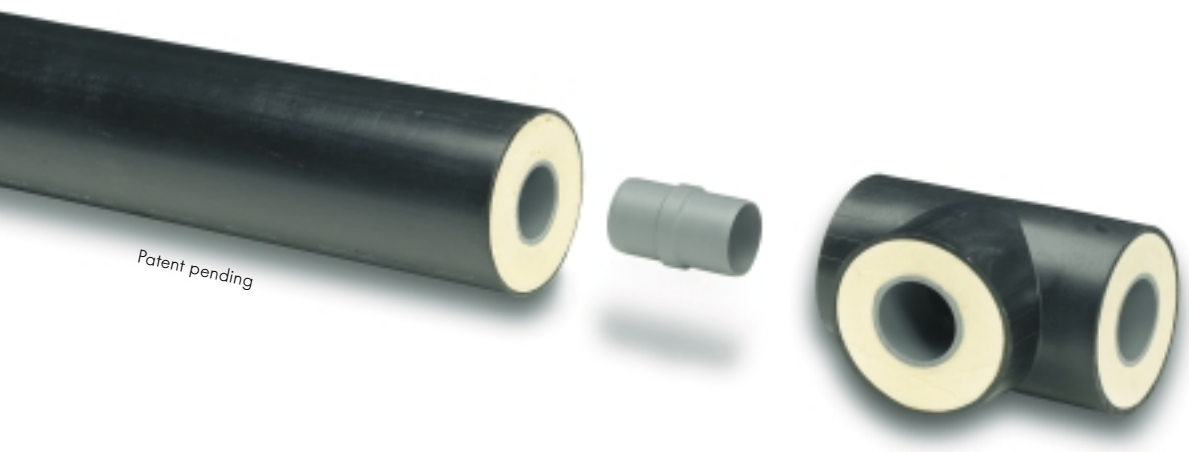
COOL-FIT™



Technical Information and Product Range

GEORG FISCHER +GF+
Piping Systems

Innovative technology
The focus of our research is on the development of new products and improved processes. Over 4,000 patents prove our innovative strength.

Long Standing Know-how
Georg Fischer is the leading supplier of piping systems in plastics.

Local support – worldwide
Our sales companies in over 24 countries and an extensive, qualified network of distributors together with our modern logistics system guarantee availability at all times.

Quality management
The high quality of our products is warranted by ISO 9001 certified quality management systems. In our ISO/IEC 17025 accredited test laboratory, we define the criteria for the market.

Planning support
Take advantage of our know-how. We are glad to share it with you.

COOL-FIT

Contents **Page**

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

General Information

COOL-FIT is a complete system solution for secondary cooling and refrigeration piping systems. The system is based on the tried and tested ABS plastic system from Georg Fischer which contains pipe fittings valves and transition fittings, now with the option for pre-insulated pipe and fittings with outer jackets in either black or white.
You can adapt the system solution to your particular needs.
For example white pre-insulated for food production halls or standard plastic pipe with control valves for pump houses or OEM chillers.

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

Pipe
The ABS pipe and fittings are available in 3 versions.
- standard un-insulated, to be insulated on-site with traditional insulation
- pre-insulated with black PE jacket
- pre-insulated with white PE jacket

Fittings
A complete range of fittings compatible to the pipe is also available either as standard or as insulated with either white or black outer jackets.
The ABS range contains shut-off valves, control valves, automated valves pneumatic and electrical as well as a complete range of transition fittings for metal to plastic connections.
See standard Georg Fischer ABS literature for the complete range available in dimensions d16 to d315mm.

Georg Fischer ABS Raw Material
ABS is a material used in a wide range of general engineering applications from general housings for vacuum cleaners for instance to car bumpers.
Georg Fischer's ABS raw material has been specifically developed for long-life pressure bearing piping systems.
For physical properties see ISO 15493 and Georg Fischer literature Fi 9030, pages 32–34.
Acrylonitrile Butadiene Styrene (ABS) is a styrne acrylonitrile copolymer grafted to polybutadiene to produce an homogeneous material with excellent impact and low temperature characterisitcs. ABS is halogen free with a low thermal conductivity and non-toxic. Georg Fischer ABS has a range of internationally recognised approvals. Please ask if you require any details regarding approvals or raw material properties.

PUR Insulation
COOL-FIT pre-insulated pipe and fittings are delivered ready to install using high density PUR $>$ 45 kg/m^3 as the insulation material, the PUR is CFC free and recyclable.

Jacket Pipes in White and Black
The outer jacket in either black or white is manufactured from high density polyethylene (PE). PE offers extremely good impact resistance and a good resistance to oil splashes and grease or other external contamination. The PE is smooth, non-corroding and thus easy to clean with a long life-span.
White PE offers an aesthetic and hygienic alternative for internal systems for instance in supermarkets or food production halls.
Black PE is UV resistant and thus ideally suited to outdoor applications and for general use.

Typical Working Conditions
With working temperatures ranging from –50 °C to +40 °C for pre-insulated and –40 °C to +60 °C for the standard ABS system with a maximum working pressure of 10 bar (water at +23 °C) COOL-FIT.

Typical Mediums
COOL-FIT can be used for example with the following mediums:
- chilled water and general water
- salt solutions
- glycol solutions
- alcohol solutions

For compatability of ABS to non-water mediums please consult Georg Fischer and see page 15.

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.

COOL-FIT
Top Quality: Minimum On Site Time

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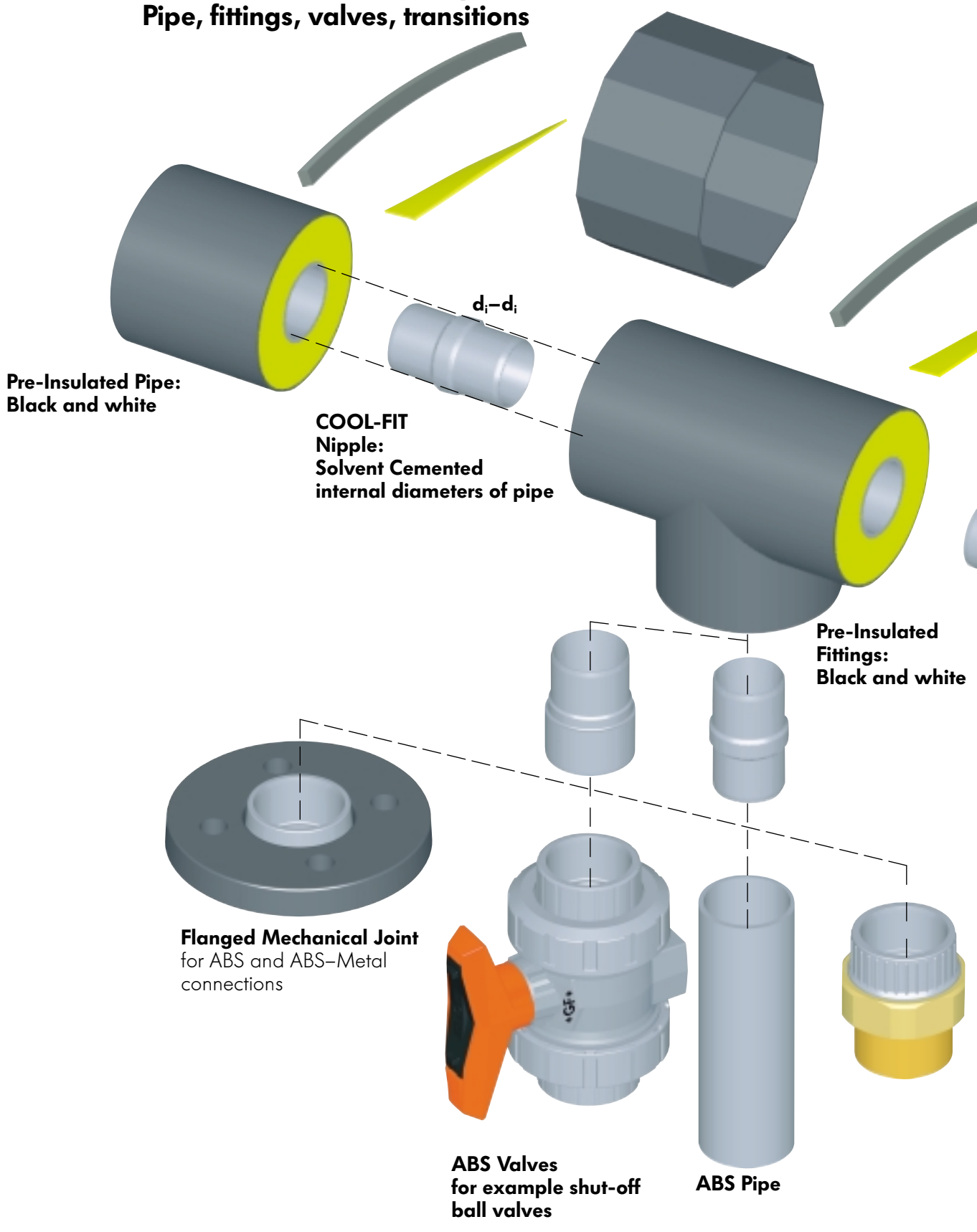
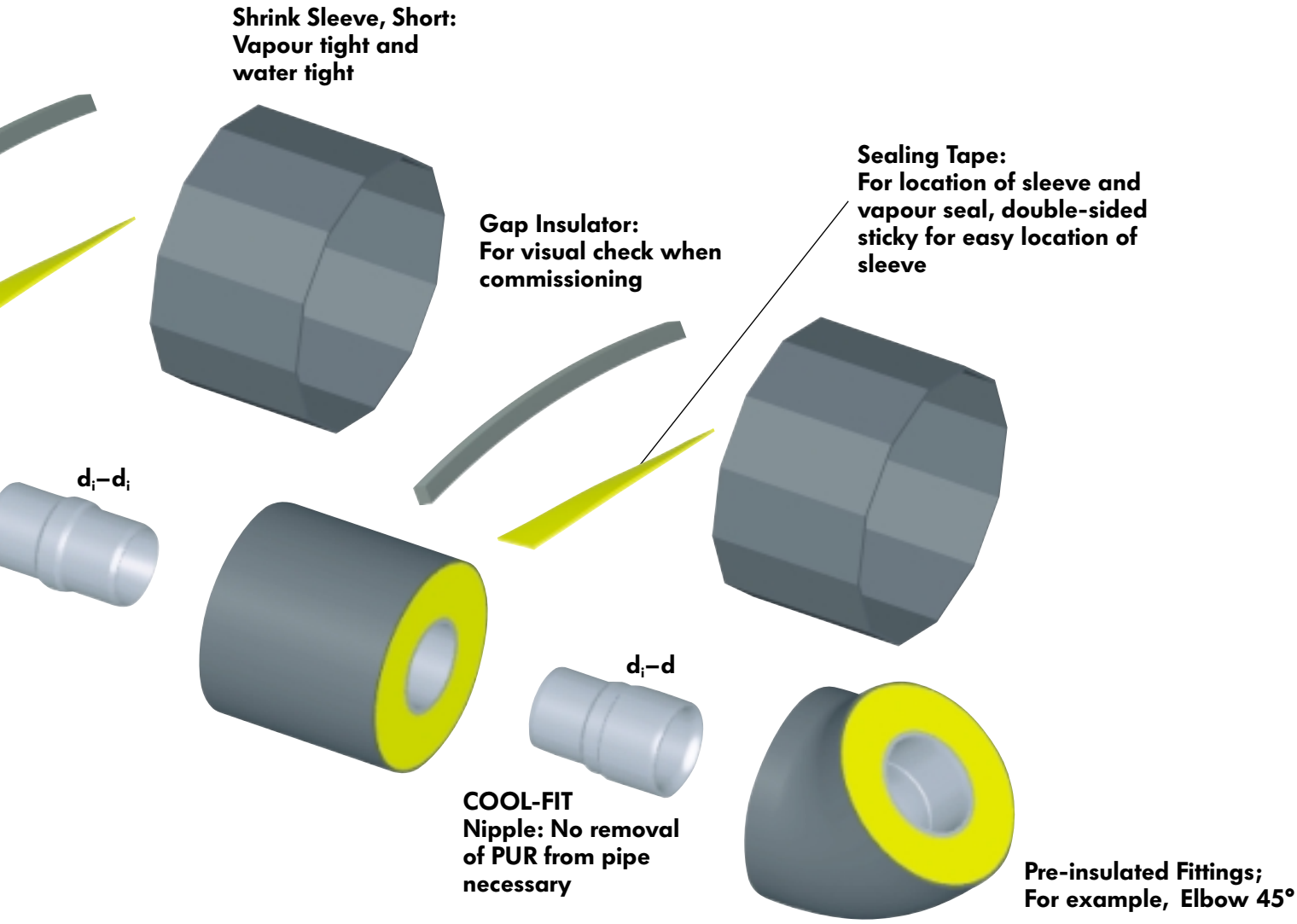
Pre-Insulated pipe and fittings
Standard ABS complete system;
Pipe, fittings, valves, transitions





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

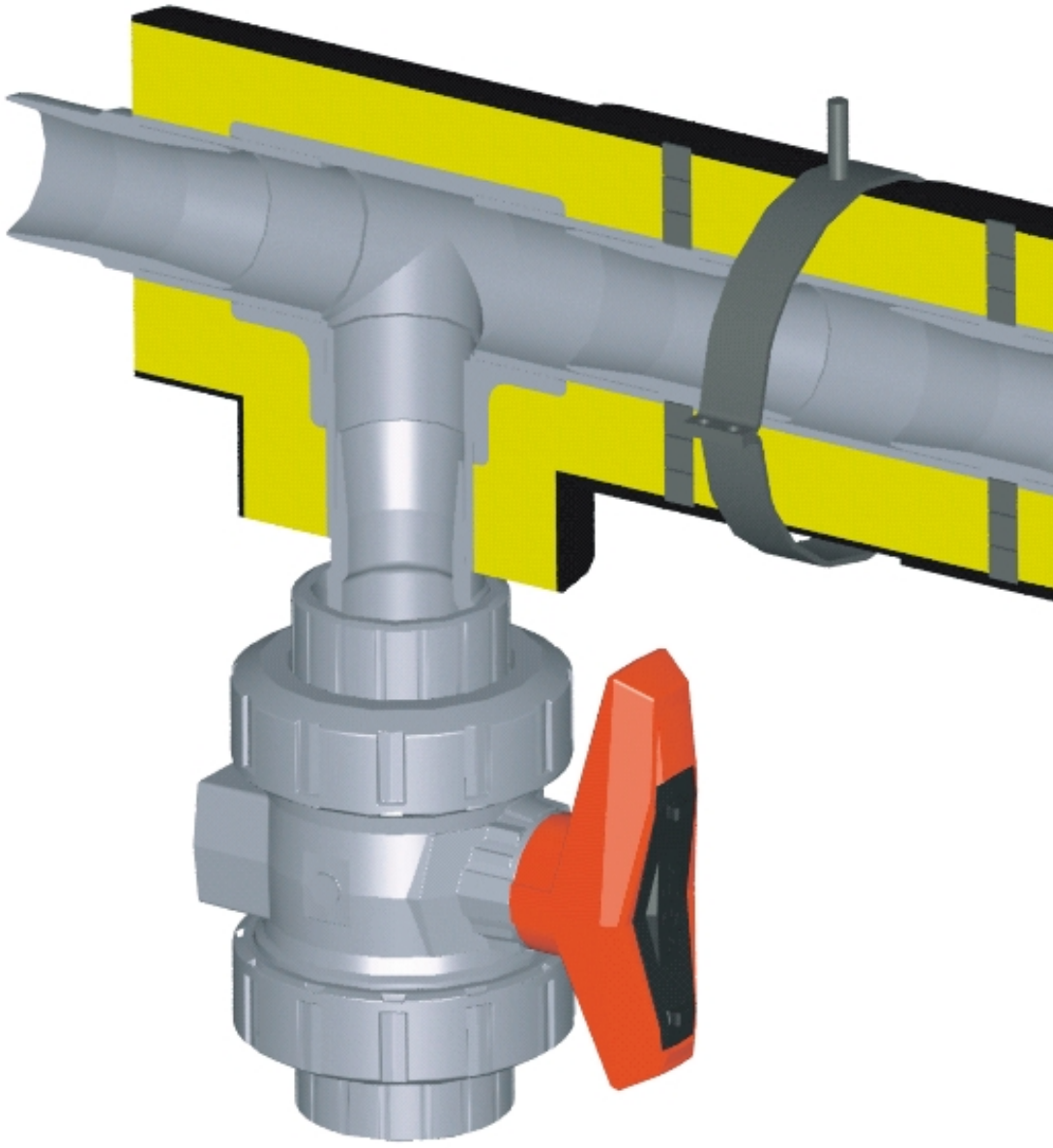
System Advantages: Your Benefit

Speed
Fittings and Pipe 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 down-time, constant long-term efficiency.

Reduce Costs for your Hanging System
Simplified pipe supports on outer jacket, no need for special refrigeration pipe hangers.
Pre-insulated pipe requires about 30% less hangers than standard plastic pipe.
Lower weight compared to metals means lower structural costs.
0.04 mm/m.K expansion coefficient, helps simplify pipeline design.

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



Reliability
Quality Georg Fischer products:
the number 1 Plastics Industrial Piping system manufacturer in the world.
Tried and Tested jointing technique with gap filling, cold welding TANGIT ABS cement.

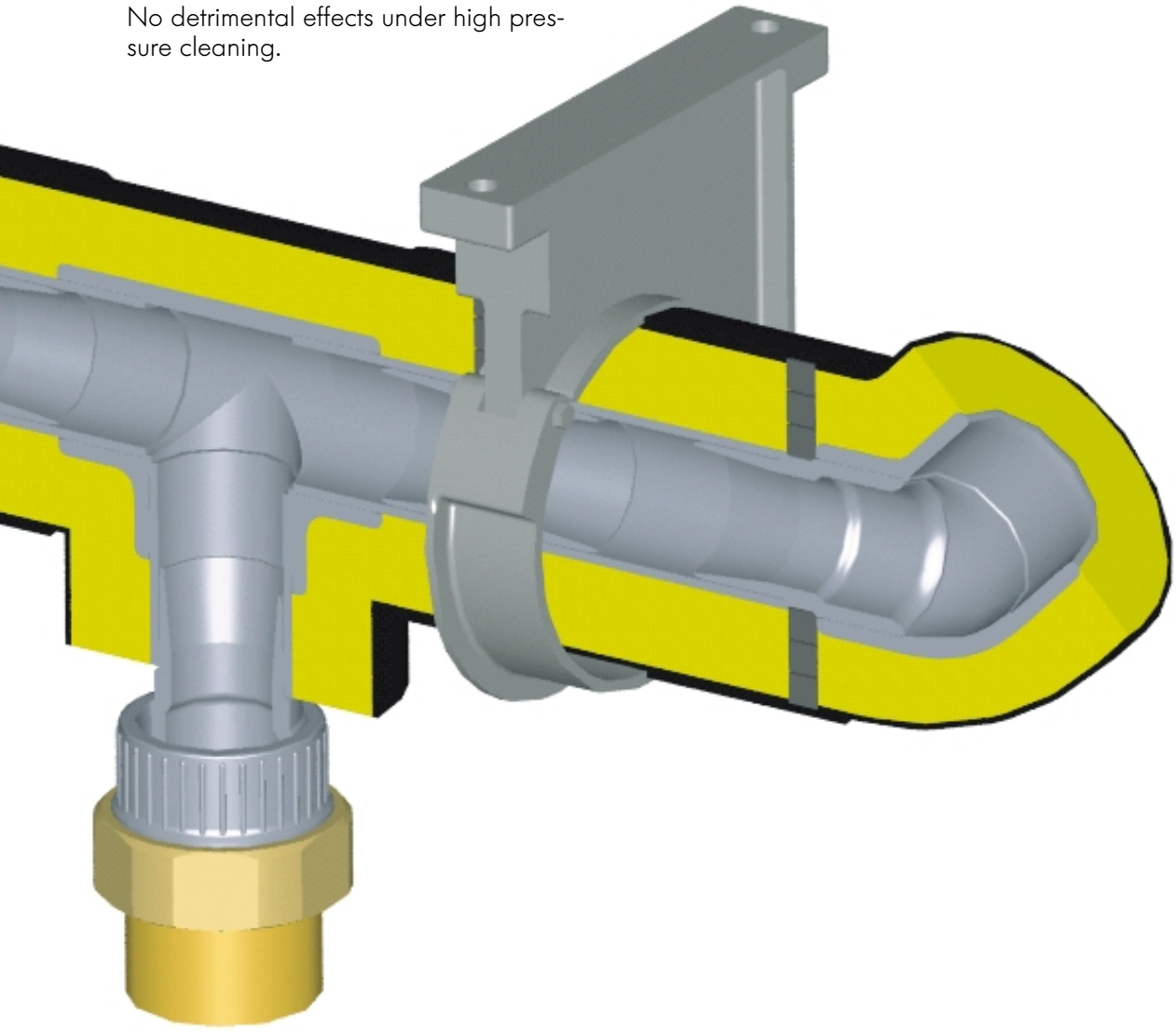
Innovative: Clever
Developed for your needs.
Internal pipe connections means no need to remove the PUR insulation from the pipe or fitting.

Outdoor and Indoor Systems: Vapour Sealed
Black and white shrink sleeve for 100% vapour sealing 100% water tight system.

Hygienic 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 on-line 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.



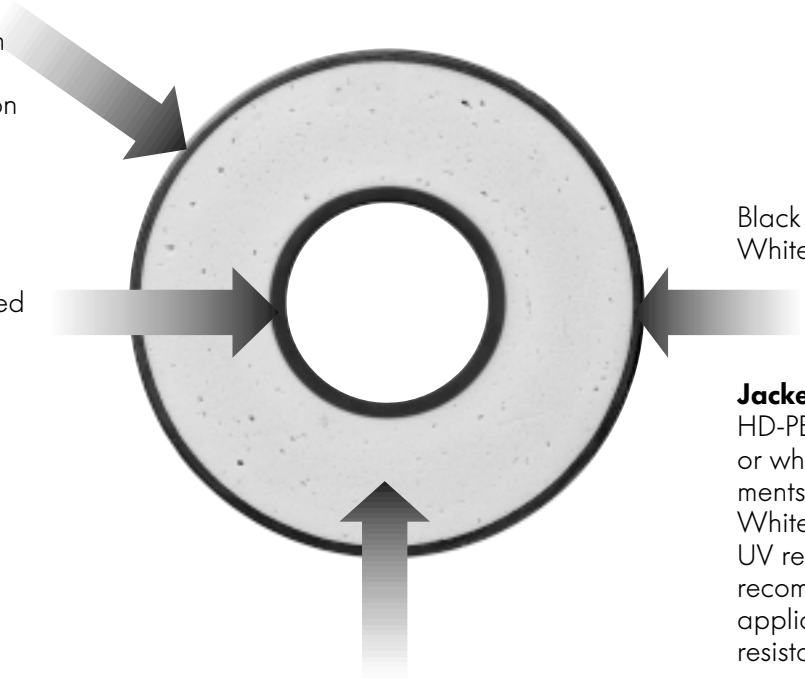
COOL-FIT ABS Pipe Technical Details

COOL-FIT ABS Contraction Coefficient: 0.04 mm/m.K

(One system coefficient for pre-insulated ABS pipe.
All three materials are bonded together deliberately to ensure expansion and contraction as one.)

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

Pipe Specification
Product Identification; Colour, PN 10, Production Date, COOL-FIT, ABS. White has no identification on pipe.



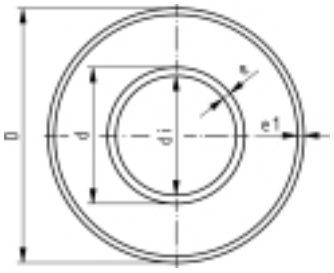
Carrier Pipe ABS
10 bar rated, cement jointed ABS plastic pipe.
5 meter lengths.
ABS Pipe to ISO 15493.

Black	RAL 9004
White	RAL 9010

Jacket Pipe
HD-PE to DIN 8075 in black or white. Functional requirements to EN 253.
White PE is only moderately UV resistant and is recommended for indoor applications. Black is UV resistant.

Hard Polyurethane Foam (PUR)

Thermal Conductivity at 50°C	< 0.026 W/m.K	Foamed using polyol and isocynate	
Axial Shear Strength	≥ 0.12 N/mm²	Expansion Coefficient	0.04 µm/m.K
Tensile Strength	≥ 0.2 N/mm²	Core density	> 45 kg/m³
Compressive Strength	≥ 0.3 N/mm²	Average Cell Sizes	max. 0.5 mm

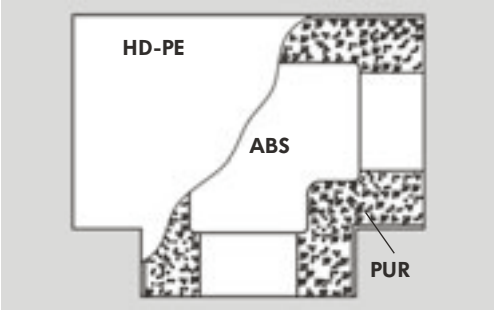


Code Number Black	Code Number White	Carrier Pipe ABS d x e	d_i	Jacket Pipe HDPE D x e1	Weight (PE + ABS + PUR) kg/m	Volume l/m	Pipe Support Distance * m	Heat Transfer Coefficient W/mK
169 017 182	**169 017 282**	25 x 2.3	20.4	90 x 2.2	1.24	0.36	1.55	0.143
169 017 183	**169 017 283**	32 x 1.9	28.2	90 x 2.2	1.29	0.61	1.55	0.177
169 017 184	**169 017 284**	40 x 2.4	35.2	110 x 2.7	1.76	0.95	1.65	0.181
169 017 185	**169 017 285**	50 x 3.0	44	110 x 2.7	1.89	1.49	1.65	0.230
169 017 186	**169 017 286**	63 x 3.8	55.4	125 x 3.0	2.48	2.34	1.75	0.264
169 017 187	**169 017 287**	75 x 4.6	65.8	140 x 3.0	3.17	3.36	1.90	0.290
169 017 188	**169 017 288**	90 x 5.4	79.2	160 x 3.0	4.11	4.80	2.05	0.316
169 017 189	**169 017 289**	110 x 6.6	96.8	180 x 3.0	5.22	7.21	2.20	0.368
169 017 191	**169 017 291**	140 x 9.2	121.6	225 x 3.2	8.16	11.69	2.55	0.382
169 017 192	**169 017 292**	160 x 10.5	139	250 x 3.9	10.34	15.22	2.75	0.405
169 017 193	**169 017 293**	200 x 13.1	173.8	280 x 4.4	13.42	24.50	3.05	0.580
169 017 194	**169 017 294**	225 x 14.8	195.4	315 x 4.9	17.97	30.05	3.30	0.546
		COOL-FIT ABS pipe d250, d280 and d315 available on request						

* COOL-FIT support distance are the same from –50°C to +40°C
d: nominal outside diameter of ABS pipe
d_i: nominal internal diameter of ABS
D: nominal outside diameter of PE pipe
e & e1: nominal wall thicknesses

COOL-FIT ABS Fittings Technical Details

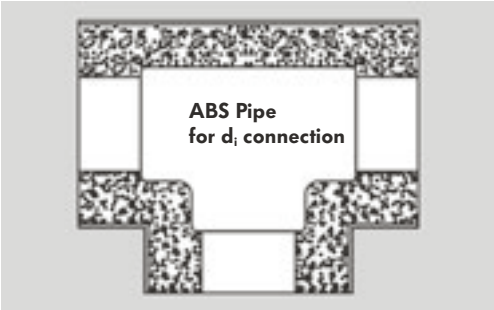
COOL-FIT ABS Fittings are manufactured using the same raw materials as the pipe and are thus completely compatible with the COOL-FIT ABS pipe in terms of insulating properties and also jointing technique.



COOL-FIT ABS Fitting

There are 2 types of COOL-FIT ABS Fittings, namely the di type and the d type.
To cement di fittings to COOL-FIT ABS pipe requires a d_i–d_i fitting.

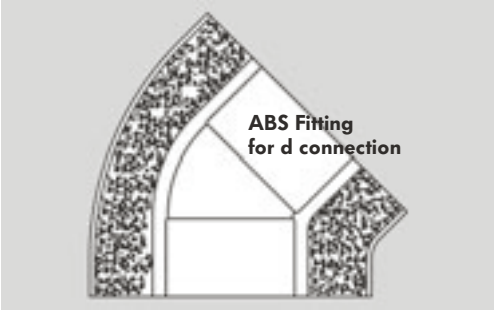
d_i is the designation for a joint which takes place in the internal diameter of the pipe.
d_i25 for instance refers to the internal diameter of d25 pipe.



d_i type fitting

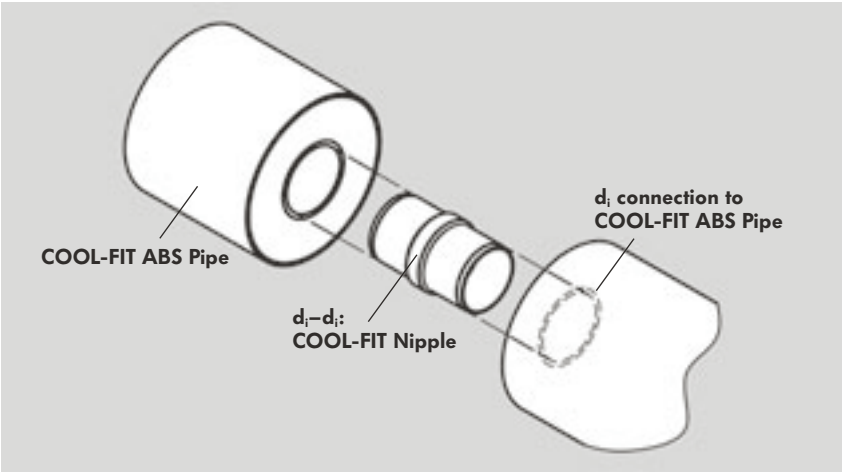
d is the designation for a normal socket solvent cemented joint as per the standard Georg Fischer ABS range.

The jointing material and technique for di and d are the same, with the same cement and the same tooling. Refer to pages 36–39 for details.



d type fitting

COOL-FIT ABS pipe to pipe connections are achieved using the d_i–d_i COOL-FIT nipple, see diagram.
Note: dimensions above d90 must be calibrated using the COOL-FIT Tool, see next page for details.



Accessory Equipment

COOL-FIT Nipple (ABS)
The nipple exists in three versions:

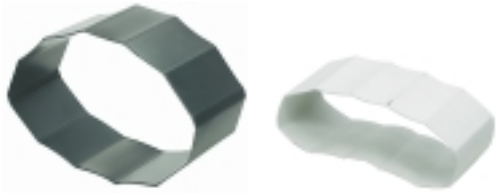
d_i–d_i
for pipe to pipe and pipe to di–di type fitting connections using the internal diameter of the pipes

d–d_i
for pipe to d–di type fitting connections

d_i–d red
to reduce diameter of the carrier pipe (Note: for dimensions d90 and above the COOL-FIT Calibration Tool is required before jointing the internal diameters of the pipe).

COOL-FIT Calibration Tool
It is necessary to calibrate pipe in dimension d90 and above to allow jointing using the COOL-FIT nipple.
This tool calibrates the inside diameter of the pipe to an exact dimension to allow internal jointing.
See page XX for order numbers and pages 42 – 43 for handling instructions.

COOL-FIT Shrink Sleeve, Short
Used to vapour seal the outer jacket in PE. The sleeve is 85 mm wide and can only seal equal dimensioned PE jackets. To ensure a vapour and water tight joint with the same insulating properties as the pipe the mini-sleeve should be used with the gap-insulator and the sealing tape.



COOL-FIT Sealing Tape
A roll of 35 mm wide, double sided mastic tape to vapour seal the joint. Double-sided sticky tape helps locate the shrink sleeve over the gap before shrinking and ensures a top quality seal.

COOL-FIT Gap Insulator
Width 13 mm and a landa / heat conductivity of 0.04 W/m.K, use of this insulation ensures the same insulating properties in the gap as the pipe.

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

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

Tangit ABS and Cementing Equipment
The solvent cementing equipment is exactly the same for internal di jointing as for standard d jointing using Tangit ABS. Code numbers can be found on page 36 in this document, see pages 36–43 for jointing instructions.

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

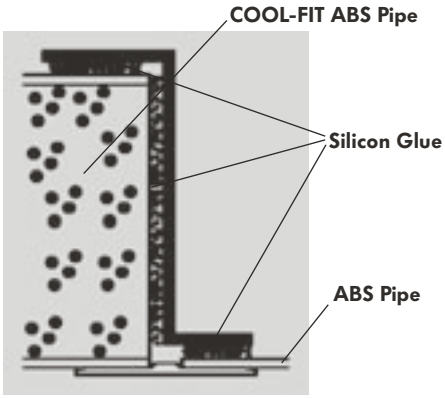
Shrink Sleeve, Long Reducing Diameters
The COOL-FIT «shrink sleeve, short» can only seal equal dimensions of PE outer jacket. The table below shows which dimensions can be sealed using which long shrink sleeve.
NOTE: the sealing tape should be applied to both outer diameters of the PE pipes.

PE Dims (D)	90	110	125	140	160	180	225	250	280	315
Shrink Sleeve, Long	738.011.167 (black) and 738.011.267 (white)									
				738.011.170 (black) and 738.011.270 (white)						
						738.011.173* (black) and 738.011.273 (white)				

* only for use over maximum three dimensions, for example, d315 to d225 or d280 to d180

End-Caps
End-caps are to be used for sealing the PUR against any water ingress at the transition to ABS standard.

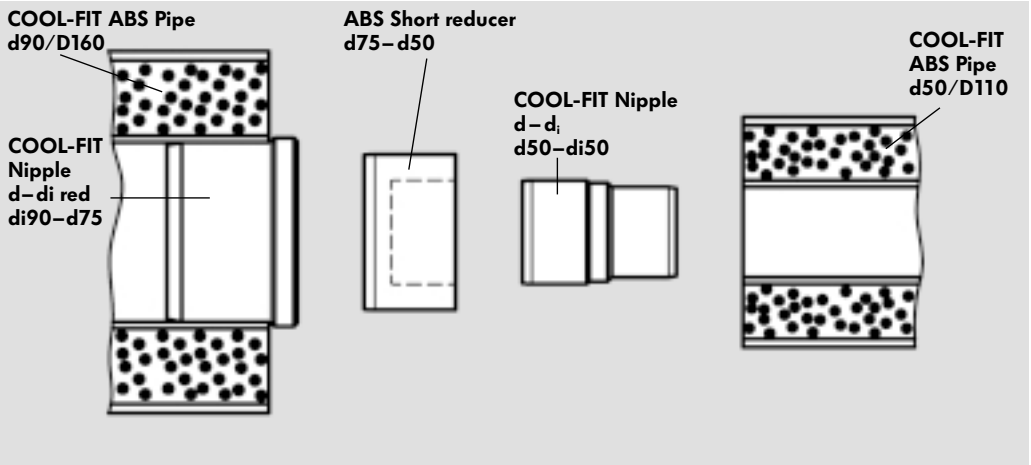
Sealing the PUR should be achieved using a chemically compatible glue to ABS. Georg Fischer offers silicon glue. If silicon products are prohibited then non-solvent based glues can be used. Chemical compatability can also be checked by Georg Fischer.



COOL-FIT ABS Reducing Diameters

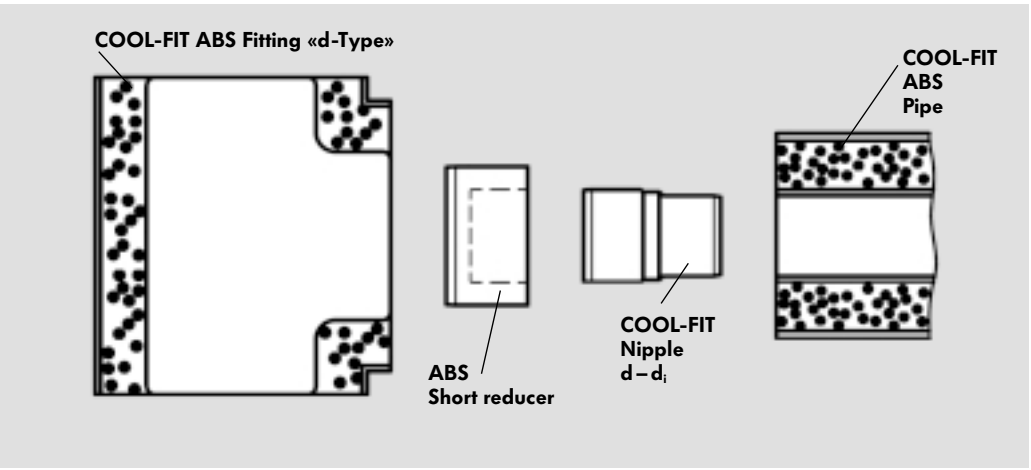
Reducing Pipe Dimensions for COOL-FIT ABS

To reduce the ABS carrier pipe diameter see sketches below. The example below shows how the carrier pipe dimension is reduced from COOL-FIT ABS 90/160 to 50/110.



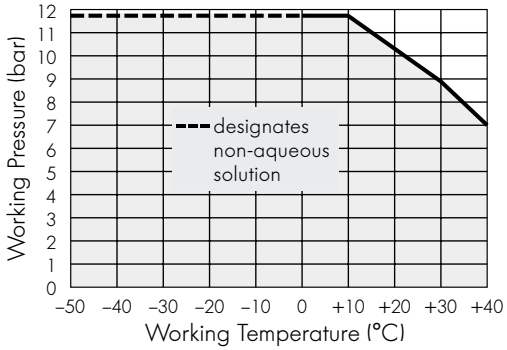
Reducing from a «d-Type» COOL-FIT ABS Fitting to COOL-FIT ABS Pipe

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

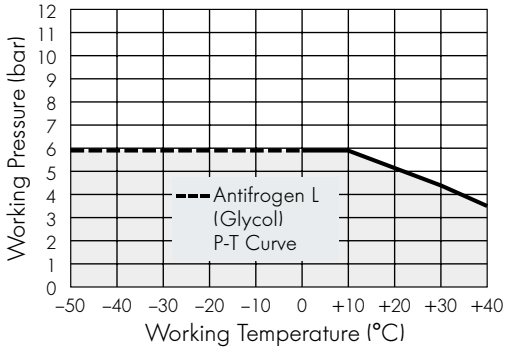


COOL-FIT ABS Pressure-Temperature Parameters

Pressure ratings for thermoplastic pipe are always quoted for water at 20 °C. It can be used at higher temperatures but it is a fundamental principle in thermoplastic pipework that if the working temperature is increased then the working pressure must be reduced.
The table below shows, for COOL-FIT ABS, the maximum permissible pressures at various temperatures up to the maximum allowable working temperature of +40 °C. The table is based on an ambient temperature of 20 °C with water as the medium. A safety factor of 1.8 is incorporated into all calculations with a minimum life span of 25 years.



For working temperatures below 0 °C an anti-freeze 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 de-rating factor has to be applied to the above curve. This is standard procedure for all plastic piping systems.
For **example** if the medium is a water-diluted **glycol** solutions ≤ 50% then a de-rating factor of 0.5 applies to the standard pressure-temperature curve. So at –10 °C for a minimum life-span of 25 years the maximum allowable working pressure is 0.5 x 11.8 = 5.9 bar. For more details regarding these de-rating values for chemical solutions or trade named products please consult Georg Fischer.



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

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

Chemical Resistance
Please consult Georg Fischer for detailed information regarding chemical resistance.
Georg Fischer offers written confirmation on material compatibility for all chemical applications.

Glycol Solutions
ABS can be used with glycol solutions (eg. Antifrogen L, Dowfrost) however a de-rating factor applies to the standard water based temperature – pressure curve, see example.

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

Ice Slurry

Temperature °C	PN 10 bar (145 psi)
–50	11.8
–20	11.8
0	11.8
20	10.5
30	8.9
40	7

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 Georg Fischer ABS and COOL-FIT are both very robust systems, nevertheless, care should be taken during handling and transport to avoid damage. Also thermoplastics have certain physical characteristics, such as a high expansion coefficient, which need to be taken into account in the design phase.

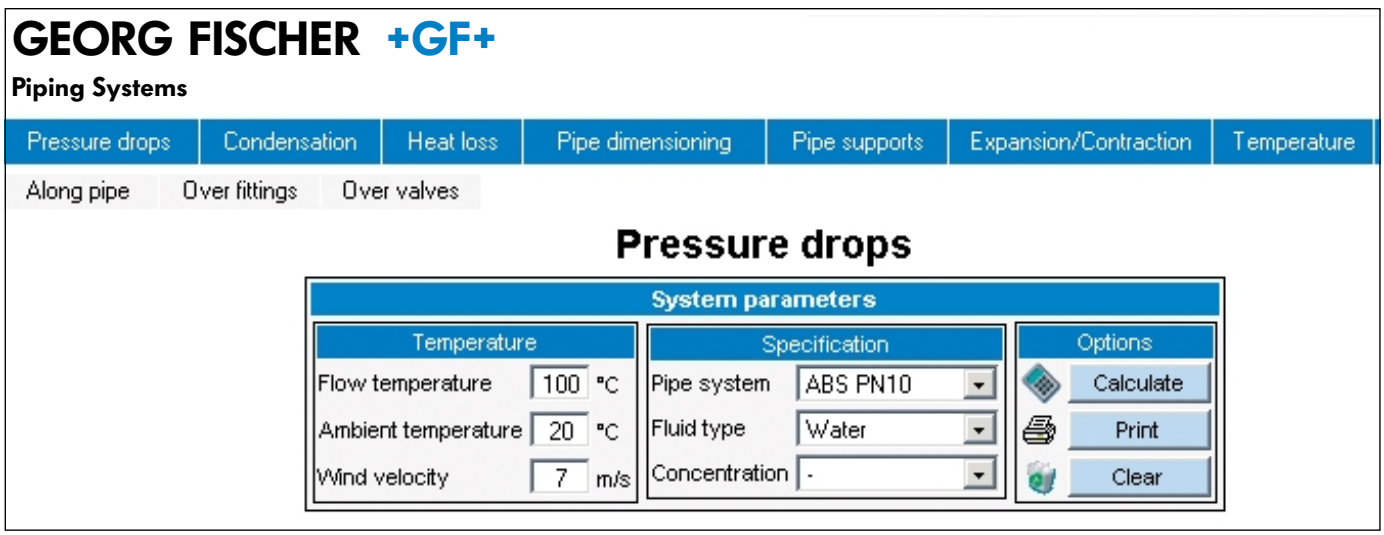
Georg Fischer has been successfully developing and selling plastic pipe systems into a spectrum of high performance installations, such as highly concentrated chemicals, for over 40 years, and experience has shown that when engineers and installers take into account the advice given in our technical 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 Georg Fischer company, consult www.cool-fit.georgfischer.com or e-mail us at info@cool-fit.georgfischer.com for advice if you have any questions.

COOL-FIT and ABS On-Line Calculation Tool
Georg Fischer has developed a calculation tool to calculate accurately and quickly all the necessary parameters for the engineering of secondary refrigeration or cooling systems using COOL-FIT ABS or standard ABS pipe.

On-Line via
www.cool-fit.georgfischer.com



Pipe Pressure Drop (ABS and COOL-FIT ABS)
When calculating the hydraulic pressure loss in m/m in a plastic pipe the excellent smoothness of ABS means that when using the standard Moody Diagram the smooth pipes curve can be used to derive the friction factor.

Imperically it is possible to use the following formulas and procedure to calculate pressure loss in the pipe for any type of fluid.

Pressure Loss in Pipes
The hydraulic loss, in m/m, is given by:

$$\Delta p_{pi} = \frac{2fv^2}{gd_i}$$

where Δp_{pi} = hydraulic loss (m/m)
f = friction factor (dimensionless)
d_i = pipe inside diameter (m)
g = acceleration due to gravity = 9.81 m/s^2
v = flow velocity (m/s)

In order to determine the value of the friction factor (f) the Reynolds number must be used. The Reynolds number is dimensionless and may be considered as the ratio of the dynamic forces of mass flow to the shear resistance due to fluid viscosity. It may be calculated using the following formula:

$$Re = \frac{vd_i}{\nu}$$

The Reynolds number may then be related to the friction factor through an empirical formula such as Blausius' smooth pipe formula:

$$f = \frac{0.079}{Re\ 0.25}$$

valid for Re between 3000 and 10^5.

For thermoplastic pipes the relative roughness is negligable and if the user is using Moody curves the curve labelled «smooth pipes» gives the correct relation. The roughness factor for ABS pipes is K=0.007 mm. Using the derived f value the hydraulic loss, Δp_{pi} can be calculated. Unlike metal pipes no allowance need be made for corrosion and subsequent reduction of pipe bore or roughness.

For ease of calculation nomograms are available in standard Georg Fischer literature.

Pressure Drop in Fittings (ABS and COOL-FIT ABS)
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.

Page 18 contains the ζ-values for common fittings.

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 be calculated according to the following formula:

$$\Delta p_{fi} = \frac{\Sigma\zeta \cdot v^2 \cdot \rho \cdot 1000}{2g}$$

where Δp_{fi} = pressure loss in all fittings (mm)
$\Sigma\zeta$ = sum of the individual losses
v = flow velocity (m/s)
g = acceleration due to gravity = 9.81 m/s^2
ρ = density of the transported medium (g/cm^3 or t/m^3)

Pressure Drop in Fittings

Please note there is a slight difference in the coefficient of resistance factors for standard ABS fittings or for COOL-FIT pre-insulated fittings. This is due to the extra fitting required, namely the internal special nipple and also as some COOL-FIT fittings have a piece of pipe in the fitting, namely the di fittings.

Coefficient of Resistance for ABS Fittings

Pipe outside diameter (d)	**20**	**32**	**50**	**⩾ 63**
Type of fitting	**Coefficient of Resistance ζ**			
90° Bend	1.5	1.0	0.6	0.5
90° Elbow	2.0	1.7	1.1	0.8
45° Elbow	0.3			
Tee 90°	1.5			
Inlet	0.5			
Outlet	0.5			

Coefficient of Resistance for COOL-FIT ABS Fittings

The factors given below are for the COOL-FIT ABS fittings inclusive COOL-FIT nipple.

Pipe outside diameter (d)	**20**	**32**	**50**	**⩾ 63**
Type of fitting	**Coefficient of Resistance ζ**			
90° Bend	1.65	1.15	0.75	0.65
45° Elbow	0.45			
Tee 90°	1.8			
Pipe to Pipe (d_i–d_i)	0.1			0.25
Tee 45°	0.8			1.0

Pressure Drop in Valves (ABS)

Flow Rate / Flow Factor

The k_v factor is defined as the flow rate of water in litres per minute with a pressure drop of 1 kg/cm^2 across the valve.

The relationships between k_v factor, flow rate (Q) and pressure drop ($\Delta\rho$) are given in the following formula:

Liquids with kinematic viscosity less than 22 centistokes

e.g. water, hydraulic oil

$$k_v = Q\sqrt{\frac{\rho}{\Delta p}} \quad \text{or} \quad Q = k_v\sqrt{\frac{\Delta\rho}{\rho}}$$

$$\text{or } \Delta p = \frac{\rho \cdot Q^2}{k_v^2}$$

where Q = flow rate (litres per minute)
ρ = density of the liquid (kg/dm^3)
Δp = pressure drop (kg/cm^2)

Liquids with kinematic viscosity greater than 22 centistokes

The effect of viscosity, caused by friction between the particles of the fluid, is no longer negligable, and the flow rate is reduced. The flow factor must be multiplied by a correction factor, c, to give a new flow factor, k_{vn}.

$$k_{vn} = k_v \cdot c$$

The correction factor is given by:

$$c = 1 + \nu \frac{\sqrt{k_v}}{200 \cdot Q} \quad \text{valid for } c \leq 3 \text{ only}$$

where ν = kinematic viscosity (centistokes)
k_v = flow factor for water (dimensionless)
Q = flow rate (litres per minute)

Pipe Support Distances Horizontals

For ABS at temperatures >+20°C refer to ABS specific literature

	Standard ABS at 20°C water, metres	COOL-FIT ABS water, metres
d16	0.7	–
d20	0.8	–
d25	0.85	1.55
d32	1.0	1.55
d40	1.1	1.65
d50	1.15	1.65
d63	1.3	1.75
d75	1.5	1.90
d90	1.6	2.05
d110	1.8	2.20
d140	2.05	2.55
d160	2.2	2.75
d200	2.3	3.05
d225	2.4	3.30

The above values are for pipe supported using normal 360° pipe clamps. For values using complete axial support please consult the COOL-FIT on-line calculation tool at www.cool-fit.georgfischer.com

Pipe supports for ABS should allow the system to move under the influence of temperature, see «Pipe Supports» page 21 for details.

Heat Transfer Coefficients – Pipe ABS and COOL-FIT ABS

	ABS W/m.K	COOL-FIT ABS W/m.K
d16	1.278	–
d20	1.487	–
d25	1.742	0.13
d32	2.078	0.162
d40	2.413	0.165
d50	2.81	0.213
d63	3.253	0.245
d75	3.643	0.27
d90	4.073	0.293
d110	4.637	0.341
d140	5.319	0.356
d160	5.686	0.381
d200	6.385	0.513
d225	6.73	0.515

Pipeline Design and Layout

Following are the formulas and information required to calculate change in length of the pipe and allowable flexible length.

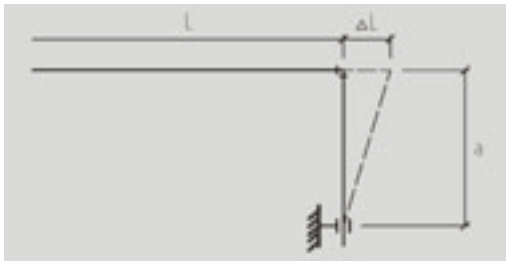
$$\Delta L = L \bullet \Delta T \bullet \delta$$

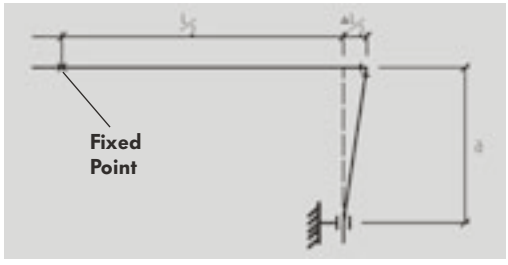
ΔL = change in length of pipe
L = original length of pipe during installation
δ = coefficient of expansion (ABS 0.1, COOL-FIT ABS 0.04 mm/m)
ΔT = difference in temperatures between ambient temperature during installation and normal working temperature.

Expansion and contraction in a pipe line can only take place in a straight direction; It is therefore necessary to calculate the change in length and then design in compensation for this to avoid unnecessary stresses.

Example: Calculating ΔL for the sketch beside for the following assumed conditions would be done as follows.
L = 15 metres (total straight length of pipe)
Ambient temperature during installation = +25 °C
Working temperature of medium = –5 °C
T = –30 (working temperature – installation temperature)
δ = 0.1 mm/m.K (for ABS)
ΔL = 15 x –30 x 0.1
ΔL = –45 mm (minus designates a contraction of the length of pipe)

A simple and effective way to compensate for this change in length is to pre-stress the system and if necessary to place a fixed point in the middle of the line to reduce the amount of lateral expansion.





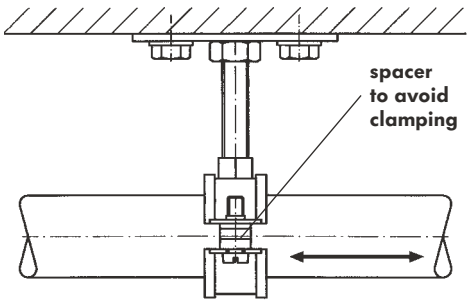
Design of other types of flexible sections and use of compensators is covered in the standard Georg Fischer technical literature for plastic pipe systems.

Pipe Supports for ABS
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.

KLIP-IT, Types 060 & 061
Georg Fischer has its own specially designed pipe support clips in PP and PE for use with plastic pipes. See product range documentation.

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.

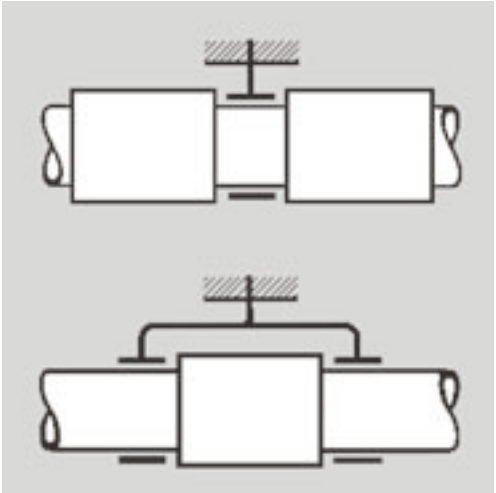


What is a fixed point?
A fixed pipe bracket is a bracket which prevents the pipe from moving horizontally. The aim of which is to control system stresses caused by temperature changes.

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 two sockets as per sketch below or by using a «double headed» bracket, see also sketch below.

See Georg Fischer plastic technical handbook and homepage for details regarding pipeline layout and installation.



Allowable flexible length, H, for ABS
To allow the pipe to bend without stressing it unduely there is a minimum length required between direction change and pipe support. This takes into account the flexibility of the pipe.

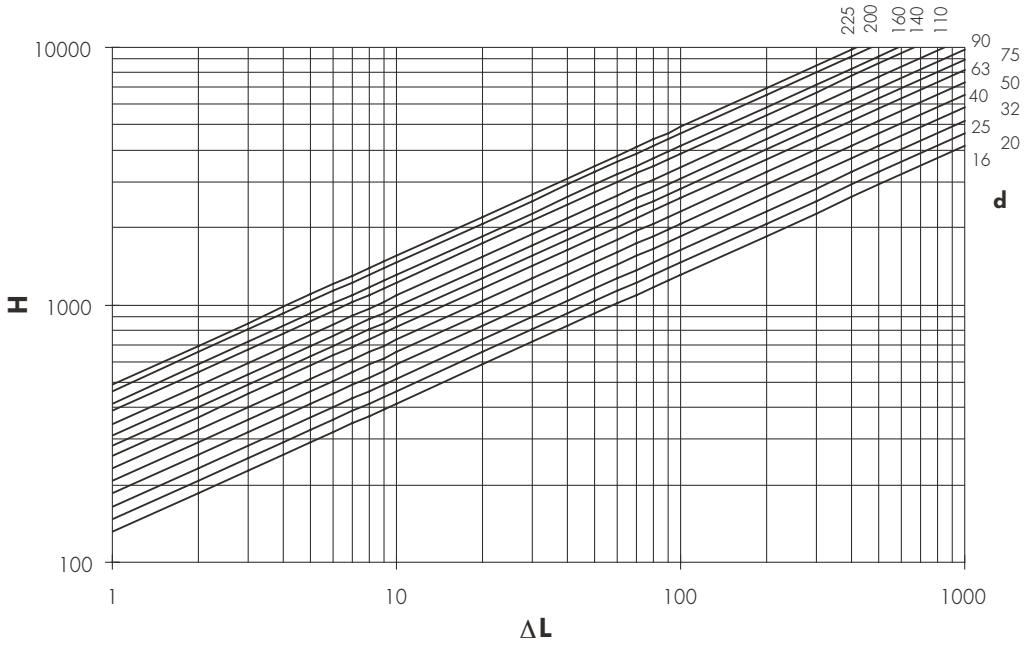
This length is called H is calculated using the formula:

$$H = c \cdot \sqrt{d \cdot \Delta L}$$

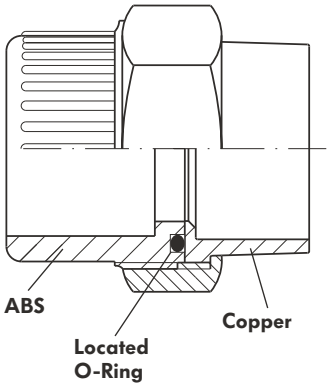
where c is the material constant which is derived from the creep modulus of the material which is:
ABS 32.7

The following table allow the flexible length a to be read from the graph once delta L has been calculated.

Below are the H values for ABS.



For COOL-FIT ABS please contact Georg Fischer Piping Systems.



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

Union Connections
This is the most reliable and cost effective method to connect metal to plastic. Georg Fischer has a whole range of transition unions with O-Rings specially designed to compensate for the changes in length which can occur in ABS and COOL-FIT due to temperature fluctuations. See ABS product range for details of the copper, brass, stainless steel and malleable iron transition unions available.

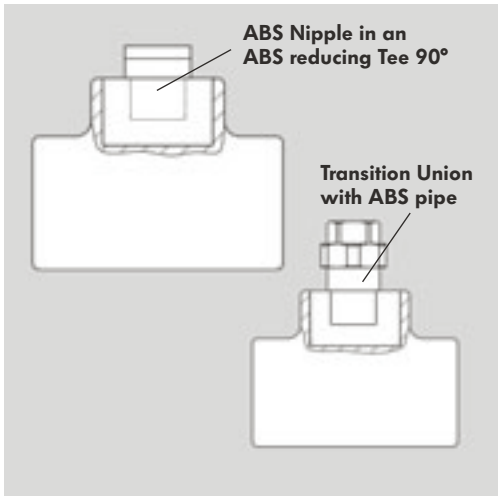
Flange connections
Metal to ABS and also ABS to ABS connections using flange adaptors is possible up to DN300.
For bolt torques, tightening sequences etc please refer to standard the Georg Fischer Plastics Technical Handbook.
Georg Fischer's new revolutionary PN 16 PP V-Flange is light weight, with location stubs to aid installation and is designed to avoid high stresses during tightening. Georg Fischer recommends this type of flange for use with plastic flange connections.
All mechanical connections including flanges should be re-tightened after commissioning if the working temperature is lower than the temperature during installation.

Threaded Connections
Georg Fischer 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.
For sealing threaded joints the mating parts should always be parallel to tapered. In the ABS range only the plastic female thread with reinforced ring should be used for connection to metal threads. For sealing we recommend **only** 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. Mechanical wrenches should not be used to tighten the joint. Namely strap type wrenches prevent damage to the plastic components.

Installation of Measuring Equipment or other Accessories
Following is a summary of the most important details regarding this subject, for more detailed guidelines please consult www.cool-fit.georgefischer.com.

Measuring Equipment in an ABS System
ABS saddles are available for mid to large dimensions to be cemented to the pipe using a wedge to fix the parts to allow curing of the cement.
Please consult Georg Fischer or www.cool-fit.georgefischer.com for the availability and fitting instructions for these fittings.

Tee 90° reduced
Standard ABS tees can be fitted with a short reducer and then a threaded nipple or a piece of pipe with a transition union to install equipment, this should be planned in in the design stage of the plant. We recommend use of a transition union rather than a threaded connection.



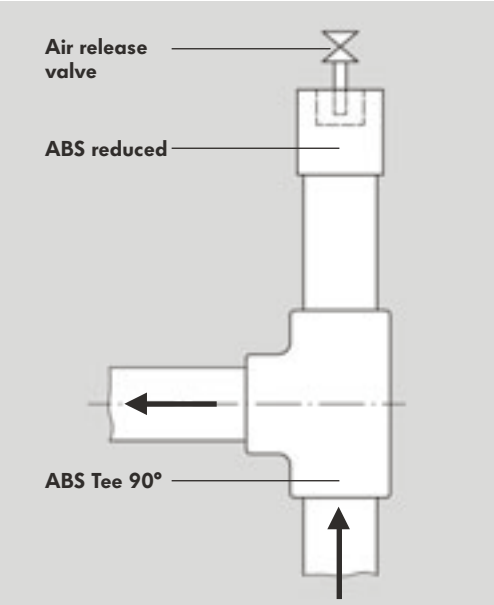
Retro-Installation of Equipment: into an already existing system
For dimensions >d90 it is possible to use the extra wall thickness in a cemented joint to bore through pipe and fitting and install a transition union.
See www.cool-fit.georgefischer.com for installation details.

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

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

- always fill the system slowly from the bottom up
- induce a vacuum in the system before filling
- install manual and/or automatic de-aerators at the highest points in the system
- long horizontal runs should be installed at a slight gradient
- avoid low points i.e. U-configurations where air can be trapped
- install de-aerators 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

For further information see www.cool-fit.georgefischer.com



SIGNET Flow Measuring Equipment
Georg Fischer 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 Georg Fischer for installation fittings details.

Curing Time
After jointing the components should be left for 2 – 3 minutes before handling. For detailed instructions see ABS jointing instructions or standard ABS literature. The length of curing time required depends on the ambient temperature and operating pressure. See standard ABS literature for details. Generally, the waiting time after the last joint before pressurising the system at 15 bar (PN10) must be at least 15 hours. If the pipe is only subjected to the operating pressure then 1 hour per 1 bar of pressure can be applied.

COOL-FIT ABS:
Please remember to place the shrink sleeve over the pipe before jointing and leak test the system before sealing the gap betwen fittings and pipe.

Pressure Testing
Medium: We recommend the use of water as testing medium. The solvent gases which may be left in the pipe after jointing dissolve in water and thus water also removes all excess solvents from the system. Water also has a very low compression ratio and is thus safer as a testing medium.
If water is not practical then inert gases can be used with ABS and COOL-FIT. However the maximum test pressure should not exceed 6 bar.
Compressed air should not be used with ABS or COOL-FIT.

Pressures:
For water 1.5 x working pressure, to a maximum of PN + 5 bar.
For pressure testing with gases maximum pressure allowed is 6 bar.

Time under Pressure Test:
We recommend that the system is left at the test pressure for minimum 6 hours to ensure complete leak tightness control.

Insulation

Insulating ABS
ABS is not chemically resistant to solvents. Solvents are used in the jointing process to soften and swell the ABS to create a weld. This use of solvent takes place under controlled conditions and uses double wall thickness by inserting pipe in fitting.
Any other contact of solvents with ABS should be avoided. Some insulation materials on the market use solvent based glues to position the insulation, as per manufacturers' instructions only the insulation itself should be glued together.

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

Insulation to avoid Dew on ABS
To calculate the necessary thickness of insulation required on ABS to avoid Dew or Condensation can be done via Georg Fischer's on-line cooling calculation program, see
www.cool-fit.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 trade-name 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 COOL-FIT.

COOL-FIT ABS: Condensation, Yes or No?
COOL-FIT 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 COOL-FIT ABS dew will appear on the outside of the pipe or not.

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

For example:

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

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

Foaming ABS with PUR On-Site
There are various types of PUR on the market using different types of activators to initiate the foaming process. All are however an exothermic reaction, i.e. generate heat, usually reaching temperatures of about 120 °C, which can be dangerous for thermoplastics. ABS has a vicat point, softening point of 98 °C, this means that any temperatures reached above this have a detrimental effect on the ABS. Also usually the foaming on-site takes place in an enclosed volume which then causes external pressures on the component. For these reasons we recommend that ABS fittings and pipe are not insulated using PUR foaming on-site. COOL-FIT is foamed under controlled conditions ensuring that the quality of the ABS is not affected by the PUR foaming process.

COOL-FIT Under-Ground
COOL-FIT ABS can be used underground. Standard guidelines for laying of plastic pipe systems underground should be followed.

Under normal circumstances it is not necessary to building any expansion loops into the system. Note: avoid movement of the pipe before filling the trench. Please consult Georg Fischer for recommendations regarding underground installation.

De-Frosting
Many secondary refrigeration loops are not only used for normal and low temperature cooling but are also used for defrosting. Georg Fischer has many years of good experience with the use of ABS in such dual de-frost / cooling systems without any detrimental effects to the system.

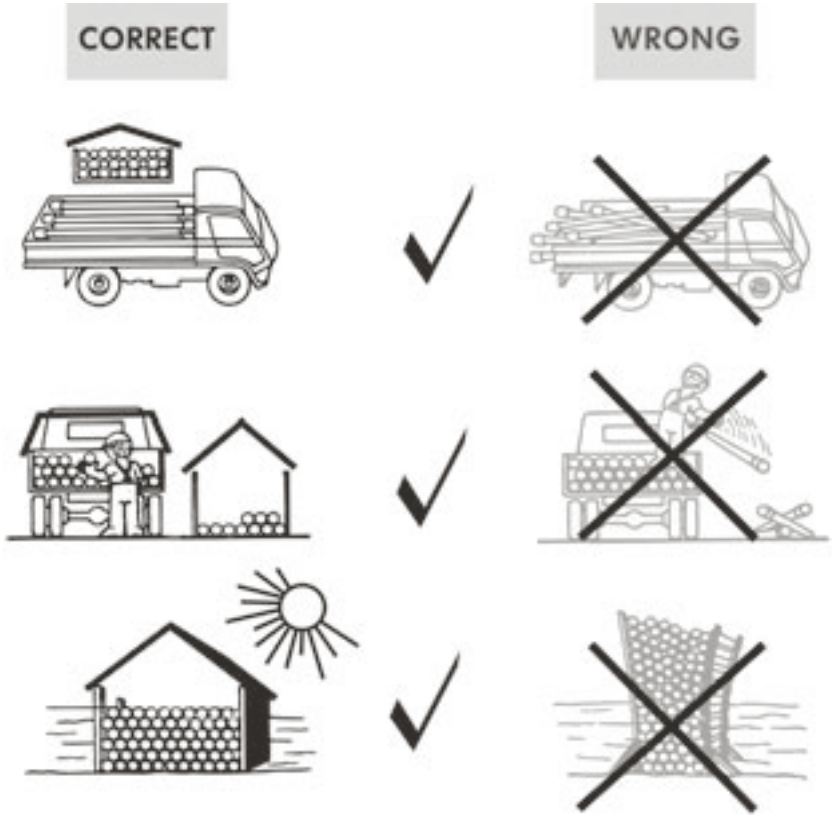
Long Term Life-Span of ABS Pipes
One of the major differences in physical characteristics between plastics and metals is the physical characteristic creep. Creep is a time related physical property of plastics. Under a constant stress plastics strain and the amount of strain is time related.
This characteristic is taken into account in the Pressure-Temperature curve which is based on a minimum Life-Span of 25 years and with a safety factor of 1.8. This curve and further background data relating to creep, the long term hydrostatic curves, and other system defining criteria can be found in ISO 15493.

Storage
All plastic pipes including pre-insulated plastic pipes, i.e. COOL-FIT ABS should be stacked on a flat surface free from sharp edges, such as stones or building debris for instance. During handling care should be taken to avoid damage to the outside surface of the pipe, for instance no dragging along the ground. Avoid pipe overhangs when stored as this will cause the pipe to bend.

UV Resistance
Most plastics suffer some loss of physical properties when exposed to UV light, only PE Black, used also for the outer jacket of the COOL-FIT ABS black, is UV resistant.
The impact strength of ABS reduces under UV light over a time period of approximately one year, after which the oxidised layer on the outside surface of the ABS acts as a barrier and the impact strength does not deteriorate further. Although the ABS impact strength is reduced under UV light it still remains at a very high level.

The Environment
ABS and COOL-FIT ABS are halogen free. The materials used in COOL-FIT ABS namely ABS, PE and PUR are all recyclable materials.
Georg Fischer 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.


The Swiss Association for Quality and Management Systems
Georg Fischer Piping Systems Ltd.
CH-8201 Schaffhausen



Flammability
A means of measuring flammability is by using the limiting oxygen index (LOI) to ASTM 2863 or BS2782-141. These values are shown below for the COOL-FIT raw materials and for comparison purposes some other commonly used materials.

A material with a LOI value above 21 does not support combustion in air at room temperature.

Material	LOI
ABS	18.3–18.8
PE	17.4
Cotton	16–17

ABS Flammability
According to UL-94, ABS has an HB (Horizontal Burning) flammability coefficient and falls into building material class B2 (conventional inflammable, non-dripping) according to DIN 4102-1. 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 fire-fighting 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 53438-1 as K2. According to DIN 4102 part 1 and ÖNORM B3800 part 1, PE is listed as B2 (normally flammable). In the French classification of building materials, polyethylene corresponds to M3 (of average flammable rating).
The self ignition temperature is 350°C. Suitable fire-fighting agents are water, foam, carbon dioxide or powder.

PUR Flammability
Rigid polyurethane-based foams are effective insulation materials commonly used in the construction industry. Polyurethane foam will burn if exposed to flames. The combustibility characteristics vary with chemical composition. Unlike expanded polystyrene (eps), polyurethane does not melt. It flashes into flames between 800°F and 850°F, and only chars rather than melts at temperatures below that range. The charring may in fact help protect the adjacent foam. Some studies have indicated that Douglas Fir was more toxic than polyurethane foam. In a paper presented at the 1985 Society of the Plastics Industry, annual meeting on polyurethane foam. Please consult Georg Fischer for further details.

ABS Metric Piping System Specification

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

2 Acrylonitrile Butadiene Styrene Material
Georg Fischer 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 ISO 15493, as supplied by Georg Fischer.
For detailed physical properties see Georg Fischer literature reference Fi9030, pages 28–30.

3 ABS Pipe
All ABS pipe shall be metric sizes manufactured in accordance with the requirements of ISO 15493, supplied by Georg Fischer.

4 ABS Fittings
All ABS fittings shall be metric sizes manufactured by Georg Fischer or equal, with dimensions and tolerances in accordance with ISO 727 and ISO 15493. All threaded connections shall have pipe threads in accordance with the requirements of ISO 7-1:1994.

5 ABS Valves
All ABS valves shall be metric sizes manufactured by Georg Fischer or equal in accordance with DIN 3441 Parts 1 to 4.

6 Solvent Cement Jointing and Installation
Should be in accordance with Georg Fischer's Guide to the Installation and Use of Plastic Pipelines.

COOL-FIT ABS Pipe and Fittings Specification

1 Scope
This specification covers requirements for Georg Fischer COOL-FIT ABS (pre-insulated ABS pipe and fittings), intended primarily for use in refrigeration and cooling plants for the secondary piping systems. The system consists of pre-insulated pipe and fittings using ABS carrier pipe and fittings, with insulation from PUR and outer jacket in PE.
The components of the COOL-FIT ABS pipe and fittings are in accordance with the following standards.

2 ABS Carrier Pipe and Fittings
2.1 Raw Material
Georg Fischer ABS pipes and fittings shall be manufactured from acrylonitrile butadiene styrene, ABS. The raw material used shall be a material for use with pressure bearing plastic pipe systems in accordance to ISO 15493. For detailed physical properties see Georg Fischer literature reference Fi9030, pages 32–34.

2.2 Physical Properties
The ABS carrier pipe and fittings shall be manufactured to metric sizes in accordance with the requirements of ISO 15493, supplied by Georg Fischer.

3 PUR Insulation
The insulating material shall be hard polyurethane foam, PUR, with a thermal conductivity, landa value, of <0.026 W/mK and a density of >45 kg/m^3.

4 HD-PE Outer Jacket
The outer jacket shall be manufactured from HDPE, high density polyethylene, black and white. Colours of the jacket shall be black to RAL 9004 and white to RAL 9010. The black jacket shall be UV resistant in accordance to DIN 8075.

5 Solvent Cement Jointing and Installation
Should be in accordance with Georg Fischer's Guide to the Installation and Use of Plastic Pipelines.

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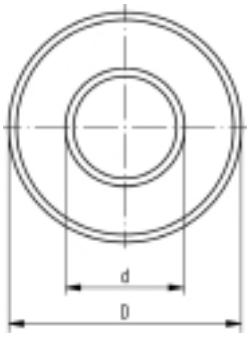
+GF+ COOL-FIT Pipes



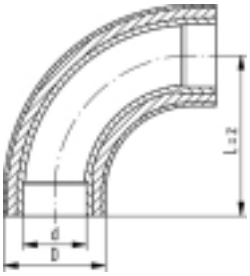
Pipes pre-insulated, ABS, metric

Model:

- 5m pipe lengths
- Outer jacket PE-HD, available in black and white
- Small quantities available with shorter delivery time (extra price)

d	D	PN	black Code	SP	kg/m	white Code	SP	kg/m	
25	90	10	**169 017 682**			**169 017 782**			
32	90	10	**169 017 683**			**169 017 783**			
40	110	10	**169 017 684**			**169 017 784**			
50	110	10	**169 017 685**			**169 017 785**			
63	125	10	**169 017 686**			**169 017 786**			
75	140	10	**169 017 687**			**169 017 787**			
90	160	10	**169 017 688**			**169 017 788**			
110	180	10	**169 017 689**			**169 017 789**			
140	225	10	**169 017 691**			**169 017 791**			
160	250	10	**169 017 692**			**169 017 792**			
200	280	10	**169 017 693**			**169 017 793**			
225	315	10	**169 017 694**			**169 017 794**			

+GF+ COOL-FIT Fittings

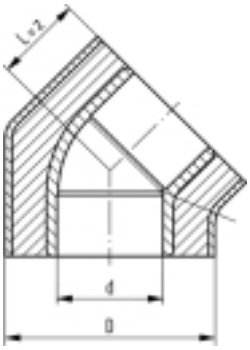


Bends 90° pre-insulated, ABS, metric

Model:

Outer jacket PE-HD, available in black and white

d	D	PN	black Code	SP	white Code	SP	kg	z	L	zugehöriger Nippel
25	90	10	**738 001 107**	-	**738 001 207**	-	0,100	69	69	738 901 607
32	90	10	**738 001 108**	-	**738 001 208**	-	0,100	86	86	738 901 608
40	110	10	**738 001 109**	-	**738 001 209**	-	0,300	109	109	738 901 609
50	110	10	**738 001 110**	-	**738 001 210**	-	0,300	131	131	738 901 610
63	125	10	**738 001 111**	-	**738 001 211**	-	0,500	164	164	738 901 611
75	140	10	**738 001 112**	-	**738 001 212**	-	0,700	194	194	738 901 612
90	160	10	**738 001 113**	-	**738 001 213**	-	1,000	231	231	738 901 613
110	180	10	**738 001 114**	-	**738 001 214**	-	2,500	281	281	738 901 614
140	225	10	**738 001 116**	-	**738 001 216**	-	4,500	356	356	738 901 616
160	250	10	**738 001 117**	-	**738 001 217**	-	6,000	406	406	738 901 617
200	280	10	**738 001 119**	-	**738 001 219**	-	4,000			738 901 619
225	315	10	**738 001 120**	-	**738 001 220**	-	6,000	287	287	738 901 620

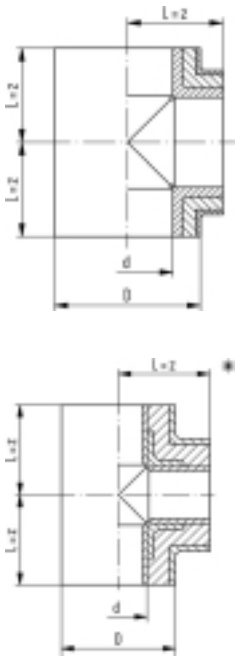


Elbow 45° pre-insulated, ABS, metric

Model:

Outer jacket PE-HD, available in black and white

d	D	PN	black Code	SP	white Code	SP	kg	z	L	zugehöriger Nippel
25	90	10	**738 151 107**	-	**738 151 207**	-	0,100	25	25	738 901 607
32	90	10	**738 151 108**	-	**738 151 208**	-	0,100	30	30	738 901 608
40	110	10	**738 151 109**	-	**738 151 209**	-	0,200	36	36	738 901 609
50	110	10	**738 151 110**	-	**738 151 210**	-	0,200	43	43	738 901 610
63	125	10	**738 151 111**	-	**738 151 211**	-	0,200	52	52	738 901 611
75	140	10	**738 151 112**	-	**738 151 212**	-	0,400	61	61	738 901 612
90	160	10	**738 151 113**	-	**738 151 213**	-	0,500	71	71	738 901 613
110	180	10	**738 151 114**	-	**738 151 214**	-	0,800	89	89	738 901 614
140	225	10	**738 151 116**	-	**738 151 216**	-	1,300	108	108	738 901 616
160	250	10	**738 151 117**	-	**738 151 217**	-	1,800	122	122	738 901 617
200	280	10	**738 151 119**	-	**738 151 219**	-	2,600	149	149	738 901 619
225	315	10	**738 151 120**	-	**738 151 220**	-	3,300	168	168	738 901 620



Tees 90° pre-insulated, ABS, metric

Model:
Outer jacket PE-HD, available in black and white

*Connecting dimensions = pipe inner diameter

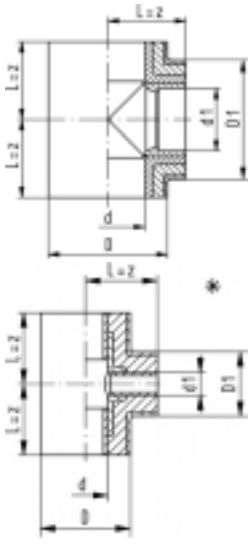
d	D	PN	black Code	SP	white Code	SP	kg	z	L	zugehöriger Nippel
25*	90	10	**738 201 107**	-	**738 201 207**	-	0,100	80	80	738 901 107
32*	90	10	**738 201 108**	-	**738 201 208**	-	0,100	80	80	738 901 108
40*	110	10	**738 201 109**	-	**738 201 209**	-	0,100	90	90	738 901 109
50*	110	10	**738 201 110**	-	**738 201 210**	-	0,200	90	90	738 901 110
63*	125	10	**738 201 111**	-	**738 201 211**	-	0,400	100	100	738 901 111
75*	140	10	**738 201 112**	-	**738 201 212**	-	0,600	125	125	738 901 112
90*	160	10	**738 201 113**	-	**738 201 213**	-	1,000	140	140	738 901 113
110	180	10	**738 201 114**	-	**738 201 214**	-	2,000	122	122	738 901 614
140	225	10	**738 201 116**	-	**738 201 216**	-	3,000	147	147	738 901 616
160	250	10	**738 201 117**	-	**738 201 217**	-	4,000	167	167	738 901 617
200	280	10	**738 201 119**	-	**738 201 219**	-	5,000	207	207	738 901 619
225	315	10	**738 201 120**	-	**738 201 220**	-	7,000	233	233	738 901 620

Tees 90° reduced pre-insulated, ABS, metric

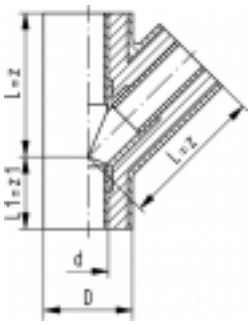
Model:
Outer jacket PE-HD, available in black and white

* Connecting dimensions = pipe inner diameter

d-d1-d	PN	D-D1-D	black Code	SP	white Code	SP	kg
32-25-32*	10	90-90-90	**738 201 138**	-	**738 201 238**	-	0,100
40-25-40*	10	110-90-110	**738 201 151**	-	**738 201 251**	-	0,200
40-32-40*	10	110-90-110	**738 201 147**	-	**738 201 247**	-	0,200
50-25-50*	10	110-90-110	**738 201 192**	-	**738 201 292**	-	0,300
50-32-50*	10	110-90-110	**738 201 164**	-	**738 201 264**	-	0,300
63-25-63*	10	125-90-125	**738 201 193**	-	**738 201 293**	-	0,400
63-32-63*	10	125-90-125	**738 201 178**	-	**738 201 278**	-	0,400
63-50-63*	10	125-110-125	**738 201 170**	-	**738 201 270**	-	0,400
75-63-75*	10	140-140-140	**738 201 184**	-	**738 201 284**	-	0,600
90-32-90*	10	160-160-160	**738 201 142**	-	**738 201 242**	-	1,200
90-63-90*	10	160-160-160	**738 201 145**	-	**738 201 245**	-	1,200
110-32-110	10	180-180-180	**738 201 135**	-	**738 201 235**	-	2,500
110-90-110	10	180-180-180	**738 201 137**	-	**738 201 237**	-	2,500



d-d1-d	z	z1	L	zugehöriger Nippel
32-25-32*	80	80	80	1 x 738 901 107; 2x 738 901 108
40-25-40*	90	90	90	1 x 738 901 107; 2x 738 901 109
40-32-40*	90	90	90	1 x 738 901 108; 2x 738 901 109
50-25-50*	90	90	90	1 x 738 901 107; 2x 738 901 110
50-32-50*	90	90	90	1 x 738 901 108; 2x 738 901 110
63-25-63*	100	100	100	1 x 738 901 107; 2x 738 901 111
63-32-63*	100	100	100	1 x 738 901 108; 2x 738 901 111
63-50-63*	100	100	100	1 x 738 901 110; 2x 738 901 111
75-63-75*	125	125	125	1 x 738 901 111; 2x 738 901 112
90-32-90*	140	140	140	1 x 738 901 108; 2x 738 901 113
90-63-90*	140	140	140	1 x 738 901 111; 2x 738 901 113
110-32-110	122	122	122	1 x 738 901 608; 2x 738 901 614
110-90-110	122	122	122	1 x 738 901 613; 2x 738 901 614

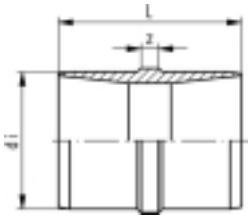


Tees 45° pre-insulated, ABS metric

Model:
Outer jacket PE-HD, available in black only

* Connecting dimensions = pipe inner diameter

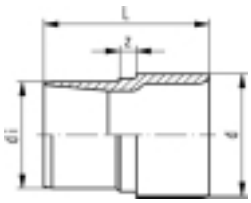
d	D	PN	Code	SP	kg	L	z	L1	z1	zugehöriger Nippel	
25*	90	10	**738 251 107**	-	0,100	160	160	80	80	738 901 107	
32*	90	10	**738 251 108**	-	0,200	160	160	80	80	738 901 108	
40*	110	10	**738 251 109**	-	0,200	180	180	90	90	738 901 109	
50*	110	10	**738 251 110**	-	0,300	180	180	90	90	738 901 110	
63*	125	10	**738 251 111**	-	0,500	200	200	100	100	738 901 111	
75*	140	10	**738 251 112**	-	0,800	240	240	120	120	738 901 112	
90*	160	10	**738 251 113**	-	1,200	250	250	125	125	738 901 113	
110*	180	10	**738 251 114**	-	2,200	300	300	250	250	738 901 114	



Barrel Nipples di-di, ABS

To connect pipe inner diameters di
Minimum order quantity: standard packings SP

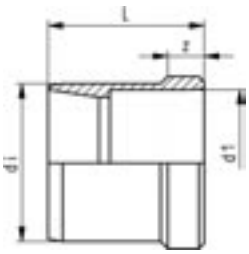
d	PN	Code	SP	kg	di	L	z	
25	10	**738 901 107**	5	0,008	20	52	10	
32	10	**738 901 108**	5	0,014	28	58	10	
40	10	**738 901 109**	5	0,022	35	66	10	
50	10	**738 901 110**	2	0,035	44	76	10	
63	10	**738 901 111**	2	0,060	55	90	10	
75	10	**738 901 112**	1	0,090	65	102	10	
90	10	**738 901 113**	1	0,127	79	104	10	
110	10	**738 901 114**	1	0,208	96	122	10	
140	10	**738 901 116**	1	0,397	123	150	10	
160	10	**738 901 117**	1	0,550	141	166	10	
200	10	**738 901 119**	-	0,990	176	202	10	
225	10	**738 901 120**	-	1,351	198	224	10	



Adaptor Nipples d-di, ABS

To connect d to pipe inner diameter di
Minimum order quantity: standard packings SP

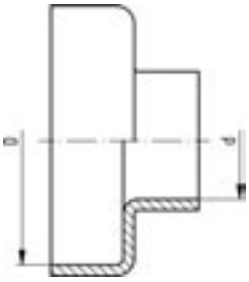
d	PN	Code	SP	kg	di	L	z	
25	10	**738 901 607**	5	0,009	20	50	10	
32	10	**738 901 608**	5	0,016	28	56	10	
40	10	**738 901 609**	5	0,026	35	64	10	
50	10	**738 901 610**	2	0,044	44	74	10	
63	10	**738 901 611**	2	0,080	55	88	10	
75	10	**738 901 612**	1	0,114	65	100	10	
90	10	**738 901 613**	1	0,179	79	108	10	
110	10	**738 901 614**	1	0,321	96	127	10	
140	10	**738 901 616**	1	0,497	123	156	10	
160	10	**738 901 617**	1	0,757	141	174	10	
200	10	**738 901 619**	-	1,821	176	212	10	
225	10	**738 901 620**	-	1,854	198	236	10	



Reducing Nipples di-dred, ABS

To connect pipe inner diameter di to reduced dred
Minimum order quantity: standard packings SP

d-d1	PN	Code	SP	kg	di	L	z
32-25	10	**738 911 341**	1	0,006	28	34	10
40-32	10	**738 911 346**	1	0,009	35	38	10
50-40	10	**738 911 352**	1	0,014	44	43	10
63-50	10	**738 911 358**	1	0,025	55	50	10
75-63	10	**738 911 364**	1	0,022	65	56	10
90-75	10	**738 911 370**	1	0,033	79	57	10
110-90	10	**738 911 376**	1	0,073	96	66	10
140-110	10	**738 911 385**	1	0,198	123	80	10
200-160	10	**738 911 392**	-	0,453	176	106	10



Caps, PE

- For sealing pipe ends

d	D	PN	schwarz		weiss		
			Code	SP	Code	SP	kg
25	90	10	**733 960 127**	-	**733 960 227**	-	0,080
32	90	10	**733 960 128**	-	**733 960 228**	-	0,120
40	110	10	**733 960 129**	-	**733 960 229**	-	0,160
50	110	10	**733 960 130**	-	**733 960 230**	-	0,180
63	125	10	**733 960 131**	-	**733 960 231**	-	0,220
75	140	10	**733 960 132**	-	**733 960 232**	-	0,260
90	160	10	**733 960 133**	-	**733 960 233**	-	0,340
110	180	10	**733 960 134**	-	**733 960 234**	-	0,460
140	220	10	**733 960 136**	-	**733 960 236**	-	0,520
160	250	10	**733 960 137**	-	**733 960 237**	-	0,620
200	280	10	**733 960 139**	-	**733 960 239**	-	0,750
225	315	10	**733 960 140**	-	**733 960 240**	-	0,900

Silicon Glue

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

	Code	SP	kg
50 ml	**738 011 102**		
290 ml	**738 011 103**		

Gap filler

- 13 x 13mm, 2.5 m on roll
- To insulate interfaces

d	Code	SP
25-225	**738 011 100**	-

Sealing tape

13 mm, 80 m on roll
To provide a water tight seal in combination with shrink sleeve

d	Code	SP
25-225	**738 011 101**	-

Shrink sleeve short, PE

To provide a water tight seal in combination with tape

D	black Code	SP	white Code	SP	L
90	**738 011 113**	-	**738 011 213**	-	85
110	**738 011 114**	-	**738 011 214**	-	85
125	**738 011 115**	-	**738 011 215**	-	85
140	**738 011 116**	-	**738 011 216**	-	85
160	**738 011 117**	-	**738 011 217**	-	85
180	**738 011 118**	-	**738 011 218**	-	85
225	**738 011 120**	-	**738 011 220**	-	85
250	**738 011 121**	-	**738 011 221**	-	85
280	**738 011 122**	-	**738 011 222**	-	85
315	**738 011 123**	-	**738 011 223**	-	85

Shrink sleeve short, PE

To provide a water tight seal in combination with tape

black Code	SP	white Code	SP	L
738 011 167	-	**738 011 267**	-	265
738 011 167	-	**738 011 267**	-	265
738 011 167	-	**738 011 267**	-	265
738 011 167	-	**738 011 267**	-	265
738 011 167	-	**738 011 267**	-	265
738 011 167	-	**738 011 267**	-	265
738 011 167	-	**738 011 267**	-	265
738 011 167	-	**738 011 267**	-	265
738 011 167	-	**738 011 267**	-	265
738 011 170	-	**738 011 270**	-	265
738 011 170	-	**738 011 270**	-	265
738 011 170	-	**738 011 270**	-	265
738 011 170	-	**738 011 270**	-	265
738 011 170	-	**738 011 270**	-	265
738 011 173	-	**738 011 273**	-	265
738 011 173	-	**738 011 273**	-	265
738 011 173	-	**738 011 273**	-	265

Repairing Tape , PE

For later closing of gaps instead of Shrink sleeve
1150mm x 150mm, black

d	Code
25-225	**738 011 104**

COOL-FIT Chamfering Tool

To calibrate pipe inner diameters of COOL-FIT pipes

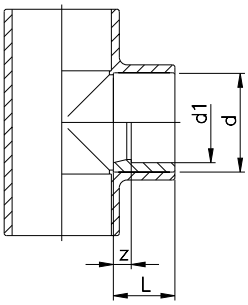
d	Code
90-225	**790 205 001**

TANGIT ABS Solvent Cement
Tin 0,75 l

	Code	SP	kg	
	799 298 022	-	0,650	

29 90 03

Reducing Bush, ABS
metric

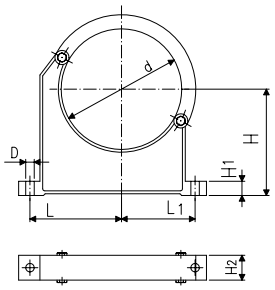


d-d1	PN	Code	SP	kg	z	L	
20-16	16	**729 900 334**	10	0,003	2	16	
25-20	16	**729 900 337**	10	0,005	3	19	
32-20	10	**729 900 342**	-	0,012	6	22	
32-25	10	**729 900 341**	10	0,009	4	22	
40-20	10	**729 900 348**	10	0,016	10	26	
40-25	10	**729 900 347**	10	0,016	7	26	
40-32	10	**729 900 346**	10	0,012	4	26	
50-20	10	**729 900 355**	10	0,024	15	31	
50-25	10	**729 900 354**	10	0,025	12	31	
50-32	10	**729 900 353**	-	0,035	9	31	
50-40	10	**729 900 352**	10	0,038	5	31	
63-32	10	**729 900 360**	-	0,060	16	38	
63-40	10	**729 900 359**	10	0,067	12	38	
63-50	10	**729 900 358**	10	0,044	7	36	
75-50	10	**729 900 365**	10	0,105	13	44	
75-63	10	**729 900 364**	10	0,076	7	44	
90-50	10	**729 900 372**	-	0,136	20	51	
90-63	10	**729 900 371**	-	0,130	14	51	
90-75	10	**729 900 370**	-	0,133	7	51	
110-63	10	**729 900 378**	-	0,287	24	61	
110-90	10	**729 900 376**	-	0,249	10	61	
140-110	10	**729 900 385**	-	0,454	15	76	
160-110	10	**729 900 390**	-	0,666	25	86	
160-140	10	**729 900 388**	-	0,416	10	86	
200-160	10	**729 900 392**	-	0,818	20	106	
225-160	10	**729 900 396**	-	1,640	33	119	
250-225	6	**729 900 303**			0	0	
280-250	6	**729 900 306**			0	0	
315-280	6	**729 900 312**			0	0	

Pipe Clips Type 060, PP, metric

Model:

- For mm pipes d90-400
- Material: Clip and safety clip PP black
- UV resistant
- Pipe with flanged connections can be installed directly
- Accidental opening of the safety clip is not possible
- **Minimum order quantity: standard packaging SP or gross packaging GP**
  Clip and safety clip are not assembled in the packaging.



d	Code	SP	kg	D	L	L1	H	H1	H2	SC	
90	**167 060 038**	10	0,163	9	89	71	105	15	32.5	M 8	
110	**167 060 039**	10	0,179	9	94	79,5	115	15	32.5	M 8	
125	**167 060 040**	10	0,300	11	115.5	91	130	20	35	M10	
140	**167 060 041**	10	0,309	11	120.5	97,5	130	20	35	M10	
160	**167 060 042**	10	0,348	11	130.5	106,5	147,5	20	35	M10	
180	**167 060 043**	-	0,378	11	142.5	115	162,5	20	35	M10	
200	**167 060 019**	-	0,582	13	151.5	119,5	175	25	39	M12	
225	**167 060 020**	-	0,612	13	164.5	131,5	175	25	39	M12	
250	**167 060 021**	-	0,698	13	182.5	142,5	200	25	39	M12	
280	**167 060 022**	-	0,722	13	197.5	155,5	200	25	39	M12	
315	**167 060 023**	-	0,842	13	218.5	171,5	225	25	39	M12	
355	**167 060 024**	-	1,250	17	275	208,5	257,5	30	50	M16	
400	**167 060 025**	-	1,450	17	300	228	287,5	30	50	M16	

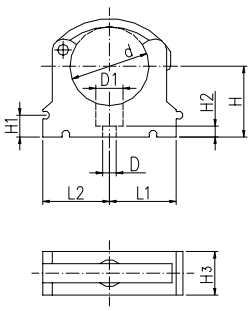
KLIP-IT Pipe Clips Type 061, PP, metric

Model:

- For mm pipes
- Material: Clip and safety clip PP black, UV resistant
- **Minimum order quantity: standard packagings SP**

To be replaced by Type 061H. Delivery until 4th quarter 2004.

d	Code	SP	kg
* 10	**167 061 003**	10	0,003
* 12	**167 061 004**	10	0,003
* 16	**167 061 005**	10	0,006
* 20	**167 061 006**	10	0,007
* 25	**167 061 007**	10	0,009
* 32	**167 061 008**	10	0,011
40	**167 061 009**	10	0,025
50	**167 061 010**	10	0,028
63	**167 061 011**	10	0,047
75	**167 061 012**	10	0,058
90	**167 061 013**	10	0,090
110	**167 061 014**	10	0,114
125	**167 061 015**	10	0,174
140	**167 061 016**	10	0,217
160	**167 061 017**	10	0,237



d	D	D1	L1	L2	H	H1	H2	H3	SC
* 10	4.5	8.3	11	13,5	20	10	6	12	M4
* 12	4.5	8.3	11	13,5	21	10	6	12	M5
* 16	5.5	10.5	14	16,5	23	10	6	16	M5
* 20	5.5	10.5	16,5	19	25	10	6	16	M5
* 25	5.5	10.5	19	21,5	27,5	10	6	16	M5
* 32	5.5	10.5	24	26,5	31	10	6	16	M5
40	6.5	14	33,5	33,5	35	10	6,5	22	M6
50	6.5	14	37	37	40	10	6,5	22	M6
63	8.5	17	44,5	44,5	51,5	10	10	25	M8
75	8.5	17	52	52	57,5	10	10	25	M8
90	8.5	17	64,5	64,5	65	10	10	28	M8
110	8.5	17	78,5	78,5	75	10	10	28	M8
125	8.5	17	88	88	90	10	10	31,5	M8
140	8.5	17	97,5	97,5	110	10	10	31,5	M8
160	8.5	17	109	109	107,5	10	10	31.5	M8

Instructions for Solvent Cement Jointing of ABS

General

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

The dimensions of Georg Fischer pipes, fittings and valves conform generally to the various national standards as well as to ISO 727 concerning dimensions of sockets. Our fittings and valves can be used with any ABS pipes whose outside diameter tolerance conforms to ISO 15493.

According to ISO 727 the following minimal cement lengths are valid:

Pipe outside diameter – Socket inside diameter d (mm)	Minimal cement length L (mm)
12	12.0
16	14.0
20	16.0
25	18.5
32	22.0
40	26.0
50	31.0
63	37.5
75	43.5
90	51.0
110	61.0
125	68.5
140	76.0
160	86.0
200	106.0
225	118.5

Cutting the pipe to length

Chamfering the pipe

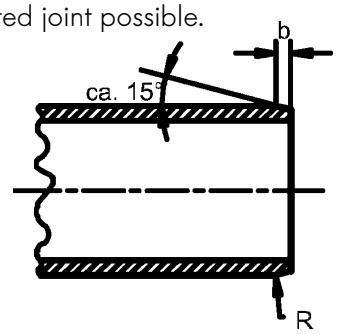
Solvent cementing equipment

Tools and equipment

Pipe cutter Type KRA	d 10–63		790 109 001
	d 50–110		790 109 002
	d 110–160		790 109 003
Plastic pipe cutter Type KRT 250	230 V/50 Hz		790 201 001
	120 V/60 Hz		790 201 002
	110 V/50 Hz		790 201 003
Chamfering tool	d 16–75		799 495 145
	d 32–200		799 495 146
Cleaner	799 298 010 (1 litre tin)		
Tangit ABS Solvent Cement	799 298 022 (0.65 kg tin)		
Brush sizes	Pipe outside diameter in mm	Brush	Code-No.
	6– 10	Round brush ø 4 mm	799 299 001
	12– 32	Round brush ø 8 mm	799 299 002
	40– 63	Flat brush 25 x 3 mm	799 299 003
	75–225	Flat brush 50 x 5 mm	799 299 004
Tin lid	799 298 028		
White absorbent paper	commercially available		
Solvent resistant protecting gloves	commercially available		

Preparations

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



Pipe outside diameter mm	b mm
6–16 mm	1–2 mm
20–50 mm	2–3 mm
⩾ 63 mm	3–6 mm

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

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.

Marking the jointing length

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.

The Tangit ABS Cement is supplied ready for use. Stir thoroughly before using! Cement of the correct consistency will run evenly from a wooden spatula held at a slant. Cement which no longer runs smoothly is unusable. The cement must not be thinned. Cement and cleaner should be stored in a cool, dry place (5–25 °C)!

Checking the cement

Cementing
For surfaces which are clean and free from grease, cleaning with absorbent paper and Tangit cleaner is not necessary for ABS. For surfaces not in perfect condition clean the outside of the pipe end and the inside of the socket **thoroughly** with ABS Cleaner and absorbent paper. Use a fresh piece of paper for each component. Remove any condensation which may have formed on the parts.

Cleaning the pipe and socket

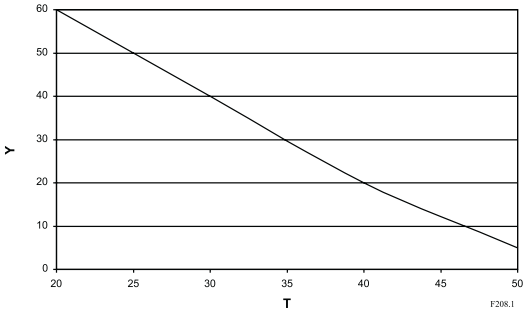
Important: Pipe end and fitting socket must be dry and free from grease and dirt and must not be touched after cleaning.

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:

At temperatures near freezing point condensation or ice water which may have formed must be removed, e. g. with warm air. Cement and cleaner should be stored at room temperature. Completed joints must be left at 20–30 °C for approximately 10 minutes to condition.

Avoid overheating when cementing at higher temperatures by protecting the jointing area from direct sunlight.

The quick curing time of the cement necessitates that the joint is made within 1 minute after application of the cement has started. The opening time of the ABS cement varies with the ambient temperature and/or the thickness (1 mm) of the cement applied:



T Temperature [°C]
Y Open time [sec]

Begin by applying a normal layer of cement to the fitting socket 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.

The joints can be made single handed for pipes with diameters up to d 63 mm.

Applying the cement

For d 75 mm and larger pipes, two people are needed to apply the cement to the pipe end and fitting socket simultaneously in order to avoid exceeding the maximum opening time of the cement of 1 minute.

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. Wait at least 10 minutes before the next joint, extend the waiting time at temperatures under 10 °C to 15 minutes.

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 reused (shake out).

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

Replace the lid of the cement tin during work breaks

Both solvent cement and cleaner dissolve ABS. Pipes and fittings must not therefore be laid on or allowed to come into contact with spilled cement or paper containing cement residues.

The pipe trench is not a rubbish tip

Adequate ventilation of the workplace

It is recommended to scavenge the pipeline after finishing, and leave it filled with water if it is not directly used. Do not use compressed air for scavenge.

Drying period and pressure testing
The length of drying period before the joint may be subjected to testing or operating pressure depends on the ambient temperature and the tolerances.
A longer waiting time should be applied when temperatures exceed ambient.
Generally the waiting time after the last joint until the pressure test at a testing pressure of 15 bar (PN 10) must be at least 15 hours. If the pipe is only subjected to the operating pressure, e. g. after adaptation or repair works, the following rule of thumb for the drying period applies:
1 hour waiting time per bar operating pressure at temperatures of up to 25 °C.
For waiting times at higher temperatures please consult your local Georg Fischer Representative.

Safety precautions
Tangit Cement and Tangit 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 minimize the amount of solvent fumes in the air.

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

No naked flames when cementing
No smoking

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 of the skin with solvent cement and cleaner. 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.

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.

ABS Tangit and Cleaner: Amounts required

d (ABS) mm	Socket Length mm*	ABS Tangit-Amount per 100 Joints kg	ABS Tangit Number of Joints per Tin 0.650 kg	Tangit-Cleaner Amount per 100 Joints litre	Tangit-Cleaner Number of Joints per Tin (1 litre)
16	14	0,25	260	0,09	1111
20	16	0,35	186	0,18	556
25	18,5	0,40	163	0,3	333
32	22	0,45	144	0,5	200
40	26	0,60	108	0,7	143
50	31	0,90	72	0,9	111
63	37,5	1,10	59	1,1	91
75	43,5	1,25	52	1,3	77
90	51	1,70	38	1,45	69
110	61	2,50	26	1,7	59
140	76	5,00	13	2,1	48
160	86	6,47	10	2,5	40
200	106	9,96	7	3,5	29
225	118,5	12,53	5	4,5	22
250	131	15,39	4	5,5	18
280	146	19,21	3	6,5	15
315	163,5	24,20	3	7	14

* The socket length can be calculated using the following simple formula: $^{d}/_{2}+6$

Instructions for Solvent Cementing COOL-FIT ABS

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

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

Chamfer to 45° the internal diameter of the ABS pipe.

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

For surfaces not in perfect condition clean the outside surface of the cool-fit nipple and the inner surfaces of the cool-fit pipe, 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 + 6 (mm), for example socket length for d90 = 51 mm (90/2 + 6).

Apply the ABS cement to the outside of the COOL-FIT nipple, axially, smoothly in one action, in an even layer, approximately 1 mm thick. Use a firm pressure on the brush when applying the cement to work the cement into the fitting.

Apply the ABS Cement to the inside surface of the COOL-FIT pipe. Apply the cement to the depth marked, using the same technique as with the fitting.

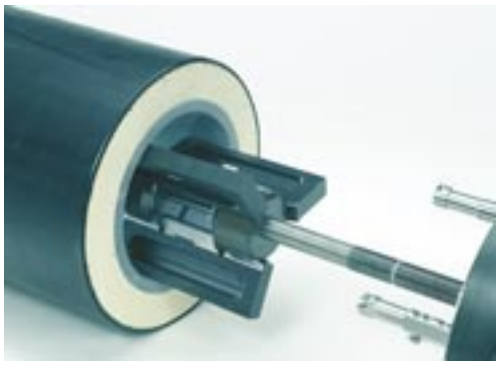
Insert the COOL-FIT ABS nipple axially into the pipe being careful not to rotate the parts. Remove all excess cement using absorbent paper.
The installer should take note of the Tangit ABS opening time and safety precautions written on the Tangit tin and in standard ABS jointing instructions.

Jointing technique: Pipe preparation

(Calibration only required for d ⩾ 90)

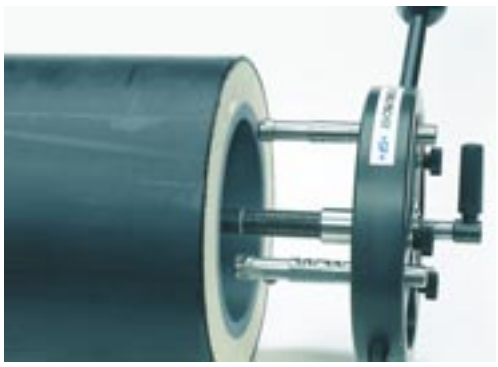
1 Cut pipe at right angles, 90°.

For ABS dimensions <d90 calibration of the pipe is not required, please follow cementing instructions.



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

2 For dimensions ⩾ d90 the internal diameter of the pipe needs to be calibrated using the COOL-FIT calibration tool.

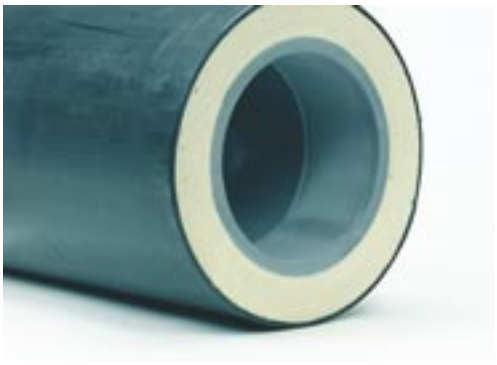


5 Wind-out the jaws of the tool until the tool is firmly located.

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

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

Jointing technique: Pipe preparation

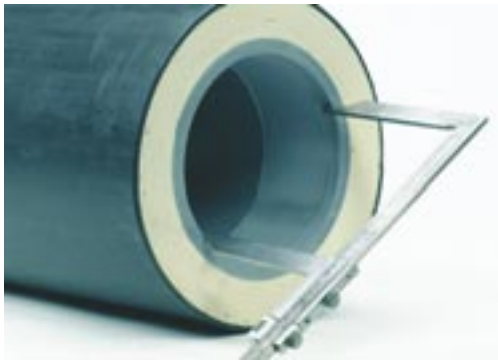


7 Please note that the tool calibrates the pipe and therefore may not always remove material and may remove different amounts of material as it cuts.

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

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

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



11 It is recommended that the installer checks the diameter of the calibrated pipe at regular intervals, the internal diameters required are listed in the COOL-FIT catalogue and in the tooling instructions.

Instructions 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 Georg Fischer has a «sealing wrap», effectively a high-duty tape available on demand. It is also possible to use other heavy-duty insulating tapes instead of the shrink sleeve. For the life-span and sealing properties of these tapes please consult the individual manufacturers.

Place the shrink sleeve over the middle of the gap. Locate the sleeve by pressing it onto the double sided sticky tape.

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

Using an open flame apply heat to the sleeve, taking care to keep the flame moving to avoid the sleeve melting.
To avoid the sleeve distorting apply the heat to the middle of the sleeve, not from the side.
The sleeve will now shrink to the outside diameter of the jacket pipe.
Note: hot air can be used to shrink the sleeve but is not recommended due to the high amount of energy required to activate shrinking.

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

ABS Product Range

Background Information to the ABS Product Range from Georg Fischer

ABS from Georg Fischer is a pressure bearing complete piping system that has been available from Georg Fischer since the mid 80's.
Georg Fischer offers 2 standard systems in ABS; firstly a BS Inch dimensioned system and secondly a metric mm dimensioned system. See ISO15493 for details.

ABS metric is available in dimensions from d16 to d315 with a complete range of fittings and transition fittings for metal to plastic connections as well as a complete range of manually and actuated valves. COOL-FIT ABS is only available using the metric ABS system. The ABS valves are completely corrosion resistant with no metal parts and can be actuated either pneumatically or electrically.

ABS metric can be used for mediums at temperatures between –40°C to +60°C and has a nominal pressure rating of PN10 (10 bar water at 20°C).

Examples of application areas are: refrigeration secondary systems, for instance in supermarkets or breweries, iced-water or ice slurry systems in pharamaceutical plants, water treatment plants, for drinking and cooling water on ships. Many other application areas are possible. Please ask Georg Fischer for recommendations of suitability.

COOL-FIT

- **Top Quality**
- **Minimum On Site Time**

pre-insulated plastic piping system

GEORG FISCHER +GF+

Piping Systems

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