GF Piping Systems

COOL-FIT® Piping Systems

Catalog and Technical Information 2019

COOL-FIT® ABS
COOL-FIT® ABS Plus
COOL-FIT® PE Plus

Pipe, fittings, valves, and accessories

Other Products Available from GF Piping Systems

Fuseal® Corrosive Waste Piping System

Pipe, Fittings, Accessories
Electrofusion
Mechanical Joint

Excellent chemical and physical properties make the Fuseal system ideal for handling corrosive chemical waste solutions DWV applications. Fuseal is suitable anywhere a mixtures of acids, bases and solvents are drained.

Signet Instrumentation

Chlorine	Dissolved Oxygen
Turbidity	Flow/Batch
pH/ORP	Conductivity/Resistivity
Pressure	Temperature
Level	

Our measurement offering will cover your needs: flow, pH, conductivity, level, temperature and various water quality parameters. Corresponding to our piping systems, most sensors are available in plastic and are therefore highly resistant to chemicals. Our plug-and-play measurement products are self-explanatory, easy to maintain and are offered with suitable installation fittings.

Actuation

With our modular set-up, valves and actuators can be combined flexibly and additional functionalities, like positioners or monitoring devices, can be added optionally. Naturally, we offer the whole range in all-plastic designs, which are capable of withstanding harsh environments. A wide range of pressure regulating valves and accessories complete our actuation portfolio.

Pipe Metric-To-Inch Conversion Chart

16 mm	=	⅜"	40 mm	=	1¼"	90 mm	=	3"	225 mm	=	8"	400 mm	=	16"
20 mm	=	½"	50 mm	=	1½"	110 mm	=	4"	250 mm	=	10"	450 mm	=	18"
25 mm	=	¾"	63 mm	=	2"	160 mm	=	6"	315 mm	=	12"	500 mm	=	20"
32 mm	=	1"	75 mm	=	2½"	200 mm	=	8"	355 mm	=	14"			

Go to www.gfpiping.com for more information!

COOL-FIT® Piping Systems

Catalog and Technical Information

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COOL-FIT ABS Plus system

The ideal system for secondary cooling

COOL-FIT ABS Plus is a completely pre-insulated plastic pipe system for secondary cooling and refrigeration systems operated with brine or glycol solutions. The system is based on proven and cold-shock resistant ABS pipes and fittings, which are insulated with high-quality PUR foam in addition to a robust and UV-resistant outer pipe. The smooth inner surface of the ABS pipe provides for minimal pressure loss, while the low thermal conductivity of plastic and the insulation ensure low energy and running costs for a lifetime. The 3-in-1 construction also reduces installation time to a minimum. COOL-FIT is ideal for use in cold storage, in food and beverage production (e.g. in breweries, dairies, slaughterhouses), in supermarkets as well as for process cooling in industrial cooling water systems or in data centers.

+ Main benefits

Safety	=	**No corrosion**
Simplicity	=	**Fast connections, easy suspension**
Efficiency	=	**Excellent insulating properties, low operating and energy costs**
Environment	=	**Low CO_2 emissions**

+ Systems for refrigeration and cooling

COOL-FIT ABS Plus System

ecoFIT System

COOL-FIT PE Plus System

iFIT System

COOL-FIT ABS System

A symbiosis of ecological and economical benefits

COOL-FIT is used exclusively in secondary cooling systems. The amount of refrigerant can be reduced in this type of installation by 80 to 90 percent compared to conventional systems. COOL-FIT thus achieves a TEWI (Total Equivalent Warming Impact) value which is 50 percent superior to other existing systems.

Compelling energy-saving arguments

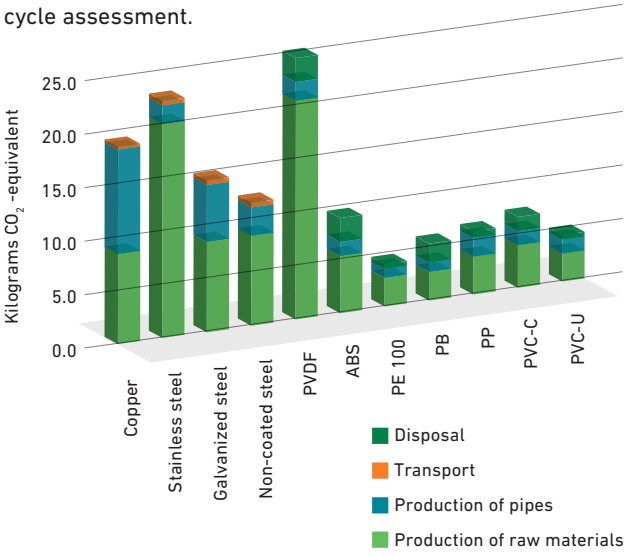
The system has clear advantages over traditional metal pipe systems in terms of energy consumption and resource conservation. This pertains to production and use by the customer.

Practically maintenance-free

The functionality of the piping is not impaired in any way by either corrosion or lime deposits; the pipes therefore remain virtually maintenance-free throughout their entire service life.

Environmental compatibility

We act and think sustainably. Georg Fischer uses natural resources sparingly and continually strives to optimize the life cycle assessment.



Source: Pioneering Green Solutions, GF Piping Systems 2010

Energy efficiency

A completely pre-insulated system helps our customers save even more energy. The low lambda value translates into high energy efficiency. COOL-FIT uses approximately 50 percent less energy in operation than conventional copper systems.

Online CO_2 calculator

We attach great importance to energy efficiency and reducing water consumption in the manufacture and use of our products. Sustainability is also supported by the durability, permanent availability and large assortment of our products. We invite you to calculate the CO2 savings potential of plastic compared to metal piping with our CO2 calculator at www.gfps.com

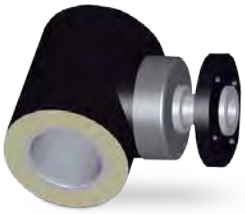
+ Everything from one source

The name Georg Fischer stands for reliability and durability - and has done so for over 200 years. We develop and manufacture pipes, fittings, manual and actuated valves, measurement and control equipment, as well as joining technology. We guarantee the best quality, state-of-the-art products and unique features. Being a system provider, we are able to put together the perfect solution for our customers' individual needs. Our Customizing Teams will also manufacture piping components on request, tailor-made to customer specifications.

The fast, sturdy and efficient joining

GF Piping Systems has invested considerably in developing the ideal joining technologies for special applications and materials. With the COOL-FIT ABS Plus nipple no peeling of the polyurethane insulation or subsequent insulating on site is required.
In addition to sophisticated and successful product ranges and systems, we offer a service package with planning tools, accessories, training, tools and high performance logistics. Our specialist teams around the world are available to assist you.

Planning tools

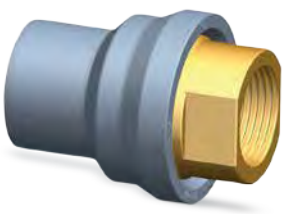


CAD library
The extensive CAD library is the most frequently used planning tool. The freely available database comprises over 30 000 drawings as well as technical data for our customers. Many formats are available.

Joining techniques

Solvent cement - tried and tested
COOL-FIT is joined quickly and safely. The solvent cement joining method saves considerable time compared to the welding of metal pipes.

Solvent cement - inner nipple connector
With the COOL-FIT ABS Plus nipple, no PUR insulation needs to be removed. An integrated pipe stop creates a gap for visual inspection. The gap is sealed afterwards and is water and vapor-tight.



Mechanical connection to metal components
The latest generation of transition fittings with integrated O-ring seal has been specially designed for cooling applications with large temperature fluctuations.

Product range overview

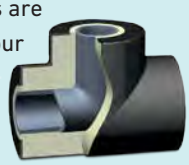
More than a system

All your requirements are met with this product range for easy installation and reliable operation.

Patented barrel nipple. Pipe-to-pipe joining.

No time-consuming peeling of the polyurethane insulation.

Fittings and pipes are pre-insulated in our plant. Compact and high quality.



High insulation values over entire lifetime.

Corrosion-free ABS valves and actuators are essential in cooling and refrigeration.

Precise control and temperature regulation.

COOL-FIT ABS Plus includes not only corrosion-free, pre-insulated pipes and fittings, but transitions to metal as well. Also available are manual and actuated valves to stop and control flow and sensors for measurement and control technology.

Product overview

Description	D [1]	90	90	110	110	125	140	160	180	225	250	280	315	335	400	450	355 → 630
	DN	20	25	32	40	50	65	80	100	125	150	200	200	250	250	300	250 → 450
	PN																
Pipes, pre-insulated	10	■	■	■	■	■	■	■	■	■	■	■	■				For further information see: COOL-FIT PE Plus System
	6													■	■	■	
Bends 45° / 90°, pre-insulated	10	■	■	■	■	■	■	■	■	■	■	■	■				
	6													■	■	■	
T-90° equal, pre-insulated	10	■	■	■	■	■	■	■	■	■	■	■	■				
	6													■	■	■	
T-90° reduced, pre-insulated	10	■	■	■	■	■	■	■	■	■	■	■	■				
	6													•	•	•	
Instrument fittings, pre-insulated	10	■	■	■	■	■	■	■	■	■	■	■	■				
Flange connections	10	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	
Ball valves, manual & actuated [2]	10	■	■	■	■	■	■	■	■								
Butterfly valves, manual & actuated [2]	10					■	■	■	■	■	■	■	■	PP	PP	PP	
Diaphragm valves, manual & pneumatic	10	■	■	■	■	■											
Check valves	10	■	■	■	■	■											
Seals	10	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	
Pipe clips in plastic	-	■	■	■	■	■	■	■									
Sensors and accessories	-	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	
Cementing	-	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	
Transitions to metal	10	■	■	■	■	■											

[1] ø of protective pipe in PE

[2] electric or pneumatic actuation

• on request

Lower operating costs and higher energy efficiency

COOL-FIT ABS Plus pipes are resistant to oxygen diffusion and corrosion, so a long service life is guaranteed. In secondary cooling applications COOL-FIT ABS Plus exhibits high energy efficiency (low lambda value) and is practically maintenance-free throughout its entire lifetime. It is also robust and easy to work with on building sites - even under difficult conditions. All in all, COOL-FIT ABS Plus pipes are easier and faster to install than metal pipes, and this naturally reduces costs for our customers.

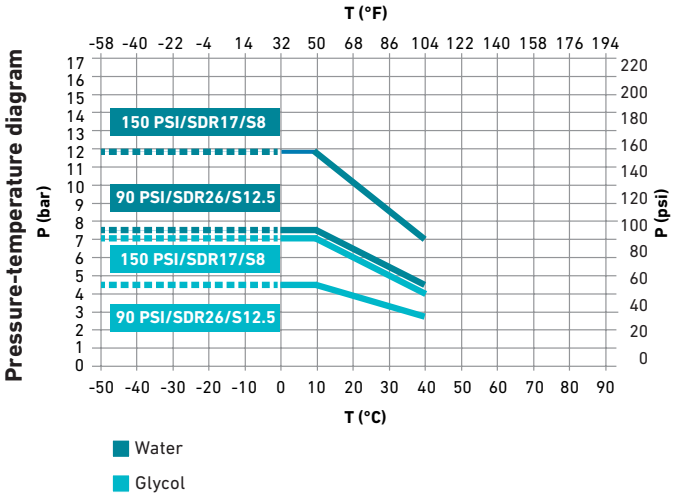
Specifications

The pre-insulated COOL-FIT ABS Plus pipe and fitting components comply with the following guidelines and norms:

	System specifications	
ABS (impact resis-tant)	Temperature	-50 °C to +40 °C
	Pressure rating	PN10 (d25–d225) PN6 (d250–d315)
	Norm	EN ISO 15493
Joining technology	Solvent cement	Tangit cement
Weight (example)	1 Meter d50 x 110	ABS 0.52 kg
		(steel pipe 3.50 kg)
Insulation	- Polyurethane rigid foam,closed-cell (no harmful foaming agents) - Density: > 45 kg/m³ - Thermal conductivity: 0.026 W/m*K	
PE protective pipe black	Properties	Impact resistant, dimensionally stable, water and vapor-tight, weatherproof
Media	F = 1.0	Water (> 0 °C)
	F = 1.0	Inorganic salt solutions
	F = 1.25	Organic salt solutions
	F = 1.7	Glycol solutions (max. 50%)
Oxygen impermeability	DIN 4726	< 0.1 g/m³ day
Pipe fire stops	Norms and approvals	EN 1366/EI 90/EI120
		DIBT Nr. Z-19.17-1194
Environment	CFC-free and recyclable	

Application limits for water and water-soluble glycol

The data given is based on 25-year values.



NB: The COOL-FIT system is not suitable for use with gaseous primary refrigerants, such as ammonia, propane, CO2, R407 and R22.

Please contact us for application support.

The left list is considered to be a rough guideline and does not take the place of a detailed assessment of material suitability for your particular application. The information is based on empirical data and according to the state of the art. These data are only intended as a guide. In practice, additional factors such as concentration, pressure and joining technology must also be taken into account. The technical data are not binding and not expressly warranted characteristics of the goods.

Application

The perfect solution

In selecting a suitable piping system to carry the coolant in a long-lasting and dependable cooling system in a warehouse for fruit and vegetable storage, special attention was dedicated to durability, efficiency, low weight and ease of installation.

State-of-the-art cooling logistics

The warehouse of a wholesaler was designed according to the latest technical know-how.
The goal was to realize an environmentally friendly and sustainable overall refrigeration concept, thus enabling long-term and reliable operation of the cooling system with low energy consumption.

Cooling system - primary cooling circuit

The cooling system was constructed as a coolant system. In the primary cold production, ammonia (NH3), a natural primary coolant, was used. NH3 has neither global warming potential (GWP) nor ozone depleting potential (ODP).
In other words, ammonia (NH3) does not fall under the EU F-Gas regulation (EC no. 842/2006) and therefore complies with the environmental specifications for this plant. Ammonia is also very energy efficient.

Cooling system - secondary cooling circuit

COOL-FIT ABS Plus is used in the secondary cooling circuit, where food-safe propylene glycol is circulated as the coolant.

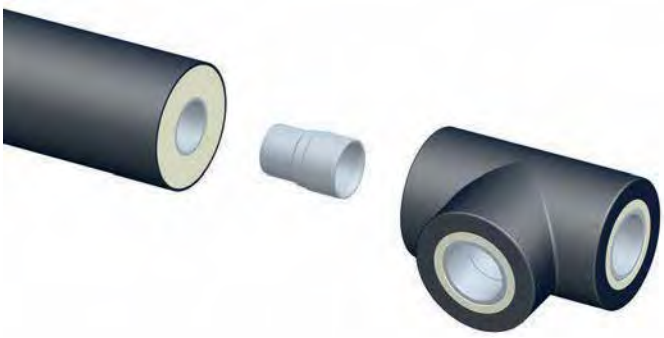
Plant engineers require specialized know-how

COOL-FIT is joined using the proven solvent cement joining method, which is easy and safe to work with. In spite of this, building a large refrigeration plant is a challenge even for experienced plant engineers. Having well-trained and qualified staff is therefore important in order to guarantee a good installation. For this reason, installation personnel was trained in the handling of pre-insulated plastic pipe systems at the GF Piping Systems Training Center prior to on-site construction.

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 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 +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.

GF Piping Systems—Cooling Family

Minimum on site time

COOL-FIT ABS
[-50°C to +60°C (-58°F to 140°F)]
[d20 (½") - d315 (12")]

SIGNET/VALVES
[d16 (⅜") - d1000 (40")]

COOL-FIT ABS PLUS
Pre-insulated with PUR & UV resistant outer jacket
[-50°C to +40°C (-58°F to 104°F)]
[d25 (¾") - d315 (12")]

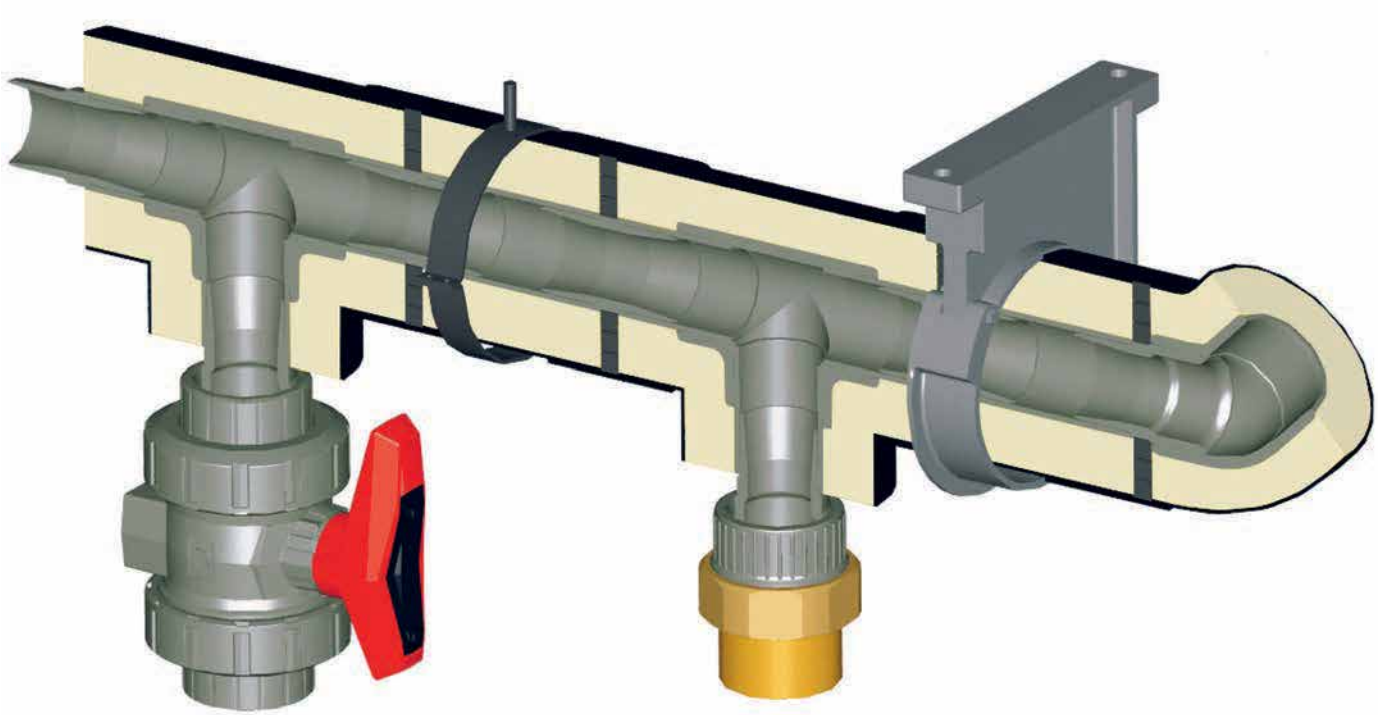
ecoFIT PE
[-50°C to +60°C (-58°F to 140°F)]
[d20 (½") - d1000(40")]

COOL-FIT Cement
Solvent Cement
Reliable and quick

COOL-FIT Adaptors
Safe, reliable


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 $\geq$ 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

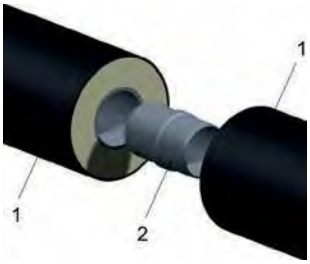
COOL-FIT ABS Plus technical details

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

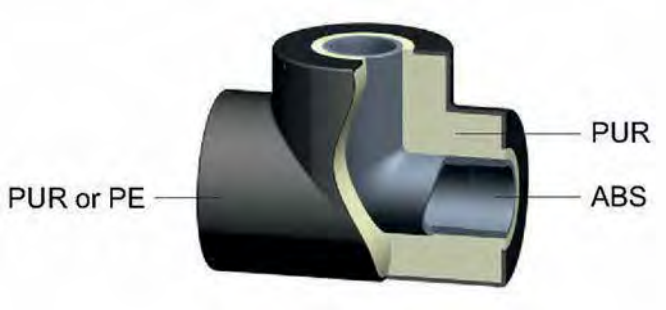
Note: Dimensions from d200 (incl.) must be calibrated using the COOL-FIT ABS Plus calibration tool.

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

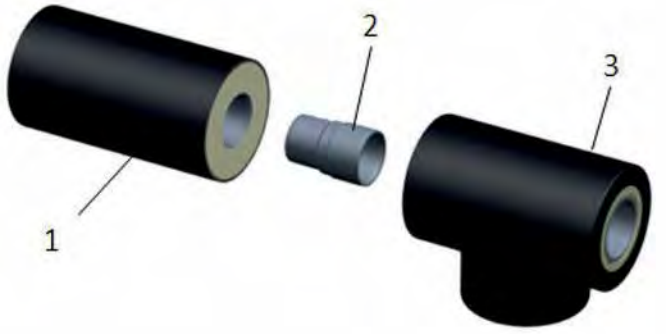
COOL-FIT ABS Plus Fittings are manufactured using the same raw materials as the pipe and are thus completely compatible with COOL-FIT ABS Plus pipes in terms of insulating properties and also jointing technique.



Connections

Pipe to Fitting

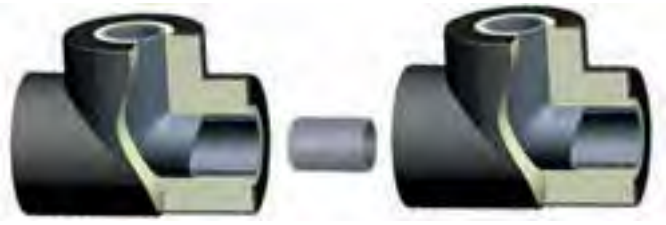
COOL-FIT ABS Plus pipe to fitting connections are achieved using the d-di COOL-FIT ABS Plus nipple. d is the designation for a normal socket solvent cemented joint as per the standard GF Piping Systems ABS range. di is the designation for a joint which takes place in the internal diameter of the pipe.



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

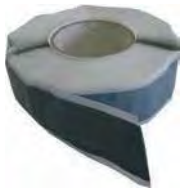
The solvent cementing equipment is exactly the same for internal di jointing as for standard d jointing..

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.

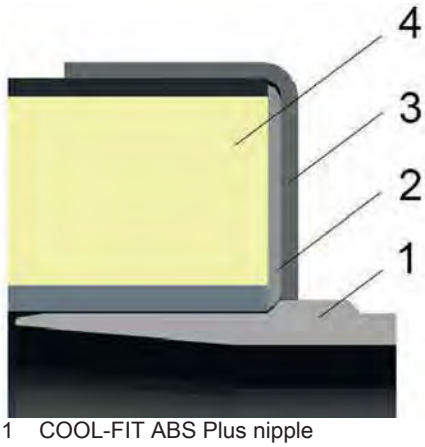
90	110	125	140	160	180	225	250	280	315
738.011.167									
					738.011.170				
							738.011.173		

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

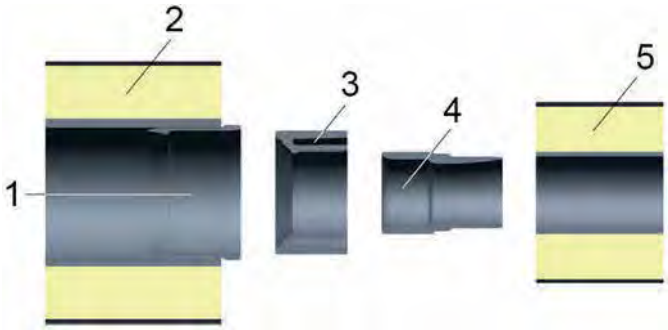
GF Piping System offers tailor made insulation sets for the ball valves type 546. The sets consist of UV resistant PE foam with a shrink tape jacket and are available from d25 up to d110mm.

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”)

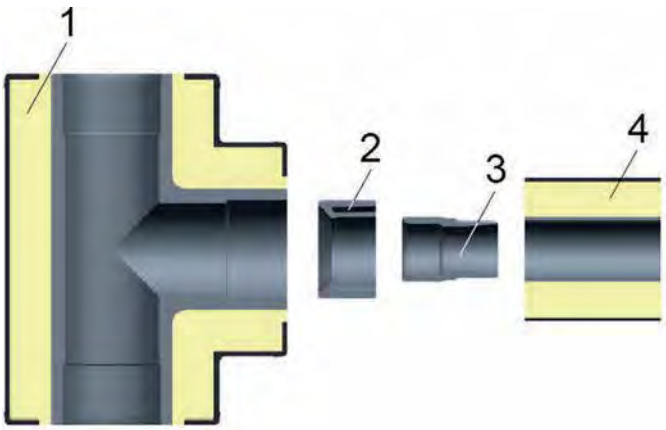
Note: the configurator below results in a gap twice as wide usual app. 20mm (0.8”) and therefore twice the amount of gap filler is required.



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.

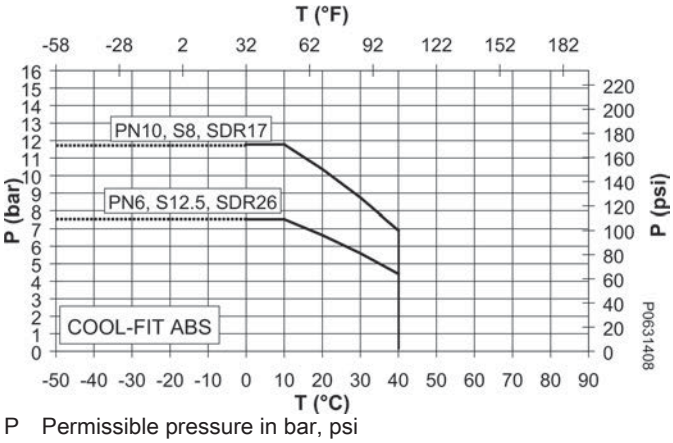
The following technical information covers the fundamental information required to ensure an economical and trouble free installation: Not all details however are published in this document, for more detailed information or if you have a specific question please ask your local GF Piping Systems company, 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.

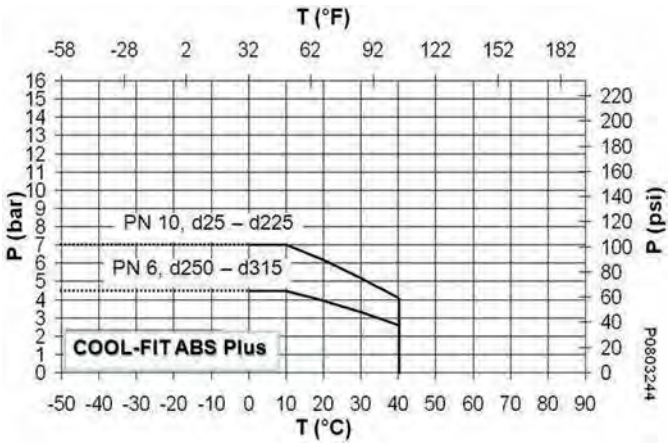
Glycol Solutions

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.

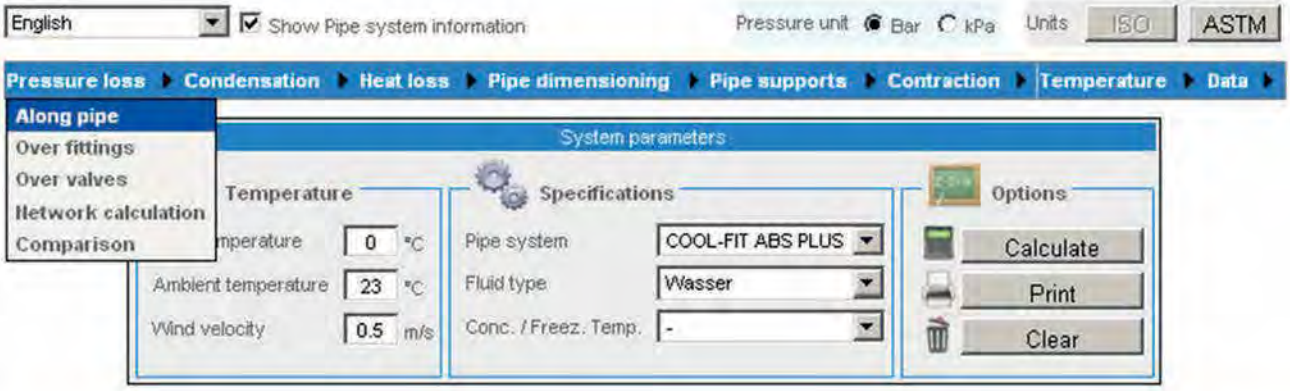
For example under the Pressure Drop function the user has 5 options. He can calculate individual products in all dimensions, for example pipe, fittings or valves. The network option allows the user to calculate the pressure drop in complete pipeline consisting of different dimensions and products. The 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.

Cooling Calculation Tool

The COOL-FIT/iFIT calculation tool allows you to calculate all the pipe system parameters important for cooling, such as pressure loss, heat emission, contraction and temperature loss.



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

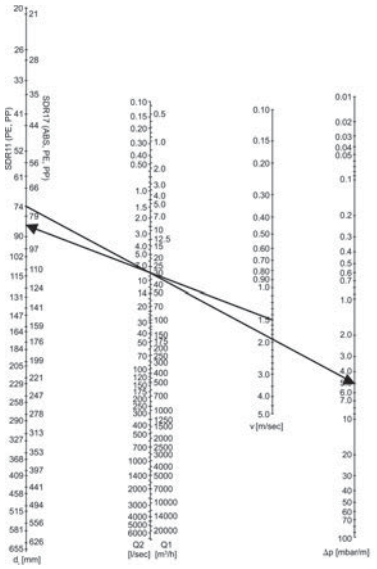
Nomogram for easy determination of diameter and pressure loss

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.

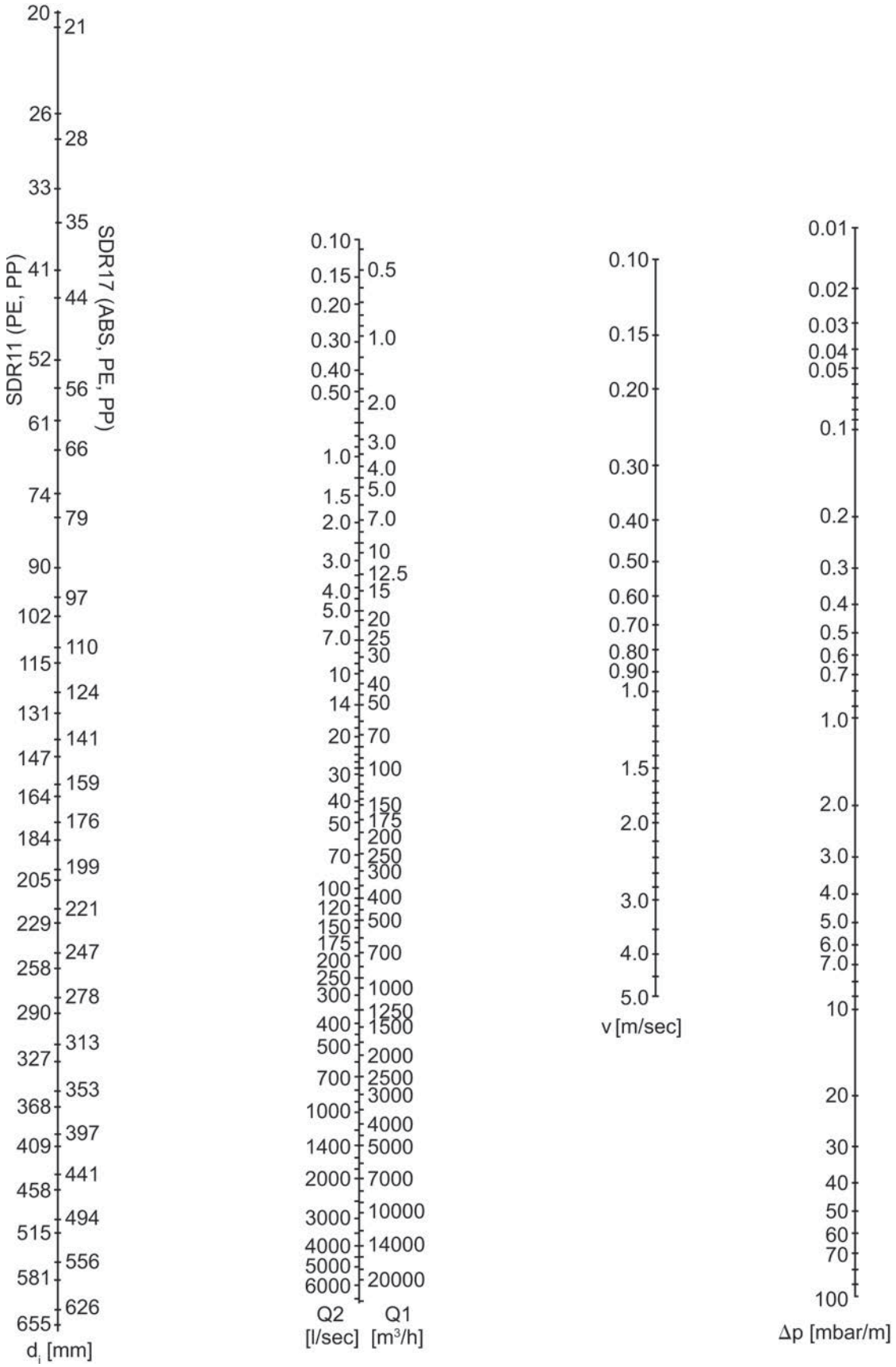
Remark: The determined pressure loss from the nomogram applies only to a density of the flow medium of 1000 kg/m³, e. g. for water. Further pressure losses of fittings, valves, etc. have to be considered as shown in the following.

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 m^3/h
ρ	density of the medium transported in kg/m^3 (1 g/cm^3 = 1000 kg/m^3)
k_v	valve flow characteristic in m^3/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

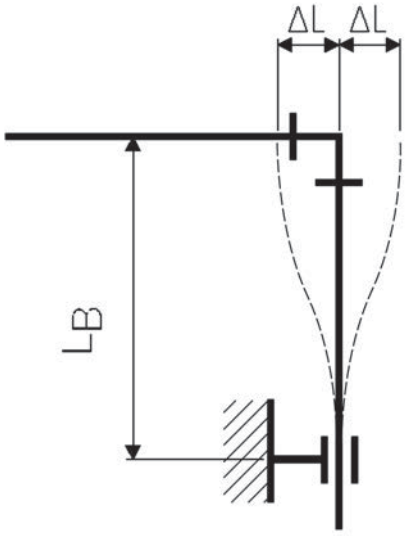
Introduction

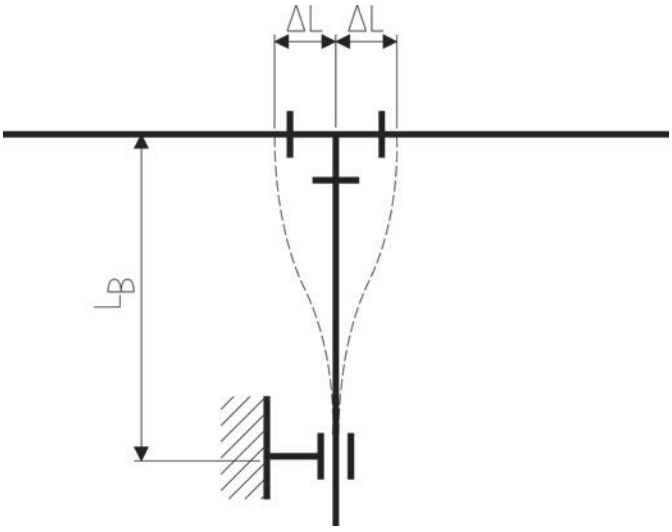
General

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.

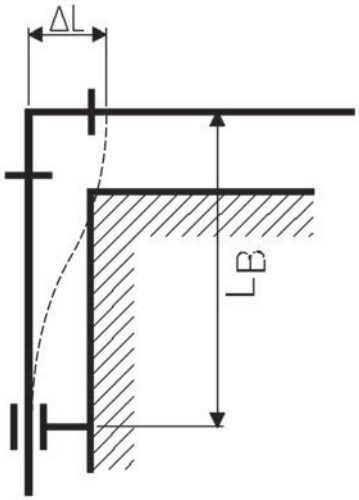


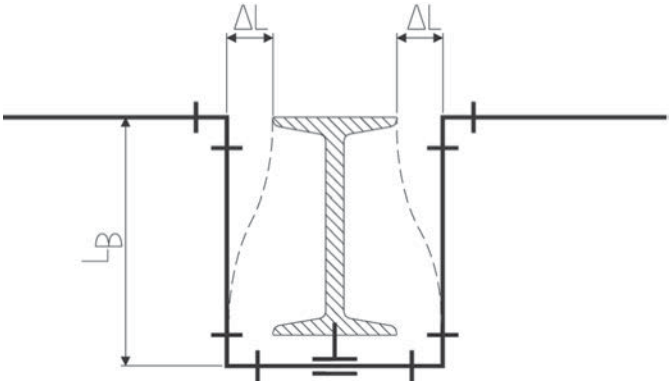


Fundamentals

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

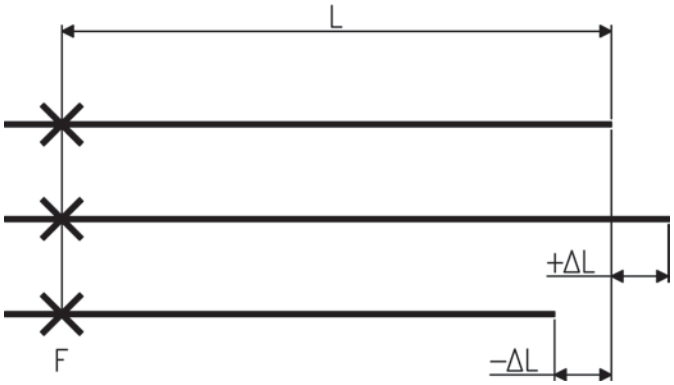
* Exact values can be calculated using GF's on-line tool (www.cool-fit.georgfischer.com) or ask your local GF representative.

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.

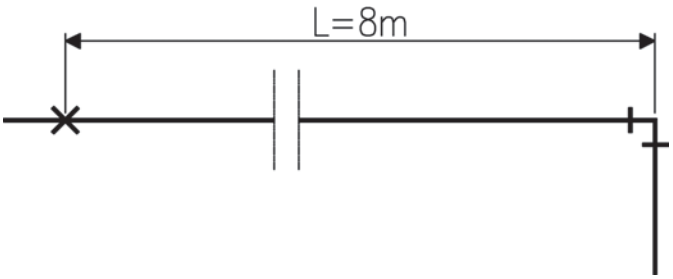


Example: Determining the required flexible section

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.

Flexible sections of COOL-FIT ABS pipelines

Flexible length (swing arm) in inches

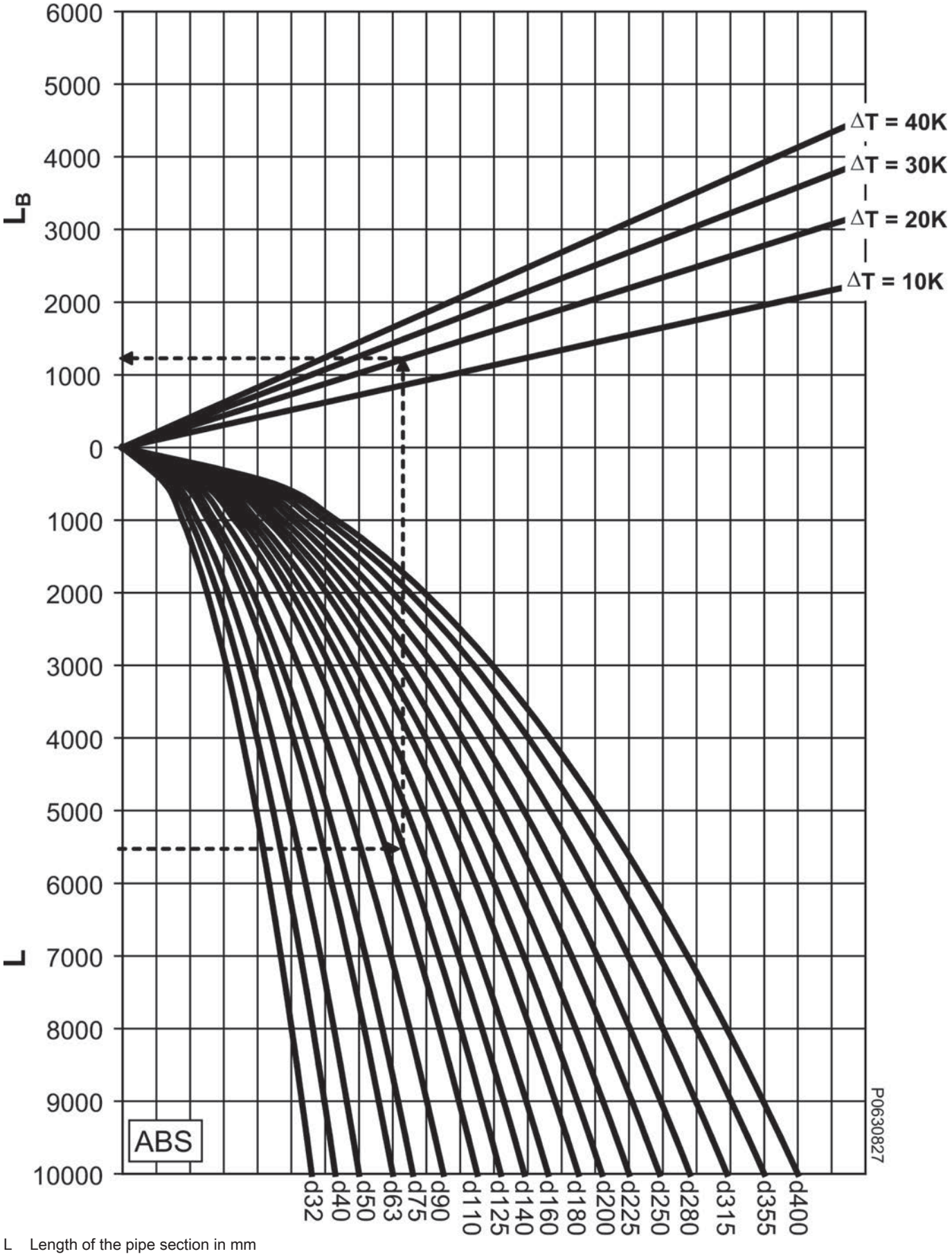
Length change in inches (Expansion or contraction ΔL)	Pipe size																
	16	20	25	32	40	50	63	75	90	110	140	160	200	225	250	280	315
0.10	8	9	10	12	13	15	16	18	19	22	24	26	29	31	32	34	36
0.20	12	13	15	16	18	21	23	25	28	30	34	37	41	44	46	49	51
0.30	14	16	18	20	22	25	28	31	34	37	42	45	50	53	56	59	63
0.40	16	18	21	23	26	29	33	36	39	43	49	52	58	62	65	69	73
0.50	18	21	23	26	29	32	36	40	44	48	54	58	65	69	73	77	81
0.60	20	22	25	28	32	36	40	44	48	53	59	64	71	75	79	84	89
0.70	22	24	27	31	34	38	43	47	51	57	64	69	77	81	86	91	96
0.80	23	26	29	33	37	41	46	50	55	61	69	73	82	87	92	97	103
0.90	25	28	31	35	39	44	49	53	58	65	73	78	87	92	97	103	109
1.10	27	30	34	38	43	48	54	59	65	71	81	86	96	102	108	114	121
1.20	28	32	36	40	45	50	56	62	67	75	84	90	101	107	112	119	126
1.30	30	33	37	42	47	52	59	64	70	78	88	94	105	111	117	124	131
1.40	31	34	38	43	49	54	61	66	73	81	91	97	109	115	121	128	136
1.50	32	36	40	45	50	56	63	69	75	83	94	101	112	119	126	133	141
1.60	33	37	41	46	52	58	65	71	78	86	97	104	116	123	130	137	146
1.70	34	38	42	48	54	60	67	73	80	89	100	107	120	127	134	142	150
1.80	35	39	44	49	55	62	69	75	83	91	103	110	123	131	138	146	154
1.90	36	40	45	51	57	63	71	77	85	94	106	113	126	134	141	150	159
2.00	37	41	46	52	58	65	73	79	87	96	109	116	130	138	145	154	163
2.10	38	42	47	53	59	66	75	81	89	99	111	119	133	141	149	157	167
2.20	38	43	48	54	61	68	76	83	91	101	114	122	136	144	152	161	171
2.30	39	44	49	56	62	70	78	85	93	103	116	124	139	148	156	165	175
2.40	40	45	50	57	64	71	80	87	95	105	119	127	142	151	159	168	178
2.50	41	46	51	58	65	73	81	89	97	108	121	130	145	154	162	172	182
2.60	42	47	52	59	66	74	83	91	99	110	124	132	148	157	165	175	186
2.70	43	48	53	60	67	75	85	92	101	112	126	135	151	160	169	178	189
2.80	43	49	54	61	69	77	86	94	103	114	128	137	154	163	172	182	193
2.90	44	49	55	63	70	78	88	96	105	116	131	140	156	166	175	185	196
3.00	45	50	56	64	71	79	89	97	107	118	133	142	159	169	178	188	199
3.10	46	51	57	65	72	81	91	99	108	120	135	145	162	171	181	191	203
3.20	46	52	58	66	73	82	92	101	110	122	137	147	164	174	184	194	206
3.30	47	53	59	67	75	83	94	102	112	124	139	149	167	177	186	197	209
3.40	48	54	60	68	76	85	95	104	113	125	142	151	169	179	189	200	212
3.50	49	54	61	69	77	86	96	105	115	127	144	154	172	182	192	203	215
3.60	49	55	62	70	78	87	98	107	117	129	146	156	174	185	195	206	218
3.70	50	56	62	71	79	88	99	108	118	131	148	158	177	187	197	209	222
3.80	51	57	63	72	80	89	100	110	120	133	150	160	179	190	200	212	224
3.90	51	57	64	72	81	91	102	111	122	134	152	162	181	192	203	214	227
4.00	52	58	65	73	82	92	103	112	123	136	154	164	184	195	205	217	230
4.25	54	60	67	76	85	95	106	116	127	140	158	169	189	201	211	224	237
4.50	55	62	69	78	87	97	109	119	131	144	163	174	195	206	218	230	244
4.75	57	63	71	80	89	100	112	122	134	148	167	179	200	212	224	237	251
5.00	58	65	73	82	92	103	115	126	138	152	172	184	205	218	229	243	257
5.25	59	66	74	84	94	105	118	129	141	156	176	188	210	223	235	249	264
5.50	61	68	76	86	96	108	121	132	144	160	180	192	215	228	241	255	270
5.75	62	70	78	88	98	110	123	135	148	163	184	197	220	233	246	260	276
6.00	64	71	79	90	101	112	126	138	151	167	188	201	225	238	251	266	282
6.25	65	73	81	92	103	115	129	140	154	170	192	205	229	243	256	271	288
6.50	66	74	83	94	105	117	131	143	157	173	196	209	234	248	262	277	294
6.75	67	75	84	95	107	119	134	146	160	177	199	213	238	253	267	282	299

L Length of the pipe section in mm

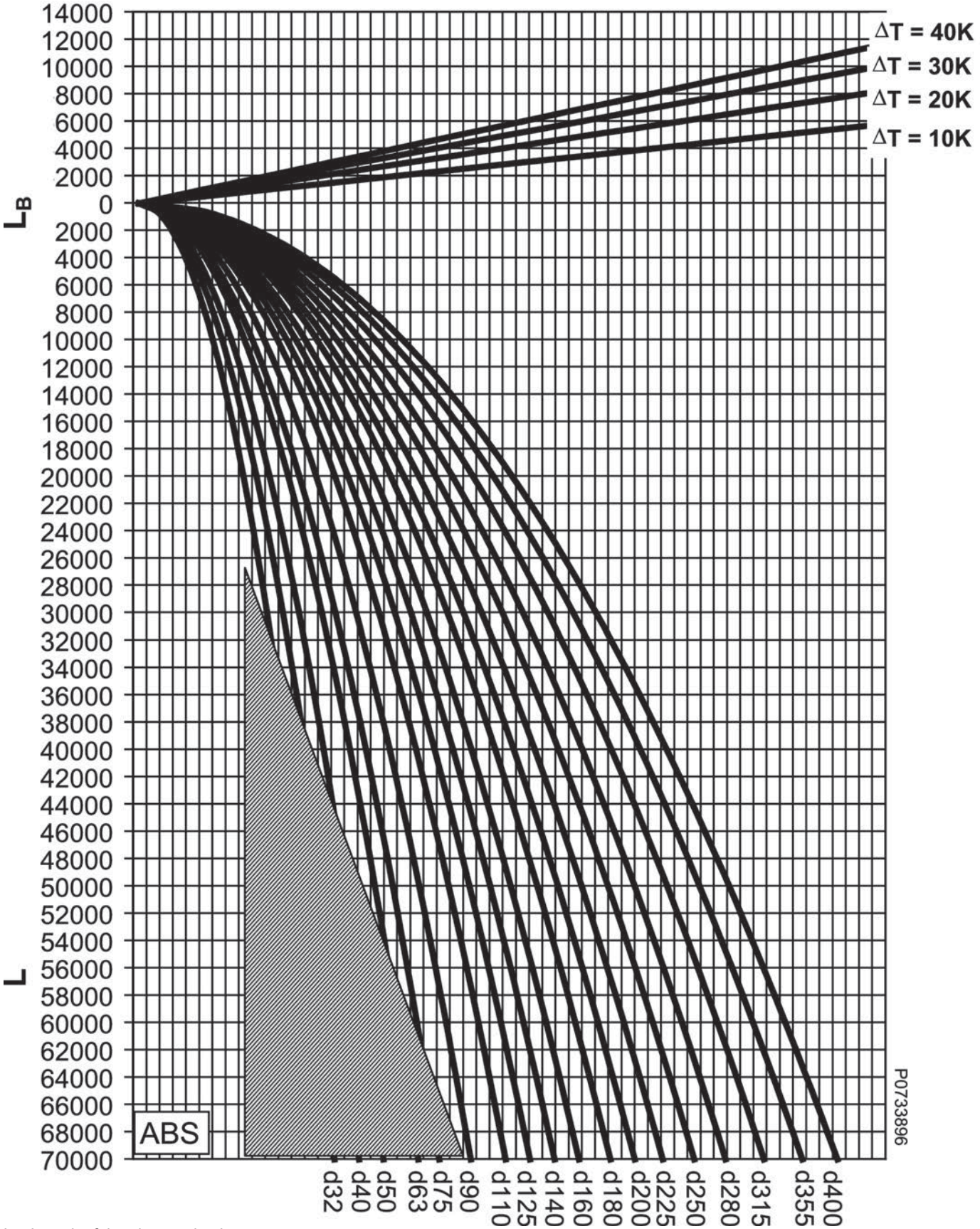
L_B Required length of flexible section in mm

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

Flexible 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/mK	**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/mK	**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

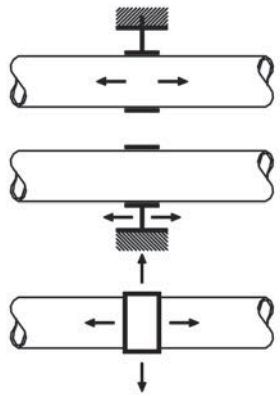
Pipe support for plastics pipes

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

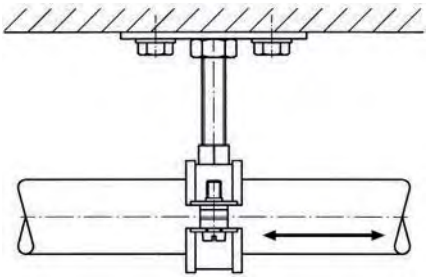
What is a loose pipe bracket?

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?

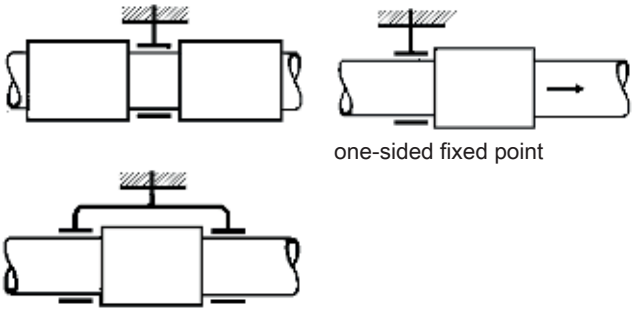
A fixed pipe bracket is a bracket which prevents the pipe from moving in any direction. The aim of which is to control system stresses caused by temperature changes.

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

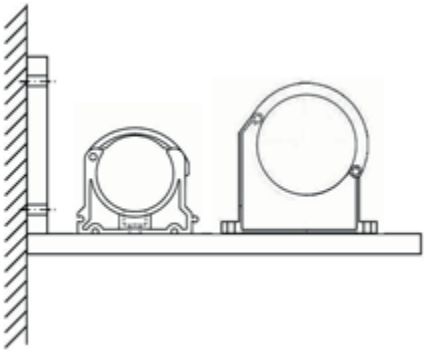
These robust plastic pipe brackets can be used not only under rigorous operating conditions, but also where the pipework is subject to aggressive media or atmospheric conditions. They may be used for all materials of pipes. Don't use KLIP-IT pipe brackets as fixed points!

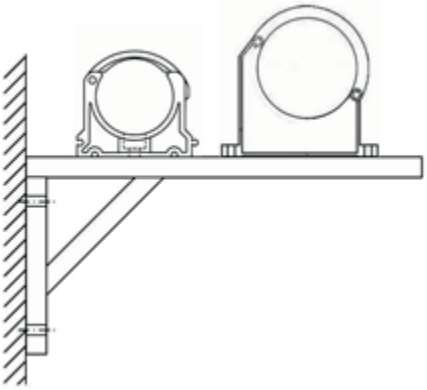
d 16 to d32

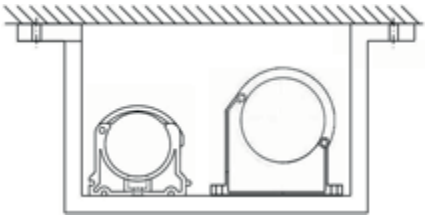
d 40 to d 160

d 90 to d 400

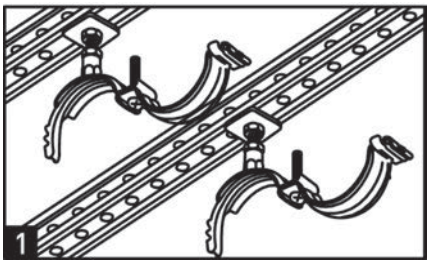
Starting from the dimension d90 the KLIP-IT brackets must be installed standing, like shown in the assembly examples. The support distances given in the following, specified for the KLIP-IT tubing clamps, apply only to this mounting method.



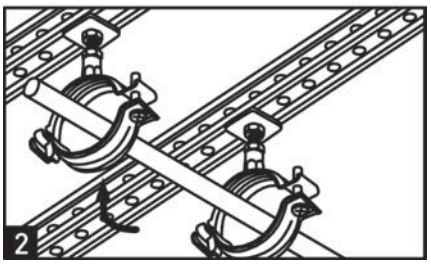




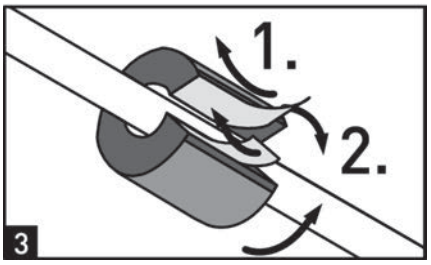
Pipe brackets for cold insulation (MIP)



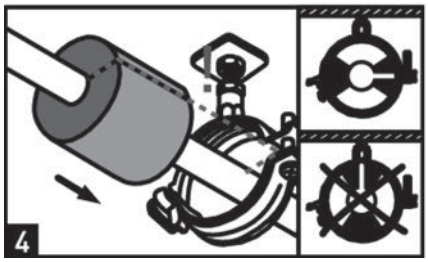
Open handle



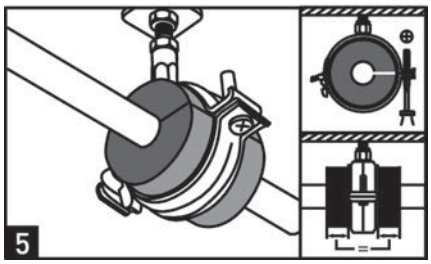
Insert pipe
Close handle with quick-action clamp



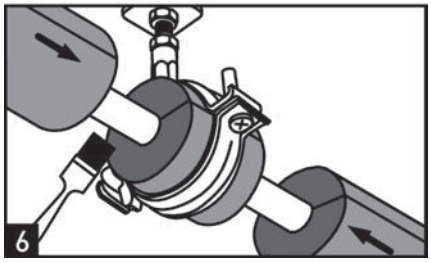
Assemble insulation
1. Take off foil
2. Press area of contact



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



Tighten the screw



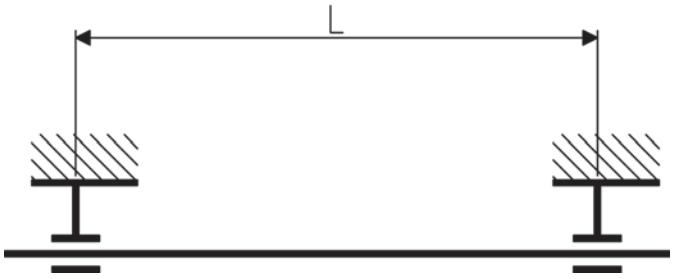
Coat areas of contact with adhesive and bond them

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

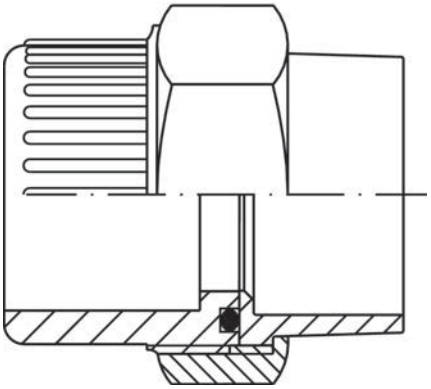
Fundamentally three options are available for plastic to metal connections, namely; threads, flanged connection and unions.
GF Piping Systems recommends that wherever possible mechanical connections are used (unions and flanges) together with a located gasket such as O-Ring.

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

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.

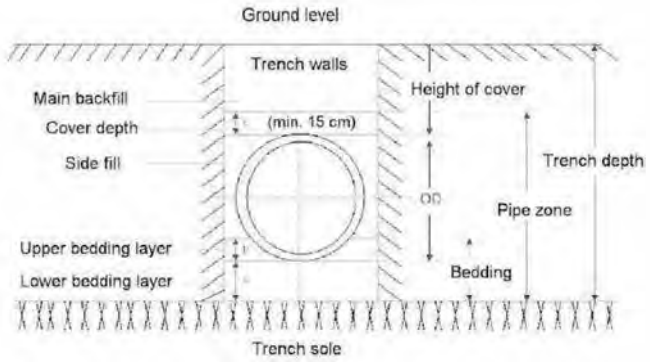
UV Resistance

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


Certificate

+GF+ GEORG FISCHER PIPING SYSTEMS

Georg Fischer Piping Systems Ltd.
8201 Schaffhausen, Switzerland

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

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.

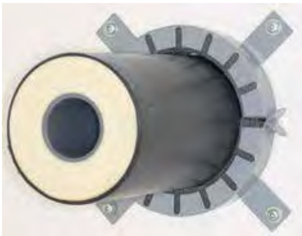
PE Flammability

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 joining

Instructions for COOL-FIT solvent cement joining of ABS dimension d20 to d315

General

Solvent cement joining 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 joining 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	790 309 003 790 309 004
COOL-FIT cleaner	1 litre tin	150 298 102
COOL-FIT solvent cement	0.65 kg tin	150 298 101
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
Cone		799 298 028
White absorbent paper	commercially available	
Solvent resistant protecting gloves, Safety glasses	commercially available	

Solvent cementing equipment

COOL-FIT cement & cleaner: Amounts required

Pipe diameter d (mm)	Cement amount per 100 joints (kg)	Cement 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)	Cleaner amount per 100 joints (litre)	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.

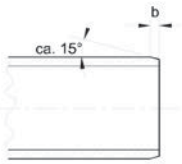
Preparations

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 joining 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

COOL-FIT 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.

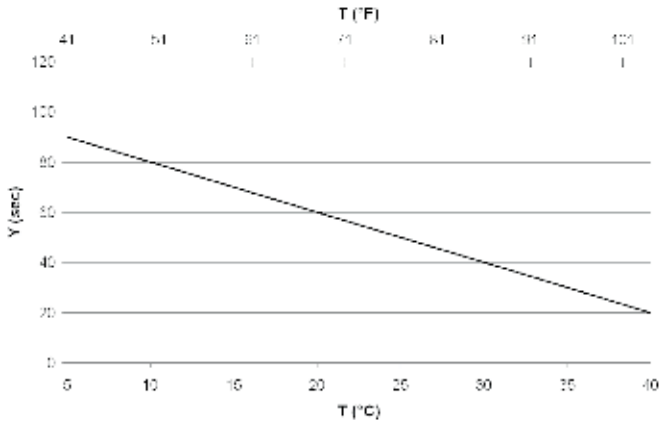
Cleaning the pipe and socket

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 the cement 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 joining 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.

Joining
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.

Joining
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 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.

Joining
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 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 cement layer is consistent and covers the entire surface as appropriate for the larger tolerances. Apply a thinner layer of Tangit in the fitting than on the pipe ends. The cementing of pipe work in this range of dimensions 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.

Joining
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 position. Hold the joint in this position for 1 minute.

Waiting time between cementing
A waiting time of 1 hours should be observed before further joining; 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 absorbent paper.

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

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

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

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

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

After the drying process (see waiting times in the following table) the pipelines can be filled. 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 recommended, after careful cleaning, to fill them with water and flush regularly. Do not use compressed air for flushing.

To ensure the traceability (if necessary) of the used cement 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.

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

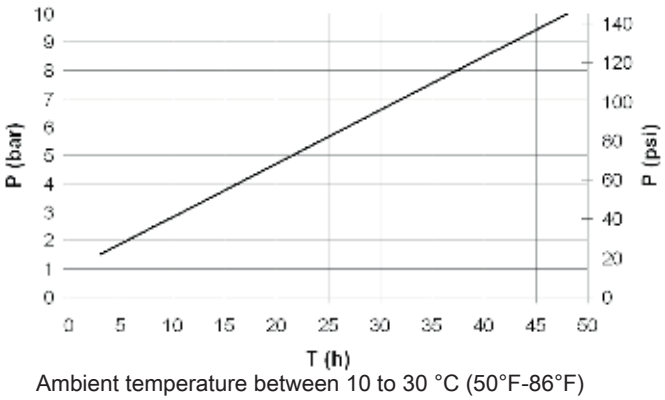
Due to the risk of a pressure test with a compressible test medium this pressure test shall be carried out only in exceptional cases! Please consult also the safety precautions given in the chapter "Internal pressure test of ABS pipelines". The following diagram shows the waiting time depending on the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

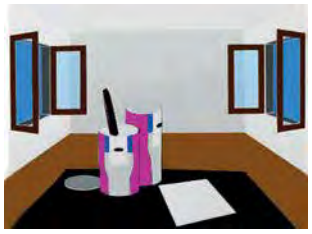
COOL-FIT cement and cleaner contain highly volatile solvents. This makes good ventilation or adequate fume extraction essential in closed spaces. Since the solvent fumes are heavier than air, extraction must occur at floor level, or at least below the working level. Place paper which has been used for 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.

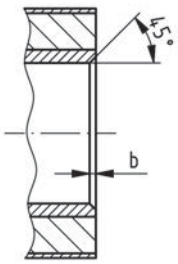
Instructions for solvent cement joining of COOL-FIT ABS Plus dimension d25 to d225

Instruction solvent cementing COOL-FIT ABS Plus

The joining 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 COOL-FIT 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

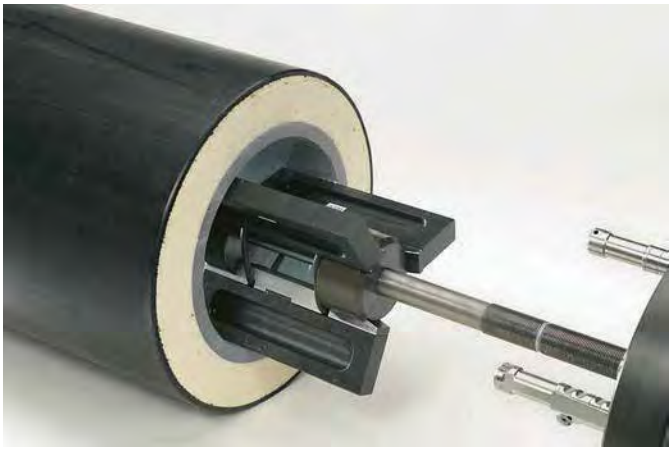
1 Cut pipe at right angles, 90°.

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.

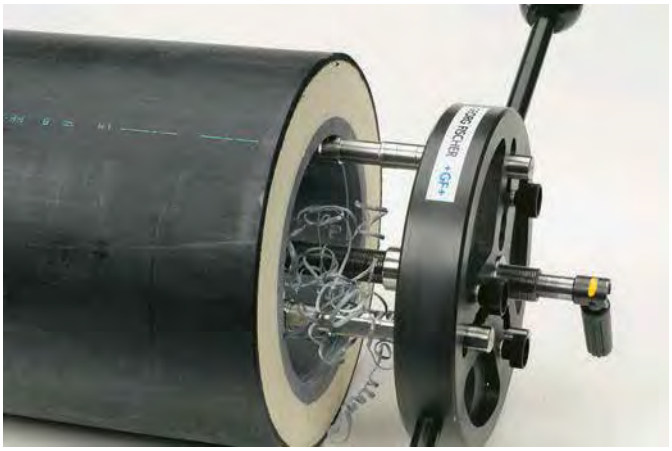
3 Assemble the COOLFIT ABS Plus calibration tool using the relevant parts for the required dimension. Detailed instructions are delivered with the tool.

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

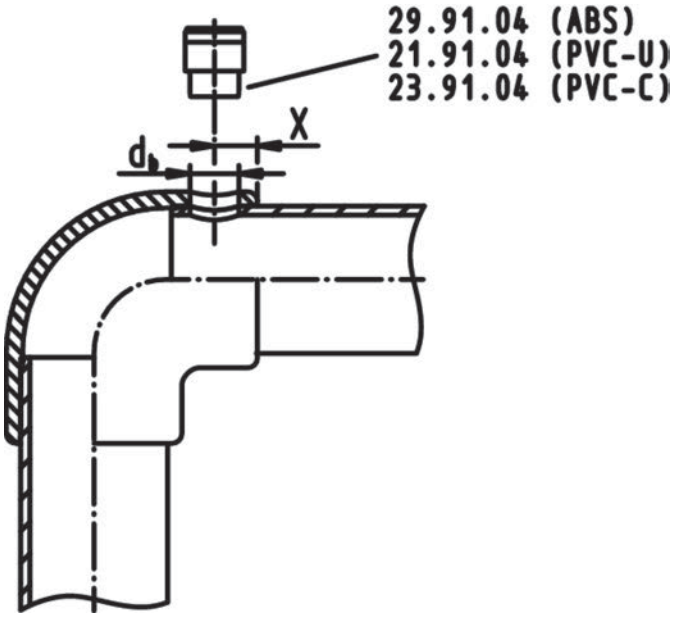
ABS PN10		**Wall thickness, e**	**Adapter dimensions**			
pipe diameter		S8, SDR17	20	25	32	40
75	x	4.5	Yes	Yes	No	No
90	x	5.4	Yes	Yes	No	No
110	x	6.6	Yes	Yes	No	No
125	x	7.4	Yes	Yes	No	No
140	x	8.3	Yes	Yes	No	No
160	x	9.5	Yes	Yes	No	No
180	x	10.7	Yes	Yes	Yes	No
200	x	11.9	Yes	Yes	Yes	No
225	x	13.4	Yes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

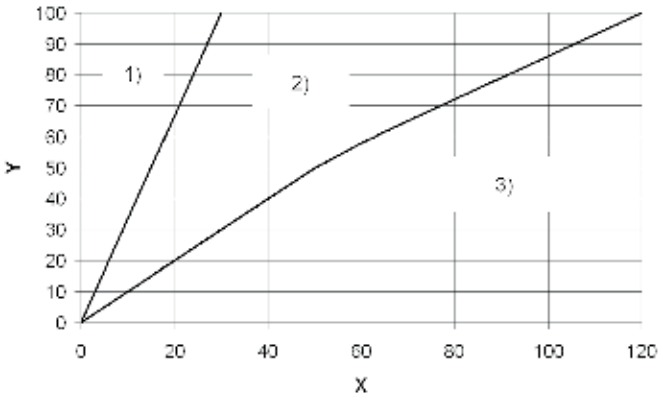
Reference values for the filling volume are given in the table below.

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:

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

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

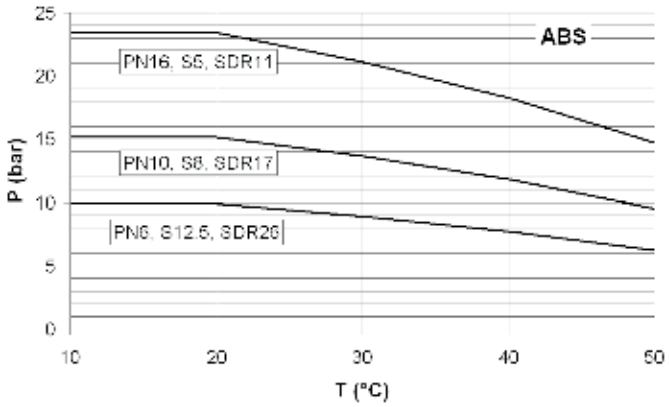
Don't overload diaphragm valves!

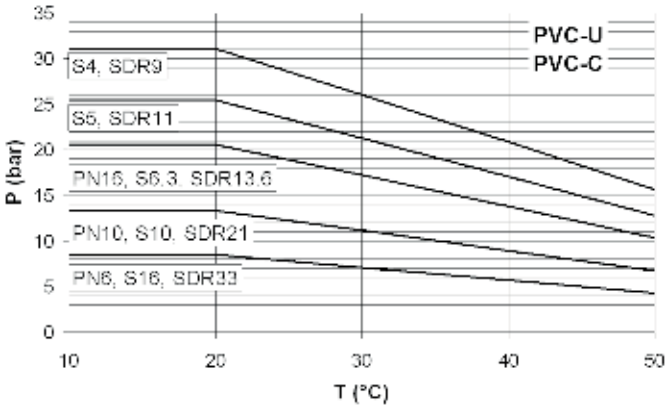
- If the piping system contains diaphragm valves the maximum allowable test pressure is limited to the nominal pressure.

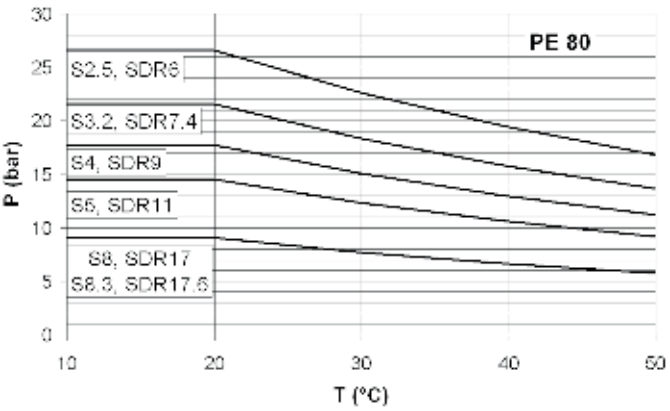
Material	S_p Minimum safety factor
ABS	1.6
PE80, PE100	1.25
PP-H	1.8
PP-R	1.4
PVC-U, PVC-C	2.5
PVDF	1.4

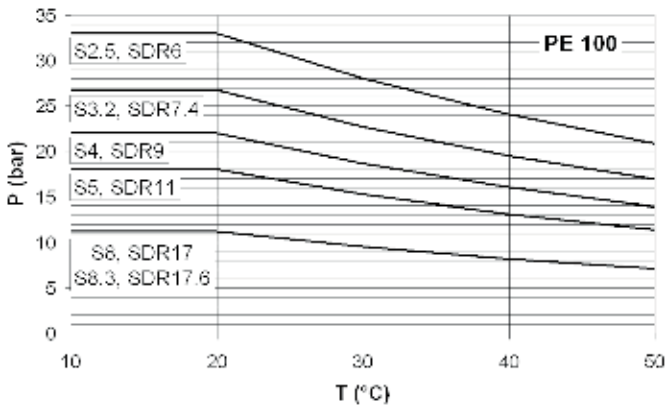
To make things easier, the permissible test pressures can be taken directly from the following diagrams.

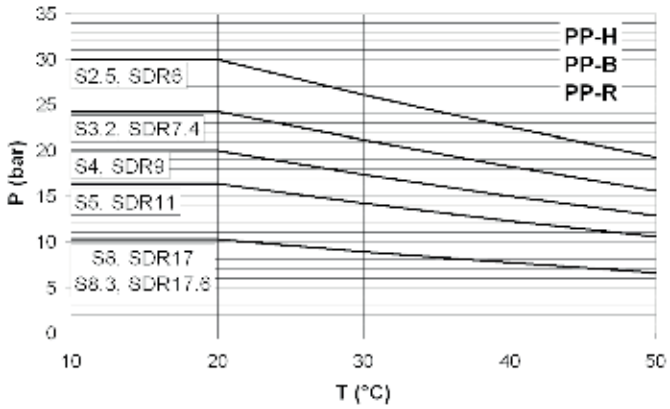
Definitions:
P = permissible test pressure in bar
T = pipe wall temperature in °C

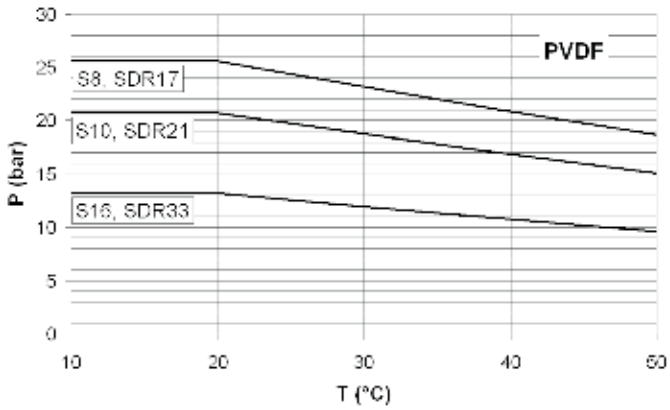












Checks during testing

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® Catalog

Background Information to the COOL-FIT Product Range

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

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

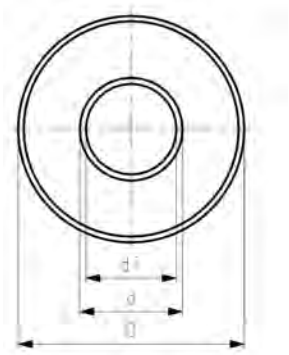
COOL-FIT ABS Plus combines pre-insulated pipe and fittings with normal standard plastic piping with complete range of the necessary valves for manual or automatic actuation. The complete system is designed to optimize the efficiency, installation costs, and life span of the secondary piping system.

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

COOL-FIT ABS Plus Pipes

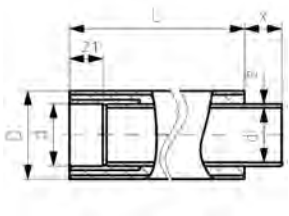


Pipe pre-insulated, ABS Metric, nominal pressure 150 psi (PN10) at 68F (20C)

Model:

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

d (mm)	D (mm)	PN (bar)	Part No.	SP	weight (kg/m)	di (mm)	Refrigeration Size (inch)	closest inch (inch)
25	90	10	**169 017 682**	5	1.300	20.4	⅞	¾
32	90	10	**169 017 683**	5	1.500	28.2	1 ⅛	1
40	110	10	**169 017 684**	5	1.900	35.2	1 ⅜	1 ¼
50	110	10	**169 017 685**	5	2.100	44.0	1 ⅝	1 ½
63	125	10	**169 017 686**	5	2.700	55.4	2 ⅛	2
75	140	10	**169 017 687**	5	3.500	66.0	2 ⅝	2 ½
90	160	10	**169 017 688**	5	4.400	79.2	3 ⅛	3
110	180	10	**169 017 689**	5	5.500	96.8	4 ⅛	4
140	225	10	**169 017 691**	5	8.500	123.4		5
160	250	10	**169 017 692**	5	10.500	141.0	6	6
200	280	10	**169 017 693**	5	13.500	175.4		8
225	315	10	**169 017 694**	5	18.500	197.2		8

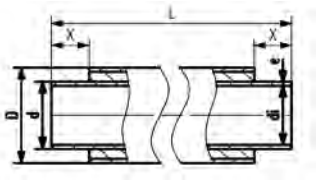


Pipe pre-insulated, ABS Metric, nominal presure 90 psi (PN6) at 68F (20C)

Model:

- Pre-insulated ABS metric
- Insulation made from PUR
- Outer jacket impact and UV resistant. Color: black
- Insulated length: 5M (also available in 10M)
- Supplied with one end as bare pipe spigot and one end with socket coupling

d (mm)	D (mm)	PN (bar)	Part No.	SP	weight (kg/m)	x (mm)	L (mm)	e (mm)	di (mm)	Z1 (mm)	closest inch (inch)
250	355	6	**169 017 695**	5	14.900	150	5000	9.6	230.8	130	10
280	400	6	**169 017 696**	5	18.700	165	5000	10.7	258.6	145	10
315	450	6	**169 017 697**	5	23.700	185	5000	12.1	290.8	165	12



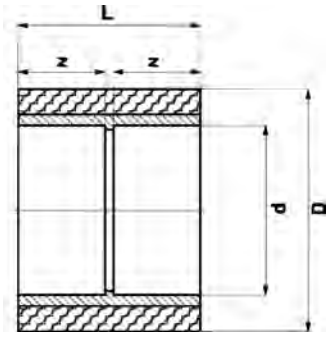
Pipe pre-insulated, ABS Metric, nominal presure 90 psi (PN6) at 68F (20C)

Model:

- Pre-insulated ABS metric
- Insulation made from PUR
- Outer jacket impact and UV resistant. Color: black
- Insulated length: 5M (also available in 10M)
- Supplied with both ends as bare pipe spigot

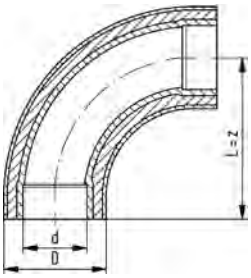
d (mm)	D (mm)	PN (bar)	Part No.	SP	weight (kg/m)	x (mm)	L (mm)	e (mm)	di (mm)	closest inch (inch)
250	355	6	**169 017 698**	5	14.900	150	5000	9.6	230.8	10
280	400	6	**169 017 699**	5	18.700	165	5000	10.7	258.6	10
315	450	6	**169 017 700**	5	23.700	185	5000	12.1	290.8	12

COOL-FIT ABS Plus Fittings



COOL-FIT ABS Plus Pre-Insulated Coupling

d (mm)	Part No.	SP	d (mm)	D (mm)	z (mm)	L (mm)
250	**700 262 810**	1	250	355	134	284
280	**700 262 811**	1	280	400	143	302
315	**700 262 812**	1	315	450	161	338



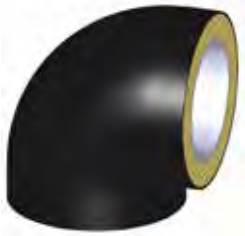
COOL-FIT ABS Plus 90° Bend PN10

Model:

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

Connecting dimensions = Pipe outer diameter ("d")

d (mm)	D (mm)	PN (bar)	Part No.	SP	weight (lb)	closest inch (inch)	z (mm)	L (mm)	required Nipple
25	90	10	**738 001 107**	1	0.403	¾	69	69	738901607
32	90	10	**738 001 108**	1	0.485	1	86	86	738901608
40	110	10	**738 001 109**	1	0.800	1 ¼	109	109	738901609
50	110	10	**738 001 110**	1	1.098	1 ½	131	131	738901610
63	125	10	**738 001 111**	1	1.673	2	164	164	738901611
75	140	10	**738 001 112**	1	2.555	2 ½	194	194	738901612
90	160	10	**738 001 113**	1	4.156	3	231	231	738901613
110	180	10	**738 001 114**	1	7.132	4	281	281	738901614
140	225	10	**738 001 116**	1	15.232	5	356	356	738901616
225	315	10	**738 001 120**	1	18.025	8	287	287	738901620

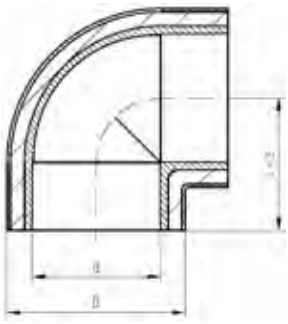


COOL-FIT ABS Plus 90° Elbow PN10

Model:

- Pre-insulated ABS metric
- Insulation made from PUR
- outer jacket impact and UV resistant. Color: Black
- Compact design

Connecting dimensions = Pipe outer diameter ("d")



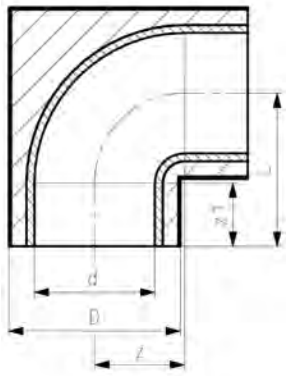
d (mm)	D (mm)	PN (bar)	Part No.	SP	weight (lb)	L (mm)	z (mm)	required Nipple	closest inch (inch)
160	250	10	**738 101 117**	1	5.732	166	166	738901617	6
200	280	10	**738 101 119**	1	11.030	207	207	738901619	8

COOL-FIT ABS Plus 90° Elbow PN6

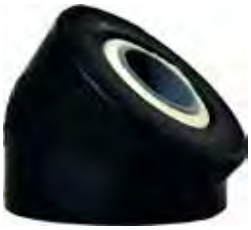
Model:

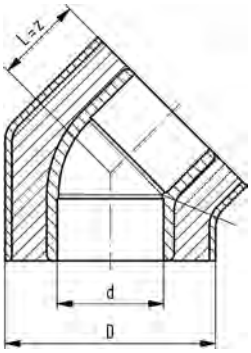
- Pre-insulated ABS metric
- Insulation made from PUR
- Outer jacket impact and UV resistant Color: black
- Compact design

Connecting dimensions = Pipe outer diameter ("d")



d (mm)	D (mm)	PN (bar)	Part No.	SP	weight (lb)	L (mm)	z1 (mm)	z (mm)	closest inch (inch)
250	355	6	**738 101 121**	1	22.046	263	130	131	10
280	400	6	**738 001 122**	1	39.683	357	145	210	10
315	450	6	**738 001 123**	1	52.911	401	165	237	12





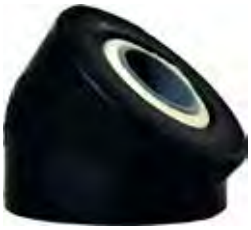
COOL-FIT ABS Plus 45° Elbow PN10

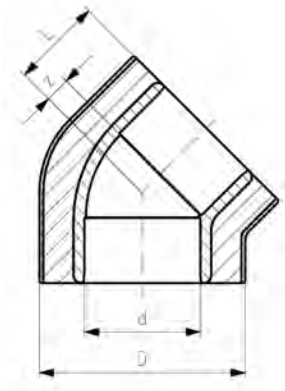
Model:

- Pre-insulated ABS metric
- Insulation made from PUR
- outer jacket impact and UV resistant. Color: Black

Connecting dimensions = Pipe outer diameter ("d")

d (mm)	D (mm)	PN (bar)	Part No.	SP	weight (lb)	closest inch (inch)	z (mm)	L (mm)	required Nipple
25	90	10	**738 151 107**	1	0.176	¾	25	25	738901607
32	90	10	**738 151 108**	1	0.227	1	30	30	738901608
40	110	10	**738 151 109**	1	0.366	1 ¼	36	36	738901609
50	110	10	**738 151 110**	1	0.425	1 ½	43	43	738901610
63	125	10	**738 151 111**	1	0.661	2	52	52	738901611
75	140	10	**738 151 112**	1	0.977	2 ½	61	61	738901612
90	160	10	**738 151 113**	1	1.526	3	71	71	738901613
110	180	10	**738 151 114**	1	2.132	4	89	89	738901614
140	225	10	**738 151 116**	1	4.336	5	108	108	738901616
160	250	10	**738 151 117**	1	6.402	6	122	122	738901617
200	280	10	**738 151 119**	1	8.128	8	149	149	738901619
225	315	10	**738 151 120**	1	10.185	8	168	168	738901620





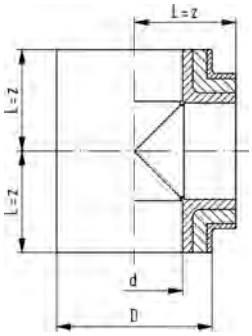
COOL-FIT ABS Plus 45° Elbow PN6

Model:

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

Connecting dimensions = Pipe outer diameter ("d")

d (mm)	D (mm)	PN (bar)	Part No.	SP	weight (lb)	closest inch (inch)	z (mm)	L (mm)
250	355	6	**738 151 121**	1	19.842	10	60	192
280	400	6	**738 151 122**	1	28.660	10	66	213
315	450	6	**738 151 123**	1	37.479	12	74	239

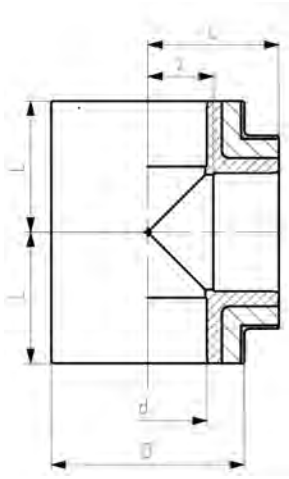


Tee 90° pre-insulated, ABS metric

Model:

- Pre-insulated ABS metric
- Insulation made from PUR
- outer jacket impact and UV resistant. Color: Black

d (mm)	D (mm)	PN (bar)	Part No.	SP	weight (kg)	z (mm)	L (mm)	required Nipple	closest inch (inch)
25	90	10	**738 201 007**	1	0.287	80	80	738901607	¾
32	90	10	**738 201 008**	1	0.292	80	80	738901608	1
40	110	10	**738 201 009**	1	0.470	90	90	738901609	1 ¼
50	110	10	**738 201 010**	1	0.517	90	90	738901610	1 ½
63	125	10	**738 201 011**	1	0.768	100	100	738901611	2
75	140	10	**738 201 012**	1	1.270	125	125	738901612	2 ½
90	160	10	**738 201 013**	1	1.600	140	140	738901613	3
110	180	10	**738 201 114**	1	2.309	122	122	738901614	4
140	225	10	**738 201 116**	1	3.639	147	147	738901616	5
160	250	10	**738 201 117**	1	5.106	167	167	738901617	6
200	280	10	**738 201 119**	1	6.800	207	207	738901619	8
225	315	10	**738 201 120**	1	10.200	233	233	738901620	8



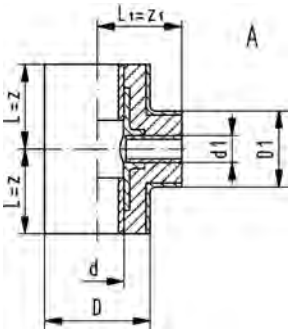
Tee 90° pre-insulated, ABS metric

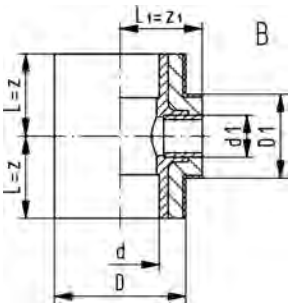
Model:

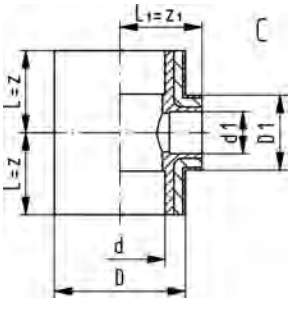
- Pre-insulated ABS metric
- Insulation made from PUR
- Outer jacket impact and UV resistant. Color: black
- Compact design

Connecting dimensions = Pipe outer diameter ("d")

d (mm)	D (mm)	PN (bar)	Part No.	SP	weight (lb)	L (mm)	closest inch (inch)	z (mm)
250	355	6	**738 201 121**	1	32.307	263	10	132
280	400	6	**738 201 122**	1	46.297	298	10	152
315	450	6	**738 201 123**	1	59.525	332	12	160







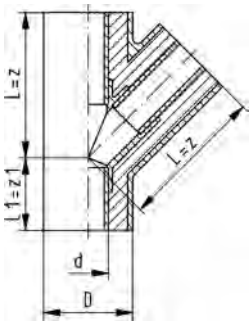
Tee 90° reduced pre-insulated, ABS metric

Model:

- Pre-insulated ABS metric
- Insulation made from PUR
- outer jacket impact and UV resistant. Color: Black

d (mm)	d1 (mm)	D (mm)	D1 (mm)	PN (bar)	Type	Part No.	weight (kg)
32	25	90	90	10	C	**738 201 038**	0.282
40	25	110	90	10	C	**738 201 051**	0.433
40	32	110	90	10	C	**738 201 047**	0.460
50	25	110	90	10	C	**738 201 092**	0.475
50	32	110	90	10	C	**738 201 064**	0.489
63	25	125	90	10	C	**738 201 093**	0.668
63	32	125	90	10	C	**738 201 078**	0.668
63	50	125	110	10	C	**738 201 070**	0.802
75	40	140	110	10	A	**738 201 182**	1.091
90	32	160	90	10	C	**738 201 043**	1.495
90	63	160	125	10	C	**738 201 046**	1.597
110	32	180	90	10	B	**738 201 144**	1.783
110	50	180	110	10	B	**738 201 136**	1.841
140	50	225	110	10	B	**738 201 148**	3.229
140	75	225	140	10	B	**738 201 149**	3.342
160	110	250	180	10	B	**738 201 152**	4.885
200	110	280	180	10	C	**738 201 153**	7.799
225	110	315	180	10	C	**738 201 156**	9.237
225	160	315	250	10	C	**738 201 157**	9.968

d (mm)	d1 (mm)	z (mm)	z1 (mm)	required Nipple	closest inch (inch)
32	25	80	80	1x738901607; 2x738901608	1 - ¾
40	25	90	90	1x738901607; 2x738901609	1 ¼ - ¾
40	32	90	90	1x738901608; 2x738901609	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 ¼
75	40	115	110	1x738901109; 2x738901112	2 ½ - 1 ¼
90	32	140	140	1x738901608; 2x738901613	3 - 1
90	63	140	140	1x738901611; 2x738901613	3 - 2
110	32	117	130	1x738901108; 2x738901614	4 - 1
110	50	117	130	1x738901110; 2x738901614	4 - 1 ½
140	50	147	153	1x738901110; 2x738901616	5 - 1 ½
140	75	147	153	1x738901112; 2x738901616	5 - 2 ½
160	110	167	165	1x738901114; 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



Tee 45° pre-insulated, ABS metric

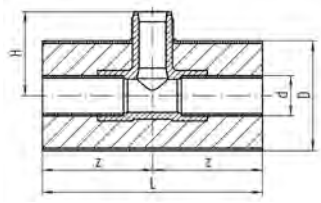
Model:

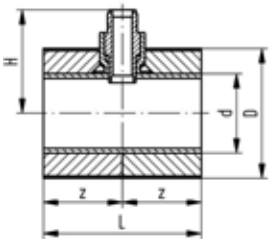
- Insulation made from PUR
- Outer jacket impact and UV resistant. Color: black

* Connecting dimensions = Pipe inner diameter

	d (mm)	D (mm)	PN (bar)	Part No.	SP	weight (lb)
	50	110	10	**738 251 110**	1	2.090
*	63	125	10	**738 251 111**	1	2.822
*	75	140	10	**738 251 112**	1	4.409
*	90	160	10	**738 251 113**	1	6.054
*	110	180	10	**738 251 114**	1	9.764

	d (mm)	closest inch (inch)	L (mm)	z (mm)	L1 (mm)	z1 (mm)	required Nipple
	50	1 ½	180	180	90	90	738901110
*	63	2	200	200	100	100	738901111
*	75	2 ½	240	240	120	120	738901112
*	90	3	250	250	125	125	738901113
*	110	4	300	300	150	150	738901114





Signet Installation Fitting Type 310 pre-insulated, ABS metric

Model:

- Pre-insulated ABS metric
- Threaded outlet 1 ¼" NPSM
- Insulation made from PUR
- outer jacket impact and UV 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, 2734, 2736, 2735

Attention:

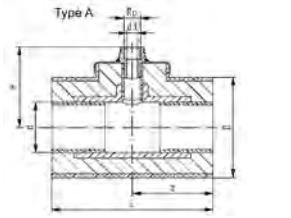
- Sensor length depends on installation fitting

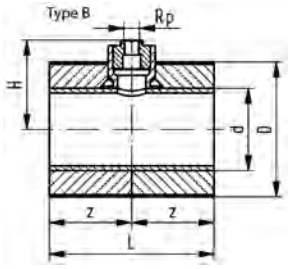
PN (bar)	d (mm)	DN (mm)	Part No.	SP	weight (lb)
10	25	20	**738 310 107**	1	0.831
10	32	25	**738 310 108**	1	0.838
10	40	32	**738 310 109**	1	1.089
10	50	40	**738 310 110**	1	1.213
10	63	50	**738 310 111**	1	1.548
10	75	65	**738 310 112**	1	1.850
10	90	80	**738 310 113**	1	2.125
10	110	100	**738 310 114**	1	2.769
10	140	125	**738 310 116**	1	3.971
10	160	150	**738 310 117**	1	5.258
10	200	200	**738 310 119**	1	7.225
10	225	200	**738 310 120**	1	11.363

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

Type A

Type B





Installation Fitting Type 313 pre-insulated, ABS metric, BSP

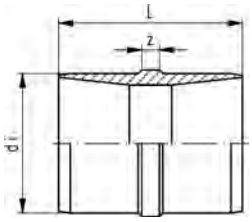
Model:

- Pre-insulated ABS metric
- Insulation made from PUR
- outer jacket impact and UV resistant. Color: Black
- With 1/2 " Rp threaded branch for sensors (i.e. pressure)

Range of use:

d (mm)	D (mm)	PN (bar)	Part No.	SP	weight (lb)
25	90	10	**738 313 007**	1	0.728
32	90	10	**738 313 008**	1	0.882
40	110	10	**738 313 009**	1	1.102
50	110	10	**738 313 010**	1	1.257
63	125	10	**738 313 011**	1	1.962
75	140	10	**738 313 012**	1	1.691
90	160	10	**738 313 013**	1	2.119
110	180	10	**738 313 114**	1	2.597
140	225	10	**738 313 116**	1	3.816
160	250	10	**738 313 117**	1	4.912
200	280	10	**738 313 119**	0	7.956
225	315	10	**738 313 120**	1	10.240

d (mm)	Rp (inch)	L (mm)	H (mm)	z (mm)	required Nipple	closest inch (inch)	Type
25	½	160	102	80	2x738901607	¾	A
32	½	180	102	80	2x738901608	1	A
40	½	180	112	90	2x738901609	1 ¼	A
50	½	180	112	90	2x738901610	1 ½	A
63	½	200	122	100	2x738901611	2	A
75	½	250	153	125	2x738901612	2 ½	A
90	½	280	168	140	2x738901613	3	A
110	½	220	119	110	2x738901114	4	B
140	½	220	134	110	2x738901116	5	B
160	½	220	145	110	2x738901117	6	B
200	½	250	165	125	2x738901119	8	B
225	½	280	178	140	2x738901120	8	B

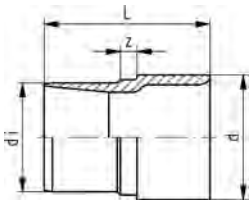


COOL-FIT ABS Plus Barrel nipple di-di PN10

Model:

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

d (mm)	PN (bar)	Part No.	SP	weight (lb)	closest inch (inch)	di (mm)	L (mm)	z (mm)
25	10	**738 901 107**	10	0.020	¾	20	52	10
32	10	**738 901 108**	10	0.031	1	28	58	10
40	10	**738 901 109**	10	0.046	1 ¼	35	66	10
50	10	**738 901 110**	10	0.077	1 ½	44	76	10
63	10	**738 901 111**	10	0.130	2	55	90	10
75	10	**738 901 112**	10	0.192	2 ½	65	102	10
90	10	**738 901 113**	6	0.280	3	79	104	10
110	10	**738 901 114**	6	0.450	4	96	122	10
140	10	**738 901 116**	1	0.917	5	123	150	10
160	10	**738 901 117**	4	1.283	6	141	166	10
200	10	**738 901 119**	1	2.247	8	176	202	10
225	10	**738 901 120**	1	3.069	8	198	224	10



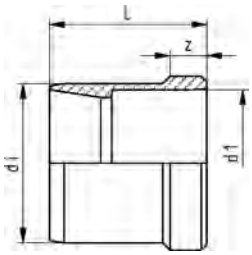
COOL-FIT ABS Plus Adaptor nipple d-di PN10

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 (bar)	Part No.	SP	weight (lb)	closest inch (inch)	di (mm)	L (mm)	z (mm)
	25	10	**738 901 607**	10	0.018	¾	20	50	10
	32	10	**738 901 608**	10	0.037	1	28	56	10
	40	10	**738 901 609**	10	0.057	1 ¼	35	64	10
	50	10	**738 901 610**	10	0.097	1 ½	44	74	10
	63	10	**738 901 611**	18	0.181	2	55	88	10
	75	10	**738 901 612**	8	0.280	2 ½	65	100	10
	90	10	**738 901 613**	6	0.395	3	79	108	10
	110	10	**738 901 614**	9	0.703	4	96	127	10
*	140	10	**738 901 616**	4	1.113	5	123	156	10
	160	10	**738 901 617**	5	1.687	6	141	174	10
	200	10	**738 901 619**	4	4.090	8	176	212	10
	225	10	**738 901 620**	1	4.235	8	198	236	10

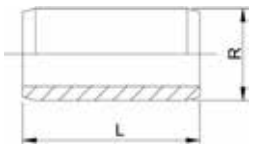


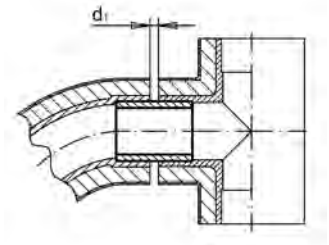
COOL-FIT ABS Plus Reducing nipple di-dred PN10

Model:

- Material: ABS metric
- To connect pipe inner diameter di to next smaller size d

d (mm)	d1 (mm)	PN (bar)	Part No.	SP	weight (lb)	closest inch (inch)	di (mm)	L (mm)	z (mm)
32	25	10	**738 911 341**	5	0.013	1	28	34	10
40	32	10	**738 911 346**	5	0.020	1 ¼	35	38	10
50	40	10	**738 911 352**	5	0.031	1 ½	44	43	10
63	50	10	**738 911 358**	2	0.053	2	55	50	10
75	63	10	**738 911 364**	2	0.049	2 ½	65	56	10
90	75	10	**738 911 370**	2	0.071	3	79	57	10
110	90	10	**738 911 376**	2	0.150	4	96	66	10
140	110	10	**738 911 385**	5	0.481	5	123	80	10
200	160	10	**738 911 392**	5	0.935	8	176	106	10





COOL-FIT ABS Plus Barrel nipple d-d PN10

Model:

- Material: ABS metric
- For jointing of typical fitting to fitting (d) connections
- For the shortest possible distance between fittings
- Overall length L = 2 x socket depths + 10mm inspection gap

d (mm)	PN (bar)	Part No.	weight (lb)	d1 (mm)	L (mm)	closest inch (inch)
25	16	**738 901 907**	0.022	10	48	¾
32	10	**738 901 908**	0.024	10	54	1
40	10	**738 901 909**	0.046	10	62	1 ¼
50	10	**738 901 910**	0.079	10	72	1 ½
63	10	**738 901 911**	0.159	10	86	2
75	10	**738 901 912**	0.254	10	98	2 ½
90	10	**738 901 913**	0.419	10	112	3
110	10	**738 901 914**	0.683	10	132	4
140	10	**738 901 916**	1.603	10	162	5
160	10	**738 901 917**	2.086	10	182	6
200	10	**738 901 919**	3.946	10	222	8
225	10	**738 901 920**	5.567	10	248	8
250	6	**738 901 921**	5.567	10	272	10
280	6	**738 901 922**	5.567	10	302	10
315	6	**738 901 923**	5.567	10	332	12

COOL-FIT ABS Plus Accessories

Shrink sleeve short, PE

Model:

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

- 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)	Part No.	SP	weight (lb)
25 - 32	90	**738 011 113**	1	0.077
40 - 50	110	**738 011 114**	1	0.115
63	125	**738 011 115**	1	0.168
75	140	**738 011 116**	1	0.161
90	160	**738 011 117**	1	0.194
110	180	**738 011 118**	1	0.192
140	225	**738 011 120**	1	0.267
160	250	**738 011 121**	1	0.287
200	280	**738 011 122**	1	0.295
225	315	**738 011 123**	1	0.287

Shrink sleeve, heavy duty, 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)	Part No.	SP	weight (lb)	L (mm)
25 - 32	90	**738 011 013**	0	0.220	100
40 - 50	110	**738 011 014**	0	0.249	100
63	125	**738 011 015**	0	0.293	100
75	140	**738 011 016**	0	0.322	100
90	160	**738 011 017**	0	0.364	100
110	180	**738 011 018**	0	0.489	100
140	225	**738 011 020**	0	0.617	100
160	250	**738 011 021**	0	0.776	100
200	280	**738 011 022**	0	0.818	100
225	315	**738 011 023**	0	0.979	100
250	355	**738 011 024**	1	1.984	100
280	400	**738 011 025**	1	2.425	100
315	450	**738 011 026**	1	4.189	100
355	500	**738 011 027**	1	2.205	100
400	560	**738 011 028**	1	2.205	100
450	630	**738 011 029**	1	2.205	100

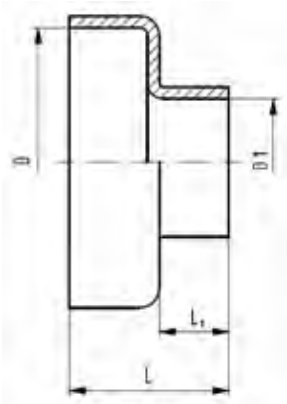
Shrink sleeve long, PE, black

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)	Part No.	weight (lb)	L (mm)	closest inch (inch)
110 - 160	**738 011 167**	0.635	200	4 - 6
180 - 225	**738 011 170**	0.216	200	7 - 8
250 - 315	**738 011 173**	1.499	200	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

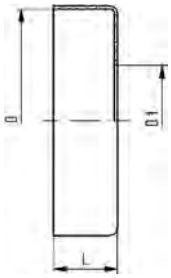


Shrink Cap PE

Model:

- To seal insulation and outer jacket pipe
- Can also be used for Reduced Tees
- No sealing tape required (included in Cap)
- Caution: Do not shrink onto ABS

D (mm)	D1 (mm)	Part No.	weight (lb)	L (mm)	L1 (mm)	closest inch (inch)
225 - 160	140 - 90	**733 960 135**	0.390	137	61	8 - 6
315 - 225	250 - 125	**733 960 140**	0.694	143	43	12 - 8



COOL-FIT Plus Insulation Cap, PE , black

Model:

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

d (mm)	D (mm)	D1 (mm)	Part No.	weight (lb)	L (mm)	closest inch (inch)
25	90	24	**733 960 171**	0.057	35	¾
32	90	32	**733 960 172**	0.031	35	1
40	110	39	**733 960 173**	0.079	35	1 ¼
50	110	48	**733 960 174**	0.053	35	1 ½
63	125	59	**733 960 175**	0.099	35	2
75	140	70	**733 960 176**	0.064	35	2 ½
90	160	83	**733 960 177**	0.068	35	3
110	180	100	**733 960 178**	0.121	35	4
140	225	127	**733 960 180**	0.179	35	5
160	250	144	**733 960 181**	0.146	35	6
200	280	187	**733 960 183**	0.322	35	8
225	315	210	**733 960 184**	0.276	35	8
250	355	265	**733 960 185**	0.342	35	10
280	400	300	**733 960 186**	0.408	35	10
315	450	335	**733 960 187**	0.496	35	12
355	500	370	**733 963 188**	0.593	35	14
400	560	420	**733 963 189**	0.593	35	16
450	630	470	**733 963 190**	0.593	35	18

Gap filler

- 13 x 13mm, 2.5 m on a roll, sold in Box of 36 rolls
- To insulate inspection gap at joints

Price listed per 2,5m roll

d-d (mm)	D (mm)	Part No.	SP	weight (kg)
25 - 315	90 - 450	**738 011 150**	1	0.020

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 per Roll

D (mm)	d-d (mm)	Part No.	weight (kg)	closest inch (inch)
90 - 450	25 - 315	**738 011 152**	2.134	¾ - 12

Silicon Glue

Model:

- For sealing and glueing end caps
- Cartridge 290ml

Standard	Part No.	SP	weight (lb)
290 ml	**738 011 103**	1	1.043

Coldshrink tape PE black

Model:

- For indoor use only
- Width (L) available in 100mm
- 15M (49.2 ft) per roll
- Does not require heat

D (mm)	d-d (mm)	Part No.	weight (lb)	closest inch (inch)
90 - 450	25 - 315	**738 011 107**	3.086	¾ - 8

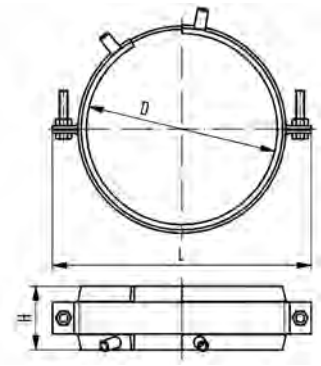
Hot shrink tape PE black

Model:

- For watertight sealing of outer pipe in underground installations
- Mastic backed
- 30 M per Roll
- Requires shrinking with burner or hot air gun
- Order sealing patches separately (738 011 109)

D (mm)	d-d (mm)	Part No.	weight (kg)	L (mm)	closest inch (inch)
90 - 630	25 - 450	**738 011 108**	3.000	150	¾ - 18

Aussenrohr/ casing pipe	Länge Schrumpfband length shrink tape
90	370
110	440
125	480
140	530
160	600
180	660
225	800
250	880
280	970
315	1080
355	1210
400	1350
450	1500
500	1660
560	1850
630	2070



COOL-FIT ABS Plus fixed point

Model:

- The product consists of two components namely electrofusion tapes and pipe brackets.
- For welding capability, use an MSA2.x, MSA4.x, MSA250, 300, 350, or 400
- When using an MSA fusion machine from Georg Fischer Piping Systems, the 799 350 339 fusion adapter is needed
- Please take note of the maximum allowable forces for this fixed point fitting noted below

d (mm)	D (mm)	Part No.	SP	weight (kg)	max. Force (kN)	closest inch (inch)	L (mm)	H (mm)
25 - 32	90	**738 912 013**	1	0.895	1.5	¾ - 1	150	60
40 - 50	110	**738 912 014**	1	0.904	2.0	1 ¼ - 1 ½	170	60
75	140	**738 912 016**	1	1.188	5.5	2 ½	215	60
90	160	**738 912 017**	1	1.177	9.0	3	220	60
110	180	**738 912 018**	1	1.530	10.0	4	255	60
140	225	**738 912 020**	1	1.813	10.0	5	310	60
160	250	**738 912 021**	1	1.957	10.0	6	335	60
200	280	**738 912 022**	1	2.001	10.0	8	365	60
225	315	**738 912 023**	1	2.388	10.0	8	400	60
250	355	**738 912 024**	1	2.388	10.0	10	420	60
63	125	**738 912 015**	1	1.103	3.5	2	180	60

COOL-FIT Y cables kit

- The COOL-FIT Y cables are used to speed up the installation of the fixed points electrofusion tapes. The Y cables allow the welding in parallel of 2 E-Tapes, halving the total duration of the fusion process.
- Compatible with MSA 210-230, MSA 330-340, MSA 250 – 400, MSA 250 – 400 PLUS

Type	Part No.	weight (kg)
4 leads cable with 2mm plugs in output	**790 156 032**	0.385

COOL-FIT fixed point adapter

- Adapter for MSA electrofusion machine

Part No.	SP	weight (kg)
799 350 339	2	0.021

Deburring Tool

- The deburring tool is used to chamfer the inside of COOL-FIT ABS Plus pipes and fittings.

d-d (mm)	Weight (lb)	Part No.	weight (kg)
		150 900 475	0.028

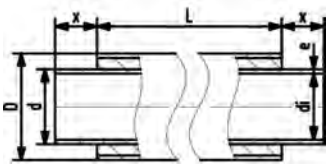
COOL-FIT® Pipe Calibration Tool

Model:

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

d-d (mm)	Part No.	SP	weight (lb)	closest inch (inch)
200 - 225	**790 205 001**	0	41.678	5 - 8

COOL-FIT PE Plus

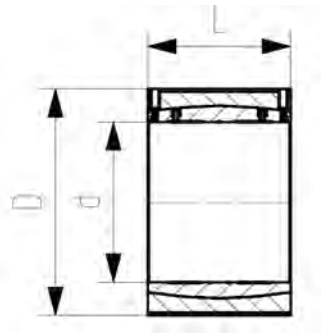


COOL-FIT 4.0 Pipe, d250-d450

Model:

- Pre-Insulated PE100 SDR17 metric
- Insulation made from PUR
- Insulation length: 5.9M (optional: 10M)
- Outer jacket impact and UV resistant. Color: black

d (mm)	D (mm)	PN (bar)	Part No.	di (mm)	x (mm)	closest inch (inch)
250	355	10	**738 173 021**	221.6	125	10
280	400	10	**738 173 022**	248.2	125	10
315	450	10	**738 173 023**	279.2	135	12
355	500	10	**738 173 024**	314.8	145	14
400	560	10	**738 173 025**	354.6	145	16
450	630	10	**738 173 026**	400.0	155	18

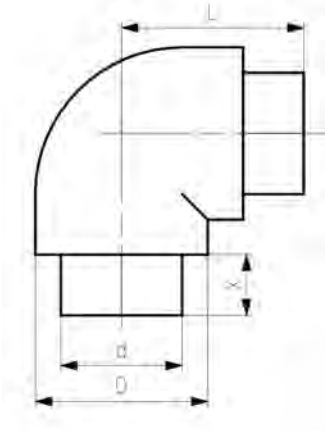


COOL-FIT 4.0 Coupler, d250-d450

Model:

- Pre-Insulated PE100 SDR17 metric
- Outer jacket PE Color: black
- Insulation made from PUR

d (mm)	Part No.	D (mm)	PN (bar)	L (mm)	closest inch (inch)
250	**738 911 821**	355	10	247	10
280	**738 911 822**	400	10	252	10
315	**738 911 823**	450	10	267	12
355	**738 911 824**	500	10	290	14
400	**738 911 875**	560	10	294	16
450	**738 911 876**	630	10	326	18

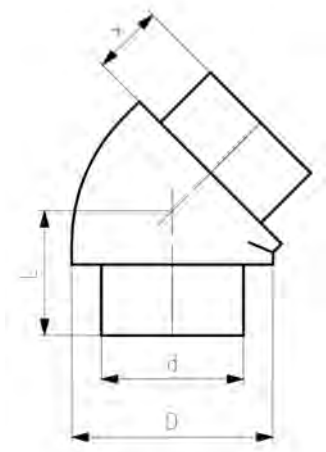


COOL-FIT 4.0 Bend 90°, d250-d450

Model:

- Pre-Insulated PE100 SDR17 metric
- Outer jacket impact and UV resistant. Color: black
- Insulation made from PUR

d (mm)	D (mm)	PN (bar)	Part No.	L (mm)	x (mm)	closest inch (inch)
250	355	10	**738 003 121**	375	123	10
280	400	10	**738 003 122**	430	126	10
315	450	10	**738 003 123**	470	133	12
355	500	10	**738 003 124**	900	145	14
400	560	10	**738 003 175**	980	147	16
450	630	10	**738 003 176**	1070	163	18



COOL-FIT 4.0 Bend 45°, d250-d450

Model:

- Pre-Insulated PE100 SDR17 metric
- Outer jacket impact and UV resistant. Color: black
- Insulation made from PUR

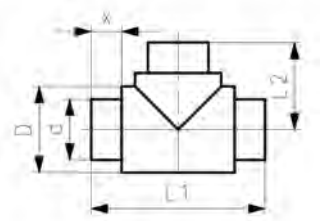
d (mm)	D (mm)	PN (bar)	Part No.	x (mm)	L (mm)	closest inch (inch)
250	355	10	**738 053 121**	123	440	10
280	400	10	**738 053 122**	126	460	10
315	450	10	**738 053 123**	133	535	12
355	500	10	**738 053 124**	145	620	14
400	560	10	**738 053 175**	147	650	16
450	630	10	**738 053 176**	163	680	18

COOL-FIT 4.0 T90° equal, d250-d450

Model:

- Pre-Insulated PE100 SDR17 metric
- Outer jacket impact and UV resistant. Color: black
- Insulation made from PUR

d (mm)	D (mm)	PN (bar)	Part No.	x (mm)	L1 (mm)	L2 (mm)	closest inch (inch)
250	355	10	**738 203 121**	123	1000	500	10
280	400	10	**738 203 122**	126	1000	500	10
315	450	10	**738 203 123**	133	1000	500	12
355	500	10	**738 203 124**	145	1300	700	14
400	560	10	**738 203 175**	147	1300	700	16
450	630	10	**738 203 176**	163	1400	750	18

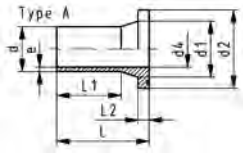


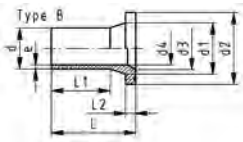
COOL-FIT 4.0 Reducer, d250-d450

Model:

- Pre-Insulated PE100 SDR17 metric
- Outer jacket impact and UV resistant. Color: black
- Insulation made from PUR

d (mm)	D (mm)	d1 (mm)	Part No.	z (mm)	L (mm)	L1 (mm)
250	355	225	**738 903 802**	332	123	110
280	400	225	**738 903 899**	335	126	110
315	450	225	**738 903 807**	365	133	110
280	400	250	**738 903 803**	340	126	123
315	450	250	**738 903 805**	365	133	123
315	450	280	**738 903 806**	365	133	126
355	500	250	**738 903 808**	390	145	123
355	500	280	**738 903 809**	390	145	126
355	500	315	**738 903 810**	390	145	133
400	560	280	**738 903 871**	415	147	126
400	560	315	**738 903 872**	415	147	133
400	560	355	**738 903 873**	420	147	145
450	630	280	**738 903 874**	389	163	126
450	630	315	**738 903 875**	390	163	133
450	630	355	**738 903 876**	393	163	145
450	630	400	**738 903 877**	395	163	147





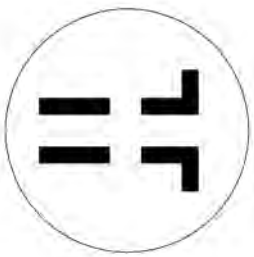
Flange adaptor PE100 SDR17/17.6
Combined jointing face: flat and serrated

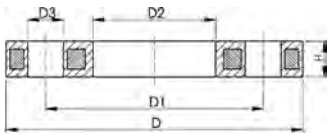
Model:

- Material: PE100
- Long spigot for Butt fusion or Electrofusion
- Suitable for flange connections to metric (from d110 also to ANSI/ASME B16.5)
- Gasket d710-d1000:flat gasket EPDM No. 48 40 03
- Gasket d20-d630: Profile flange gasket NBR No. 45 44 07, EPDM No. 48 44 07
- Type A without chamfer, Type B with chamfer

* Not suitable for butterfly valves type 037/038/039

	d (mm)	Part No.	weight (lb)	d1 (mm)	d2 (mm)	d3 (mm)	d4 (mm)	L (mm)	L1 (mm)	L2 (mm)	e (mm)	Type
	250	**753 800 096**	7.716	285	320	245	220	220	148	35	14.8	B
	280	**753 800 097**	8.333	291	320	265	246	230	154	35	16.6	B
*	315	**753 800 098**	12.059	335	370	300	277	242	166	36	18.7	B
**	355	**753 800 099**	35.715	373	430	340	312	261	179	30	21.1	B
**	400	**753 800 100**	22.708	427	483	385	352	290	196	33	23.7	B
**	450	**753 800 101**	34.833	514	585		396	333	195	60	26.7	A





Backing flange PP-Steel For butt fusion systems Inch/ANSI

Model:

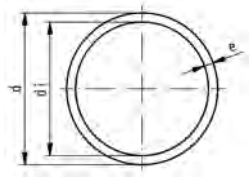
- UV-resistant.
- **Bolt circle class 150**

AL: number of holes

	d (inch)	d (mm)	DN (mm)	PN (bar)	Part No.	weight (kg)	D (mm)	D1 (mm)	D2 (mm)	D3 (mm)	H (mm)	AL	SC
	10	250/280	250	10	**727 701 321**	6.000	406	362	293	25	30	12	M24
	12	315	300	10	**727 701 322**	11.800	483	432	338	25	34	12	M24
	14	355	350	10	**727 701 323**	17.900	540	476	376	29	42	12	M27
	16	400	400	10	**727 701 324**	24.500	597	539	429	29	44	16	M27
	20	450/500	500	10	**727 701 325**	33.600	712	635	540	32	53	20	M30

COOL-FIT ABS

Pipe

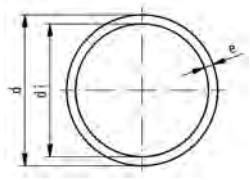


Pipe ABS Metric, nominal pressure 240 psi (PN16) at 68F (20C)

Model:

- Colour: RAL 7001, gravel grey
- Length: Lengths of 16.4 feet (5 meters)
- Minimum order quantity: 1 length
- PN6 (90PSI) / PN10 (150PSI) / PN16 (240PSI) at 20°C (68°F)

d (mm)	PN (bar)	Part No.	weight (kg/m)	e (inch)	di (inch)	closest inch (inch)	Refrigeration size (inch)
16	16	**169 017 080**	0.095	0.071	0.49	⅜	½
20	16	**169 017 081**	0.152	0.091	0.61	½	⅝
25	16	**169 017 082**	0.195	0.091	0.80	¾	⅞
32	16	**700 262 397**	0.820	0.114	1.03	1	1 ⅛
40	16	**700 262 398**	1.210	0.146	1.28	1 ¼	1 ⅜

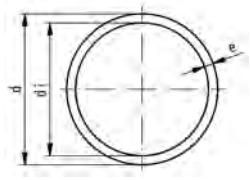


Pipe ABS Metric, nominal pressure 150 psi (PN10) at 68F (20C)

Model:

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

d (mm)	PN (bar)	Part No.	SP	weight (kg/m)	e (mm)	di (mm)	Refrigeration size (inch)	closest inch (inch)
32	10	**169 017 083**	25	0.213	1.9	28.2	1 ⅛	1
40	10	**169 017 084**	25	0.337	2.4	35.2	1 ⅜	1 ¼
50	10	**169 017 085**	25	0.526	3.0	44.0	1 ⅝	1 ½
63	10	**169 017 086**	15	0.839	3.8	55.4	2 ⅛	2
75	10	**169 017 087**	10	1.183	4.5	66.0	2 ⅝	2 ½
90	10	**169 017 088**	5	1.704	5.4	79.2	3 ⅛	3
110	10	**169 017 089**	5	2.546	6.6	96.8	4 ⅛	4
140	10	**169 017 091**	0	4.489	8.3	123.4		5
160	10	**169 017 092**	0	5.856	9.5	141.0	6	6
200	10	**169 017 093**	5	9.133	12.3	175.4		8
225	10	**169 017 094**	5	11.605	13.9	197.2		9



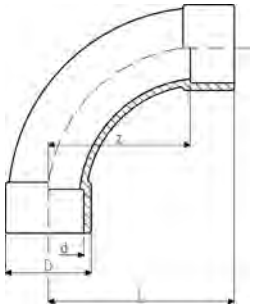
Pipe ABS Metric, nominal pressure 90 psi (PN6) at 68F (20C)

Model:

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

d (mm)	PN (bar)	Part No.	SP	weight (kg/m)	di (mm)	e (mm)	closest inch (inch)
250	6	**169 017 095**	5	8.299	230.8	9.6	10
280	6	**169 017 096**	5	10.346	258.6	10.7	11
315	6	**169 017 097**	5	13.173	290.8	12.1	12

Fittings

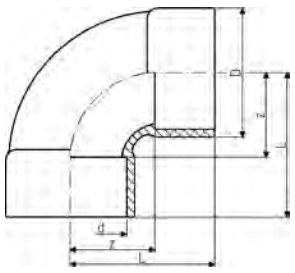


Bend 90°, ABS metric

- Radius = 2 d

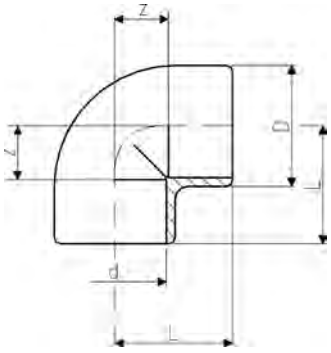
* Available as long as our stock will last

	d (mm)	PN (bar)	Part No.	SP	weight (lb)	D (mm)	L (mm)	z (mm)	closest inch (inch)
	20	16	**729 000 106**	10	0.060	27	58	40	½
	25	16	**729 000 107**	10	0.086	35	69	50	¾
	32	10	**729 000 108**	10	0.123	38	86	64	1
	40	10	**729 000 109**	30	0.218	54	109	80	1 ¼
	50	10	**729 000 110**	10	0.505	61	131	100	1 ½
	63	10	**729 000 111**	4	0.862	76	164	126	2
	75	10	**729 000 112**	5	1.312	90	194	150	2 ½
	90	10	**729 000 113**	5	2.302	113	231	180	3
	110	10	**729 000 114**	5	4.632	137	281	220	4
	140	10	**729 000 116**	1	8.810	168	356	280	5
*	160	10	**729 000 117**	1	12.346	191	406	320	6



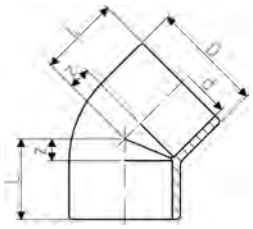
Bend 90° short pattern ABS metric

d (mm)	PN (bar)	Part No.	SP	weight (lb)	closest inch (inch)	z (mm)	D (mm)	L (mm)
225	10	**729 010 120**	1	12.657	9	168	256	287
280	6	**729 010 122**	1	39.683	11	210	318	357
315	6	**729 010 123**	1	46.297	12	237	356	401



Elbow 90°, ABS metric

d (mm)	PN (bar)	Part No.	SP	weight (lb)	D (mm)	L (mm)	z (mm)	closest inch (inch)
20	16	**729 100 106**	10	0.022	26	27	11	½
25	16	**729 100 107**	10	0.040	31	33	14	¾
32	10	**729 100 108**	10	0.073	40	39	17	1
40	10	**729 100 109**	10	0.121	49	47	21	1 ¼
50	10	**729 100 110**	10	0.216	61	57	26	1 ½
63	10	**729 100 111**	10	0.410	76	72	33	2
75	10	**729 100 112**	5	0.661	90	84	40	2 ½
90	10	**729 100 113**	5	0.952	110	97	46	3
110	10	**729 100 114**	3	1.695	136	116	55	4
140	10	**729 100 116**	4	3.342	162	146	70	5
160	10	**729 100 117**	1	4.799	185	166	80	6
200	10	**729 100 119**	1	7.434	225	207	101	8
250	6	**729 100 121**	1	18.118	282	263	131	9

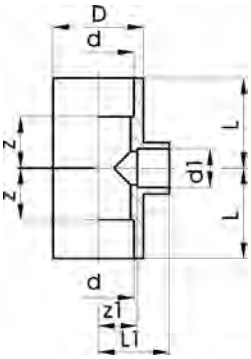


Elbow 45°, ABS metric

d (mm)	PN (bar)	Part No.	SP	weight (lb)	z (mm)	D (mm)	L (mm)	closest inch (inch)
20	16	**729 150 106**	10	0.020	5	25	21	½
25	16	**729 150 107**	10	0.029	6	31	25	¾
32	10	**729 150 108**	10	0.057	8	40	30	1
40	10	**729 150 109**	10	0.097	10	49	36	1 ¼
50	10	**729 150 110**	5	0.174	12	61	43	1 ½
63	10	**729 150 111**	10	0.315	14	76	52	2
75	10	**729 150 112**	5	0.496	17	89	61	2 ½
90	10	**729 150 113**	4	0.800	20	107	71	3
110	10	**729 150 114**	10	1.250	28	131	89	4
140	10	**729 150 116**	1	2.590	32	162	108	5
160	10	**729 150 117**	4	3.777	36	185	122	6
200	10	**729 150 119**	1	5.613	43	225	149	8
225	10	**729 150 120**	1	6.971	49	250	168	8
250	6	**729 150 121**	1	13.534	60	282	192	9
280	6	**729 150 122**	1	23.149	66	318	213	10
315	6	**729 150 123**	1	32.187	74	356	239	12

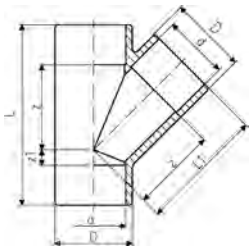
Tee 90° ABS metric

d (mm)	PN (bar)	Part No.	SP	weight (lb)	z (mm)	D (mm)	L (mm)	closest inch (inch)
20	16	**729 200 106**	10	0.033	11	25	27	½
25	16	**729 200 107**	10	0.055	14	31	33	¾
32	10	**729 200 108**	10	0.093	17	40	39	1
40	10	**729 200 109**	10	0.172	21	49	47	1 ¼
50	10	**729 200 110**	5	0.295	26	61	57	1 ½
63	10	**729 200 111**	5	0.562	34	76	72	2
75	10	**729 200 112**	6	0.891	40	90	84	2 ½
90	10	**729 200 113**	4	1.464	47	107	98	3
110	10	**729 200 114**	6	2.227	55	133	116	4
140	10	**729 200 116**	1	5.666	71	169	147	5
160	10	**729 200 117**	1	8.272	81	193	167	6
200	10	**729 200 119**	1	9.802	101	225	207	8
225	10	**729 200 120**	1	15.124	114	256	233	8
250	6	**729 200 121**	1	24.668	132	282	263	9
280	6	**729 200 122**	1	26.431	152	318	298	10
315	6	**729 200 123**	1	44.092	168	356	332	12



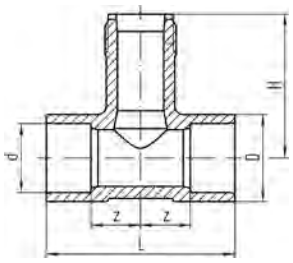
Reducing Tee 90°, ABS metric

d (mm)	d1 (mm)	PN (bar)	Part No.	SP	weight (lb)	z1 (mm)	z (mm)	L (mm)	L1 (mm)	D (mm)	closest inch (inch)
25	20	16	**729 200 134**	10	0.066	14	14	33	30	33	¾ - ½ - ¾
32	25	10	**729 200 138**	10	0.108	17	17	39	36	41	1 - ¾ - 1
40	25	10	**729 200 151**	10	0.183	23	23	49	42	50	1 ¼ - ¾ - 1 ¼
40	32	10	**729 200 147**	10	0.187	23	23	49	45	50	1 ¼ - 1 - 1 ¼
50	25	10	**729 200 010**	5	0.304	28	28	59	47	62	1 ½ - ¾ - 1 ½
50	32	10	**729 200 164**	5	0.311	28	28	59	50	62	1 ½ - 1 - 1 ½
63	25	10	**729 200 011**	10	0.542	34	34	73	53	77	2 - ¾ - 2
63	32	10	**729 200 178**	5	0.564	34	35	73	56	77	2 - 1 - 2
63	50	10	**729 200 170**	5	0.595	34	35	73	65	77	2 - 1 ½ - 2
75	40	10	**729 200 182**	9	0.875	41	40	84	66	92	2 ½ - 1 ¼ - 2 ½
90	32	10	**729 200 143**	6	1.479	55	46	97	77	110	3 - 1 - 3
90	63	10	**729 200 146**	5	1.576	55	46	97	93	110	3 - 2 - 3
110	32	10	**729 200 144**	3	2.445	67	56	117	89	133	4 - 1 - 4
110	50	10	**729 200 136**	3	2.520	67	56	117	98	133	4 - 1 ½ - 4
140	50	10	**729 200 148**	1	5.406	82	72	148	113	172	5 - 1 ½ - 5
140	75	10	**729 200 149**	1	5.463	78	72	148	122	172	5 - 2 ½ - 5
160	110	10	**729 200 152**	1	9.491	91	81	167	142	192	6 - 3 - 6
160	90	10	**729 200 158**	1	7.564	91	81	167	142	192	6 - 3 - 6
200	110	10	**729 200 153**	1	14.745	131	106	213	192	232	7 - 4 - 7
225	110	10	**729 200 156**	1	17.849	143	119	239	204	257	8 - 4 - 8
225	160	10	**729 200 157**	1	16.502	119	119	239	205	257	8 - 6 - 8



Tee 45° ABS metric

d (mm)	PN (bar)	Part No.	SP	weight (lb)	D (mm)	L (mm)	L1 (mm)	closest inch (inch)	z (mm)	z1 (mm)
20	10	**729 250 106**	10	0.060	28	68	46	½	30	6
25	10	**729 250 107**	10	0.095	33	83	55	¾	36	9
32	10	**729 250 108**	10	0.161	41	99	67	1	45	10
40	10	**729 250 109**	10	0.271	50	118	82	1 ¼	56	10
50	10	**729 250 110**	8	0.445	60	140	97	1 ½	66	12
63	10	**729 250 111**	5	0.736	74	175	123	2	85	14
75	6	**729 250 112**	5	1.334	91	207	145	2 ½	101	18
90	6	**729 250 113**	1	2.119	107	245	173	3	122	20
110	6	**729 250 114**	3	4.204	134	298	210	4	149	27



Signet Installation Fittings Type 310, ABS metric

Model:

- Threaded outlet 1 ¼" NPSM
- With solvent cement socket metric
- Material: ABS (price is per meter)

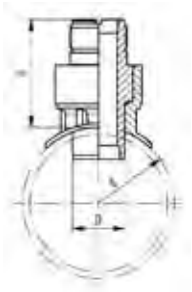
Range of use:

- Compatible Signet pH/ORP sensors: type 2724, 2725, 2726, 2734, 2736, 2735
- Compatible Signet flow sensors: type 2551, 2537, 515, 8510, 2536, 8512

Attention:

- Sensor length depends on installation fitting

DN (mm)	d (mm)	PN (bar)	Part No.	SP	weight (lb)	closest inch (inch)	z (mm)	Sensor Type	D (mm)	H (mm)	L (mm)
20	25	10	**729 310 007**	1	0.220	¾	32	flow X0, pH XX	35	78	100
25	32	10	**729 310 008**	1	0.315	1	33	flow X0, pH XX	44	81	110
32	40	10	**729 310 009**	1	0.309	1 ¼	29	flow X0, pH XX	51	84	110
40	50	10	**729 310 010**	1	0.412	1 ½	29	flow X0, pH XX	63	88	120
50	63	10	**729 310 011**	1	0.567	2	28	flow X0, pH XX	78	94	130



Signet Installation Fitting Type 312, ABS metric

Model:

- Saddle with threaded outlet 1 ¼" NPSM
- Top saddle for solvent cement bonding
- Material: ABS (price is per meter)

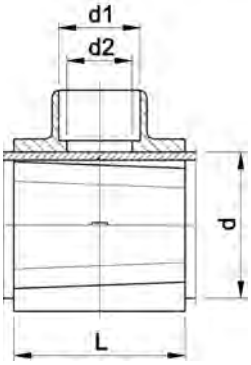
Range of use:

- Compatible Signet flow sensors: type 2551, 2537, 515, 8510, 2536, 8512

Attention:

- Sensor length depends on installation fitting

d (mm)	DN (mm)	PN (bar)	Part No.	SP	weight (lb)	D (mm)	H (mm)	Sensor Type	closest inch (inch)
75	65	10	**729 312 012**	1	0.375	38	91	flow X1	2 ½
90	80	10	**729 312 013**	1	0.388	38	91	flow X1	3
110	100	10	**729 312 014**	1	0.379	38	91	flow X1	4
140	125	10	**729 312 016**	1	0.366	38	81	flow X1	5
160	150	10	**729 312 017**	1	0.366	38	77	flow X1	6
200	200	10	**729 312 019**	1	0.335	38	71	flow X1	8
225	200	10	**729 312 020**	1	0.432	38	67	flow X1	8

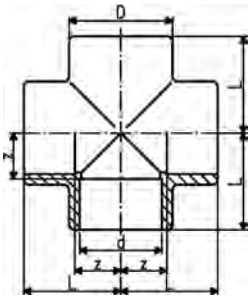


Branch Saddle, ABS metric

Model:

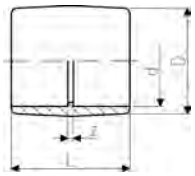
- For ABS pipes
- Outlet with solvent cement socket metric
- PN 10, ISO PSI
- Top saddle (ABS) for solvent cementing
- Bottom part and wedges made from PVC

d (mm)	PN (bar)	Part No.	SP	weight (lb)	d1 (mm)	d2 (mm)	Tapping-Ø (mm)	L (mm)
90	10	**169 110 056**	1	1.733	50	40	39	105
110	10	**169 110 066**	1	1.905	50	40	39	105
160	10	**169 110 097**	1	2.930	63	49	48	120
225	10	**169 110 117**	1	3.499	63	49	48	120



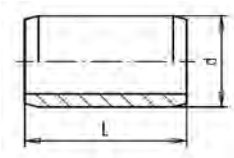
Cross ABS metric

d (mm)	PN (bar)	Part No.	SP	weight (lb)	closest inch (inch)	z (mm)	D (mm)	L (mm)
32	10	**729 300 108**	10	0.154	1	17	43	39
63	10	**729 300 111**	5	0.791	2	34	79	72
90	10	**729 300 113**	5	2.066	3	48	106	97



Coupling, ABS metric socket

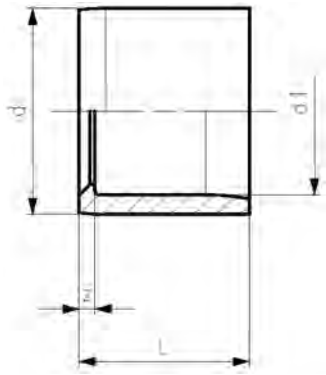
d (mm)	PN (bar)	Part No.	SP	weight (lb)	D (mm)	L (mm)	z (mm)	closest inch (inch)
20	16	**729 910 106**	10	0.015	26	35	3	½
25	16	**729 910 107**	10	0.026	32	41	3	¾
32	10	**729 910 108**	10	0.044	40	47	3	1
40	10	**729 910 109**	10	0.077	49	55	3	1 ¼
50	10	**729 910 110**	10	0.132	61	65	3	1 ½
63	10	**729 910 111**	10	0.243	76	79	3	2
75	10	**729 910 112**	10	0.320	87	92	4	2 ½
90	10	**729 910 113**	10	0.531	104	107	5	3
110	10	**729 910 114**	5	1.248	131	132	5	4
140	10	**729 910 116**	2	1.792	162	159	7	5
160	10	**729 910 117**	2	2.593	183	180	8	6
200	10	**729 910 119**	1	3.331	221	221	9	8
225	10	**729 910 120**	1	5.593	253	248	10	8
250	6	**729 910 121**	1	8.946	284	284	16	9
280	6	**729 910 122**	1	13.323	321	314	16	10
315	6	**729 910 123**	1	17.857	356	348	16	12



Barrel nipple ABS metric

Model:

d (mm)	PN (bar)	Part No.	weight (lb)	L (mm)	closest inch (inch)
20	16	**729 900 906**	0.018	32	½
25	16	**729 900 907**	0.018	38	¾
32	10	**729 900 908**	0.015	44	1
40	10	**729 900 909**	0.035	52	1 ¼
50	10	**729 900 910**	0.071	62	1 ½
63	10	**729 900 911**	0.130	76	2
75	10	**729 900 912**	0.209	88	2 ½
90	10	**729 900 913**	0.355	102	3
110	10	**729 900 914**	0.622	122	4

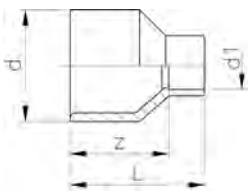


Reducing bush ABS metric

Model:

- With solvent cement spigot and socket metric

d (mm)	d1 (mm)	PN (bar)	Part No.	SP	weight (lb)	z (mm)	L (mm)
25	20	16	**729 900 337**	10	0.011	3	19
32	20	10	**729 900 342**	10	0.024	6	22
32	25	10	**729 900 341**	10	0.018	4	22
40	20	10	**729 900 348**	10	0.035	10	26
40	25	10	**729 900 347**	10	0.035	7	26
40	32	10	**729 900 346**	10	0.026	4	26
50	20	10	**729 900 355**	10	0.057	15	31
50	25	10	**729 900 354**	10	0.024	12	31
50	32	10	**729 900 353**	10	0.077	9	31
50	40	10	**729 900 352**	10	0.049	5	31
63	32	10	**729 900 360**	10	0.132	16	38
63	40	10	**729 900 359**	10	0.112	12	38
63	50	10	**729 900 358**	10	0.095	7	36
75	50	10	**729 900 365**	10	0.181	13	44
75	63	10	**729 900 364**	10	0.134	7	44
90	50	10	**729 900 372**	10	0.315	20	51
90	63	10	**729 900 371**	10	0.284	14	51
90	75	10	**729 900 370**	10	0.220	7	51
110	63	10	**729 900 378**	5	0.509	24	61
110	90	10	**729 900 376**	5	0.432	10	61
125	110	10	**700 244 660**	10	0.785	8	69
140	110	10	**729 900 385**	5	1.012	15	76
160	110	10	**729 900 390**	6	1.459	25	86
160	140	10	**729 900 388**	5	0.904	10	86
200	160	10	**729 900 392**	1	1.808	20	106
225	160	10	**729 900 396**	2	3.640	33	119
225	200	10	**729 900 181**	0	2.244	13	119
250	225	6	**729 900 303**	4	2.853	12	131
280	250	6	**729 900 306**	1	5.512	15	146
315	280	6	**729 900 312**	1	6.288	17	164

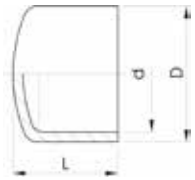


Reducing bush long ABS metric

Model:

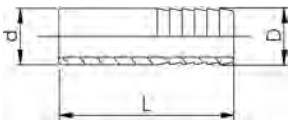
- With solvent cement spigot and socket metric

d (mm)	d1 (mm)	PN (bar)	Part No.	SP	weight (lb)	z (mm)	L (mm)	closest inch (inch)
32	20	10	**729 910 342**	10	0.031	30	46	1 - ½
40	25	10	**729 910 347**	10	0.057	36	55	1 ¼ - ¾
50	25	10	**729 910 354**	10	0.084	44	63	1 ⅓ - ¾
63	32	10	**729 910 360**	5	0.170	54	76	2 - 1
75	40	10	**729 910 366**	5	0.254	62	88	2 ½ - 1 ¼
90	63	10	**729 910 371**	5	0.474	74	112	3 - 2



Cap ABS metric

d (mm)	PN (bar)	Part No.	SP	weight (lb)	closest inch (inch)	D (mm)	L (mm)
20	16	**729 960 106**	10	0.015	½	30	25
25	16	**729 960 107**	10	0.029	¾	37	30
32	10	**729 960 108**	10	0.042	1	44	34
40	10	**729 960 109**	10	0.075	1 ¼	55	41
50	10	**729 960 110**	10	0.101	1 ½	64	44
63	10	**729 960 111**	5	0.194	2	80	54
75	10	**729 960 112**	5	0.254	2 ½	87	65
90	10	**729 960 113**	5	0.481	3	112	77
110	10	**729 960 114**	5	1.100	4	145	101
140	10	**729 960 116**	10	1.940	5	163	114
160	10	**729 960 117**	2	2.513	6	188	130

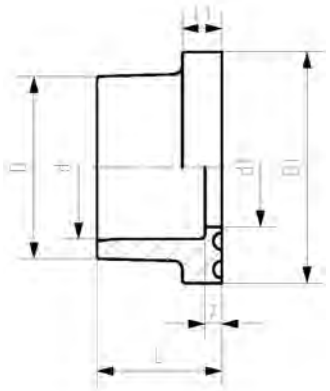


Hose connector ABS metric

Model:

- With solvent cement spigot metric and parallel hose connection

d (mm)	PN (bar)	Part No.	SP	weight (lb)	closest inch (inch)	D (mm)	L (mm)
20	10	**729 960 406**	10	0.026	½	20	73
25	10	**729 960 407**	10	0.033	¾	25	79
32	10	**729 960 408**	10	0.060	1	30	89
32	10	**729 960 508**	10	0.060	1	32	89
40	10	**729 960 409**	10	0.057	1 ¼	40	100



Flange Adaptor, ABS metric

Model:

- Counter part: Same flange adaptor
- Gasket: profile flange gasket EPDM code no. 748 440 706-723, FKM code no. 749 440 706-723
- Gasket: flat gasket EPDM code no. 748 400 306-323
- Joining faces flat/serrated

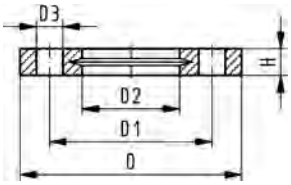
Note:

	d (mm)	PN (bar)	Part No.	SP	weight (lb)	D (mm)	D1 (mm)	d1 (mm)	L (mm)	L1 (mm)	z (mm)	closest inch (inch)
	20	10	**729 790 106**	10	0.015	27	34	16	21	6	3	½
	25	10	**729 790 107**	10	0.033	33	41	21	24	7	3	¾
	32	10	**729 790 108**	10	0.044	41	50	28	27	7	3	1
	40	10	**729 790 109**	10	0.062	50	61	36	30	8	3	1 ¼
	50	10	**729 790 110**	10	0.084	61	73	45	34	8	3	1 ½
	63	10	**729 790 111**	10	0.150	76	90	57	41	9	3	2
	75	10	**729 790 112**	10	0.256	91	106	69	47	10	3	2 ½
	90	10	**729 790 113**	10	0.408	108	125	82	56	11	5	3
	110	10	**729 790 114**	10	0.672	131	150	102	66	12	5	4
	140	10	**729 790 116**	6	1.179	165	188	132	81	14	5	5
*	160	10	**729 790 117**	2	1.810	188	213	152	91	16	5	6
*	200	10	**729 790 119**	2	2.476	224	250	192	112	24	6	8
	225	10	**729 790 120**	2	2.932	248	274	217	125	25	6	8
	250	6	**729 790 121**	1	3.746	274	303	240	140	23	9	9
	280	6	**729 790 122**	1	4.813	307	329	270	151	23	5	10
	315	6	**729 790 123**	1	7.322	346	379	302	172	27	8	12

Full Face, Flange Gasket EPDM

- Full Face Flange Gasket EPDM
- Connecting dimension: ANSI/ASME B 16.5 class 150 and BS 1560
- Bolt circle class 150
- AL: Number of holes

Size (inch)	D (inch)	D2 (inch)	D3 (inch)	D1 (inch)	AL	Part No.	weight (lb)
1/2	0.63	2.38	3.50	0.84	4	**150 400 306**	0.002
3/4	0.63	2.75	3.88	1.06	4	**150 400 307**	0.066
1	0.63	3.13	4.25	1.31	4	**150 400 308**	0.077
1 1/4	0.63	3.50	4.63	1.66	4	**150 400 309**	0.088
1 1/2	0.63	3.88	5.00	1.90	4	**150 400 310**	0.088
2	0.75	4.75	6.00	2.38	4	**150 400 311**	0.141
2 1/2	0.75	5.50	7.00	2.88	4	**150 400 312**	0.194
3	0.75	6.00	7.50	3.50	4	**150 400 313**	0.216
4	0.75	7.50	9.00	4.50	8	**150 400 314**	0.278
5	0.88	8.50	10.00	5.56	8	**150 400 316**	0.002
6	0.88	9.50	11.00	6.63	8	**150 400 317**	0.348
8 & 9	0.88	11.75	13.50	8.63	8	**150 400 319**	0.549
10	1.00	14.25	16.00	10.75	12	**150 400 321**	0.002
12	1.00	17.00	19.00	12.75	12	**150 400 323**	0.620



Backing flange PP-V Inch ANSI for Socket systems metric and BS

Model:

- Full-plastic flange PP-GF (30% glass-fiber reinforced), with V-groove which applies force evenly on collar
- With V-groove which applies force evenly on collar
- With integrated bolt-fixing as an assembly aid
- UV-resistant.
- Connecting dimension: ANSI/ASME B 16.5 class 150, ASTM D 4024, BS 1560, BS EN 1759
- **Bolt circle class 150**

AL: number of holes
* Combined version, metric-ANSI
All sizes suitable for butt fusion. Sizes 20-75mm also for socket fusion.

- 727701414, 727700417, 727700419: only for use with original metric flange adaptors

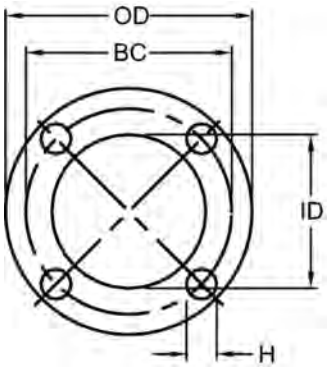
	Size (inch)	d (mm)	PN (bar)	Part No.	SP	weight (lb)	D (mm)	D1 (mm)	D2 (mm)	D3 (mm)	H (mm)	AL	SC
1	½	20	16	**727 701 406**	56	0.201	95	60	28	16	16	4	M12
1	¾	25	16	**727 701 407**	38	0.265	105	70	34	16	17	4	M12
1	1	32	16	**727 701 408**	80	0.324	115	79	42	16	18	4	M12
1	1 ¼	40	16	**727 701 409**	40	0.542	140	89	51	16	20	4	M16
1	1 ½	50	16	**727 701 410**	30	0.659	150	98	62	16	22	4	M16
1	2	63	16	**727 701 411**	25	0.796	165	121	78	19	24	4	M16
1	2 ½	75	16	**727 701 412**	19	1.085	185	140	92	19	26	4	M16
	3	90	16	**727 701 413**	14	1.334	200	152	110	19	27	4	M16
	4	110	16	**727 701 414**	12	1.552	229	190	133	19	28	8	M16
	6	160	16	**727 700 417**	220	2.315	285	241	190	22	32	8	M20
*	8	200	16	**727 700 419**	154	3.591	340	297	226	22	34	8	M20
*	8	225	16	**727 700 420**	154	3.086	340	297	250	22	34	8	M20
	10	280	16	**727 701 422**	108	4.052	406	362	310	26	38	12	M20
	12	315	16	**727 701 423**	56	7.676	483	432	348	26	42	12	M20

Flange Ring Galvanized Steel ANSI 150 Class

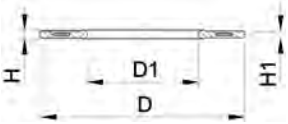
Model:

- **Bolt circle class 150**

Size (inch)	d (mm)	Part No.	SP	OD (inch)	ID (inch)	lbs (lb)
5	140	**150 900 465**	1	10.00	6.22	5



Profile Flange Gasket, metric
EPDM / FKM

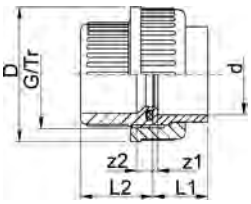


Model:

- For all metric GF Flange Adaptors
- Profile Gasket with steel insert (type G-ST-P/K)
- Hardness: 70° Shore **EPDM**, 75° Shore **FKM**
- **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)	PN (bar)	DN (mm)	EPDM Part No.	FKM Part No.	weight (lb)	D (mm)	D1 (mm)	H (mm)	H1 (mm)	di FA (mm)
16	16	10	**748 440 705**	**749 440 705**	0.026	46	16	4	3	6 - 16
20	16	15	**748 440 706**	**749 440 706**	0.029	51	20	4	3	10 - 20
25	16	20	**748 440 707**	**749 440 707**	0.031	61	22	4	3	12 - 22
32	16	25	**748 440 708**	**749 440 708**	0.042	71	28	4	3	18 - 28
40	16	32	**748 440 709**	**749 440 709**	0.057	82	40	4	3	30 - 40
50	16	40	**748 440 710**	**749 440 710**	0.086	92	46	4	3	36 - 46
63	16	50	**748 440 711**	**749 440 711**	0.110	107	58	5	4	48 - 58
75	16	65	**748 440 712**	**749 440 712**	0.181	127	69	5	4	59 - 69
90	16	80	**748 440 713**	**749 440 713**	0.183	142	84	5	4	73 - 84
110	16	100	**748 440 714**	**749 440 714**	0.280	162	104	6	5	94 - 104
125	16	100	**748 440 715**	**749 440 715**	0.231	162	123	6	5	113 - 123
140	16	125	**748 440 716**	**749 440 716**	0.381	192	137	6	5	127 - 137
160 - 180	16	150	**748 440 717**	**749 440 717**	0.456	218	160	8	6	150 - 160
200	16	200	**748 440 719**	**749 440 719**	0.580	273	203	8	6	192 - 203
225	16	200	**748 440 720**	**749 440 720**	0.562	273	220	8	6	207 - 220
250	16	250	**748 440 721**	**749 440 721**	1.019	328	252	8	6	238 - 252
280	16	250	**748 440 722**	**749 440 722**	0.712	328	274	8	6	264 - 274
315	16	300	**748 440 723**	**749 440 723**	1.210	378	306	8	6	296 - 306
355	16	350	**748 440 724**	**749 440 724**	1.918	438	355	10	7	340 - 355
400	16	400	**748 440 725**	**749 440 725**	2.399	489	400	10	7	385 - 400
450	16	500	**748 440 726**	**749 440 726**	1.583	594	403	10	7	393 - 403
500	16	500	**748 440 727**	**749 440 727**	1.583	594	447	10	7	437 - 447
560	16	600	**748 440 728**	**749 440 728**	2.035	695	494	10	7	484 - 494
630	16	600	**748 440 729**	**749 440 729**	2.035	695	555	10	7	545 - 555

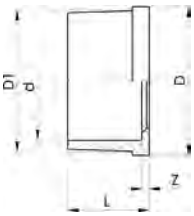


Union, ABS metric

Model:

- Union End: Solvent cement socket metric
- Union bush: Solvent cement socket metric
- Gasket: O-ring EPDM code no. 748 410 006-016

d (mm)	PN (bar)	Part No.	SP	weight (lb)	L1 (mm)	D (mm)	L2 (mm)	z1 (mm)	z2 (mm)	G/Tr (inch)	closest inch (inch)
20	10	**729 510 106**	10	0.077	21	43	26	4	10	1	½
25	10	**729 510 107**	10	0.097	24	53	29	5	10	1 1/4	¾
32	10	**729 510 108**	10	0.141	27	60	33	5	10	1 1/2	1
40	10	**729 510 109**	10	0.287	31	74	39	3	12	2	1 ¼
50	10	**729 510 110**	5	0.340	33	83	46	3	14	2 1/4	1 ½
63	10	**729 510 111**	5	0.569	40	103	58	3	18	2 3/4	2
75	10	**729 510 112**	2	1.034	47	135	62	3	18	Tr 108x5	2 ½
90	10	**729 510 313**	2	1.545	56	158	69	5	18	Tr 128x5	3
110	10	**729 510 114**	1	2.357	66	158	72	5	11	Tr 154x5	4

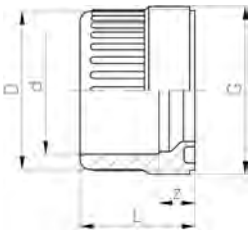


Union End, ABS metric

Model:

- Solvent cement socket metric
- For union 729 510 106-114, 729 510 156-164

d (mm)	PN (bar)	Part No.	SP	weight (lb)	z (mm)	L (mm)	D (mm)	D1 (mm)	closest inch (inch)
20	10	**729 800 106**	10	0.015	4	21	30	28	½
25	10	**729 800 107**	10	0.026	5	24	39	36	¾
32	10	**729 800 108**	10	0.035	5	27	44	41	1
40	10	**729 800 109**	10	0.093	3	31	57	53	1 ¼
50	10	**729 800 110**	10	0.099	3	34	63	59	1 ½
63	10	**729 800 111**	10	0.185	3	41	78	74	2
75	10	**729 800 162**	20	0.240	3	47	101	91	2 ½
90	10	**729 800 163**	12	0.392	5	56	121	108	3
110	10	**729 800 164**	10	0.650	5	66	146	131	4

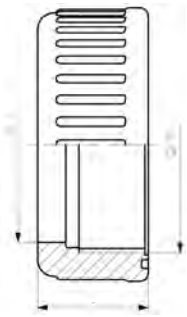


Union bush ABS metric

Model:

- Solvent cement socket metric
- For union 729 510 106-114
- Jointing face: With O-Ring groove

d (mm)	PN (bar)	Part No.	SP	weight (lb)	z (mm)	D (mm)	L (mm)	G/Tr (inch)	closest inch (inch)
20	10	**729 840 106**	10	0.024	10	28	26	1	½
25	10	**729 840 107**	10	0.035	10	33	29	1 1/4	¾
32	10	**729 840 108**	10	0.060	10	41	33	1 1/2	1
40	10	**729 840 109**	10	0.101	12	50	39	2	1 ¼
50	10	**729 840 110**	10	0.128	14	62	46	2 1/4	1 ½
63	10	**729 840 111**	10	0.243	18	77	58	2 3/4	2
75	10	**729 840 112**	20	0.353	18	93	62	Tr108x5	2 ½
90	10	**729 840 123**	12	0.604	18	110	69	Tr128x5	3
110	10	**729 840 114**	10	0.728	11	133	72	Tr154x6	4

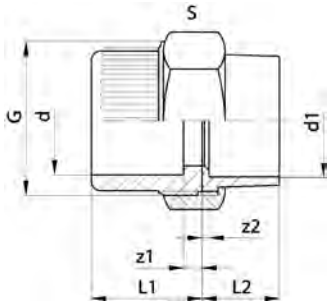


Union nut ABS

Model:

- For union 723 510 105-114

d (mm)	PN (bar)	Part No.	SP	weight (lb)	L (mm)	G/Tr (inch)	D (mm)	closest inch (inch)
16	10	**729 890 405**	10	0.020	21	3/4		⅜
20	10	**729 890 406**	10	0.106	23	1	28	½
25	10	**729 890 407**	10	0.101	25	1 1/4	36	¾
32	10	**729 890 408**	10	0.055	27	1 1/2	42	1
40	10	**729 890 409**	10	0.132	30	2	53	1 ¼
50	10	**729 890 410**	10	0.220	34	2 1/4	59	1 ½
63	10	**729 890 411**	10	0.324	38	2 3/4	74	2
75	10	**729 690 012**	0	0.423	40	Tr108x5	92	2 ½
90	10	**729 690 013**	0	0.593	43	Tr128x5	110	3
110	10	**729 690 014**	0	0.917	48	Tr154x6	133	4



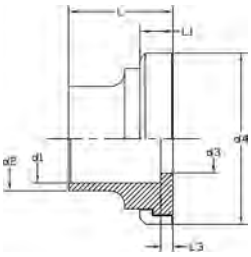
Adaptor Union, Copper for sweating, ABS

Model:

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

d (mm)	d1 (inch)	Refrigeration Size (inch)	PN (bar)	Part No.	weight (lb)
16	⅜	½	10	**720 512 105**	0.240
20	½	⅝	10	**720 512 106**	0.335
25	¾	⅞	10	**720 512 107**	0.441
32	1	1 ⅛	10	**720 512 108**	0.518
40	1 ¼	1 ⅜	10	**720 512 109**	0.926
50	1 ½	1 ⅝	10	**720 512 110**	2.293
63	2	2 ⅛	10	**720 512 111**	2.293

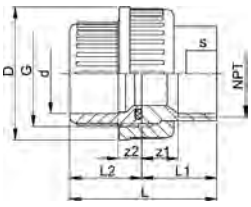
d (mm)	z2 (inch)	z1 (inch)	L2 (inch)	L1 (inch)	G (inch)	s (mm)	closest inch (inch)
16	0	0	1	1	¾	32	⅜
20	0	0	1	1	1	40	½
25	0	0	1	1	1 ¼	50	¾
32	0	0	1	1	1 ½	52	1
40	0	0	1	2	2	66	1 ¼
50	0	1	2	2	2 ¼	72	1 ½
63	0	1	2	2	3	86	2



Copper Union End with ABS Adapter Ring for 546 Ball Valve

- This set has to be used in combination with the 546 ball valve
- Copper union end for sweating
- Perfect transition from 546 ball valve to copper

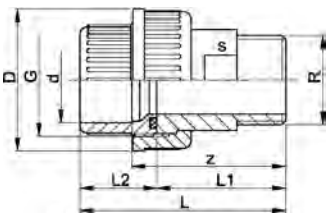
d (mm)	Part No.	SP	weight (kg)	d1 (inch)	d2 (mm)	d3 (mm)	d4 (mm)	L (mm)	L1 (mm)	L3 (mm)	Refrigeration size (inch)
25	**169 481 463**	1	0.082	⅜	27	20	44	22	6	3	⅞
32	**169 481 464**	1	0.115	1	34	26	53	26	8	3	1 ⅛
40	**169 481 465**	1	0.185	1 ¼	41	32	65	28	8	3	1 ⅜
50	**169 481 466**	1	0.225	1 ½	47	38	77	31	8	3	1 ⅝
63	**169 481 467**	1	0.410	2	61	51	99	37	9	3	2 ⅛



Adapter Union ABS Metric Socket x Stainless Steel Female NPT

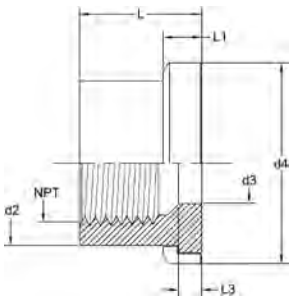
- Union End: stainless steel (304L) female NPT tread
- Union Bush: solvent cement socket ABS metric
- Union Nut: ABS
- Gasket: O-ring EPDM

NPT (inch)	PN (bar)	d (mm)	Part No.	SP	weight (lb)	z2 (inch)	s (inch)	L (inch)	L1 (inch)	D (inch)	z1 (inch)	G (inch)	L2 (inch)
¾	150	25	**729 541 007**	5	0.340	0	1 ¼	2	1	2	0	1 ¼	1
1	150	32	**729 541 008**	10	0.397	0	1 ½	2	1	2	0	1 ½	1
1 ¼	150	40	**150 541 009**	1	0.287					3			
1 ½	150	50	**150 541 010**	1	0.970					3			
2	150	63	**150 541 011**	1	1.521					4			



Adapter Union ABS Metric Socket x Stainless Steel Male NPT

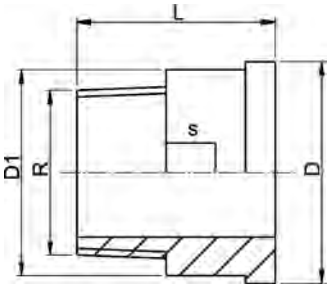
d (mm)	R (inch)	Part No.	SP	weight (kg)	z (mm)	D (mm)	L (mm)	L1 (mm)	L2 (mm)	G (inch)	s (mm)
20	½	**150 541 706**	1	0.126	44	43	60	34	26	1	24
25	¾	**150 541 707**	1	0.174	46	51	65	36	29	1 ¼	32
32	1	**150 541 708**	1	0.262	50	58	72	40	33	1 ½	37
40	¼	**150 541 709**	1	0.476	58	74	84	46	39	2	48
50	1 ½	**150 541 710**	1	0.535	62	83	93	48	46	2 ¼	54
63	2	**150 541 711**	1	0.861	73	100	111	55	58	2 ¾	69



Union End Stainless Steel Female NPT with Adapter Ring for 546 Ball Valve

- This set has to be used in combination with the 546 ball valve
- Stainless Steel (304L) union end with NPT thread
- Perfect transition from 546 ball valve to NPT

NPT (inch)	d (mm)	Part No.	SP	weight (kg)	d2 (mm)	d3 (mm)	d4 (mm)	L (mm)	L1 (mm)	L3 (mm)	Refrigeration size (inch)
¾	25	**150 481 025**	1	0.110	36.07	21.08	43.94	25.91	6.09	5.08	⅞
1	32	**150 481 032**	1	0.145	40.89	25.91	53.09	28.97	7.87	6.09	1 ⅛
1 ¼	40	**150 481 040**	1	0.270	52.80	32.70	56.40	30.50	6.50	5.50	1 ⅜
1 ⅝	50	**150 481 050**	1	0.330	58.00	40.10	62.20	34.20	7.10	5.90	1 ½
2	63	**150 481 063**	1	0.510	73.30	53.80	78.30	33.50	8.20	7.20	2



Union End Stainless Steel Male NPT with Adapter Ring for 546 Ball Valve

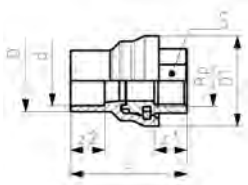
- This set has to be used in combination with the 546 ball valve
- Stainless Steel (304L) union end with NPT thread
- Perfect transition from 546 ball valve to NPT

d (mm)	R (inch)	Part No.	SP	weight (kg)	D (mm)	D1 (mm)	L (mm)
25	¾	**150 481 725**	1	0.170	38.8	36.0	40.50
32	1	**150 481 732**	1	0.241	44.7	41.5	45.00
40	1 ¼	**150 481 740**	1	0.427	56.5	53.0	51.50
50	1 ½	**150 481 750**	1	0.504	62.6	59.0	53.50
63	2	**150 481 763**	1	0.826	78.4	74.0	57.50

Transition Male Adaptor ABS Socket/SS NPT

- With solvent cement spigot/socket metric and male thread NPT
- Gasket: O-ring EPDM
- For transition from ABS to stainless steel

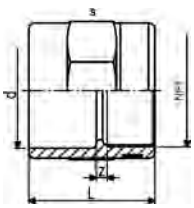
d (mm)	D (mm)	NPT (inch)	PN (bar)	Part No.	SP	weight (lb)	z2 (inch)	lbs	z1 (inch)	L (inch)	S (mm)
20	25	½	150	**729 942 606**	10	0.262	1	0	1	3	25
25	32	¾	150	**729 942 607**	5	0.461	1	1	1	3	30
32	40	1	150	**729 942 608**	5	0.703	1	1	1	4	36



Transition Female Adaptor ABS Socket/SS NPT

- With solvent cement spigot/socket metric and female thread NPT
- Gasket: O-ring EPDM
- For transition from ABS to stainless steel

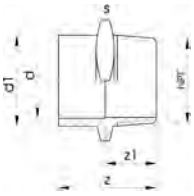
d (mm)	D (mm)	NPT (inch)	PN (bar)	Part No.	SP	weight (lb)	lbs	z1 (inch)	z2 (inch)	L (inch)	S (mm)
20	25	½	150	**729 942 106**	10	0.207	0	1	1	2	25
25	32	¾	150	**729 942 107**	5	0.362	0	1	1	3	30
32	40	1	150	**729 942 108**	5	0.553	1	1	1	3	36



Female Adapter socket ABS metric x FNPT thread

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

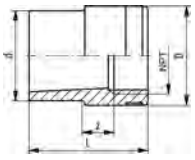
PN (bar)	d (mm)	NPT (inch)	Part No.	SP	weight (kg)	s (inch)	z (inch)	L (inch)	closest inch (inch)
150	20	½	**729 914 206**	0	0.001	1	0	1	½
150	25	¾	**729 914 207**	10	0.026	1	0	2	¾
150	32	1	**729 914 208**	0	0.040	2	0	2	1
150	40	1 ¼	**729 914 209**	0	0.060	2	0	2	1 ¼
150	50	1 ½	**729 914 210**	10	0.400	3	0	2	1 ½
150	63	2	**729 914 211**	0	0.160	3	0	3	2



Adaptor spigot, male nipple ABS metric x MNPT thread

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

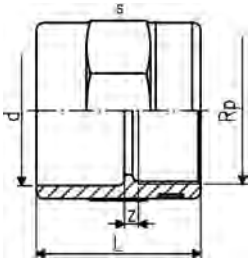
PN (bar)	d (mm)	NPT (inch)	d1 (mm)	Part No.	weight (kg)	z1 (inch)	closest inch (inch)	z (inch)	s (inch)
150	16	½	20	**729 914 556**	0.001	1	½	2	1
150	20	¾	25	**729 914 557**	0.040	1	¾	2	1
150	25	1	32	**729 914 558**	0.020	1	1	2	2
150	32	1 ¼	40	**729 914 559**	0.050	2	1 ¼	2	2
150	40	1 ½	50	**729 914 560**	0.082	2	1 ½	3	3
150	50	2	63	**729 914 561**	0.120	2	2	3	3



Reducing Adapter Bushing, spigot ABS metric x FNPT thread

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

PN (bar)	NPT (inch)	d (mm)	Part No.	SP	weight (kg)	z (inch)	D (inch)	L (inch)	closest inch (inch)
150	⅜	20	**729 914 434**	0	0.001	1	1	1	½
150	½	25	**729 914 437**	0	0.001	1	1	2	¾
150	¾	32	**729 914 441**	10	0.027	1	1	2	1
150	1	40	**729 914 446**	10	0.050	2	2	2	1 ¼
150	1 ¼	50	**729 914 452**	10	0.080	2	2	3	1 ½
150	1 ½	63	**729 914 458**	5	0.128	2	2	3	2

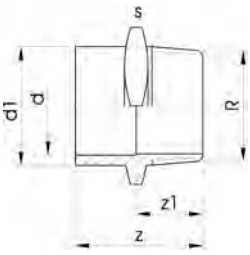


Female Adapter ABS metric Rp

Model:

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

d (mm)	Rp (inch)	PN (bar)	Part No.	SP	weight (lb)	closest inch (inch)	z (mm)	L (mm)	s (mm)
20	½	10	**729 910 206**	10	0.044	½	4	35	32
25	¾	10	**729 910 207**	10	0.055	¾	3	40	36
32	1	10	**729 910 208**	10	0.099	1	3	45	46
40	1 ¼	10	**729 910 209**	10	0.148	1 ¼	5	51	55
50	1 ½	10	**729 910 210**	10	0.218	1 ½	7	59	65
63	2	10	**729 910 211**	5	0.368	2	7	69	80

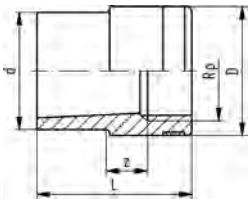


Adaptor Socket Nipple, ABS metric - R BSP

Model:

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

PN (bar)	d (mm)	R (inch)	d1 (mm)	Part No.	SP	weight (kg)	closest inch (inch)	z (mm)	z1 (mm)	s (mm)
10	16	½	20	**729 910 556**	10	0.012	⅜	42	28	32
10	20	¾	25	**729 910 557**	10	0.017	½	47	31	36
10	25	1	32	**729 910 558**	10	0.030	¾	54	35	46
10	32	1 ¼	40	**729 910 559**	10	0.046	1	60	38	55
10	40	1 ½	50	**729 910 560**	10	0.072	1 ¼	66	40	65
10	50	2	63	**729 910 561**	5	0.125	1 ½	78	47	80

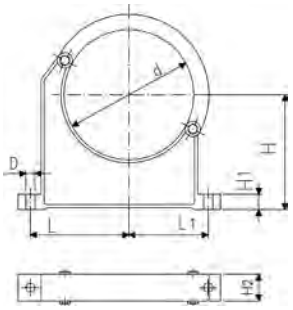


Reducing Bush, ABS metric - Rp BSP

Model:

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

d (mm)	Rp (inch)	PN (bar)	Part No.	SP	weight (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

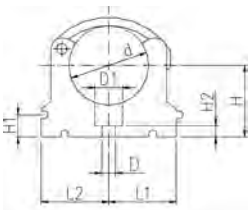


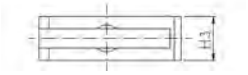
Pipe Clips Type 060, PP metric

Model:

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

d (mm)	Part No.	SP	weight (lb)	D (mm)	L (mm)	L1 (mm)	H (mm)	H1 (mm)	H2 (mm)	SC	closest inch (inch)
90	**167 060 038**	10	0.317	9	89	71	105	15	33	M8	3
110	**167 060 039**	10	0.348	9	94	80	115	15	33	M8	4
125	**167 060 040**	10	0.549	11	116	91	130	20	35	M10	
140	**167 060 041**	10	0.573	11	121	98	130	20	35	M10	5
160	**167 060 042**	10	0.653	11	131	107	148	20	35	M10	6
180	**167 060 043**	10	0.721	11	143	115	163	20	35	M10	7
200	**167 060 019**	5	1.188	13	152	120	175	25	39	M12	8
225	**167 060 020**	5	0.392	13	165	132	175	25	39	M12	8
250	**167 060 021**	5	1.448	13	183	143	200	25	39	M12	9
280	**167 060 022**	5	0.467	13	198	156	200	25	39	M12	10
315	**167 060 023**	5	1.775	13	219	172	225	25	39	M12	12
355	**167 060 024**	5	2.758	17	275	209	258	30	50	M16	14
400	**167 060 025**	4	2.273	17	300	228	288	30	50	M16	16





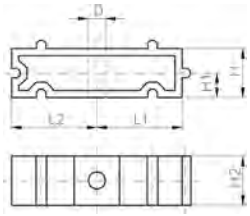
Pipe Bracket Type 061, PP metric

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)	Part No.	SP	weight (lb)
*	10	**167 061 003**	10	0.007
*	12	**167 061 004**	10	0.007
*	16	**167 061 035**	10	0.015
*	20	**167 061 036**	10	0.015
*	25	**167 061 037**	10	0.020
*	32	**167 061 038**	10	0.026
	40	**167 061 039**	10	0.060
	50	**167 061 040**	10	0.068
	63	**167 061 041**	10	0.115
	75	**167 061 012**	10	0.126
	90	**167 061 013**	10	0.203
	110	**167 061 014**	10	0.258
	125	**167 061 015**	10	0.397
	140	**167 061 016**	10	0.494
	160	**167 061 017**	10	0.534

	d (mm)	D (mm)	D1 (mm)	H (mm)	H1 (mm)	H2 (mm)	H3 (mm)	L1 (mm)	L2 (mm)	SC	closest inch (inch)
*	10	5	8	20	10	6	12	11	14	M4	⅛
*	12	5	8	21	10	6	12	11	14	M5	¼
*	16	6	11	27	10	6	16	14	17	M5	⅜
*	20	6	11	27	10	6	16	17	19	M5	½
*	25	6	11	30	10	6	16	19	22	M5	¾
*	32	6	11	36	10	6	16	24	27	M5	1
	40	7	14	44	10	7	22	34	34	M6	1 ¼
	50	7	14	51	10	7	22	37	37	M6	1 ½
	63	9	17	64	10	10	25	45	45	M8	2
	75	9	17	58	10	10	25	52	52	M8	2 ½
	90	9	17	65	10	10	28	65	65	M8	3
	110	9	17	75	10	10	28	79	79	M8	4
	125	9	17	90	10	10	32	88	88	M8	
	140	9	17	110	10	10	32	98	98	M8	5
	160	9	17	108	10	10	32	109	109	M8	6

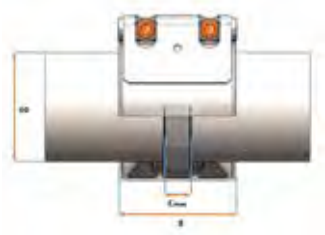


Spacer Type 061, PP

Model:

- For pipe clips Type 061/061H, PP black, UV resistant
- **Minimum order quantity: standard packagings SP**

d (mm)	Inch (inch)	Part No.	SP	weight (kg)	D (mm)	L1 (mm)	L2 (mm)	H (mm)	H1 (mm)	H2 (mm)	SC
10 - 12	⅛ - ¼	**167 061 153**	10	0.003	5	11	14	20	10	12	M4
16	⅜	**167 061 155**	10	0.005	6	14	17	20	10	16	M4
20	½	**167 061 156**	10	0.005	6	17	19	20	10	16	M4
25	¾	**167 061 157**	10	0.007	6	19	22	20	10	16	M4
32	1	**167 061 158**	10	0.006	6	24	27	20	10	16	M4
40	1 ¼	**167 061 159**	1	0.015	7	34	34	20	10	22	M4
50	1 ½	**167 061 160**	10	0.017	7	37	37	20	10	22	M4
63	2	**167 061 161**	10	0.020	9	45	45	20	10	25	M4
75	2 ½	**167 061 162**	10	0.027	9	52	52	20	10	25	M4
90	3	**167 061 163**	10	0.039	9	65	65	20	10	28	M4
110	4	**167 061 164**	10	0.048	9	79	79	20	10	28	M4
125	4 ½	**167 061 165**	10	0.059	9	88	88	20	10	32	M4
140	5	**167 061 166**	10	0.065	9	98	98	20	10	32	M4
160	6	**167 061 167**	10	0.071	9	109	109	20	10	32	M4



UNI-Plastgrip L PN10

Model:

- Housing, Bars and Strip insert (option): Stainless Steel W5 (1.4571) Quality

Temperature/Pressure:

- Operating Temperature EPDM: -22° F to 257° F

Remark:

- **For safe installation on PE/PP/PB pipes use insert stiffeners**

OD nominal (mm) (mm)	EPDM Part No.	SP	weight (kg)
40	**779 732 006**	0	0.4
50	**779 732 008**	0	0.5
63	**779 732 010**	0	0.6
75	**779 732 012**	0	1.4
90	**779 732 014**	0	1.5
110	**779 732 016**	0	1.7
125	**779 732 018**	0	1.8
140	**779 732 020**	0	3.5
160	**779 732 022**	0	3.7

OD nominal (mm) (mm)	M	PN (bar)	WP (bar)	C max. (mm)	OD min (mm)	OD max. (mm)	d (mm)	Torque (N/m)	B (mm)	H (mm)
40	M8	10	16	15	39.0	43.0	66	25	60	104
50	M8	10	16	15	47.5	52.5	74	25	60	112
63	M8	10	16	25	58.0	64.0	85	25	75	125
75	M10	10	16	30	72.0	80.0	108	40	95	164
90	M10	10	16	30	88.0	96.0	124	40	95	170
110	M10	10	16	30	104.0	112.0	141	40	95	187
125	M10	10	16	30	122.0	130.0	158	40	95	202
140	M12	10	16	40	137.0	145.0	186	65	110	238
160	M12	10	16	40	157.0	165.0	205	65	110	255

Tools and Solvent Cement

COOL-FIT Cleaner

- 1 Quart, (32 Fl. Oz U.S.), (946mL)

Part No.	weight (lb)
150 298 102	2.189

COOL-FIT Cement

- 1 Quart, (32 Fl. Oz U.S.), (946mL)

Part No.	weight (lb)
150 298 101	2.438

Round brush

d-d (mm)	Standard	Part No.	SP	weight (kg)	closest inch (inch)
6 - 10	4 mm (for Fittings 6-10mm)	**799 299 001**	12	0.004	⅛
12 - 32	8 mm (for Fittings 12-32mm)	**799 299 002**	12	0.006	¼ - 1

Flat brush

d-d (mm)	Standard	Part No.	SP	weight (kg)	closest inch (inch)
40 - 63	25x3 mm (for Fittings 40-63mm)	**799 299 003**	12	0.015	1 ¼ - 2
75 - 225	50x5 mm (for Fittings 75-225mm)	**799 299 004**	12	0.035	2 ½ - 8
250 - 400	75x6 mm (for Fittings 250-400mm)	**799 299 005**	12	0.053	9 - 16

Two-Component Adhesive/Sealer

- The Starter Kit includes two cartridges, one dispensing gun, and six mixing tips.

Description	Part No.	SP	weight (kg)
Starter Kit	**150 845 001**	1	0.825
Adhesive 43mL	**150 845 002**	1	0.080
Mixing Tip	**150 845 003**	1	0.001
Dispensing Gun	**150 845 004**	1	0.235

Chamfering tools

- Chamfering tool with 15° bevel for plastic pipes (PVC, ABS, PP, PB, PE). Coated prism surface suitable for clean room applications. Fast and reliable adjustment to different pipe diameters and wall thickness.

Part No.	weight (lb)	d-d (mm)
790 309 003	2.258	16 - 200
790 309 004	5.617	63 - 400

Spare blade for chamfering tool

d-d (mm)	Description	Part No.	SP	weight (kg)
16 - 400	Spare blade	**790 309 015**	0	0.010
16 - 400	Counter blade	**790 309 016**	1	0.012

PPC Plastic pipe cutter

- For cutting plastic pipes d10 - d160

Article	d-d (mm)	Part No.	SP	weight (lb)	closest inch (inch)
PPC 63, s max. = 7.2 mm	10 - 63	**790 109 001**	1	1.907	⅛ - 2
PPC 110, s max. = 12.7 mm	50 - 110	**790 109 002**	1	3.580	1 ½ - 4
PPC 160, s max. = 19.0 mm	110 - 160	**790 109 003**	1	4.877	4 - 6

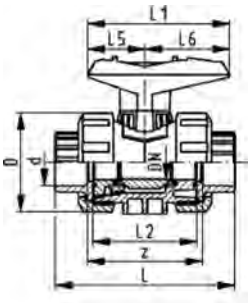
Replacement cutting wheels

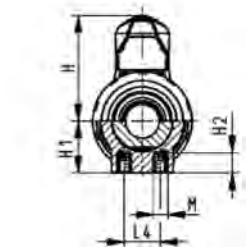
- **for plastic pipe cutter**

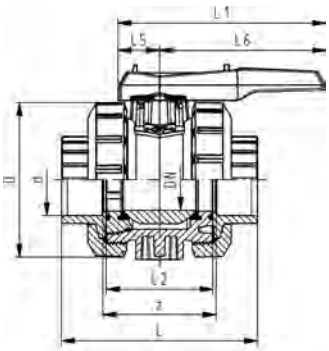
d-d (mm)	Article	Part No.	SP	weight (kg)
10 - 63	SR 63 max. s = 7.2 mm	**790 109 011**	1	0.004
50 - 110	SR 110/160 max. s = 12.7 mm	**790 109 012**	1	0.015
110 - 160	SR 160 max. s = 19.0 mm	**790 109 013**	1	0.023

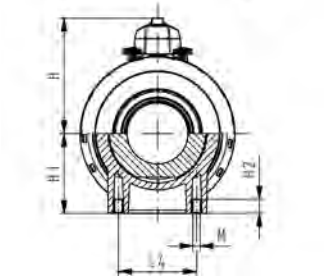
Manual Valves ABS

Ball Valves









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

Model:

- Designed For easy installation and removal
- Ball seats PTFE
- Integrated stainless steel mounting inserts

Option:

- Contact customer services for customization
- Multifunctional module with integrated limit switches
- Pneumatic or electric actuators from GF

d (mm)	PN (bar)	EPDM Part No.	SP	weight (lb)
16	10	**169 546 061**	1	0.247
20	10	**169 546 062**	1	0.251
25	10	**169 546 063**	1	0.414
32	10	**169 546 064**	1	0.600
40	10	**169 546 065**	1	1.060
50	10	**169 546 066**	1	1.448
63	10	**169 546 067**	1	2.646
75	10	**169 546 068**	1	7.635
90	10	**169 546 069**	1	12.566
110	10	**169 546 070**	1	15.399

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 (inch)
16	50	57	27	12	92	77	56	25	32	45	M6	64	⅜
20	50	57	27	12	95	77	56	25	32	45	M6	64	½
25	58	67	30	12	110	97	65	25	39	58	M6	72	¾
32	68	73	36	12	123	97	71	25	39	58	M6	79	1
40	84	90	44	15	146	128	85	45	54	74		94	1 ¼
50	97	97	51	15	157	128	89	45	54	74	M8	95	1 ½
63	124	116	64	15	183	152	101	45	66	87		107	2
75	166	149	85	15	233	270	136	70	64	206		144	2 ½
90	200	161	105	15	254	270	141	70	64	206		151	3
110	238	178	123	22	301	320	164	120	64	256	M12	174	4

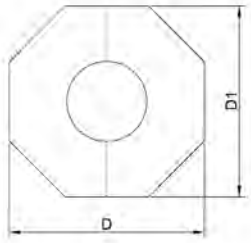
546 Ball Valve Insulation Kit

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

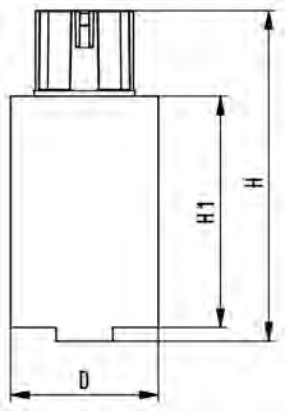
	d (mm)	Part No.	SP	weight (lb)	L (mm)	D (mm)	closest inch (inch)	D1 (mm)
	25	**738 990 138**	1	0.220	108	89	¾	87
	32	**738 990 139**	1	0.220	121	96	1	94
	40	**738 990 140**	1	0.220	143	110	1 ¼	110
	50	**738 990 141**	1	0.220	156	122	1 ½	120
	63	**738 990 142**	1	0.220	181	150	2	147
*	75	**738 990 143**	1	0.220	235	190	2 ½	185
*	90	**738 990 144**	1	0.220	255	226	3	221
*	110	**738 990 145**	1	2.425	300	268	4	262



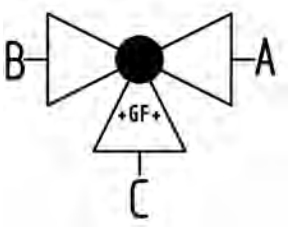
Handle extension for Ball valve type 546, 75-110mm

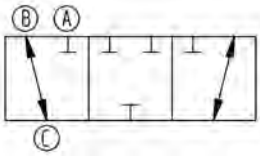
Model:

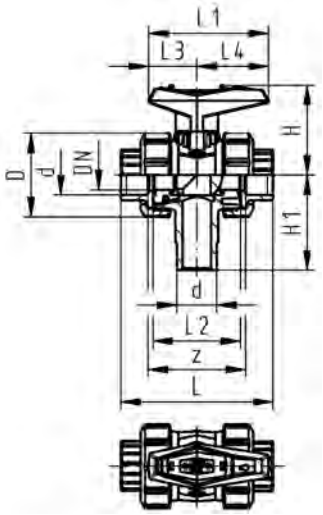
- Height Variable
- Multiple use in succession possible.



d-d (mm)	Part No.	SP	weight (lb)	H (mm)	D (mm)	H1 (mm)
75 - 90	**161 490 920**	1	0.712	143	58	100
- - 110	**161 490 921**	1	0.911	143	64	100







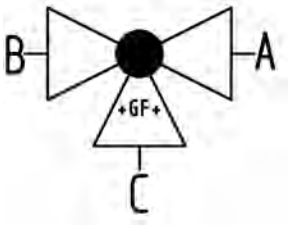
3-way Ball valve type 543 ABS Vertical/L-port with solvent cement sockets metric

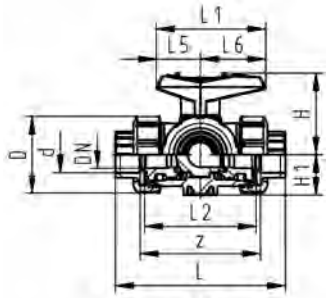
Model:

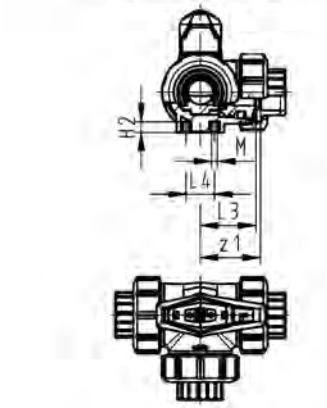
- Vertical inlet solvent cement spigot metric
- Easy installation and removal using union on third outlet
- Ball seats PTFE
- Angle of operation 360° without turn limiter
- Delivery status B-C opened, see flow scheme

d (mm)	PN (bar)	EPDM Part No.	SP	weight (lb)
16	10	**169 543 401**	1	0.273
20	10	**169 543 402**	1	0.271
25	10	**169 543 403**	1	0.428
32	10	**169 543 404**	1	0.626
40	10	**169 543 405**	1	1.047
50	10	**169 543 406**	1	1.490
63	10	**169 543 407**	1	2.721

d (mm)	D (mm)	H (mm)	H1 (mm)	L (mm)	L1 (mm)	L2 (mm)	L3 (mm)	L4 (mm)	z (mm)	closest inch (inch)
16	50	57	62	92	77	56	32	45	64	⅜
20	50	57	62	95	77	56	32	45	64	½
25	58	67	72	111	97	66	39	58	74	¾
32	68	73	77	123	97	71	39	58	79	1
40	84	90	87	146	128	85	54	74	95	1 ¼
50	97	97	97	157	128	89	54	74	95	1 ½
63	124	116	112	183	152	101	66	87	107	2







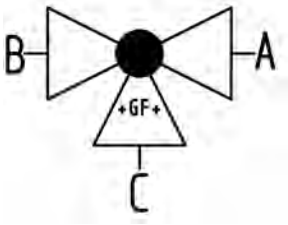
3-way Ball valve type 543 ABS Horizontal/L-port with solvent cement sockets metric

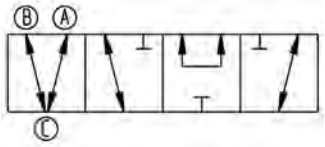
Model:

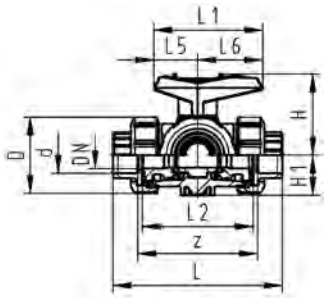
- For easy installation and removal (valve end and union nut are compatible with type 546)
- Ball seats PTFE
- Angle of operation 360° without turn limiter
- Turn limiter 90° enclosed, in different positions usable as a clip-on ring
- Integrated stainless steel mounting inserts
- Delivery status A-C opened, see flow scheme

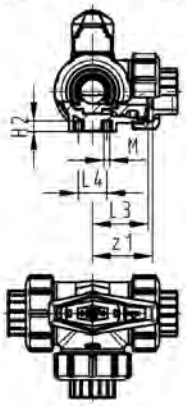
d (mm)	PN (bar)	EPDM Part No.	SP	weight (lb)
16	10	**169 543 001**	1	0.412
20	10	**169 543 002**	1	0.384
25	10	**169 543 003**	1	0.608
32	10	**169 543 004**	1	0.888
40	10	**169 543 005**	1	1.559
50	10	**169 543 006**	1	2.335
63	10	**169 543 007**	1	4.546

d (mm)	D (mm)	H (mm)	H1 (mm)	H2 (mm)	L (mm)	L1 (mm)	L2 (mm)	L3 (mm)	L4 (mm)	L5 (mm)	L6 (mm)	M	z (mm)	z1 (mm)	closest inch (inch)
16	50	57	28	8	109	77	73	36	25	32	45	6	81	40	⅜
20	50	57	28	8	112	77	73	36	25	32	45	6	81	40	½
25	58	67	32	8	131	97	86	43	25	39	58	6	94	47	¾
32	68	73	36	8	151	97	99	50	25	39	58	6	107	54	1
40	84	90	45	9	181	128	120	60	45	54	74	8	130	65	1 ¼
50	97	97	51	9	205	128	137	69	45	54	74	8	143	72	1 ½
63	124	116	65	9	261	152	179	89	45	66	87	8	185	92	2









3-way Ball valve type 543 ABS Horizontal/T-port with solvent cement sockets metric

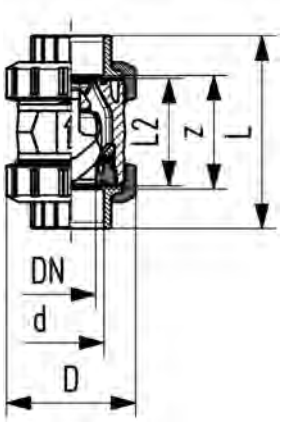
Model:

- For easy installation and removal (valve end and union nut are compatible with type 546)
- Ball seats PTFE
- Angle of operation 360° without turn limiter
- Turn limiter 90° enclosed, in different positions usable as a clip-on ring
- Integrated stainless steel mounting inserts
- Delivery status A-B-C opened, see flow scheme

d (mm)	PN (bar)	EPDM Part No.	SP	weight (lb)
16	10	**169 543 201**	1	0.410
20	10	**169 543 202**	1	0.392
25	10	**169 543 203**	1	0.580
32	10	**169 543 204**	1	0.888
40	10	**169 543 205**	1	1.541
50	10	**169 543 206**	1	2.306
63	10	**169 543 207**	1	4.475

d (mm)	D (mm)	H (mm)	H1 (mm)	H2 (mm)	L (mm)	L1 (mm)	L2 (mm)	L3 (mm)	L4 (mm)	L5 (mm)	L6 (mm)	M	z (mm)	z1 (mm)	closest inch (inch)
16	50	57	28	8	109	77	73	36	25	32	45	6	81	40	⅜
20	50	57	28	8	112	77	73	36	25	32	45	6	81	40	½
25	58	67	32	8	131	97	86	43	25	39	58	6	94	47	¾
32	68	73	36	8	151	97	99	50	25	39	58	6	107	54	1
40	84	90	45	9	181	128	120	60	45	54	74	8	130	65	1 ¼
50	97	97	51	9	205	128	137	69	45	54	74	8	143	72	1 ½
63	124	116	65	9	261	152	179	89	45	66	87	8	185	92	2

Check Valves

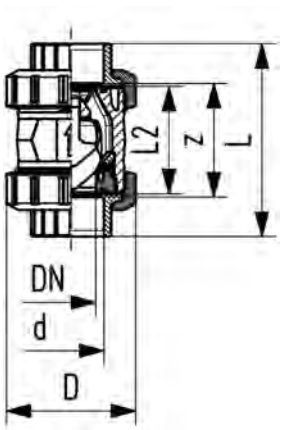


Check valve type 561 ABS with solvent cement sockets metric

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
- New DN65-DN100

d (mm)	PN (bar)	EPDM Part No.	SP	weight (lb)	D (mm)	L (mm)	L2 (mm)	z (mm)	closest inch (inch)
16	10	**169 561 001**	1	0.198	50	92	56	64	⅜
20	10	**169 561 002**	1	0.198	50	95	56	64	½
25	10	**169 561 003**	1	0.419	58	110	65	72	¾
32	10	**169 561 004**	1	0.485	68	123	71	79	1
40	10	**169 561 005**	1	0.838	84	146	85	94	1 ¼
50	10	**169 561 006**	1	1.235	97	157	89	95	1 ½
63	10	**169 561 007**	1	2.183	124	183	101	107	2
75	10	**169 561 008**	1	5.335	166	233	136	144	2 ½
90	10	**169 561 009**	1	8.532	200	254	141	151	3
110	10	**169 561 010**	1	13.757	238	301	164	174	4

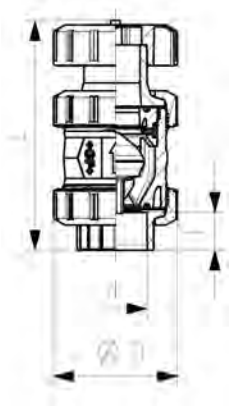


Check valve type 562 ABS with solvent cement sockets metric

Model:

- For horizontal or vertical installation
- Spring loaded, spring made of stainless steel (1.4310)
- Spring available in other materials
- Designed for easy installation and removal
- Vibration free even at high flow velocity
- Flow-optimized return cone, double guided
- Compact installation length, same as ball valve type 546
- Z-length, end connectors and union nuts **not** compatible with type 360
- New DN65-DN100

d (mm)	PN (bar)	EPDM Part No.	SP	weight (lb)	D (mm)	L (mm)	L2 (mm)	z (mm)	closest inch (inch)
16	10	**169 562 001**	1	0.198	50	92	56	64	⅜
20	10	**169 562 002**	1	0.198	50	95	56	64	½
25	10	**169 562 003**	1	0.419	58	110	65	72	¾
32	10	**169 562 004**	1	0.485	68	123	71	79	1
40	10	**169 562 005**	1	0.838	84	146	85	94	1 ¼
50	10	**169 562 006**	1	1.235	97	157	89	95	1 ½
63	10	**169 562 007**	1	2.183	124	183	101	107	2
75	10	**169 562 008**	1	5.335	166	233	136	144	2 ½
90	10	**169 562 009**	1	8.532	200	254	141	151	3
110	10	**169 562 010**	1	13.757	238	301	164	174	4

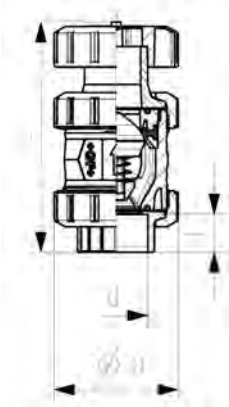


Ventilating and bleed valve type 591 ABS with solvent cement sockets metric

Model:

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

d (mm)	PN (bar)	EPDM Part No.	SP	weight (lb)	D (mm)	L (mm)	t (mm)	closest inch (inch)
16	10	**169 591 001**	1	0.236	50	126	14	⅜
20	10	**169 591 002**	1	0.236	50	127	16	½
25	10	**169 591 003**	1	0.470	58	142	18	¾
32	10	**169 591 004**	1	0.560	68	155	22	1
40	10	**169 591 005**	1	0.952	84	177	26	1 ¼
50	10	**169 591 006**	1	1.387	97	195	31	1 ½
63	10	**169 591 007**	1	2.416	124	227	38	2
75	10	**169 591 008**	1	5.335	166	256	45	2 ½
90	10	**169 591 009**	1	8.532	200	275	52	3
110	10	**169 591 010**	1	13.757	238	318	64	4



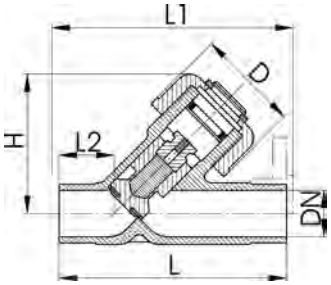
Ventilating and bleed valve type 595 ABS with solvent cement sockets metric

Model:

- With protection cap up to DN50 made from PP-GF, DN65-100 made from POM
- Spring loaded, spring made of stainless steel (1.4310)
- Spring available in other materials
- Designed for easy installation and removal
- Compact installation length

d (mm)	PN (bar)	EPDM Part No.	SP	weight (lb)	D (mm)	L (mm)	t (mm)	closest inch (inch)
16	10	**169 595 001**	1	0.236	50	126	14	⅜
20	10	**169 595 002**	1	0.236	50	127	16	½
25	10	**169 595 003**	1	0.470	58	142	18	¾
32	10	**169 595 004**	1	0.560	68	155	22	1
40	10	**169 595 005**	1	0.952	84	177	26	1 ¼
50	10	**169 595 006**	1	1.387	97	195	31	1 ½
63	10	**169 595 007**	1	2.416	124	227	38	2
75	10	**169 595 008**	1	5.335	166	256	45	2 ½
90	10	**169 595 009**	1	8.532	200	275	52	3
110	10	**169 595 010**	1	13.757	238	318	64	4

Y-Strainer and Check

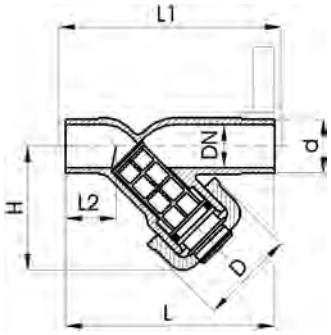


Angle seat Check valve type 303 ABS with solvent cement sockets metric

Model:

- For horizontal or vertical installation

d (mm)	PN (bar)	EPDM Part No.	SP	weight (lb)	D (mm)	H (mm)	L (mm)	L1 (mm)	L2 (mm)	closest inch (inch)
20	10	**169 303 006**	1	0.203	43	65	124	130	28	½
25	10	**169 303 007**	1	0.293	47	75	144	150	37	¾
32	10	**169 303 008**	1	0.483	56	90	154	160	37	1
40	10	**169 303 009**	1	0.767	64	102	174	180	44	1 ¼
50	10	**169 303 010**	1	1.356	82	123	194	200	48	1 ½
63	10	**169 303 011**	1	2.335	95	144	224	230	60	2



Line strainer type 305 ABS
With solvent cement spigots metric

Model:

- Protects valves, pumps, etc. from becoming damaged
- Easy dismantling to clean or replace the screen
- Stainless steel screen sold separately

d (mm)	PN (bar)	EPDM Part No.	SP	weight (lb)	D (mm)	H (mm)	L (mm)	L1 (mm)	L2 (mm)	closest inch (inch)
20	10	**169 305 302**	1	0.179	48	65	124	130	28	½
25	10	**169 305 303**	1	0.265	54	76	144	150	37	¾
32	10	**169 305 304**	1	0.397	62	90	154	160	37	1
40	10	**169 305 305**	1	0.626	71	104	174	180	44	1 ¼
50	10	**169 305 306**	1	1.067	88	124	194	200	48	1 ½
63	10	**169 305 307**	1	1.720	103	148	224	230	60	2

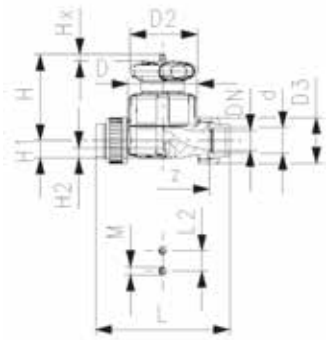
Stainless Steel Screen for Type 306
30 mesh, 1/64" hole

Model:

- Stainless Steel A4 Quality (AISI 316)
- For line strainers Type 306

d (mm)	Part No.	D (mm)	L (mm)	closest inch (inch)
20	**161 486 100**	14	39	½
25	**161 486 101**	18	48	¾
32	**161 486 102**	24	60	1
40	**161 486 103**	30	71	1 ¼
50	**161 486 104**	38	87	1 ½
63	**161 486 105**	48	106	2
75	**161 486 106**	61	100	2 ½
90	**161 486 107**	73	118	3

Diaphragm Valves



Diaphragm valve type 514 ABS
With solvent cement sockets metric

Model:

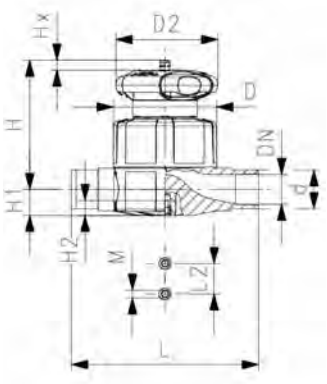
- Double flow rate compared to predecessor
- One housing nut replaces four screws
- Handwheel with built-in locking mechanism
- Designed For easy installation and removal
- Short overall length

Option:

- Self adjusting multifunctional module with integrated limit switches

d (mm)	DN (mm)	PN (bar)	EPDM Part No.	SP	weight (kg)	PTFE/EPDM Part No.	SP	weight (lb)
20	15	10	**169 514 012**	1	0.355	**169 514 032**	1	0.805
25	20	10	**169 514 013**	1	0.365	**169 514 033**	1	1.056
32	25	10	**169 514 014**	1	1.061	**169 514 034**	1	2.383
40	32	10	**169 514 015**	1	1.338	**169 514 035**	1	2.992
50	40	10	**169 514 016**	1	1.408	**169 514 036**	1	5.234
63	50	10	**169 514 017**	1	2.230	**169 514 037**	1	6.859

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



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

Option:

- Self adjusting multifunctional module with integrated limit switches

d (mm)	DN (mm)	PN (bar)	EPDM Part No.	SP	weight (kg)	PTFE/EPDM Part No.	SP	weight (lb)
20	15	10	**169 515 012**	1	0.308	**169 515 032**	1	0.701
25	20	10	**169 515 013**	1	0.400	**169 515 033**	1	0.908
32	25	10	**169 515 014**	1	0.509	**169 515 034**	1	2.187
40	32	10	**169 515 015**	1	1.143	**169 515 035**	1	2.566
50	40	10	**169 515 016**	1	2.112	**169 515 036**	1	4.720
63	50	10	**169 515 017**	1	1.805	**169 515 037**	1	6.010

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

Diaphragm valve type 317 ABS
With flanges

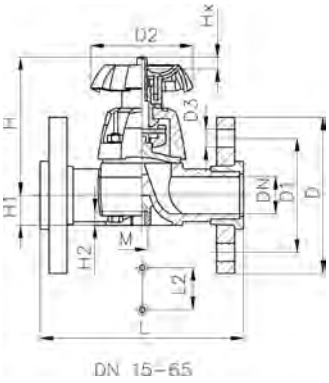
Model:

- Flat sealing faces
- DN 80-150 withfixed flange
- Operating temperature as low -22°F

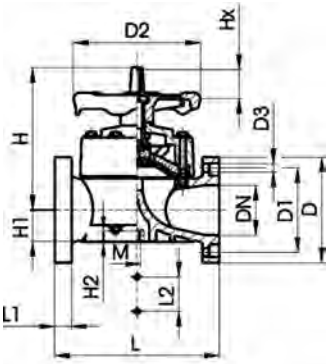
*** 3# and 6# fixed flanges metric and inch ANSI B16.5**

	d (mm)	DN (mm)	PN (bar)	EPDM Part No.	weight (lb)	PTFE/EPDM Part No.
	75	65	10	**169 317 423**	10.430	**169 317 038**
*	90	80	10	**169 317 024**	18.409	**169 317 039**
	110	100	10	**169 317 025**	25.726	**169 317 040**

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

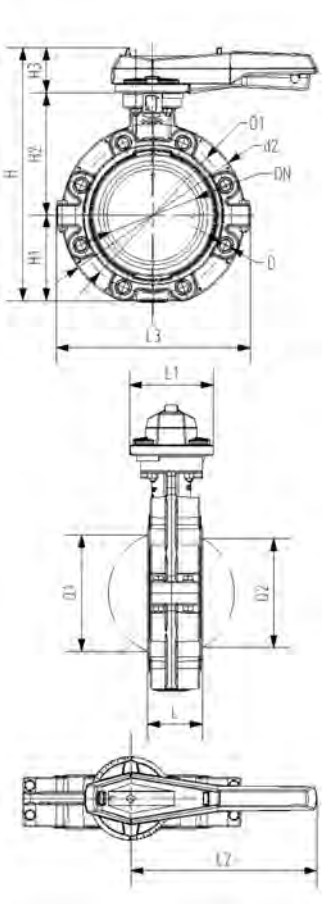


DN 15–65



DN 80-100

Butterfly Valves



Lugstyle butterfly valve type 578 ABS
Hand lever with ratchet settings

Model:

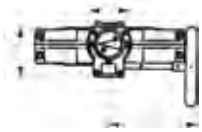
- Housing material: PP-GF30 with 316SS lug inserts
- Connecting dimension: ANSI/ASME B 16.5 class 150, ASTM D 4024, BS 1560, BS EN 1759

Option:

- Optional accessory: Integrated position feedback with limit switches (sold separately)

d (mm)	Size (inch)	DN (mm)	PN (bar)	EPDM Part No.	SP	weight (lb)
63	2	50	10	**169 578 102**	1	3.968
75	2 ½	65	10	**169 578 103**	1	4.178
90	3	80	10	**169 578 104**	1	4.963
110	4	100	10	**169 578 105**	1	6.936
140	5	125	10	**169 578 106**	1	10.274
160	6	150	10	**169 578 107**	1	14.176
225	8	200	10	**169 578 108**	1	19.015
280	10	250	10	**169 578 109**	1	43.052
315	12	300	10	**169 578 110**	1	57.554

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)
160	UNC 5/8	120.6	265	77	134	54	45	106	205	165	40	
180	UNC 5/8	139.7	277	83	140	54	46	106	205	182	54	35
195	UNC 5/8	152.4	289	89	146	54	49	106	205	210	67	50
226	UNC 5/8	190.5	328	106	167	55	56	106	255	240	88	74
258	UNC 3/4	215.9	357	121	181	55	64	106	255	272	113	97
284	UNC 3/4	241.3	377	133	189	55	72	106	255	300	139	123
341	UNC 3/4	298.4	436	159	210	67	73	140	408	360	178	169
412	UNC 7/8	362.0	536	205	264	67	113	140	408	440	210	207
482	UNC 7/8	431.8	586	234	285	67	113	140	408	510	256	253



Lugstyle butterfly valve type 578 ABS
Reduction gear with handwheel

Model:

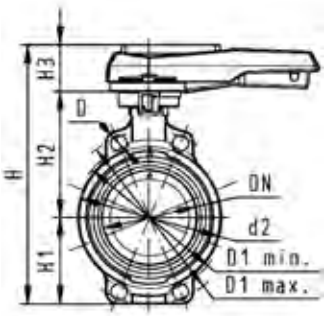
- Housing material: PP-GF30 with 316SS lug inserts
- Connecting dimension: ANSI/ASME B 16.5 class 150, ASTM D 4024, BS 1560, BS EN 1759

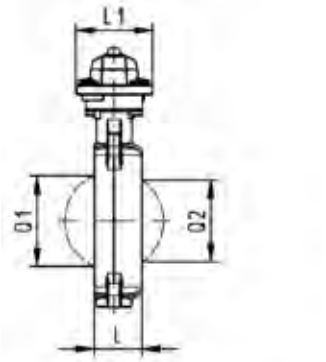
Option:

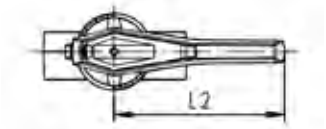
- Optional accessory: Integrated position feedback with limit switches (sold separately)

d (mm)	Size (inch)	DN (mm)	PN (bar)	EPDM Part No.	SP	weight (lb)
63	2	50	10	**169 578 122**	1	7.643
75	2 ½	65	10	**169 578 123**	1	7.959
90	3	80	10	**169 578 124**	1	8.662
110	4	100	10	**169 578 125**	1	10.657
140	5	125	10	**169 578 126**	1	13.995
160	6	150	10	**169 578 127**	1	17.877
225	8	200	10	**169 578 128**	1	20.620
280	10	250	10	**169 578 129**	1	43.052
315	12	300	10	**169 578 130**	1	57.554

d2 (mm)	D	D1 (mm)	D3 (mm)	H (mm)	H1 (mm)	H2 (mm)	H3 (mm)	H4 (mm)	L (mm)	L1 (mm)	L2 (mm)	L3 (mm)	L4 (mm)	Q1 (mm)	Q2 (mm)
160	UNC 5/8	120.6	150	273	77	134	62	23	45	78	112	179	165	40	
180	UNC 5/8	139.7	150	285	83	140	62	23	46	78	112	179	182	54	35
195	UNC 5/8	152.4	150	297	89	146	62	23	49	78	112	179	210	67	50
226	UNC 5/8	190.5	150	335	106	167	62	23	56	78	112	179	240	88	74
258	UNC 3/4	215.9	150	364	121	181	62	23	64	78	112	179	272	113	97
284	UNC 3/4	241.3	160	384	133	189	62	23	72	78	112	179	300	139	123
341	UNC 3/4	298.4	160	431	159	210	62	23	73	78	112	179	360	178	169
412	UNC 7/8	362.0	200	524	205	264	55	23	113	130	140	440	200	210	207
482	UNC 7/8	431.8	200	574	234	285	55	23	113	130	140	510	200	256	253







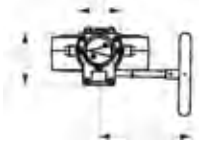
Butterfly valve type 567 ABS
Hand lever with ratchet settings

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

d (mm)	DN (mm)	PN (bar)	EPDM Part No.	SP	weight (kg)
63	50	10	**169 567 002**	1	1.187
75	65	10	**169 567 003**	1	1.282
90	80	10	**169 567 004**	1	1.420
110	100	10	**169 567 005**	1	2.020
140	125	10	**169 567 006**	1	2.536
160	150	10	**169 567 007**	1	3.337
225	200	10	**169 567 008**	1	5.808
280	250	10	**169 567 009**	1	14.328
315	300	10	**169 567 010**	1	18.899

d (mm)	d2 (mm)	D (mm)	D1 min. (mm)	D1 max. (mm)	H (mm)	H1 (mm)	H2 (mm)	H3 (mm)	L (mm)	L1 (mm)	L2 (mm)	Q1 (mm)	Q2 (mm)	closest inch (inch)
63	104	19	120.0	125.0	265	77	134	54	45	106	205	40		2
75	115	19	139.7	145.0	277	83	140	54	46	106	205	54	35	2 ½
90	131	19	150.0	160.0	289	89	146	54	49	106	205	67	50	3
110	161	19	175.0	190.5	326	104	167	55	56	106	255	88	74	4
140	187	23	210.0	215.9	353	117	181	55	64	106	255	113	97	5
160	215	24	241.3	241.3	374	130	189	55	72	106	255	139	123	6
225	267	23	290.0	295.0	435	158	210	67	73	140	408	178	169	8
280	329	25	353.0	362.0	554	205	264	85	113	149	408	210	207	10
315	379	25	400.0	432.0	598	228	285	85	113	149	408	256	253	12



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

d (mm)	DN (mm)	PN (bar)	EPDM Part No.	SP	weight (kg)
63	50	10	**169 567 022**	1	3.078
75	65	10	**169 567 023**	1	3.201
90	80	10	**169 567 024**	1	3.259
110	100	10	**169 567 025**	1	3.493
140	125	10	**169 567 026**	1	4.526
160	150	10	**169 567 027**	1	5.118
225	200	10	**169 567 028**	1	6.389
280	250	10	**169 567 029**	1	12.998
315	300	10	**169 567 030**	1	19.139

d (mm)	d2 (mm)	D (mm)	D1 min. (mm)	D1 max. (mm)	D3 (mm)	H (mm)	H1 (mm)	H2 (mm)	H3 (mm)	L (mm)	L1 (mm)	L2 (mm)	L3 (mm)	Q1 (mm)
63	104	19	120	125	160	273	77	134	62	45	78	112	179	40
75	115	19	140	145	150	285	83	140	62	46	78	112	179	54
90	131	19	150	160	150	297	89	146	62	49	78	112	179	67
110	160	19	175	191	150	333	104	167	62	56	78	112	179	88
140	187	23	210	216	150	360	117	181	62	64	78	112	179	113
160	215	24	241	241	160	381	130	189	62	72	78	112	179	139
225	267	23	290	295	160	430	158	210	62	73	78	112	179	178
280	329	25	353	362	200	538	205	264	69	113	97	130	198	210
315	379	25	400	432	200	582	228	285	69	113	97	130	198	256

d (mm)	Q2 (mm)	closest inch (inch)
63		2
75	35	2 ½
90	50	3
110	74	4
140	97	5
160	123	6
225	169	8
280	207	10
315	253	12

Spare Parts

Valve end 546 and 543 ABS
With solvent cement socket metric

d (mm)	PN (bar)	Part No.	weight (kg)	D1 (mm)	z (mm)	L (mm)	D (mm)	L1 (mm)
16	10	**169 480 775**	0.006	23	4	18	38	4
20	10	**169 480 776**	0.008	27	4	20	38	4
25	10	**169 480 777**	0.012	33	4	22	44	5
32	10	**169 480 778**	0.019	41	4	26	53	5
40	10	**169 480 779**	0.031	51	5	31	65	5
50	10	**169 480 780**	0.047	62	3	34	77	6
63	10	**169 480 781**	0.086	77	3	41	99	7
75	10	**169 480 782**	0.175	92	4	49	125	9
90	10	**169 480 783**	0.292	110	5	57	150	10
110	10	**169 480 784**	0.495	134	5	69	180	11

Union nut 546 and 543 ABS

d (mm)	DN (mm)	Part No.	weight (kg)	D (mm)	D1 (mm)	L (mm)	S (mm)
16 - 20	10 - 15	**169 480 713**	0.014	50	34	19	42
25	20	**169 480 714**	0.021	58	39	20	48
32	25	**169 480 715**	0.030	68	47	24	58
40	32	**169 480 716**	0.047	84	57	27	71
50	40	**169 480 717**	0.067	97	65	30	84
63	50	**169 480 718**	0.139	124	79	36	106
75	65	**169 480 719**	0.435	166	94	48	135
90	80	**169 480 720**	0.683	200	113	54	135
110	100	**169 480 721**	1.048	238	137	60	198

Actuated Valves ABS

Electric Actuated Ball Valves

Ball valve type 127 ABS 100-230V
With manual emergency override
With solvent cement sockets metric

Model:

- Built with electric actuator EA15
- Voltage 100-230V, 50-60Hz
- Factory set control range 90°<)
- Heating element, position feedback (Open/Close)
- Integrated stainless steel mounting inserts

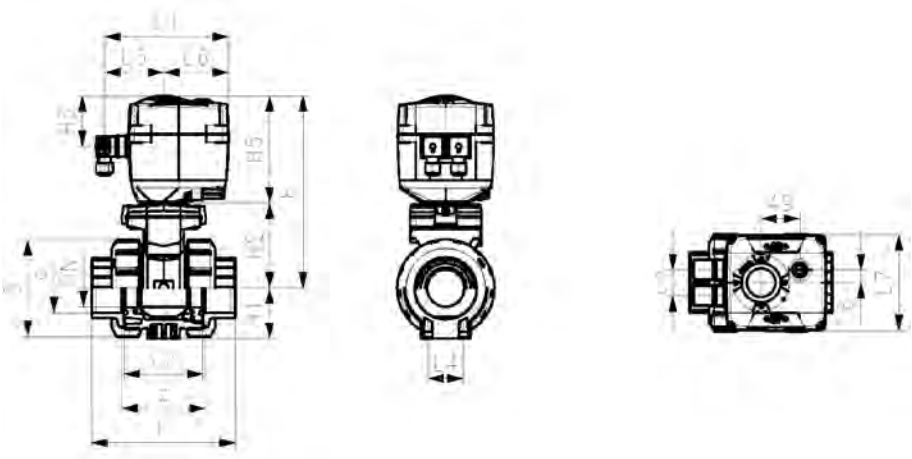
Option:

- Fail-safe return unit

d (mm)	DN (mm)	PN (bar)	EPDM Part No.	SP	weight (kg)
16	10	10	**199 127 082**	1	2.072
20	15	10	**199 127 083**	1	2.072
25	20	10	**199 127 084**	1	2.189
32	25	10	**199 127 085**	1	2.261
40	32	10	**199 127 086**	1	2.465
50	40	10	**199 127 087**	1	2.648
63	50	10	**199 127 088**	1	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 (inch)
16	⅜
20	½
25	¾
32	1
40	1 ¼
50	1 ½
63	2



Ball valve type 127 ABS 24V
With manual emergency override
With solvent cement sockets metric

Model:

- Built with electric actuator EA15
- Voltage 24V AC/DC
- Factory set control range 90°<)
- Heating element, position feedback (Open/Close)
- Integrated stainless steel mounting inserts

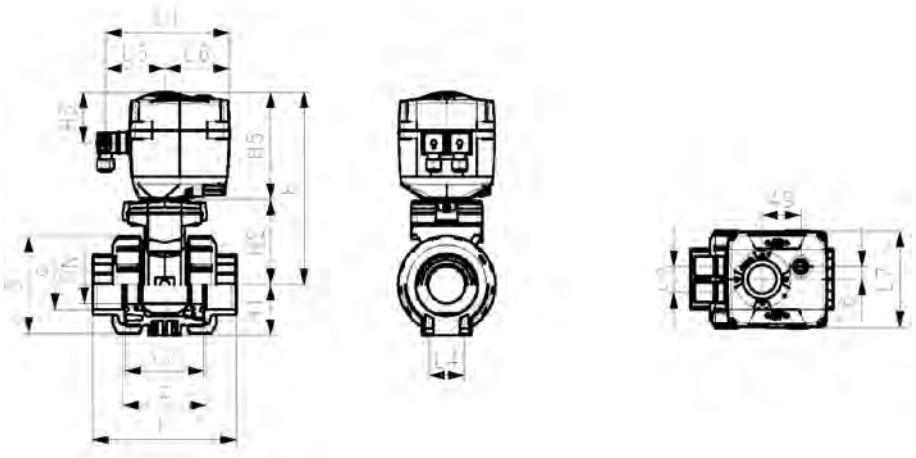
Option:

- Fail-safe return unit

d (mm)	DN (mm)	PN (bar)	EPDM Part No.	SP	weight (kg)
16	10	10	**199 127 092**	1	2.072
20	15	10	**199 127 093**	1	2.097
25	20	10	**199 127 094**	1	2.189
32	25	10	**199 127 095**	1	2.253
40	32	10	**199 127 096**	1	2.592
50	40	10	**199 127 097**	1	2.914
63	50	10	**199 127 098**	1	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 (inch)
16	⅜
20	½
25	¾
32	1
40	1 ¼
50	1 ½
63	2



Ball valve type 179 ABS 100-230V
With manual emergency override
With solvent cement sockets metric

Model:

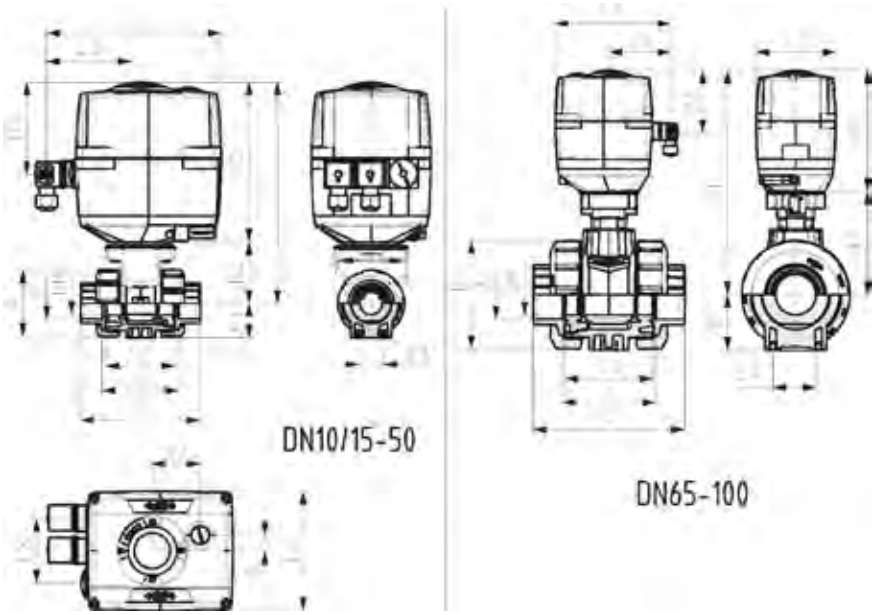
- Voltage 100-230V, 50-60Hz
- Factory set control range 90°<)
- Integrated stainless steel mounting inserts

Option:

- Fail-safe return unit, Monitoring board, Position controller, Profibus DP board

d (mm)	DN (mm)	PN (bar)	EA	EPDM Part No.	SP	weight (kg)
16	10	10	EA25	**199 179 702**	1	2.100
20	15	10	EA25	**199 179 703**	1	2.100
25	20	10	EA25	**199 179 704**	1	2.200
32	25	10	EA25	**199 179 705**	1	2.300
40	32	10	EA25	**199 179 706**	1	2.600
50	40	10	EA25	**199 179 707**	1	3.000
63	50	10	EA25	**199 179 708**	1	3.555
75	65	10	EA45	**199 179 709**	1	6.300
90	80	10	EA120	**199 179 710**	1	8.200
110	100	10	EA120	**199 179 711**	1	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 (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



Ball valve type 179 ABS 24V
With manual emergency override
With solvent cement sockets metric

Model:

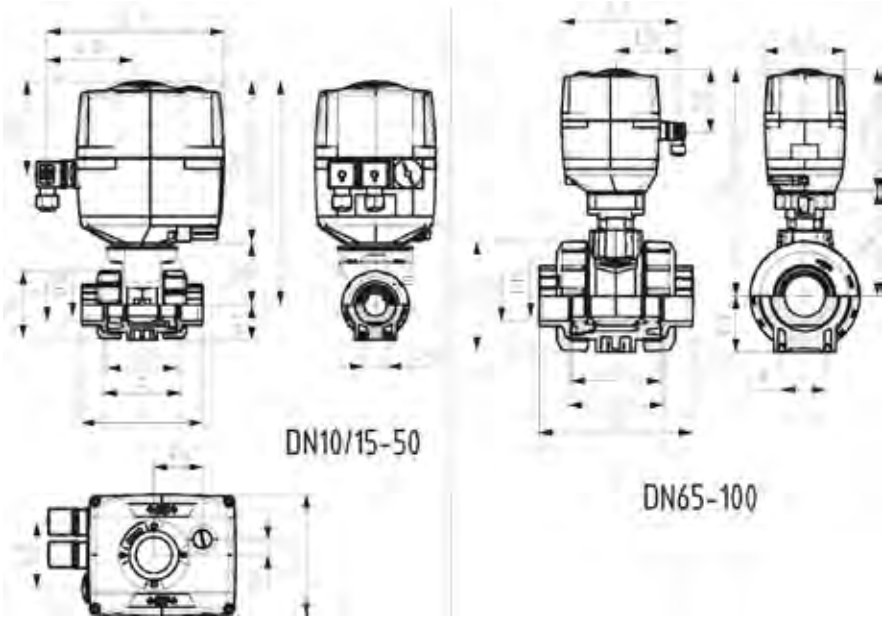
- Voltage 24V AC/DC
- Factory set control range 90°<)
- Integrated stainless steel mounting inserts

Option:

- Fail-safe return unit, Monitoring board, Position controller, Profibus DP board

d (mm)	DN (mm)	PN (bar)	EA	EPDM Part No.	SP	weight (kg)
16	10	10	EA25	**199 179 742**	1	2.100
20	15	10	EA25	**199 179 743**	1	2.100
25	20	10	EA25	**199 179 744**	1	2.200
32	25	10	EA25	**199 179 745**	1	2.300
40	32	10	EA25	**199 179 746**	1	2.600
50	40	10	EA25	**199 179 747**	1	3.000
63	50	10	EA25	**199 179 748**	1	3.535
75	65	10	EA45	**199 179 749**	1	6.300
90	80	10	EA120	**199 179 750**	1	8.200
110	100	10	EA120	**199 179 751**	1	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 (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



3-Way ball valve type 167 ABS
Horizontal/L-port 100-230V
With manual emergency override
With solvent cement sockets metric

Model:

- Voltage 100-230V, 50-60Hz
- Integrated stainless steel mounting inserts

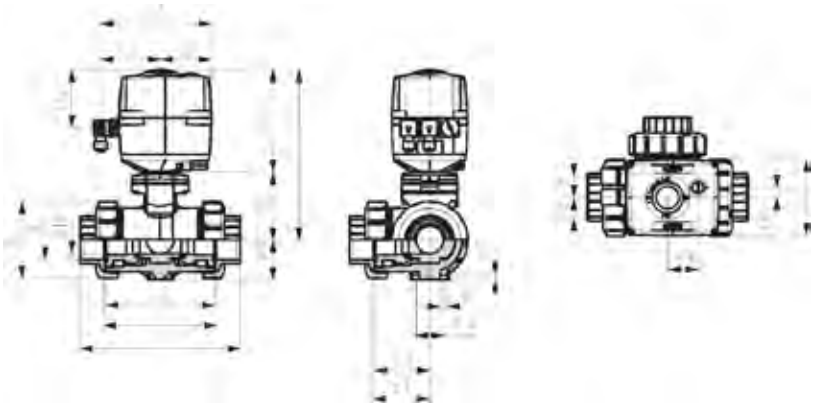
Option:

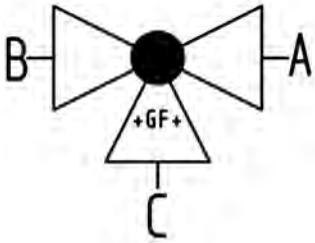
- Fail-safe return unit, Monitoring board, Position controller, Profibus DP board

d (mm)	DN (mm)	PN (bar)	EA	EPDM Part No.	SP	weight (kg)
16	10	10	EA25	**199 167 162**	1	2.065
20	15	10	EA25	**199 167 163**	1	2.069
25	20	10	EA25	**199 167 164**	1	2.171
32	25	10	EA25	**199 167 165**	1	2.316
40	32	10	EA25	**199 167 166**	1	2.649
50	40	10	EA25	**199 167 167**	1	3.384
63	50	10	EA25	**199 167 168**	1	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 (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





3-Way ball valve type 167 ABS
Horizontal/L-port 24V
With manual emergency override
With solvent cement sockets metric

Model:

- Voltage 24V AC/DC
- Integrated stainless steel mounting inserts

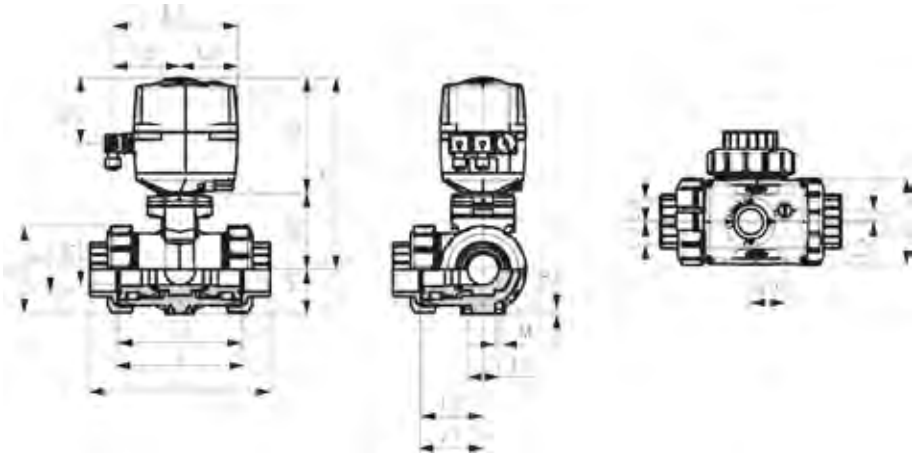
Option:

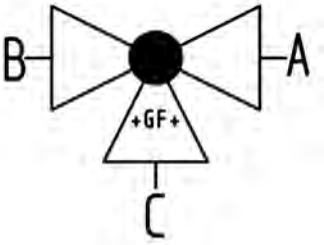
- Fail-safe return unit, Monitoring board, Position controller, Profibus DP board

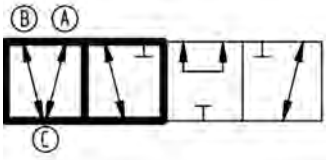
d (mm)	DN (mm)	PN (bar)	EA	EPDM Part No.	SP	weight (kg)
16	10	10	EA25	**199 167 342**	1	2.065
20	15	10	EA25	**199 167 343**	1	2.069
25	20	10	EA25	**199 167 344**	1	2.171
32	25	10	EA25	**199 167 345**	1	2.704
40	32	10	EA25	**199 167 346**	1	3.681
50	40	10	EA25	**199 167 347**	1	3.370
63	50	10	EA25	**199 167 348**	1	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 (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







3-Way ball valve type 167 ABS
Horizontal/T-port 100-230V
With manual emergency override
With solvent cement sockets metric

Model:

- Voltage 100-230V, 50-60Hz
- Integrated stainless steel mounting inserts

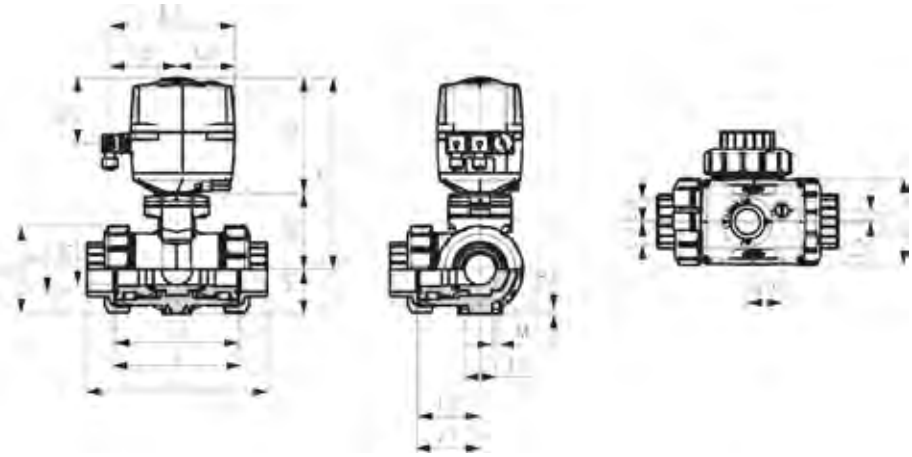
Option:

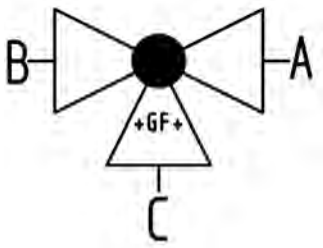
- Fail-safe return unit, Monitoring board, Position controller, Profibus DP board

d (mm)	DN (mm)	PN (bar)	EA	EPDM Part No.	SP	weight (kg)
16	10	10	EA25	**199 167 172**	1	2.064
20	15	10	EA25	**199 167 173**	1	2.068
25	20	10	EA25	**199 167 174**	1	2.169
32	25	10	EA25	**199 167 175**	1	2.732
40	32	10	EA25	**199 167 176**	1	2.640
50	40	10	EA25	**199 167 177**	1	3.377
63	50	10	EA25	**199 167 178**	1	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 (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





3-Way ball valve type 167 ABS
Horizontal/T-port 24V
With manual emergency override
With solvent cement sockets metric

Model:

- Voltage 24V AC/DC
- Factory set control range 90°<)
- Other positions possible by adjusting the limit switches
- Integrated stainless steel mounting inserts

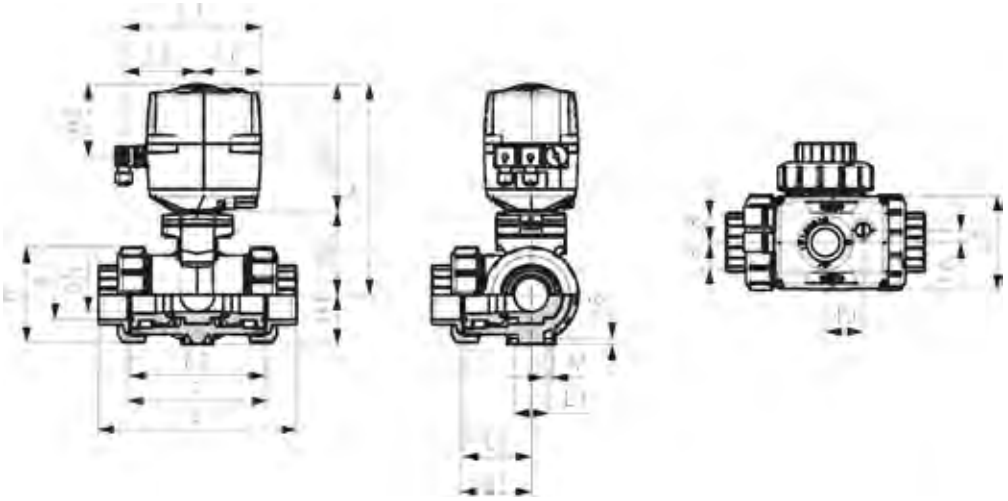
Option:

- Fail-safe return unit, Monitoring board, Position controller, Profibus DP board

d (mm)	DN (mm)	PN (bar)	EA	EPDM Part No.	SP	weight (kg)
16	10	10	EA25	**199 167 352**	1	2.064
20	15	10	EA25	**199 167 353**	1	2.068
25	20	10	EA25	**199 167 354**	1	2.169
32	25	10	EA25	**199 167 355**	1	2.311
40	32	10	EA25	**199 167 356**	1	2.640
50	40	10	EA25	**199 167 357**	1	2.977
63	50	10	EA25	**199 167 358**	1	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 (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



3-Way ball valve type 170 ABS
Vertical/L-port 100-230V
With manual emergency override
With solvent cement sockets metric

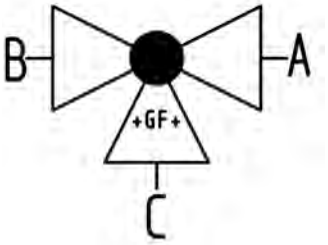
Model:

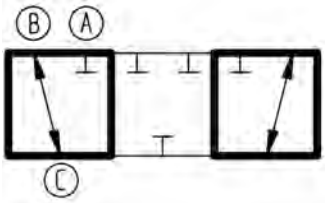
- Voltage 100-230V, 50-60Hz
- Integrated stainless steel mounting inserts

Option:

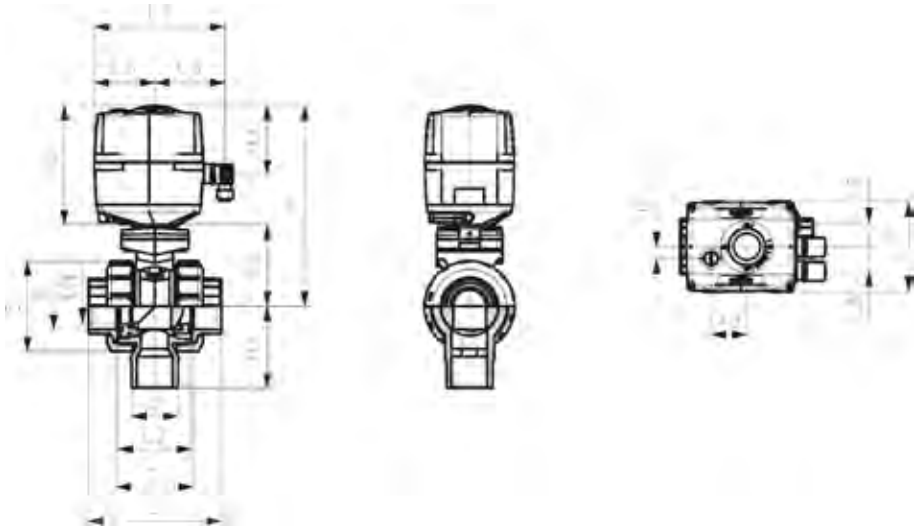
- Fail-safe return unit, Monitoring board, Position controller, Profibus DP board

d (mm)	DN (mm)	PN (bar)	EA	EPDM Part No.	SP	weight (kg)
16	10	10	EA25	**199 170 242**	1	2.039
20	15	10	EA25	**199 170 243**	1	2.043
25	20	10	EA25	**199 170 244**	1	2.150
32	25	10	EA25	**199 170 245**	1	2.267
40	32	10	EA25	**199 170 246**	1	2.554
50	40	10	EA25	**199 170 247**	1	3.203
63	50	10	EA25	**199 170 248**	1	3.977





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)	closest inch (inch)
16	50	231	62	64	94	167	92	180	56	97	83	122	33	64	⅜
20	50	231	62	64	94	167	95	180	56	97	83	122	33	64	½
25	58	240	72	73	94	167	111	180	66	97	83	122	33	74	¾
32	68	240	77	73	94	167	123	180	71	97	83	122	33	79	1
40	84	251	87	84	94	167	146	180	85	97	83	122	33	95	1 ¼
50	97	251	97	84	94	167	157	180	89	97	83	122	33	95	1 ½
63	124	273	112	106	94	167	183	180	101	97	83	122	33	107	2



3-Way ball valve type 170 ABS
Vertical/L-port 24V
With manual emergency override
With solvent cement sockets metric

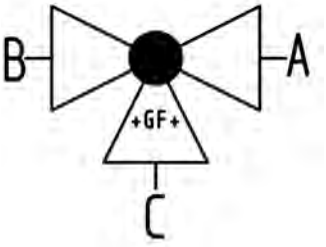
Model:

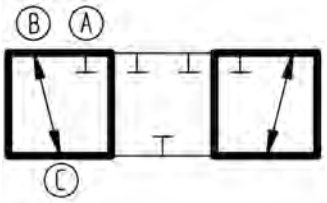
- Factory set control range 90°<)
- Integrated stainless steel mounting inserts

Option:

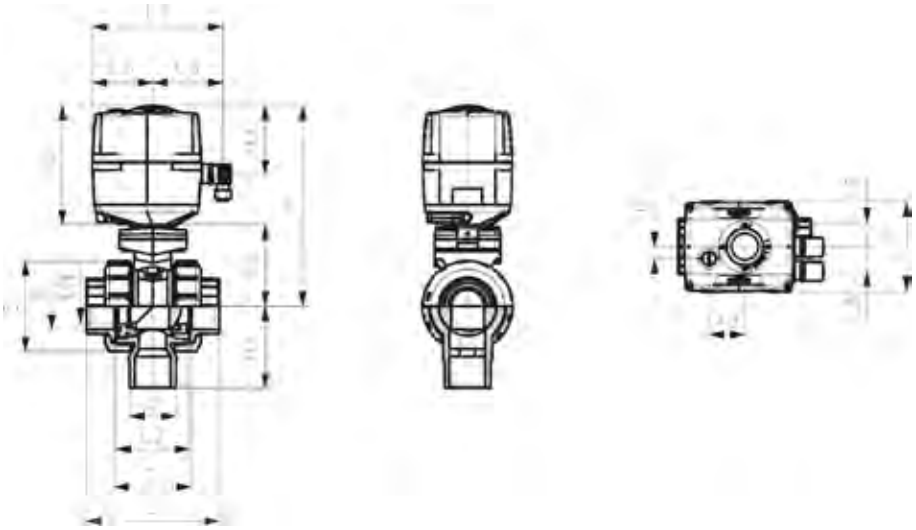
- Fail-safe return unit, Monitoring board, Position controller, Profibus DP board

d (mm)	DN (mm)	PN (bar)	EA	EPDM Part No.	SP	weight (kg)
16	10	10	EA25	**199 170 262**	1	2.039
20	15	10	EA25	**199 170 263**	1	2.043
25	20	10	EA25	**199 170 264**	1	2.546
32	25	10	EA25	**199 170 265**	1	2.267
40	32	10	EA25	**199 170 266**	1	2.922
50	40	10	EA25	**199 170 267**	1	2.818
63	50	10	EA25	**199 170 268**	1	3.595





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)	closest inch (inch)
16	50	231	62	64	94	167	92	180	56	97	83	122	33	64	⅜
20	50	231	62	64	94	167	95	180	56	97	83	122	33	64	½
25	58	240	72	73	94	167	111	180	66	97	83	122	33	74	¾
32	68	240	77	73	94	167	123	180	71	97	83	122	33	79	1
40	84	251	87	84	94	167	146	180	85	97	83	122	33	95	1 ¼
50	97	251	97	84	94	167	157	180	89	97	83	122	33	95	1 ½
63	124	273	112	106	94	167	183	180	101	97	83	122	33	107	2



Pneumatic Actuated Ball Valves

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

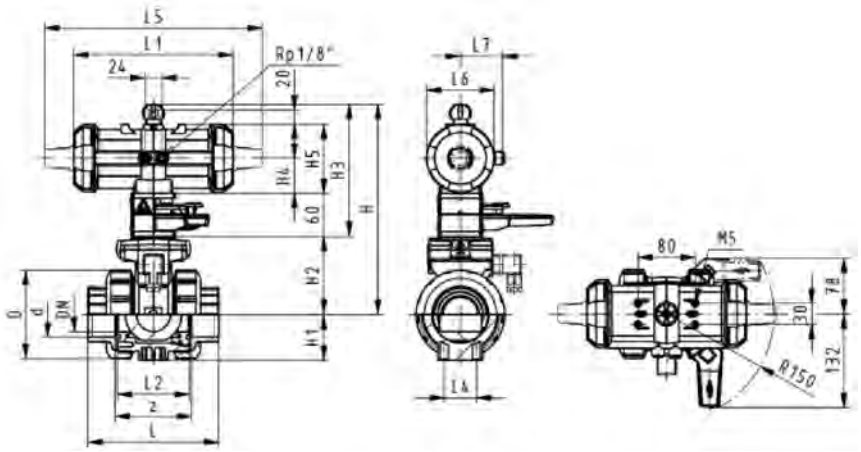
Model:

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

d (mm)	DN (mm)	PN (bar)	EPDM Part No.	SP	weight (kg)
16	10	10	**199 230 702**	1	1.459
20	15	10	**199 230 703**	1	1.459
25	20	10	**199 230 704**	1	1.576
32	25	10	**199 230 705**	1	1.394
40	32	10	**199 230 706**	1	2.751
50	40	10	**199 230 707**	1	3.073
63	50	10	**199 230 708**	1	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 (inch)
16	⅜
20	½
25	¾
32	1
40	1 ¼
50	1 ½
63	2



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

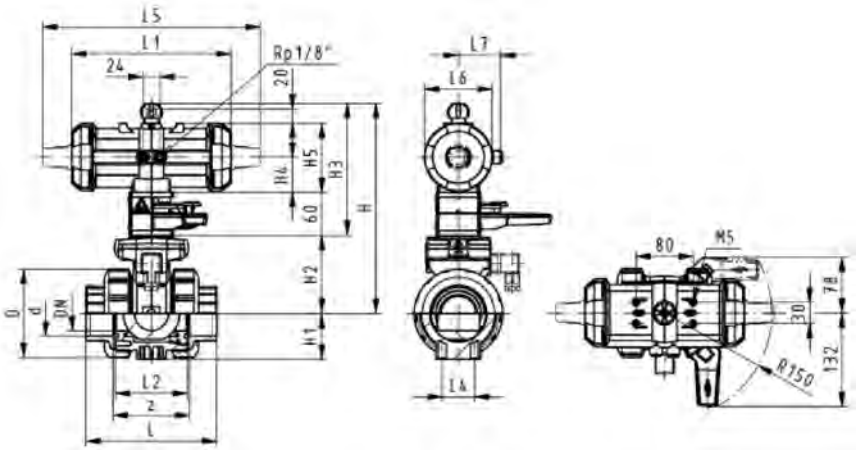
Model:

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

d (mm)	DN (mm)	PN (bar)	EPDM Part No.	SP	weight (kg)
16	10	10	**199 230 742**	1	1.459
20	15	10	**199 230 743**	1	1.459
25	20	10	**199 230 744**	1	1.576
32	25	10	**199 230 745**	1	1.700
40	32	10	**199 230 746**	1	2.751
50	40	10	**199 230 747**	1	3.073
63	50	10	**199 230 748**	1	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 (inch)
16	⅜
20	½
25	¾
32	1
40	1 ¼
50	1 ½
63	2



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

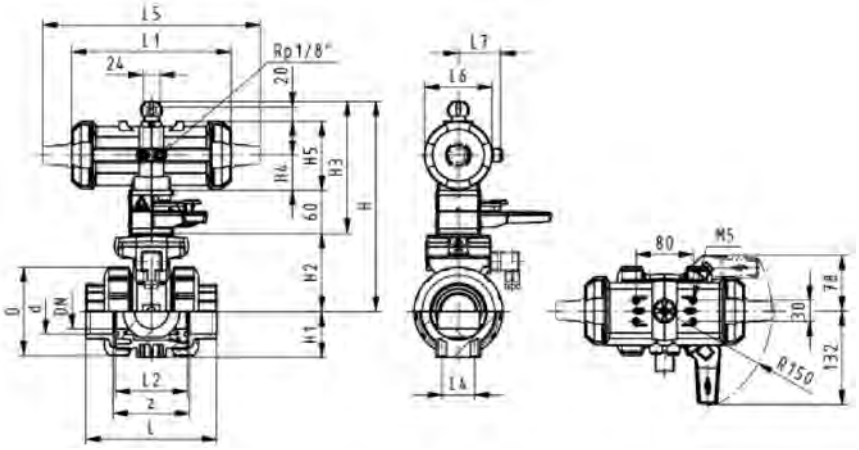
Model:

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

d (mm)	DN (mm)	PN (bar)	EPDM Part No.	SP	weight (kg)
16	10	10	**199 230 782**	1	1.459
20	15	10	**199 230 783**	1	1.459
25	20	10	**199 230 784**	1	1.576
32	25	10	**199 230 785**	1	1.700
40	32	10	**199 230 786**	1	2.751
50	40	10	**199 230 787**	1	3.073
63	50	10	**199 230 788**	1	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 (inch)
16	⅜
20	½
25	¾
32	1
40	1 ¼
50	1 ½
63	2



DN10/15 - 50

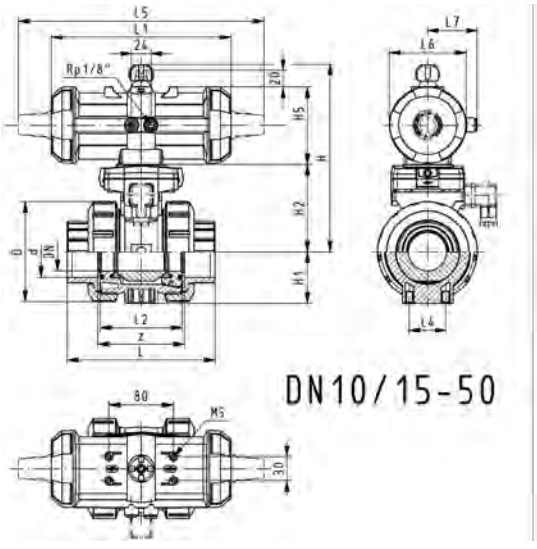
Ball valve type 230 ABS FC (Fail safe to close)
Without manual override
With solvent cement sockets metric

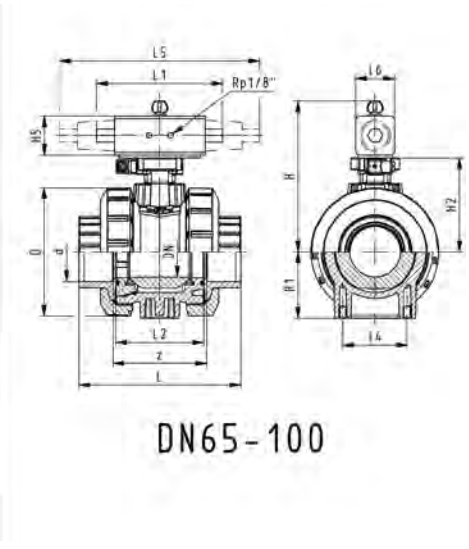
Model:

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

d (mm)	DN (mm)	PN (bar)	EPDM Part No.	SP	weight (kg)
16	10	10	**199 230 822**	1	1.459
20	15	10	**199 230 823**	1	1.459
25	20	10	**199 230 824**	1	1.576
32	25	10	**199 230 825**	1	1.700
40	32	10	**199 230 826**	1	2.751
50	40	10	**199 230 827**	1	3.073
63	50	10	**199 230 828**	1	3.931
75	65	10	**199 230 829**	1	6.700
90	80	10	**199 230 830**	1	8.600
110	100	10	**199 230 831**	1	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 (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

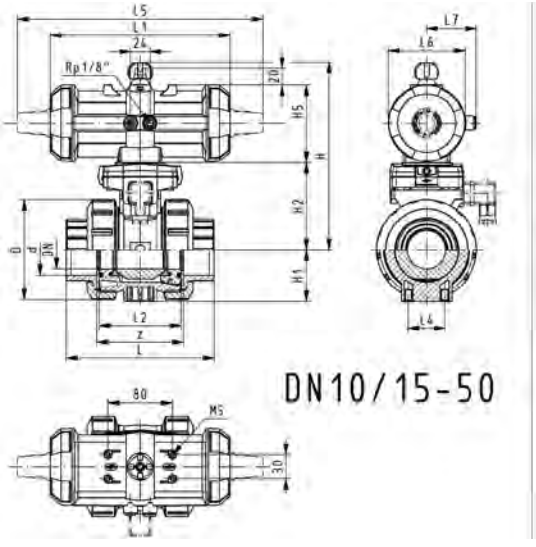
Ball valve type 230 ABS FO (Fail safe to open)
Without manual override
With solvent cement sockets metric

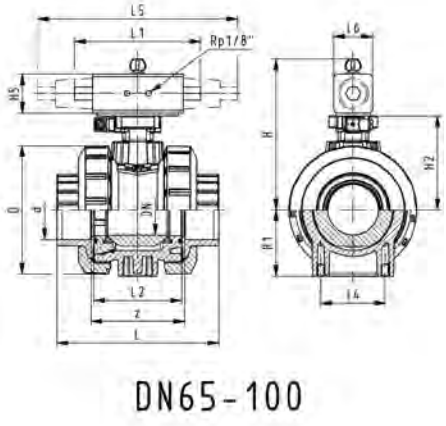
Model:

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

d (mm)	DN (mm)	PN (bar)	EPDM Part No.	SP	weight (kg)
16	10	10	**199 230 862**	1	1.459
20	15	10	**199 230 863**	1	1.459
25	20	10	**199 230 864**	1	1.576
32	25	10	**199 230 865**	1	1.700
40	32	10	**199 230 866**	1	2.751
50	40	10	**199 230 867**	1	3.073
63	50	10	**199 230 868**	1	3.931
75	65	10	**199 230 869**	1	6.700
90	80	10	**199 230 870**	1	8.600
110	100	10	**199 230 871**	1	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 (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

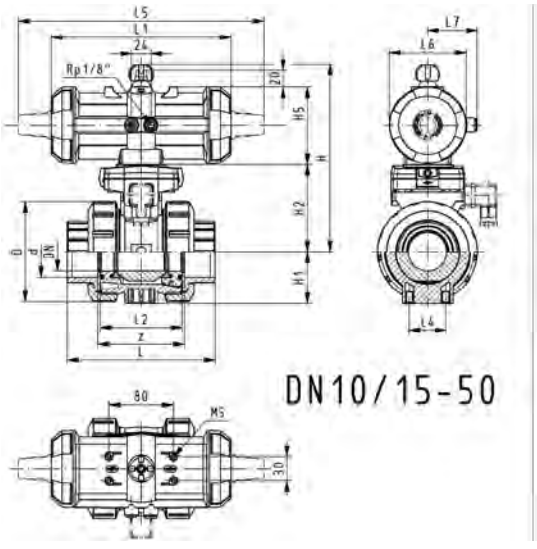
Ball valve type 230 ABS DA (Double acting)
Without manual override
With solvent cement sockets metric

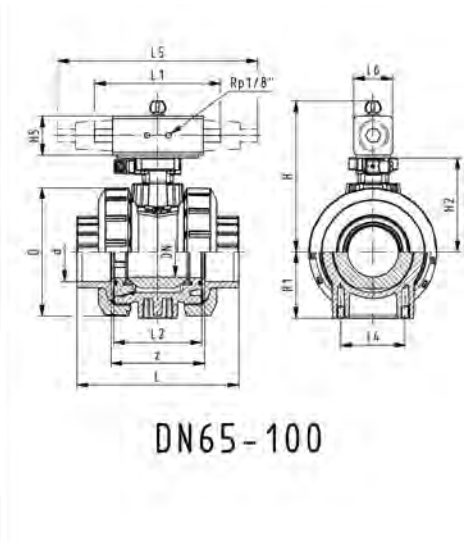
Model:

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

d (mm)	DN (mm)	PN (bar)	EPDM Part No.	SP	weight (kg)
16	10	10	**199 230 902**	1	1.459
20	15	10	**199 230 903**	1	1.459
25	20	10	**199 230 904**	1	1.576
32	25	10	**199 230 905**	1	1.700
40	32	10	**199 230 906**	1	2.751
50	40	10	**199 230 907**	1	3.073
63	50	10	**199 230 908**	1	3.931
75	65	10	**199 230 909**	1	5.600
90	80	10	**199 230 910**	1	7.900
110	100	10	**199 230 911**	1	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 (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





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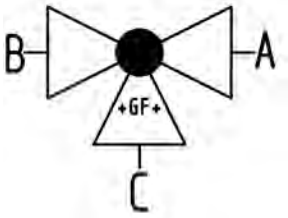
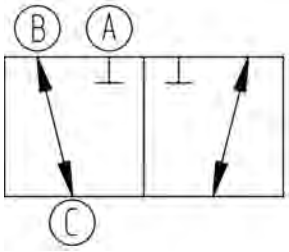




3-Way ball valve type 285 ABS
Horizontal/L-port FC (Fail-close)
Without manual override
With solvent cement sockets metric

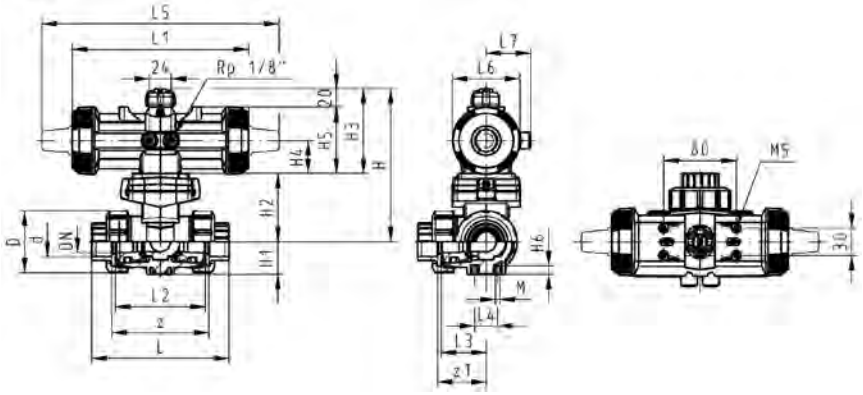
Model:

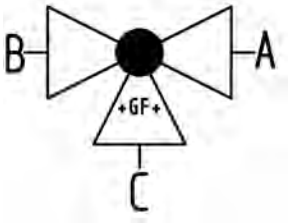
- Built on with pneumatic actuator PA11 (DN10/15-25), PA21 (DN32-50)
- Control time 90° 1-3 s
- Integrated stainless steel mounting inserts

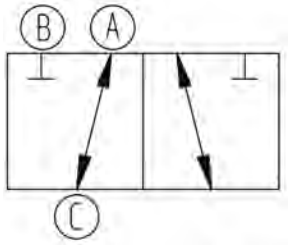
d (mm)	DN (mm)	PN (bar)	EPDM Part No.	SP	weight (kg)
16	10	10	**199 285 162**	1	1.058
20	15	10	**199 285 163**	1	1.062
25	20	10	**199 285 164**	1	1.164
32	25	10	**199 285 165**	1	1.309
40	32	10	**199 285 166**	1	2.318
50	40	10	**199 285 167**	1	2.662
63	50	10	**199 285 168**	1	3.689

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 (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







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

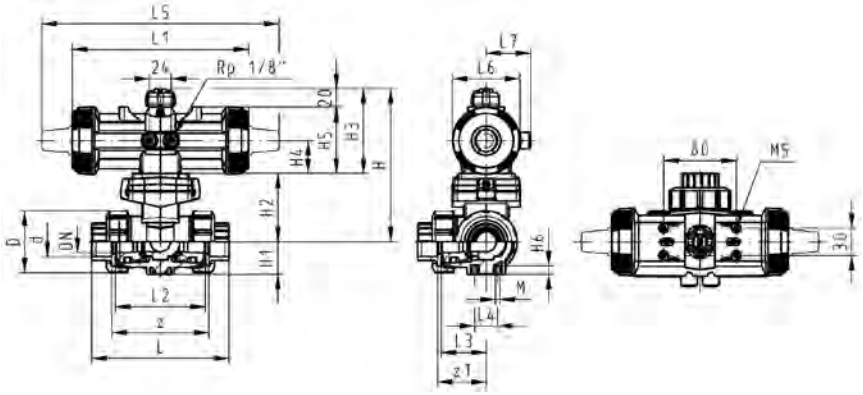
Model:

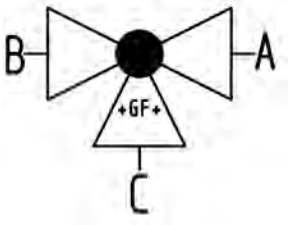
- Built on with pneumatic actuator PA11 (DN10/15-25), PA21 (DN32-50)
- Control time 90° 1-3 s
- Integrated stainless steel mounting inserts

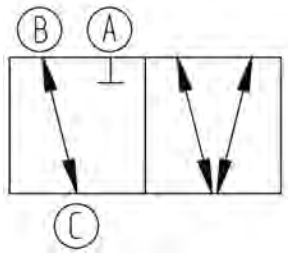
d (mm)	DN (mm)	PN (bar)	EPDM Part No.	SP	weight (kg)
16	10	10	**199 285 342**	1	0.867
20	15	10	**199 285 343**	1	0.872
25	20	10	**199 285 344**	1	0.974
32	25	10	**199 285 345**	1	1.119
40	32	10	**199 285 346**	1	1.894
50	40	10	**199 285 347**	1	2.238
63	50	10	**199 285 348**	1	3.287

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 (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







3-Way ball valve type 285 ABS
Horizontal/T-port FC (Fail-close)
Without manual override
With solvent cement sockets metric

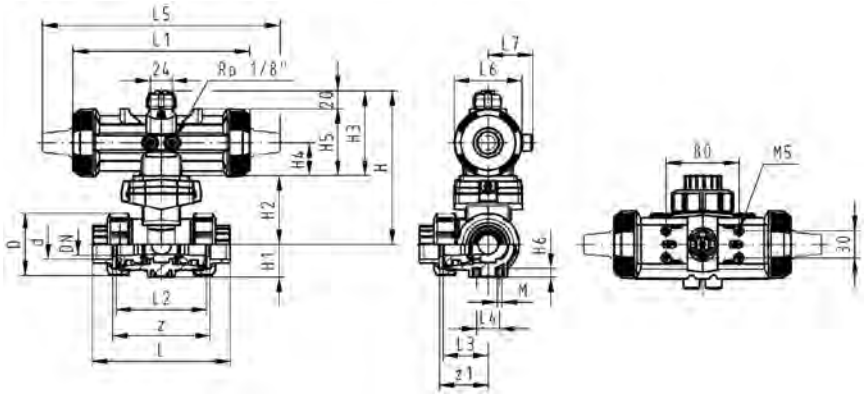
Model:

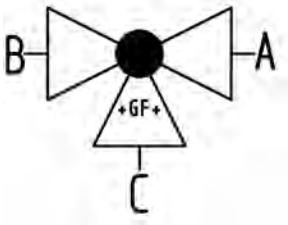
- Built on with pneumatic actuator PA11 (DN10/15-25), PA21 (DN32-50)
- Control time 90° 1-3 s
- Integrated stainless steel mounting inserts

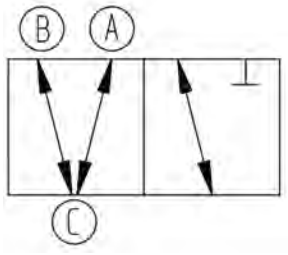
d (mm)	DN (mm)	PN (bar)	EPDM Part No.	SP	weight (kg)
16	10	10	**199 285 172**	1	1.057
20	15	10	**199 285 173**	1	1.061
25	20	10	**199 285 174**	1	1.162
32	25	10	**199 285 175**	1	1.304
40	32	10	**199 285 176**	1	2.309
50	40	10	**199 285 177**	1	2.646
63	50	10	**199 285 178**	1	3.677

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 (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







3-Way ball valve type 285 ABS
Horizontal/T-port DA (Double acting)
Without manual override
With solvent cement sockets metric

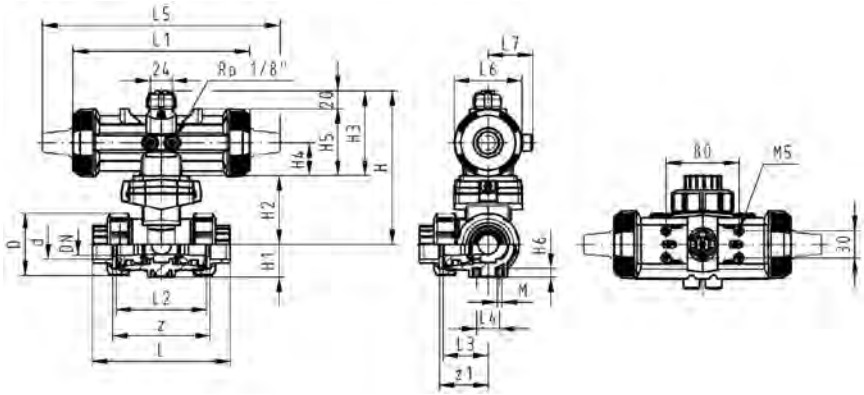
Model:

- Built on with pneumatic actuator PA11 (DN10/15-25), PA21 (DN32-50)
- Control time 90° 1-3 s
- Integrated stainless steel mounting inserts

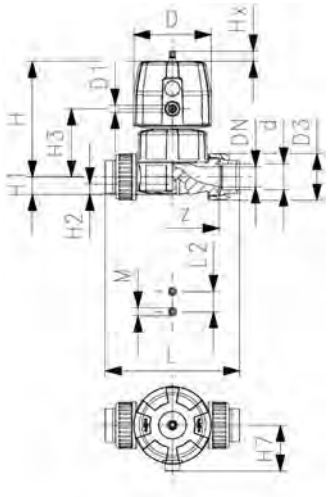
d (mm)	DN (mm)	PN (bar)	EPDM Part No.	SP	weight (kg)
16	10	10	**199 285 352**	1	0.866
20	15	10	**199 285 353**	1	0.871
25	20	10	**199 285 354**	1	0.972
32	25	10	**199 285 355**	1	1.060
40	32	10	**199 285 356**	1	1.783
50	40	10	**199 285 357**	1	2.222
63	50	10	**199 285 358**	1	3.253

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 (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



Pneumatic Actuated Diaphragm Valves



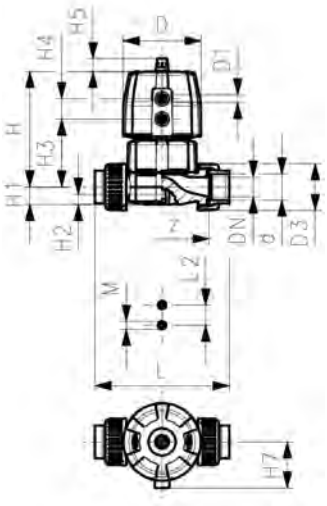
Diaphragm valve DIASTAR Six ABS FC (fail safe to close) with Union End Sockets metric

Model:

- Double flow rate compared to predecessor
- One housing nut replaces four screws
- Short overall length

d (mm)	PN (bar)	EPDM Part No.	SP	weight (lb)
25	6	**169 614 013**	1	2.174
32	6	**169 614 014**	1	2.590
40	6	**169 614 015**	1	4.359
50	6	**169 614 016**	1	5.501
63	6	**169 614 017**	1	7.628

d (mm)	D (mm)	D1_G (inch)	H (mm)	H1 (mm)	H2 (mm)	H3 (mm)	H7 (mm)	L (mm)	L2 (mm)	M	z (mm)	Lift = Hx (mm)	closest inch (inch)
25	96	⅛	132	18	12	73	57	152	25	M6	114	10	¾
32	96	⅛	143	22	12	84	57	166	25	M6	122	13	1
40	120	⅛	173	26	15	99	69	192	45	M8	140	14	1 ¼
50	120	⅛	193	32	15	119	69	222	45	M8	160	16	1 ½
63	120	⅛	205	39	15	132	69	266	45	M8	190	16	2



Diaphragm valve DIASTAR Ten ABS FC (fail safe to close) with Union End Sockets metric

Model:

- Double flow rate compared to predecessor
- One housing nut replaces four screws
- Short overall length

Option:

d (mm)	PN (bar)	EPDM Part No.	SP	weight (lb)
20	10	**169 624 012**	1	1.210
25	10	**169 624 013**	1	2.339
32	10	**169 624 014**	1	2.749
40	10	**169 624 015**	1	4.689
50	10	**169 624 016**	1	8.009
63	10	**169 624 017**	1	9.658

d (mm)	D (mm)	D1_G (inch)	H (mm)	H1 (mm)	H2 (mm)	H3 (mm)	H4 (mm)	H5 (mm)	H7 (mm)	L (mm)	L2 (mm)	M	z (mm)	Lift = Hx (mm)
20	68	⅛	101	14	12	60	24	16	43	128	25	M6	96	7
25	96	⅛	132	18	12	73	25	16	57	152	25	M6	114	10
32	96	⅛	143	22	12	84	25	16	57	166	25	M6	122	13
40	120	⅛	173	26	15	99	26	26	69	192	45	M8	140	15
50	150	¼	214	32	15	119	36	26	88	222	45	M8	160	19
63	150	¼	226	39	15	132	36	26	88	266	45	M8	190	23

d (mm)	closest inch (inch)
20	½
25	¾
32	1
40	1 ¼
50	1 ½
63	2

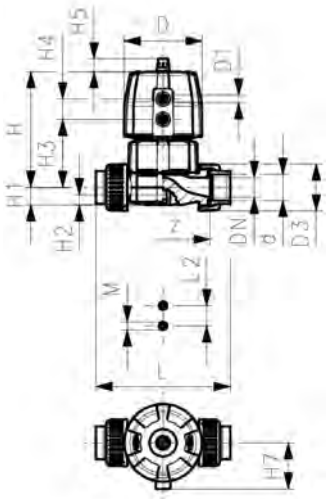
Diaphragm valve DIASTAR Ten ABS FO (fail safe to open) with Union End Sockets metric

Model:

- Double flow rate compared to predecessor
- One housing nut replaces four screws
- Short overall length

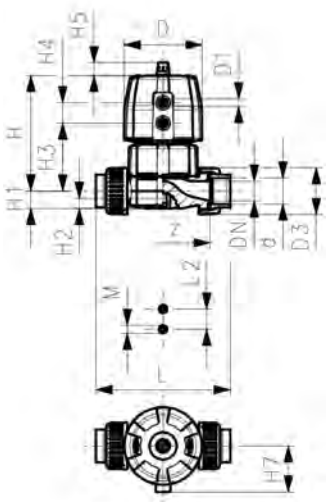
Option:

d (mm)	PN (bar)	EPDM Part No.	SP	weight (kg)
20	10/10*	**169 644 012**	1	0.499
25	10/10*	**169 644 013**	1	0.887
32	10/10*	**169 644 014**	1	1.067
40	10/10*	**169 644 015**	1	1.767
50	10/10*	**169 644 016**	1	3.543
63	10/10*	**169 644 017**	1	4.291



d (mm)	D (mm)	D1_G (inch)	H (mm)	H1 (mm)	H2 (mm)	H3 (mm)	H4 (mm)	H5 (mm)	H7 (mm)	L (mm)	L2 (mm)	M	z (mm)	Lift = Hx (mm)
20	68	⅛	101	14	12	60	24	16	43	128	25	M6	96	7
25	96	⅛	132	18	12	73	25	16	57	152	25	M6	114	10
32	96	⅛	143	22	12	84	25	16	57	166	25	M6	122	13
40	120	⅛	173	26	15	99	26	26	69	192	45	M8	140	15
50	150	¼	214	32	15	119	36	26	88	222	45	M8	160	19
63	150	¼	226	39	15	132	36	26	88	266	45	M8	190	23

d (mm)	closest inch (inch)
20	½
25	¾
32	1
40	1 ¼
50	1 ½
63	2



Diaphragm valve DIASTAR Ten ABS DA (double acting) with Union End Sockets metric

Model:

- Double flow rate compared to predecessor
- One housing nut replaces four screws
- Short overall length

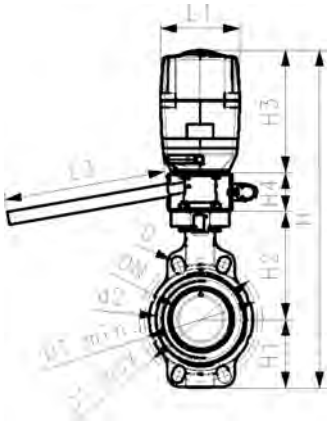
Option:

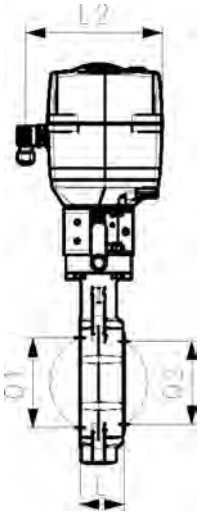
d (mm)	PN (bar)	EPDM Part No.	SP	weight (kg)
20	10/10*	**169 654 012**	1	0.483
25	10/10*	**169 654 013**	1	0.851
32	10/10*	**169 654 014**	1	1.037
40	10/10*	**169 654 015**	1	1.707
50	10/10*	**169 654 016**	1	2.793
63	10/10*	**169 654 017**	1	3.541

d (mm)	D (mm)	D1_G (inch)	H (mm)	H1 (mm)	H2 (mm)	H3 (mm)	H4 (mm)	H5 (mm)	H7 (mm)	L (mm)	L2 (mm)	M	z (mm)	Lift = Hx (mm)
20	68	⅛	101	14	12	60	24	16	43	128	25	M6	96	7
25	96	⅛	132	18	12	73	25	16	57	152	25	M6	114	10
32	96	⅛	143	22	12	84	25	16	57	166	25	M6	122	13
40	120	⅛	173	26	15	99	26	26	69	192	45	M8	140	15
50	150	¼	214	32	15	119	36	26	88	222	45	M8	160	19
63	150	¼	226	39	15	132	36	26	88	266	45	M8	190	23

d (mm)	closest inch (inch)
20	½
25	¾
32	1
40	1 ¼
50	1 ½
63	2

Electric Actuated Butterfly Valves





Butterfly valve type 145 ABS 100-230V
With manual override

Model:

- Voltage 100-230V, 50-60Hz
- Factory set control range 90°<)
- 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

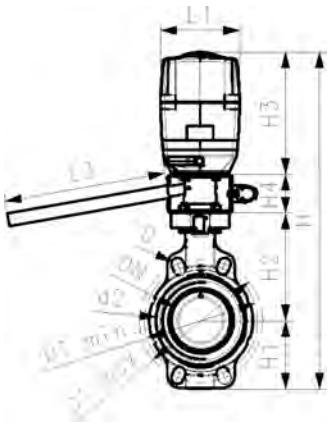
Option:

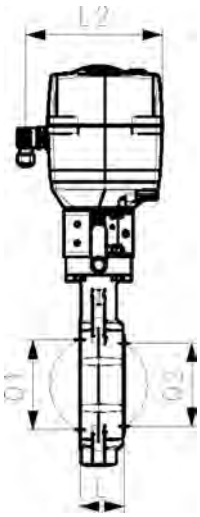
- Fail-safe return unit, Monitoring board, Position controller, Profibus DP board

d (mm)	DN (mm)	PN (bar)	EPDM Part No.	SP	weight (kg)
63	50	10	**199 145 482**	1	5.678
75	65	10	**199 145 483**	1	5.781
90	80	10	**199 145 484**	1	5.859
110	100	10	**199 145 485**	1	6.395
140	125	10	**199 145 486**	1	5.389
160	150	10	**199 145 487**	1	7.718
225	200	10	**199 145 488**	1	13.529

d (mm)	Actuator unit type	d2 (mm)	D (mm)	D1 min. (mm)	D1 max. (mm)	H (mm)	H1 (mm)	H2 (mm)	H3 (mm)	H4 (mm)	L (mm)	L1 (mm)	L2 (mm)	L3 (mm)
63	EA-120	104	19	120	125	475	77	134	188	75	45	122	180	250
75	EA-120	115	19	140	145	488	83	140	188	75	46	122	180	250
90	EA-120	131	19	150	160	488	89	146	188	60	49	122	180	250
110	EA-120	161	19	175	191	520	104	167	188	60	56	122	180	250
140	EA-120	187	23	210	216	547	117	181	188	60	64	122	180	250
160	EA-120	215	24	241	241	568	130	189	188	60	72	122	180	250
225	EA-250	267	23	290	295	635	158	210	208	60	73	122	180	250

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





Butterfly valve type 145 ABS 24V
With manual override

Model:

- Voltage 24V AC/DC
- Factory set control range 90°<)
- 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

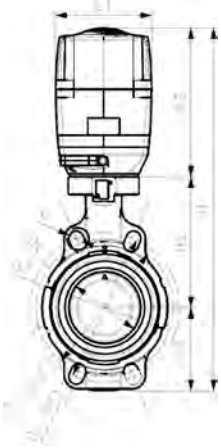
Option:

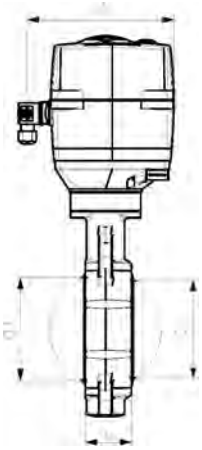
- Fail-safe return unit, Monitoring board, Position controller, Profibus DP board

d (mm)	DN (mm)	PN (bar)	EPDM Part No.	weight (kg)
63	50	10	**199 145 522**	4.161
75	65	10	**199 145 523**	4.257
90	80	10	**199 145 524**	5.859
110	100	10	**199 145 525**	6.395
140	125	10	**199 145 526**	5.389
160	150	10	**199 145 527**	9.910
225	200	10	**199 145 528**	13.529

d (mm)	Actuator unit type	d2 (mm)	D (mm)	D1 min. (mm)	D1 max. (mm)	H (mm)	H1 (mm)	H2 (mm)	H3 (mm)	H4 (mm)	L (mm)	L1 (mm)	L2 (mm)	L3 (mm)
63	EA-120	104	19	120	125	475	77	134	188	75	45	122	180	250
75	EA-120	115	19	140	145	488	83	140	188	75	46	122	180	250
90	EA-120	131	19	150	160	488	89	146	188	60	49	122	180	250
110	EA-120	161	19	175	191	520	104	167	188	60	56	122	180	250
140	EA-120	187	23	210	216	547	117	181	188	60	64	122	180	250
160	EA-120	215	24	241	241	568	130	189	188	60	72	122	180	250
225	EA-250	267	23	290	295	635	158	210	208	60	73	122	180	250

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





Butterfly valve type 145 ABS 24V
Without manual override

Model:

- Voltage 24V AC/DC
- Factory set control range 90°<)
- 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

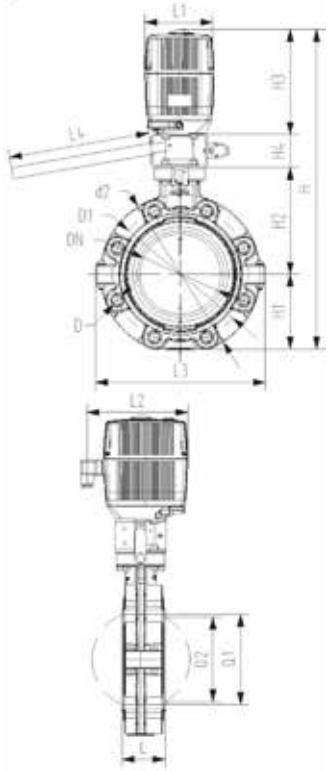
Option:

- Fail-safe return unit, Monitoring board, Position controller, Profibus DP board

d (mm)	DN (mm)	PN (bar)	EPDM Part No.	SP	weight (kg)
63	50	10	**199 145 542**	1	4.178
75	65	10	**199 145 543**	1	3.217
90	80	10	**199 145 544**	1	4.359
110	100	10	**199 145 545**	1	4.895
140	125	10	**199 145 546**	1	4.376
160	150	10	**199 145 547**	1	6.218
225	200	10	**199 145 548**	1	12.029
280	250	6	**199 145 549**	1	14.334
315	300	6	**199 145 550**	1	19.546

d (mm)	Actuator unit type	d2 (mm)	D (mm)	D1 min. (mm)	D1 max. (mm)	H (mm)	H1 (mm)	H2 (mm)	H3 (mm)	L (mm)	L1 (mm)	L2 (mm)	Q1 (mm)	Q2 (mm)
63	EA-45	104	19	120	125	415	77	134	188	45	122	180	40	
75	EA-45	115	19	140	145	428	83	140	188	46	122	180	54	35
90	EA-120	131	19	150	160	428	89	146	188	49	122	180	67	50
110	EA-120	161	19	175	191	460	104	167	188	56	122	180	88	74
140	EA-120	187	23	210	216	487	117	181	188	64	122	180	113	97
160	EA-120	215	24	241	241	508	130	189	188	72	122	180	139	123
225	EA-250	267	23	290	295	575	158	210	208	73	122	180	178	169
280	EA-250	329	25	353	362	677	205	264	208	113	122	180	210	207
315	EA-250	329	25	353	362	677	205	264	208	113	122	180	210	207

d (mm)	closest inch (inch)
63	2
75	2 ½
90	3
110	4
140	5
160	6
225	8
280	10
315	12



Lugstyle butterfly valve type 147 ABS 100-230V With manual override

Model:

- Voltage 100-230V, 50-60Hz
- Factory set control range 90°<)
- Connecting dimension: ANSI/ASME B 16.5 class 150, ASTM D 4024, BS 1560, BS EN 1759

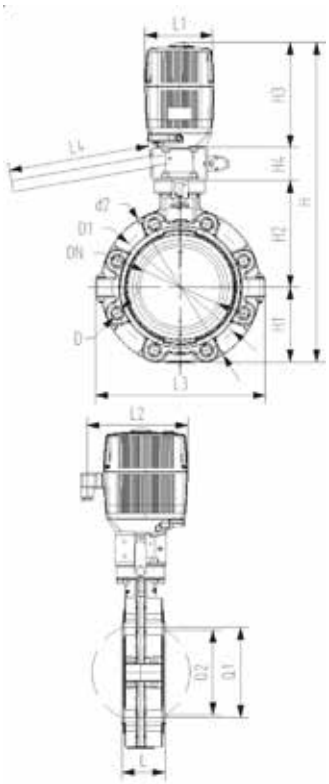
Option:

- Optional accessory: Integrated position feedback with limit switches (sold separately)

Size (inch)	DN (mm)	PN (bar)	EPDM Part No.	SP	weight (kg)
2	50	10	**150 147 482**	1	5.799
2 ½	65	10	**150 147 483**	1	5.956
3	80	10	**150 147 484**	1	6.201
4	100	10	**150 147 485**	1	7.106
5	125	10	**150 147 486**	1	8.620
6	150	10	**150 147 487**	1	10.381
8	200	10	**150 147 488**	1	15.125

Size (inch)	Actuator unit type	d2 (mm)	D	D1 (mm)	H (mm)	H1 (mm)	H2 (mm)	H3 (mm)	H4 (mm)	L (mm)	L1 (mm)	L2 (mm)	L3 (mm)
2	EA-120	160	UNC 5/8	121	459	77	134	188	60	45	122	180	165
2 ½	EA-120	180	UNC 5/8	140	471	83	140	188	60	46	122	180	182
3	EA-120	195	UNC 5/8	152	483	89	146	188	60	49	122	180	210
4	EA-120	226	UNC 5/8	191	521	106	167	188	60	56	122	180	240
5	EA-120	258	UNC 3/4	216	550	121	181	188	60	64	122	180	272
6	EA-120	284	UNC 3/4	241	570	133	189	188	60	72	122	180	300
8	EA-250	341	UNC 3/4	298	637	159	210	208	60	73	122	180	360

Size (inch)	L4 (mm)	Q1 (mm)	Q2 (mm)
2	200	40	
2 ½	200	54	35
3	200	67	50
4	250	88	74
5	250	113	97
6	250	139	123
8	250	178	169



Lugstyle butterfly valve type 147 ABS 24V With manual override

Model:

- Voltage 24V AC/DC
- Connecting dimension: ANSI/ASME B 16.5 class 150, ASTM D 4024, BS 1560, BS EN 1759
- Factory set control range 90°<)

Option:

- Optional accessory: Integrated position feedback with limit switches (sold separately)

Size (inch)	DN (mm)	PN (bar)	EPDM Part No.	SP	weight (kg)
2	50	10	**150 147 522**	1	5.799
2 ½	65	10	**150 147 523**	1	5.956
3	80	10	**150 147 524**	1	6.201
4	100	10	**150 147 525**	1	7.106
5	125	10	**150 147 526**	1	8.620
6	150	10	**150 147 527**	1	10.381
8	200	10	**150 147 528**	1	15.125

Size (inch)	Actuator unit type	d2 (mm)	D	D1 (mm)	H (mm)	H1 (mm)	H2 (mm)	H3 (mm)	H4 (mm)	L (mm)	L1 (mm)	L2 (mm)	L3 (mm)
2	EA-120	160	UNC 5/8	121	459	77	134	188	60	45	122	180	165
2 ½	EA-120	180	UNC 5/8	140	471	83	140	188	60	46	122	180	182
3	EA-120	195	UNC 5/8	152	483	89	146	188	60	49	122	180	210
4	EA-120	226	UNC 5/8	191	521	106	167	188	60	56	122	180	240
5	EA-120	258	UNC 3/4	216	550	121	181	188	60	64	122	180	272
6	EA-120	284	UNC 3/4	241	570	133	189	188	60	72	122	180	300
8	EA-250	341	UNC 3/4	298	637	159	210	208	60	73	122	180	360

Size (inch)	L4 (mm)	Q1 (mm)	Q2 (mm)
2	200	40	
2 ½	200	54	35
3	200	67	50
4	250	88	74
5	250	113	97
6	250	139	123
8	250	178	169

Lugstyle butterfly valve type 147 ABS 100-230V Without manual override

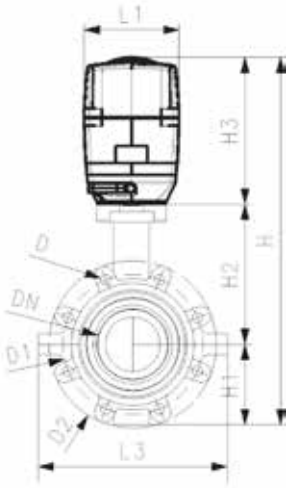
Model:

- Voltage 100-230V, 50-60Hz
- Factory set control range 90°<)
- Connecting dimension: ANSI/ASME B 16.5 class 150, ASTM D 4024, BS 1560, BS EN 1759

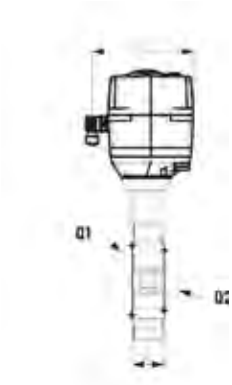
Option:

- Fail-safe return unit, Monitoring board, Position controller, Profibus DP board

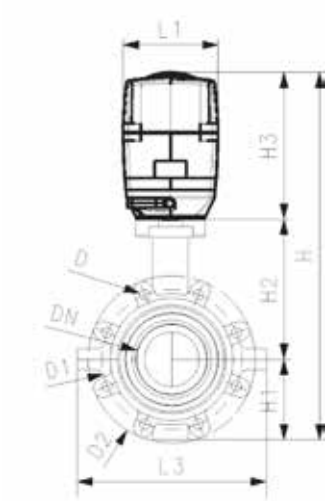
Size (inch)	DN (mm)	PN (bar)	EPDM Part No.	SP	weight (kg)
2	50	10	**150 147 502**	1	4.299
2 ½	65	10	**150 147 503**	1	4.456
3	80	10	**150 147 504**	1	4.701
4	100	10	**150 147 505**	1	5.606
5	125	10	**150 147 506**	1	7.120
6	150	10	**150 147 507**	1	8.881
8	200	10	**150 147 508**	1	13.625
10	250	6	**150 147 509**	1	24.385
12	300	4	**150 147 510**	1	30.916

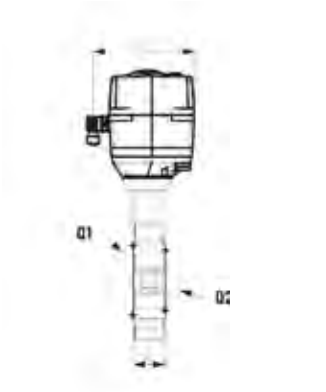


Size (inch)	Actuator unit type	d2 (mm)	D	D1 (mm)	H (mm)	H1 (mm)	H2 (mm)	H3 (mm)	L (mm)	L1 (mm)	L2 (mm)	L3 (mm)	Q1 (mm)
2	EA-45	160	UNC 5/8	121.0	399	77	134	188	45	122	180	165	40
2 ½	EA-45	180	UNC 5/8	139.7	411	83	140	188	46	122	180	182	54
3	EA-120	195	UNC 5/8	152.4	423	89	146	188	49	122	180	210	67
4	EA-120	226	UNC 5/8	190.5	461	106	167	188	56	122	180	240	88
5	EA-120	258	UNC 3/4	215.9	490	121	181	188	64	122	180	272	113
6	EA-120	284	UNC 3/4	241.3	510	133	189	188	72	122	180	300	139
8	EA-250	341	UNC 3/4	298.4	577	159	210	208	73	122	180	360	178
10	EA-250	329	UNC 7/8	362.0	677	205	264	208	113	122	180	440	210
12	EA-250	412	UNC 7/8	362.0	677	205	264	208	113	122	180	440	210



Size (inch)	Q2 (mm)
2	
2 ½	35
3	50
4	74
5	97
6	123
8	169
10	207
12	207





Lugstyle butterfly valve type 147 ABS 24V Without manual override

Model:

- Voltage 24V AC/DC
- Connecting dimension: ANSI/ASME B 16.5 class 150, ASTM D 4024, BS 1560, BS EN 1759
- Factory set control range 90°<)

Option:

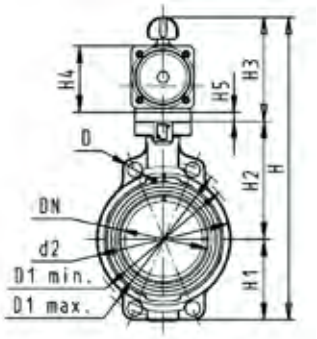
- Fail-safe return unit, Monitoring board, Position controller, Profibus DP board

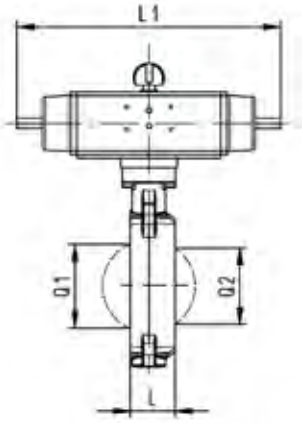
Size (inch)	DN (mm)	PN (bar)	EPDM Part No.	SP	weight (kg)
2	50	10	**199 147 542**	1	4.299
2 ½	65	10	**199 147 543**	1	4.456
3	80	10	**199 147 544**	1	4.701
4	100	10	**199 147 545**	1	5.606
5	125	10	**199 147 546**	1	7.120
6	150	10	**199 147 547**	1	8.881
8	200	10	**199 147 548**	1	13.625
10	250	6	**199 147 549**	1	24.385
12	300	4	**199 147 550**	1	30.916

Size (inch)	Actuator unit type	d2 (mm)	D	D1 (mm)	H (mm)	H1 (mm)	H2 (mm)	H3 (mm)	L (mm)	L1 (mm)	L2 (mm)	L3 (mm)	Q1 (mm)
2	EA-45	160	UNC 5/8	121.0	399	77	134	188	45	122	180	165	40
2 ½	EA-45	180	UNC 5/8	139.7	411	83	140	188	46	122	180	182	54
3	EA-120	195	UNC 5/8	152.4	423	89	146	188	49	122	180	210	67
4	EA-120	226	UNC 5/8	190.5	461	106	167	188	56	122	180	240	88
5	EA-120	258	UNC 3/4	215.9	490	121	181	188	64	122	180	272	113
6	EA-120	284	UNC 3/4	241.3	510	133	189	188	72	122	180	300	139
8	EA-250	341	UNC 3/4	298.4	577	159	210	208	73	122	180	360	178
10	EA-250	329	UNC 7/8	362.0	677	205	264	208	113	122	180	440	210
12	EA-250	412	UNC 7/8	431.8	727	205	285	208	113	122	180	510	256

Size (inch)	Q2 (mm)
2	
2 ½	35
3	50
4	74
5	97
6	123
8	169
10	207
12	253

Pneumatic Actuated Wafer Butterfly Valve





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

Model:

- Control range 90 °
- 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

d (mm)	DN (mm)	PN (bar)	EPDM Part No.	SP	weight (kg)
63	50	10	**199 240 402**	1	3.371
75	65	10	**199 240 403**	1	3.100
90	80	10	**199 240 404**	1	3.399
110	100	10	**199 240 405**	1	5.133
140	125	10	**199 240 406**	1	6.826
160	150	10	**199 240 407**	1	9.779
225	200	10	**199 240 408**	1	13.529
280	250	10	**199 240 409**	1	28.200
315	300	10	**199 240 410**	1	36.200

d (mm)	Actuator unit type	d2 (mm)	D (mm)	D1 min. (mm)	D1 max. (mm)	H (mm)	H1 (mm)	H2 (mm)	H3 (mm)	H4 (mm)	H5 (mm)	L (mm)	L1 (mm)
63	PA-30 FC	104	19	120	125	327	77	134	117	70	15	45	276
75	PA-30 FC	115	19	140	145	340	83	140	117	70	15	46	276
90	PA-35 FC	131	19	150	160	361	89	146	126	78	15	49	326
110	PA-40 FC	161	19	175	191	400	104	167	129	86	0	56	370
140	PA-45 FC	187	23	210	216	436	117	181	139	96	0	64	411
160	PA-50 FC	215	24	241	241	468	130	189	149	106	0	72	423
225	PA-55 FC	267	23	290	295	529	158	210	161	118	0	73	452
280	PA-65 FC	329	25	353	362	808	205	264	191	148	0	113	648
315	PA-70 FC	379	25	400	432	866	228	285	196	157	0	113	663

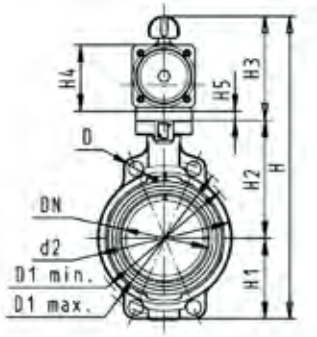
d (mm)	L2 (mm)	Q1 (mm)	Q2 (mm)	closest inch (inch)
63	65	40		2
75	65	54	35	2 ½
90	72	67	50	3
110	80	88	74	4
140	90	113	97	5
160	100	139	123	6
225	112	178	169	8
280	137	210	207	10
315	145	256	253	12

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

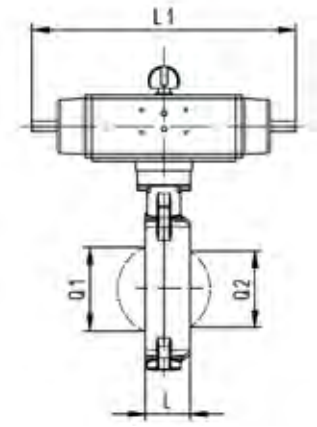
Model:

- Control range 90 °
- 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

d (mm)	DN (mm)	PN (bar)	EPDM Part No.	SP	weight (kg)
63	50	10	**199 240 422**	1	3.371
75	65	10	**199 240 423**	1	3.467
90	80	10	**199 240 424**	1	3.399
110	100	10	**199 240 425**	1	5.133
140	125	10	**199 240 426**	1	6.826
160	150	10	**199 240 427**	1	9.779
225	200	10	**199 240 428**	1	13.529



d (mm)	Actuator unit type	d2 (mm)	D (mm)	D1 min. (mm)	D1 max. (mm)	H (mm)	H1 (mm)	H2 (mm)	H3 (mm)	H4 (mm)	H5 (mm)	L (mm)	L1 (mm)
63	PA-30 FO	104	19	120	125	327	77	134	117	70	15	45	276
75	PA-30 FO	115	19	140	145	340	83	140	117	70	15	46	276
90	PA-35 FO	131	19	150	160	361	89	146	126	78	15	49	326
110	PA-40 FO	161	19	175	191	400	104	167	129	86		56	370
140	PA-45 FO	187	23	210	216	436	117	181	139	96		64	411
160	PA-50 FO	215	24	241	241	468	130	189	149	106		72	423
225	PA-55 FO	267	23	290	295	529	158	210	161	118		73	452



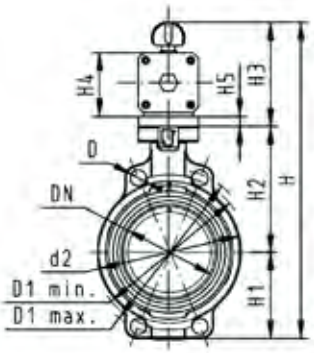
d (mm)	L2 (mm)	Q1 (mm)	Q2 (mm)	closest inch (inch)
63	65	40		2
75	65	54	35	2 ½
90	72	67	50	3
110	80	88	74	4
140	90	113	97	5
160	100	139	123	6
225	112	178	169	8

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

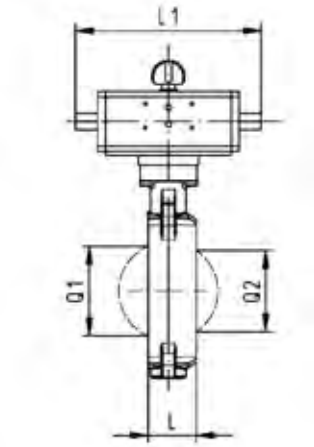
Model:

- Control range 90 °
- 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

d (mm)	DN (mm)	PN (bar)	EPDM Part No.	SP	weight (kg)
63	50	10	**199 240 442**	1	2.221
75	65	10	**199 240 443**	1	2.317
90	80	10	**199 240 444**	1	2.730
110	100	10	**199 240 445**	1	3.385
140	125	10	**199 240 446**	1	4.076
160	150	10	**199 240 447**	1	6.258
225	200	10	**199 240 448**	1	7.529

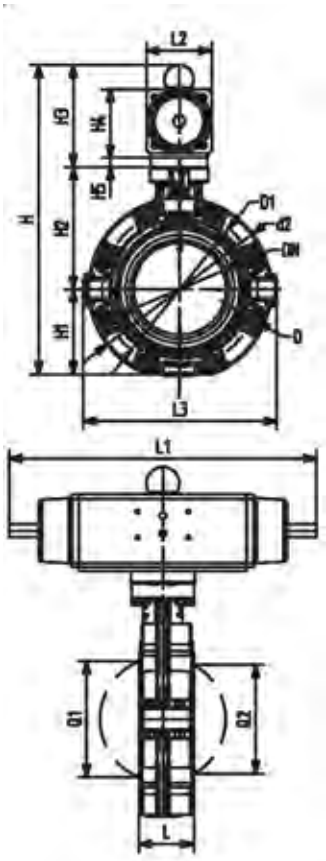


d (mm)	Actuator unit type	d2 (mm)	D (mm)	D1 min. (mm)	D1 max. (mm)	H (mm)	H1 (mm)	H2 (mm)	H3 (mm)	H4 (mm)	H5 (mm)	L (mm)	L1 (mm)
63	PA-35 DA	104	19	120	125	317	77	134	107	60	15	45	177
75	PA-35 DA	115	19	140	145	330	83	140	107	60	15	46	177
90	PA-40 DA	131	19	150	160	348	89	146	113	66	15	49	190
110	PA-45 DA	161	19	175	191	372	104	167	102	71		56	235
140	PA-45 DA	187	23	210	216	408	117	181	111	78		64	235
160	PA-55 DA	215	24	241	241	448	130	189	129	86		72	279
225	PA-55 DA	267	23	290	295	507	158	210	139	96		73	279



d (mm)	L2 (mm)	Q1 (mm)	Q2 (mm)	closest inch (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

Pneumatic Actuated Lug Butterfly Valve



Lug Style butterfly valve Type 244 ABS
FC (Fail safe to close)
Without manual override

Model:

- Housing material: PP-GF30 with 316SS lug inserts
- Control range 90 °
- Connecting dimension: ANSI/ASME B 16.5 class 150, ASTM D 4024, BS 1560, BS EN 1759

Option:

- Optional accessory: Integrated position feedback with limit switches (sold separately)

d (mm)	PN (bar)	Size (inch)	EPDM Part No.
63	10	2	**199 244 402**
75	10	2 ½	**199 244 403**
90	10	3	**199 244 404**
110	10	4	**199 244 405**
140	10	5	**199 244 406**
160	10	6	**199 244 407**
225	10	8	**199 244 408**

d (mm)	Actuator unit type	d2 (mm)	D	D1 (mm)	H (mm)	H1 (mm)	H2 (mm)	H3 (mm)	H4 (mm)	H5 (mm)	L (mm)	L1 (mm)	L2 (mm)
63	PA-30 FC	160	UNC 5/8	120.6	328	77	134	117	70	15	45	276	65
75	PA-30 FC	180	UNC 5/8	139.7	340	83	140	117	70	15	46	276	65
90	PA-35 FC	195	UNC 5/8	152.4	361	89	146	126	78	15	49	326	72
110	PA-40 FC	226	UNC 5/8	190.5	402	106	167	129	86		56	370	80
140	PA-45 FC	258	UNC 3/4	215.9	441	121	181	139	96		64	411	90
160	PA-50 FC	284	UNC 3/4	241.3	471	133	189	149	106		72	423	100
225	PA-55 FC	341	UNC 3/4	298.4	530	159	210	161	118		73	452	112

d (mm)	L3 (mm)	Q1 (mm)	Q2 (mm)
63	165	40	
75	182	54	35
90	210	67	50
110	240	88	74
140	272	113	97
160	300	139	123
225	360	178	169

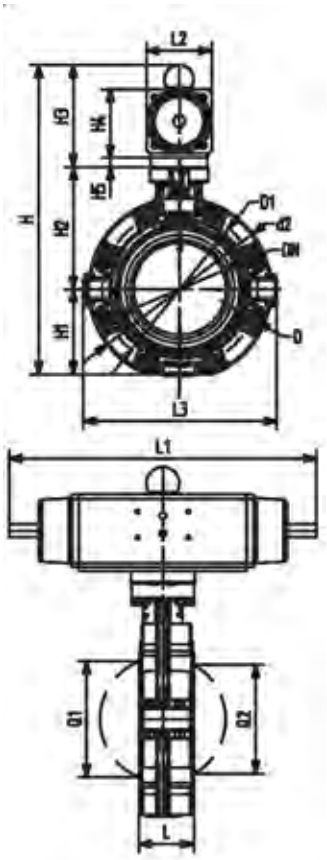
Lug Style butterfly valve type 244 ABS
FO (Fail safe to open)
Without manual override

Model:

- Housing material: PP-GF30 with 316SS lug inserts
- Control range 90 °
- Connecting dimension: ANSI/ASME B 16.5 class 150, ASTM D 4024, BS 1560, BS EN 1759

Option:

- Optional accessory: Integrated position feedback with limit switches (sold separately)



d (mm)	PN (bar)	Size (inch)	EPDM Part No.
63	10	2	**199 244 422**
75	10	2 ½	**199 244 423**
90	10	3	**199 244 424**
110	10	4	**199 244 425**
140	10	5	**199 244 426**
160	10	6	**199 244 427**
225	10	8	**199 244 428**

d (mm)	Actuator unit type	d2 (mm)	D	D1 (mm)	H (mm)	H1 (mm)	H2 (mm)	H3 (mm)	H4 (mm)	H5 (mm)	L (mm)	L1 (mm)	L2 (mm)
63	PA-30 FO	160	UNC 5/8	120.6	328	77	134	117	70	15	45	276	65
75	PA-30 FO	180	UNC 5/8	139.7	340	83	140	117	70	15	46	276	65
90	PA-35 FO	195	UNC 5/8	152.4	361	89	146	126	78	15	49	326	72
110	PA-40 FO	226	UNC 5/8	190.5	402	106	167	129	86		56	370	80
140	PA-45 FO	258	UNC 3/4	215.9	441	121	181	139	96		64	411	90
160	PA-50 FO	284	UNC 3/4	241.3	471	133	189	149	106		72	423	100
225	PA-55 FO	341	UNC 3/4	298.4	530	159	210	161	118		73	452	112

d (mm)	L3 (mm)	Q1 (mm)	Q2 (mm)
63	165	40	
75	182	54	35
90	210	67	50
110	240	88	74
140	272	113	97
160	300	139	123
225	360	178	169

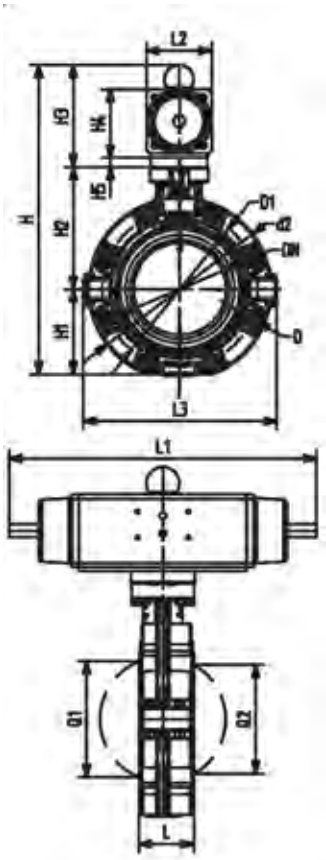
Lug Style butterfly valve type 244 ABS
DA (Double acting)
Without manual override

Model:

- Housing material: PP-GF30 with 316SS lug inserts
- Control range 90 °
- Connecting dimension: ANSI/ASME B 16.5 class 150, ASTM D 4024, BS 1560, BS EN 1759

Option:

- Optional accessory: Integrated position feedback with limit switches (sold separately)



d (mm)	PN (bar)	Size (inch)	EPDM Part No.
63	10	2	**199 244 442**
75	10	2 ½	**199 244 443**
90	10	3	**199 244 444**
110	10	4	**199 244 445**
140	10	5	**199 244 446**
160	10	6	**199 244 447**
225	10	8	**199 244 448**

d (mm)	Actuator unit type	d2 (mm)	D	D1 (mm)	H (mm)	H1 (mm)	H2 (mm)	H3 (mm)	H4 (mm)	H5 (mm)	L (mm)	L1 (mm)	L2 (mm)
63	PA-35 DA	160	UNC 5/8	120.6	318	77	134	107	60	15	45	177	55
75	PA-35 DA	180	UNC 5/8	139.7	330	83	140	107	60	15	46	177	55
90	PA-40 DA	195	UNC 5/8	152.4	348	89	146	113	66	15	49	190	60
110	PA-45 DA	226	UNC 5/8	190.5	384	106	167	111	78		56	235	65
140	PA-45 DA	258	UNC 3/4	215.9	413	121	181	111	78		64	235	72
160	PA-55 DA	284	UNC 3/4	241.3	461	133	189	129	96		72	279	90
225	PA-55 DA	341	UNC 3/4	298.4	508	159	210	139	96		73	279	90

d (mm)	L3 (mm)	Q1 (mm)	Q2 (mm)
63	165	40	
75	182	54	35
90	210	67	50
110	72	88	74
140	272	113	97
160	300	139	123
225	360	178	169

Actuated Valves Accesories

Pressure pilot valve type PV94 3/2-ways

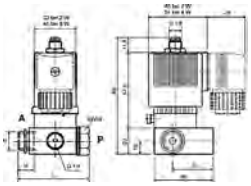
- For direct installation on single acting pneumatic actuators (FC/FO)
- Hollow screw
- Valve material: polyamid/brass

Compressed air connection P	Actuator connection	Voltage	DN (mm)	PN (bar)	Cable plug form	Cv-value (l/min)
NPT 1/8	G 1/8	24 V=	1.2	10	C	48
NPT 1/8	G 1/8	110 V, 50-60 Hz	1.2	10	C	48

NBR Part No.	SP	weight (kg)
199 190 546	0	0.118
199 190 547	0	0.173

Pressure pilot valve type PV95 3/2-ways

- For direct installation on single acting pneumatic actuators (FC/FO)
- Hollow screw
- Power consumption: 24VA at AC inrush; 17VA/8W at AC hold; 8W at DC
- Connector plug form A
- Valve material: polyamid/brass



Compressed air connection P	Actuator connection	Voltage	DN (mm)	PN (bar)	Cv-value (l/min)	NBR Part No.	SP	weight (kg)
G 1/4	G 1/8	110 V, 50-60 Hz	2	10	120	**199 190 534**	1	0.473
G 1/4	G 1/8	230 V, 50-60 Hz	2	10	120	**199 190 535**	1	0.435

General Terms and Conditions of Sale

Always check for the most current General Terms and Conditions and Warranty Statement at www.gfpiping.com under "Catalogs and Pricing"

These GF Piping Systems USA Terms and Conditions (Rev.11/2018) supersede all previous Terms and Conditions for Georg Fischer LLC and Georg Fischer Harvel LLC.

It is the responsibility of the Distributor, Dealer, or Agent to provide a current copy of these Terms and Conditions to the Consumers of Georg Fischer Piping products.

Always check for the most current General Terms and Conditions and Warranty Statement at www.gfpiping.com under "Price Lists," which supersede and replace these General Terms and Conditions and Warranty Statement. If unable to access this website please request a copy at (714) 731-8800.

Acceptance of Terms and Conditions

Acceptance by Customer of GF Piping Systems USA, (hereinafter "Seller") offer of Products for sale is hereby expressly conditioned upon Customer's acceptance of these General Terms and Conditions of Sale and these General Terms and Conditions of Sale will be deemed accepted, as written, despite any language in Customer's purchase order and/or other documentation which is either conflicting or supplemental, unless promptly after this offer, Customer specifically advises Seller of each term and condition not so accepted and Seller accepts Customer's conflicting and/or supplemental term(s) in writing.

Order Acceptance

Seller reserves the right to accept or reject any order. Possession of a price list by Customer does not constitute an offer to sell.

Credit Approval and Minimum Order Charge

Customer credit approval is required prior to any shipment.

The minimum order is $100 net.

List Price, Discount or Freight Charges

List prices, discount, and freight terms are subject to change without notice. All prices are F.O.B. Seller's factory or authorized warehouse at Seller's discretion.

Quotes

All prices provided by the Seller are in US currency and cover only the goods expressly specified. Quotations are valid for a period of 30 days unless otherwise specified. HDPE Pipe pricing is valid for seven (7) days after quote issuance unless otherwise stated or unless there has been fundamental change to our cost exposure within the seven (7) day period.

Payment Terms

Net 30, from date the invoice is issued unless otherwise stated in a specific quotation. No unauthorized deductions allowed, such as deductions for pending Return Material Transactions that are subject to review. Seller reserves the right to apply a finance charge to the balance of any past-due invoice (over 30 days from date of invoice) at a rate of 1.5% per month, 18% per annum. Payment terms on fusion machine rentals net 30; see rental agreement for more details.

Taxes

Seller charges Customer for all sales, excise and other taxes and governmental charges Seller is required to collect from Customer. Customers claiming exemption must furnish documentation required by law, which is satisfactory to Seller to permit Seller to refrain from collecting such charges.

Order Changes or Cancellations

Cancellation or modifications of orders may be possible only with prior written consent from Seller. Since all orders are individually entered for processing immediately upon receipt, Seller reserves the right to charge back to the Customer costs incurred from either order cancellation or order modification. Seller also reserves the right to consider all order additions as new orders and subject to all terms and conditions. Seller will not cancel orders for custom or non-cancelable products if Seller has already produced the product or incurred expenses toward producing the product at the time the Customer seeks to cancel.

Delivery

Seller disclaims liability for consequential damages from late deliveries unless seller assumes liability for such damages in writing when the order is placed. Further, Seller disclaims liability where delivery delays caused by strike, differences with workmen, or causes beyond Seller's control, including but not limited to fires, floods, accidents, government actions, shortages of labor, raw materials, production facilities, or transportation. Where delivery delays are caused by labor problems, Seller is not obligated to seek or obtain any settlement, which, in Seller's judgment, is not in Seller's best interest.

Standard Packaging

Seller will accept orders from Customer exclusively in multiples of the standard packaging quantity or boxed quantity. Seller reserves the right to reject any order that is not a standard packaging or boxed quantity of a Product.

Freight

Continental US – Full freight will be paid on the following orders:

1. Pipe $8,000 net or greater in one of the following categories:

Combination of products to meet freight allowance is at the sole discretion of the Seller.

2. Fittings, Valves, & Actuation $2,200 net or greater

Freight allowed orders will be sent by a designated carrier of Seller's choice. Additional charges will be invoiced to Customer for special handling and airfreight when requested. Standard Pipe lengths require long truck beds for shipping and may be shipped separately from valves and/or fittings purchased on the same order. Valves and/or fittings will be shipped using practical shipping methods.

Freight will not be paid on the following orders:

Unless otherwise specified, shipments are surface, prepaid and added to invoice.

Mode of Shipment and Packaging

Seller reserves the right to ship orders in the most economical manner, as long as the product is shipped on or before the promised ship date. If product ships after the promised ship date, Seller may automatically adjust the shipping method to help improve delivery of the delayed shipment, at no additional cost. If Seller pays freight, Seller may hold shipment until all items become available. Customer bears extra cost of non-standard packaging or handling requested by Customer.

Transfer of Ownership

All products are FOB Seller's facility and title of merchandise transfers when product is loaded onto carrier. Claims for damaged merchandise should be made to carrier by Customer.

Non-Conforming Shipments

Customer must notify Seller in writing within 7 days after receipt of shipments not conforming with Customer's order, stating specifically Customer's claim of non-conformity, or Customer is deemed to accept the shipment as is. If Seller is satisfied the shipment is non-conforming, Seller will (i) credit Customer for the price of defective goods or goods shipped but not ordered (including allocated outbound and return freight) upon return of goods; (ii) promptly ship omitted items waiving Seller's new order charges. Customer is required to make timely payment to Seller of any amount, which is undisputed, or not subject to such claims.

Return of Goods for Credit

Seller accepts returns of certain Engineered Piping Products, Valve and Actuation Products, Signet Instrumentation Products, Waste and Containment Products, PVC/CPVC/HDPE Fittings and Accessories for a standard restock charge of 25%. Pipe and Custom Products are not returnable. Products denoted with a caret (^) symbol in front of the part number in the current Master Distributor Price List have a 40% restock and products denoted with an asterisk (*) symbol are non-cancelable/non-returnable. Only products purchased within the past six (6) months, in original "like new" packaging (full carton quantities), of current design, and listed in the current Master Distributor Price List shall be considered for returns. All products qualifying for return are subject to review for marketability (quantities in question in relationship to historical stock movement) before issuance of a Return Material Authorization (RMA) number. Returns due to Seller's product warranty or order entry/shipping error will not be charged a restock fee. Product for credit consideration should be returned to location designated by Seller. All returns are subject to inspection upon receipt. No credit will be issued until the returned material has been inspected, accepted, and processed. Customers will be contacted if quantity differences and/or non-acceptable material are found during inspection. Any credit issued will reflect only quantities actually received and accepted by Seller. Disposition (return to Customer or scrap) of returned product not accepted back by Seller must be provided by Customer within 10 business days, otherwise it will be subject to disposal. All material returns must be accompanied by a valid Return Material Authorization (RMA) number. RMA numbers may be obtained from the Inside Sales Department. When requesting a RMA, the original purchase order number and date of purchase must be provided. All material returns must be received within thirty (30) days of the RMA issuance. All material returns must be shipped freight prepaid and arrive to Seller's location in saleable condition. No collect shipments will be accepted by Seller. Restock charges and prepaid freight do not apply to warranty defective merchandise or returns due to Seller order entry or shipping errors.

Return of Goods for Warranty Evaluation

When requesting a RMA for material evaluation, Customer must first complete and submit a Material Safety Disclosure sheet and Request For Evaluation form obtained from Customer Service. Material
arriving to Seller without a valid RMA number will be returned to the customer/distributor, freight collect. RMA numbers must be clearly referenced on all shipping documents and shipping containers.

Technical Documentation and Intellectual Property

Unless specified otherwise, technical documents such as drawings, descriptions, illustrations and the like constitute only an approximate guide. Seller reserves the right to make any changes considered necessary. Seller expressly reserves any and all intellectual property rights therein.

Warranty and Limitations

Seller's Products are carefully inspected for manufacturing defects; however, it is not always possible to detect hidden defects.

Seller warrants that its products and/or services shall conform to the description of such products or services as provided to Customer by Seller through Seller's catalog, analytical data or other literature. **THIS WARRANTY IS EXCLUSIVE, AND SELLER MAKES NO OTHER WARRANTY, EXPRESS OR IMPLIED, INCLUDING ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR ANY PARTICULAR
PURPOSE OR COURSE OF DEALING OR USAGE OF TRADE – WHICH ARE HEREBY DISCLAIMED.**

Seller's warranties made in connection with the sale of Products shall not be effective if Seller has determined, in its sole discretion, that Customer has misused the products in any manner, has failed to use the products in accordance with industry standards and practices, or has failed to use the products in accordance with instructions, if any, furnished by Seller. Seller does not warrant any Products or Services obtained through an unauthorized Distributor, Dealer, or Agent.

Limitations of Remedy

Seller's sole and exclusive liability and Customer's exclusive remedy with respect to products proved to Seller's satisfaction to be defective or nonconforming shall be repair or replacement of such products without charge or refund of the purchase price, in Seller's sole discretion, upon the return of such products in accordance with Seller's instructions. **SELLER SHALL NOT IN ANY EVENT BE LIABLE FOR INDIRECT, DIRECT, INCIDENTAL, CONSEQUENTIAL OR SPECIAL DAMAGES OF ANY KIND RESULTING FROM ANY USE OR FAILURE OF THE PRODUCTS, OR IN CONNECTION WITH ANY SERVICES, EVEN IF SELLER HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGE INCLUDING, WITHOUT LIMITATION, LIABILITY FOR LOSS OF USE, LOSS OF WORK IN PROGRESS, DOWN TIME, LOSS OF REVENUE OR PROFITS, FAILURE TO REALIZE SAVINGS, LOSS OF PRODUCTS OF CUSTOMER OR OTHER USE, ANY LIABILITY OF CUSTOMER TO A THIRD PARTY ON ACCOUNT OF SUCH LOSS, OR FOR ANY OTHER EXPENSE, DAMAGE OR LOSS OCCASIONED BY SUCH PRODUCT OR SERVICE, INCLUDING PERSONAL INJURY OR PROPERTY DAMAGE.**

Any and all claims of Customer against Seller must be brought within one (1) year of Seller's tender of delivery, regardless of their nature.

Services

In the event Seller provides any technical or other information, advice, suggestions, assistance, work, training, or services of any kind to Buyer ("Services"), whether or not for a fee, **SELLER MAKES NO WARRANTIES, EXPRESS OR IMPLIED, ORAL OR WRITTEN, WITH RESPECT TO SUCH SERVICES,
EXCEPT AS STATED IN THESE TERMS AND CONDITIONS.** The willingness of Seller to provide the Services is based upon Buyer's acceptance of and agreement to the terms, conditions, and obligations set forth herein and in any related Service Agreement signed by Buyer.

Welder Certifications

Training and certifications, for example, LeveL I, II, III (Welder Certifications) are provided based on the agreement of Buyer to follow and conform to all instructions, recommendations, and requirements of such certifications and related training. Buyer shall indemnify, defend and forever hold Seller and its directors, officers, employees, agents, suppliers, parents, affiliates, subsidiaries, successors and assigns harmless from any and all fines, penalties, suits, actions, claims, liabilities, judgments, costs, and expenses (including reasonable attorneys' fees) resulting or arising from the acts or omissions of Buyer, its directors, officers, employees, agents, suppliers, customers, parents, affiliates, subsidiaries, successors and assigns (all collectively referred to herein as "Buyer") related to or arising from Welder Certifications, or the performance of any related work by Buyer. The foregoing shall apply, but shall not be limited to, injury to person (including death) or damage or harm to property or the environment. Buyer shall not be obligated to indemnify Seller for any fine, penalty, suit, action, claim, liability, judgment, cost, or expense to the extent attributable to Seller's negligence or willful misconduct.

Export Law Compliance

Buyer represents that Products will not be diverted, transshipped, exported or re exported to any country whatsoever, except in accordance with all applicable United States laws and regulations, including, but not limited to the Export Administration Act of 1979, and the regulations issued thereunder.

EU GDPR Compliance

Seller affiliates are subject to the European Union's General Data Privacy Regulation [Regulation (EU) 2016/679] (the "GDPR") when acting as a controller or processor of personal data of an individual data subject located in the European Union, as those terms are defined in the GDPR. Buyer acknowledges and agrees that it may be acting as a processor of personal data for Seller or its affiliates under these Terms and Conditions and that all applicable requirements of the GDPR are incorporated by reference herein. Buyer represents and warrants that (1) it is aware of and understands its compliance obligations under GDPR; (2) it will process personal data received from Seller or its affiliates only in accordance with Seller instructions and only in compliance with GDPR; and (3) with regard to its obligations under these Terms and Conditions it shall comply with all applicable requirements of the GDPR to the same extent as required for Seller.

Assignment

Customer may not assign its rights under or interest in any purchase order without the prior written consent of Seller. These terms and conditions of sale shall be binding upon and inure to the benefit of Customer and Seller, their successors and permitted assigns.

Applicable Law

The sale and purchase of Products and/or Services shall be governed by, and these terms and conditions shall be interpreted in accordance with the laws of the State where the Products purchased hereunder are manufactured or Services purchased hereunder are performed. All disputes hereunder shall be resolved in courts of competent jurisdiction located within the State where the Products sold or Services performed hereunder are manufactured or performed. The parties hereby waive the right to trial by jury.

Relationship of the Parties

The relationship between the parties shall be that of Seller and independent contractor. Neither Party shall be the agent of the other or have authority to act on behalf of the other party, except in a manner and to the extent provided herein or otherwise agreed to in writing. There is no special relationship between the parties or between Seller and any customer of Buyer. This Agreement creates a contractual relationship among the parties hereto, and creates no other relationship, including but not limited to a franchise, partnership, joint venture, agency, or any form of fiduciary or special relationship. Buyer agrees that it will never represent itself to third parties as having any relationship with Seller other than that of independent contractor.

Entire Agreement

These terms and conditions constitute the entire and complete agreement between Seller and Buyer concerning the sale and purchase of Products or Services. Neither party shall claim any modification, amendment or release from any of these terms and conditions unless the parties have entered into a mutual agreement to that effect, signed by Buyer and Seller.

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