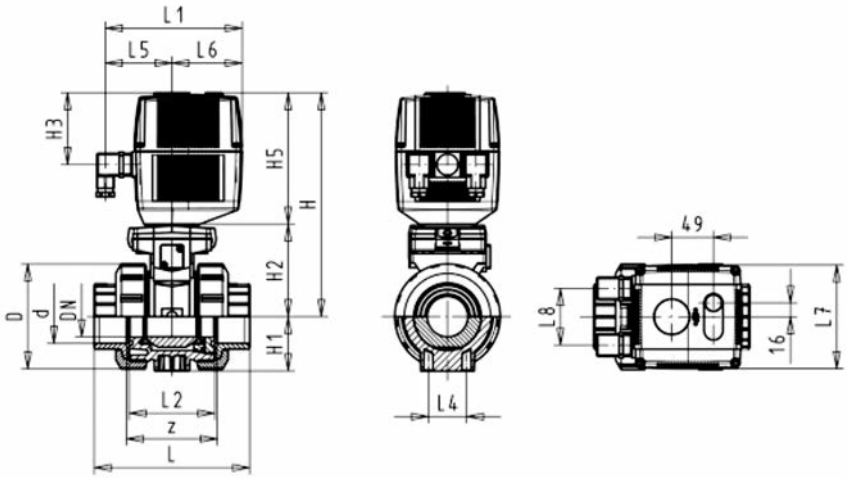
- For easy installation and removal
- Integrated stainless steel mounting inserts
- Voltage 24 V AC/DC
- Control range 90°<)
- Built on with electric actuator EA21
- Control time 5 s/90°<)

Option:

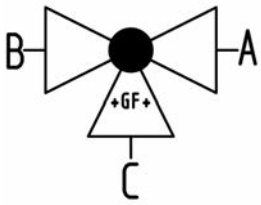
- Individual configuration of the valve (see diagram)

Rp [inch]	DN [mm]	PN	kv-value (Δp=1 bar) [l/min]	EPDM Code	kg
⅜	10	10	70	**199 130 762**	2.100
½	15	10	185	**199 130 763**	2.100
¾	20	10	350	**199 130 764**	2.200
1	25	10	700	**199 130 765**	2.300
1 ¼	32	10	1000	**199 130 766**	2.600
1 ½	40	10	1600	**199 130 767**	3.000
2	50	10	3100	**199 130 768**	3.800

Rp [inch]	D [mm]	H [mm]	H1 [mm]	H2 [mm]	H3 [mm]	H5 [mm]	L [mm]	L1 [mm]	L2 [mm]	L4 [mm]	L5 [mm]	L6 [mm]	L7 [mm]	L8 [mm]	z [mm]
⅜	50	231	27	64	94	167	92	180	56	25	97	83	122	66	64
½	50	231	27	64	94	167	95	180	56	25	97	83	122	66	64
¾	58	240	30	73	94	167	110	180	65	25	97	83	122	66	72
1	68	240	36	73	94	167	123	180	71	25	97	83	122	66	79
1 ¼	84	251	44	84	94	167	146	180	85	45	97	83	122	66	94
1 ½	97	251	51	84	94	167	157	180	89	45	97	83	122	66	95
2	124	273	64	106	94	167	183	180	101	45	97	83	122	66	107



PF 3 39 695 033



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

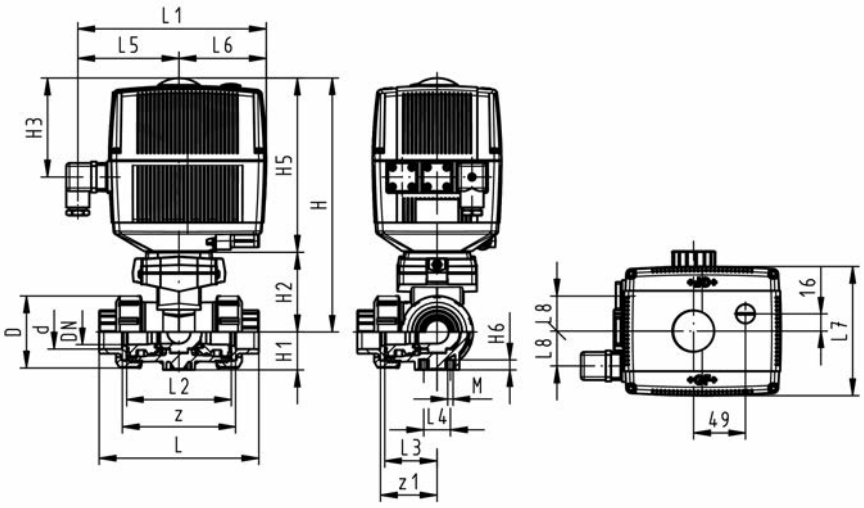
Model:

- 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 (Δp=1 bar) [l/min]	EPDM Code	kg
16	10	10	50	**199 185 162**	2.065
20	15	10	75	**199 185 163**	2.069
25	20	10	150	**199 185 164**	2.171
32	25	10	280	**199 185 165**	2.316
40	32	10	480	**199 185 166**	2.649
50	40	10	620	**199 185 167**	3.384
63	50	10	1230	**199 185 168**	5.324

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	⅜
20	33	6	81	40	½
25	33	6	94	47	¾
32	33	6	107	54	1
40	33	8	130	65	1 ¼
50	33	8	143	72	1 ½
63	33	8	185	92	2

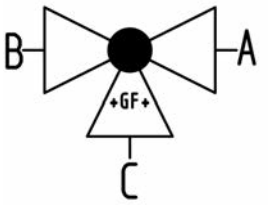


PF 3 39 980 033

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

Model:

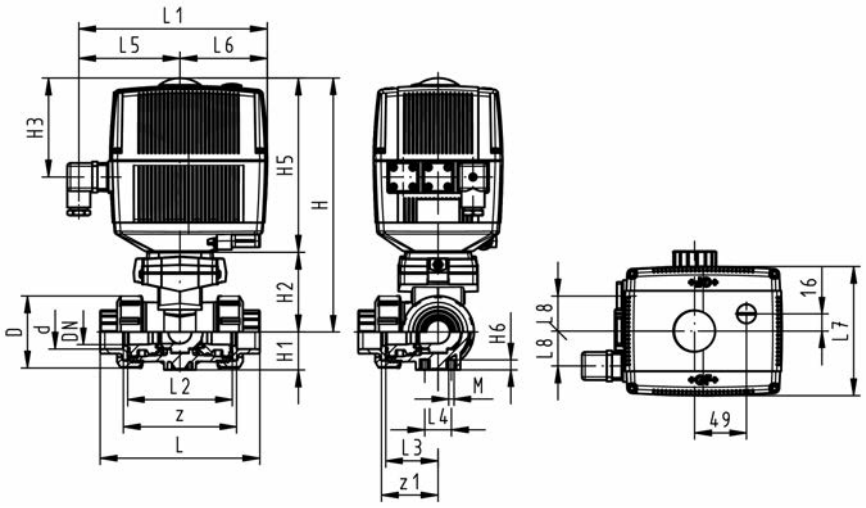
- Built on with electric actuator EA21
- Voltage 24 V AC/DC
- Control range 90°<)
- Basic position A-C opened, activated position B-C opened, see flow scheme
- Other positions possible by adjusting the limit switches
- Control time 5 s/90°<)
- For easy installation and removal
- Integrated stainless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



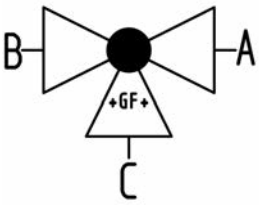
d [mm]	DN [mm]	PN	kv-value (Δp=1 bar) [l/min]	EPDM Code	kg
16	10	10	50	**199 185 342**	2.065
20	15	10	75	**199 185 343**	2.069
25	20	10	150	**199 185 344**	2.171
32	25	10	280	**199 185 345**	2.704
40	32	10	480	**199 185 346**	3.681
50	40	10	620	**199 185 347**	3.370
63	50	10	1230	**199 185 348**	4.042

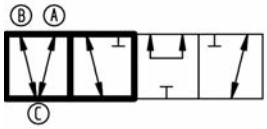
d [mm]	D [mm]	H [mm]	H1 [mm]	H2 [mm]	H3 [mm]	H5 [mm]	H6 [mm]	L [mm]	L1 [mm]	L2 [mm]	L3 [mm]	L4 [mm]	L5 [mm]	L6 [mm]	L7 [mm]
16	50	231	28	64	94	167	8	109	180	73	36	25	97	83	122
20	50	231	28	64	94	167	8	112	180	73	36	25	97	83	122
25	58	240	32	73	94	167	8	131	180	86	43	25	97	83	122
32	68	240	36	73	94	167	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	⅜
20	33	6	81	40	½
25	33	6	94	47	¾
32	33	6	107	54	1
40	33	8	130	65	1 ¼
50	33	8	143	72	1 ½
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

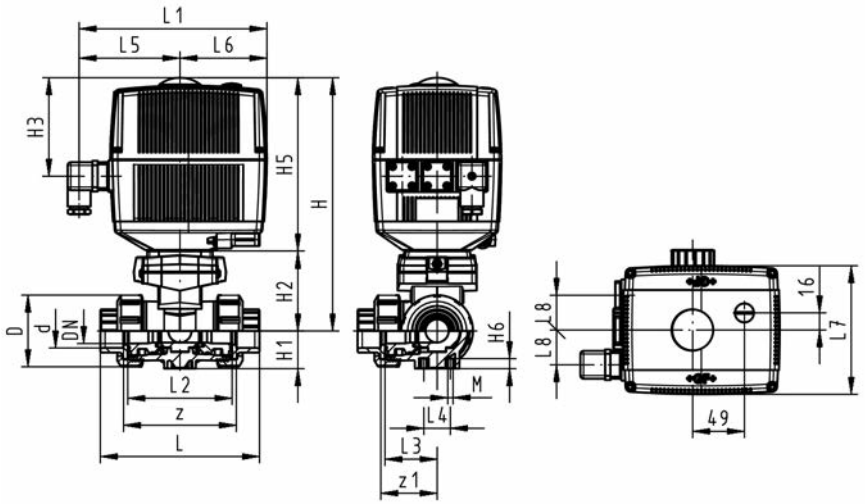
Model:

- 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	**199 185 172**	2.064
20	15	10	200	**199 185 173**	2.068
25	20	10	470	**199 185 174**	2.169
32	25	10	793	**199 185 175**	2.732
40	32	10	1290	**199 185 176**	2.640
50	40	10	1910	**199 185 177**	3.377
63	50	10	3100	**199 185 178**	5.135

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	⅜
20	33	6	81	40	½
25	33	6	94	47	¾
32	33	6	107	54	1
40	33	8	130	65	1 ¼
50	33	8	143	72	1 ½
63	33	8	185	92	2



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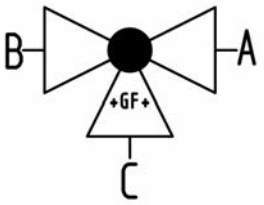
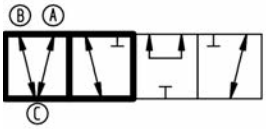




3-Way ball valve type 185 ABS
Horizontal/T-port 24V
With manual emergency override
With solvent cement sockets metric

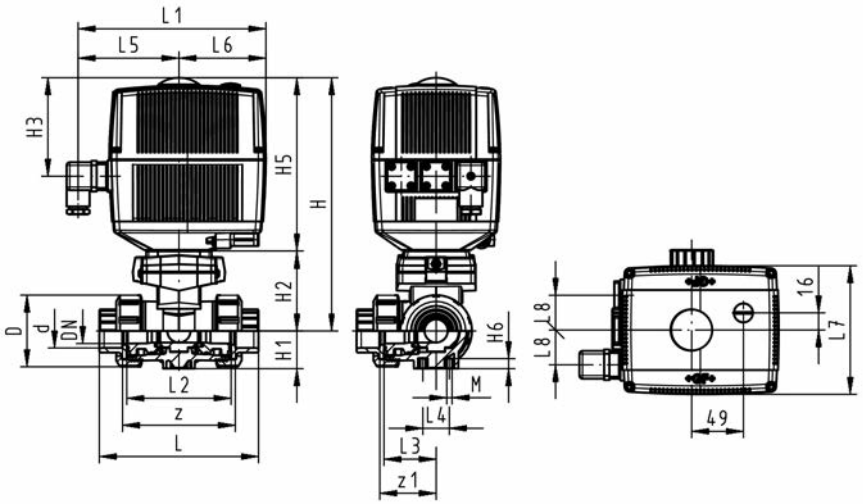
Model:

- 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 (Δp=1 bar) [l/min]	EPDM Code	kg
16	10	10	140	**199 185 352**	2.064
20	15	10	200	**199 185 353**	2.068
25	20	10	470	**199 185 354**	2.169
32	25	10	793	**199 185 355**	2.311
40	32	10	1290	**199 185 356**	2.640
50	40	10	1910	**199 185 357**	2.977
63	50	10	3100	**199 185 358**	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	⅜
20	33	6	81	40	½
25	33	6	94	47	¾
32	33	6	107	54	1
40	33	8	130	65	1 ¼
50	33	8	143	72	1 ½
63	33	8	185	92	2



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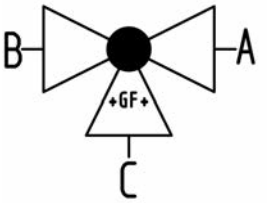
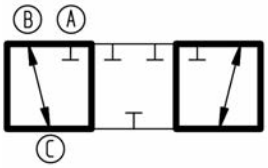




3-Way ball valve type 188 ABS
Vertical/L-port 100-230V
With manual emergency override
With solvent cement sockets metric

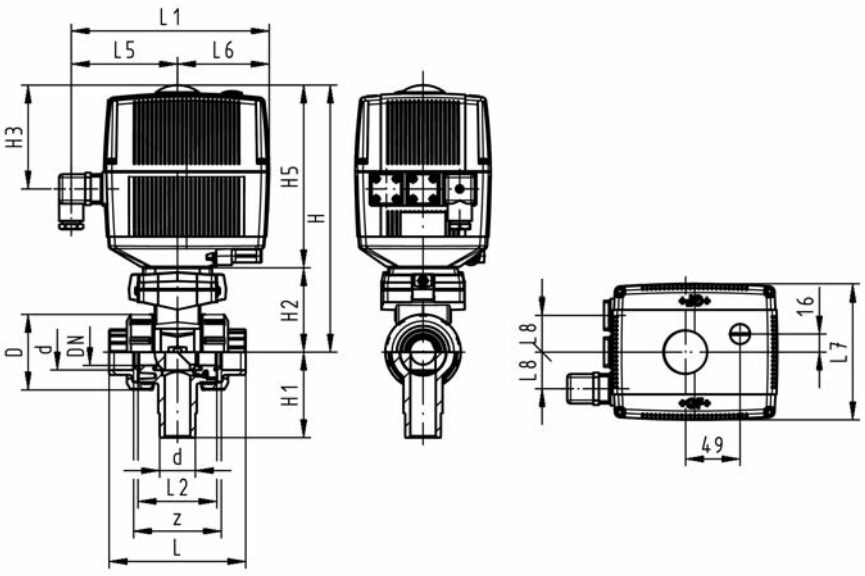
Model:

- Vertical inlet solvent cement spigot metric
- Built on with electric actuator EA21
- Voltage 100-230 V, 50-60 Hz
- Control range 180°<)
- Basic position B-C opened, activated position A-C opened, see flow scheme
- Control time 10 s/180°<)
- Easy installation and removal using union on third outlet

d [mm]	DN [mm]	PN	kv-value (Δp=1 bar) [l/min]	EPDM Code	kg
16	10	10	49	**199 188 162**	2.001
20	15	10	77	**199 188 163**	2.004
25	20	10	146	**199 188 164**	2.090
32	25	10	260	**199 188 165**	2.179
40	32	10	437	**199 188 166**	2.407
50	40	10	667	**199 188 167**	2.609
63	50	10	1293	**199 188 168**	3.212

d [mm]	D [mm]	H [mm]	H1 [mm]	H2 [mm]	H3 [mm]	H5 [mm]	L [mm]	L1 [mm]	L2 [mm]	L5 [mm]	L6 [mm]	L7 [mm]	L8 [mm]	z [mm]
16	50	231	62	64	94	167	92	180	56	97	83	122	33	64
20	50	231	62	64	94	167	95	180	56	97	83	122	33	64
25	58	240	72	73	94	167	111	180	66	97	83	122	33	74
32	68	240	77	73	94	167	123	180	71	97	83	122	33	79
40	84	251	87	84	94	167	146	180	85	97	83	122	33	95
50	97	251	97	84	94	167	157	180	89	97	83	122	33	95
63	124	273	112	106	94	167	183	180	101	97	83	122	33	107

d [mm]	closest inch
16	⅜
20	½
25	¾
32	1
40	1 ¼
50	1 ½
63	2



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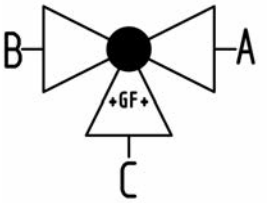
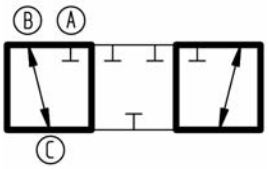




3-Way ball valve type 188 ABS
Vertical/L-port 24V
With manual emergency override
With solvent cement sockets metric

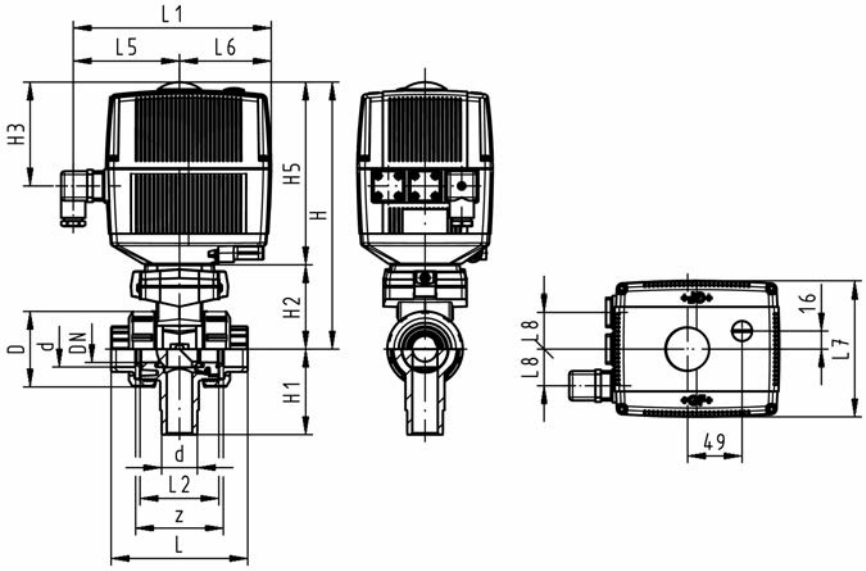
Model:

- Vertical inlet solvent cement spigot metric
- Built on with electric actuator EA21
- Voltage 24 V AC/DC
- Control range 180°<)
- Basic position B-C opened, activated position A-C opened, see flow scheme
- Control time 10 s/180°<)
- Easy installation and removal using union on third outlet

d [mm]	DN [mm]	PN	kv-value (Δp=1 bar) [l/min]	EPDM Code	kg
16	10	10	49	**199 188 452**	2.001
20	15	10	77	**199 188 453**	2.004
25	20	10	146	**199 188 454**	2.090
32	25	10	260	**199 188 455**	2.179
40	32	10	437	**199 188 456**	2.407
50	40	10	667	**199 188 457**	2.609
63	50	10	1293	**199 188 458**	3.212

d [mm]	D [mm]	H [mm]	H1 [mm]	H2 [mm]	H3 [mm]	H5 [mm]	L [mm]	L1 [mm]	L2 [mm]	L5 [mm]	L6 [mm]	L7 [mm]	L8 [mm]	z [mm]
16	50	231	62	64	94	167	92	180	56	97	83	122	33	64
20	50	231	62	64	94	167	95	180	56	97	83	122	33	64
25	58	240	72	73	94	167	111	180	66	97	83	122	33	74
32	68	240	77	73	94	167	123	180	71	97	83	122	33	79
40	84	251	87	84	94	167	146	180	85	97	83	122	33	95
50	97	251	97	84	94	167	157	180	89	97	83	122	33	95
63	124	273	112	106	94	167	183	180	101	97	83	122	33	107

d [mm]	closest inch
16	⅜
20	½
25	¾
32	1
40	1 ¼
50	1 ½
63	2



PF 3 39 980 133

Ball valves pneumatic

DN10/15 - 50

Ball valve type 230 ABS FC (Fail safe to close)
With manual override
With solvent cement sockets metric

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

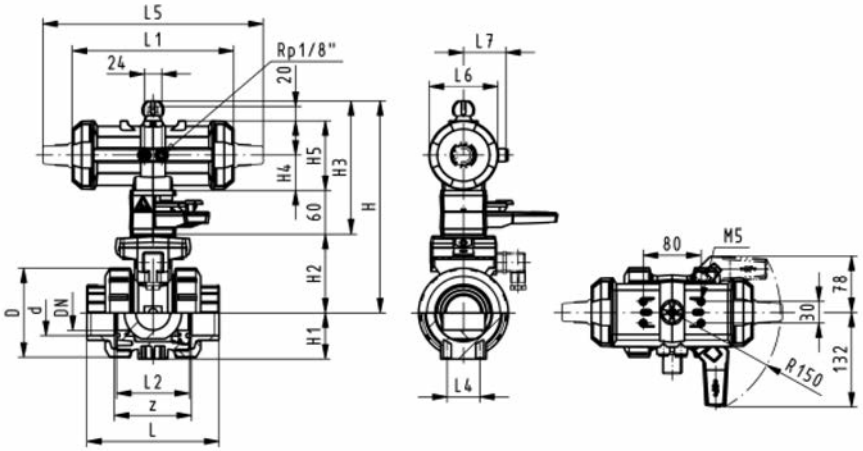
Option:

- Individual configuration of the valve (see diagram)

d [mm]	DN [mm]	PN	kv-value (Δp=1 bar) [l/min]	EPDM Code	kg
16	10	10	70	**199 230 702**	1.459
20	15	10	185	**199 230 703**	1.459
25	20	10	350	**199 230 704**	1.576
32	25	10	700	**199 230 705**	1.394
40	32	10	1000	**199 230 706**	2.751
50	40	10	1600	**199 230 707**	3.073
63	50	10	3100	**199 230 708**	3.054

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	⅜
20	½
25	¾
32	1
40	1 ¼
50	1 ½
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:

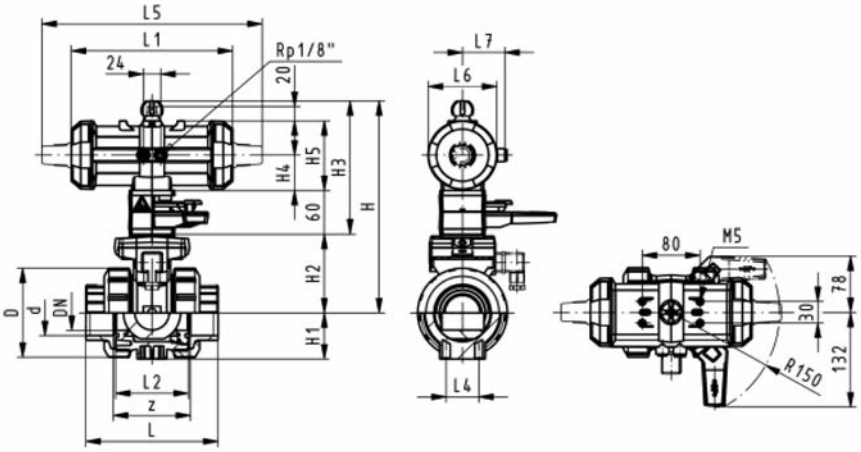
- Built on with pneumatic actuator PA11 (DN10/15-25), PA21 (DN32-50)
- Control time 90°<) 1-2 s
- For easy installation and removal
- Integrated stainless steel mounting inserts

Option:

- Individual configuration of the valve (see diagram)

Rp [inch]	DN [mm]	PN	kv-value (Δp=1 bar) [l/min]	EPDM Code	kg
⅜	10	10	70	**199 230 722**	1.459
½	15	10	185	**199 230 723**	1.459
¾	20	10	350	**199 230 724**	1.576
1	25	10	700	**199 230 725**	1.700
1 ¼	32	10	1000	**199 230 726**	2.751
1 ½	40	10	1600	**199 230 727**	3.073
2	50	10	3100	**199 230 728**	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]
⅜	50	159	27	62	168	40	77	92	194	56	25	261	76	48	64
½	50	159	27	62	168	40	77	95	194	56	25	261	76	48	64
¾	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 ¼	84	202	44	84	187	51	99	146	224	85	45	305	95	59	94
1 ½	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°<) 1-2 s
- For easy installation and removal
- Integrated stainless steel mounting inserts

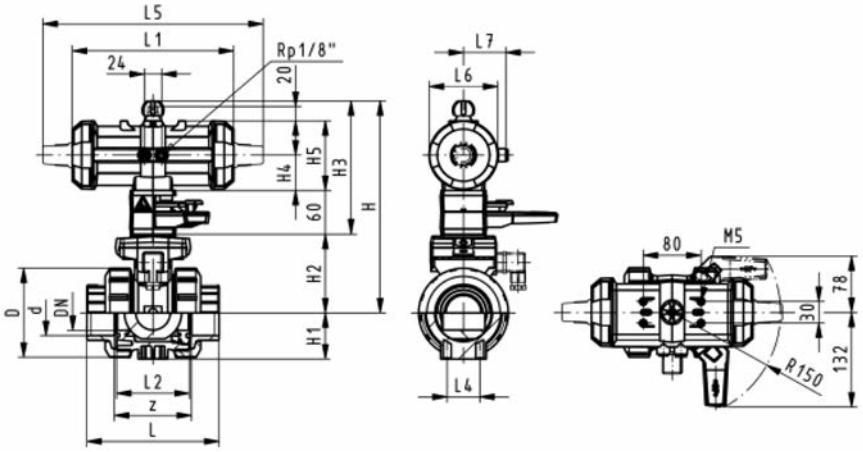
Option:

- Individual configuration of the valve (see diagram)

d [mm]	DN [mm]	PN	kv-value (Δp=1 bar) [l/min]	EPDM Code	kg
16	10	10	70	**199 230 742**	1.459
20	15	10	185	**199 230 743**	1.459
25	20	10	350	**199 230 744**	1.576
32	25	10	700	**199 230 745**	1.700
40	32	10	1000	**199 230 746**	2.751
50	40	10	1600	**199 230 747**	3.073
63	50	10	3100	**199 230 748**	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	⅜
20	½
25	¾
32	1
40	1 ¼
50	1 ½
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:

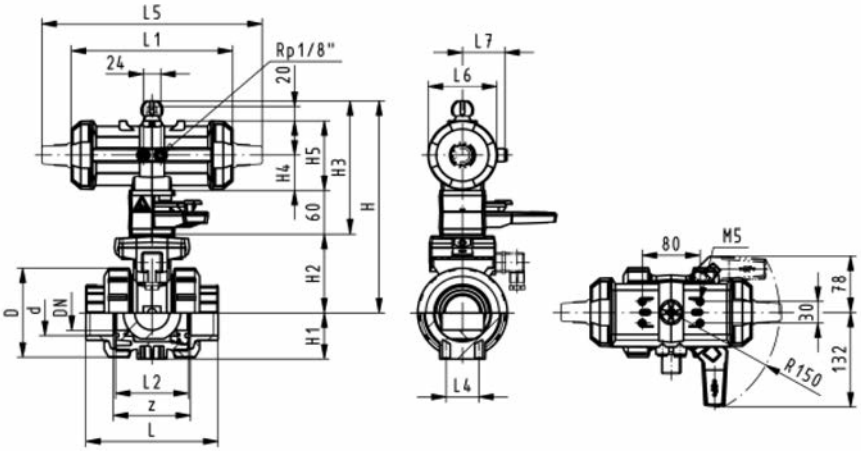
- Built on with pneumatic actuator PA11 (DN10/15-25), PA21 (DN32-50)
- Control time 90°<) 1-2 s
- For easy installation and removal
- Integrated stainless steel mounting inserts

Option:

- Individual configuration of the valve (see diagram)

Rp [inch]	DN [mm]	PN	kv-value (Δp=1 bar) [l/min]	EPDM Code	kg
⅜	10	10	70	**199 230 762**	1.459
½	15	10	185	**199 230 763**	1.459
¾	20	10	350	**199 230 764**	1.576
1	25	10	700	**199 230 765**	1.700
1 ¼	32	10	1000	**199 230 766**	2.751
1 ½	40	10	1600	**199 230 767**	3.073
2	50	10	3100	**199 230 768**	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]
⅜	50	159	27	62	168	40	77	92	194	56	25	261	76	48	64
½	50	159	27	62	168	40	77	95	194	56	25	261	76	48	64
¾	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 ¼	84	202	44	84	187	51	99	146	224	85	45	305	95	59	94
1 ½	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°<) 1-2 s
- For easy installation and removal
- Integrated stainless steel mounting inserts

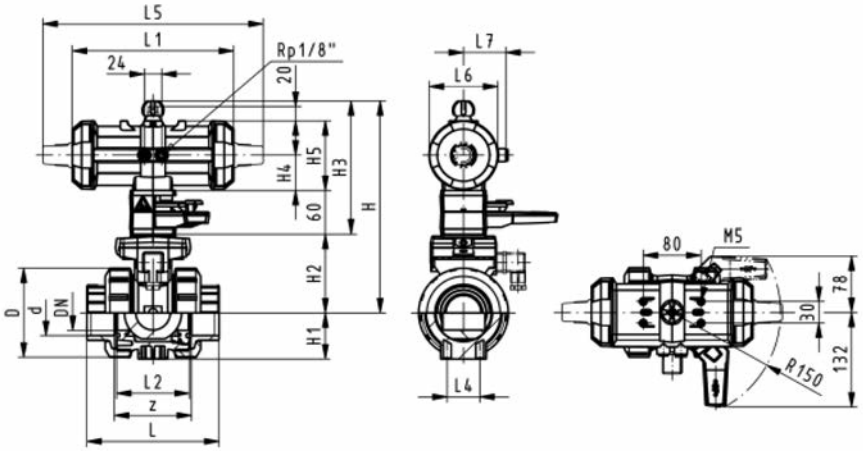
Option:

- Individual configuration of the valve (see diagram)

d [mm]	DN [mm]	PN	kv-value (Δp=1 bar) [l/min]	EPDM Code	kg
16	10	10	70	**199 230 782**	1.459
20	15	10	185	**199 230 783**	1.459
25	20	10	350	**199 230 784**	1.576
32	25	10	700	**199 230 785**	1.700
40	32	10	1000	**199 230 786**	2.751
50	40	10	1600	**199 230 787**	3.073
63	50	10	3100	**199 230 788**	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	⅜
20	½
25	¾
32	1
40	1 ¼
50	1 ½
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:

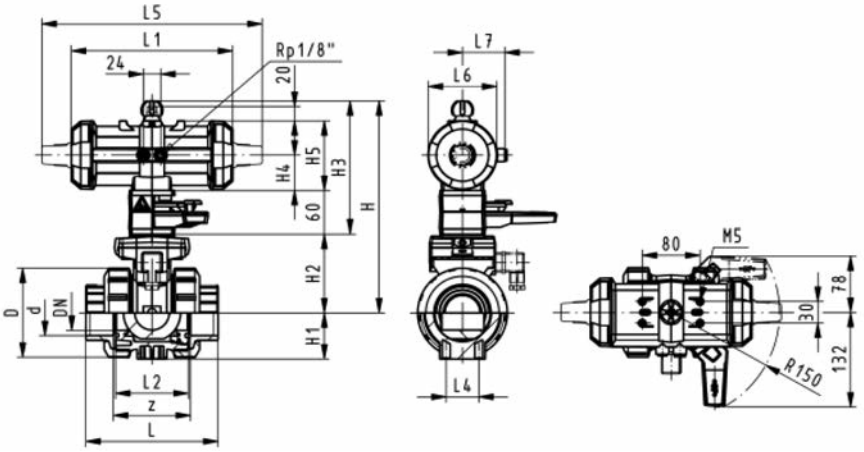
- Built on with pneumatic actuator PA11 (DN10/15-25), PA21 (DN32-50)
- Control time 90°<) 1-2 s
- For easy installation and removal
- Integrated stainless steel mounting inserts

Option:

- Individual configuration of the valve (see diagram)

Rp [inch]	DN [mm]	PN	kv-value (Δp=1 bar) [l/min]	EPDM Code	kg
⅜	10	10	70	**199 230 802**	1.459
½	15	10	185	**199 230 803**	1.459
¾	20	10	350	**199 230 804**	1.576
1	25	10	700	**199 230 805**	1.700
1 ¼	32	10	1000	**199 230 806**	2.751
1 ½	40	10	1600	**199 230 807**	3.073
2	50	10	3100	**199 230 808**	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]
⅜	50	159	27	62	168	40	77	92	194	56	25	261	76	48	64
½	50	159	27	62	168	40	77	95	194	56	25	261	76	48	64
¾	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 ¼	84	202	44	84	187	51	99	146	224	85	45	305	95	59	94
1 ½	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:

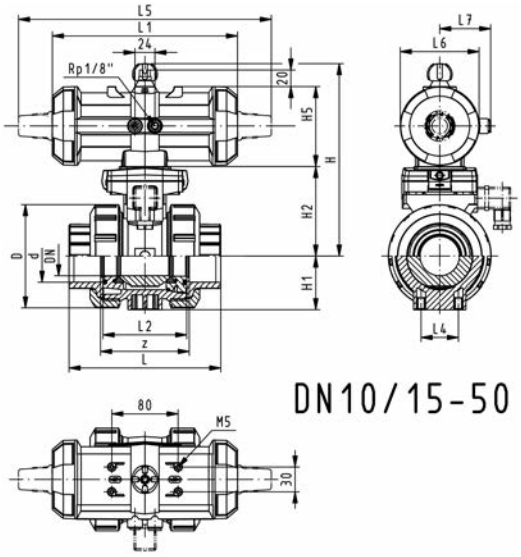
- For easy installation and removal
- Integrated stainless steel mounting inserts
- Control time 90°<) 1-2 s
- Assignment of actuators: PA11 (DN10/15-25), PA21 (DN32-50), PA30 (DN65), PA40 (DN80), PA40 (DN100)

Option:

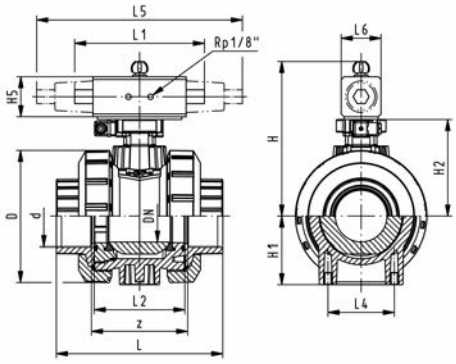
- Individual configuration of the valve (see diagram)

d [mm]	DN [mm]	PN	kv-value (Δp=1 bar) [l/min]	EPDM Code	kg
16	10	10	70	**199 230 822**	1.459
20	15	10	185	**199 230 823**	1.459
25	20	10	350	**199 230 824**	1.576
32	25	10	700	**199 230 825**	1.700
40	32	10	1000	**199 230 826**	2.751
50	40	10	1600	**199 230 827**	3.073
63	50	10	3100	**199 230 828**	3.931
75	65	10	5000	**199 230 829**	6.700
90	80	10	7000	**199 230 830**	8.600
110	100	10	11000	**199 230 831**	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	⅜
20	50	159	27	62	77	95	194	56	25	261	76	48	64	½
25	58	168	30	71	77	110	194	65	25	261	76	48	72	¾
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 ¼
50	97	202	51	84	99	157	224	89	45	305	95	59	95	1 ½
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 ½
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



DN10/15-50



DN65-100

PF 3 39 696 033

DN10/15 - 50

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

Model:

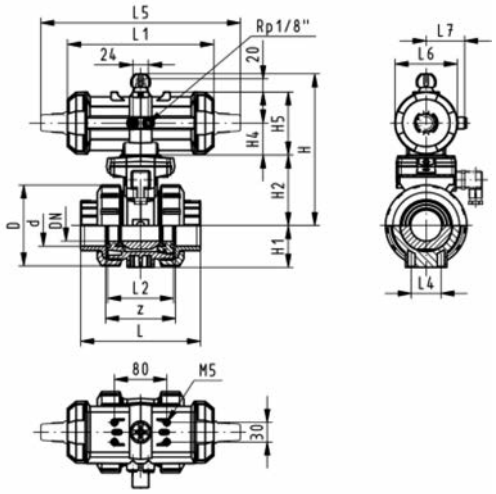
- For easy installation and removal
- Integrated stainless steel mounting inserts
- Control time 90°<) 1-2 s
- Built on with pneumatic actuator PA11 (DN10/15-25), PA21 (DN32-50)

Option:

- Individual configuration of the valve (see diagram)

Rp [inch]	DN [mm]	PN	kv-value (Δp=1 bar) [l/min]	EPDM Code	kg
⅜	10	10	70	**199 230 842**	1.200
½	15	10	185	**199 230 843**	1.200
¾	20	10	350	**199 230 844**	1.300
1	25	10	700	**199 230 845**	1.400
1 ¼	32	10	1000	**199 230 846**	2.500
1 ½	40	10	1600	**199 230 847**	2.800
2	50	10	3100	**199 230 848**	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]
⅜	50	159	27	62	40	77	92	194	56	25	261	76	48	64
½	50	159	27	62	40	77	95	194	56	25	261	76	48	64
¾	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 ¼	84	202	44	84	51	99	146	224	85	45	305	95	59	94
1 ½	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:

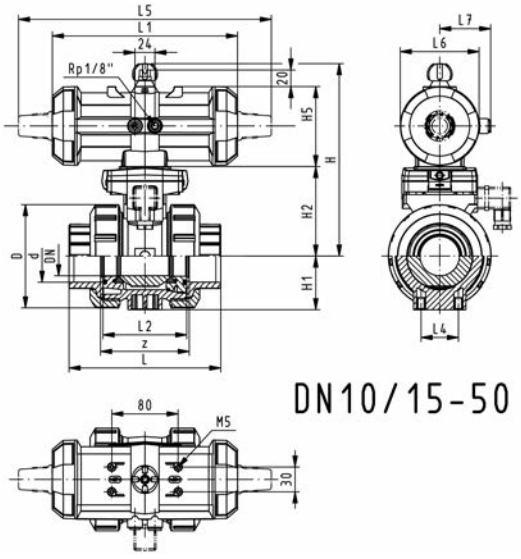
- For easy installation and removal
- Integrated stainless steel mounting inserts
- Control time 90°<) 1-2 s
- Assignment of actuators: PA11 (DN10/15-25), PA21 (DN32-50), PA30 (DN65), PA40 (DN80), PA40 (DN100)

Option:

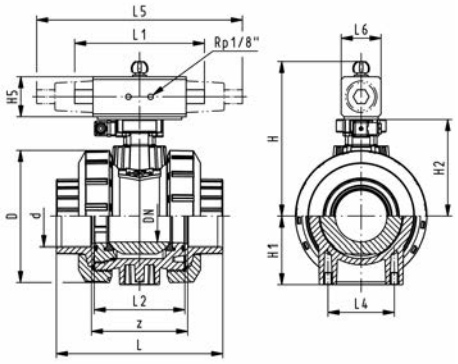
- Individual configuration of the valve (see diagram)

d [mm]	DN [mm]	PN	kv-value (Δp=1 bar) [l/min]	EPDM Code	kg
16	10	10	70	**199 230 862**	1.459
20	15	10	185	**199 230 863**	1.459
25	20	10	350	**199 230 864**	1.576
32	25	10	700	**199 230 865**	1.700
40	32	10	1000	**199 230 866**	2.751
50	40	10	1600	**199 230 867**	3.073
63	50	10	3100	**199 230 868**	3.931
75	65	10	5000	**199 230 869**	6.700
90	80	10	7000	**199 230 870**	8.600
110	100	10	11000	**199 230 871**	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	⅜
20	50	159	27	62	77	95	194	56	25	261	76	48	64	½
25	58	168	30	71	77	110	194	65	25	261	76	48	72	¾
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 ¼
50	97	202	51	84	99	157	224	89	45	305	95	59	95	1 ½
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 ½
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



DN10/15-50



DN65-100

PF 3 39 696 033

DN10/15 - 50

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

Model:

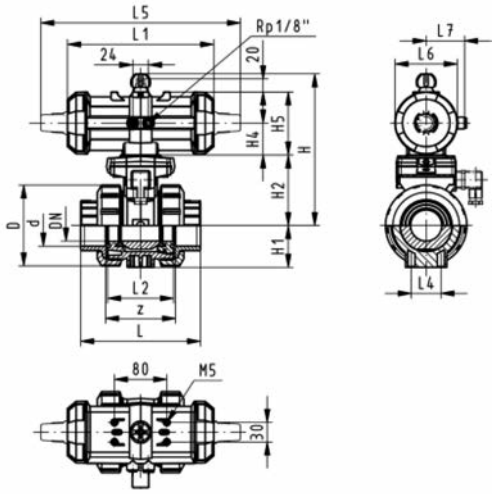
- For easy installation and removal
- Integrated stainless steel mounting inserts
- Control time 90°<) 1-2 s
- Built on with pneumatic actuator PA11 (DN10/15-25), PA21 (DN32-50)

Option:

- Individual configuration of the valve (see diagram)

Rp [inch]	DN [mm]	PN	kv-value (Δp=1 bar) [l/min]	EPDM Code	kg
⅜	10	10	70	**199 230 882**	1.200
½	15	10	185	**199 230 883**	1.200
¾	20	10	350	**199 230 884**	1.300
1	25	10	700	**199 230 885**	1.400
1 ¼	32	10	1000	**199 230 886**	2.500
1 ½	40	10	1600	**199 230 887**	2.800
2	50	10	3100	**199 230 888**	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]
⅜	50	159	27	62	40	77	92	194	56	25	261	76	48	64
½	50	159	27	62	40	77	95	194	56	25	261	76	48	64
¾	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 ¼	84	202	44	84	51	99	146	224	85	45	305	95	59	94
1 ½	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:

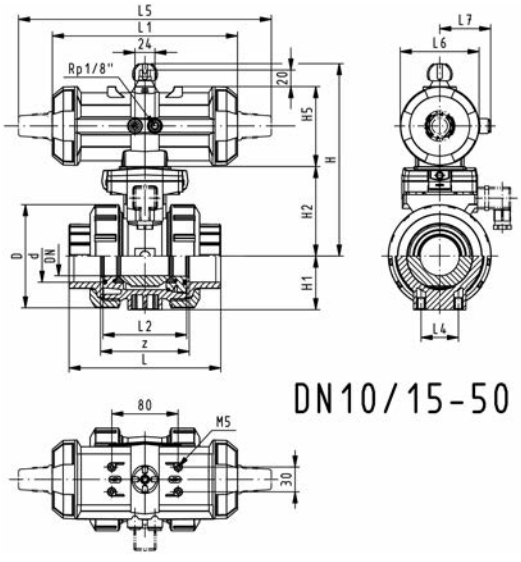
- For easy installation and removal
- Integrated stainless steel mounting inserts
- Control time 90°<) 1-2 s
- Assignment of actuators: PA11 (DN10/15-25), PA21 (DN32-50), PA35 (DN65), PA40 (DN80), PA45 (DN100)

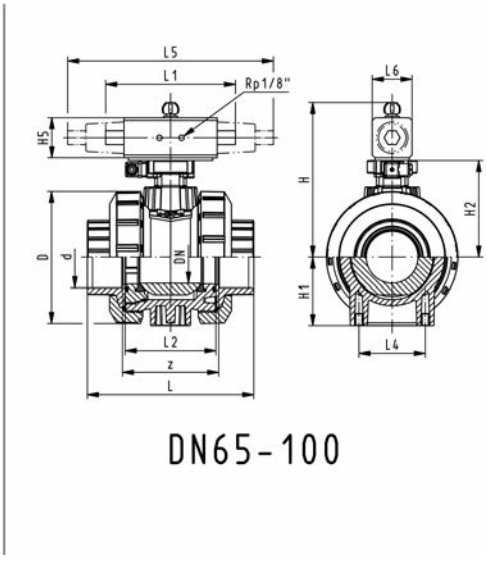
Option:

- Individual configuration of the valve (see diagram)

d [mm]	DN [mm]	PN	kv-value (Δp=1 bar) [l/min]	EPDM Code	kg
16	10	10	70	**199 230 902**	1.459
20	15	10	185	**199 230 903**	1.459
25	20	10	350	**199 230 904**	1.576
32	25	10	700	**199 230 905**	1.700
40	32	10	1000	**199 230 906**	2.751
50	40	10	1600	**199 230 907**	3.073
63	50	10	3100	**199 230 908**	3.931
75	65	10	5000	**199 230 909**	5.600
90	80	10	7000	**199 230 910**	7.900
110	100	10	11000	**199 230 911**	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	⅜
20	50	159	27	62	77	95	194	56	25	261	76	48	64	½
25	58	168	30	71	77	110	194	65	25	261	76	48	72	¾
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 ¼
50	97	202	51	84	99	157	224	89	45	305	95	59	95	1 ½
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 ½
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 39 696 033

DN10/15 - 50

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

Model:

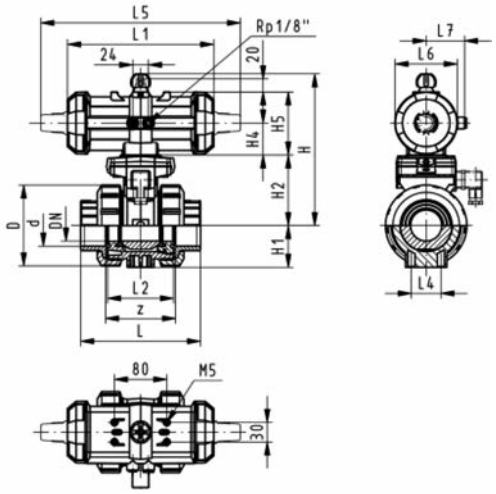
- For easy installation and removal
- Integrated stainless steel mounting inserts
- Control time 90°<) 1-2 s
- Built on with pneumatic actuator PA11 (DN10/15-25), PA21 (DN32-50)

Option:

- Individual configuration of the valve (see diagram)

Rp [inch]	DN [mm]	PN	kv-value (Δp=1 bar) [l/min]	EPDM Code	kg
⅜	10	10	70	**199 230 922**	1.200
½	15	10	185	**199 230 923**	1.200
¾	20	10	350	**199 230 924**	1.300
1	25	10	700	**199 230 925**	1.400
1 ¼	32	10	1000	**199 230 926**	2.500
1 ½	40	10	1600	**199 230 927**	2.800
2	50	10	3100	**199 230 928**	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]
⅜	50	159	27	62	40	77	92	194	56	25	261	76	48	64
½	50	159	27	62	40	77	95	194	56	25	261	76	48	64
¾	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 ¼	84	202	44	84	51	99	146	224	85	45	305	95	59	94
1 ½	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



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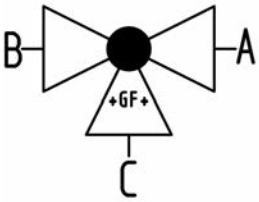
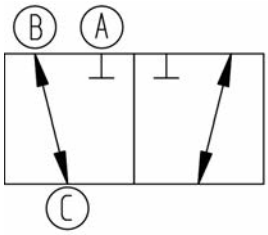




3-Way ball valve type 285 ABS
Horizontal/L-port
Without manual override
With solvent cement sockets metric

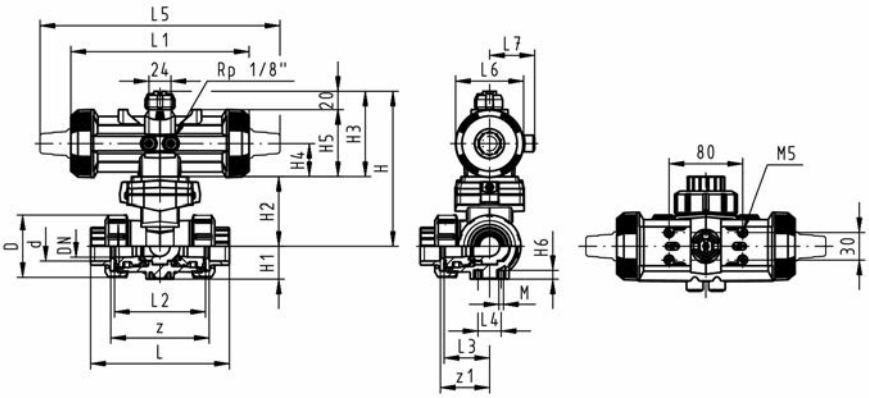
Model:

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

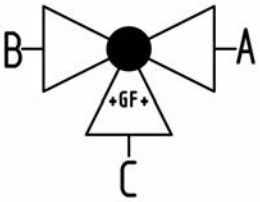
d [mm]	DN [mm]	PN	kv-value (Δp=1 bar) [l/min]	EPDM Code	kg
16	10	10	50	**199 285 162**	1.058
20	15	10	75	**199 285 163**	1.062
25	20	10	150	**199 285 164**	1.164
32	25	10	280	**199 285 165**	1.309
40	32	10	480	**199 285 166**	2.318
50	40	10	620	**199 285 167**	2.662
63	50	10	1230	**199 285 168**	3.689

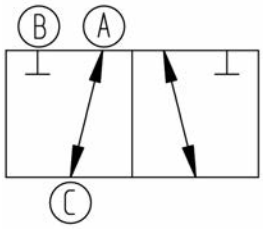
d [mm]	D [mm]	H [mm]	H1 [mm]	H2 [mm]	H3 [mm]	H4 [mm]	H5 [mm]	H6 [mm]	L [mm]	L1 [mm]	L2 [mm]	L3 [mm]	L4 [mm]	L5 [mm]	L6 [mm]
16	50	159	28	62	97	40	77	8	109	194	73	36	25	261	76
20	50	159	28	62	97	40	77	8	112	194	73	36	25	261	76
25	58	168	32	71	97	40	77	8	131	194	86	43	25	261	76
32	68	168	36	71	97	40	77	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	⅜
20	48	6	81	40	½
25	48	6	94	47	¾
32	48	6	107	54	1
40	59	8	130	65	1 ¼
50	59	8	143	72	1 ½
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

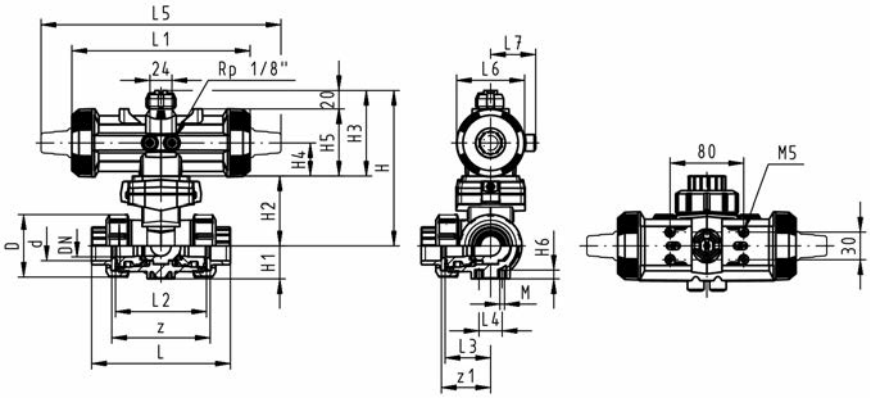
Model:

- 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

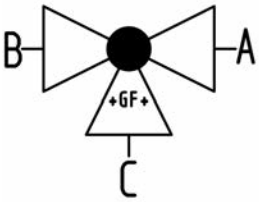
d [mm]	DN [mm]	PN	kv-value (Δp=1 bar) [l/min]	EPDM Code	kg
16	10	10	50	**199 285 342**	0.867
20	15	10	75	**199 285 343**	0.872
25	20	10	150	**199 285 344**	0.974
32	25	10	280	**199 285 345**	1.119
40	32	10	480	**199 285 346**	1.894
50	40	10	620	**199 285 347**	2.238
63	50	10	1230	**199 285 348**	3.287

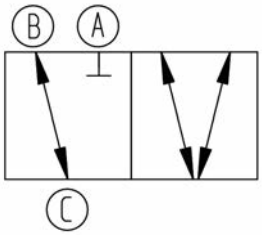
d [mm]	D [mm]	H [mm]	H1 [mm]	H2 [mm]	H3 [mm]	H4 [mm]	H5 [mm]	H6 [mm]	L [mm]	L1 [mm]	L2 [mm]	L3 [mm]	L4 [mm]	L5 [mm]	L6 [mm]
16	50	159	28	62	97	40	77	8	109	194	73	36	25	261	76
20	50	159	28	62	97	40	77	8	112	194	73	36	25	261	76
25	58	168	32	71	97	40	77	8	131	194	86	43	25	261	76
32	68	168	36	71	97	40	77	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	⅜
20	48	6	81	40	½
25	48	6	94	47	¾
32	48	6	107	54	1
40	59	8	130	65	1 ¼
50	59	8	143	72	1 ½
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

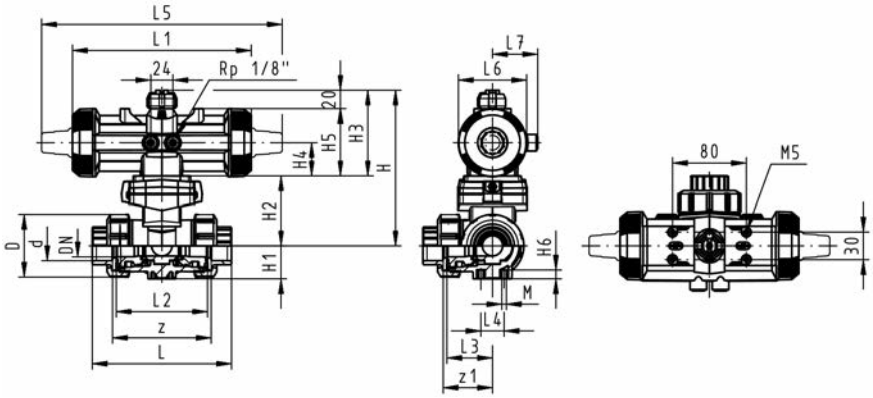
Model:

- Built on with pneumatic actuator PA11 (DN10/15-25), PA21 (DN32-50)
- Actuator fails safe to the basic position
- 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

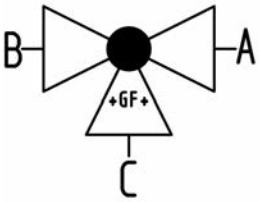
d [mm]	DN [mm]	PN	kv-value (Δp=1 bar) [l/min]	EPDM Code	kg
16	10	10	140	**199 285 172**	1.057
20	15	10	200	**199 285 173**	1.061
25	20	10	470	**199 285 174**	1.162
32	25	10	793	**199 285 175**	1.304
40	32	10	1290	**199 285 176**	2.309
50	40	10	1910	**199 285 177**	2.646
63	50	10	3100	**199 285 178**	3.677

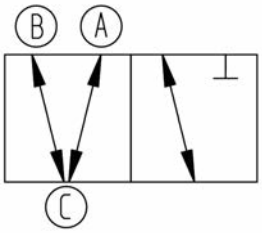
d [mm]	D [mm]	H [mm]	H1 [mm]	H2 [mm]	H3 [mm]	H4 [mm]	H5 [mm]	H6 [mm]	L [mm]	L1 [mm]	L2 [mm]	L3 [mm]	L4 [mm]	L5 [mm]	L6 [mm]
16	50	159	28	62	97	40	77	8	109	194	73	36	25	261	76
20	50	159	28	62	97	40	77	8	112	194	73	36	25	261	76
25	58	168	32	71	97	40	77	8	131	194	86	43	25	261	76
32	68	168	36	71	97	40	77	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	z [mm]	z1 [mm]	closest inch
16	48	6	81	40	⅜
20	48	6	81	40	½
25	48	6	94	47	¾
32	48	6	107	54	1
40	59	8	130	65	1 ¼
50	59	8	143	72	1 ½
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

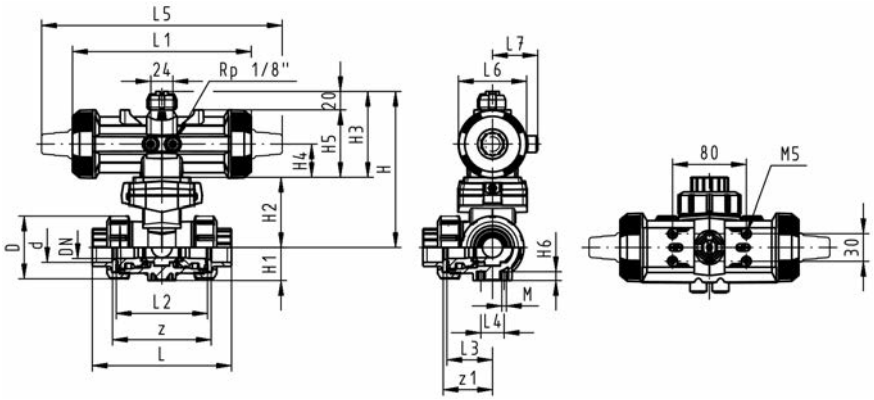
Model:

- 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 (Δp=1 bar) [l/min]	EPDM Code	kg
16	10	10	140	**199 285 352**	0.866
20	15	10	200	**199 285 353**	0.871
25	20	10	470	**199 285 354**	0.972
32	25	10	793	**199 285 355**	1.060
40	32	10	1290	**199 285 356**	1.783
50	40	10	1910	**199 285 357**	2.222
63	50	10	3100	**199 285 358**	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	⅜
20	48	6	81	40	½
25	48	6	94	47	¾
32	48	6	107	54	1
40	59	8	130	65	1 ¼
50	59	8	143	72	1 ½
63	59	8	185	92	2



PF 3 39 981 033

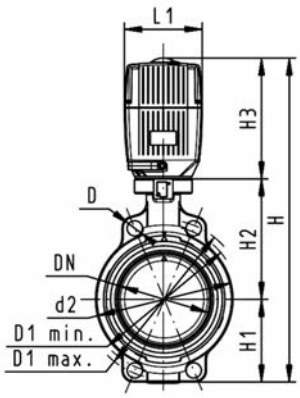
Butterfly valves electric

Butterfly valve type 140 ABS 100-230V
Without manual override

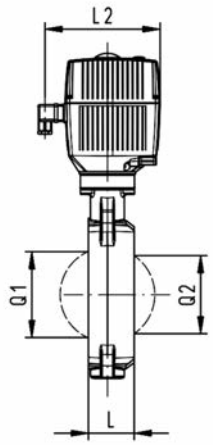
Model:

- 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 (Δp=1 bar) [l/min]	EPDM Code	kg
63	50	10	1470	**199 140 502**	3.121
75	65	10	2200	**199 140 503**	4.281
90	80	10	3000	**199 140 504**	4.359
110	100	10	6500	**199 140 505**	4.895
140	125	10	11500	**199 140 506**	4.376
160	150	10	16600	**199 140 507**	6.218
225	200	10	39600	**199 140 508**	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

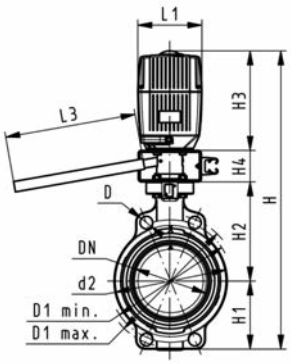
PF 3 39 643 035

Butterfly valve type 140 ABS 100-230V
With manual override

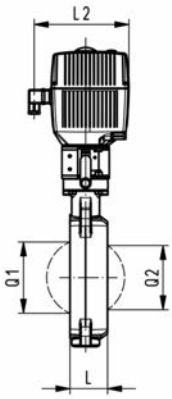
Model:

- 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 (Δp=1 bar) [l/min]	EPDM Code	kg
63	50	10	1470	**199 140 482**	5.678
75	65	10	2200	**199 140 483**	5.781
90	80	10	3000	**199 140 484**	5.859
110	100	10	6500	**199 140 485**	6.395
140	125	10	11500	**199 140 486**	5.389
160	150	10	16600	**199 140 487**	7.718
225	200	10	39600	**199 140 488**	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

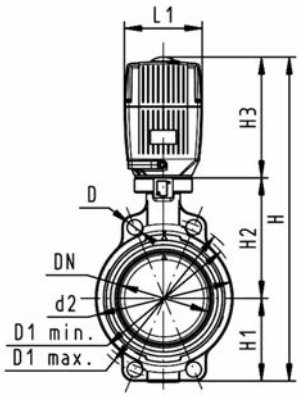
PF 3 39 643 035

Butterfly valve type 140 ABS 24V
Without manual override

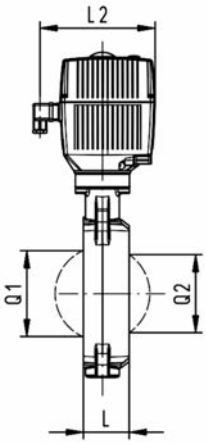
Model:

- 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	**199 140 542**	4.178
75	65	10	2200	**199 140 543**	3.217
90	80	10	3000	**199 140 544**	4.359
110	100	10	6500	**199 140 545**	4.895
140	125	10	11500	**199 140 546**	4.376
160	150	10	16600	**199 140 547**	6.218
225	200	10	39600	**199 140 548**	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

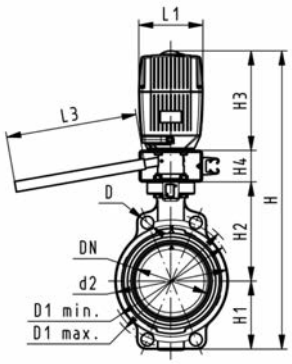
PF 3 39 643 035

Butterfly valve type 140 ABS 24V
With manual override

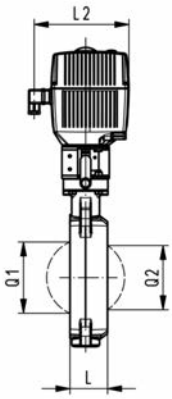
Model:

- 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 (Δp=1 bar) [l/min]	EPDM Code	kg
63	50	10	1470	**199 140 522**	4.161
75	65	10	2200	**199 140 523**	4.257
90	80	10	3000	**199 140 524**	5.859
110	100	10	6500	**199 140 525**	6.395
140	125	10	11500	**199 140 526**	5.389
160	150	10	16600	**199 140 527**	9.910
225	200	10	39600	**199 140 528**	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



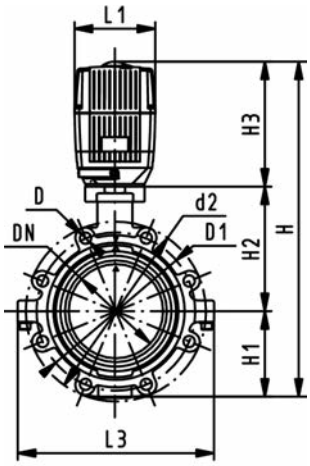
d [mm]	L3 [mm]	Q1 [mm]	Q2 [mm]	closest inch
63	250	40		2
75	250	54	35	2 ½
90	250	67	50	3
110	250	88	74	4
140	250	113	97	5
160	250	139	123	6
225	250	178	169	8

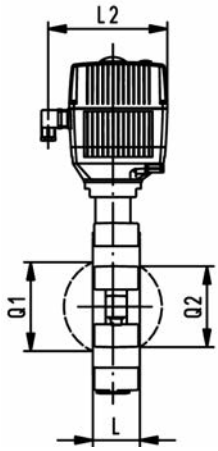
PF 3 39 643 035

Lugstyle butterfly valve type 141 ABS 100-230V 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
- 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



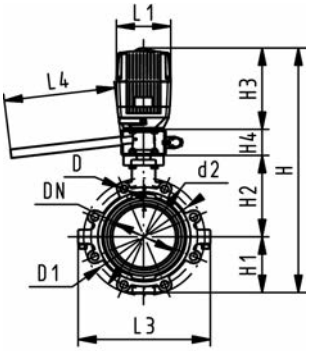


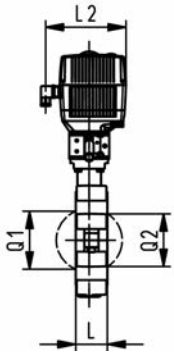
PF 3 39 643 036

d [mm]	DN [mm]	PN	kv-value (Δp=1 bar) [l/min]	EPDM Code	kg
63	50	10	1470	**199 141 502**	6.213
75	65	10	2200	**199 141 503**	6.560
90	80	10	3000	**199 141 504**	7.577
110	100	10	6500	**199 141 505**	8.993
140	125	10	11500	**199 141 506**	10.862
160	150	10	16600	**199 141 507**	12.701
225	200	10	39600	**199 141 508**	22.005

d [mm]	Actuator unit type	D	D1 [mm]	d2 [mm]	H [mm]	H1 [mm]	H2 [mm]	H3 [mm]	L [mm]	L1 [mm]	L2 [mm]	L3 [mm]	Q1 [mm]
63	EA-31	M16	125	150	399	77	134	188	45	122	180	150	40
75	EA-31	M16	145	170	411	83	140	188	46	122	180	160	54
90	EA-31	M16	160	184	423	89	146	188	49	122	180	205	67
110	EA-31	M16	180	216	459	104	167	188	56	122	180	244	88
140	EA-31	M16	210	246	486	117	181	188	64	122	180	272	113
160	EA-31	M20	240	273	507	130	189	188	72	122	180	297	139
225	EA-42	M20	295	334	576	158	210	208	73	122	180	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 3 39 643 036

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 (Δp=1 bar) [l/min]	EPDM Code	kg
63	50	10	1470	**199 141 482**	7.713
75	65	10	2200	**199 141 483**	8.060
90	80	10	3000	**199 141 484**	9.077
110	100	10	6500	**199 141 485**	10.493
140	125	10	11500	**199 141 486**	12.362
160	150	10	16600	**199 141 487**	14.201
225	200	10	39600	**199 141 488**	23.505

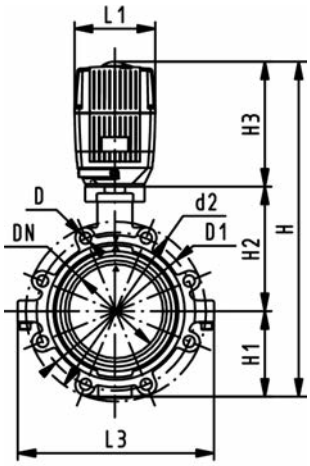
d [mm]	Actuator unit type	D	D1 [mm]	d2 [mm]	H [mm]	H1 [mm]	H2 [mm]	H3 [mm]	H4 [mm]	L [mm]	L1 [mm]	L2 [mm]	L3 [mm]
63	EA-31	M16	125	150	459	77	134	188	60	45	122	180	150
75	EA-31	M16	145	170	471	83	140	188	60	46	122	180	160
90	EA-31	M16	160	184	483	89	146	188	60	49	122	180	205
110	EA-31	M16	180	216	519	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

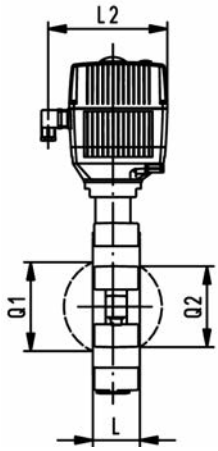
d [mm]	L4 [mm]	Q1 [mm]	Q2 [mm]	closest inch
63	200	40		2
75	200	54	35	2 ½
90	200	67	50	3
110	250	88	74	4
140	250	113	97	5
160	250	139	123	6
225	250	178	169	8

Lugstyle butterfly valve type 141 ABS 24V 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
- 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



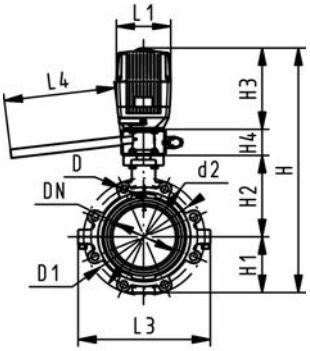


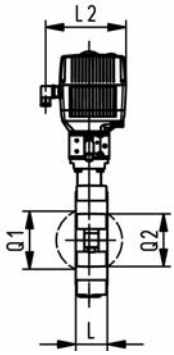
PF 3 39 643 036

d [mm]	DN [mm]	PN	kv-value (Δp=1 bar) [l/min]	EPDM Code	kg
63	50	10	1470	**199 141 542**	6.213
75	65	10	2200	**199 141 543**	6.560
90	80	10	3000	**199 141 544**	7.577
110	100	10	6500	**199 141 545**	8.993
140	125	10	11500	**199 141 546**	10.862
160	150	10	16600	**199 141 547**	12.701
225	200	10	39600	**199 141 548**	22.005

d [mm]	Actuator unit type	D	D1 [mm]	d2 [mm]	H [mm]	H1 [mm]	H2 [mm]	H3 [mm]	L [mm]	L1 [mm]	L2 [mm]	L3 [mm]	Q1 [mm]
63	EA-31	M16	125	150	399	77	134	188	45	122	180	150	40
75	EA-31	M16	145	170	411	83	140	188	46	122	180	160	54
90	EA-31	M16	160	184	423	89	146	188	49	122	180	205	67
110	EA-31	M16	180	216	459	104	167	188	56	122	180	244	88
140	EA-31	M16	210	246	486	117	181	188	64	122	180	272	113
160	EA-31	M20	240	273	507	130	189	188	72	122	180	297	139
225	EA-42	M20	295	334	576	158	210	208	73	122	180	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 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 (Δp=1 bar) [l/min]	EPDM Code	kg
63	50	10	1470	**199 141 522**	7.713
75	65	10	2200	**199 141 523**	8.060
90	80	10	3000	**199 141 524**	9.077
110	100	10	6500	**199 141 525**	10.493
140	125	10	11500	**199 141 526**	12.362
160	150	10	16600	**199 141 527**	14.201
225	200	10	39600	**199 141 528**	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

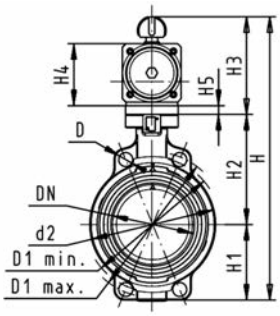
Butterfly valves pneumatic

Butterfly valve type 240 ABS
FC (Fail safe to close)
Without manual override

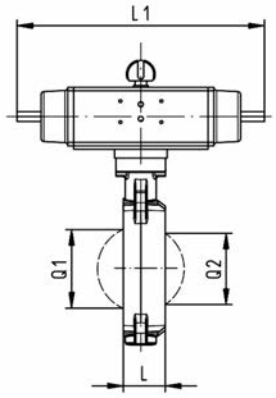
Model:

- 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 (Δp=1 bar) [l/min]	EPDM Code	kg
63	50	10	1470	**199 240 402**	3.371
75	65	10	2200	**199 240 403**	3.100
90	80	10	3000	**199 240 404**	3.399
110	100	10	6500	**199 240 405**	5.133
140	125	10	11500	**199 240 406**	6.826
160	150	10	16600	**199 240 407**	9.779
225	200	10	39600	**199 240 408**	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

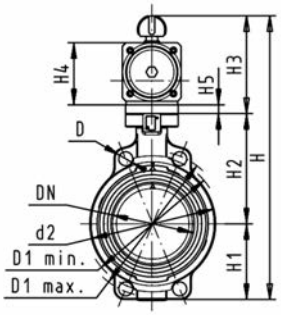
PF 3 39 644 035

Butterfly valve type 240 ABS
FO (Fail safe to open)
Without manual override

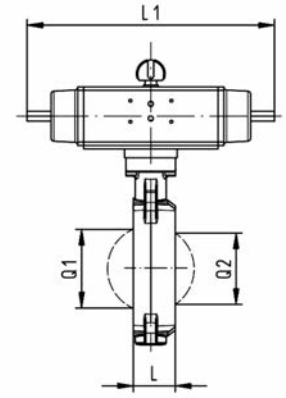
Model:

- 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 (Δp=1 bar) [l/min]	EPDM Code	kg
63	50	10	1470	**199 240 422**	3.371
75	65	10	2200	**199 240 423**	3.467
90	80	10	3000	**199 240 424**	3.399
110	100	10	6500	**199 240 425**	5.133
140	125	10	11500	**199 240 426**	6.826
160	150	10	16600	**199 240 427**	9.779
225	200	10	39600	**199 240 428**	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

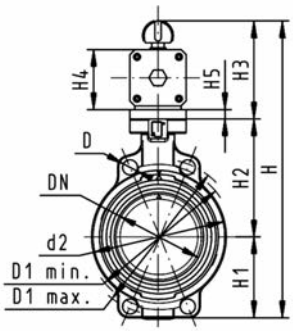
PF 3 39 644 035

Butterfly valve type 240 ABS
DA (Double acting)
Without manual override

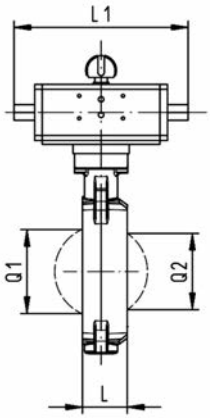
Model:

- 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	**199 240 442**	2.221
75	65	10	2200	**199 240 443**	2.317
90	80	10	3000	**199 240 444**	2.730
110	100	10	6500	**199 240 445**	3.385
140	125	10	11500	**199 240 446**	4.076
160	150	10	16600	**199 240 447**	6.258
225	200	10	39600	**199 240 448**	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

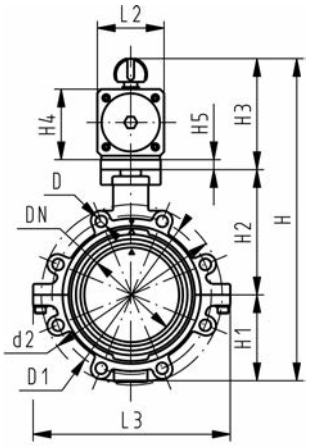
PF 3 39 644 035

Lugstyle butterfly valve type 241 ABS FC (Fail safe to close) Without manual override

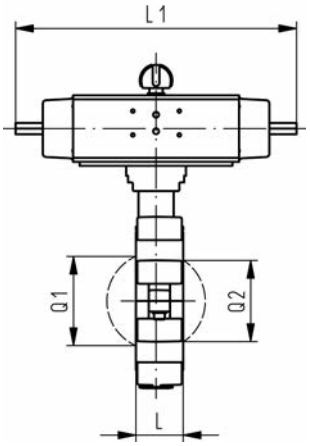
Model:

- 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 (Δp=1 bar) [l/min]	EPDM Code	kg
63	50	10	1470	**199 241 402**	5.253
75	65	10	2200	**199 241 403**	5.600
90	80	10	3000	**199 241 404**	6.617
110	100	10	6500	**199 241 405**	5.231
140	125	10	11500	**199 241 406**	12.102
160	150	10	16600	**199 241 407**	16.262
225	200	10	39600	**199 241 408**	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 FC	M16	125	150	328	77	134	117	70	15	45	276	65
75	PA-30 FC	M16	145	170	340	83	140	117	70	15	46	276	65
90	PA-35 FC	M16	160	184	361	89	146	126	78	15	49	326	72
110	PA-40 FC	M16	180	216	400	104	167	129	86		56	370	80
140	PA-45 FC	M16	210	246	437	117	181	139	96		64	411	90
160	PA-50 FC	M20	240	273	468	130	189	149	106		72	423	100
225	PA-55 FC	M20	295	334	529	158	210	161	118		73	452	112



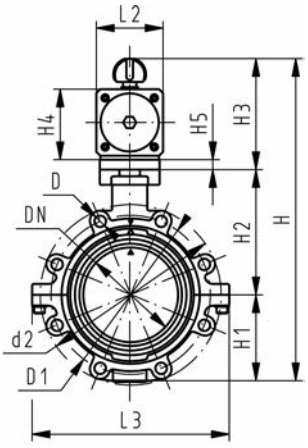
d [mm]	L3 [mm]	Q1 [mm]	Q2 [mm]	closest inch
63	150	40		2
75	160	54	35	2 ½
90	205	67	50	3
110	244	88	74	4
140	272	113	97	5
160	297	139	123	6
225	360	178	169	8

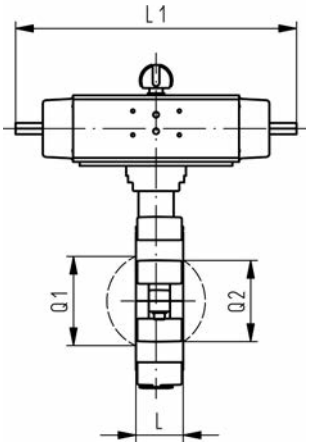
PF 3 39 644 036

Lugstyle butterfly valve type 241 ABS 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°<)





PF 3 39 644 036

d [mm]	DN [mm]	PN	kv-value (Δp=1 bar) [l/min]	EPDM Code	kg
63	50	10	1470	**199 241 422**	5.253
75	65	10	2200	**199 241 423**	5.600
90	80	10	3000	**199 241 424**	6.617
110	100	10	6500	**199 241 425**	5.231
140	125	10	11500	**199 241 426**	12.102
160	150	10	16600	**199 241 427**	16.262
225	200	10	39600	**199 241 428**	23.505

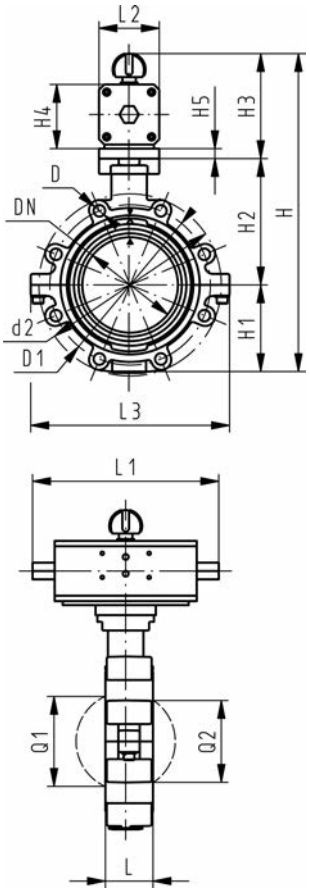
d [mm]	Actuator unit type	D	D1 [mm]	d2 [mm]	H [mm]	H1 [mm]	H2 [mm]	H3 [mm]	H4 [mm]	H5 [mm]	L [mm]	L1 [mm]	L2 [mm]
63	PA-30 FO	M16	125	150	328	77	134	117	70	15	45	276	65
75	PA-30 FO	M16	145	170	340	83	140	117	70	15	46	276	65
90	PA-35 FO	M16	160	184	361	89	146	126	78	15	49	326	72
110	PA-40 FO	M16	180	216	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

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°<)



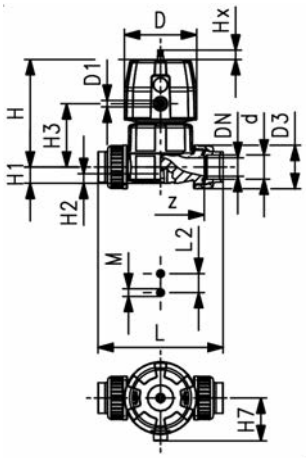
PF 3 39 644 036

d [mm]	DN [mm]	PN	kv-value (Δp=1 bar) [l/min]	EPDM Code	kg
63	50	10	1470	**199 241 442**	4.103
75	65	10	2200	**199 241 443**	4.450
90	80	10	3000	**199 241 444**	5.948
110	100	10	6500	**199 241 445**	7.483
140	125	10	11500	**199 241 446**	9.352
160	150	10	16600	**199 241 447**	12.741
225	200	10	39600	**199 241 448**	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

Diaphragm valves pneumatic
New generation



Diaphragm valve DIASTAR Six ABS
FC (Fail safe to close)
Unions with solvent cement sockets metric

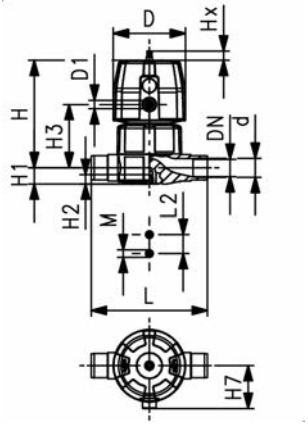
Model:
- Double flow rate compared to predecessor
- One housing nut replaces four screws
- Rotating air connection at 90° intervals
- For easy installation and removal
- Short overall length

Option:
- Individual configuration of the valve (see diagram)

d [mm]	DN [mm]	PN	kv-value (Δp=1 bar) [l/min]	EPDM Code	kg
20	15	6	125	**169 614 012**	0.523
25	20	6	271	**169 614 013**	0.986
32	25	6	481	**169 614 014**	1.175
40	32	6	759	**169 614 015**	1.977
50	40	6	960	**169 614 016**	2.495
63	50	6	1181	**169 614 017**	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	⅛	128	25	101	14	12	60	43	M6	96	7	½
25	96	⅛	152	25	132	18	12	73	57	M6	114	10	¾
32	96	⅛	166	25	143	22	12	84	57	M6	122	13	1
40	120	⅛	192	45	173	26	15	99	69	M8	140	14	1 ¼
50	120	⅛	222	45	193	32	15	119	69	M8	160	16	1 ½
63	120	⅛	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 (Δp=1 bar) [l/min]	EPDM Code	kg
20	15	6	125	**169 615 012**	0.476
25	20	6	271	**169 615 013**	0.919
32	25	6	481	**169 615 014**	1.086
40	32	6	759	**169 615 015**	1.782
50	40	6	960	**169 615 016**	2.262
63	50	6	1181	**169 615 017**	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	⅛	124	25	101	14	12	60	43	M6	7	½
25	96	⅛	144	25	132	18	12	73	57	M6	10	¾
32	96	⅛	154	25	143	22	12	84	57	M6	13	1
40	120	⅛	174	45	173	26	15	99	69	M8	14	1 ¼
50	120	⅛	194	45	193	32	15	119	69	M8	16	1 ½
63	120	⅛	224	45	205	39	15	132	69	M8	16	2

PF 3 39 772 210

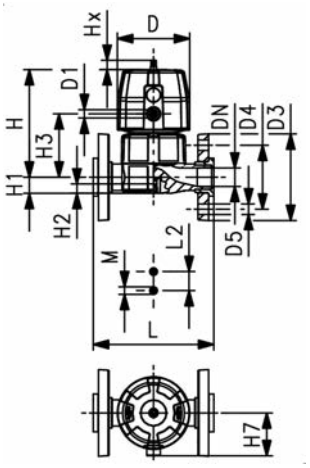
Diaphragm valve DIASTAR Six ABS
FC (Fail safe to close)
With backing flanges PP-V metric/BS

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 (Δp=1 bar) [l/min]	EPDM Code	kg
20	15	6	125	**169 617 112**	0.652
25	20	6	271	**169 617 113**	1.144
32	25	6	481	**169 617 114**	1.406
40	32	6	759	**169 617 115**	2.280
50	40	6	960	**169 617 116**	2.798
63	50	6	1181	**169 617 117**	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	⅛	95	65	14	130	25	101	14	12	60	43	M6	7
25	96	⅛	105	75	14	150	25	132	18	12	73	57	M6	10
32	96	⅛	115	85	14	160	25	143	22	12	84	57	M6	13
40	120	⅛	140	100	18	180	45	173	26	15	99	69	M8	14
50	120	⅛	150	110	18	200	45	193	32	15	119	69	M8	16
63	120	⅛	165	125	18	230	45	205	39	15	132	69	M8	16

d [mm]	closest inch
20	½
25	¾
32	1
40	1 ¼
50	1 ½
63	2

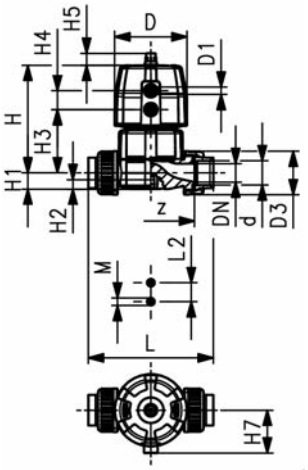
PF 3 39 772 230

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

* PN: PTFE
Working Pressure: **one side**

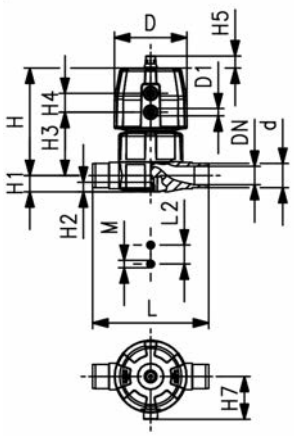


d [mm]	DN [mm]	PN* [bar]	kv-value (Δp=1 bar) [l/min]	EPDM Code	kg
20	15	10/10*	125	**169 624 012**	0.549
25	20	10/10*	271	**169 624 013**	1.061
32	25	10/10*	481	**169 624 014**	1.247
40	32	10/10*	759	**169 624 015**	2.127
50	40	10/10*	1263	**169 624 016**	3.633
63	50	10/10*	1728	**169 624 017**	4.381

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	⅛	128	25	101	14	12	60	24	16	43	M6	96	7
25	96	⅛	152	25	132	18	12	73	25	16	57	M6	114	10
32	96	⅛	166	25	143	22	12	84	25	16	57	M6	122	13
40	120	⅛	192	45	173	26	15	99	26	26	69	M8	140	15
50	150	¼	222	45	214	32	15	119	36	26	88	M8	160	19
63	150	¼	266	45	226	39	15	132	36	26	88	M8	190	23

d [mm]	closest inch
20	½
25	¾
32	1
40	1 ¼
50	1 ½
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

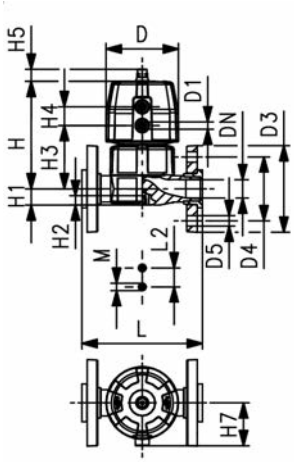
Option:
- Individual configuration of the valve (see diagram)
- Comprehensive range of accessories available

* PN: PTFE
Working Pressure: **one side**

d [mm]	DN [mm]	PN* [bar]	kv-value (Δp=1 bar) [l/min]	EPDM Code	kg
20	15	10/10*	125	**169 625 012**	0.502
25	20	10/10*	271	**169 625 013**	0.994
32	25	10/10*	481	**169 625 014**	1.158
40	32	10/10*	759	**169 625 015**	1.932
50	40	10/10*	1263	**169 625 016**	3.520
63	50	10/10*	1728	**169 625 017**	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	⅛	124	25	101	14	12	60	24	16	43	M6	7	½
25	96	⅛	144	25	132	18	12	73	25	16	57	M6	10	¾
32	96	⅛	154	25	143	22	12	84	25	16	57	M6	13	1
40	120	⅛	174	45	173	26	15	99	26	26	69	M8	15	1 ¼
50	150	¼	194	45	214	32	15	119	36	26	88	M8	19	1 ½
63	150	¼	224	45	226	39	15	132	36	26	88	M8	23	2

PF 3 39 772 210



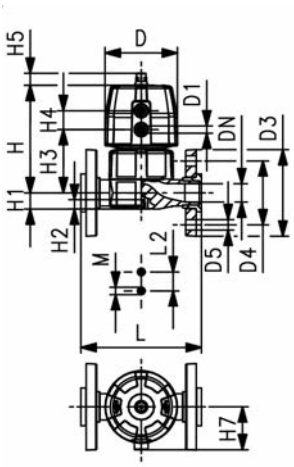
Diaphragm valve DIASTAR Ten ABS FC (Fail safe to close) With backing flanges PP-V metric/BS

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

* PN: PTFE
Working Pressure: **one side**

d [mm]	DN [mm]	PN* [bar]	kv-value (Δp=1 bar) [l/min]	EPDM Code	kg
20	15	10/10*	125	**169 627 112**	0.678
25	20	10/10*	271	**169 627 113**	1.219
32	25	10/10*	481	**169 627 114**	1.478
40	32	10/10*	759	**169 627 115**	2.430
50	40	10/10*	1263	**169 627 116**	3.936
63	50	10/10*	1728	**169 627 117**	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	⅛	95	65	14	130	25	101	14	12	60	24	16	43	M6
25	96	⅛	105	75	14	150	25	132	18	12	73	25	16	57	M6
32	96	⅛	115	85	14	160	25	143	22	12	84	25	16	57	M6
40	120	⅛	140	100	18	180	45	173	26	15	99	26	26	69	M8
50	150	¼	150	110	18	200	45	193	32	15	119	36	26	88	M8
63	150	¼	165	125	18	230	45	205	39	15	132	36	26	88	M8

d [mm]	Lift = Hx [mm]	closest inch
20	7	½
25	10	¾
32	13	1
40	15	1 ¼
50	19	1 ½
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:

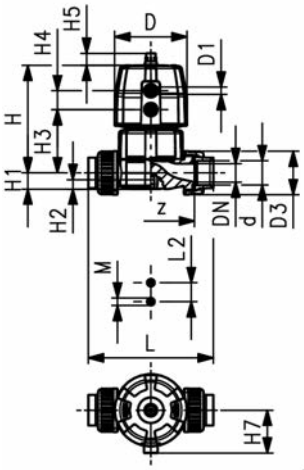
- Double flow rate compared to predecessor
- One housing nut replaces four screws
- Rotating air connection at 90° intervals
- For easy installation and removal
- Short overall length

Option:

- Individual configuration of the valve (see diagram)
- Comprehensive range of accessories available

* PN: PTFE

Working Pressure: **one side**

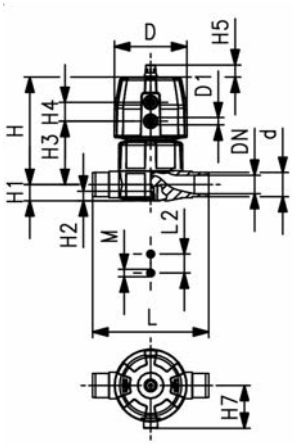


d [mm]	DN [mm]	PN* [bar]	kv-value (Δp=1 bar) [l/min]	EPDM Code	kg
20	15	10/10*	125	**169 644 012**	0.499
25	20	10/10*	271	**169 644 013**	0.887
32	25	10/10*	481	**169 644 014**	1.067
40	32	10/10*	759	**169 644 015**	1.767
50	40	10/10*	1263	**169 644 016**	3.543
63	50	10/10*	1728	**169 644 017**	4.291

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	⅛	128	25	101	14	12	60	24	16	43	M6	96	7
25	96	⅛	152	25	132	18	12	73	25	16	57	M6	114	10
32	96	⅛	166	25	143	22	12	84	25	16	57	M6	122	13
40	120	⅛	192	45	173	26	15	99	26	26	69	M8	140	15
50	150	¼	222	45	214	32	15	119	36	26	88	M8	160	19
63	150	¼	266	45	226	39	15	132	36	26	88	M8	190	23

d [mm]	closest inch
20	½
25	¾
32	1
40	1 ¼
50	1 ½
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

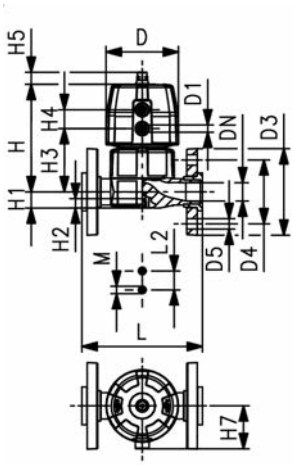
Option:
- Individual configuration of the valve (see diagram)
- Comprehensive range of accessories available

* PN: PTFE
Working Pressure: **one side**

d [mm]	DN [mm]	PN* [bar]	kv-value (Δp=1 bar) [l/min]	EPDM Code	kg
20	15	10/10*	125	**169 645 012**	0.452
25	20	10/10*	271	**169 645 013**	0.820
32	25	10/10*	481	**169 645 014**	0.977
40	32	10/10*	759	**169 645 015**	1.572
50	40	10/10*	1263	**169 645 016**	3.310
63	50	10/10*	1728	**169 645 017**	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	⅛	124	25	101	14	12	60	24	16	43	M6	7	½
25	96	⅛	144	25	132	18	12	73	25	16	57	M6	10	¾
32	96	⅛	154	25	143	22	12	84	25	16	57	M6	13	1
40	120	⅛	174	45	173	26	15	99	26	26	69	M8	15	1 ¼
50	150	¼	194	45	214	32	15	119	36	26	88	M8	19	1 ½
63	150	¼	224	45	226	39	15	132	36	26	88	M8	23	2

PF 3 39 772 210



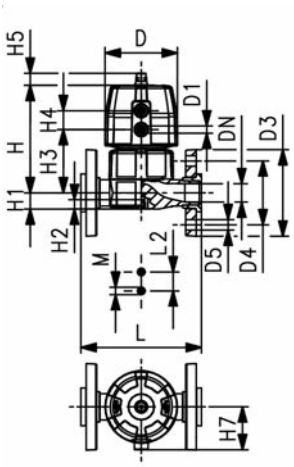
Diaphragm valve DIASTAR Ten ABS FO (Fail safe to open) With backing flanges PP-V metric/BS

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

* PN: PTFE
Working Pressure: **one side**

d [mm]	DN [mm]	PN* [bar]	kv-value (Δp=1 bar) [l/min]	EPDM Code	kg
20	15	10/10*	125	**169 647 112**	0.628
25	20	10/10*	271	**169 647 113**	1.045
32	25	10/10*	481	**169 647 114**	1.298
40	32	10/10*	759	**169 647 115**	2.070
50	40	10/10*	1263	**169 647 116**	3.846
63	50	10/10*	1728	**169 647 117**	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	⅛	95	65	14	130	25	101	14	12	60	24	16	43	M6
25	96	⅛	105	75	14	150	25	132	18	12	73	25	16	57	M6
32	96	⅛	115	85	14	160	25	143	22	12	84	25	16	57	M6
40	120	⅛	140	100	18	180	45	173	26	15	99	26	26	69	M8
50	150	¼	150	110	18	200	45	214	32	15	119	36	26	88	M8
63	150	¼	165	125	18	230	45	226	39	15	132	36	26	88	M8

d [mm]	Lift = Hx [mm]	closest inch
20	7	½
25	10	¾
32	13	1
40	15	1 ¼
50	19	1 ½
63	23	2

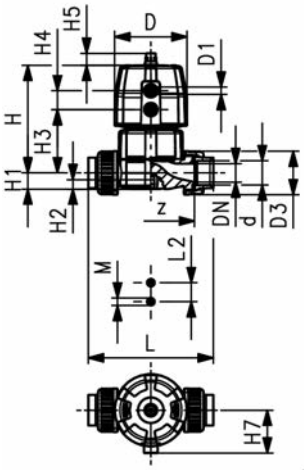
PF 3 39 772 230

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

* PN: PTFE
Working Pressure: **one side**

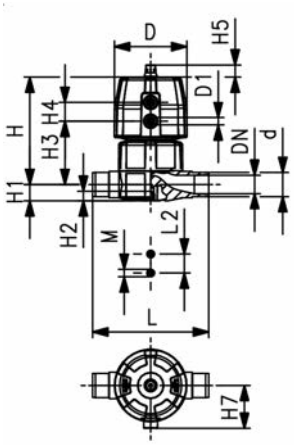


d [mm]	DN [mm]	PN* [bar]	kv-value (Δp=1 bar) [l/min]	EPDM Code	kg
20	15	10/10*	125	**169 654 012**	0.483
25	20	10/10*	271	**169 654 013**	0.851
32	25	10/10*	481	**169 654 014**	1.037
40	32	10/10*	759	**169 654 015**	1.707
50	40	10/10*	1263	**169 654 016**	2.793
63	50	10/10*	1728	**169 654 017**	3.541

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	⅛	128	25	101	14	12	60	24	16	43	M6	96	7
25	96	⅛	152	25	132	18	12	73	25	16	57	M6	114	10
32	96	⅛	166	25	143	22	12	84	25	16	57	M6	122	13
40	120	⅛	192	45	173	26	15	99	26	26	69	M8	140	15
50	150	¼	222	45	214	32	15	119	36	26	88	M8	160	19
63	150	¼	266	45	226	39	15	132	36	26	88	M8	190	23

d [mm]	closest inch
20	½
25	¾
32	1
40	1 ¼
50	1 ½
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

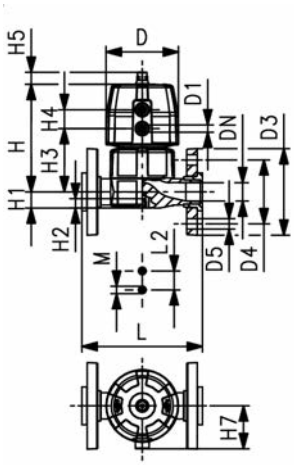
Option:
- Individual configuration of the valve (see diagram)
- Comprehensive range of accessories available

* PN: PTFE
Working Pressure: **one side**

d [mm]	DN [mm]	PN* [bar]	kv-value (Δp=1 bar) [l/min]	EPDM Code	kg
20	15	10/10*	125	**169 655 012**	0.436
25	20	10/10*	271	**169 655 013**	0.784
32	25	10/10*	481	**169 655 014**	0.947
40	32	10/10*	759	**169 655 015**	1.512
50	40	10/10*	1263	**169 655 016**	2.560
63	50	10/10*	1728	**169 655 017**	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	⅛	124	25	101	14	12	60	24	16	43	M6	7	½
25	96	⅛	144	25	132	18	12	73	25	16	57	M6	10	¾
32	96	⅛	154	25	143	22	12	84	25	16	57	M6	13	1
40	120	⅛	174	45	173	26	15	99	26	26	69	M8	15	1 ¼
50	150	¼	194	45	214	32	15	119	36	26	88	M8	19	1 ½
63	150	¼	224	45	226	39	15	132	36	26	88	M8	23	2

PF 3 39 772 210



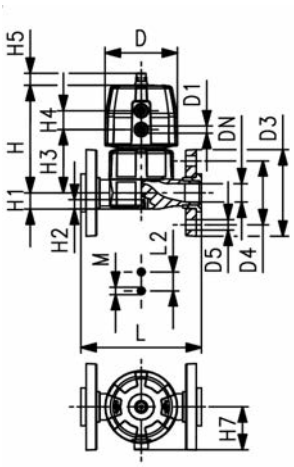
Diaphragm valve DIASTAR Ten ABS DA (Double acting) With backing flanges PP-V metric/BS

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

* PN: PTFE
Working Pressure: **one side**

d [mm]	DN [mm]	PN* [bar]	kv-value (Δp=1 bar) [l/min]	EPDM Code	kg
20	15	10/10*	125	**169 657 112**	0.612
25	20	10/10*	271	**169 657 113**	1.009
32	25	10/10*	481	**169 657 114**	1.268
40	32	10/10*	759	**169 657 115**	2.010
50	40	10/10*	1263	**169 657 116**	3.096
63	50	10/10*	1728	**169 657 117**	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	⅛	95	65	14	130	25	101	14	12	60	24	16	43	M6
25	96	⅛	105	75	14	150	25	132	18	12	73	25	16	57	M6
32	96	⅛	115	85	14	160	25	143	22	12	84	25	16	57	M6
40	120	⅛	140	100	18	180	45	173	26	15	99	26	26	69	M8
50	150	¼	150	110	18	200	45	214	32	15	119	36	26	88	M8
63	150	¼	165	125	18	230	45	226	39	15	132	36	26	88	M8

d [mm]	Lift = Hx [mm]	closest inch
20	7	½
25	10	¾
32	13	1
40	15	1 ¼
50	19	1 ½
63	23	2

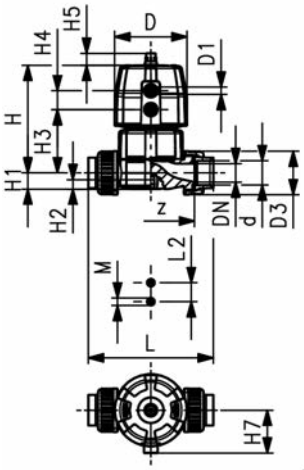
PF 3 39 772 230

Diaphragm valve DIASTAR TenPlus 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

* PN: PTFE
Working Pressure: **both sides**

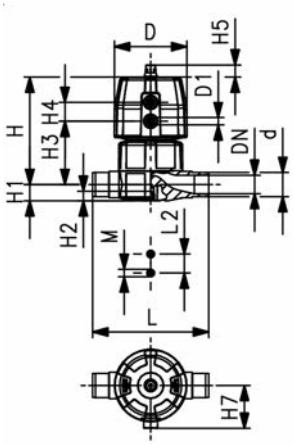


d [mm]	DN [mm]	PN* [bar]	kv-value (Δp=1 bar) [l/min]	EPDM Code	kg
20	15	10/10*	125	**169 684 012**	0.949
25	20	10/10*	271	**169 684 013**	1.061
32	25	10/10*	481	**169 684 014**	1.841
40	32	10/10*	759	**169 684 015**	3.197
50	40	10/10*	1263	**169 684 016**	5.041
63	50	10/10*	1728	**169 684 017**	5.788

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	96	⅛	128	25	127	14	12	68	25	16	57	M6	96	7
25	96	⅛	152	25	132	18	12	73	25	16	57	M6	114	10
32	120	⅛	166	25	167	22	12	93	26	26	69	M6	122	13
40	150	¼	192	45	196	26	15	101	36	26	88	M8	140	15
50	180	¼	222	45	239	32	15	124	37	26	103	M8	160	19
63	180	¼	266	45	251	39	15	137	37	26	103	M8	190	23

d [mm]	closest inch
20	½
25	¾
32	1
40	1 ¼
50	1 ½
63	2

PF 3 39 772 220



Diaphragm valve DIASTAR TenPlus 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

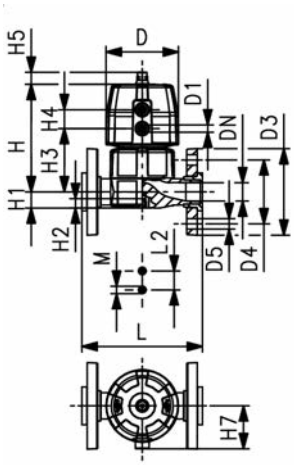
Option:
- Individual configuration of the valve (see diagram)
- Comprehensive range of accessories available

* PN: PTFE
Working Pressure: **both sides**

d [mm]	DN [mm]	PN* [bar]	kv-value (Δp=1 bar) [l/min]	EPDM Code	kg
20	15	10/10*	125	**169 685 012**	0.902
25	20	10/10*	271	**169 685 013**	0.994
32	25	10/10*	481	**169 685 014**	1.752
40	32	10/10*	759	**169 685 015**	3.002
50	40	10/10*	1263	**169 685 016**	4.808
63	50	10/10*	1728	**169 685 017**	5.403

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	96	⅛	124	25	127	14	12	68	25	16	57	M6	7	½
25	96	⅛	144	25	132	18	12	73	25	16	57	M6	10	¾
32	120	⅛	154	25	167	22	12	93	26	26	69	M6	13	1
40	150	¼	174	45	196	26	15	101	36	26	88	M8	15	1 ¼
50	180	¼	194	45	239	32	15	124	37	26	103	M8	19	1 ½
63	180	¼	224	45	251	39	15	137	37	26	103	M8	23	2

PF 3 39 772 210



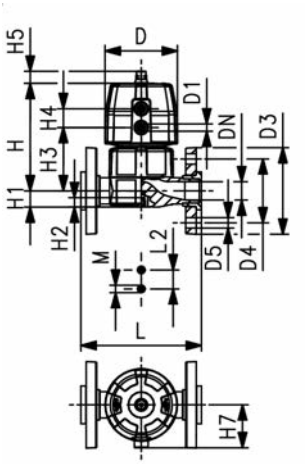
Diaphragm valve DIASTAR TenPlus ABS FC (Fail safe to close) With backing flanges PP-V metric/BS

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

* PN: PTFE
Working Pressure: **both sides**

d [mm]	DN [mm]	PN* [bar]	kv-value (Δp=1 bar) [l/min]	EPDM Code	kg
20	15	10/10*	125	**169 687 112**	1.079
25	20	10/10*	271	**169 687 113**	1.219
32	25	10/10*	481	**169 687 114**	2.072
40	32	10/10*	759	**169 687 115**	3.500
50	40	10/10*	1263	**169 687 116**	5.344
63	50	10/10*	1728	**169 687 117**	6.311



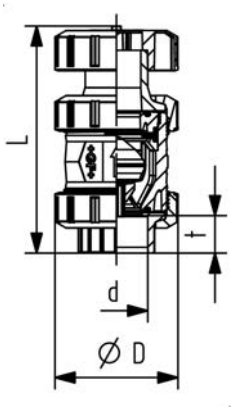
PF 3 39 772 230

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	96	⅛	95	65	14	130	25	127	14	12	68	25	16	57	M6
25	96	⅛	105	75	14	150	25	132	18	12	73	25	16	57	M6
32	120	⅛	115	85	14	160	25	167	22	12	93	26	26	69	M6
40	150	¼	140	100	18	180	45	196	26	15	101	36	26	88	M8
50	180	¼	150	110	18	200	45	239	32	15	124	37	26	103	M8
63	180	¼	165	125	18	230	45	251	39	15	137	37	26	103	M8

d [mm]	Lift = Hx [mm]	closest inch
20	7	½
25	10	¾
32	13	1
40	15	1 ¼
50	19	1 ½
63	23	2

Process control valves

Ventilating and bleed valve
Type 591 ABS
With solvent cement sockets metric

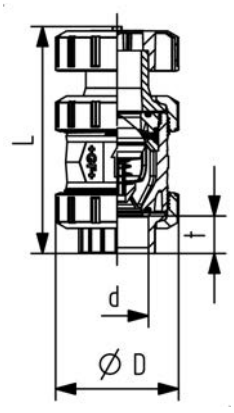


PF 2 33 988 311

Model:
- With protection cap up to DN50 made of PP-GF, DN65-100 made of POM
- Floater made of PP-H
- Designed for easy installation and removal
- Compact installation length

d [mm]	DN [mm]	PN	EPDM Code	kg	D [mm]	L [mm]	t [mm]	closest inch
16	10	10	**169 591 001**	0.107	50	126	14	⅜
20	15	10	**169 591 002**	0.107	50	127	16	½
25	20	10	**169 591 003**	0.213	58	142	18	¾
32	25	10	**169 591 004**	0.254	68	155	22	1
40	32	10	**169 591 005**	0.432	84	177	26	1 ¼
50	40	10	**169 591 006**	0.629	97	195	31	1 ½
63	50	10	**169 591 007**	1.096	124	227	38	2
75	65	10	**169 591 008**	2.420	166	256	45	2 ½
90	80	10	**169 591 009**	3.870	200	275	52	3
110	100	10	**169 591 010**	6.240	238	318	64	4

Ventilating valve type 595 ABS
With solvent cement sockets metric



PF 2 33 988 411

Model:
- With protection cap up to DN50 made of PP-GF, DN65-100 made of POM
- Spring loaded, spring made of NIMONIC 90, HALAR coated
- Spring available in other materials, see spare parts
- Designed for easy installation and removal
- Compact installation length

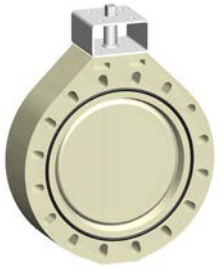
d [mm]	DN [mm]	PN	EPDM Code	kg	D [mm]	L [mm]	t [mm]	closest inch
16	10	10	**169 595 001**	0.107	50	126	14	⅜
20	15	10	**169 595 002**	0.107	50	127	16	½
25	20	10	**169 595 003**	0.213	58	142	18	¾
32	25	10	**169 595 004**	0.254	68	155	22	1
40	32	10	**169 595 005**	0.432	84	177	26	1 ¼
50	40	10	**169 595 006**	0.629	97	195	31	1 ½
63	50	10	**169 595 007**	1.096	124	227	38	2
75	65	10	**169 595 008**	2.420	166	256	45	2 ½
90	80	10	**169 595 009**	3.870	200	275	52	3
110	100	10	**169 595 010**	6.240	238	318	64	4

Butterfly valves

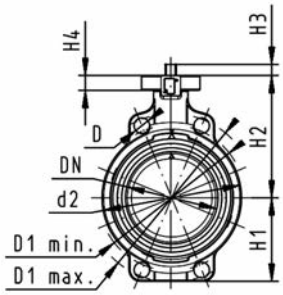
PROGEF Standard
Butterfly valve type 567
Bare shaft

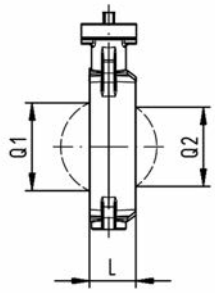
Model:

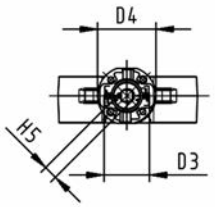
- Material: PP-H, DN350-DN600 material PP-R
- Connecting dimension: ISO 7005 PN 10, EN 1092 PN 10, DIN 2501 PN 10, ANSI/ASME B 16.5 Class 150, BS 1560: 1989, BS 4504, JIS B 2220
- Up to DN 300: Overall length according to EN558 (DN 50-200: line 25, DN250, 300 line 16), ISO 5752
- Interface F07 for the dimensions DN50-200 according to DIN/ISO 5211
- Interface F10 for the dimensions DN250-300 according to DIN/ISO 5211
- Interface F12 for the Dimensions DN350-400 according to DIN/ISO 5211
- Interface F14 for the Dimensions DN450-600 according to DIN/ISO 5211

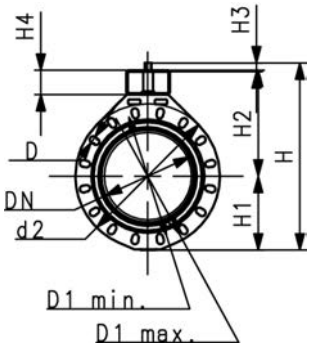


d [mm]	DN [mm]	Inch	PN	kv-value (Δp=1 bar) [l/min]	EPDM Code	FPM Code	kg	
280	250	10	8	51000	**167 567 809**	**167 567 829**	10.251	
315	300	12	8	73000	**167 567 810**	**167 567 830**	13.251	









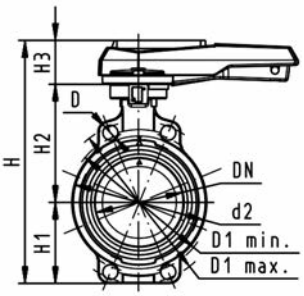
PF 2 34 637 005

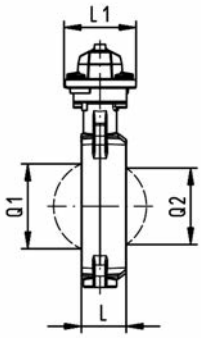
d [mm]	D [mm]	D1 min. [mm]	D1 max. [mm]	d2 [mm]	D3 [mm]	D4 [mm]	H1 [mm]	H2 [mm]	H3 [mm]	H4 [mm]	H5 [mm]	L [mm]	Q1 [mm]	Q2 [mm]	
280	25	353	362	329	102	125	205	264	40	23	22	113	210	207	
315	25	400	432	379	102	125	228	285	40	23	22	113	256	253	

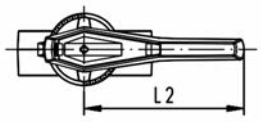
PROGEF Standard
Butterfly valve type 567
Hand lever with ratchet settings

Model:

- Material: PP-H, DN350-DN600 material PP-R
- 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
- Up to DN 300: Overall length according to EN558 (DN 50-200: line 25, DN250, 300 line 16), ISO 5752
- We recommend for the dimensions DN250 and DN300 only 6 bar maximum system pressure for the hand lever version







PF 2 34 637 001

d [mm]	DN [mm]	Inch	PN	kv-value (Δp=1 bar) [l/min]	EPDM Code	FPM Code	kg
280	250	10	8	55200	**167 567 009**	**167 567 029**	11.841
315	300	12	8	80000	**167 567 010**	**167 567 030**	13.245

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]
280	25	353.0	362.0	329	554	205	264	85	113	149	408	210	207
315	25	400.0	432.0	379	598	228	285	85	113	149	408	256	253

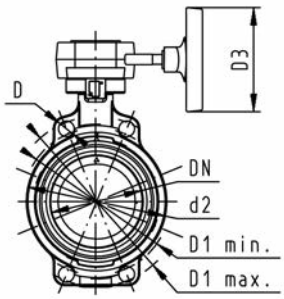
PROGEF Standard
Butterfly valve type 567
Reduction gear with handwheel

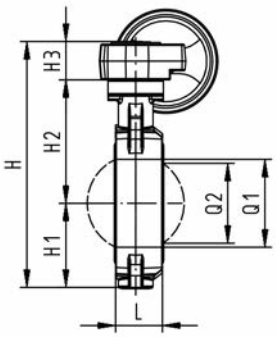
Model:

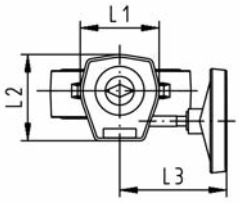
- Material: PP-H, DN350-DN600 material PP-R
- Connecting dimension: ISO 7005 PN 10, EN 1092 PN 10, DIN 2501 PN 10, ANSI/ASME B 16.5 Class 150, BS 1560: 1989, BS 4504, JIS B 2220
- Up to DN 300: Overall length according to EN558 (DN 50-200: line 25, DN250, 300 line 16), ISO 5752

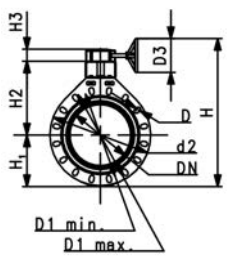
d [mm]	DN [mm]	Inch	PN	kv-value (Δp=1 bar) [l/min]	EPDM Code	FPM Code	kg
280	250	10	8	51000	**167 567 049**	**167 567 069**	13.074
315	300	12	8	73000	**167 567 050**	**167 567 070**	16.066

d [mm]	D [mm]	D1 min. [mm]	D1 max. [mm]	d2 [mm]	D3 [mm]	H1 [mm]	H2 [mm]	H3 [mm]	L [mm]	L1 [mm]	L2 [mm]	L3 [mm]	Q1 [mm]	Q2 [mm]
280	25	353	362	329	200	205	264	55	113	130	140	200	210	207
315	25	400	432	379	200	228	285	55	113	130	140	200	256	253









PF 2 34 637 003

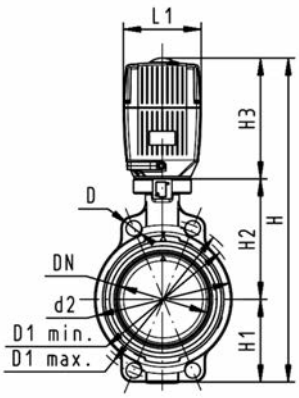
Butterfly valves electric

PROGEF Standard
Butterfly valve type 140 100-230V
Without manual override

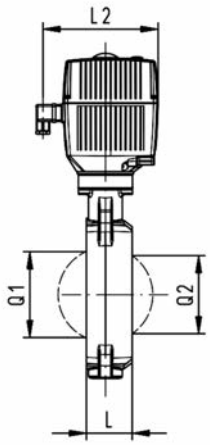
Model:

- 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
- 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
- Material: PP-H, DN350-DN600 material PP-R
- Up to DN 300: Overall length according to EN558 (DN 50-200: line 25, DN250, 300 line 16), ISO 5752
- For DN350-DN600 electric actuator from Valpes is equipped, various options available

d [mm]	DN [mm]	Inch	PN	kv-value (Δp=1 bar) [l/min]	EPDM Code	FPM Code	kg
280	250	10	6	55200	**199 140 369**	**199 140 389**	13.747
315	300	12	4	80000	**199 140 370**	**199 140 390**	16.722



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]
280	EA-42	25	353.0	362.0	329	677	205	264	208	113	122	180	210
315	EA-42	25	400.0	432.0	379	721	228	285	208	113	122	180	256



d [mm]	Q2 [mm]
280	207
315	253

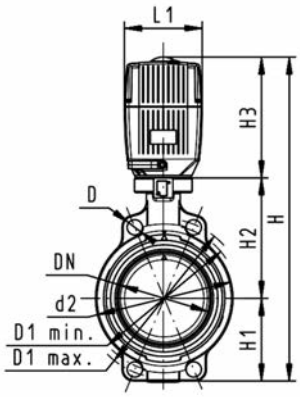
PF 3 39 643 037

PROGEF Standard
Butterfly valve type 140 24V
Without manual override

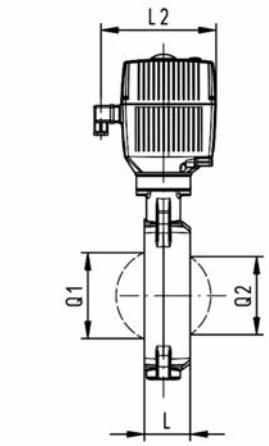
Model:

- Material: PP-H
- 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]	Inch	PN	kv-value (Δp=1 bar) [l/min]	EPDM Code	FPM Code	kg
280	250	10	6	55200	**199 140 449**	**199 140 469**	13.747
315	300	12	4	80000	**199 140 450**	**199 140 470**	16.722



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]
280	EA-42	25	353.0	362.0	329	677	205	264	208	113	122	180	210
315	EA-42	25	400.0	432.0	379	721	228	285	208	113	122	180	256



d [mm]	Q2 [mm]
280	207
315	253

PF 3 39 643 037

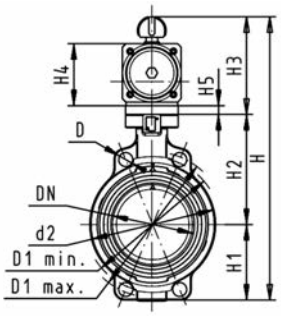
Butterfly valves pneumatic

PROGEF Standard
Butterfly valve type 240
FC (Fail safe to close)
Without manual override

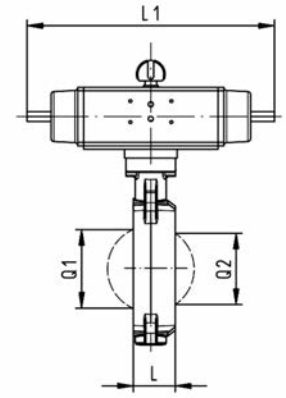
Model:

- Material: PP-H, DN350-DN600 material PP-R
- For DN350-DN600 pneumatic actuator supplied by Revac
- 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
- Up to DN 300: Overall length according to EN558 (DN 50-200: line 25, DN250, 300 line 16), ISO 5752
- Control range 90°<)

d [mm]	DN [mm]	Inch	PN	kv-value (Δp=1 bar) [l/min]	EPDM Code	FPM Code	kg
280	250	10	8	55200	**199 240 289**	**199 240 309**	26.888
315	300	12	8	80000	**199 240 290**	**199 240 310**	33.459



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]
280	PA-65 FC	25	353.0	362.0	329	808	205	264	191	148		113	648
315	PA-70 FC	25	400.0	432.0	379	866	228	285	196	157		113	663



d [mm]	Q1 [mm]	Q2 [mm]
280	210	207
315	256	253

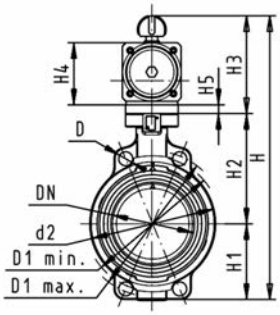
PF 3 39 644 037

PROGEF Standard
Butterfly valve type 240
FO (Fail safe to open)
Without manual override

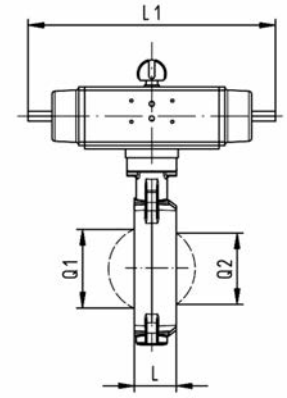
Model:

- Material: PP-H
- 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]	Inch	PN	kv-value (Δp=1 bar) [l/min]	EPDM Code	FPM Code	kg	
280	250	10	8	55200	**199 240 329**	**199 240 349**	30.484	
315	300	12	8	80000	**199 240 330**	**199 240 350**	33.459	



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]	
280	PA-70 FO	25	353.0	362.0	329	808	205	264	191	148		113	648	
315	PA-70 FO	25	400.0	432.0	379	866	228	285	196	157		113	663	



d [mm]	L2 [mm]	Q1 [mm]	Q2 [mm]
280	137	210	207
315	145	256	253

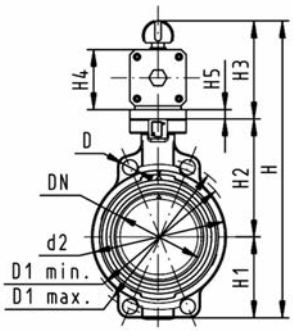
PF 3 39 644 037

PROGEF Standard
Butterfly valve type 240
DA (Double acting)
Without manual override

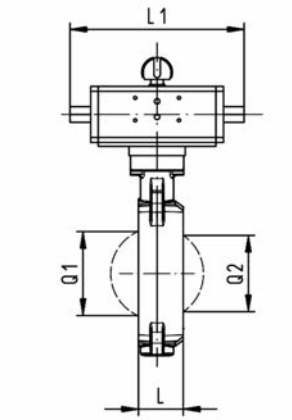
Model:

- Material: PP-H, DN350-DN600 material PP-R
- For DN350-DN600 pneumatic actuator supplied by Revac
- 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
- Up to DN 300: Overall length according to EN558 (DN 50-200: line 25, DN250, 300 line 16), ISO 5752
- Control range 90°<)

d [mm]	DN [mm]	Inch	PN	kv-value (Δp=1 bar) [l/min]	EPDM Code	FPM Code	kg
280	250	10	8	55200	**199 240 369**	**199 240 389**	18.188
315	300	12	8	80000	**199 240 370**	**199 240 390**	24.263



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]
280	PA-65 DA	25	353.0	362.0	329	748	205	264	161	118		113	350
315	PA-70 DA	25	400.0	432.0	379	816	228	285	173	130		113	381



d [mm]	Q1 [mm]	Q2 [mm]
280	210	207
315	256	253

PF 3 39 644 037

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Notes:

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 Piping Systems Limited («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 (6) months, either party may cancel the contract forthwith.
Georg Fischer shall not be liable for any damage or loss of any kind whatsoever resulting the refrom, 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 (1) 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 (6) 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 seven (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.
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 five (5) years from the date of installation or seven (7) 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 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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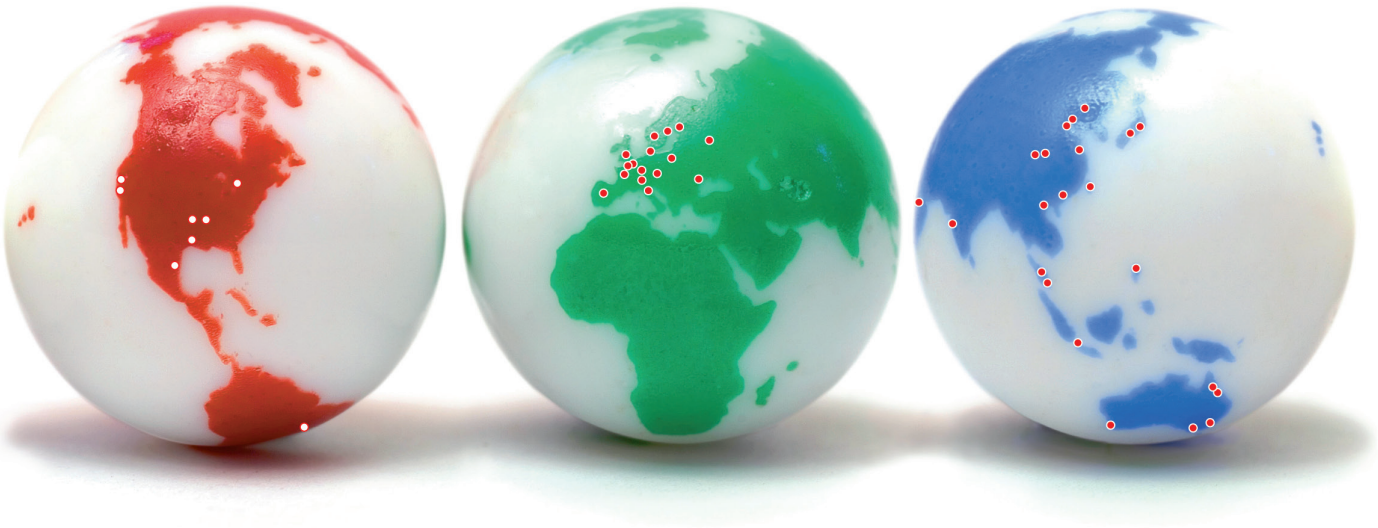

The technical data are not binding. They neither constitute expressly warranted characteristics nor guaranteed properties nor a guaranteed durability. They are subject to modification. Our General Terms of Sale apply.

Adding Quality to People's Lives

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