Double containment system - CONTAIN-IT Plus

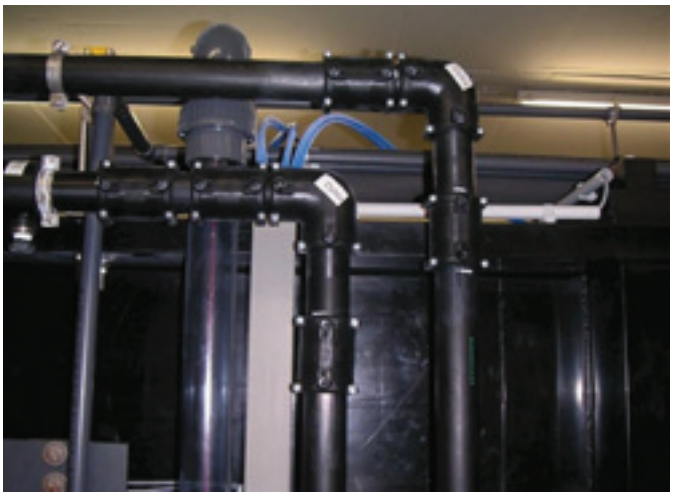
Customized parts

Double containment system - CONTAIN-IT Plus

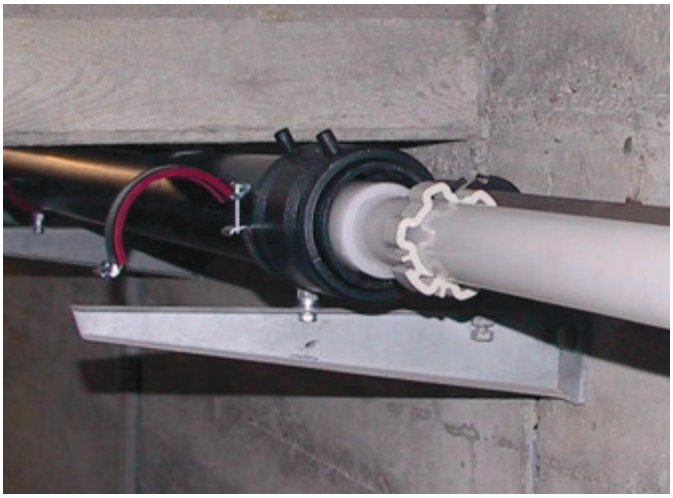
Introduction

Application range

- Recommended for gaseous or liquid media, where any leakage of the piping system would endanger the personnel, the operations or the environment.
- For strong diffusing media (HF, HC_L, HNO_3)
- Recommended for application conveying critical liquids.
- For piping systems which must be maintained in operation under all circumstances, in order to guarantee process reliability, even in the case of a leak.

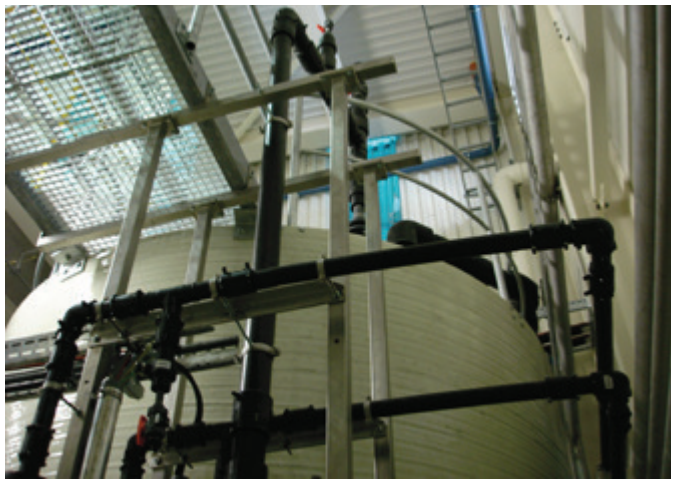


Hydrochloric acid and caustic soda solution for water treatment



Nitric acid pipe system under construction for metal finishing in the automotive industry

Drainage system für HCl, HF and hydrocarbons in the semiconductor industry



Sulphuric acid pipe system for water conditioning for pigment production

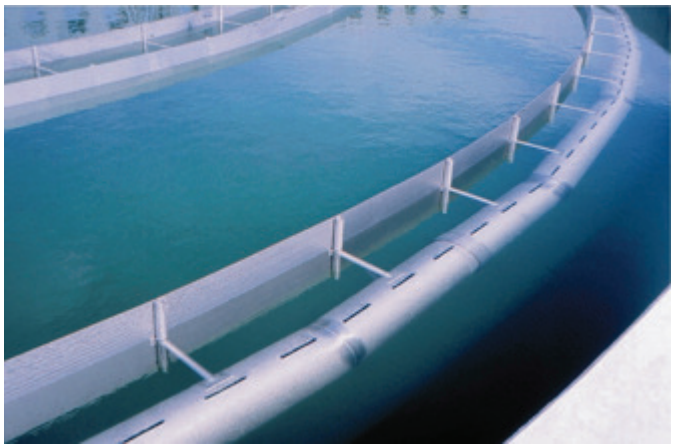
Market segments

- Water treatment (waste water treatment)
- Chemical process industry (distribution pipe systems, galvanization plant for metal treatment)
- Micro electronics industry (chemical waste, photovoltaics)
- Life science (breweries and food industry)

Personnel protection in solar cell production

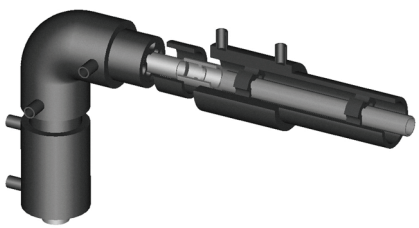

Electroplating plant in the chemical-process industry


Life science system in a brewery


Precipitant, ferric chloride in a sewage works

Characteristics

The connection benefit

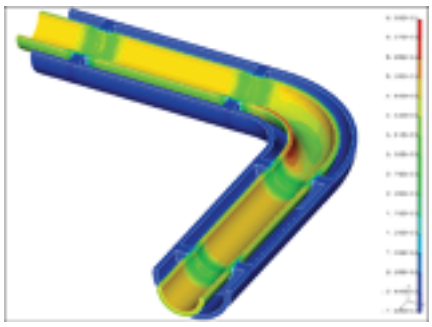


The patented double containment jointing technique allows fitting of the double containment pipe to the single pipe according to the same directives and guidelines from the DVS (German association for jointing) as for standard thermoplastic piping connections. Therefore the double containment piping system from +GF+ allows a pressure testing of the inner pipe before the outside pipe is welded. This unique and patented technique gives the operational safety that the inner pipe really is leak-tight.

The design benefit

To ensure operational safety, reliability and long life, the choice of the material and welding technology is of key importance.
GF helps you to find the ideal material for your application from a large product range in six different thermoplastics materials.

The planning benefit



A large number of well known international companies choose a complete system from a single source supplier. Reliable calculation can be made only with a dedicated system. An optimal piping design can only be achieved with perfectly harmonised piping components under defined process conditions. We offer the possibility to calculate the longitudinal expansion stresses and temperature differences between the inside and outside pipe. This will confirm the mechanical stability of the whole piping system.

The environmental benefit

Environmental risks are systematically analysed in the scope of ISO 14001, and appropriate measures are then taken to minimise these risks. Double containment systems help you to minimise the risks of incidents, giving you the opportunity to reduce insurance premiums and maintain your company image.

Enviroment

Environmental awareness and increased safety standards are becoming ever more important in today's society.

Personal injury, property damage and environmental pollution, caused by leakages, are key concerns that have led us, as a piping system supplier, to design a suitable system to reduce potential hazards.

To ensure plant safety in the conveyance of hazardous liquids jeopardizing personnel, process and environment, piping systems are needed which offer the optimal chemical resistance and which signal and collect any leakage which may occur.

Customer-friendly installation and approved connection techniques are important requirements for the design of such double containment system.

Legal provisions Switzerland

The regulation concerning the protection of disturbances (**§** 3, General Safety Measures) stating that companies are subject to take all measures in order to minimize risks. By definition, these measures are the decrease of the risk potential, the avoidance of disturbances and limitation of interferences in the nature.

The federal law about the prevention of water pollution (**§** 22, General Requirements) states that owners of installations conveying liquids hazardous to waters have to make sure that all measures are taken to protect waters. These Measures define that installations must be designed, installed, maintained and operated to guarantee that no natural water supplies can be polluted. Furthermore, for storage facilities and reloading points, any kind of loss of liquids must be avoided and any leakage of liquids must be prevented.

Legal provisions Germany

The German Water Management Act (§ 19 g WHG) applies the "duty of care" principle for the storage, filling, manufacturing and treatment of substances which are hazardous to water and to internal piping systems in the industry. This defines that installations which handle liquids that endanger the water quality must be designed, installed, maintained and operated to guarantee that no natural water supplies can be polluted.

In accordance with a ruling of the German Federal Administrative Court, the "duty of care" principle requires the elimination of even the likelihood of water pollution occurring.

Requirement of German regulations on installations handling substances which are hazardous to water (§3 VAwS)

Installations must be designed and operated in such a way that no substances which are hazardous to water can leak. They must be leak-proof, stable and sufficiently resistant against the expected thermal, mechanical and chemical influences.

Leakage of any part of an installation conveying media which endanger the water quality, needs to be recognised in a fast and reliable way.

The above mentioned requirements for piping systems can be fulfilled through the existing retention space between the inner and outside pipe in our double containment system.

Double containment

CONTAIN-IT Plus pressure-tight outer pipe

The CONTAIN-IT Plus pressure-tight double containment system comprises an outer protective pipe, made from PE100, which is welded pressure-tight, using **ELGEF®Plus** electrofusion coupler.

The protective pipe serves as a leak monitoring space, where spills which, under certain circumstances could leak from the inner pipe, are contained until the leak has been discovered and repaired. Also it is to convey fluids for the purpose of stabilising the temperature of the medium in the inner pipe.

Both the inner and the outer protective pipes are reliable, quality-controlled pressure piping systems, which are implemented **unmodified**. The jointing techniques correspond without exception to the relevant guidelines for pressure piping system construction. There are no limits to the choice of pipe materials, ensuring that the material can be ideally matched to the chemical resistance required by the particular application.

CONTAIN-IT Plus splash guard

The CONTAIN-IT Plus spray protection system differs from the pressure-tight system in that the measure makes use of an EPDM rubber sleeve with a stainless steel coupler for connection of the outer pipe.

The EPDM rubber sleeve is **pressure-tight up to 1 bar**. The rubber sleeve allows different outer pipe materials to be quickly connected together, without the use of tools or any machining of the pipe. The connection of the fittings (elbow, T-piece and termination fitting) is the same as on the pressure-tight system. The preferred material for the outer pipe is transparent PVC-U.

The following criteria are significant for safe operation:

1. For safety reasons, the components of the media-conveying inner pipe should not be altered from their standard version. This, in order to guarantee the consistent, tested quality of our DIBt-approved (German Institute for Building Technology) individual components of the fittings for the following materials:
   PVC-U Z-40.23-2;
   PE–80 / PE–100 Z-40.23-282 ;
   PP-H Z-40.23-264; PVDF Z-40.23-262.
   Please ensure that the pipes are also DIBt-approved!
2. The DVS (German Association for Fusion Technology) fusion guidelines and KRV (Plastic Pipe Association) solvent cementing instructions are applicable without exception, especially to double containment piping systems. Particularly important quality factors are the monitoring and the visual inspection during the building-up of the weld bead on the internal pipe during the welding process.
3. The pressure test on the inner pipe must be carried out before the outer pipe is sealed. Particularly in the case of double containment systems, where the emphasis is on safety, no "dry joints" can be tolerated.
4. Fixed-point installation with structural certificate: the minimum dimensional difference between the inner and outer pipes prevents any possible longitudinal expansion. The entire system must be finished as a fixed-point installation. A structural certificate is recommended for the pipe system (cf. Questionnaire for the structural certificate, Section: Structural certificate).
5. The product range includes radial dismountable mechanical couplings for maintenance or repair of the piping system, or to carry out subsequent extensions.
6. Connections for commercial leak detection devices must be provided.

Authorisation of installation personnel

Easy-to-learn technology, strict adherence to norms and regulations as well as many years of experience in plastic piping system construction are the marks of distinction of the GF double containment piping system.

Added to these essential prerequisites is the careful training of the installation personnel, in the interest of safety.

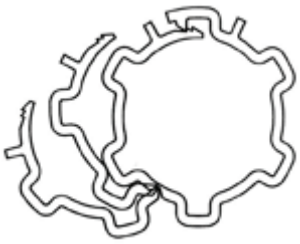
For this reason:
Double containment systems must be installed only by persons who have been specifically trained and authorised by GF.

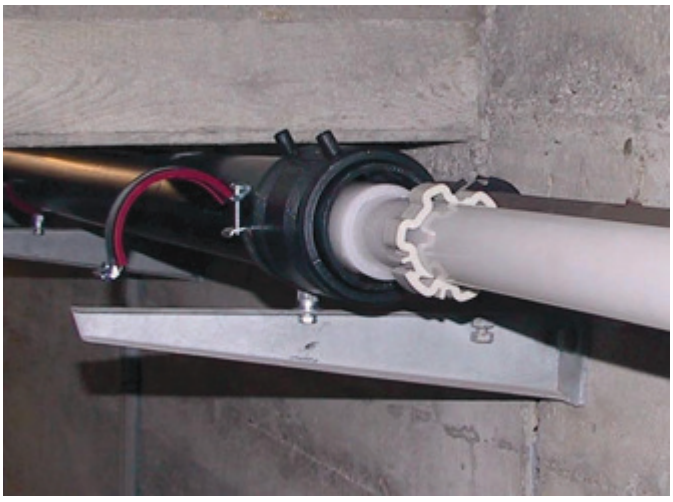
CONTAIN-IT Plus product range

Inner pipe

The choice of different types of plastic for the inner pipe allows the pipe material to be optimally matched to the physical and chemical requirements: PVC-U (unplasticized polyvinyl chloride), PVC-C (post-chlorinated PVC-U), PP-H (polypropylene), PE (polyethylene), PVDF (polyvinylidene fluoride).

"Click system" spacers are clamped to the inner pipe, which is then pushed into the outer pipe – pipes are not supplied ex-works as double pipes. The pipes can also be used as single pipes.





PE 100 outer pipe

The outer protective pipe, which surrounds the medium-conveying inner pipe, is made of PE100 polyethylene. The key features of this material are its good chemical resistance to acids, alkalis and salts as well as a number of organic and inorganic solvents. The high resistance of this black (stabilised with carbon black) polyethylene to UV effects, its insusceptibility to notching, flexibility and impact resistance, even at low temperatures down to -50 °C, make this protective pipe material ideal for pipes laid indoors, outdoors and in the ground.

Transparent PVC-U splash outer pipe

The pressure level of the outer pipe is restricted to 1 bar by the use of an EPDM rubber sleeve.

The code numbers and wall thicknesses of the protective pipes (PE100 or PVC-U) are listed in the double containment product catalogue.

Seals

When laying the inner pipe, sealing material should be selected that is suitable for the prevailing operating conditions. Available choices are EPDM, FPM and, for ball valves, also FFPM. The sealing material used for the protective pipe is EPDM.

Fittings for inner and outer pipes

The individual fittings for the inner and outer pipes are injection moulded using the latest quality assured procedures. The inner fittings are available in all GF plastic materials. Fittings are factory made and supplied ready to install.

In the CONTAIN-IT Plus double containment system, the outer fitting – always made from PE-100 polyethylene – is already attached to the inner fitting. The inner and outer fittings are connected together using sturdy support rings, which act as fixed points for the inner pipe. This prevents expansion of the inner pipe in the outer pipe. The entire system must be finished as a fixed-point installation with a structural certificate.

On solvent cementable plastics (PVC-U, PVC-C), a cemented socket joint is used to connect the inner pipes. A number of different fusion processes are available for connecting weldable plastics (PE, PP-H, PVDF). Socket fusion can be used for PP-H / PE (d 20/50 to d 110/160) and PVDF (d 20/50 to d 63/110). For the size range d 20/50 to d 225/315, butt fusion techniques can be used. Infrared fusion techniques can also be used in certain cases (refer to Overview of product range). Wherever possible, factory-finished joints are made by infrared fusion.

The PE outer fittings have integrated joint spigots – which also act as the support rings for the inner pipes – for connection by means of push-on ELGEF® Plus electrofusion coupler or EPDM rubber sleeves.

The push-on ELGEF® Plus electrofusion coupler or rubber sleeve can be pushed over the end of the pipe being connected, or the long end of the fitting, before the inner pipe is connected. The electrofusion coupler will fit along only half the length of the short end of the fitting.

Termination fittings

Specially designed and patented termination fittings, with an Rp ½" connection to the monitoring space, are installed at the start and end of the double containment system. These fittings are also suitable for subdividing the outer pipe, i. e. to divide the pipe system into leak detection zones, thereby enabling easier location of leaks.

Branch saddles

Branch saddles, for fitting to the protective pipe after connection, are used for the installation of a leakage locating system, for flushing the space between the pipes or as unions for carrying out a pressure test in the space between the pipes.

Valves

Specially designed manual and actuated double containment valves can be integrated in the system. In the same way as the fittings they are easy to install in the pipe system. Double containment valves are factory made and supplied as a system unit. They can be externally operated and opened for maintenance purposes and to carry out a pressure test on the inner pipe.

Overview of product range

Outer Pipe PE-100											
Dimen-sion	**Inner Pipe**										
d*D	**Socket Cementing**				**Socket Fusion**			**Butt Fusion**			
inner x outer	**PVC-U Tangit**	**PVC-U Dytex**	**PVC-C Tangit**	**PVC-C Dy-tex**	**PP-H**	**PE-80**	**PVDF**	**PP-H SDR11**	**PE-100 SDR11**	**PVDF PN16**	**PVDF PN10**
20*50	X	X	X	X	X	X	X	°	°	°	
25*50	X	X	X	X	X	X	X	°	°	°	
32*63	X	X	X	X	X	X	X	°	°	°	
40*75	X	X	X	X	X	X	X	X	X	X	
50*90	X	X	X	X	X	X	X	X	X	X	
63*110	X	X	X	X	X	X	X	°	°	°	
75*125	X	X	X	X	X	X		°	°	°	
90*140	X	X	X	X	X	X		°	°	°	
110*160	X	X	X	X	X	X		°	°	°	
125*180	X							X	X		X
140*200	X							X	X		X
160*225	X							X	X		X
200*280	X							X	X		X
225*315	X							X	X		X

° = *Butt-welding and infrared-compatible (IR-Plus)*

Other combinations e. g. PVDF BCF (beat and crevice free welded) on request.

Planning criteria

Material selection for the medium-conveying inner pipes

To ensure operational safety and achieve the minimum designed service life, the selection of the material and the pressure classification of the pipe system components are extremely important. The key influential factors are: operating pressure, operating temperature, the medium being transported and the duration of stressing.

The chemical resistance list and the material-related pressure and temperature charts can be used to pre-select the material. These aids can be found in our technical manual, on the CD and on our website at www.piping.georgfischer.com, Support, Planning Fundamentals.

We will naturally provide any assistance you need in selecting the right material.

General chemical resistance of thermoplastics

	PVC-U / PVC-C	PP / PE	PVDF
Resistant to	Acids and alkalis	Acids, alkalis and weak solvents	Acids, oxidizing media, solvents, halogens
Not resistant to	Aromatic solvents, tensides	Oxidizing acids, halogens	Amines, alkalis

Material selection for the outer pipes

The pressure rating of the outer pipe must correspond to the service pressure of the inner pipe until the damage is repaired. In case of leakage, the pressure-resistant and chemical-resistant PE100 outer pipe must be able to contain the spill. In the event of a leak, exposure to the medium normally does not require an immediate shutdown of the operation. It may be possible to complete ongoing production runs before shutting down.

When using the splash guard outer pipe system with a transparent PVC-U outer pipe, the restricted pressure loading of 1 bar must be taken into account. There must be no possibility of higher pressure developing in the protective pipe in the event of a leak.

Questionnaire for static evidence

The questionnaire for static evidence (Section: Static Evidence) is used by GF to determine if the selected pipeline is resistant under the given operating conditions.

For fixed-point installation (restricted longitudinal expansion), it is necessary to calculate the stresses and forces on the outer pipe fittings, which the fixed-point pipe brackets are required to absorb.

The fixed point for the inner pipe is already built into each fitting by means of a support ring. If the calculated stress on the pipe is too great, the operating conditions or the material must be changed.

The calculation also indicates the distances between spacers for the inner pipe and the distances between pipe brackets for the outer pipe, as well as the forces on fixed points.

Expansion in the pipeline need not be taken into consideration; no additional expansion loops or compensators are required.

Layout

The pipe layout should be planned so that the pipes are protected from mechanical and thermal effects.

The necessary minimum distance from walls and ceilings as well as the required axis dimensions can be found in the tables for calculation of cutting lengths.

For great fixed-point forces, the anchoring method on the building material should be checked. If building material cannot absorb any fixed-point forces (e.g. trapezoidal corrugated roofs), the forces must be absorbed via sturdy travelling rails.

Leak detection

Leak detection is an important element of the double containment piping system and must be taken into consideration. Please see the section on leak detection and location.

Isometric drawing

The 30° isometric diagram (see example of cutting length calculation) provides an accurate view of the piping layout. When the axis dimensions are entered, the cutting lengths can be calculated and the installation direction of the fittings determined.

This can be used to represent the ventilation, rinsing and shut-off requirements, as well as the installation position of the end and sectional fittings.

Sizing

The pipe diameter is determined by calculating the pressure loss within the pipe. This depends not only on the diameter, length, and pipe material but also on the flow medium and the flow volume.

For project planning, construction and installation of double containment systems, please refer to DVS 2210-2.

Installation instructions

Jointing double containment pipes

Patented double containment jointing technology

The principle of the GF double containment jointing technology is based on the fact that the inner pipe is joined first using the techniques described below. This means that a double containment pipeline is joined in the same manner as a single pipeline. The so-called "last joints", which occur with every change of direction in other systems and which are then usually done "blind", are therefore not applicable. When the clamps are removed, there is a gap of 30 mm between the ends of the outer pipe. This serves to check the joint of the inner pipe according to the DVS guidelines. When the pressure test on the inner pipe has been completed, this gap is closed with a snap ring.

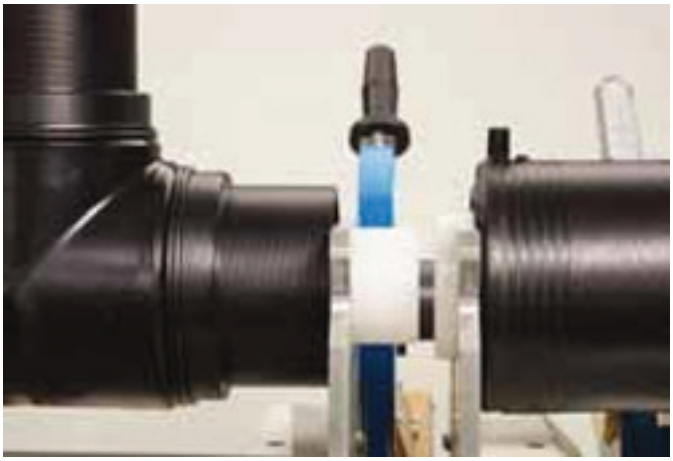
Inner pipe

The inner pipes are connected using standard, tried and tested jointing methods. Depending on the material and sizes, the available options are: solvent cementing, socket fusion, butt fusion and infrared fusion. The choice of method is also determined by suitability for the operating conditions. PVDF BCF (beat and crevice free welded) on request.

Solvent cement joints (PVC-U, PVC-C)

A quick jointing method, carried out without extensive use of tools or machinery.

Socket fusion heater element (PP, PE and SYGEF PVDF)



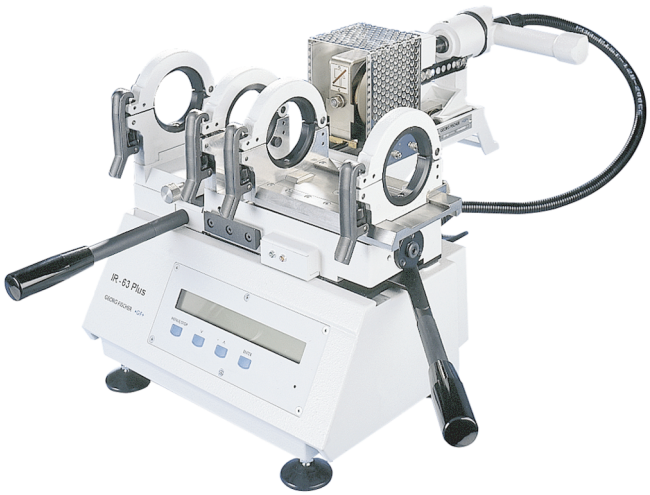
Socket fusion in a fusion machine

Socket fusion is particularly suited for use with smaller sizes. Up to and including 50 mm diameter inner pipes, these joints can be easily made in the pipeline route, using hand fusion equipment.

Butt fusion heater element (PP, PE and SYGEF PVDF)

In pressurised pipe systems, all butt fusion joints must be produced in a butt fusion machine, and not by hand!

IR infrared fusion (PP, SYGEF PVDF)



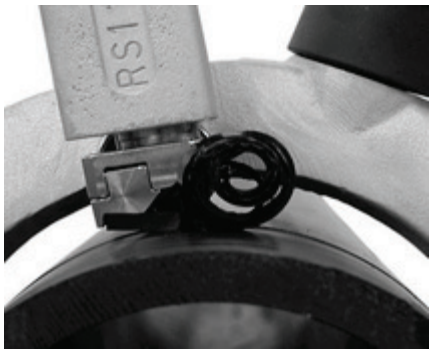
In IR fusion, the parts to be connected (pipe and fitting) are heated to fusion temperature in the fusion zone and fused in a contact-free process. This low-stress fusion method allows smaller fusion beads to be created.

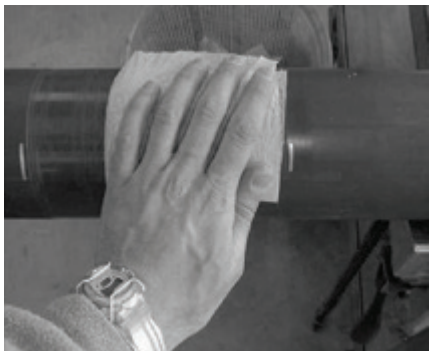
Jointing the outer pipe

After the inner pipe has been pressure-tested, the outer pipe is sealed. A pressure-resistant version with an electrofusion coupler and the splash guard version (PN 1) with an EPDM rubber sleeves are available for this purpose. The activities described next, to prepare for making the joint, must be carried out at the same time as the installation of the inner pipe.

Jointing the outer pipe with ELGEF® Plus electrofusion coupler

- Cut the pipe to size, square, in accordance with the calculation sheet (it is advisable to number the cut lengths of pipe)
- Clean any coarse dirt from the pipe
- Machine the pipe ends with a rotary scraper
- Depending on the recess type of the electrofusion coupler, the length of the pipe to be scraped is either ½ or full length of the coupler
- New double containment fittings, removed from the packaging shortly before processing, do not need to be scraped!
- Please refer to the separate installation instructions for electrofusion fittings and the dimensional tolerances when scraping the PE pipes
- Clean/degrease pipe end with Tangit KS cleaner and clean absorbent paper.





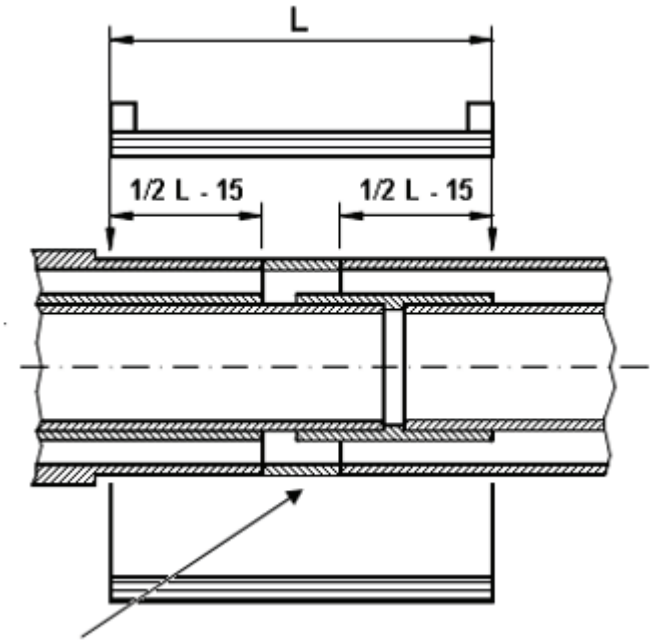
Permissible minimum pipe outside diameter:

Pipe diameter (mm)	**Min. chip thickness** (mm)	**Permissible minimum pipe outside diameter** (mm)
50	0.20	49.5
63	0.20	62.5
75	0.20	74.4
90	0.20	89.4
110	0.20	109.4
125	0.20	124.4
140	0.20	139.4
160	0.20	159.4
180	0.20	179.4
200	0.20	199.4
225	0.20	224.4
250	0.20	249.3
280	0.20	279.3
315	0.20	314.3

Push on electrofusion coupler

- Insertion depth: mark ½ coupler length minus 15 mm (snap ring width 30 mm divided by 2 = 15 mm)
- Immediately prior to use, remove ELGEF®Plus electrofusion coupler from the bag, without dirtying it, remove the middle stop and push completely over the stripped end of the pipe. Seal/secure with the PE stretch film to protect from contamination and moisture. Check for proper functioning.
  Important:
  The ELGEF®Plus coupler must be on the pipe before the inner pipes are jointed.
- Remove the stretch film immediately before fusing the outer pipe
- Apply the snap ring: if the electrofusion coupler is pushed on without a snap ring, the outer pipe can shift, so that a reliable weld can no longer be guaranteed.
  The snap ring must sit centrally on the ELGEF®Plus electrofusion coupler (cold zone). The ends of the outer pipes must butt up to the snap ring with no gap.

- Clean the fusion zone
- Refer to instructions, wherever possible, use clamps for electrofusion of couplers and branch saddles.
- Fuse



Snap ring 30 mm

MSA 400 fusion machine for ELGEF® Plus coupler

D	SDR	L	1/2 L - 15
50	11	88	29
63	11	96	33
75	11	110	40
90	11	125	47.5
110	11	145	57.5
125	11	158	64
140	11	168	69
160	11	180	75
180	11	194	82
200	11	208	89
225	11	224	97
280	11	252	111
315	17	268	119

L = Length of ELGEF® Plus coupler

Jointing the outer pipe using the EPDM rubber sleeve with stainless steel coupler

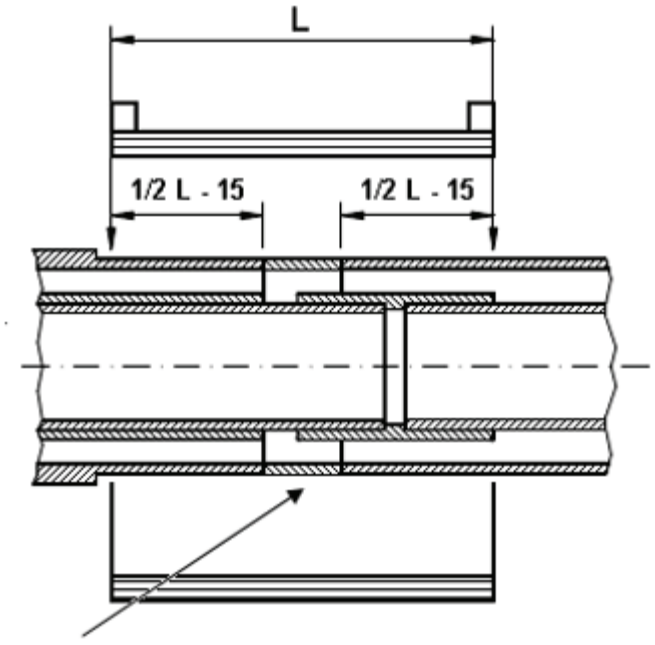
When carrying out installation using the rubber sleeve, it is essential to ensure that the outer pipe is securely clamped to prevent axial movement (clamping force details in structural certificate) and that no pipe expansion occurs. The rubber sleeve has no tensile strength. Clean the square-cut pipe with a clean cloth, push the rubber sleeve onto the outer pipe. The snap ring must sit centrally on the rubber sleeve. The ends of the outer pipes must butt up to the snap ring without gap. On long lengths of pipe, the snap ring can be dispensed with transparent PVC-U pipes / pipe joints. Advantage: Achieving greater tensile strength by jointing Pipe / Pipe.

Insertion depth: mark ½ socket length minus 15 mm (snap ring width 30 mm divided by 2 = 15 mm)

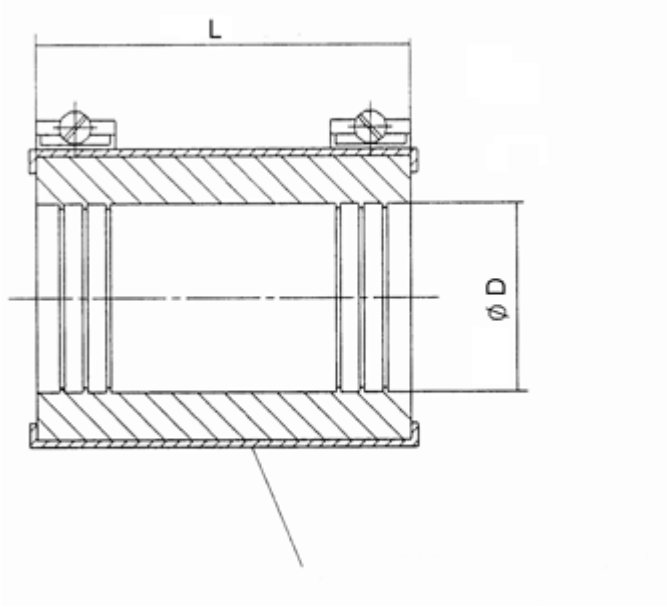
Important: The rubber sleeve must be on the pipe before the inner pipes are jointed.

L = Length of the rubber sleeve

D	Number of pipe clips	L	½ L - 15
50	2	85	27.5
63	2	85	27.5
75	2	85	27.5
90	2	85	27.5
110	4	125	47.5
125	4	125	47.5
140	4	125	47.5
160	4	125	47.5
180	4	125	47.5
200	4	125	47.5
225	4	125	47.5
280	4	150	60
315	4	150	60



Snap ring



V2A metal pipe clip

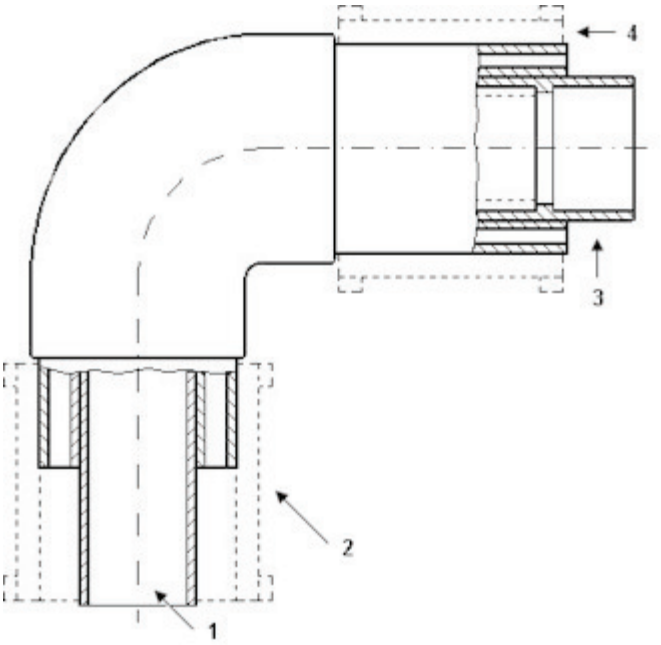
Fittings for solvent cementing / fusion and installation

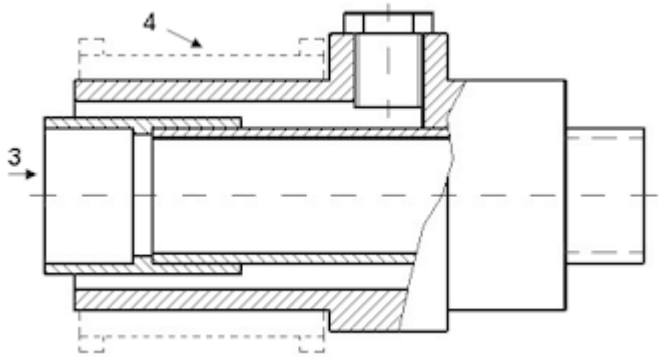
Introduction

As the axis sizes of 90 ° and 45 ° elbows and the T-piece are the same, only the 90 ° elbow is shown. The coupler is always on the long side of the fitting.

Possible connections:

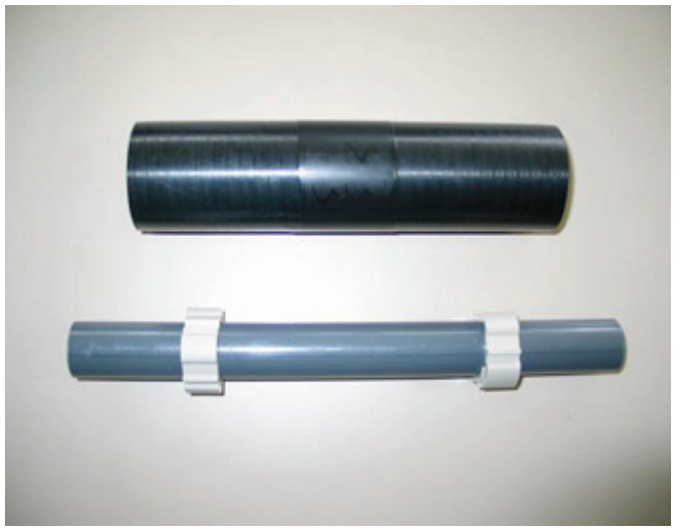
- fitting to fitting direct
- fitting to intermediate pipe section
- fitting to termination fitting





1 Spigot for coupler cementing / fusion
2 Space for ½ ELGEF® Plus coupler
3 Socket on double containment fitting for coupler cementing / fusion
4 Space for complete ELGEF® Plus coupler or EPDM sleeve

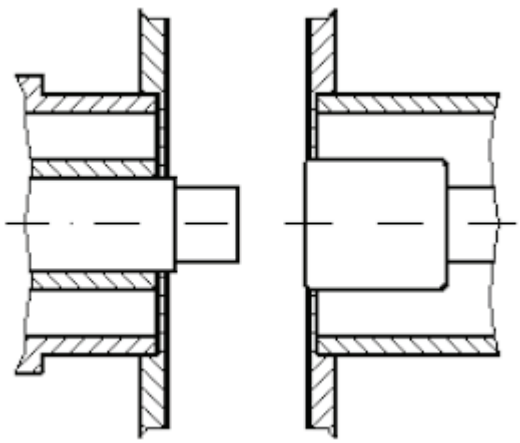
From the central axis to the front edge, all types of fittings have the same Z dimension (i. e. same axis size). **Note**: This applies only to fittings made from the same material and for use with the same jointing method!



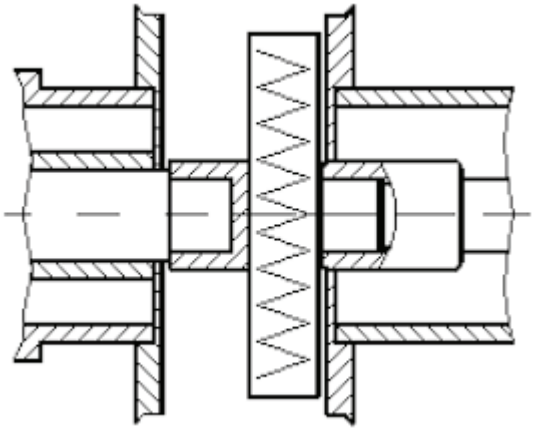
The lengths of the outer pipe (black, scraped and cleaned fusion surfaces) and inner pipe (grey with clipped-on spacers) are different .

The inner pipe is pushed into the outer pipe and the fusion coupler are positioned on the outer pipe.

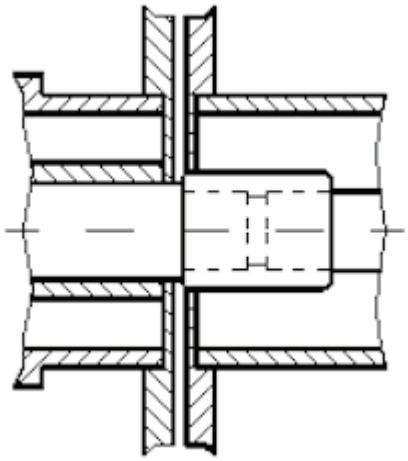
The fitting is first of all jointed (fused or cemented) to the inner pipe with the prepared double containment pipe piece. The inner pipe is now pressure tested. Following the successful pressure test, a pressure-tight joint of the outer pipe with inserted snap ring is produced, using an electrofusion coupler.



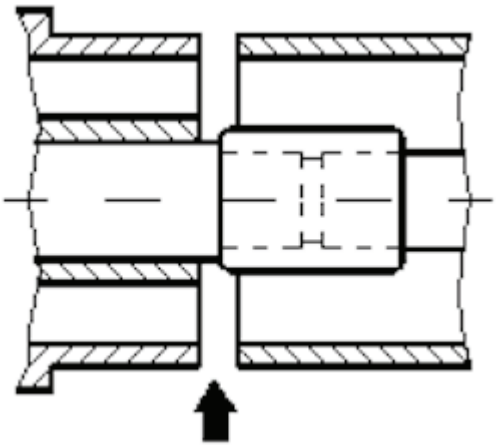
1. Special clamps hold the inner pipe and the inner fitting.



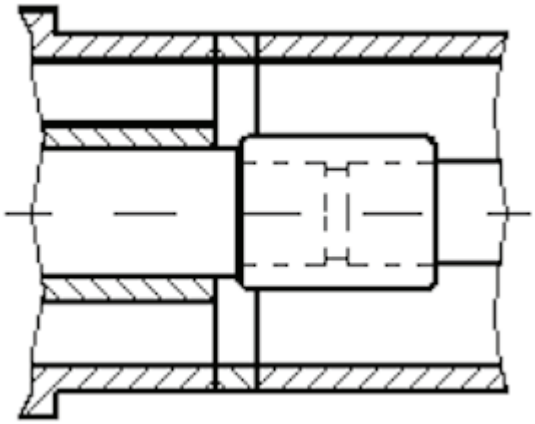
2. Standard heating element for coupler fusion.
   The pipe and fitting are heated simultaneously.



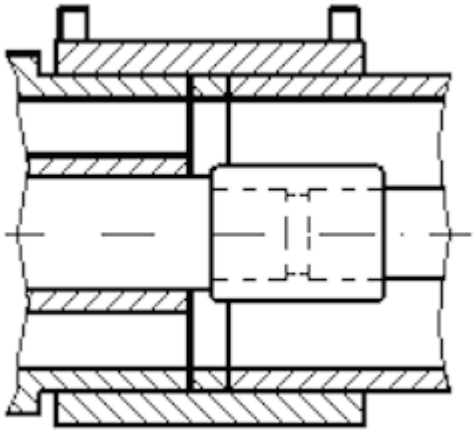
3. Heating element for coupler fusion.



4. Visual inspection.
   Check the joint, then pressure test the inner pipe.



5. Place the snap ring between the ends of the outer pipe.



6. A pressure-tight seal of the outer pipe is produced by the ELGEF® Plus electrofusion coupler, or the EPDM sleeve is used as splash guard.

Various connection examples

CONTAIN-IT Plus: socket cementing / fusion

- Short end of fitting with internal spigot (**S**)
  (90 ° elbow, 45 ° elbow, equal-sided 90 ° T-piece)
- Long end of fitting with internal socket (**L**)
  (90 ° elbow, 45 ° elbow, equal-sided 90 ° T-piece)
- Termination fitting (**E**) - long end of fitting with internal socket
- Pipe (**P**)

Legend:

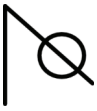
The following symbols are used to demonstrate the various connection examples.

Abbreviation:

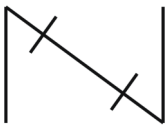
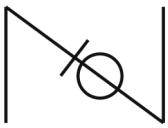
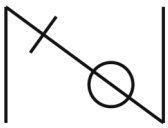
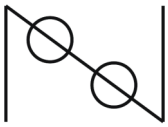
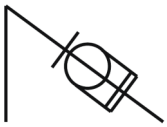
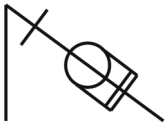
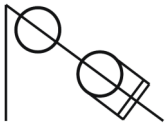
Example 90 ° elbow:

S = Short end of fitting with internal spigot

L = Long end of fitting with internal socket

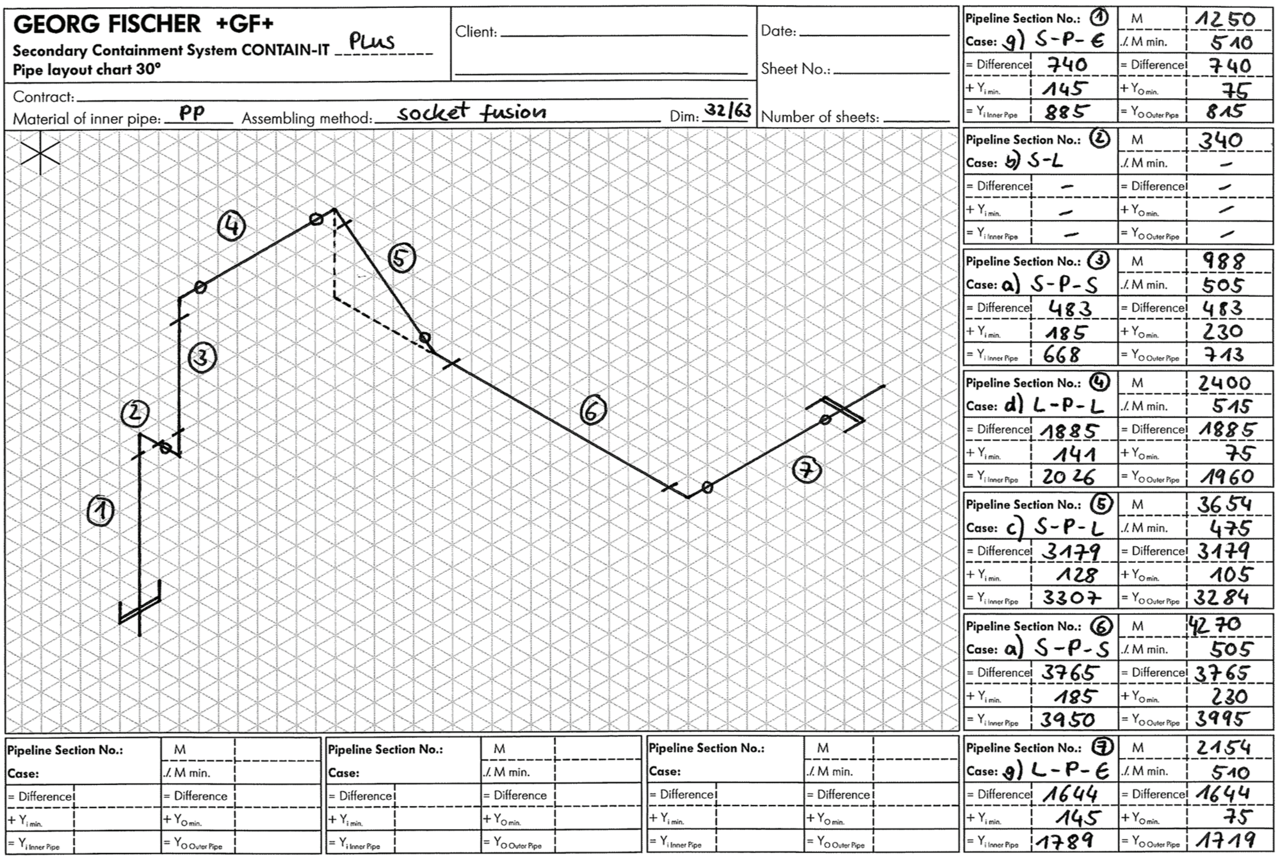


E = Endfitting

Example	Symbol	Combination
a) S - P - S		Fitting end with spigot - Pipe with 2 equal sockets - Fitting end with spigot
b) S - L		Fitting end with spigot - direct - Fitting end with socket
c) S - P - L		Fitting end with spigot - Pipe with 1 socket - Fitting end with socket
d) L - P - L		Fitting end with socket - Pipe - Fitting end with socket
e) S - E		Fitting end with spigot - direct - Termination fitting with socket
f) S - P - E		Fitting end with spigot - Pipe with 1 socket - Termination fitting with socket
g) L - P - E		Fitting end with socket - Pipe - Termination fitting with socket

Example calculation to find cutting lengths for inner and outer pipes

In the double containment system, the inner and outer pipes are always cut to different lengths.
The deduction sizes./. M min and allowance sizes + $Y_{i\,min}$ for the inner pipe and + $Y_{O\,min}$ for the outer pipe are dependent on a combination of the installation length of the fittings, and can be found in the following tables.
Since the axis sizes for the 90 ° elbow, 45 ° elbow and T-piece are the same, only the 90 ° elbows are shown and discussed here.



Pipeline section: 1		M	1250
Case S - P - E		**./. M min**	**510**
= Difference	740	= Difference	740
+ $Y_{i\ min}$	145	+ $Y_{O\ min}$	75
= $Y_{i\ inner\ pipe}$	885	= $Y_{O\ outer\ pipe}$	815

Pipeline section: 2		M	340
Case: b) S - L direct		**./. M min**	**-**
= Difference	0	= Difference	-
+ $Y_{i\ min}$	-	+ $Y_{O\ min}$	-
= $Y_{i\ inner\ pipe}$	no pipe required	= $Y_{O\ outer\ pipe}$	no pipe required

Pipeline section: 3		M	988
Case: a) S - P - S		**./. M min**	**505**
= Difference	483	= Difference	483
+ $Y_{i\ min}$	185	+ $Y_{O\ min}$	230
= $Y_{i\ inner\ pipe}$	668	= $Y_{O\ outer\ pipe}$	713

Pipeline section: 4		M	2400
Case: L - P - L		**./. M min**	**515**
= Difference	1885	= Difference	1885
+ $Y_{i\ min}$	141	+ $Y_{O\ min}$	75
= $Y_{i\ inner\ pipe}$	2026	= $Y_{O\ outer\ pipe}$	1960

Pipeline section: 5		M	3654
Case: S - P - L		**./. M min**	**475**
= Difference	3179	= Difference	3179
+ $Y_{i\ min}$	128	+ $Y_{O\ min}$	105
= $Y_{i\ inner\ pipe}$	3307	= $Y_{O\ outer\ pipe}$	3284

Pipeline section: 6		M	4270
Case: a) S - P - S		**./. M min**	**505**
= Difference	3765	= Difference	3765
+ $Y_{i\ min}$	185	+ $Y_{O\ min}$	230
= $Y_{i\ inner\ pipe}$	3950	= $Y_{O\ outer\ pipe}$	3995

Pipeline section: 7		**M**	**2154**
Case: L - P - E		**./. M min**	**510**
= Difference	1644	= Difference	1644
+ $Y_{i\ min}$	145	+ $Y_{O\ min}$	75
= $Y_{i\ inner\ pipe}$	1789	= $Y_{O\ outer\ pipe}$	1719

Calculation of examples on previous pages

The shortest connection between 2 double containment fittings is the direct connection. The M dimension between axes is preset.

Pipeline section*: 2		**M**	**340**
Case: b) S - L direct		**./. M min**	-
= Difference	-	= Difference	-
+ $Y_{i\ min}$	-	+ $Y_{O\ min}$	-
= $Y_{i\ inner\ pipe}$	no pipe re-quired	= $Y_{O\ outer\ pipe}$	no pipe required

*given axes distance

If a pipe is required between the fittings, the minimum dimension M min between axes must be observed.

Pipeline section: 3		**M**	**988**
Case: a) S- P- S		**./. M min**	**505 *** [1]
= Difference	483	= Difference	483
+ $Y_{i\ min}$	185	+ $Y_{O\ min}$	230 * [2]
= $Y_{i\ inner\ pipe}$	668	= $Y_{O\ outer\ pipe}$	713

* [1]minimum distance between axes

* [2]minimum length of inner or outer pipe

All longer dimensions are calculated as follows:

Pipeline section: 6		**M**	**4270 ***
Case: a) S - P - S		**./. M min**	**505**
= Difference	3765	= Difference	3765
+ $Y_{i\ min}$	185	+ $Y_{O\ min}$	230
= $Y_{i\ inner\ pipe}$	3950	= $Y_{O\ outer\ pipe}$	3995

distance between axes

Material checklist

Required quantity per	**Socket equal**	**Snap ring**	**ELGEF® Plus electro-fusion coupler**	**EPDM rubber sleeve**
90 ° elbow	1	2	2	2
45 ° elbow	1	2	2	2
T-90 ° equal	2	3	3	3
Termination fitting	0 (1**)	1 (2**)	1 (2**)	1 (2**)
Butt fusion				
90 ° elbow	0	2	2	2
45 ° elbow	0	2	2	2
T-90 ° equal	0	3	3	3
Termination fitting	0	1	1	1
Inner pipeline	*	0	0	0
Outer pipeline	0	*	*	*

* 1 x per pipe length
** For segmentation of the pipeline into leak detection sections

GEORG FISCHER +GF+

Secondary Containment System CONTAIN-IT ____________

Pipe layout chart 30°

Client: ______________________

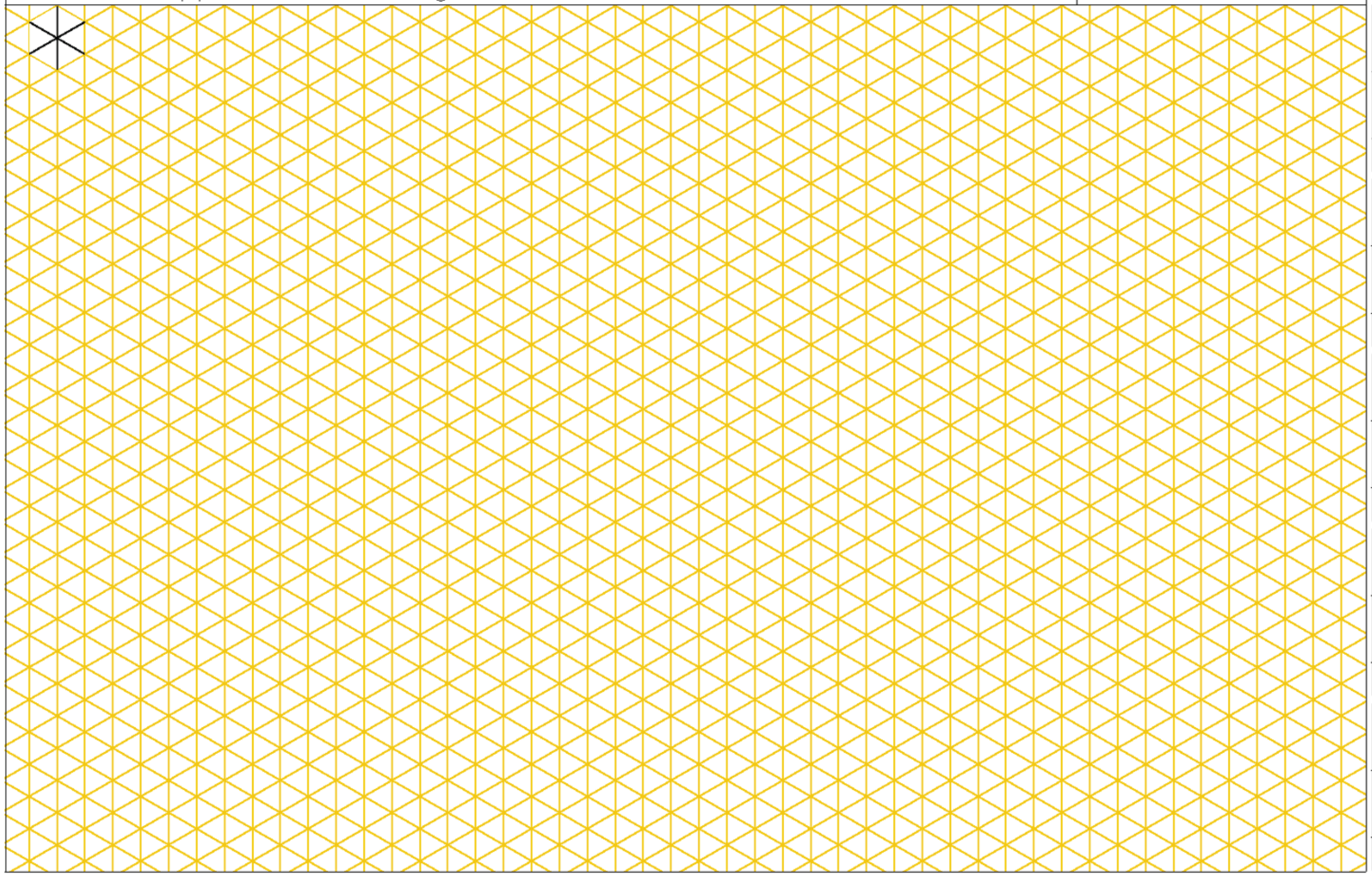
Date: ______________

Sheet No.: ______________

Contract: ______________________

Material of inner pipe: ________ Assembling method: ______________ Dim: ______

Number of sheets: ________



Pipeline Section No.:	M	
Case:	./. M min.	
= Difference	= Difference	
+ $Y_{i\,min.}$	+ $Y_{O\,min.}$	
= $Y_{i\,Inner\,Pipe}$	= $Y_{O\,Outer\,Pipe}$	

Pipeline Section No.:	M	
Case:	./. M min.	
= Difference	= Difference	
+ $Y_{i\,min.}$	+ $Y_{O\,min.}$	
= $Y_{i\,Inner\,Pipe}$	= $Y_{O\,Outer\,Pipe}$	

Pipeline Section No.:	M	
Case:	./. M min.	
= Difference	= Difference	
+ $Y_{i\,min.}$	+ $Y_{O\,min.}$	
= $Y_{i\,Inner\,Pipe}$	= $Y_{O\,Outer\,Pipe}$	

Pipeline Section No.:	M	
Case:	./. M min.	
= Difference	= Difference	
+ $Y_{i\,min.}$	+ $Y_{O\,min.}$	
= $Y_{i\,Inner\,Pipe}$	= $Y_{O\,Outer\,Pipe}$	

Pipeline Section No.:	M	
Case:	./. M min.	
= Difference	= Difference	
+ $Y_{i\,min.}$	+ $Y_{O\,min.}$	
= $Y_{i\,Inner\,Pipe}$	= $Y_{O\,Outer\,Pipe}$	

Pipeline Section No.:	M	
Case:	./. M min.	
= Difference	= Difference	
+ $Y_{i\,min.}$	+ $Y_{O\,min.}$	
= $Y_{i\,Inner\,Pipe}$	= $Y_{O\,Outer\,Pipe}$	

Pipeline Section No.:	M	
Case:	./. M min.	
= Difference	= Difference	
+ $Y_{i\,min.}$	+ $Y_{O\,min.}$	
= $Y_{i\,Inner\,Pipe}$	= $Y_{O\,Outer\,Pipe}$	

Pipeline Section No.:	M	
Case:	./. M min.	
= Difference	= Difference	
+ $Y_{i\,min.}$	+ $Y_{O\,min.}$	
= $Y_{i\,Inner\,Pipe}$	= $Y_{O\,Outer\,Pipe}$	

Pipeline Section No.:	M	
Case:	./. M min.	
= Difference	= Difference	
+ $Y_{i\,min.}$	+ $Y_{O\,min.}$	
= $Y_{i\,Inner\,Pipe}$	= $Y_{O\,Outer\,Pipe}$	

Pipeline Section No.:	M	
Case:	./. M min.	
= Difference	= Difference	
+ $Y_{i\,min.}$	+ $Y_{O\,min.}$	
= $Y_{i\,Inner\,Pipe}$	= $Y_{O\,Outer\,Pipe}$	

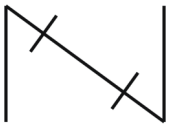
Dimensions for calculating the cutting lengths

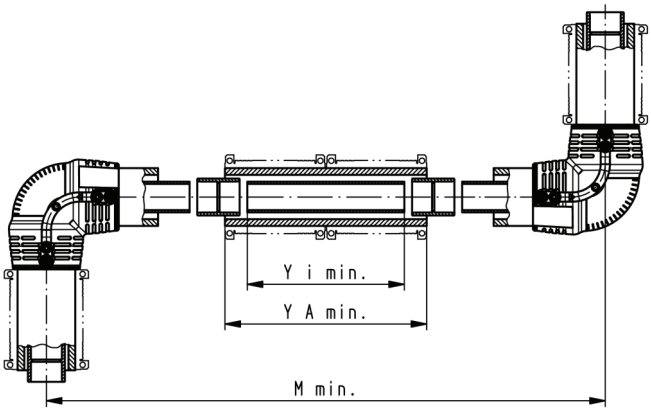
CONTAIN-IT Plus: socket cementing / fusion

Attention: The ”last joint” should always be made on the double containment fitting. Loose sockets should first be connected with the intermediate pipe.

Example a) S - P - S

Pipeline 3 + 6



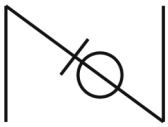


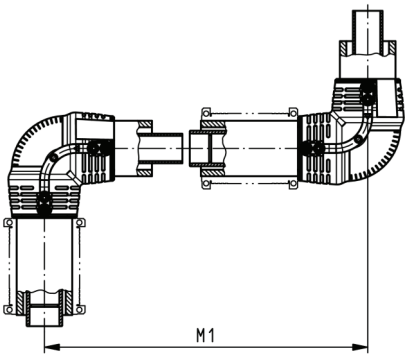
1 Spigots (S)

d*D	Direct M	M min.	Inner pipe: Y i min / Material				Outer pipe Y A min
		S - P - S	PVC-U	PVC-C	PP-H, PE80	PVDF	
20*50	-	460	182	182	178	178	190
25*50	-	460	176	176	174	174	190
32*63	-	505	185	185	185	185	230
40*75	-	580	202	202	204	204	230
50*90	-	660	222	222	228	228	260
63*110	-	780	248	248	264	260	300
75*125	-	840	264	264	286	-	330
90*140	-	905	263	263	284	-	345
110*160	-	950	266	261	290	-	370
125*180	-	1020	278	-	-	-	400
140*200	-	1060	294	-	-	-	430
160*225	-	1190	302	-	-	-	460
200*280	-	1315	313	-	-	-	515
225*315	-	1310	322	-	-	-	550

Example b) S - L

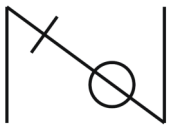
Pipeline 2

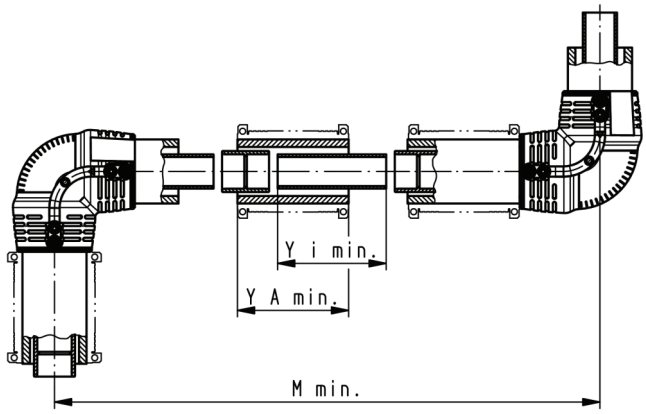




1 Spigot (S)
2 Coupler (L)

Example c-) S - P - L

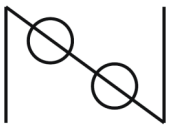


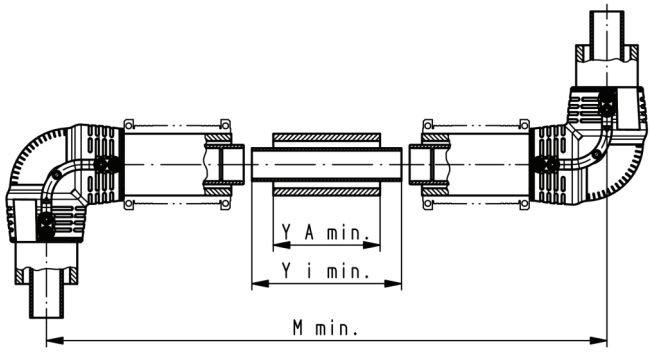


1 Spigot (S)
2 Coupler (L)

d*D	Direct M	M min.	Inner pipe: Y i min /Material				Outer pipe Y A min
	S - L	S - P - L	PVC-U	PVC-C	PP-H, PE80	PVDF	
20*50	310	435	122	122	118	118	95
25*50	310	435	122	122	118	118	95
32*63	340	475	132	132	128	128	105
40*75	400	545	142	142	137	137	115
50*90	460	620	157	157	152	152	130
63*110	550	730	177	177	176	172	150
75*125	585	780	191	191	191	-	165
90*140	640	845	200	200	194.5	-	175
110*160	665	880	209	209	201	-	185
125*180	710	940	223	-	-	-	200
140*200	720	965	238	-	-	-	215
160*225	825	1085	252	-	-	-	230
200*280	900	1190	280	-	-	-	260
225*315	880	1185	295	-	-	-	275

Example d) L - P - L

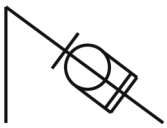


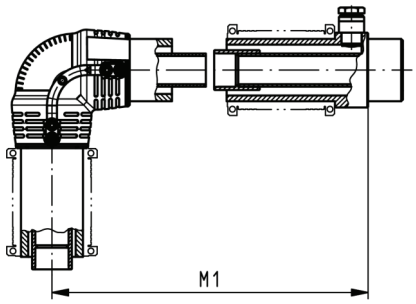


1 Coupler (L)

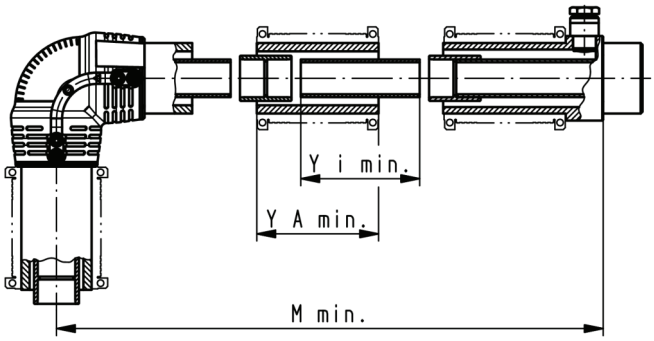
d*D	Direct M	$M_{min.}$	Inner pipe: $Y_{i\,min}$ /Material				Outer pipe $Y_{A\,min}$
		L - P - L	PVC-U	PVC-C	PP-H, PE80	PVDF	
20*50	-	475	127	127	123	123	65
25*50	-	475	133	133	127	127	65
32*63	-	515	149	149	141	141	75
40*75	-	595	167	167	155	155	85
50*90	-	680	192	192	176	176	100
63*110	-	800	226	226	208	204	120
75*125	-	855	253	253	231	-	135
90*140	-	925	277	277	245	-	145
110*160	-	965	307	312	267	-	155
125*180	-	1030	338	-	-	-	170
140*200	-	1055	367	-	-	-	185
160*225	-	1180	402	-	-	-	200
200*280	-	1290	472	-	-	-	230
225*315	-	1305	513	-	-	-	245

Example e) S - E





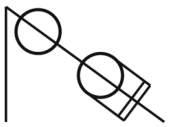
Example f) S - P - E

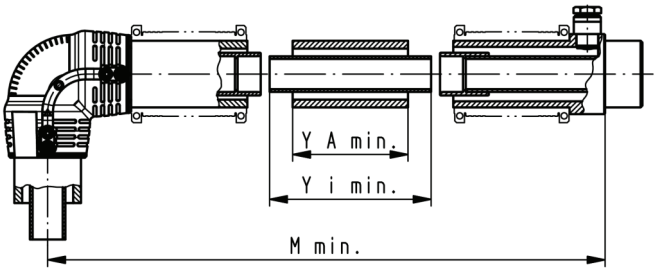


1 Spigots (S)
2 Socket (E)

d*D	Direct M	$M_{min.}$	Inner pipe: $Y_{i\,min}$ /Material				Outer pipe $Y_{A\,min}$
	S - E	S - P - E	PVC-U	PVC-C	PP-H, PE80	PVDF	
20*50	310	428	115	115	113	113	88
25*50	310	428	115	115	114	114	88
32*63	340	466	128	128	128	128	101
40*75	400	540	157	157	158	158	130
50*90	460	615	162	162	165	165	135
63*110	550	725	212	212	220	218	185
75*125	585	773	224	224	235	-	198
90*140	640	838	243	243	253.5	-	218
110*160	665	875	249	246.5	261	-	225
125*180	710	934	272	-	-	-	249
140*200	720	958	276	-	-	-	253
160*225	825	1079	316	-	-	-	294
200*280	900	1182	397	-	-	-	377
225*315	880	1178	358	-	-	-	338

Example g) L - P - E





1 Coupler (L)
2 Coupler (E)

d*D	Direct M	$M_{min.}$	Inner pipe: $Y_{i\,min}$ /Material				Outer pipe $Y_{A\,min}$
		L - P - E	PVC-U	PVC-C	PP-H, PE80	PVDF	
20*50	-	475	127	127	125	125	65
25*50	-	475	133	133	130	130	65
32*63	-	510	149	149	145	145	75
40*75	-	575	167	167	161	161	85
50*90	-	670	192	192	184	184	100
63*110	-	760	226	226	217	215	120
75*125	-	815	253	253	242	-	135
90*140	-	875	277	277	261	-	145
110*160	-	920	307	309.5	287	-	155
125*180	-	975	338	-	-	-	170
140*200	-	1010	367	-	-	-	185
160*225	-	1110	402	-	-	-	200
200*280	-	1165	472	-	-	-	230
225*315	-	1235	513	-	-	-	245

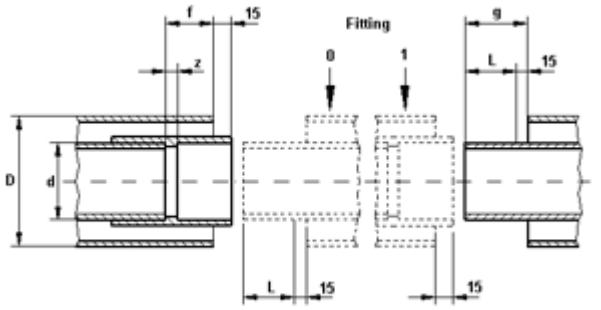
Connection sizes for double containment fittings

If the cutting sizes on long pipes are not calculated from tables, the inner and outer pipes can be finished to dimension “f” for connection to fitting end S, and to dimension “g” for connection to fitting end L.

Note:

Last connection always on the double containment fitting!

First, fit equal socket to the pipe section to be connected.



f insertion depth of socket: "L" + z-dimension of equal socket "z" - 15 mm
g insertion depth of socket: "L" + 15 mm
30 width of snap ring
L insertion depth of pipe in socket
z z-dimension of socket
0 type 0
1 type 1

Diameter d	**Connection to DC fitting, spigot end. Shorter length compared with outer pipe: "f"**		**Connection to DC fitting, coupler end. Longer length compared with outer pipe: "g"**	
Inner pipes	**PVC-U, PVC-C**	**PP, PE, PVDF**	**PVC-U**	**PP, PE, PVDF**
20	4.0	6.0	31.0	29.0
25	7.0	8.0	34.0	31.0
32	10.0	10.0	37.0	33.0
40	14.0	13.0	41.0	35.0
50	19.0	16.0	46.0	38.0
63	26.0	20.0	53.0	42.0
75	33.0	24.0	59.0	46.0
90	41.0	30.5	66.0	50.0
110	52.0	40.0	76.0	56.0
125	61.0	-	84.0	-
140	68.0	-	91.0	-
160	79.0	-	101.0	-
200	100.0	-	121.0	-
225	114.0	-	134.0	-

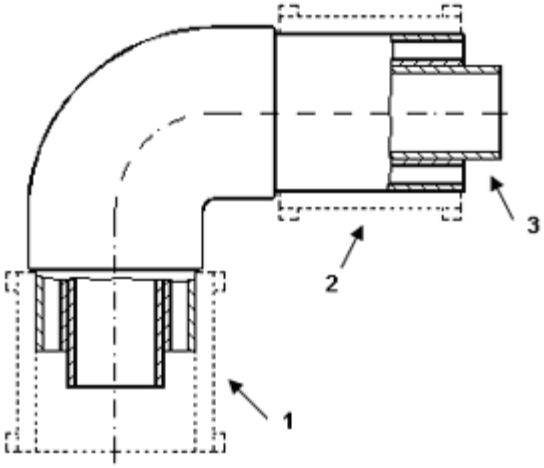
Fittings for butt and IR fusion and installation

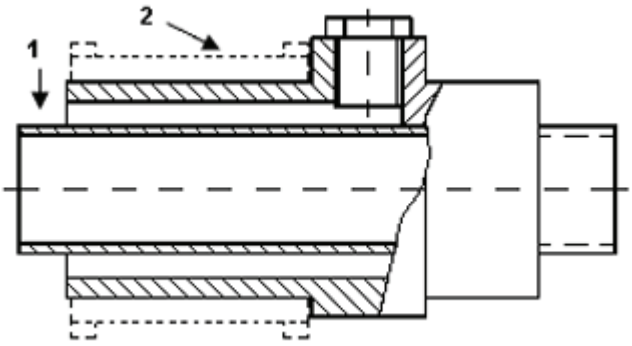
Various connection examples

Butt fusion

Possible connections:

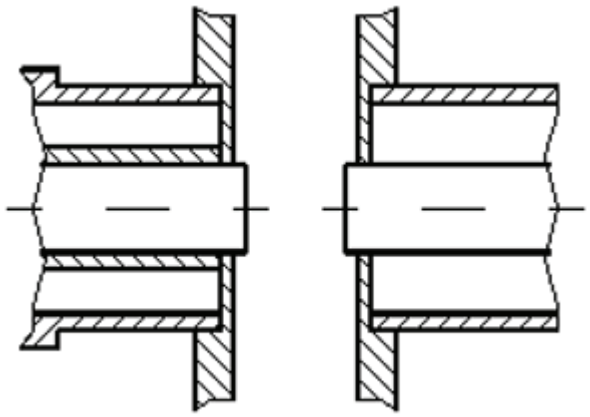
- fitting to fitting direct
- fitting to intermediate pipe section
- fitting to termination fitting



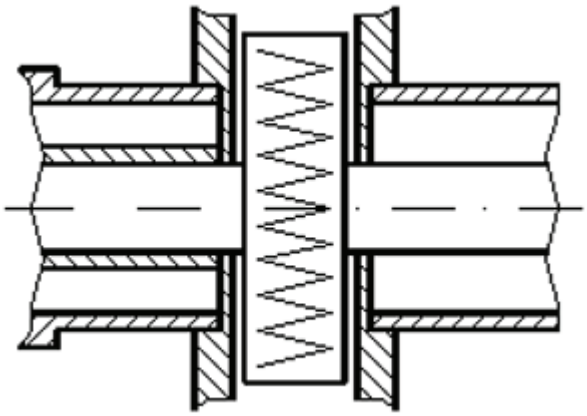


1 Spigot for butt fusion
2 Space for full ELGEF® Plus electrofusion coupler or EPDM rubber sleeve
3 Space for ½ ELGEF® Plus electrofusion coupler or EPDM rubber sleeve

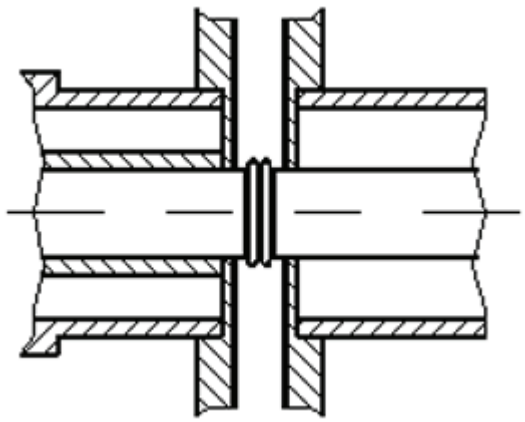
Patented GF double containment pipe jointing method for butt fusion in 6 steps



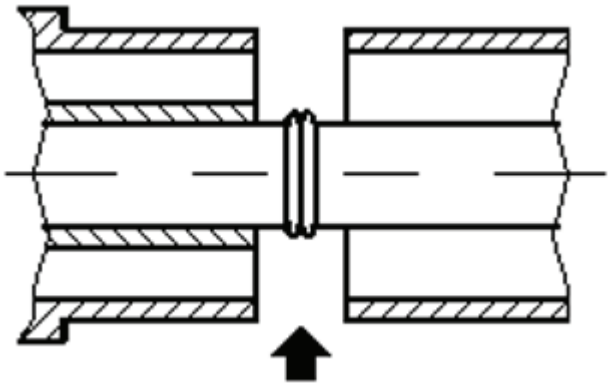
1. Clamps hold the inner pipe and/or fitting.



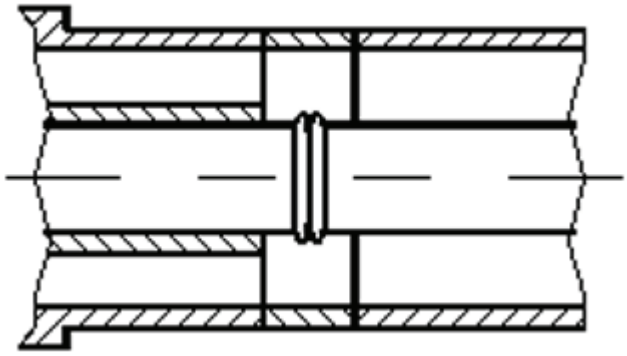
2. Standard heating element for butt fusion. The pipe and fitting are heated simultaneously.



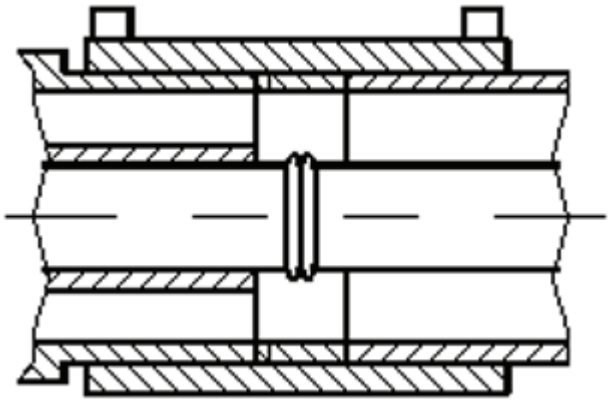
3. Heating element for butt fusion.



4. Carry out a visual inspection of the joint, then pressure test the inner pipe.



5. A snap ring is fitted between the ends of the outer pipes to close the inspection gap.



6. An ELGEF® Plus coupler or EPDM rubber sleeve is used to seal the outer pipe.

Various connection examples

CONTAIN-IT Plus: butt fusion

- Short end of fitting (**S**) with space for (½ - 15 mm) ELGEF® Plus coupler
- Long end of fitting (**L**) for full ELGEF® Plus coupler
- Termination fitting (**E**)
- Pipe (**P**)

Legend:

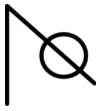
The following symbols are used to demonstrate the various connection examples.

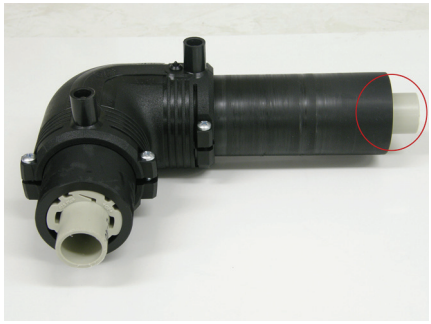
Abbreviation, Symbol:

Example 90 ° elbow:

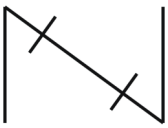
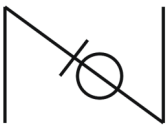
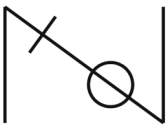
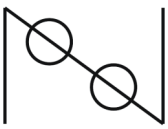
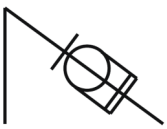
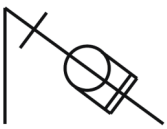
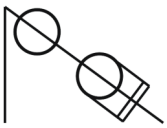
S = Short end of fitting with internal spigot.

L = Long end of fitting with internal spigot.





E = Endfitting

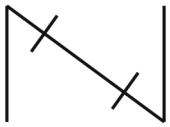
Example	Symbol	Combination
m) S - P - S		Short end of fitting - Pipe - Short end of fitting
n) S - L		Short end of fitting - Direct - Long end of fitting
o) S - P - L		Short end of fitting - Pipe - Long end of fitting
p) L - P - L		Long end of fitting - Pipe - Long end of fitting
q) S - E		Short end of fitting - Direct - Termination fitting (long)
r) S - P - E		Short end of fitting - Pipe - Termination fitting (long)
s) L - P - E		Long end of fitting - Pipe - Termination fitting (long)

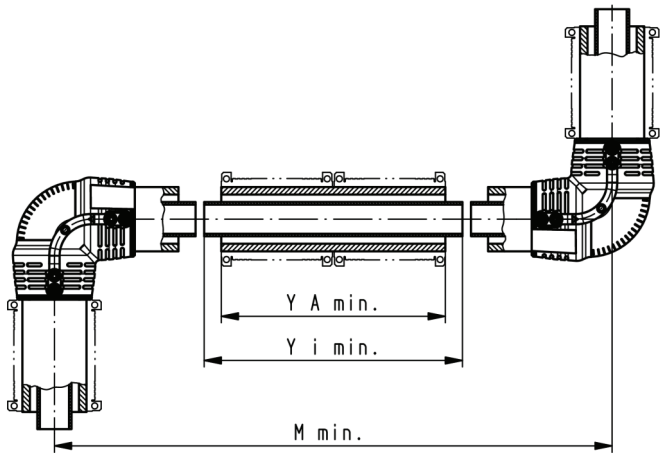
Dimensions for calculating the cutting lengths

CONTAIN-IT Plus: butt fusion

Attention: Dimensional allowances, for planning (preparation for welding) and the weld bead (fusion process), need to be added when calculating the cut size!

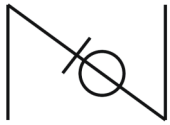
Example m) S - P - S

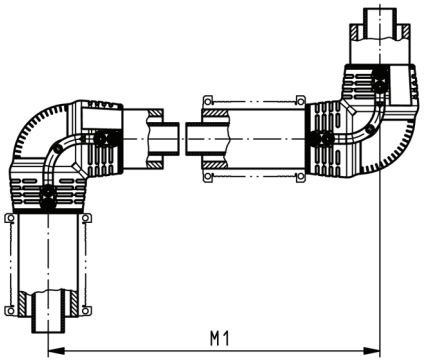




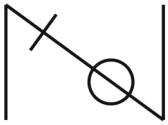
d*D	Direct M	M min.	Inner pipe: Y i min / Material			Outer pipe Y A min
		S - P - S	PP	PE	PVDF	
20*50	-	455	215	215	215	185
25*50	-	455	215	215	215	185
32*63	-	500	230	230	230	200
40*75	-	575	255	255	255	225
50*90	-	655	285	285	285	255
63*110	-	775	325	325	325	295
75*125	-	835	355	355	355	325
90*140	-	905	375	375	375	345
110*160	-	945	395	395	395	365
125*180	-	1015	425	425	425	395
140*200	-	1055	455	455	455	425
160*225	-	1185	485	485	485	455
200*280	-	1310	540	540	540	510
225*315	-	1305	575	575	575	545

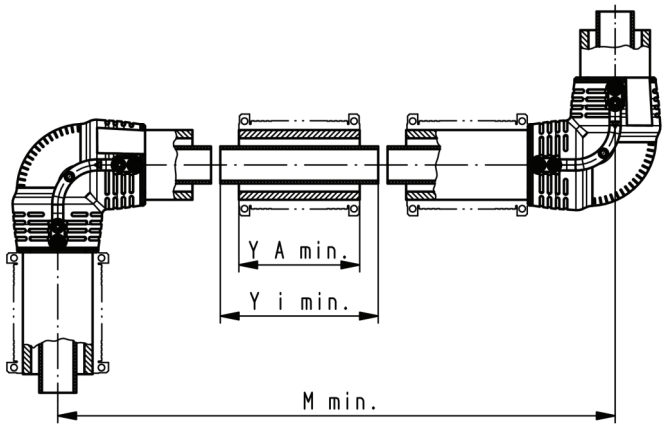
Example n) S - L





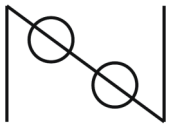
Example o) S - P - L

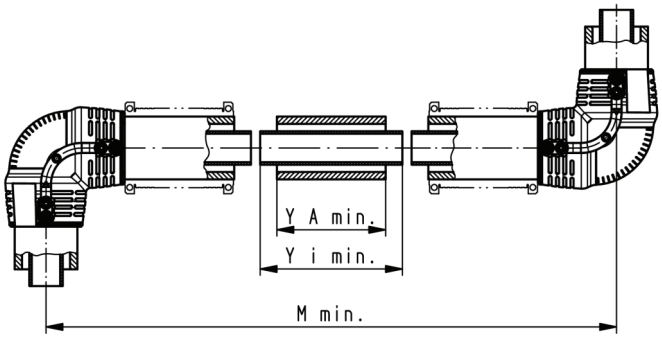




d*D	Direct M	M min.	Inner pipe: Y i min / Material			Outer pipe Y A min
	S - L	S - P - L	PP	PE	PVDF	
20*50	310	435	125	125	125	95
25*50	310	435	125	125	125	95
32*63	340	475	135	135	135	105
40*75	400	545	145	145	145	115
50*90	460	620	160	160	160	130
63*110	550	730	180	180	180	150
75*125	585	780	195	195	195	165
90*140	640	845	205	205	205	175
110*160	665	880	215	215	215	185
125*180	710	940	230	230	230	200
140*200	720	965	245	245	245	215
160*225	825	1085	260	260	260	230
200*280	900	1190	290	290	290	260
225*315	880	1185	305	305	305	275

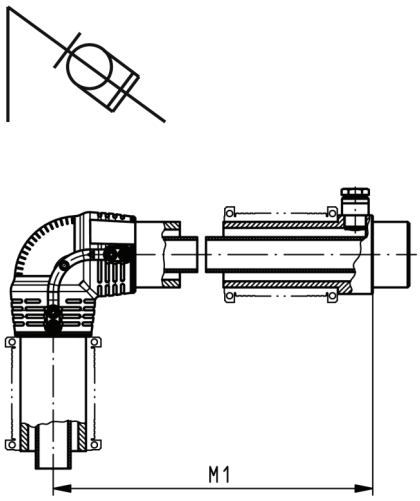
Example p) L - P - L



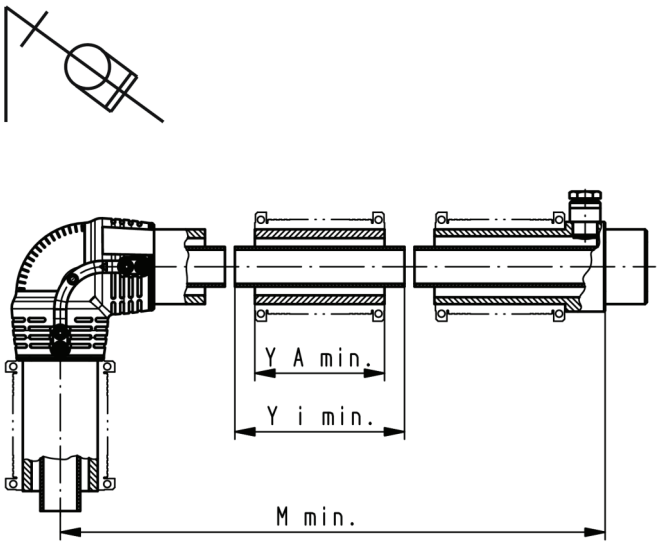


d*D	Direct M	$M_{min.}$	Inner pipe: $Y_{i\ min}$ / Material			Outer pipe $Y_{A\ min}$
		L - P - L	PP	PE	PVDF	
20*50	380	480	100	100	100	70
25*50	380	480	100	100	100	70
32*63	410	515	105	105	105	75
40*75	480	595	115	115	115	85
50*90	550	680	130	130	130	100
63*110	650	800	150	150	150	120
75*125	690	855	165	165	165	135
90*140	750	925	175	175	175	145
110*160	780	965	185	185	185	155
125*180	830	1030	200	200	200	170
140*200	840	1055	215	215	215	185
160*225	950	1180	230	230	230	200
200*280	1030	1290	260	260	260	230
225*315	1030	1305	275	275	275	245

Example q) S - E

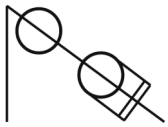


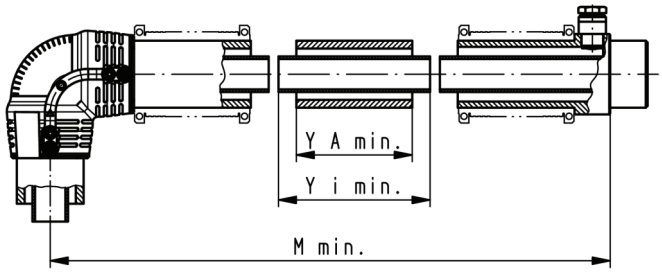
Example r) S - P - E



d*D	Direct M	M $_{min.}$	Inner pipe: Y $_{i\ min}$ / Material			Aussenrohr Y $_{A\ min}$
	S - E	S - P - E	PP	PE	PVDF	
20*50	310	435	125	125	125	95
25*50	313	435	125	125	125	95
32*63	335	475	140	140	140	110
40*75	380	545	165	165	165	135
50*90	450	620	170	170	170	140
63*110	510	730	220	220	220	190
75*125	545	780	235	235	235	205
90*140	590	845	255	255	255	225
110*160	620	880	260	260	260	230
125*180	655	940	285	285	285	255
140*200	675	965	290	290	290	260
160*225	755	1085	330	330	330	300
200*280	775	1190	415	415	415	385
225*315	810	1185	375	375	375	345

Example s) L - P - E





d*D	Direct M	$M_{min.}$	Inner pipe: $Y_{i\,min}$ / Material			Outer pipe $Y_{A\,min}$
		L - P - E	PP	PE	PVDF	
20*50	380	480	100	100	100	70
25*50	380	480	100	100	100	70
32*63	405	510	105	105	105	75
40*75	460	575	115	115	115	85
50*90	540	670	130	130	130	100
63*110	610	760	150	150	150	120
75*125	650	815	165	165	165	135
90*140	700	875	175	175	175	145
110*160	735	920	185	185	185	155
125*180	775	975	200	200	200	170
140*200	795	1010	215	215	215	185
160*225	880	1110	230	230	230	200
200*280	905	1165	260	260	260	230
225*315	960	1235	275	275	275	245

Leak detection and leak locating systems

To make certain that a leak in the inner pipe of a double containment system does not go unnoticed (rendering the system no better than a regular single pipe), it is essential that leaks are being detected. There are several different systems available on the market for the purpose of monitoring pipes.

Differential pressure

We distinguish between over and underpressure monitoring:

Overpressure monitoring

In differential pressure monitoring with overpressure, nitrogen is pumped at a specific pressure into the space between the inner and outer pipes. If there is a pressure loss in this space, an alarm will indicate the leak.

Advantages:

- The inner and outer pipes are monitored for leak-tightness
- Retrofit installation is possible
- TÜV test certificate
- Automatic alarm

Disadvantage:

- The nitrogen, which is pumped in, must be at a higher pressure than the medium-conveying inner pipe. It is therefore essential to check that the inner pipe will not collapse, taking account of the operating conditions (please refer to the questionnaire for the structural certificate).

Locating leaks:

- Outer pipe direct
- Inner pipe through special holes in the outer pipe

Vacuum monitoring (underpressure monitoring)

In differential pressure monitoring in a vacuum, a pump is used to create a vacuum in the range of 600 – 700 mbar in the space between the inner and outer pipes. If there is a pressure loss in this space, a vacuum switch (VS) switches on a vacuum pump. At the same time, a warning light and buzzer provide visual and acoustic warnings.

Advantages:

- No pressure loading on the inner pipe
- The inner and outer pipes are monitored for leak-tightness
- Retrofit installation is possible
- Automatic alarm
- TÜV test certificate

Disadvantages:

- Pumping volume of the vacuum pump must be at least 750 mbar with clear intake.
- Where there is a large volume of space between the inner and outer pipes, the vacuum pump will need to be powerful enough, or the pipeline will need to be divided into leakage sections, each with its own vacuum pump (Divisions with termination fittings, refer to Section: Tools for locating leaks in all systems).

Leak location:

- Outer pipe direct
- Inner pipe through special holes in the outer pipe

Suppliers of differential pressure monitoring systems:

SGB Sicherungsgerätebau GmbH
Hofstrasse 10
57076 Siegen, Germany
Tel: +49 271 48964 0
Fax: + 49 271 48964 6
sgb@sgb.de
www.sgb.de

Optical monitoring

For optical leak detection, a 20-mm diameter ball valve with a transparent PVC-U monitoring pipe is mounted on the Rp ½" branch of the termination fitting or on the branch saddle.

Advantages:

- Cost-efficient
- Retrofit on the branch saddle is possible

Disadvantages:

- No automatic alarm
- Outer pipe is not monitored
- Can be installed only at the lowest point

Branch saddle with leak monitoring

Optoelectronic monitoring

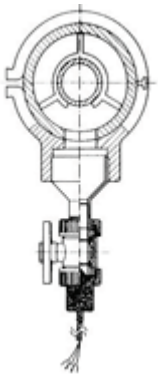
For optoelectronic leak detection, a fluid sensor and a 20-mm diameter ball valve with a transparent PVC-U monitoring pipe is mounted on the ½" branch of the termination fitting or on the branch saddle.

Advantages:

- Relatively cost-efficient
- Retrofit on the branch saddle is possible
- Automatic alarm

Disadvantages:

- Outer pipe is not monitored
- Can be installed only at the lowest point



Suppliers of optoelectronic leak detection systems:

Fa. CARLO CAVAZZI AG
Verkauf Schweiz/Vente
Sumpfstrasse 32
CH-6312 Steinhausen
Tel. +41 41 747 45 25
Fax +41 41 740 45 60
verkauf_vente@carlovagazzi.ch
www.carlogavazzi.ch,
www.gavazzi-automation.com

Fa. BAMO-IER GmbH
Innstrasse 2
D-68199 Mannheim
Tel: +49 621 842240
Fax +49 621-8422490
info@ier
www.ier.de

Fa. VEGA Grieshaber KG
Am Hohenstein 113
D-77761 Schiltach
Tel: +49 7836 50-0
Fax +49 7836 50-201
info@de.vega.com
www.vega.com

Sensor cable

In the space between the inner and outer pipes a cable is laid which reacts either to conductive fluids or chemicals and emits an alarm.

Advantages:

- Leak point is indicated precisely to within 1 m
- Automatic alarm

Disadvantages:

- Outer pipe is not monitored
- Relatively expensive
- Retrofit is not possible
- Depending on the system, larger outer diameter of outer pipe will be required
- Susceptibility to condensates

Note:

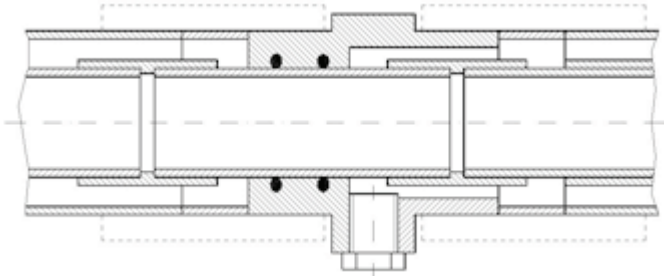
Due to the minimal difference in dimensions between the inner and outer pipes in the CONTAIN-IT Plus double containment system, sensor cables are not feasible. If this option is required, please contact our local sales representative.

Tools for locating leaks in all systems: Termination fittings

By separating the outer pipe into leak detection sections with termination fittings, the spill and the leak can be easily localised in the section between the built-in termination fittings.

Advantages:

- Fast and safe leak detection
- Only the respective section of the outer pipe needs to be rinsed and cleaned
- Length of leakage sections freely selectable



Operating and maintenance instructions

Important:
Installation or repair of double containment systems must be made only by personnel trained for the purpose and authorised by GF.

Maintenance

- If the leakage warning system signals an incident, the safety procedures – defined in advance by the operator of the double containment – system, must be followed.
- If the installation includes more than one double containment line or section, a leak detection system must be installed in each individual sector. If this is not done, and the space between the pipes becomes filled with the medium being carried, the double containment system effectively becomes a single pipe system. The leak detection system must be capable of detecting and indicating a leak within 72 hours.
- Double containment systems must be protected from uncontrolled thermal and mechanical influences.

Pressure test
Refer to section: "Pressure testing the inner und outer pipes".

Carrying out repairs

- Prior to beginning with a repair, it is essential to take appropriate precautions, including completely emptying and flushing the inner and outer pipes, preventing any dripping, etc.
  If a leak cannot be precisely located, it is useful to proceed section by section.
  Caution: Only use water to search for the leak.
- Our mechanically fastened drill-in saddle, with a ½" tapping point, allows test drillings to be carefully made on the underside of the protective pipe to section off the leak. The saddle is later resealed with a PVC plug.
- We recommend the use of termination fittings when the pipe system is being installed, to divide it up into leakage detection zones.
- The pipe must be replaced in accordance with our pipe installation instructions.

Extension of the installation and retrofit installation of a T-piece
Before starting work, it is essential to take appropriate precautions, including completely emptying and flushing the inner and outer pipes, preventing any dripping, etc.

Safety and fire prevention measures
We refer to the relevant safety datasheets of the plastic materials used.

Laying pipes in the ground
When laying pipes in the ground, care must be taken to ensure compliance with the relevant regulations and directives of professional organisations and public authorities and agencies, relating to trenching, embedding the double containment system and backfilling.

Pressure testing the inner and outer pipes

Inner pipe

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

Main test

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

Observe if using compensators

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

Observe if using valves

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

Filling the pipeline

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

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

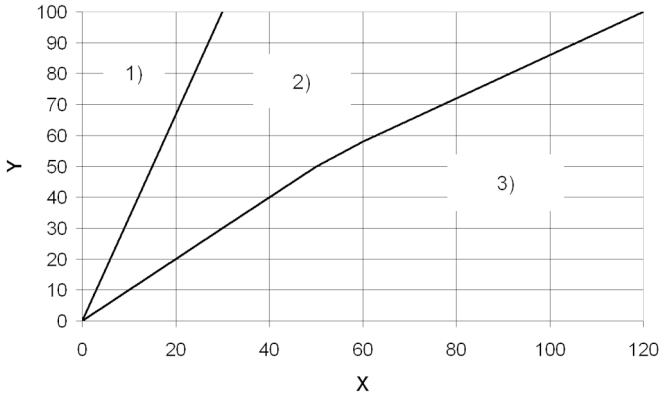
Now the pipeline can be filled from the geodetic lowest point. Special attention should be given to the air vent. If possible, vents should be provided at all the high points of the pipeline and these should be open when filling the system. Flushing velocity should be at least 1 m/sec.

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

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

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

Applying the test pressure



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

Definitions
Y = test pressure in %
X = time for pressure increase in min
1) = pressure increase rate up to DN 100
2) = range of pressure increase rates >DN 100 - 400
3) = reference values for pressure increase rate DN 500 and greater is: 500 / DN [bar/10 min]

Determining the test pressure

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

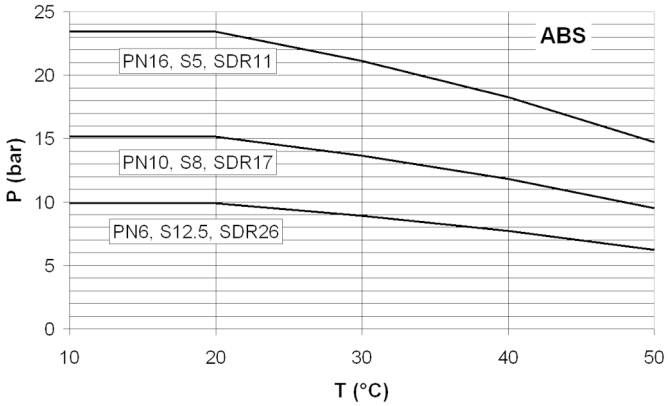
$$P_{p(perm)} = \frac{1}{SDR} \cdot \frac{20 \ \sigma_{v(T,100h)}}{S_P \ A_G}$$

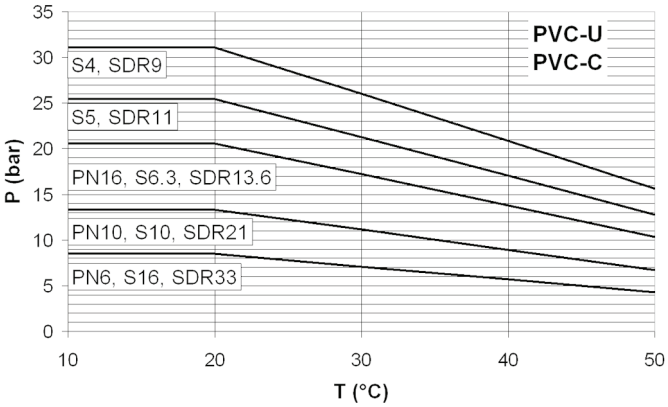
with
$\sigma_{v(T, 100h)}$ Long-term creep strength for the pipe wall temperature T_R (at t = 100 h)
S_p Minimum safety factor for long-term creep strength
A_G Processing or geometrical specific factor that reduces the allowable test pressure
T_R Pipe wall temperature: average value of test medium temperature and pipe surface temperature

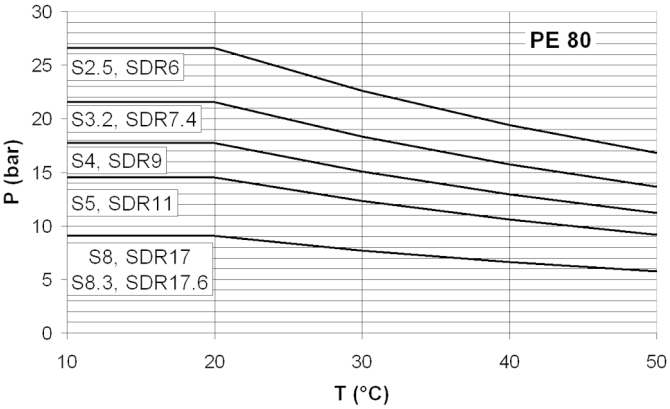
Attention: If the piping system contains diaphragm valves the maximum allowable test pressure is limited to the nominal pressure.

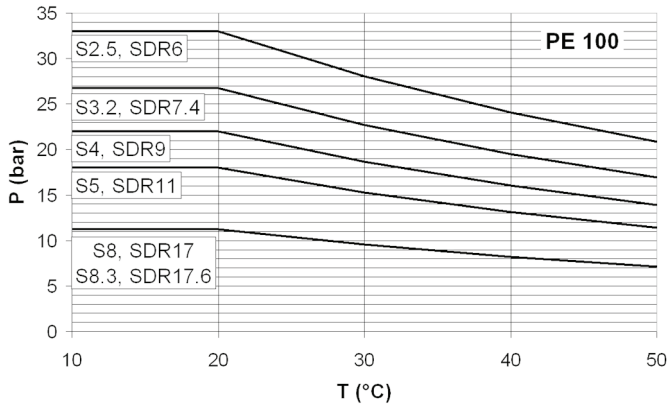
To make things easier, the permissible test pressures can be taken directly from the following diagrams.

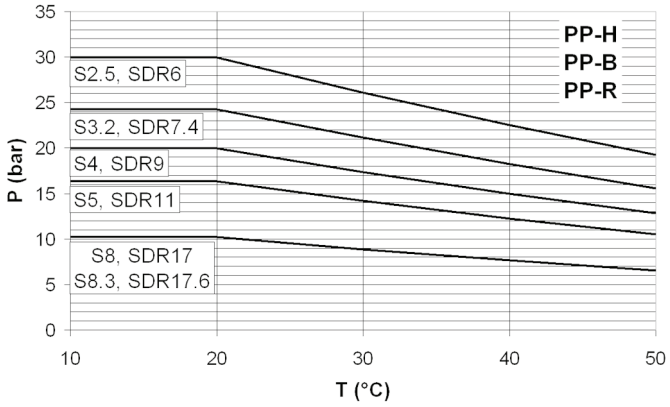
Definitions:
P = permissible test pressure in bar
T = pipe wall temperature in °C

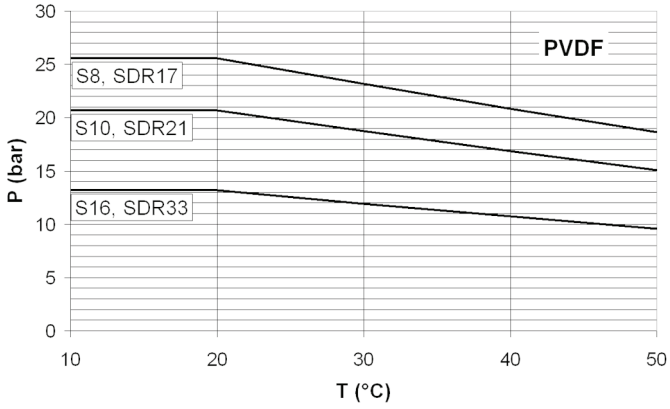












Checks during testing

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

Leak-tightness test

If it is not possible to use water to carry out an internal pressure test (e.g. piping systems need to be kept dry), a leak-tightness test can be carried out at low pressure. For safety reasons, the test pressure must be restricted to 0.5 bar (overpressure).

During the leak-tightness test, all joints are sprayed with a foaming agent and checked. Since the efficiency of the leak-tightness test is considerably restricted, due to the low loading, this should preferably be used only on systems with operating pressures below 0.5 bar.

Outer pipe

General

Once the test of the inner pipe is complete, the outer pipe is tested with a fully filled inner pipe under internal pressure (the internal pressure of the inner pipe must be at least equal to or greater than the internal pressure of the outer pipe) to avoid loading the inner pipe as a result of external pressure. To carry out the pressure test, suitable filling and ventilation facilities must be provided on the outer pipe.

After the installation of the double containment system has been completed, the pressure connection (pressure union) for the leakage indicator, or a test union to monitor the proper operation of the leakage indicator, is installed as near as possible to (no further than 1 m from) or directly inside the termination fitting and at the end of each length of piping. The leak-tightness test of the space between the pipes is carried out at room temperature (20 °C).

Caution:

Thin-walled inner pipes in particular can collapse under excess pressure in the space between the pipes. The maximum permissible test and / or overpressure in the space between the pipes depends on the load capacity of the medium-conveying inner pipe. Care should be taken here to ensure that the internal pressure load on the pipe (PN stage) is not the same as the external pressure load.

Water is the preferred test medium. However, complete drainage must be ensured. In many cases, air or inert gas are also suitable test media. The following points should be noted:

- Compressor oils can contain damaging elements for the pipe.
- Depending on the temperature, some materials tend to chip and break under mechanical influence and inner pressure of compressed media.
- The appropriate safety precautions should be taken in the event of a crack in the outer pipe, especially transparent PVC-U.
- The maximum gas pressure depends on the material and should not exceed the following values:

Test Parameter CONTAIN-IT Plus

Pipelines	**PE100 outer pipe, pressure-resistant fused with ELGEF® Plus coupler**		**PVC-U outer pipe, spray protection with EPDM rubber sleeve**	
	SDR11 SDR17 or SDR17.6			
	Pre-test	Main test	Pre-test	Main test
Water	≤ $p_{p\ (zul)}$	≤ 0.85 * $p_{p\ (zul)}$	1 bar	1 bar
Inert gas	0.5 bar	0.5 bar	0.3 bar	0.3 bar

Testing time

Holding the pipeline under the test pressure all connection parts of the pipeline like flanges, unions, valves, etc. are inspected on tightness using a foam building agent. A soap solution, which can be removed simply with water after the test, is best.

Attention: Commercial leak detection sprays can cause stress cracks in plastics. Using these sprays remove any residues after testing.

No overloading of the components

Please consider that the test pressure has to be adapted to the installed components: for example where fittings or valves are installed a maximum test pressure of 6 bar is admissible for the protective pipe!

Double containment valves	**PE100 outer pipe, pressure-resistant fused with ELGEF® Plus coupler**		**PVC-U outer pipe, spray protection with EPDM rubber sleeve**	
	SDR11 SDR17 or SDR17.6			
	Pre-test	Main test	Pre-test	Main test
Water	6 bar	6 bar	1 bar	1 bar
Inert gas	0.5 bar	0.5 bar	0.3 bar	0.3 bar

Static evidence

The questionnaire for static evidence is used by GF to determine if the selected pipeline is resistant under the given operating conditions. For fixed-point installation (inhibited longitudinal expansion), it is necessary to calculate the stresses and forces on the outer pipe fittings, which the fixed-point pipe brackets are required to absorb.

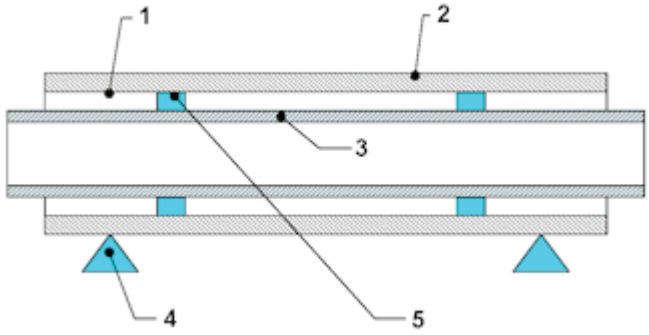
The fixed point for the inner pipe is already built into each fitting by means of a support ring. If the calculated stress on the pipe is too great, the operating conditions or the material must be changed. The calculation also indicates the distances between spacers for the inner pipe and the distances between pipe brackets for the outer pipe as well as the forces on fixed points. Expansion in the pipeline need not be taken into consideration; no additional expansion loops or compensators are required. To prevent the pipe sagging because of bending or not exactly aligned installation, it is advisable to install guide supports between the fixed points, designed for lateral forces of around 15 % of the axial forces, acting on the fixed points.

Double containment system fixed point

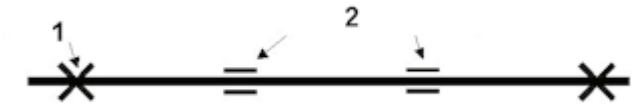
CONTAIN-IT Plus loadings

- Medium, pressure, temperature, time
- Stresses resulting from impeded thermal expansion
- Kink resistance
- External pressure stability
- Intermittent stressing
- Special case of EPDM sleeve

CONTAIN-IT Plus system



1 Monitoring space
2 Outer pipe
3 Inner pipe
4 Pipe bracket
5 Spacer



1 Fixed point
2 Guide supports

Questionnaire for static evidence

General project information	
Project / Object = File name	
Order placed by / Customer	
Bid / Order number	

Materials selection for outer pipe *	PE-80	PE-100	PVC-U
	☐	☐	☐

Leak detection information	optical	N_2	cable	other
Type of monitoring *	☐	☐	☐	☐
Overpressure difference [bar]				
Underpressure [mbar]				
No pressure *	☐			

Additional system data *	Installation location 1	Installation location 2
	Above ground ☐	In buildings ☐
	In the ground ☐	Outdoors ☐
Time period for temperatur change:		
Ambient temperature:	Max. Min.	Max. Min.
Installation temperature:	Max. Min.	Max. Min.

Selection of Secondary Containment components

Type of fittings required * ☐ 90° elbow ☐ 45° elbow ☐ T-equal ☐ T-red

Inner pipe:		Outer pipe:	
Material		Material	
Nominal diameter DN		Nominal diameter DN	
Outer diameter da		Outer diameter da	
Wall thickness e		Wall thickness e	
Nominal pressure rating PN		Nominal pressure rating PN	
Standard dimension ratio SDR		Standard dimension ratio SDR	

Jointing technology	HS	HD	IR	KL	HM	GM
Inner pipe *	☐	☐	☐	☐		
Outer pipe *					☐	☐

HS = Butt fusion HD = Socket fusion
IR = Infrared KL = Cementing
HM = Electrofusion GM = EPDM coupler

Operating Conditions

Flow media Density: g/cm³

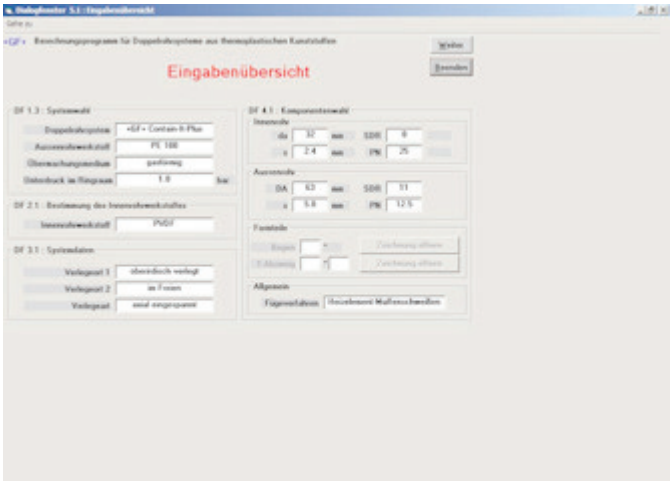
			Total load time:	
Maximum working temperature	°C		In percent	%
Minimum working temperature	°C		In percent	%
Maximum working pressure	bar		In percent	%
Minimum working pressure	bar		In percent	%

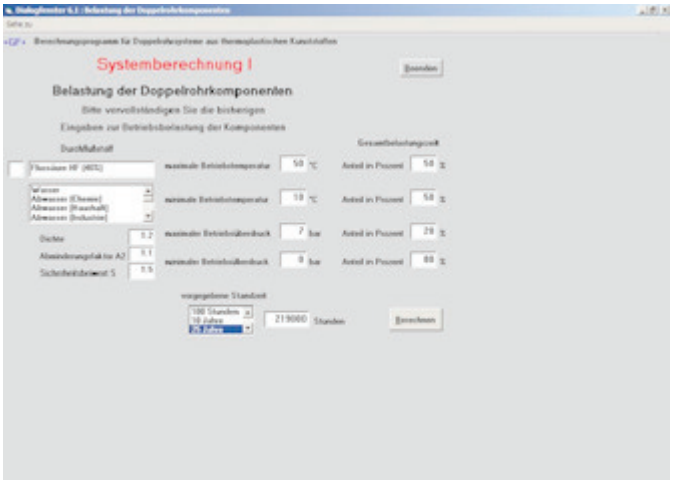
Required service life * (years) 10 ☐ 25 ☐ 50 ☐

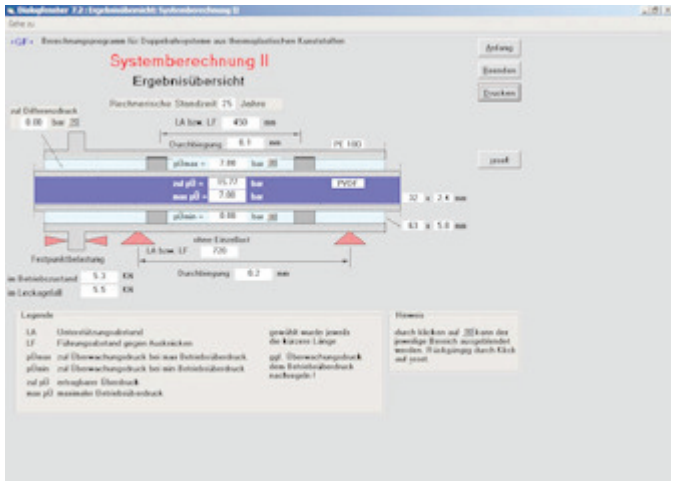
*)please mark if applicable

Static evidence - Calculation by GF Piping Systems

On the basis of the customer data entered in the questionnaire (cf. Questionnaire for static evidence, Section: Static evidence) the calculation programme produces a static evidence, as shown in the following illustrations. The static evidence is sent to the customer.



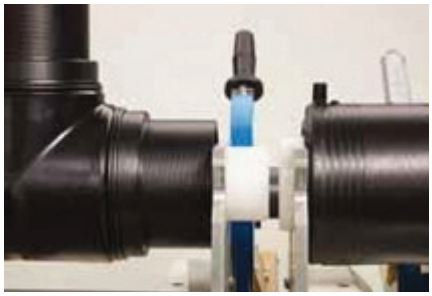




Welding machines for butt and socket fusion

SG 160 welding machine

- for butt fusion joints from d20/50 to d110/160
- for larger sizes, use SG 315 welding machine



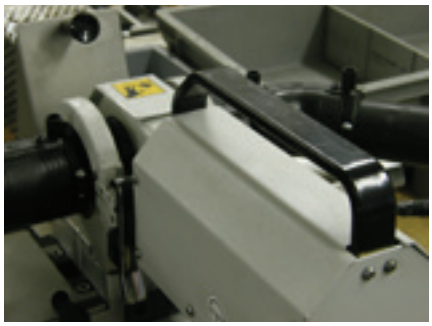
SG160

- for socket fusion joints from d20/50 to d110/160

Welding machine for IR-fusion

Welding machine IR63:

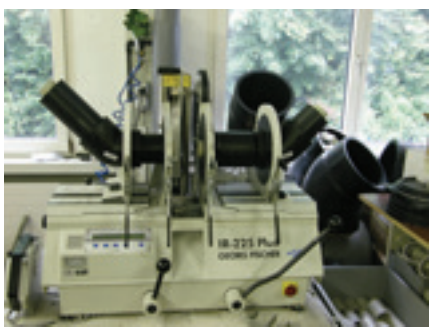
- For IR-fusion joints up to Dimension d32/63
- Please use the special half shell for the double containment system.



Welding machine IR110:

- For IR-fusion joints up to Dimension d50/90
- No special half shells

Welding machine IR225:

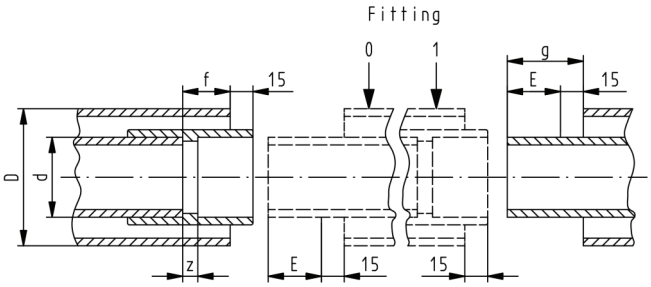


- For IR-fusion joints up to Dimension d63/110
- Please use the special half shell for the double containment system.

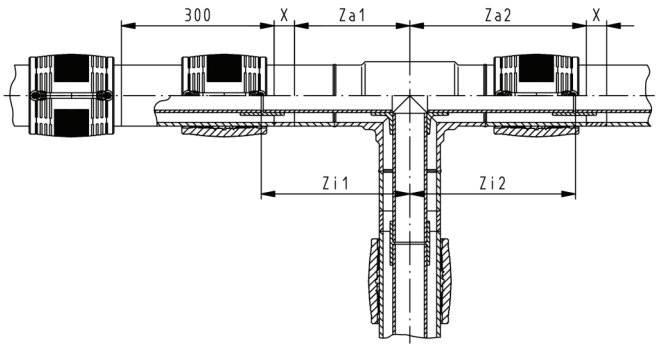
Safety measures - extensions and repairs

- Completely drain the inner and outer pipes
- If necessary, wash out
- Take precautions to ensure no dripping of medium
- Caution when separating the pipes – protect personnel and equipment from leaking medium
- Use water to search for leak (must be compatible with product)

Separating for retrofit installation of a T-90°



1	Separation inner and outer
2, 3, 4	Separation outer
5, 6	Separation inner
7	Branch axis for 90 ° T-piece



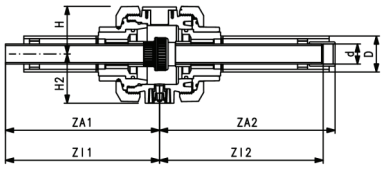
X = 30 mm snap ring width

Z-dimensions can be taken from the double containment product catalogue.
Branch axis for 90 ° T-piece The piping must be capable of being moved axially.

CONTAIN-IT Plus - mechanical joint

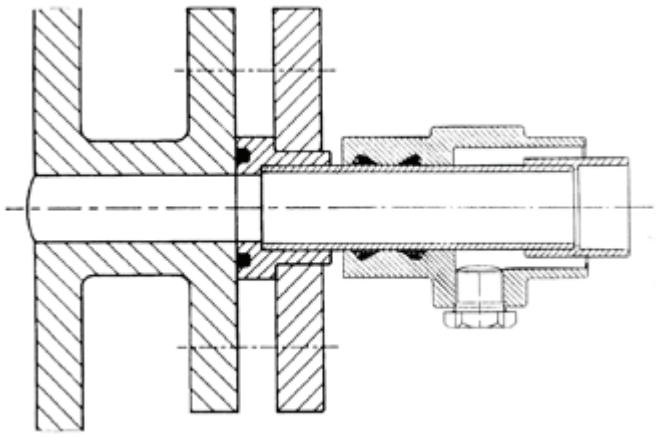
Radially removable stainless steel collar for the outer pipe
For retrofit extension or repair

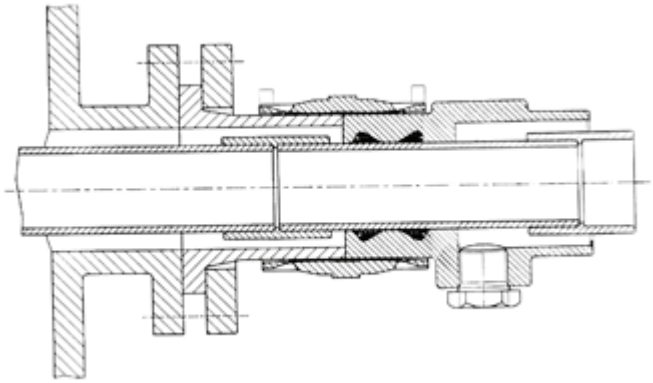
- Inner pipe with screwed union
- Flanged inner pipe



Further information available on request.

Double containment - flanged connection to a tank





Double containment valves

Versions

- Pneumatic actuator
- Electric actuator
- Hand operated
- PVC-U PN 6 protective case
- Internal ball valve: can be radially installed and removed

CONTAIN-IT Plus ball valve

Operating instructions

1 Introduction

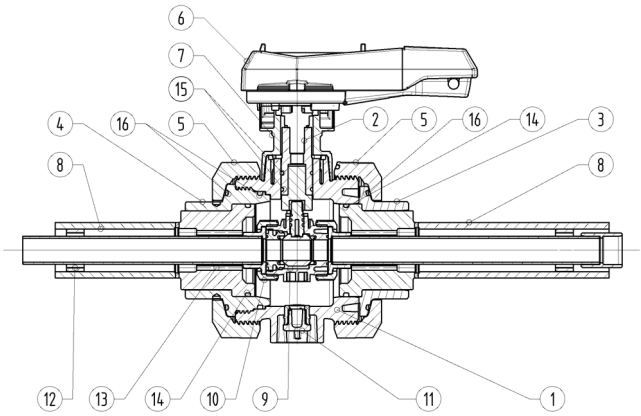
Double containment valves from GF Piping Systems are supplied as a ready-to-install system unit and the jointing technology used is similar to that for a double containment fitting. The concept is that the inner pipe is first joined according to the jointing technology which you have selected. The following jointing methods and materials can be chosen from:

Jointing methods for inner pipe	Material
Butt fusion	PE100, PP-H, PVDF
IR fusion	PE100, PP-H, PVDF
Socket fusion	PE80, PP-H, PVDF
Socket cementing	PVC-C, PVC-U

- installation and pressure testing of a double containment ball valve
- removing and reinstalling, e.g. in case of a leak
- retrofitting the valve for actuation

Please note that the installation conditions and safety instructions contained in the enclosed installation and operation instruction manual for the 2-way ball valve type 546, manual operation, must be complied with each time the double containment valve is built in or dismantled!

2 Design of a double containment valve



1 Protective housing
2 Stem
3 Union end
4 Union bush
5 Union nut of protective housing
6 Hand lever
7 Nuts and screws to fix the hand lever
8 Support pieces PE
9 Ball valve type 546 (central part)
10 Union nut ball valve type 546
11 Connection for 1/2 inch leak detection or PVC-U 1/2 inch plug
12 Spacer
13 Borehole for leak detection of inner pipe
14 O-ring for PE connection adaptor
15 O-rings for stem
16 O-rings for union bush / union end

3. Installation

Before putting the double containment valve into operation, the following 4 steps are required to install the CONTAIN-IT Plus ball valve:

Step 1: Valve mounting

NOTICE

Installation of the valve

Incorrect installation may cause problems with tolerances.

- Make sure to join up the pipe ends with the other pipe sections only after the valve has been assembled

NOTICE

Fixing of the valve

Tension within the assembly reduced the life expectancy and functionality of the valve.

- Fix the valve at both ends with fixing points in order to minimise any tension within the assembly

Step 2: Preparing for pressure testing

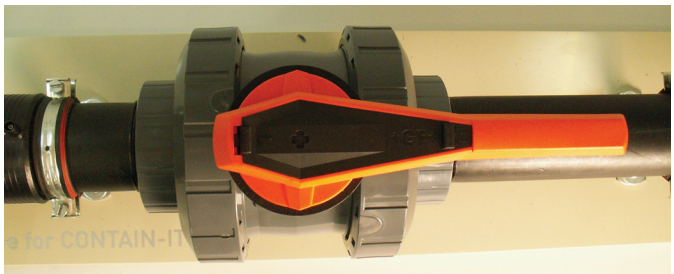
CAUTION

Removing the hand lever

A build-up of internal pressure may cause the valve pinion to pop out, leading to injury and / or damage.

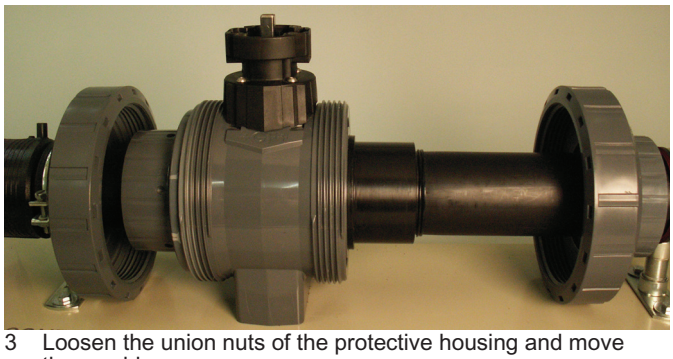
- Before removing the hand lever, any internal operating or test pressures must be released

Procedure:

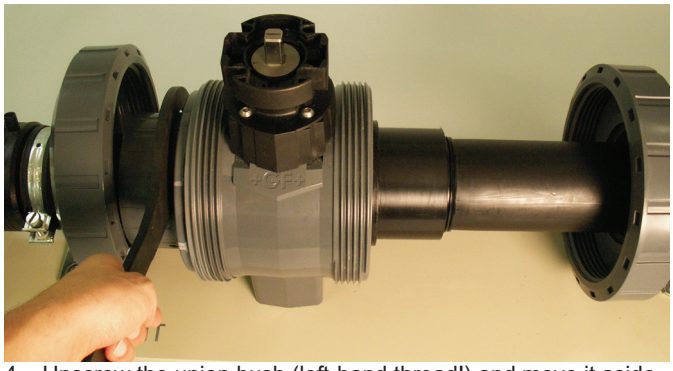


1 Make sure that the red hand lever is in parallel position to the pipe system.

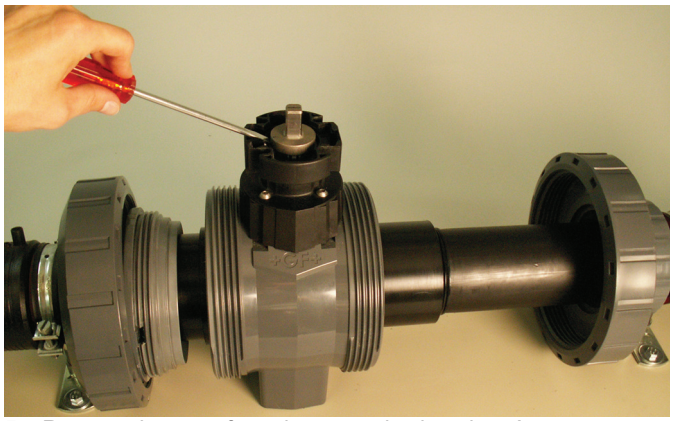
2 Loosen the nuts and remove the hand lever.



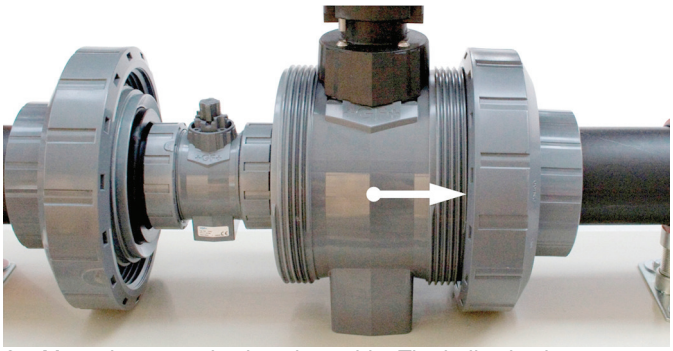
3 Loosen the union nuts of the protective housing and move them aside.



4 Unscrew the union bush (left-hand thread!) and move it aside. Note: The use of a pin wrench is recommended (00 23 90).



5 Remove the stem from the protective housing. A groove on the stem allows the use of a screw driver.



6 Move the protective housing aside. The ball valve is now accessible.

Step 3: Pressure testing the inner pipe

WARNING

Pressure Testing

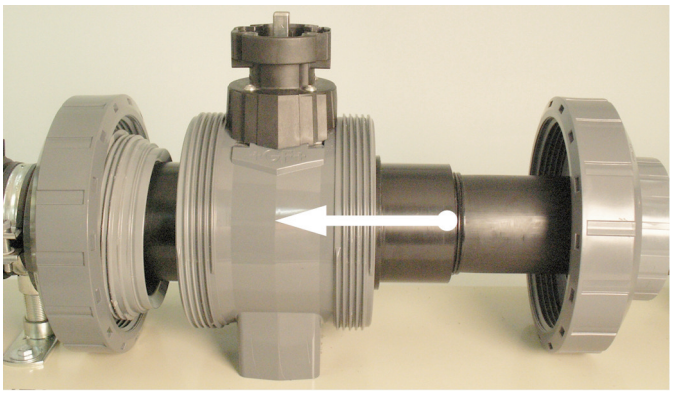
Using hazardous media for pressure testing may put the installation at risk and cause physical damage or bodily harm in case of leakage.

- The pressure test must be performed using non-hazardous media (e.g. water) and with due care and attention in handling.
- Please pay attention to the instructions in the user manual included for ball valve type 546 (valves only)

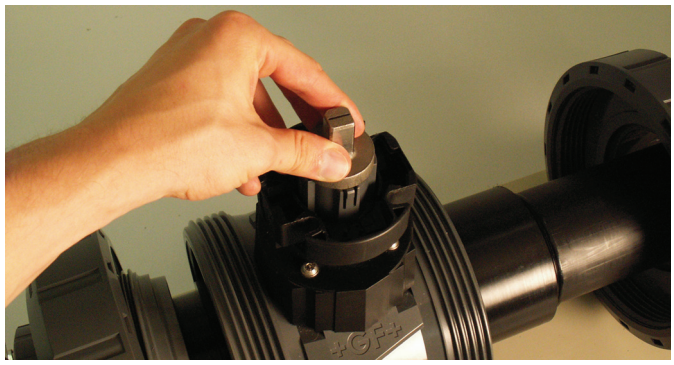
Procedure:
1. Check to make sure the protective housing is open (cover removed) to determine if there is leakage during the pressure testing.
2. The pressure test must be performed with water or another non-hazardous medium. See **DVS 2210-2 with reference to DVS 2210-1, Suppl. 2, as well as the instructions contained in the above mentioned Installation and Operating Instructions for Ball Valve Type 546**.

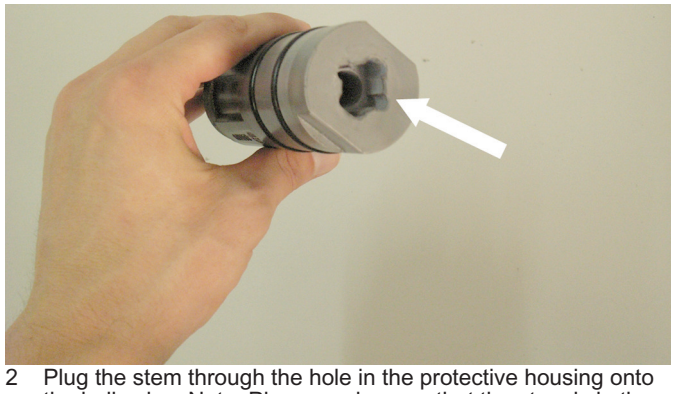
When the pressure test has been successfully completed, proceed to Step 4.

Step 4: Assembling the CONTAIN-IT Plus Ball Valve Type 546

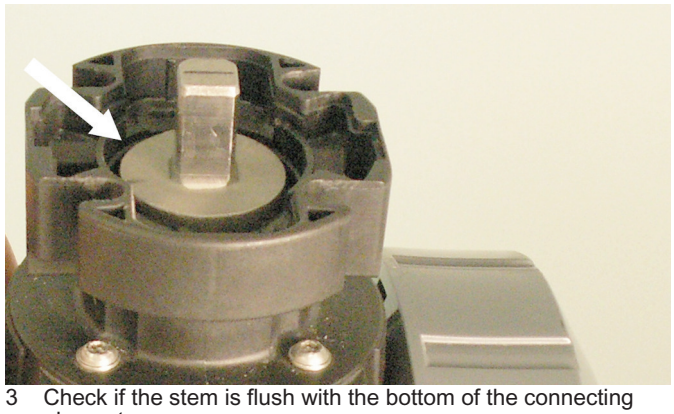


1 Move the protective housing over the ball valve.

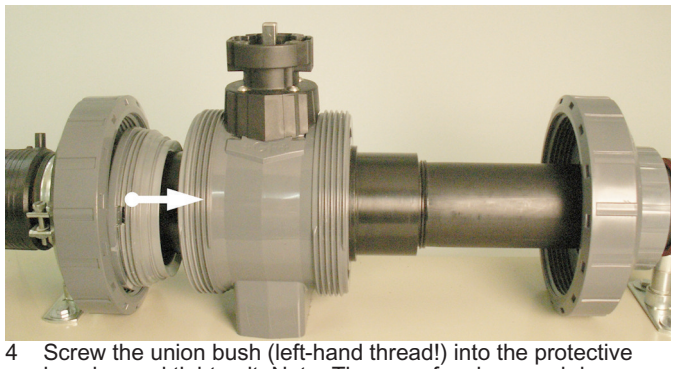




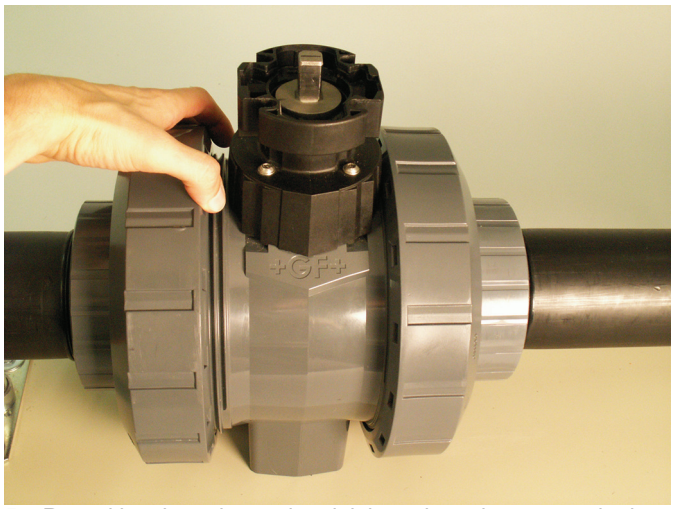
2 Plug the stem through the hole in the protective housing onto the ball valve. Note: Please make sure that the stem is in the right position. Therefore please consider the outline of the stem and of the ball valve.



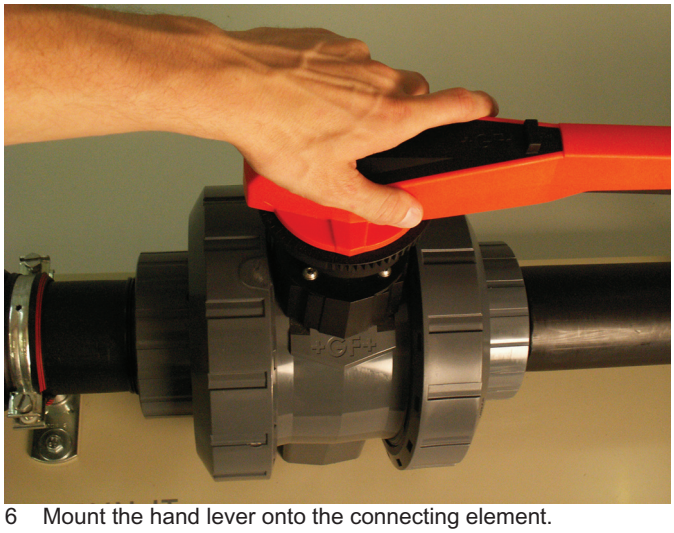
3 Check if the stem is flush with the bottom of the connecting element.



4 Screw the union bush (left-hand thread!) into the protective housing and tighten it. Note: The use of a pin wrench is recommended (00 23 90).



5 Reposition the union end and tighten the union nuts on both sides with an adequate wrench.



6 Mount the hand lever onto the connecting element.

4 Installing and removing the double containment Ball Valve Type 546

WARNING

Opening of protective housing and ball valve

Uncontrolled leakage of medium may occur from the pipeline or the valve both with and without pressure. Contact with any remaining quantities of hazardous, aggressive, flammable or explosive media within the pipeline or the valve may cause death or serious injury.

- Release the control and operating pressures
- Completely drain the medium from protective housing (the medium-conducting inner pipe as well as the outer pipe)
- Rinse the inner and outer pipes
- Protect against dripping

4.1: Opening the protective housing

Procedure see chapter 3 - step 2

4.2: Removing the ball valve type 546

Procedure:

1. Loosen the union nuts of the ball valve
2. Take the ball valve out of the inner pipe
3. Perform revision work according to the instruction manual of the ball valve type 546

4.3: Re-installing the ball valve type 546

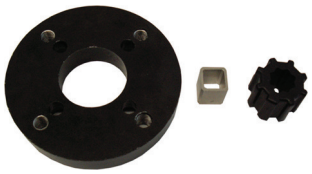
Procedure:

1. Check O-rings on ball valve and grease with a ten-side-free, silicone or polyglycol-based lubricant (we recommend using new gaskets when re-installing the ball valve).
2. Fit the ball valve 546 in the inner pipe, making sure the ball valve is in the "open" position.
3. Re-tighten the adjustment bush and union nut in the counter-clockwise direction (Fig. 4)
4. Perform pressure test and assembly according to steps 3 and 4 described in paragraph 3.

5 Upgrade the CONTAIN-IT Plus Ball Valve Type 546 with an actuator

The CONTAIN-IT Plus Ball Valve can be upgraded with the EA11, EA21 and PA21 actuators according to the following description.
To upgrade the CONTAIN-IT Plus Ball Valve you will need the Adaptor Set 700 238 796. This Adaptor Set includes the following items:

- 1 x Adaptor Code 198 204 007
- 1 x Interface adaptor Code 198 803 156
- 2 x Reducing bush Code 198 803 145



Upgrades with other actuators on request.

5.1: Procedure:

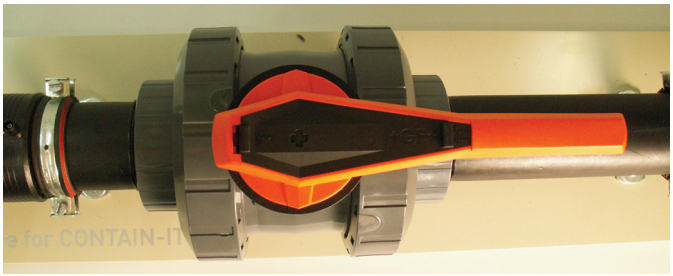
The upgrade of the actuators EA11, EA21 and PA21 follows the same steps.

CAUTION

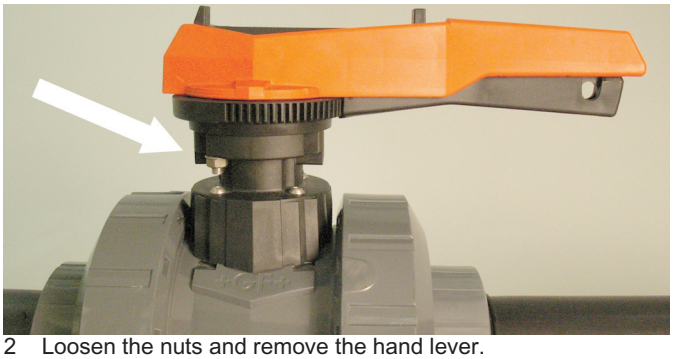
Removing the hand lever

A build-up of internal pressure may cause the valve pinion to pop out, leading to injury and / or damage.

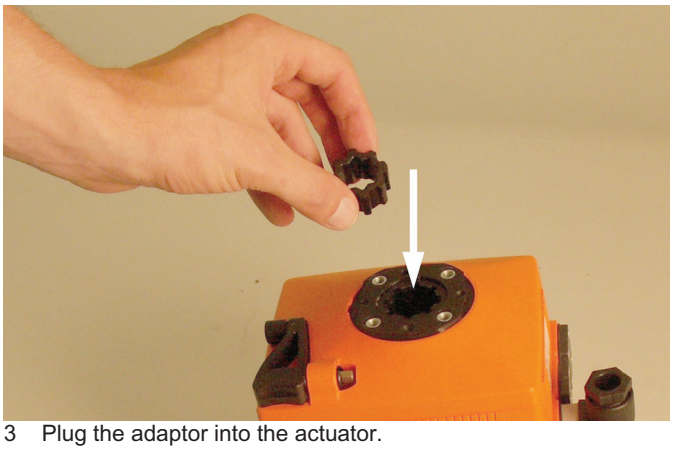
- Before removing the hand lever, any internal operating or test pressures must be released



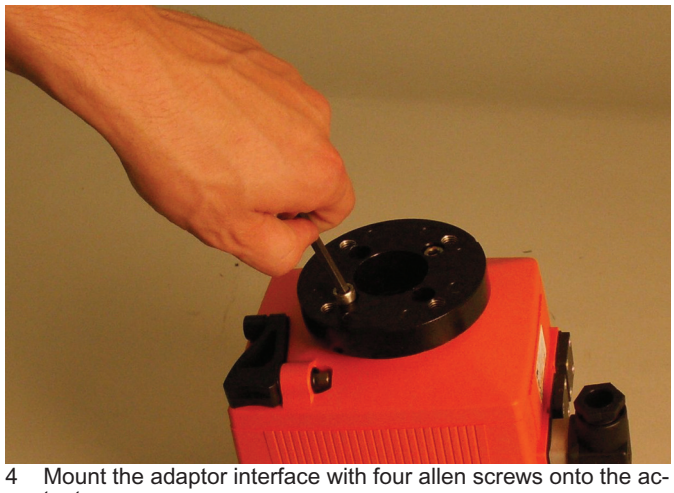
1 Make sure that the red hand lever is in parallel position to the pipe system.



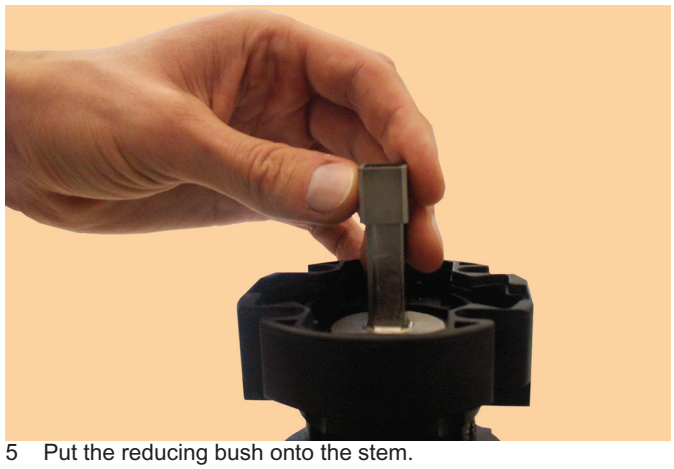
2 Loosen the nuts and remove the hand lever.



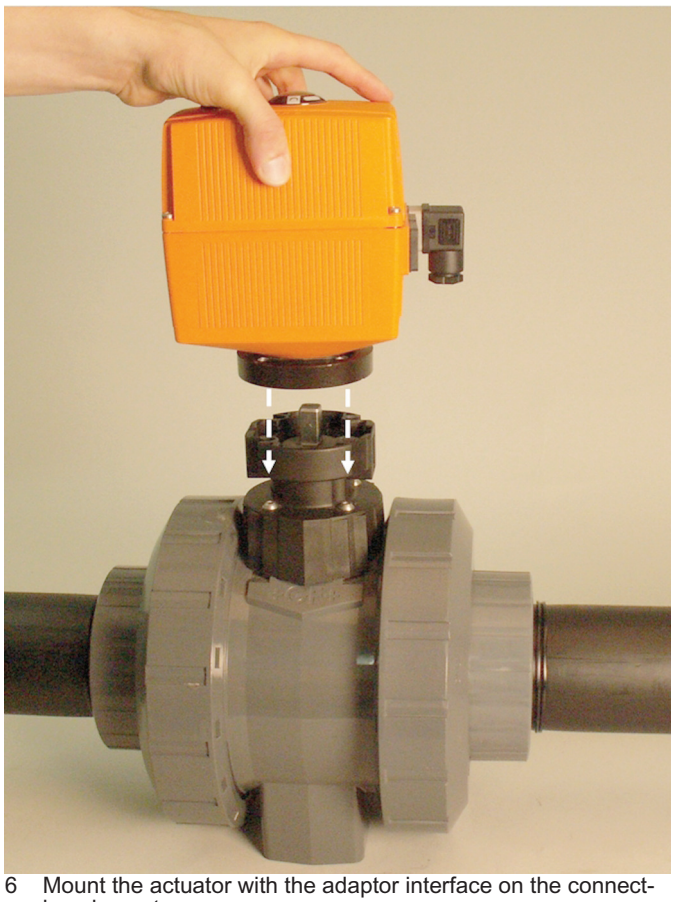
3 Plug the adaptor into the actuator.



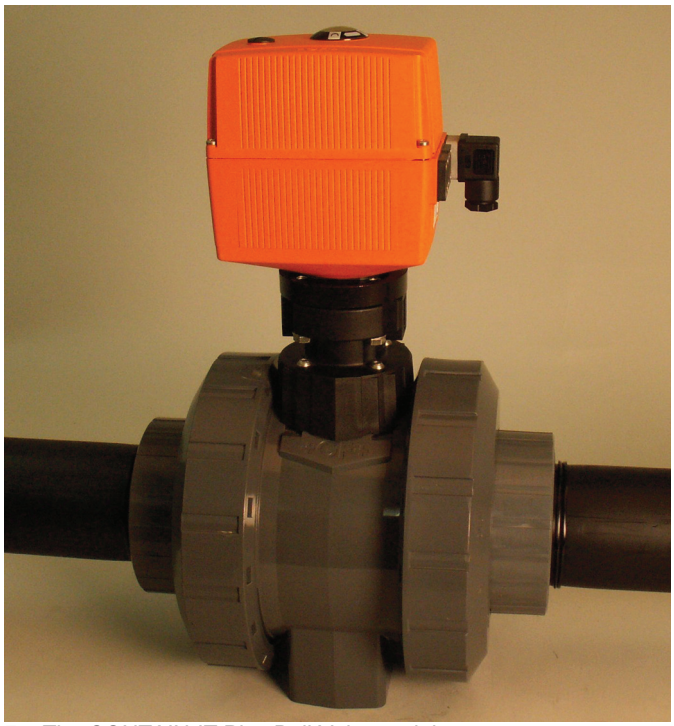
4 Mount the adaptor interface with four allen screws onto the actuator.



5 Put the reducing bush onto the stem.



6 Mount the actuator with the adaptor interface on the connecting element.



7 The CONTAIN-IT Plus Ball Valve and the actuator are now ready to use.

6 Spare part seals for the CONTAIN-IT Plus Ball Valve Type 546

6.1 Stem

Dimension Ball Valve	Code	Qty.	Dimension mm	O-ring
d20/50-d32/50	748410103	2	3.54 x 29.75	EP-DM
	749410103	2	3.54 x 29.75	FPM
d40/75-d63/110	748410027	2	3.54 x 37.69	EP-DM
	749410027	2	3.54 x 37.69	FPM

6.2 PE-connecting adaptor

d20/50–d25/50	748410119	2	5.34 x 71.39	EP-DM
	749410119	2	5.34 x 71.39	FPM
d32/63	748410023	2	5.34 x 91.44	EP-DM
	749410023	2	5.34 x 91.44	FPM
d40/75-d63/110	748410254	2	7.0 x 108.0	EP-DM
	749410254	2	7.0 x 108.0	FPM

6.3 Union end / union bush

d20/50–d25/50	748410111	2	5.34 x104.37	EP-DM
	749410111	2	5.34 x104.37	FPM
d32/63	748410249	2	5.34 x123.19	EP-DM
	749410249	2	5.34 x123.19	FPM
d40/75–d63/110	748410258	3	5.34 x146.1	EP-DM
	749410258	(d63=4)	5.34 x146.1	FPM

6.4 Ball Valve Type 546 (Central Part)

Seal sets consist of:
2 backing seals, 1 body seal, 2 face seals, 2 stern seals

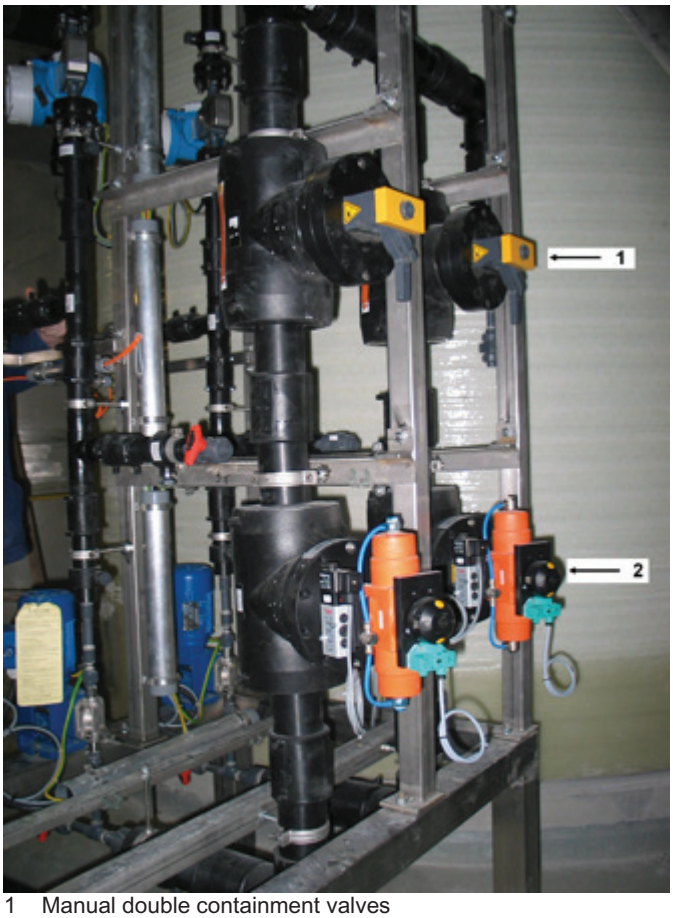
EPDM sealing set:

Dimension	Code
d20/50	161486400
d25/50	161486401
d32/63	161486402
d40/75	161486403
d50/90	161486404
d63/110	161486405

FPM sealing set:

Dimension	Code
d20/50	161486410
d25/50	161486411
d32/63	161486412
d40/75	161486413
d50/90	161486414
d63/110	161486415

Installation example of double containment valves

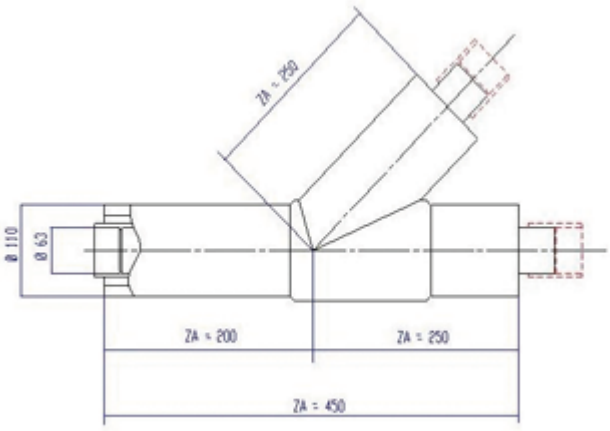


1 Manual double containment valves
2 Double containment valve with pneumatic drive

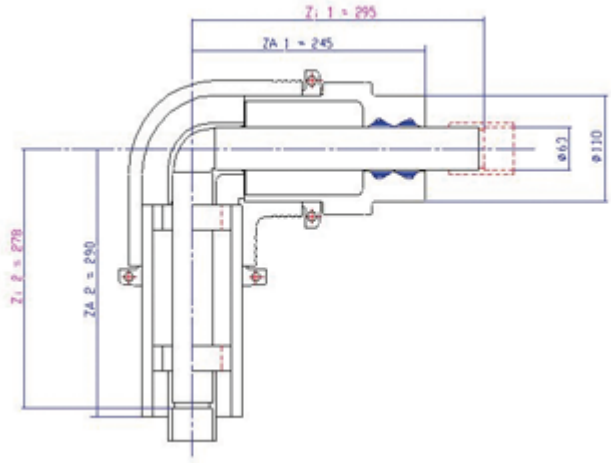
Customized parts

A large number of components in the double containment range are manufactured to customer requirements. Prefabricated tapping pieces, reducing T-pieces, termination fittings integrated into the preform or the prefabrication of entire sub-assemblies offer simplified installation on the construction site.

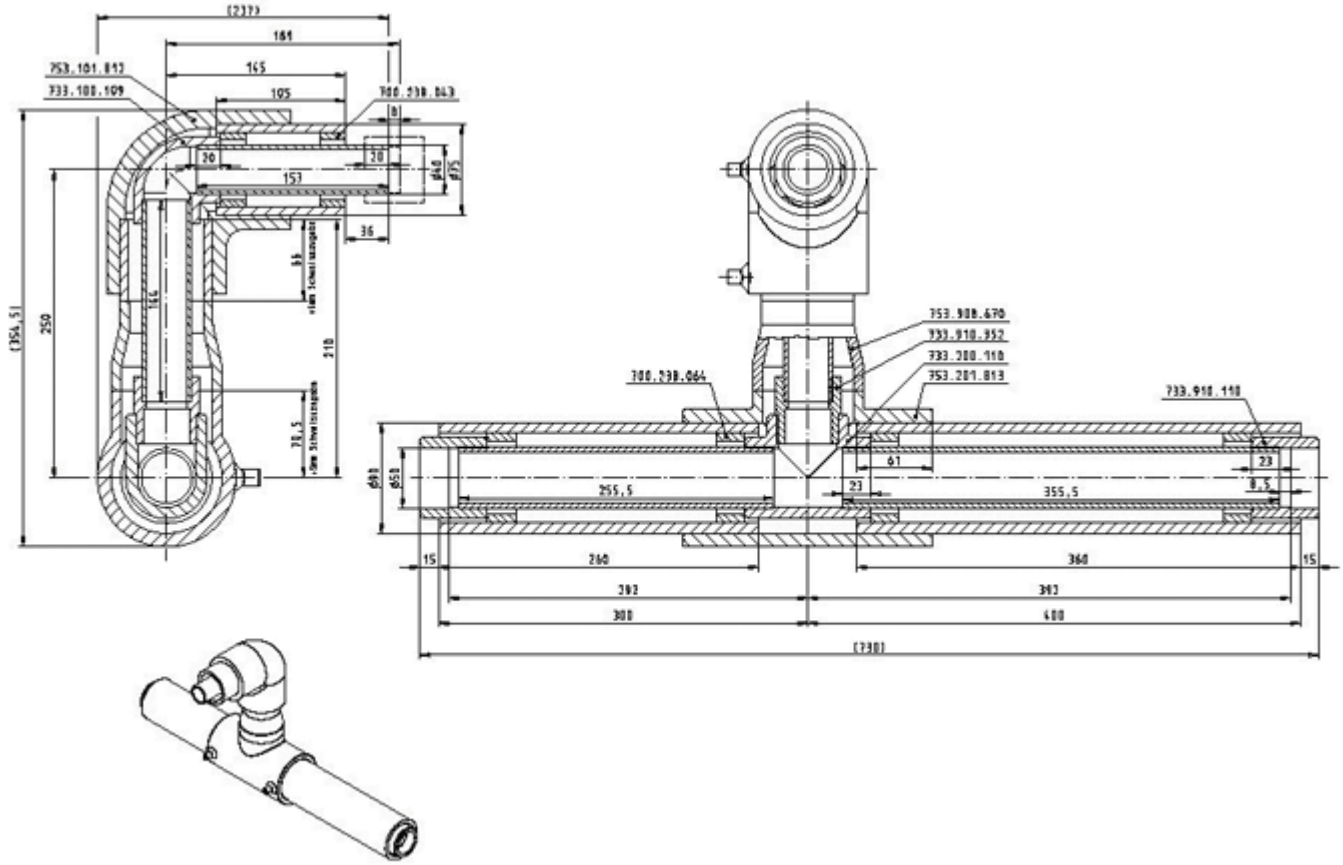
T-piece with 45 ° tapping point for socket fusion and cementing or butt fusion



90 ° elbow including termination fitting



Double containment reducing 90 ° T-piece with elbow



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