

INSTALLATION MANUAL FOR PRE-INSULATED PIPES



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1. General Rules for Installation

The reliability and total life of the pre-insulated piping system greatly depends on the quality of its installation. The quality of joints is crucial for the lifetime and efficiency of the entire system. Defects caused by poor installation can cause serious failures, particularly corrosion of steel pipes or degradation of insulation material,

This Installation Manual contains working procedures, recommendations and important information that must be followed when installing individual pre-insulated components of FINTHERM system. Adherence to correct procedures is required to achieve the anticipated working life of individual elements of pre-insulated pipes and the entire piping system.

The installation of pre-insulated pipes and accessories must be carried out in accordance with the following:

- Applicable laws, standards, and regulations
- Design documentation of FINTHERM a.s.
- Product catalogue of FINTHERM a.s.
- Installation procedures and rules provided in this Manual
- Approved design documentation

The design and installation of piping made of plastic casing and media-carrying steel pipes are subject to the following standards:

- EN 253** District heating pipes - Preinsulated bonded **pipe** systems for directly buried hot water networks
- Pipe assembly of steel service pipe, polyurethane thermal insulation and outer casing of polyethylene
- EN 448** District heating pipes - Preinsulated bonded pipe systems for directly buried hot water networks
- **Fitting** assemblies of steel service pipes, polyurethane thermal insulation and outer casing of polyethylene
- EN 488** District heating pipes - Preinsulated bonded pipe systems for directly buried hot water networks
- **shut-off valves** for steel service pipes, polyurethane thermal insulation and outer casing of polyethylene
- EN 489** District heating pipes - Preinsulated bonded pipe systems for directly buried hot water networks
- **Joint assembly** for steel service pipes, polyurethane thermal insulation and outer casing of polyethylene
- EN 13941** **Design and installation** of preinsulated bonded pipe systems for district heating
- EN 14419** District heating pipes - Preinsulated bonded pipe systems for directly buried hot water networks - **Surveillance systems**
- EN 15698** District heating pipes - Preinsulated bonded twin pipe systems for directly buried hot water networks - Part 1: **Twin pipe assembly** of steel service pipe, polyurethane thermal insulation and outer casing of polyethylene



Failure to observe the installation procedures and conditions specified in the documents of Uponor Infra FINTHERM a.s. may result in damage to the pre-insulated pipes and accessories, which will not be covered by the warranty.



The safety of staff and other persons must be ensured in accordance with applicable regulations.

The waste generated during the installation of pre-insulated pipes shall be disposed of in an environmentally friendly manner and in accordance with applicable laws, standards, regulations and legislation.



According to the requirements of EN 13941 and the EHP directive, the installation of joints can only be carried out by personnel trained for this technology with a valid certificate issued by the supplier of the pipe system, FINTHERM a.s., or an organization providing certification of employees and installation companies according to national practices, e.g. AGFW in Germany according to German directives FW603 and FW605.

2. Handling and Storage

2.1 Handling

2.2 Storage

2.2.1 *Pipes*

2.2.2 *Fittings*

2.2.3 *Foam components*

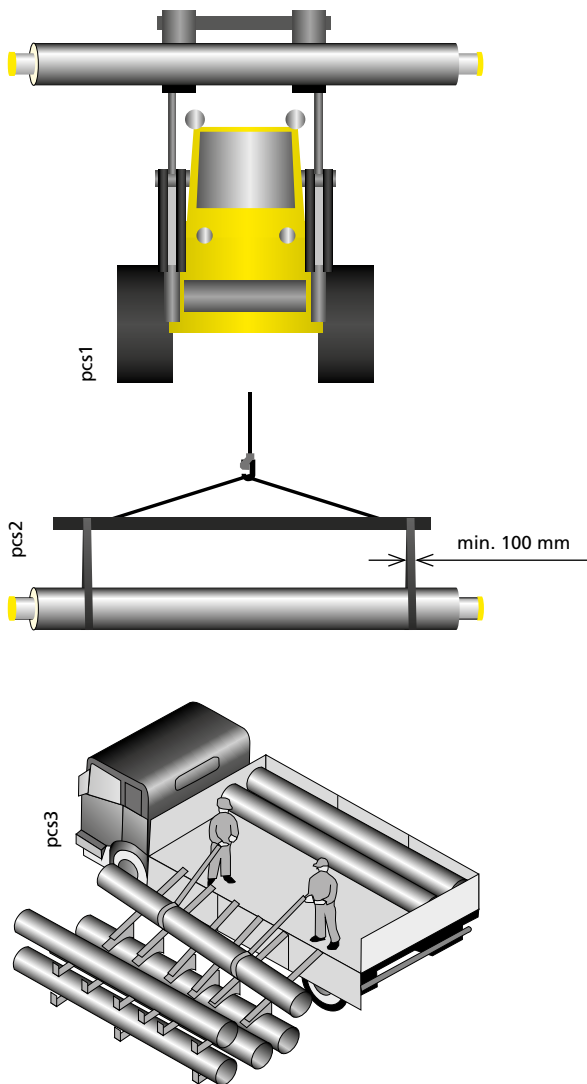
2.2.4 *Connecting materials*

2. Handling and Storage

2.1 Handling

During handling, it is essential to observe all safety regulations and take utmost care so as to avoid personal injury and prevent damage to the casing, isolation, detection wires or ends of steel pipes. The pipe ends are protected from the penetration of dirt by plastic caps.

The pipes can be handled using:



Loader

It is necessary to pay attention primarily to the stability (centre of gravity) of transported material

Crane with the use of lashing straps and a spreader beam:

- Lifting the piping at the casing - the distance between the lashing straps must be at least 4.5 m for 12 metre long pipes
- The pipes should only be lifted by the steel pipe - the lashing straps are fastened vertically at the ends of the steel pipe to prevent damage to the casing

Manually in case of smaller dimensions

Extreme care shall must be taken, when unloading is carried out manually. The only method that can be recommended is the use of wooden ramps and belts, as shown in the figure.



Pipes and other piping components must never be dumped or dropped from the vehicle!

Other types of handling, e.g. use of hooks or chains, are not recommended, as there is a high risk of damage especially to the pipe casing.

It must be ensured that handling is always carried out to prevent potential damage to the casing of the pre-insulated pipes.

The pipes and other piping components must not be dragged on the ground!



The products shall not be handled at temperatures below -15°C. At temperatures below 10°C the polyethylene casing loses its elasticity (ie. becomes brittle) and is more susceptible to damage; therefore, measures must be taken to prevent potential damage to the outer casing.

2. Handling and Storage

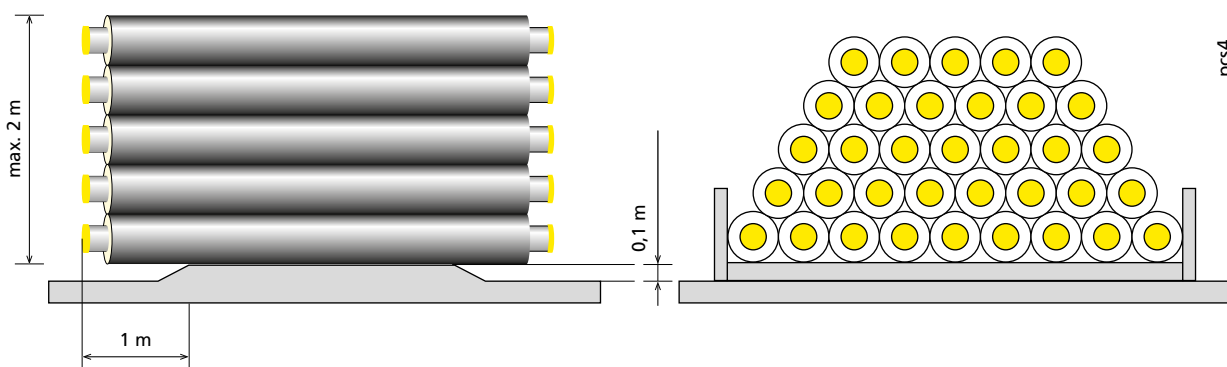
2.2 Storage

2.2.1 Pipes

The pipes must be stored on a flat surface and protected against possible ingress of moisture into the PUR insulation or flooding of the pipes with water.

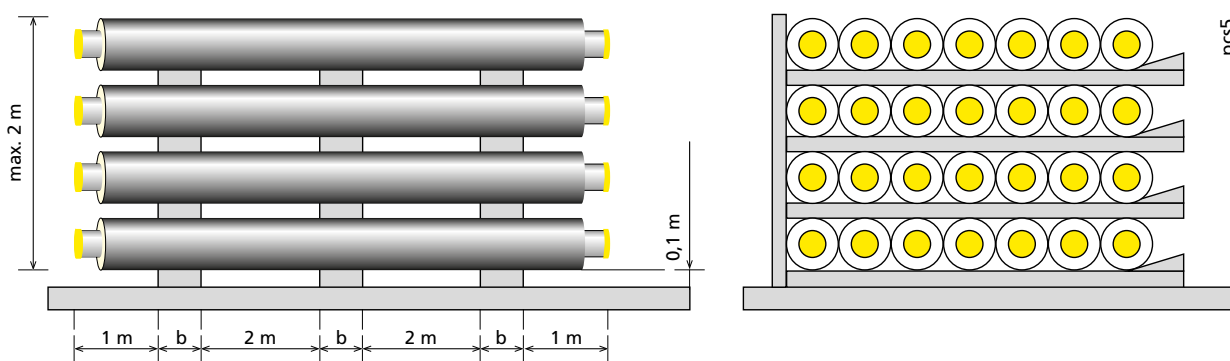
Storing pipes on a sand bed

The pipes should be ideally stored on a flat, compact sandy surface without any stones or sharp objects. The sandy surface must be designed so that the ends of pipes exceed it by 1 m. The pipes must be secured against slipping.



Storing pipes on wooden beams

When storing pipes on wooden beams, it is necessary to level the beams and place them with a maximum spacing of 2 m. The pipes must be secured against slipping by wedges. Failure to comply with the storage conditions may cause irreversible deformation of the pipe casing.



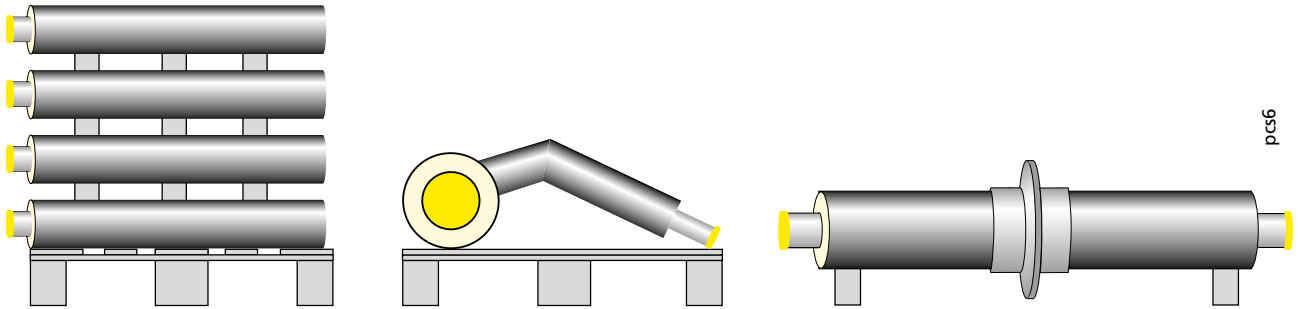
Width of support depending on the height of the bundle of pipes

Height of bundle of pipes (m)	b width of support (mm)
do 0,5 m	125 mm
0,5 - 1,0 m	200 mm
1,0 - 1,5 m	250 mm
1,5 - 2,0 m	400 mm

2. Handling and Storage

2.2.2 Fittings

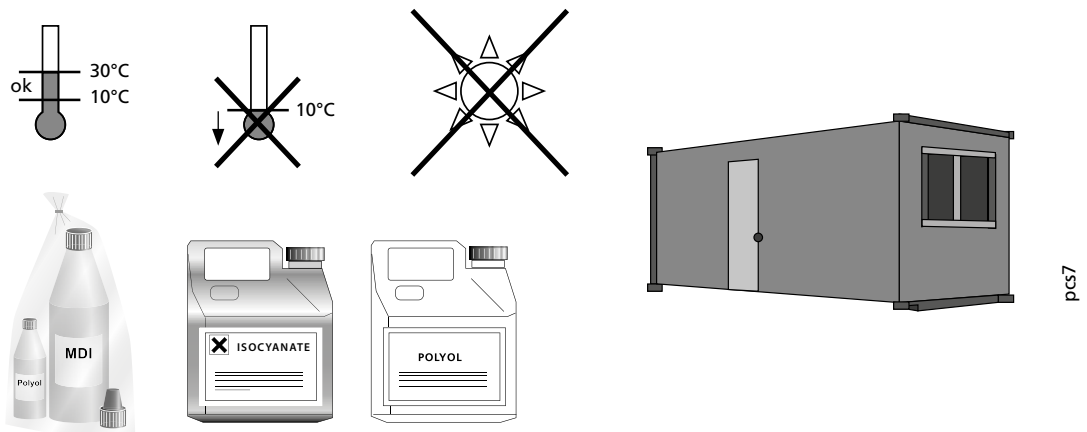
All fittings (bends, branches, reducers, valves, etc.) must always be stored above the surrounding terrain to prevent the penetration of moisture into the PUR foam.



2.2.3 Foam Components

The components for foam insulation should be stored at temperatures +10° to +30°C in closed containers placed in lockable and ventilated areas.

 **The components for foam shall not be exposed to direct sunlight or temperatures below +10° C.** Exposure to lower temperatures results in irreversible damage to the components containing isocyanate by crystallization.



The maximum shelf life of properly stored PUR foam components is 9 months; after this period, the properties of the finished PUR foam are not guaranteed.

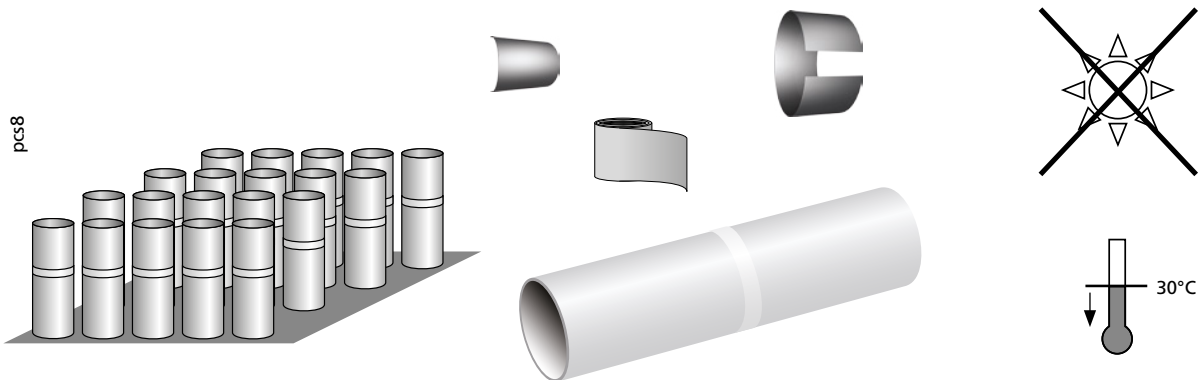
2. Handling and Storage

2.2.4 Jointing Materials

Jointing materials must be kept in dry storage areas. Joint casing material shall be stored in a vertical position in white protective packaging.



The white protective packaging protects the joint casing material against dirt, moisture and shrinkage by the effect of heat and UV radiation. **The white protective packaging is removed from the joint sleeves (already slipped on welded pre-insulated pipes) just before the assembly of joints!**



All shrinkable materials shall be protected against direct sunlight and high temperatures over +30 °C.

3. Trench, Pipe Laying and Backfilling

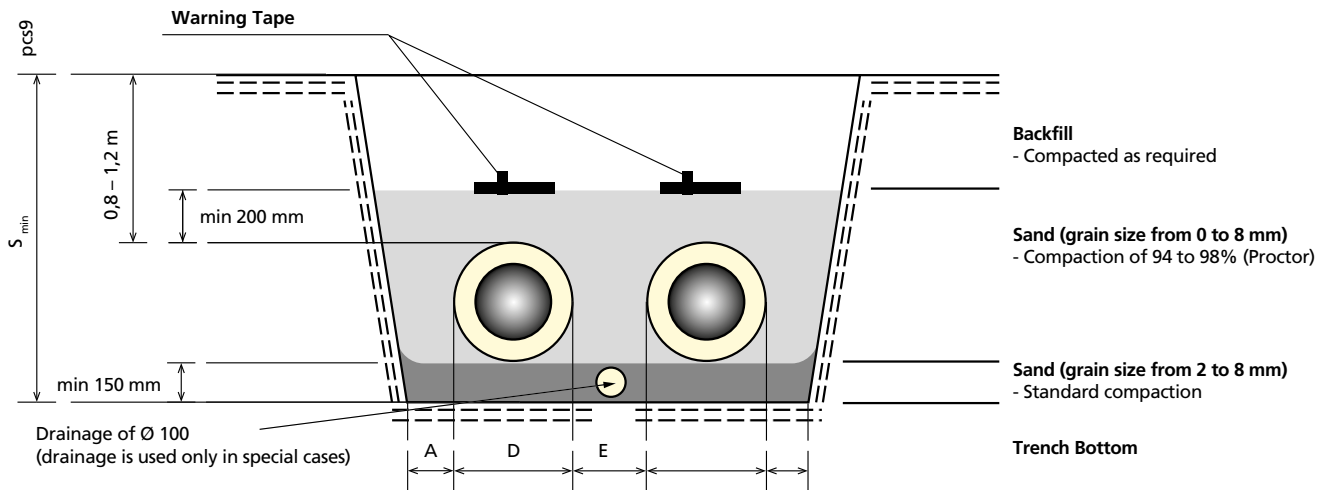
- 3.1 Trench**
- 3.2 Laying Pipes in Trenches**
- 3.3 Installation of Foam Expansion Elements**
- 3.4 Backfilling**

3. Pipe Laying and Backfilling

3.1 Trench

The trench must always be secured against soil slippage according to local regulations (it is recommended to protect the sides of the trench against slipping by formwork from a depth of 1 m). The trench must be dry and free of stones and other sharp objects that could damage the pipe casing.

Dimensions of the trench for Fintherm® Standard pipes



The sand bed of the pre-insulated pipes can be protected by geotextile that helps to ensure the consistency of the sand bed in the ground and separates it from the soil.

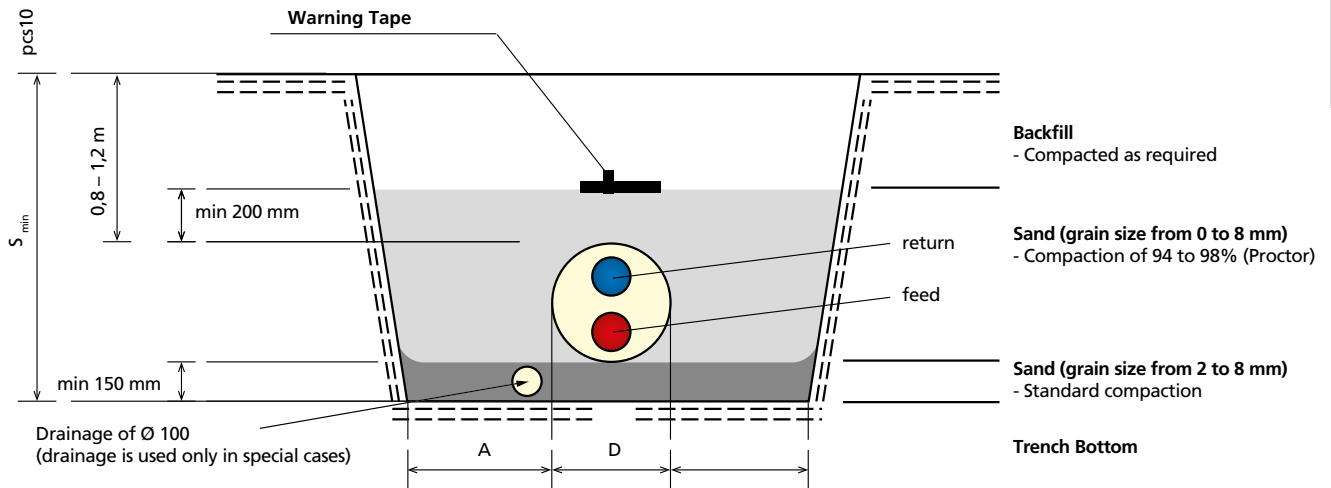
Recommended minimum dimensions of the trench for Fintherm® Standard-pipes

Casing pipe diameter D (mm)	A _{min} (mm)	S _{min} (mm) At a minimum backfill depth of 400 mm	E _{min} (mm)
90	200	640	200
110	200	660	200
125	200	675	200
140	200	690	200
160	200	710	200
180	200	730	200
200	250	750	250
225	250	775	250
250	250	800	250
280	250	830	250
315	250	865	250
355	250	905	250
400	250	950	250
450	250	1000	250
500	250	1050	250
560	300	1110	300
630	300	1180	300
710	300	1260	300
800	300	1350	300

3. Pipe Laying and Backfilling

Dimensions of the trench for Fintherm® Twin pipes

The system of **Fintherm®** Twin piping is installed in the ground with the supply pipe placed under the return pipe. All elements of this system (branches, bends, valves, etc.) are designed for this type of installation.



The sand bed of the pre-insulated pipes can be protected by geotextile that helps to ensure the consistency of the sand bed in the ground and separates it from the soil.

Recommended minimum dimensions of the trench for Fintherm® Twins pipes

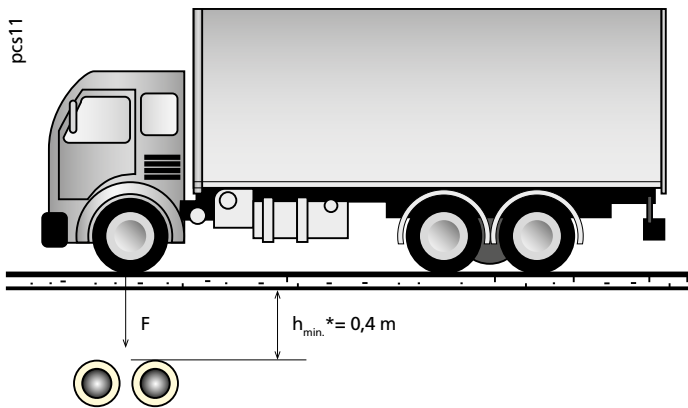
Casing pipe diameter D (mm)	A_{\min} (mm)	S_{\min} (mm) At a minimum backfill depth of 400 mm
125	200	675
140	200	690
160	200	710
180	200	730
200	250	750
225	250	775
250	250	800
315	250	870
400	250	950
450	250	1000
500	250	1050
630	300	1180

3. Pipe Laying and Backfilling

Minimum height of backfill

The minimum height of the backfill (H) is measured from the top (crown) of the pipe. If there is a roadway above the pipe, the height is measured to the underside of the roadway. If the pipe may be exposed to traffic load, the minimum height of backfill shall be determined according to the formula below, **and it must never be less than 0.4 m**.

In the case of roads with heavy traffic, it is necessary to consider the possible effects of dynamic load and increase the minimum backfill depth, if necessary. All such cases must be determined in the design documentation.



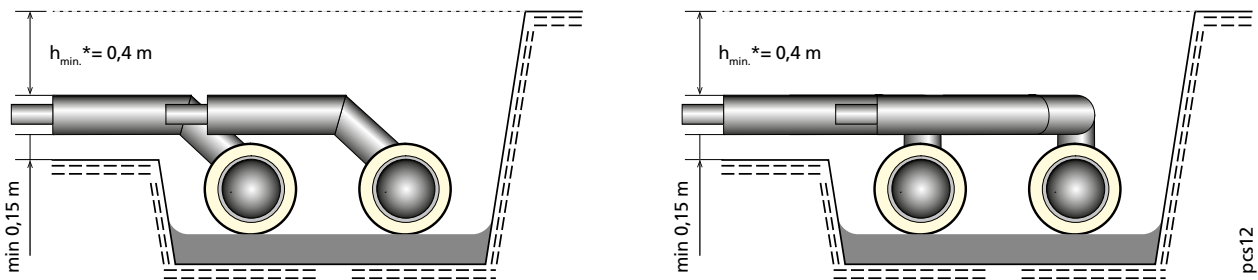
$$h = 0,17 \cdot \sqrt{F} \quad [\text{m}]$$

Minimum depth of backfill

F = loading by one vehicle axle [t]
(max. 10 tons)

* The minimum depth of backfill (h) is measured from the top (crown) of the pipe to the underside of the roadway

Minimum depth of backfill h_{\min} must be adhered to also in case of elevated branches (measured from the top of the branch casing).



If it is not possible to comply with the minimum depth of backfill, some kind of pipe protection or another technical solution must be used to distribute the load over a larger area.

Specific materials, dimensions of pipe protectors and distribution plates, their locations and other details must be specified in the design documentation.

3. Pipe Laying and Backfilling

Maximum depth of pipe installation

The maximum depth of the backfill measured from the top (crown) of the pipe casing should not exceed 2.0 m, when considering the mechanical properties of the PUR foam

Technical measures agreed with the technical department of FINTHERM a.s. are required for a greater depth of pipe laying.



The correct depth of backfill is very important. Insufficient depth of backfill material may cause the pipe to move as the medium begins to increase in temperature, while excessive depth of backfill may result in the deformation of the pipe insulation layer and prevent the pipe expansion due to friction.



Recommended backfill height: 0.5 to 1.5 m

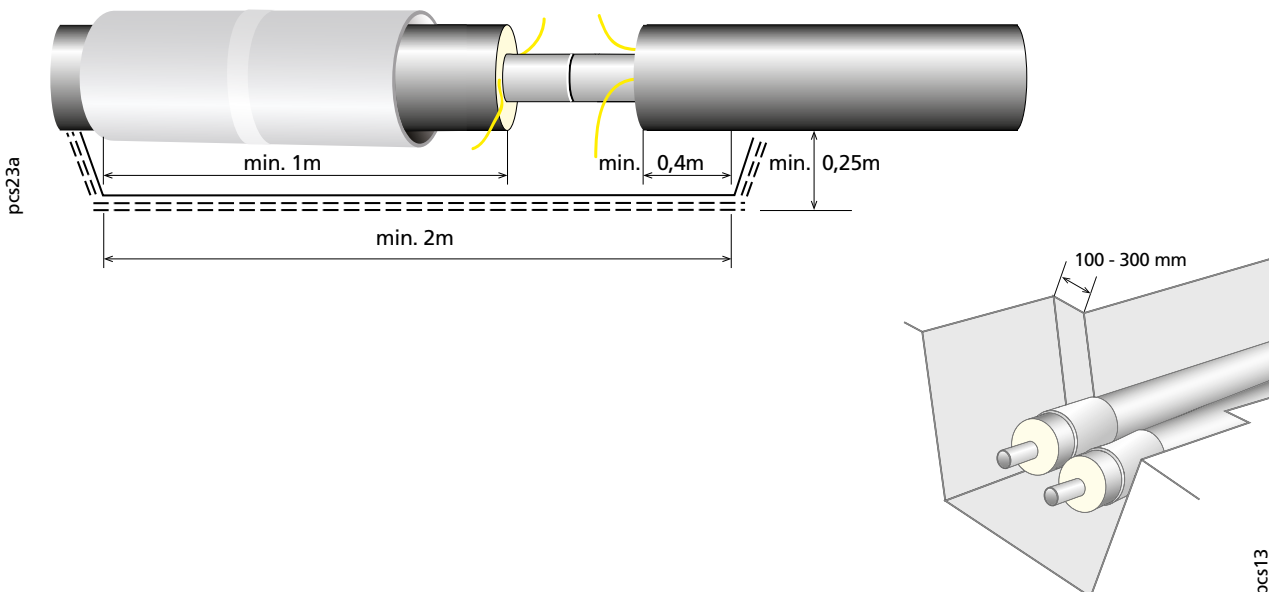
Crossing cables and pipelines

Crossing of pipelines and other utility lines must be carried out in accordance with applicable national standards.

All crossings and parallel pipelines and cable lines shall always be located at least 150 mm from the pipe casing.

Dimensions of trench to ensure a successful joint assembly

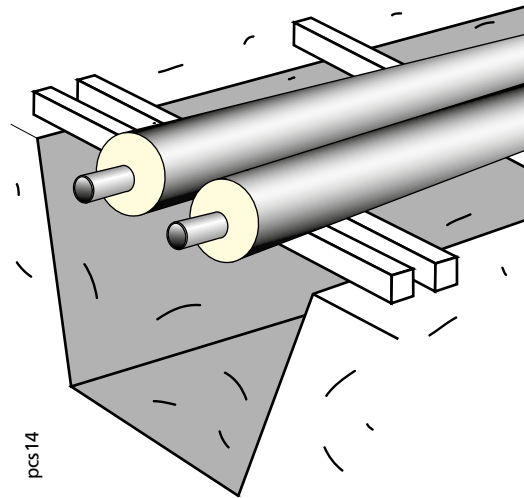
As successful joint assembly requires sufficient space for installation (mainly for pipes of larger dimensions), the width and depth of the trench must be greater where jointing is to be carried out. This also applies to supporting the pipes with polystyrene blocks, wooden beams and bags filled with sand.



3. Pipe Laying and Backfilling

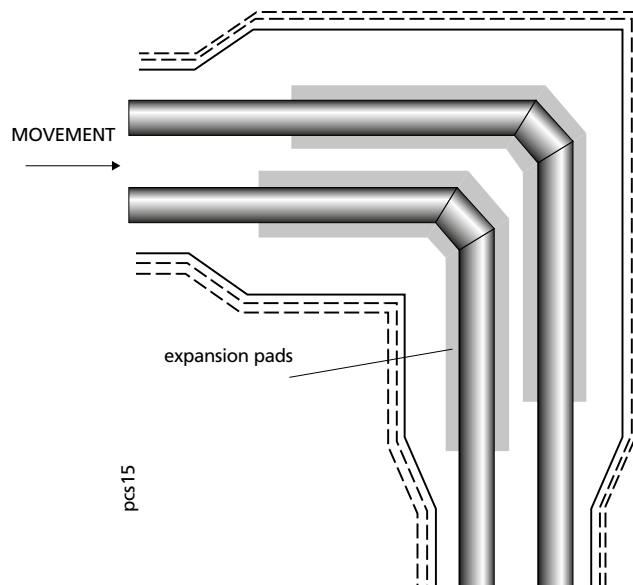


Installation can be made easier if you weld several components together, including the assembly of joints, outside the trench, or assemble the components on wooden beams placed over the trench. Then the assembled section of the pipeline is laid into the trench.



Extension of trenches for bends etc.

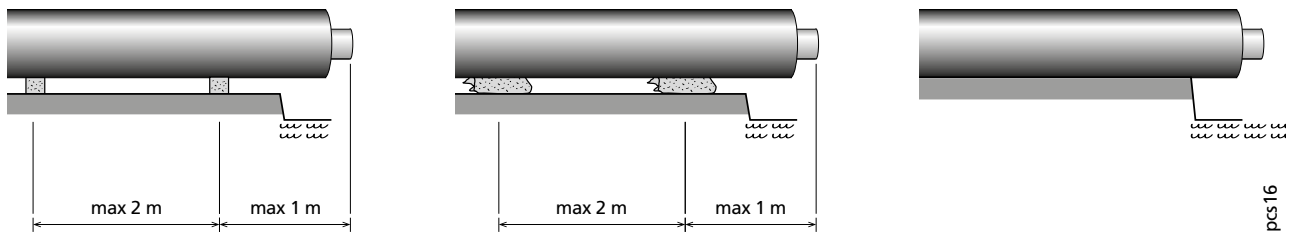
Where there are bends and branches for example, the trench must be extended to allow for any pipe expansion and to facilitate the installation of expansion pads.



3. Pipe Laying and Backfilling

3.2 Laying Pipes in Trenches

Before laying pipes in trenches, the dimensions of the trench must be checked. The bottom of the trench must be level, without water, stones and other debris. The levelled trench bottom is covered with a layer of sieved sand (with a grain size of 2 to 8 mm with no sharp edges) to a height of 150 mm. The pipes can also be placed on polystyrene blocks of sufficient hardness or bags filled with sand or wooden beams**.



** The wooden beams must be removed before the trench is backfilled to prevent damage to the casing of the pre-insulated pipe during soil compaction. Polystyrene supports can be left in the trench. The bags filled with sand must be cut open before burying the pipe, so that the resulting sand bed is homogeneous.

3.3 Installation of Expansion Elements

Due to the change in the temperature of the medium in the piping, its length expansion results in mechanical stress between the casing pipe and the soil. To reduce this stress and to protect the piping, particularly the casing pipe and PUR foam insulation, it is necessary to place the expansion elements (profile plates) in the most exposed areas.

3.3.1 Location and selection of appropriate size

The expansion elements are placed not only in the refractions of the route (curves and bends ranging from 30° to 90°), which serve as natural compensating formations, but also at the branches, reducers, valves, end fittings, etc.

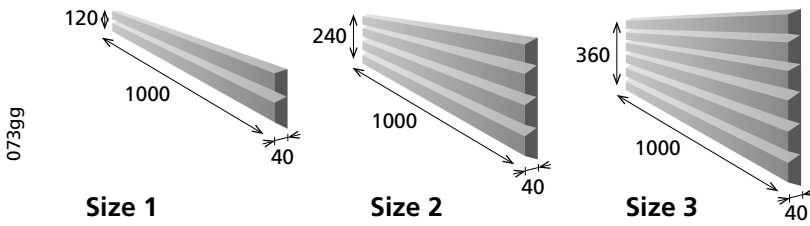


The amount and location of the expansion elements are always determined by the designer and specified in the layout plan.

The most suitable expansion elements are: profile plates of cross-linked polyethylene, which exhibit increased resistance to soil moisture and chemicals and guarantee a long service life.

The profile plates are available in 4 sizes. The first three sizes in the form of pre-cut segments are designed for smaller sizes with sheath diameters up to 315 mm, see table below. For larger dimensions, plates with dimensions of 1000x2000 mm are the most suitable, they can be adjusted to the required dimension directly on site depending on the pipe diameter.

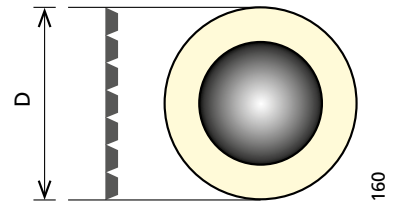
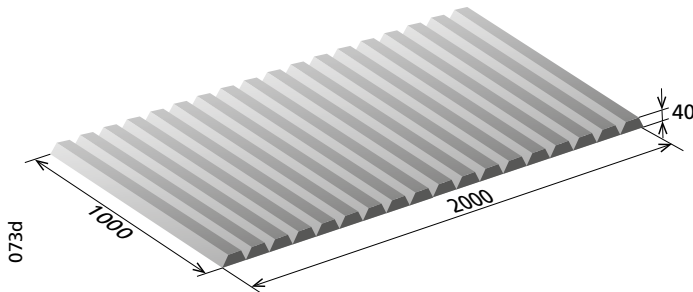
3. Pipe Laying and Backfilling



Sheath diameter (mm)	Cut segment size
90 - 140	1
160 - 225	2
250 - 315	3

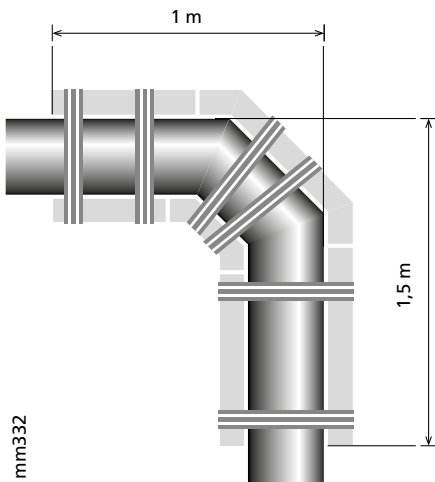


We always cut the plates parallel to the individual profiles, ideally in the place of the smallest thickness (gap). The height of the resulting segment should always be equal to or greater than the diameter of the casing of the pipe to be lined.

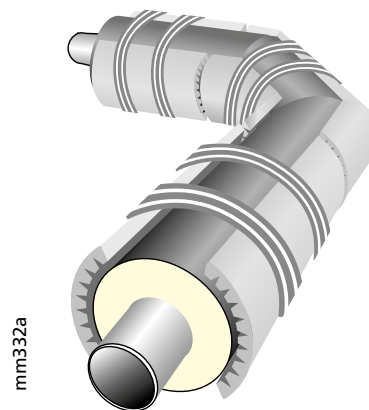


3.3.2 Assembling

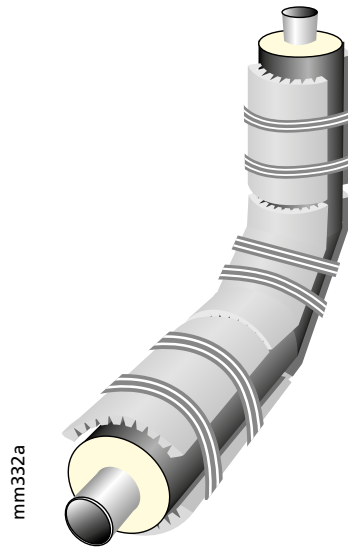
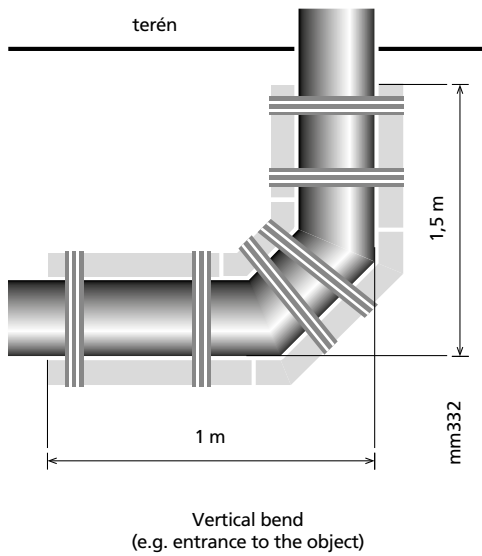
The plates are always fixed perpendicular to the expansion (shift) of the pipeline. For example, in conventional horizontal bends, the opposite arm is always lined and the profiles are placed on the sides of the casing pipe. In vertical bends, the opposite arm of the casing pipe is also lined, but only at the top and the bottom.



Horizontal bend
(e.g. changing the route direction)



3. Pipe Laying and Backfilling

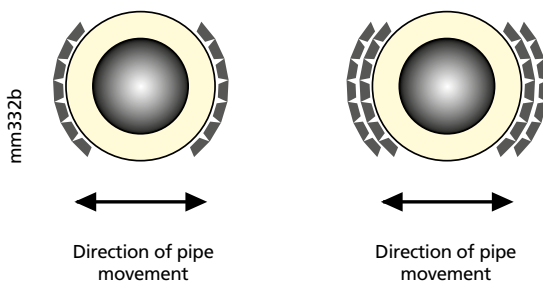


We always place the expansion plates on both sides (arms) from the top of the bend. The first plate must always cover the refractions on the sheath - see Fig. mm332.

If it is necessary to contain greater expansions, several layers of expansion plates are used, while the piping must be lined so that no heat accumulation occurs on the piping sheath. 3 layers are used at maximum.



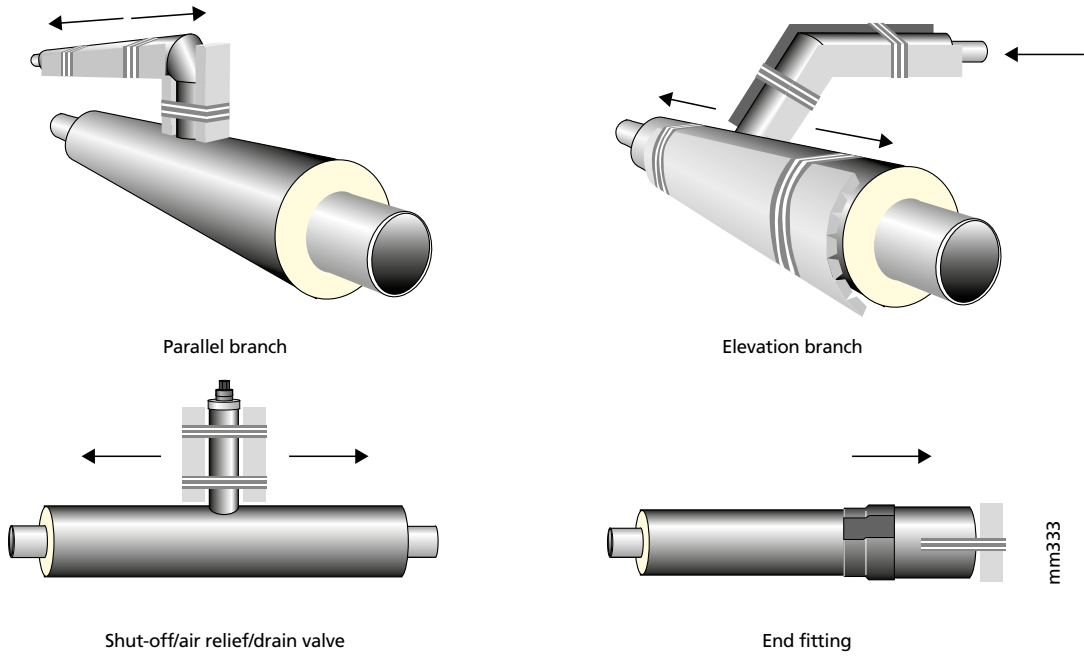
Piping should always be lined on both sides! The profile side of the plate must always face the casing pipe!



The expansion plates must be attached to the piping so that they do not slip off or get separated from the piping during backfilling with sand. Pads of smaller dimensions are fixed to the pipe with adhesive tape reinforced with glass fibres or plastic ties. Pads of larger dimensions should be fixed by geotextile.

3. Pipe Laying and Backfilling

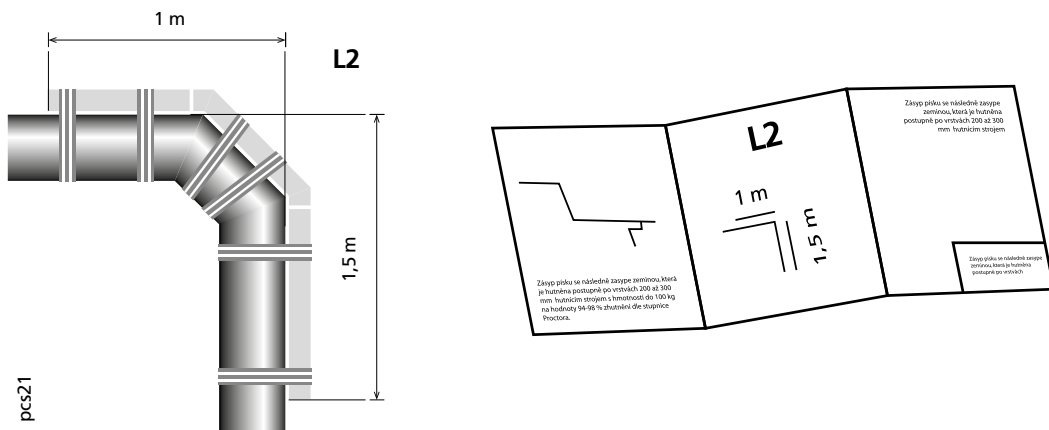
3.3.3 Examples of the lining the individual elements



3.4 Backfilling

1) Check before Backfilling

Before the pipe is backfilled with sand and soil, all joints must be checked to ensure that they comply to the installation plan with particular regard to correct placing of the expansion pads, correct length of pad and the number of layers required to compensate for the anticipated expansion.



3. Pipe Laying and Backfilling

2) Pipe Backfilling

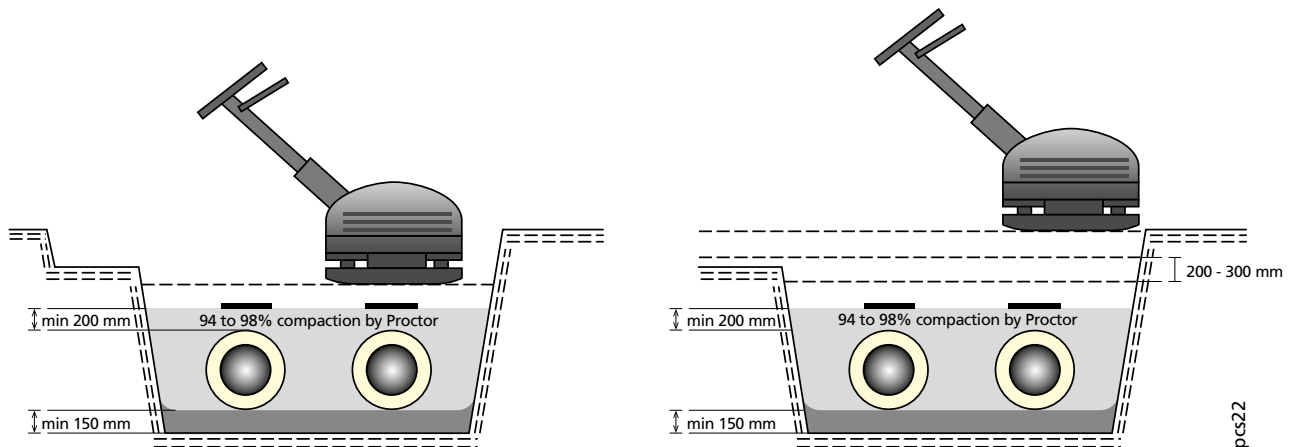
The trench must be dry and free of fragments of concrete, stones and other sharp objects that could damage the pipe casing. The pipe is gradually backfilled with sand of the grain size of 0 to 8 mm and at least 200 mm layer above the crown of the pipe. The sand backfill must be compacted in its full height to a value of 94 to 98% according to Proctor. Compaction should be carried out evenly on both sides to prevent displacement or lifting of the pipe.

3) Location of the marking tape

On this layer of compacted sand, a warning marking tape (foil) must be placed above each pipe, indicating the position of the pipe in case of possible excavation work.

4) Pipe backfilling with soil

Finally, the trench is filled with soil which is compacted gradually in layers of 200 to 300 mm by a compactor. Compaction should be carried out uniformly and according to the requirements for the final use of the surface (pavement, vegetation, etc.).



A warning marking tape (foil) must be placed 200 mm above each pipe.

3. Pipe Laying and Backfilling

3.5 Distribution plates

Distribution plates are used in cases where the limit tension on the sheath of pre-insulated piping can be exceeded due to excessive load which may consequently lead to the damage to PEHD sheath and PUR insulation. To this end, steel (protected against corrosion) or reinforced concrete can be used as suitable materials.



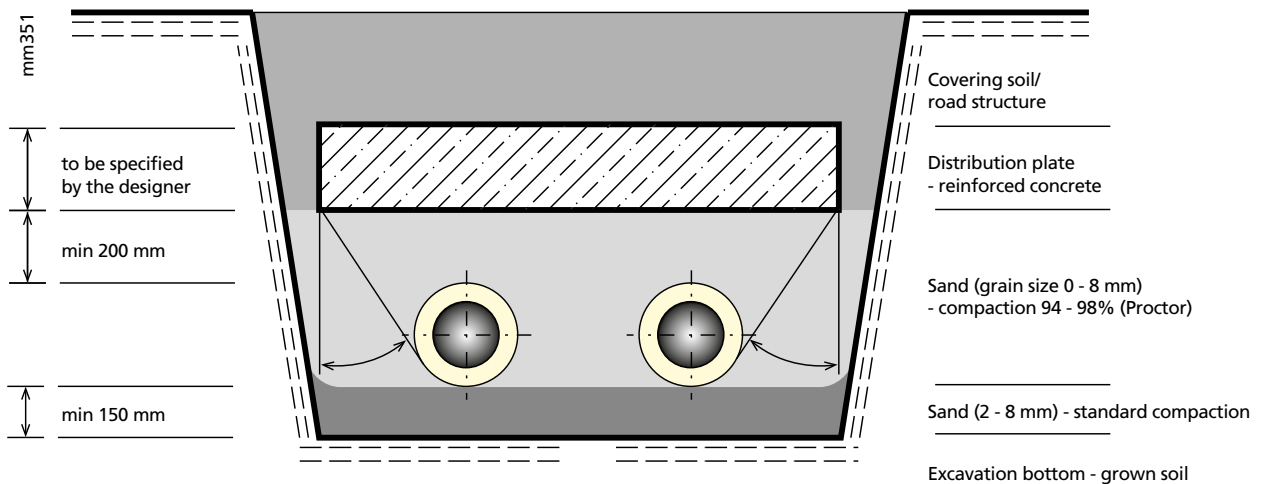
The parameters of the individual plates (type of concrete, reinforcement, dimensions, overlaps, etc.) are always determined by the structural engineer.

In practice, the limit stresses are most often exceeded for two reasons, which also correspond to the different placement of the distribution plate.

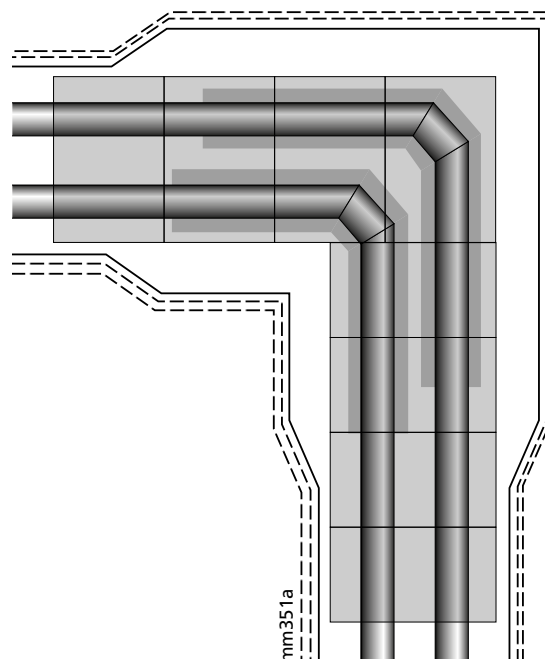
3.5.1 Insufficient soil coverage

In pipes that are placed too shallowly (insufficient soil coverage of the casing pipe) may cause excessive point loads, especially due to vehicle travel.

Excavation cut:



Ground plan
(laying method):

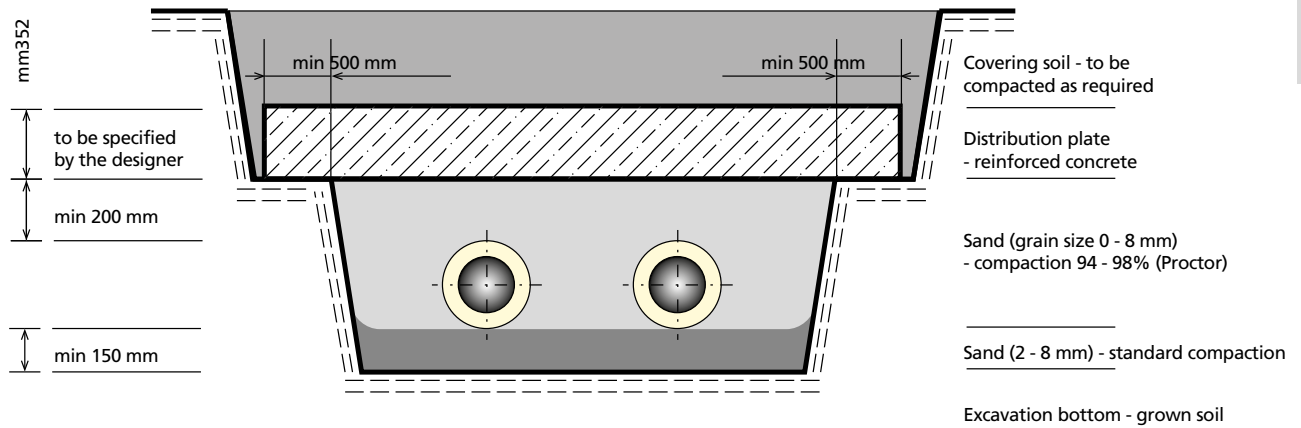


3. Pipe Laying and Backfilling

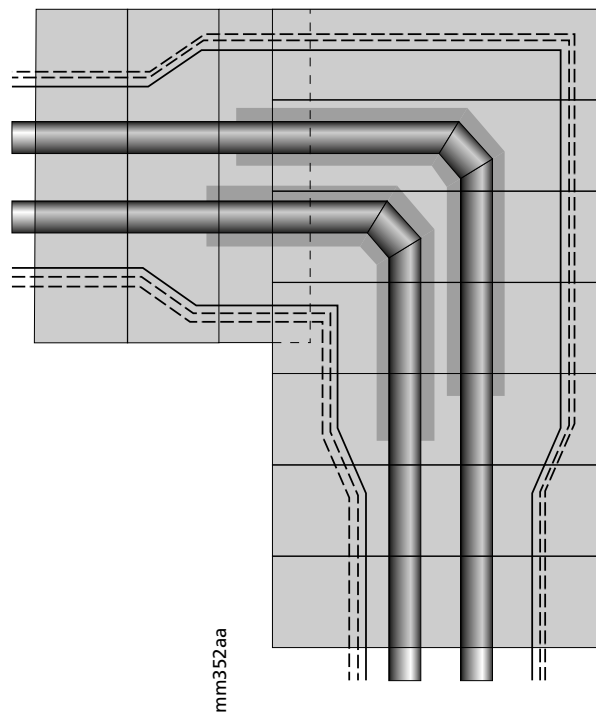
3.5.2 Excessive soil coverage

In pipes placed too deep (exceeding the maximum covering height) an over-limit surface load occurs due to an excessive weight of the upper bed.

Excavation cut:



Ground plan (laying method):



The distribution plates are placed transversely over the excavation and must be laid on the grown soil. If this is not technically feasible, it is necessary to prepare a foundation strip or similar structure to ensure that the load is transferred outside the pre-insulated piping.

4. Welding & Testing

4.1 Welding of Steel Pipes

4.2 Cutting Pipes and Shortening Pre-Insulated Pipes

4.3 Pipe Tests

4.3.1 Compressive Strength Test and Tightness Test

4.3.2 Parameters of Process Water

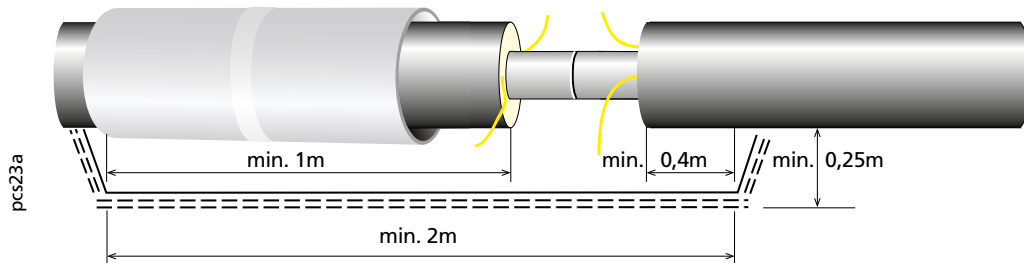
4.3.3 Putting the Pipe in Operation

4. Welding & Testing

4.1 Welding of Steel Pipes

The steel media-carrying pipe must be welded according to EN 489. The welders must have a valid certificate according to EN 287-1 and shall observe the instructions of the construction welding technologist.

Before welding the pipe, check the readiness according to the figure below:



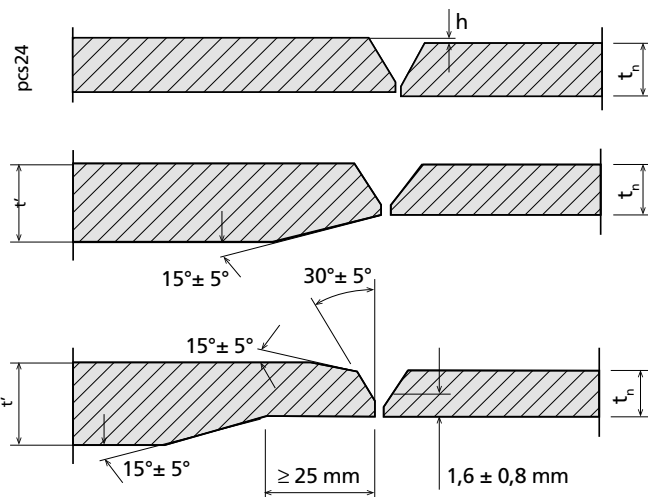
- 1) Joints in protective packaging must be slid onto the piping before welding!
- 2) It is necessary to check the signal wires of pre-insulated elements.
- 3) The length of the free ends must be at least 150 mm and there must be no residues of the PUR foam around the weld to prevent the generation of harmful fumes and possible weld contamination.
- 4) In case of straight pipes, maintain the continuity of the detection wires by turning them.



It is recommended to protect the pipe casing and PUR foam from overheating or burning during welding.

Welding steel pipes - chamfer of steel pipe at weld points

The ends of walls of steel pipes of different wall thickness must be adjusted to provide a chamfer according to the requirements of EN 13941, which refers to EN ISO 9692-2. These adjustments are done on site.



The chamfer of $h \leq 0,3 \times t_n$ (mm) and max. 1 mm is set by adjusting to the outer pipe diameter.

The difference in the wall thickness of $t' \leq 1,5 \times t_n$ is adjusted by modifying the pipe with a thicker wall of t' .

The difference in the wall thickness of $t' > 1,5 \times t_n$ is adjusted by modifying the pipe on both sides.

Welding of steel pipes - bend in weld. Max. angular change in welding steel pipes of standard steel wall thickness.

Nominal size	max. angle
DN 25 - DN 250	3,0°
DN 300 - DN 350	2,5°
DN 400 - DN 450	1,5°
DN 500 - DN 600	1,0°

4. Welding & Testing

4.2 Cutting Pipes and Shortening Pre-Insulated Pipes

The pre-insulated pipe is normally supplied in the lengths of 6, 12 and exceptionally in 16 meters. If a different length of a straight section is envisaged in the project and if it cannot be "composed" of standard pipes, it is necessary to adjust (shorten) them directly on site.

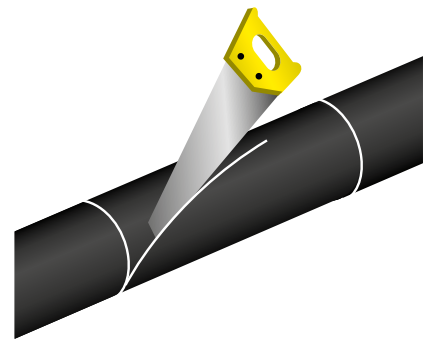
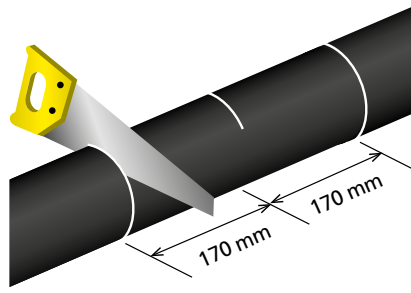
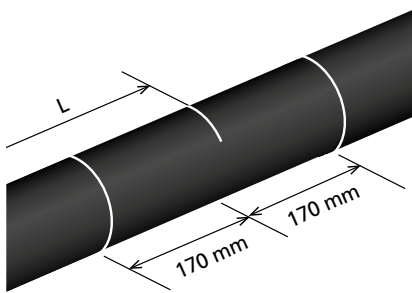


Elements other than straight pipes and bends may not be modified in any way.

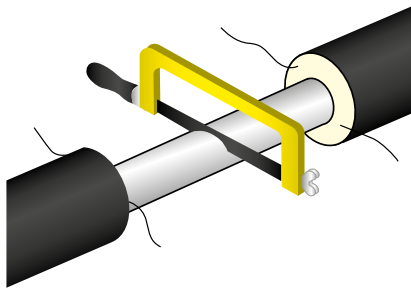
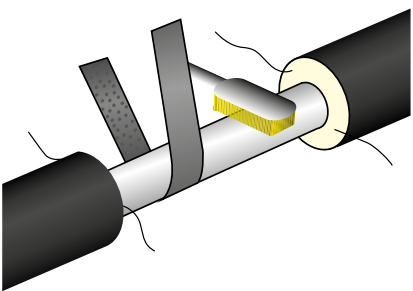
It is recommended that the pipeline should be shortened carefully and after studying the entire layout plan, because the excess part of a suitably shortened pipe in one section may serve as an additional part in another section.



When shortening the pipes, please be careful not to damage the detection wires. Even a small damage of a wire can cause its breakage and consequent malfunction of the entire detection system.



- 1) First, measure and mark the total length of the required additional part L and then from this mark in both directions designate (a line along the perimeter) the area where the insulating jacket should be removed (future free ends). For pipes $\leq \text{DN } 350$ $2 * 170$ mm is recommended, and for $\geq \text{DN } 400 = 2 * 190$ mm.
- 2) Make circumferential cuts through the PEHD sheath at the outermost marks. The cuts should be relatively shallow, running only through the casing pipe (they must not interfere significantly with the PUR insulation) to avoid damaging the detection wires.
- 3) Connect the drainage cuts with one oblique cut and then use a hammer and a steel chisel to remove the PEHD sheath and cut out the PUR foam down to the medium-bearing pipe. When removing the foam, be careful not to damage the detection wires.



- 4) Interrupt the detection wires in the middle and remove the PUR insulation residues from the medium-bearing tube using a scraper, steel brush or abrasive cloth. The trimmed edge of the PEHD casing pipe must be straight, with no cuts and notches.
- 5) Finally, cut the medium-bearing pipe in the middle of the cleaned section and adjust the weld areas for subsequent welding. If necessary, the detection wires can be adjusted using a copper wire and a connector (supplied in the connection kit).



The length of the free end of the pipe must be at least 150 mm according to ČSN EN 253, it must be carefully cleaned from the residues of the PUR foam due to its flammability.

4. Welding & Testing

4.3 Pipe Tests

Upon the completion of the pipeline, it is necessary to flush the pipeline, perform a visual inspection and a pressure test of the installed system before mounting joints. The visual inspection of the welds is made on site over the entire length of the weld seam according to EN ISO 5817. The welds may only be checked by qualified personnel.



For the purpose of the leak test and compressive strength test, **the compensators must be secured by securing welds** to prevent their destruction.

4.3.1 Compressive Strength Test and Tightness Test

Leak test

Welds must be subjected to the leak test according to EN 13941, using one of the following methods:

- a) Air leak test with air pressure of 0.2 bar or negative pressure of 0.65 bar, the tightness of the weld being checked by an appropriate testing liquid;
- b) Water leak test carried out at a pressure corresponding to 1.3 times the design pressure with a simultaneous check of the welds;
- c) 100% non-destructive check of the steel media-carrying pipe, e.g. X-ray or ultrasound.

Compressive strength test

Procedure similar to the water leak test, but the pressure must be increased to 1.5 times the design pressure.

While the leak test is obligatory, the pressure test is optional and can be required according to local practices or by the investor.

The leak test may be replaced with the compressive strength test, if such test is required.

The test reports are an integral part of the archived construction documentation.

4.3.2 Parameters of Process Water

The parameters of heating water must meet the requirements of applicable national standards and norms and their currently valid equivalents. Notwithstanding the different applicable national standards, the following parameters must be met: pH value of water in the steel piping at 25°C must always be higher than 8.5, the total concentration of Fe + Mn shall not exceed 0.3 mg/l, the apparent alkalinity from 0.5 to 1.5 nmol/l, the excess of NaSO₂ must be from 10 to 40 mg/l, and the concentration of chlorides and sulphates must not exceed 15 mg/l.

The pipeline flushing and pressure test must be performed using water of appropriate properties to prevent corrosion and be free of any kind of contamination.

4.3.3 Putting the Pipe in Operation

When putting the pipe in operation, temperature shall be increased gradually to prevent thermal shock and to facilitate smooth expansion movement of the pipe. The recommended maximum increase in water temperature is 10°C per hour. The information on compensation and pre-heating of the pipe must be provided in the design.

5. Detection System

- 5.1 Checking the detection wires of pre-insulated components**
- 4.2 Connection of detection wires - NORDIC system**
- 4.3 Checking the correct connection of detection wires in the pipeline route**
- 5.4.1 *Termination allowing measurement***
- 4.4.2 *Termination not allowing measurement (inaccessible branch)***

5. Detection System

Monitoring of the condition of the insulation of pre-insulated pipes by means of detection wires is desirable to prevent extensive damage to the pipe. There are several types of detection systems. This manual focuses only on the most commonly used NORDIC system (copper and tin-plated copper wires).

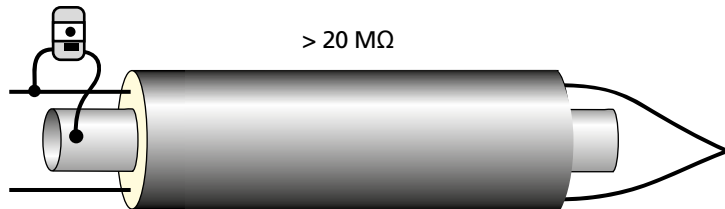
The system connection in the entire route, including connections to terminal systems, shall be governed by drawings.

5.1 Checking the detection wires of pre-insulated components

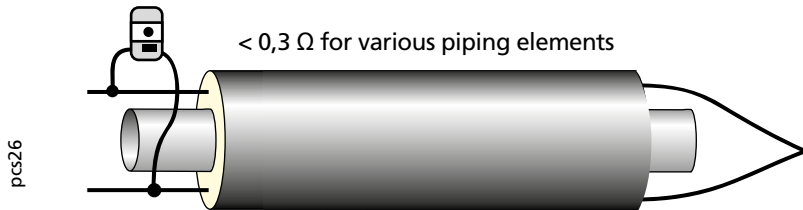
Before welding individual pipe elements, the detection wires shall be checked to avoid installation of damaged pipe elements.

Control tests are carried out to check the integrity of detection wires and their possible mutual contact or contact of the wire with the media-carrying pipe:

- 1) Test for the exclusion of leakage between the detection wire and steel pipe



- 2) Testing the integrity of detection wires

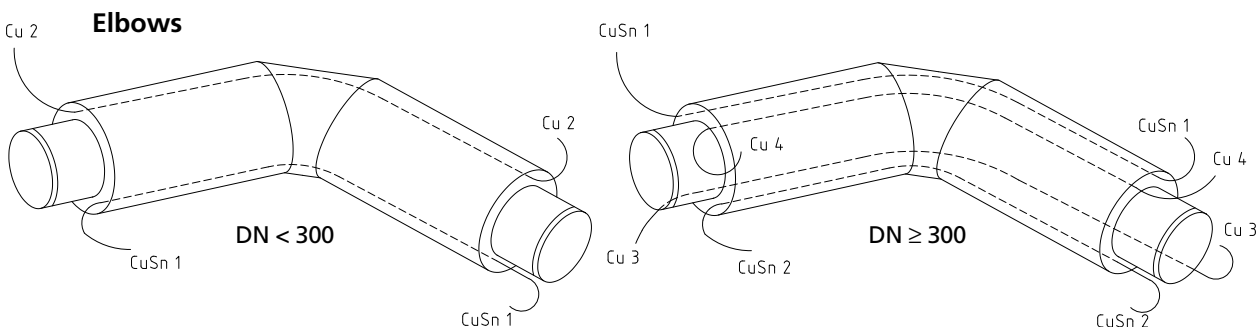


It is not allowed to install piping elements with values other than those listed here!

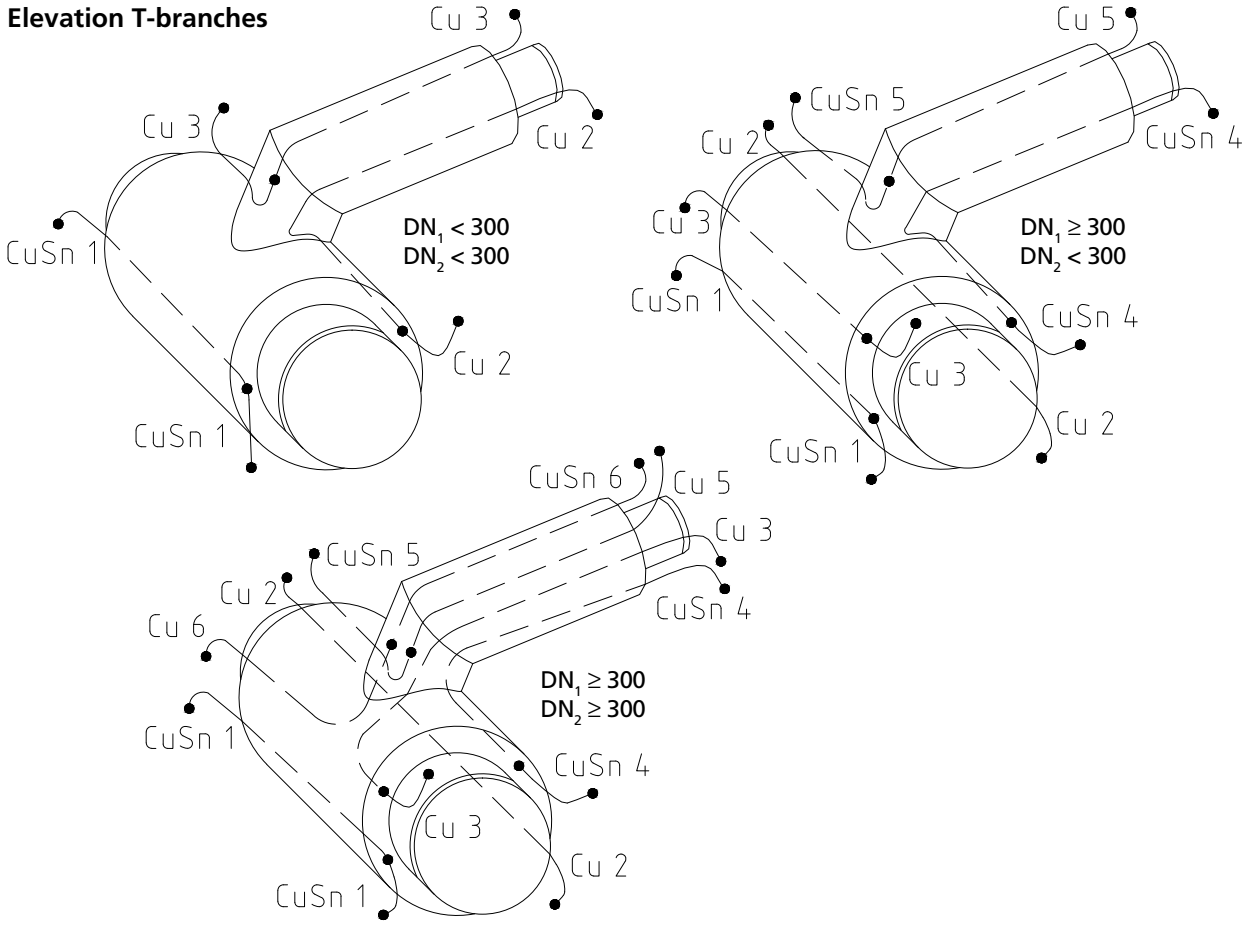
Examples of detection wires installation for different piping elements:



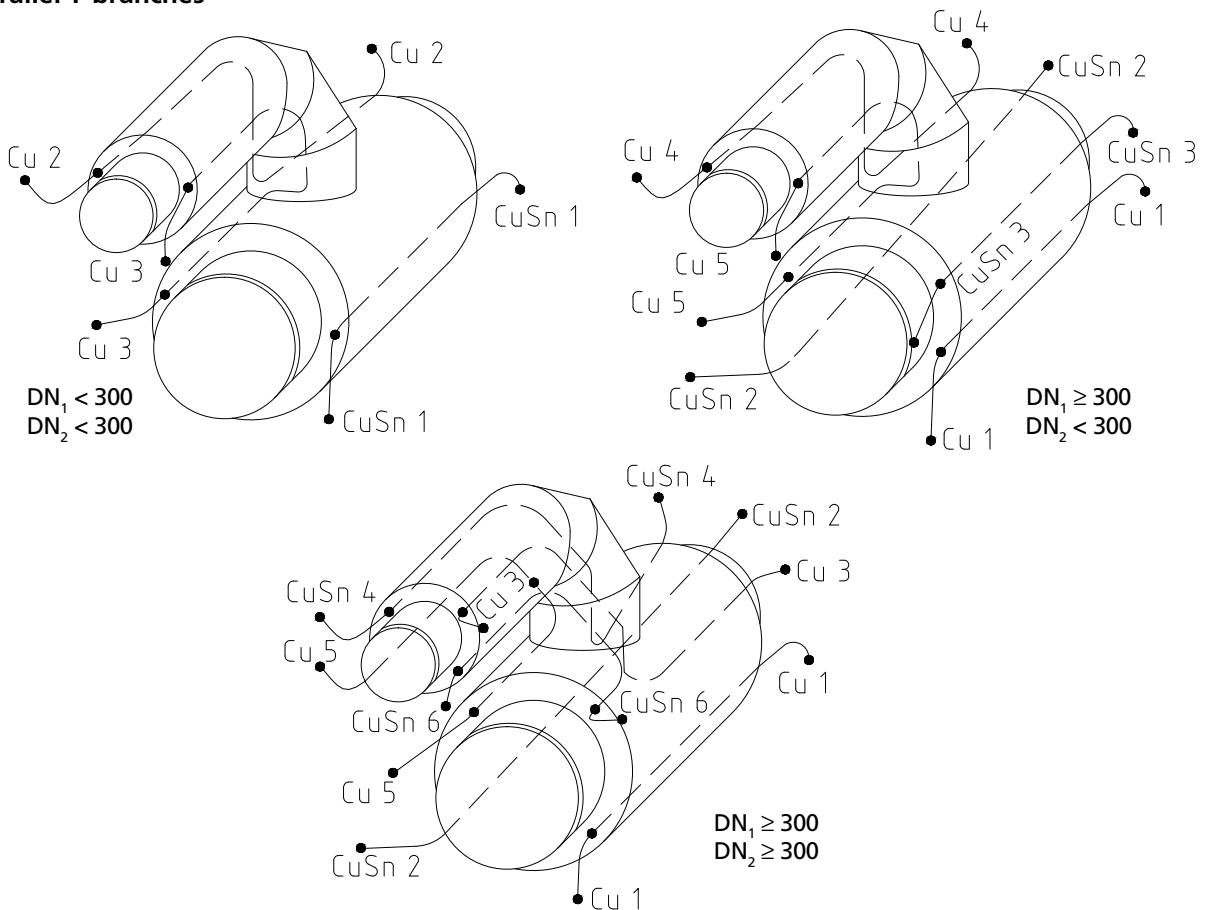
There are four detection wires installed in the pipes of dimension $\geq \text{DN } 300$.



Elevation T-branches



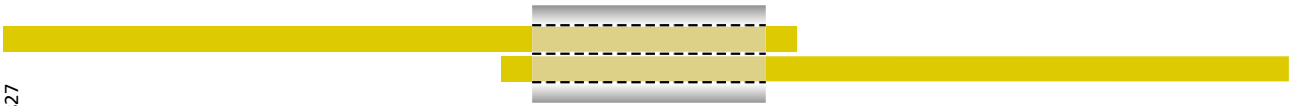
Parallel T-branches



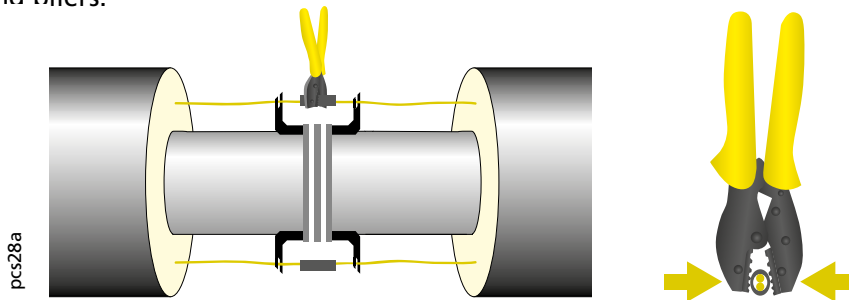
5. Detection System

5.2 Connecting detection wires - NORDIC system (copper and tin-plated copper wires)

The area of the joint must be dry and clean before the installation of the detection system. Prior to assembly, remove any damp foam from the pipe ends. Straighten the wires carefully and check that they are not broken or damaged. Clean the wires with sandpaper and then pull them through the connector. Place the special connector in the centre so that the wires pass through it in parallel.

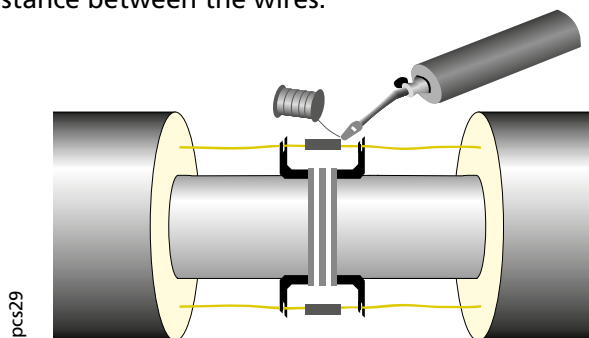


The detection wires must be sufficiently tensioned to prevent their deflection and contact with the steel media-carrying pipe during foaming. A contact of the detection wire with the steel pipes will result in a short circuit and the entire detection system becomes non-functional. Therefore, it is necessary to place a detection wire support (supplied in the joint mounting kit) on the media-carrying pipe in the middle of the joint and attach it with adhesive tape reinforced with fibreglass. Press the connector by suitable crimping pliers.



Do not use wire cutters, pliers or other improper tools!

Solder the connection at both ends of the connector with an electrical solder or soldering burner with a tip. Soldering of the connector increases the mechanical strength of the connection and eliminates the contact resistance between the wires.



Subsequently, check that the connection of wires along the route is flawless.



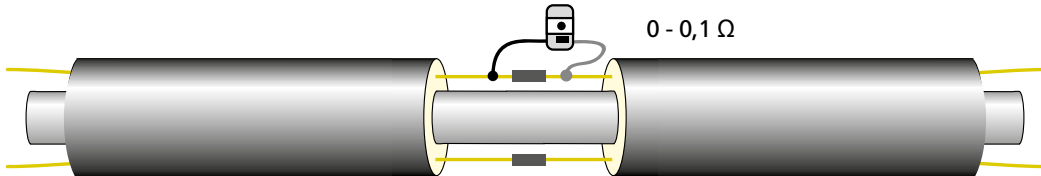
- **Do not use direct flame, flux or acid for soldering.** Doing so could cause embrittlement of the detection wires and their subsequent damage.
- **Avoid excessive tensioning of the detection wires**, which could result in the reduced tensile strength of the detection wires.
- After connecting the detection wires, the **joint must be insulated without undue delay** to protect it against moisture. For this reason it is **unacceptable to leave unfinished connections "for later"**.
- It is recommended to check the connection of the conductors in the pipeline after insulating each connection.

5. Detection System

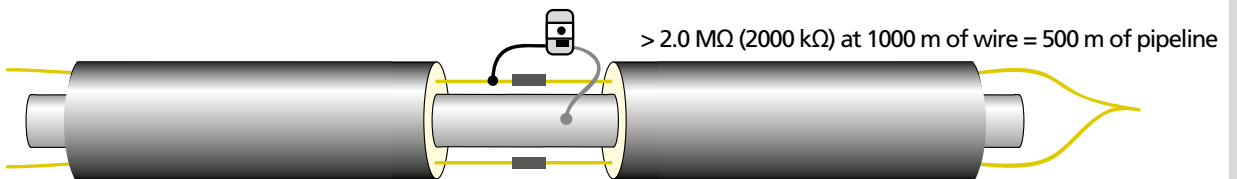
5.3 Checking the correct connection of detection wires in the pipeline route

After welding a pipe fitting to the pipe and connecting the detection wires, perform the following tests on the connections of the detection system:

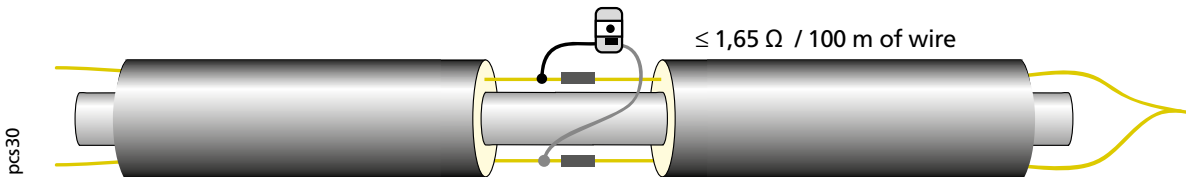
1) Test of proper connector installation. Test each connector separately.



2) Test of insulation resistance between the detection wire and steel pipe.



3) Test of detection wire integrity.



The detection wires must be tested over the entire length of the pipe before making any joints. The resistance of the copper wire is 1.35 to 1.65 Ω / 100 m of wire.

The insulation resistance between the wire and the steel pipe is from 500 kΩ to 200 MΩ, depending on the pipe length and climatic conditions. The minimum allowable value is 200 kΩ per 1000 m of detection wire (500 m long pipeline).

The following table shows the permissible resistance values recalculated according to these rules for different lengths of wire in the monitored section.

For new construction:

Wire length in monitored section [m]	Minimum electrical resistance of insulation foam [kΩ]	Maximum resistance of detection wire [Ω]
< 100	2000	< 1,5
100	2000	1,5
200	1000	3,0
500	400	7,5
1000	200	15
2000	100	30
> 2000	100	> 30

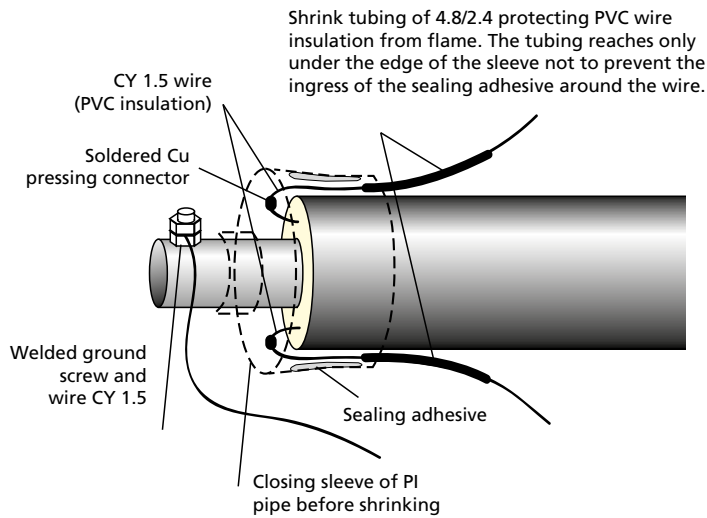
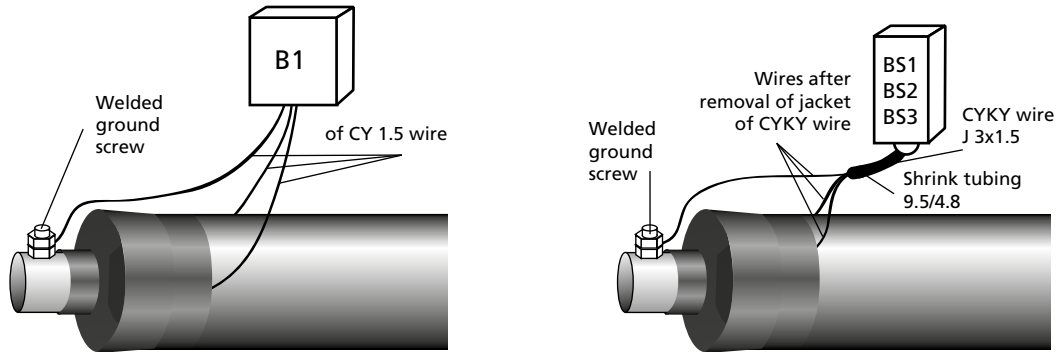
For older structures, it can be half the value.

5. Detection System

5.4 Termination of detection wires

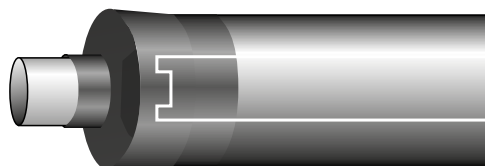
5.4.1 Termination allowing measurement

Weld a control screw on the accessible part of the supporting steel pipe near the future sleeve. Attach a ground conductor CY1.5 between two nuts. Lead the detection wires between the pipe casing and the end sleeve according to the design. Lead the wires into the electrical box and connect them to the terminals. In case of insufficient length of a detection wire, you can extend it with CY1.5 wire by means of a soldered pressing connector. Connect the detector and the terminal elements according to the instructions in the operating manual.



5.4.2 Termination not allowing measurement (inaccessible branch)

The detection wires shall be connected under the sleeve to a short circuit by means of soldered pressing connectors according to the design. The connected wires shall be placed in a groove made in the foam and protected against short circuit with the pipe by fixed anchoring in the groove.



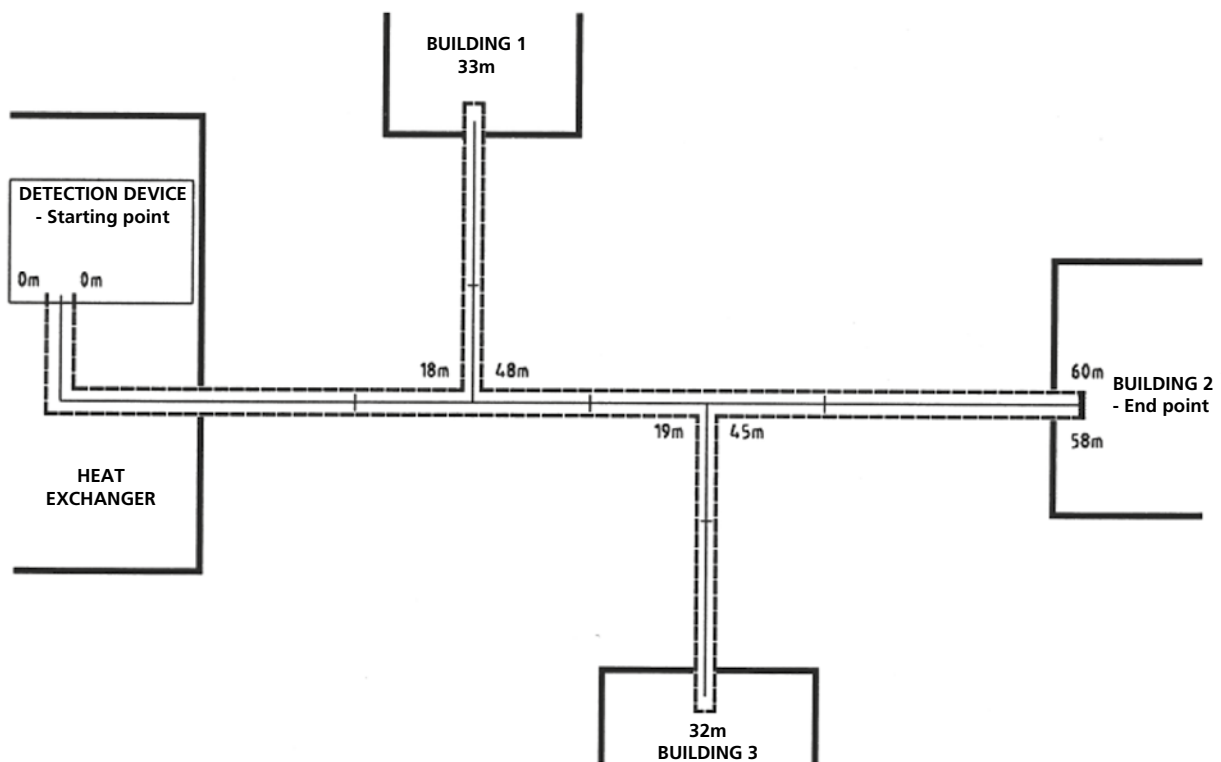
5. Detection System

5.5 Diagram of detection conductors

When connecting the detection wires of piping elements, the wiring diagram of the detection wires, which forms an integral part of the project documentation, shall be followed. This diagram specifies the positions (distance from the starting point) of all elements of the detection system and their interconnection.



Compliance with the diagram of the detection wires is crucial for locating the fault in the event of a leak.



During continuous monitoring of the pipeline by means of stationary measuring instruments (principle of conductometric measurement of moisture in insulating foam) the wires are connected at the end point and form a closed circuit. In the case of leak detection in pre-insulated piping and subsequent location of the fault by means of portable detection devices (reflectometric method of electrical leakage in the pipeline insulating foam), the detection system must be disconnected at the end point and each wire measured separately. The end point must therefore be permanently accessible.

6. Joint Assembly

6.1 General Instructions

6.2 Assembly Procedure

6.3 Joint Casing Leak Test

6.4 Insulating Joints

6.4.1 *Foaming from Bottles*

6.4.2 *Dispensing PUR Foam from Bottles*

6.5 Installation of Welding Plugs

6. Joint Assembly

6.1 General Instructions

Long-term statistics show that a large number of failures in pre-insulated pipes occur in the area of the joint. Inadequate joint quality may require subsequent repairs or even cause failures in heat supplies. Substantial costs can be incurred in repairing or replacing joint-failures.

A quality joint installation requires optimum working environment and appropriate installation conditions, in particular:

- Trench according to safety regulations and with enough space
- Sufficient space around the pipes for the installation of joints
- Dry trench (provided with drainage, if necessary)
- Protection against adverse weather conditions (tent or similar)
- Co-ordination of construction work
- Use of appropriate systems and materials for making joints in accordance with EN 489
- Compliance with the instructions from the manufacturers of pipes, fittings and jointing systems
- Sufficient time for quality work



Cleaning is crucial for quality joints. Before making a joint, it is necessary to ensure the cleanliness of the whole area of the joint and jointing system, in particular by cleaning the surfaces of any impurities, such as dust, sand and especially grease.

Take utmost care, when working with detection wires throughout the installation. These must never be damaged.



Before making the joint, remove 2-5 mm of oxidized PUR foam from the ends of the pipes to ensure better adhesion of the foam.
All moist insulating foam must be removed from the pipe ends.



There must be no moisture (not even residual moisture) in the area of the joint before foaming. Moisture trapped inside the insulating polyurethane foam may later cause degradation of the insulation foam and rusting of the media-carrying steel pipe.



The temperature of the individual components of the PUR foam before they are mixed must be in the range of 15°C to 25°C.
The surface temperature of the joint materials (media-carrying and casing tubes) that will be in contact with the PUR foam must be in the range of 15°C to 45°C. At lower temperatures, it is necessary to preheat the joint with hot air, e.g. in welding tents. If proper temperature cannot be ensured for foaming, prefabricated PUR foam sections are used.



According to the requirements of EN 13941 and the EHP directive, the installation of joints can only be carried out by personnel trained for this technology with a valid certificate issued by the supplier of the pipe system, FINTHERM a.s., or an organization providing certification of employees and installation companies according to national practices, e.g. AGFW in Germany according to German directives FW603 and FW605.



After the installation of the pipeline connections, a record must be made in the building log (please specify: pipeline dimensions, number of connections, date, time, extra work, weather conditions, etc.).

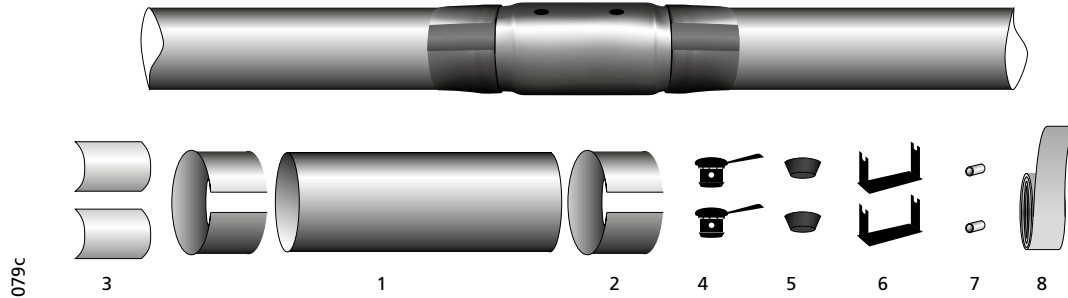


Each pipeline connection performed must be recorded by the responsible employee in the form "Report on Connection Installation", which is available for downloading at www.fintherm.cz.

Note: Only one installer is responsible for each pipeline connection.

6. Joint Assembly

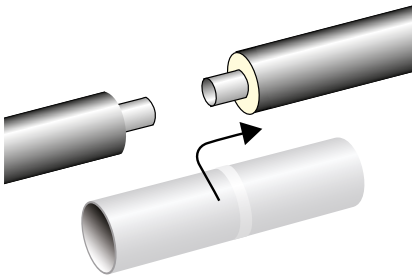
6.2 Assembly Procedure DSJ Double-Sealed Shrinkable Joint



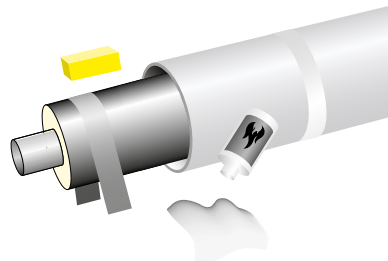
The joint is delivered in 3 packages - 1) shrinkable casing, 2) installation kit, 3) PUR components
The complete joint comprises:

1. PE shrinkable casing	1 pc	6. Electrical wire supports	2 pcs
2. Shrinkable sleeves	2 pcs	7. Electrical wire connectors	2 pcs
3. Closing patches	2 pcs	8. Sealing tape *	1 pc
4. Venting plugs	2 pcs	PUR components	
5. Welding plugs	2 pcs	(quantity according to dimensions)	

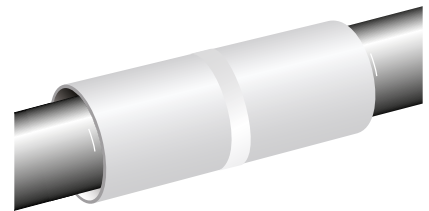
Installation:



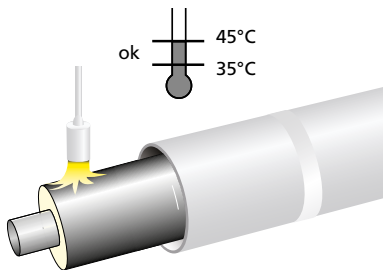
1) Before welding the media-carrying pipes, pull a shrinkable casing on the pipe end.



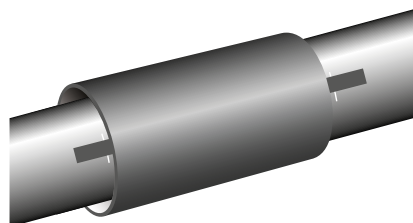
2) Clean the casing pipe of mechanical impurities, roughen the surface by grinding and then thoroughly clean with alcohol up to a distance of 15-20 cm from both ends of the pipe.



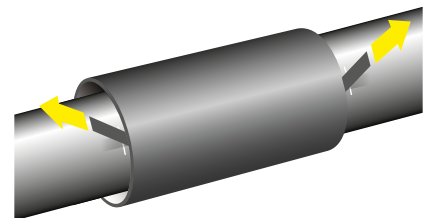
3) Use a white marker to indicate both the extreme positions of the centred sleeve of the joint. *



4) Activate the surfaces of the casing pipe ends with a soft flame and heat up at 35°C - 45°C. Never direct the flame on the PUR foam.



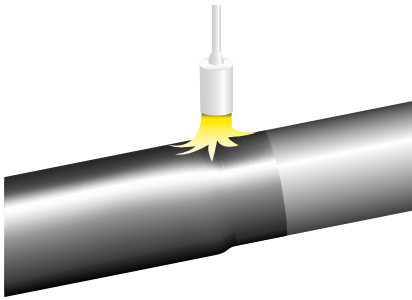
5) Remove the white plastic protective cover and fold the ends of the sealing tape protective foil so that it can be completely removed afterwards.



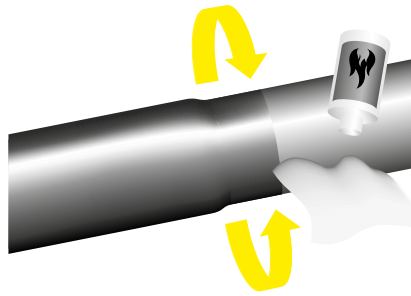
6) Centre the joint casing to fit the white marks and completely remove the sealing tape protective foil.

* Does not apply to casings supplied with the tape pasted on.

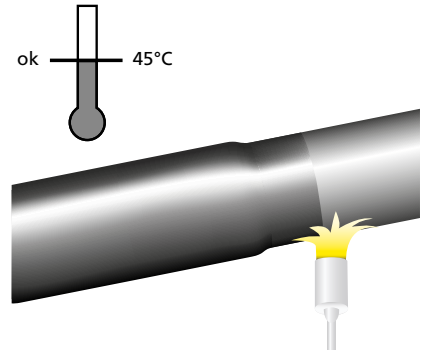
6. Joint Assembly



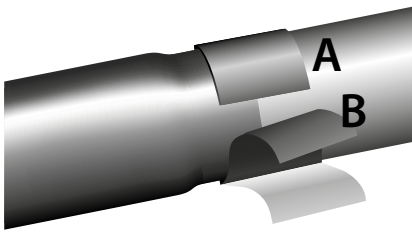
7) Heat both ends of the shrinkable sleeve to a distance of about 10 cm with soft flame so that the heat is gradually spreading in the material, until the sleeve edges adhere completely to the casing tube. No protruding edges of the casing are permissible.



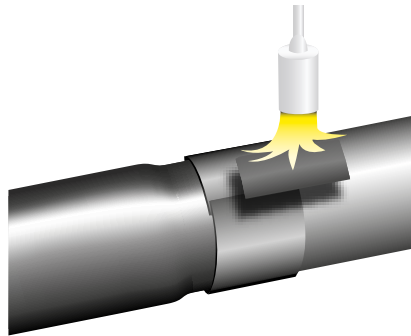
8) When the casing shrinks and cools down, clean both its edges and ends of the pipe of mechanical impurities, roughen the surface by grinding and then clean thoroughly with alcohol to a distance greater than the width of the shrinkable sleeve.



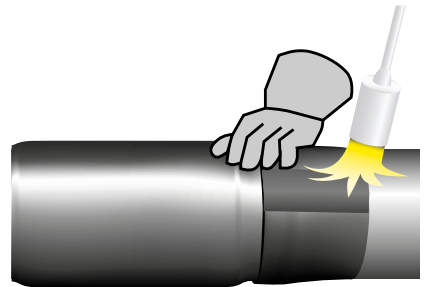
9) Preheat the casing and the part of the casing, on which the shrinkable sleeve will be placed, to a temperature of about 60°C. Use soft yellow flame and continue until the heat penetrates the material. Check the surface temperature using a contactless or contact thermometer.



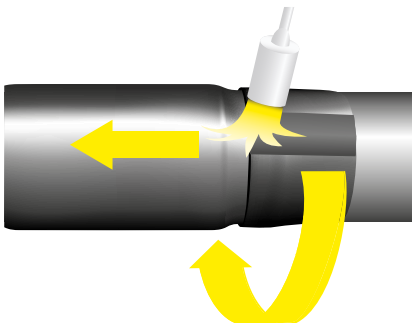
10) Remove the protective foil from end A, heat it up and attach it in 50/50 ratio (50% on the pulled casing and 50% on the casing pipe). Then remove the protective foil from the entire length of the sleeve and wrap it with some sagging around the pipe. Heat end B and fold it about 7-10 cm over end A, attach it and warm it up.



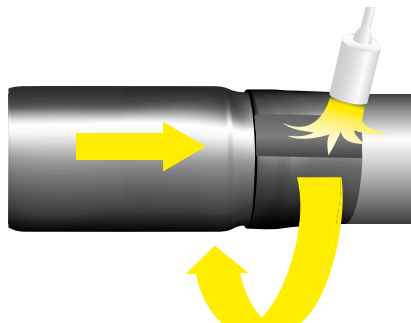
11) Heat the contact layer of the closing patch (bright side). Heat it up until the surface gets soft. Align it at the centre of the overlapping of the shrinkable sleeve and press.



12) Heat the closing patch with soft flame while pressing it at the overlap with sleeve (by punches with gloved hands) until the bottom meshing appears on the surface. There must be no air trapped under the closing patch.

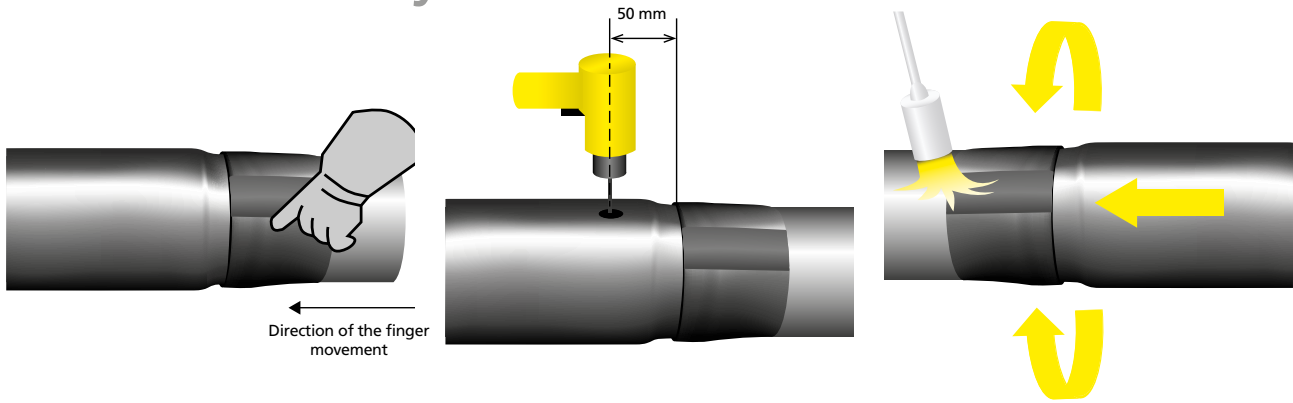


13) First shrink the part of the sleeve on the casing. Start heating from the centre on the bottom and proceed with circular movement along the circumference towards the edge. The adhesive must be melted properly and the sleeve adhere to the casing.



14) Continue with shrinking at a smaller diameter on the tube casing towards the edge of the shrinkable sleeve to prevent arresting air below the melt layer which may result in unevenness and bubbles.

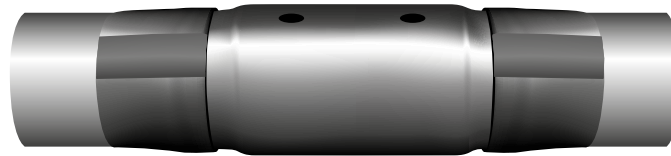
6. Joint Assembly



15) Touch with your finger gently to make sure that the melt adhesive is in liquid state (small wrinkles will disappear and smooth surface will remain).

16) After shrinking, drill a vent hole with a drill of 25 mm diameter, which is necessary to prevent the generation of pressure by the expansion of heated air.

17) Install the shrinkable sleeve on the other end of the casing in the same way. Then, drill a filling hole of 25 mm diameter.



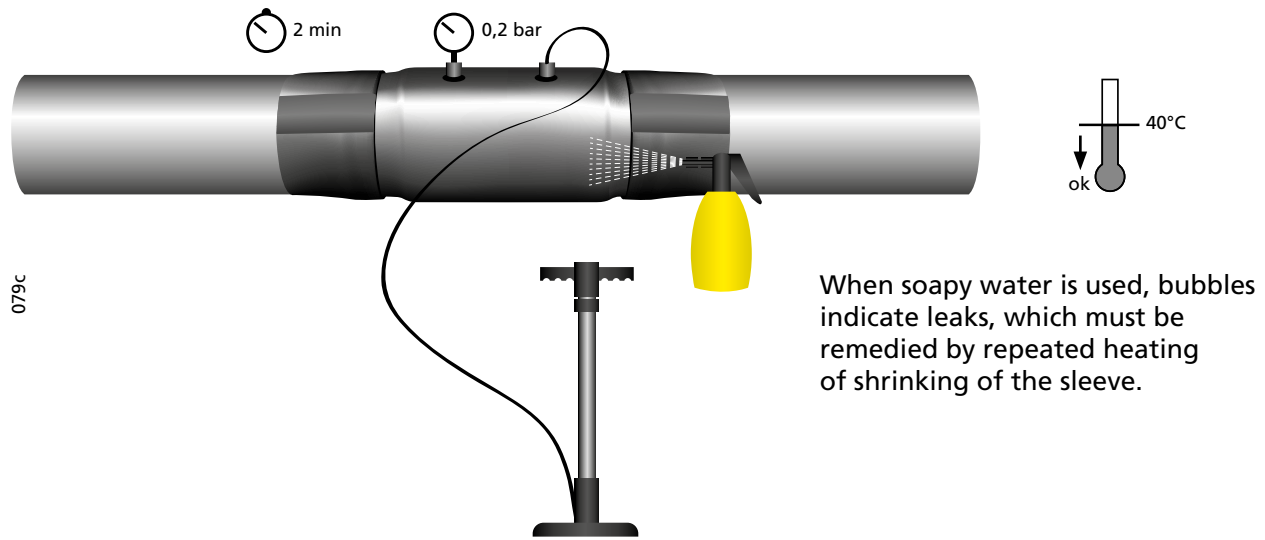
18) Now, the DPJ is ready for foaming and sealing with a welding plug (see next section).

6. Joint Assembly

6.3 Joint Casing Leak Test

The joints must be installed so that all joints are watertight. According to the requirements of EN 13941 referring to EN 489, each joint, which is not double-sealed shall be subjected to a leakage test.

The joint leak test is carried out with air or another suitable gas. The test pressure 0.2 bar must be applied for at least 2 minutes at a temperature up to 40°C. The pressure is generated by a pump or a compressor (for larger joints). Potential leaks are indicated by bubbles formed by escaping air and suitable detection liquid (e.g. soapy water) which is not harmful to the joint materials or the environment.



6. Joint Assembly

6.4 Insulating Joints



Working with foam components requires compliance with the basic rules and precautions for “work with harmful substances:”

- Make sure to read carefully and understand all instructions for foaming joints.
- Observe all principles of occupational health and safety.
- During work, smoking, eating, drinking and handling open flame is strictly prohibited (risk of vapour inhalation, ignition of flammable substances or ingestion of these substances).
- Sufficient ventilation of the workplace shall be ensured.
- The employees shall wear all protective equipment, such as face shield, protective clothing and gloves (danger of foam getting into eyes, skin irritation, etc.)

Recommendations for first aid:



Always follow the instructions and safety data sheet for the supplied components.

In case of any health problems, seek medical advice and show the supplied instructions or safety data sheet or a bottle or canister of the relevant PUR foam component.

Inhalation:

Remove the victim to fresh air and let them rest in a position comfortable for breathing. Seek medical advice.

Skin contact:

Wash with plenty of soap and water. After drying and treatment, a regenerative cream can be applied.

Eye contact:

Rinse carefully with water for a few minutes. If you wear contact lenses, remove them. Then seek medical advice.

Exposure and accidental ingestion:

Seek medical advice or contact the poison information centre on the telephone number: 224 919 293 or 224 915 402 (24/7 service).

6. Joint Assembly

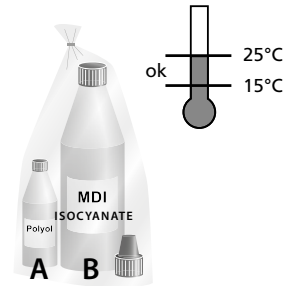
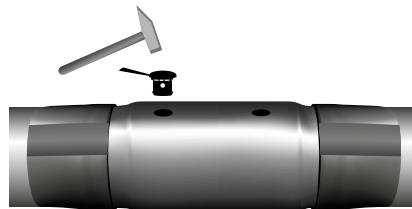
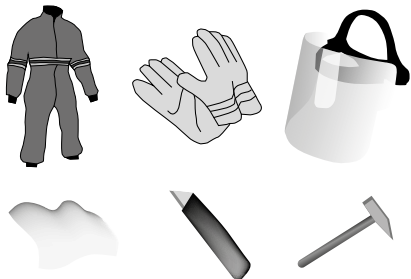
6.4.1 Foaming from Bottles

The joints may only be made by trained and certified personnel.

When insulating the joints, the following six principles must be observed in particular:

- 1) Use of protective equipment
- 2) Dry joint surfaces
- 3) Optimum temperature of the foam components (15°C to 25°C)
- 4) Ambient temperature, temperature of PE-HD casing and media-carrying tube (15°C to 45°C)
- 5) Correct dosing of foam components for the given length of the foamed joint
- 6) Thorough mixing of foam components

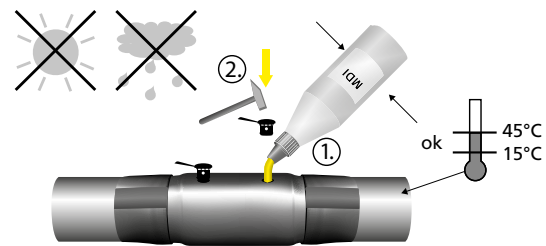
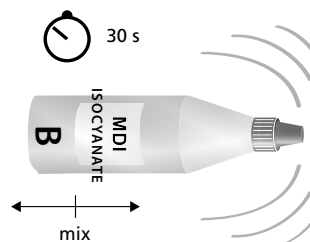
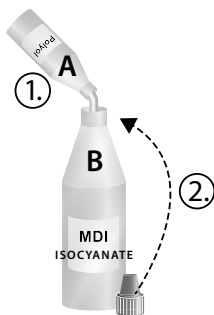
Foaming at air temperatures below + 5°C or in rain is not permitted without additional measures. Suitable measures include the use of a tent with preheating, etc. At air temperatures above 30°C there is a risk of a vigorous reaction of foam which may be ejected from the joint; therefore, it is recommended to shadow the joint before foaming it at higher temperatures.



1) Prepare all the tools for the job: protective clothing, gloves, face shield or goggles, a rag, a knife and a hammer.

2) Seal one of the joint openings with a venting plug.

3) To ensure proper chemical reaction the temperature of the foam components must be 20 - 25°C. Use bottles of an appropriate size.



4) First, shake both components separately to mix any deposits. Then carefully pour component A (polyol) into component B (isocyanate MDI). Close the mixture with a lid with a pouring piece.

5) Shake the contents very vigorously and quickly for perfect mixing of components A and B for about 30 s (max. 40 s in colder months). Immediately after mixing, cut off the tip of the pouring piece.

6) Pour the entire mixture immediately through the opening into the space of the sealed joint. Close the pouring opening immediately by the venting plug.



If foam has not poured out of the joint pouring openings, check all the necessary foaming parameters. Disconnect the joint and perform the operation again!



The joint should not be foamed from several batches of the mixture, but always at one pouring.

6. Joint Assembly

6.4.2 Dispensing PUR Foam from Bottles

Calculated values:

Density of 85 kg/m³ of

polyurethane, DSJ type

Length of foamed part: 350 mm

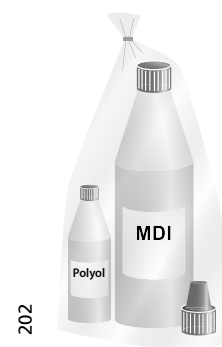
Components:

MDI: Diphenylmethane diisocyanate, dark, viscous, higher

amount Polyol: Polyether alcohol, light, bright, viscous

Dispensing foam for Fintherm® Standardsystem						
DN	Insulation class 1		Insulation class 2		Insulation class 3	
	Casing diameter [mm]	Bottle size	Casing diameter [mm]	Bottle size	Casing diameter [mm]	Bottle size
25	90	1	110	2	125	3
32	110	2	125	3	140	4
40	110	2	125	3	140	4
50	125	3	140	4	160	6
65	140	3	160	5	180	6
80	160	4	180	6	200	6.1
100	200	6.1	225	8	250	8
125	225	7	250	9	280	9
150	250	8	280	9	315	10
200	315	9	355	7+8	400	9,1+7/ 9+9
250*	400	7+8	450	9,1+9,1	500	10+11
300	450	8+8	500	10+11	560	11+11
350	500	9+9,1	560	9+9+9		
400**	560	9+9,1+6				

Dispensing foam for Fintherm® Twins system				
DN	Insulation class 1		Insulation class 2	
	Casing diameter [mm]	Bottle size	Casing diameter [mm]	Bottle size
25	140	4	160	5
32	160	5	180	6
40	160	5	180	6
50	200	6.1	225	7
65	225	7	250	8
80	250	8	280	9
100	315	10	355	11

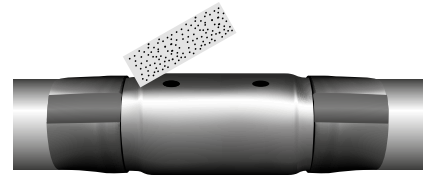
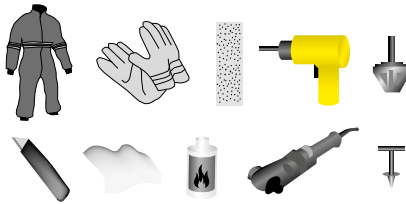
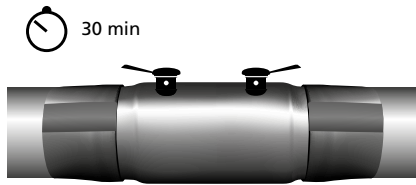


* For foaming joints of larger dimensions, we can provide foaming machines ensuring premium quality and proper mechanical and thermal insulating properties. Alternatively, the foam components can also be supplied in canisters.

** For DN400 and larger dimensions, the manual foaming (from bottles) is not recommended – only in the rare, extreme cases.

6. Joint Assembly

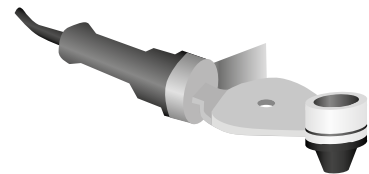
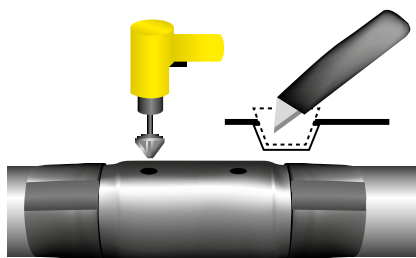
6.5 Installation of Welding Plugs



1) Before mounting the welding plugs, wait at least 30 minutes after the foaming of the joint closed by the venting plugs (for the foam degassing and cooling).

2) Prepare your work clothes and gloves, sandpaper, cone drill with a stopper, knife, alcohol, cloth, polyfusion welding machine with supplied adapters and screw holder for welding plugs.

3) Remove the venting plugs, remove the leaking foam and clean the openings of the residues of the foam and other impurities with sandpaper.

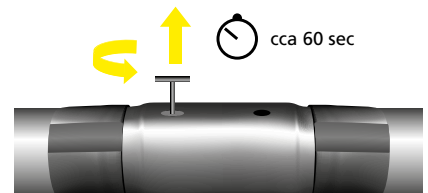
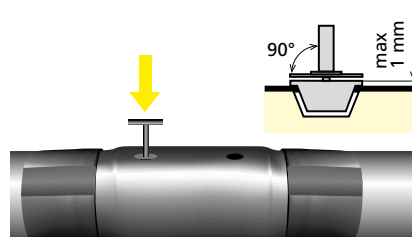
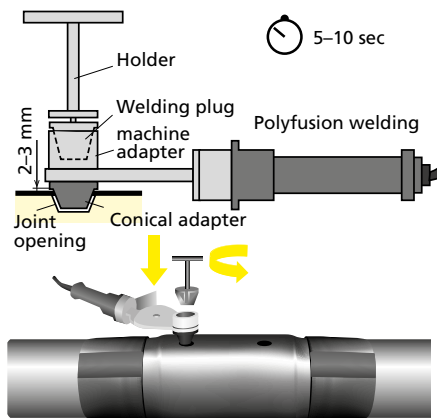


4) Drill openings with a special drill of 25 mm diameter. Cut appropriate grooves in the foam for the welding plugs using a knife (to prevent clogging of the joint with foam and extend the life of the heating adapter).

5) Remove from the two openings any foam residues and polyethylene chips and clean them with a cloth soaked in alcohol.

6) Heat the polyfusion welding machine for plastics with special adapters for the welding plugs to a temperature of 240 to 260°C.

It is recommended to perform regular annual checks of the temperature of the adapters of the polyfusion welding machine to ensure appropriate temperature for welding plastics.



7) Insert the welding plug using a holder to the top fixture of polyfusion welding machine while gently pushing the bottom conical adapter of the polyfusion welding machine into the joint opening. It is necessary to remain at a distance of the adapter (flange) 2-3 mm from the surface of the pipe for approx. 5-10 seconds.

8) Remove the polyfusion welding machine from the opening and immediately insert there a heated welding plug perpendicularly (max. 6 s). The upper edge of the plug should be in level with the surface of the joint casing; it can protrude by max. 1 mm but it should never be sunken below the surface of the casing! The trim formed around the plug must be uniform.

9) When the area around the plug cools down (approx. 60 s), remove the holder.

Proceed in the same way when installing the second welding plug.

Please note:
Maintain the melting adapters clean!

7. Installation of Pipe Fittings

7.1 Pre-Insulated Valves

7.2 Spindle valve extender

7.3 Anchors

7.4 One Time Compensators

7.5 End Sealing of Insulation

**7.6 Inlets to Buildings
and Existing Channels**

7.6.1 *Channel Rubber*

**7.6.2 *Inlets in buildings provided with a steel
pipe protector and sleeve***

**7.6.3 *Connecting pipes to channel
distribution systems***

7.7 Branch set (installation with tapping)

7. Installation of Pipe Fittings

7.1 Pre-Insulated Valves



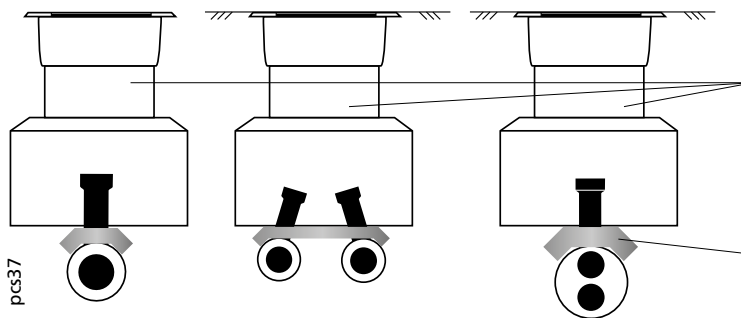
Pre-insulated valves must always be welded in the open position to the pipeline to prevent damage to the seal or the surface of the valve ball.

- Before closing the valve for the first time and putting the pipeline in operation, flush the pipeline to prevent damage to the seal by solid impurities.
- The expansion movement of the valve in the shaft must be ensured.



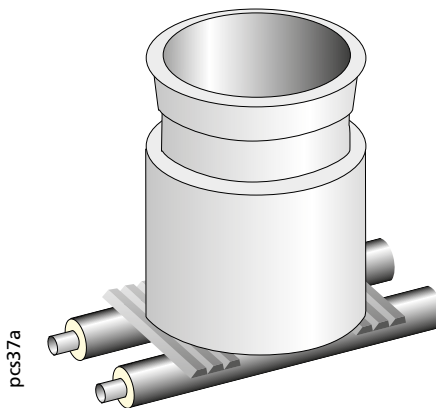
The valves must be turned from "Open" to "Closed" position at least twice a year in order to maintain their functioning.

- The valves must be controlled slowly to prevent surges in the pipeline. Controlling the flow by partial opening of the valve is not allowed.
- The installation of the shut-off valve close to expansion loops in forms "L", "Z" or "U" is not recommended.
- A control T-wrench for valves of DN 20 to DN 150 can be delivered on request, as well as a manual torque booster or complete valve with gearbox, which is recommended for larger dimensions from DN200.
- The pre-insulated valves should be installed in plastic telescopic shafts.



The telescopic shaft prevents the transfer of forces from the surface to the pipe

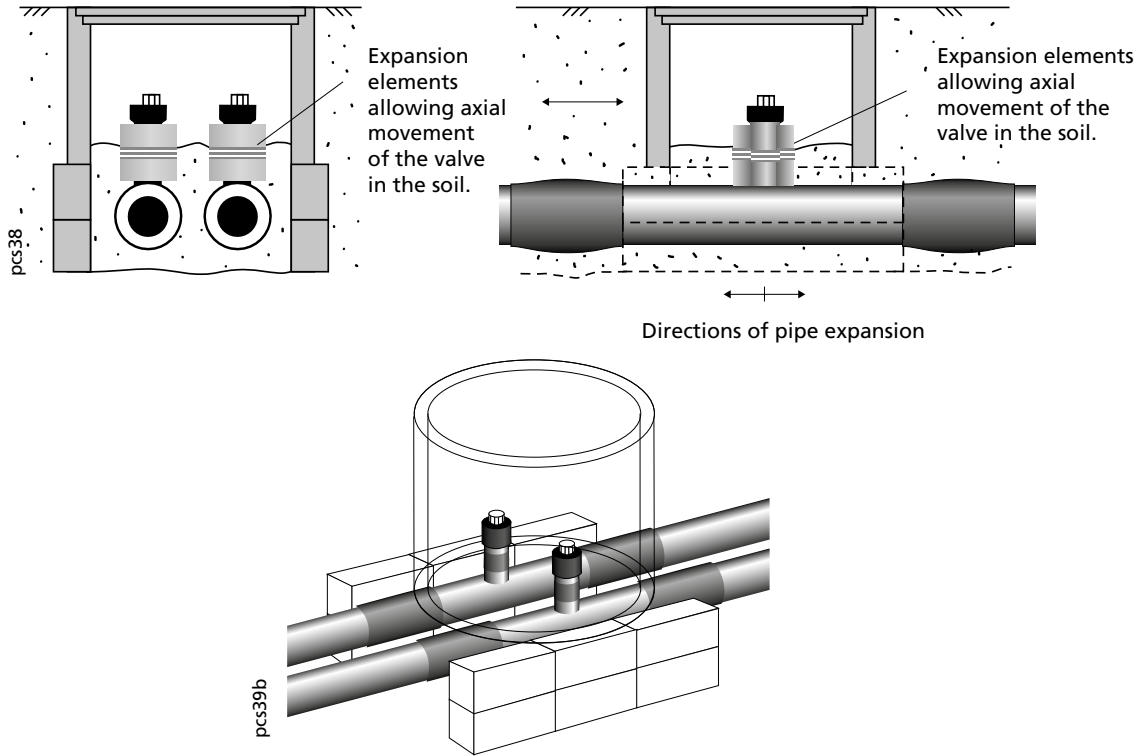
Expansion elements protecting the pipe at the point of contact with the shaft



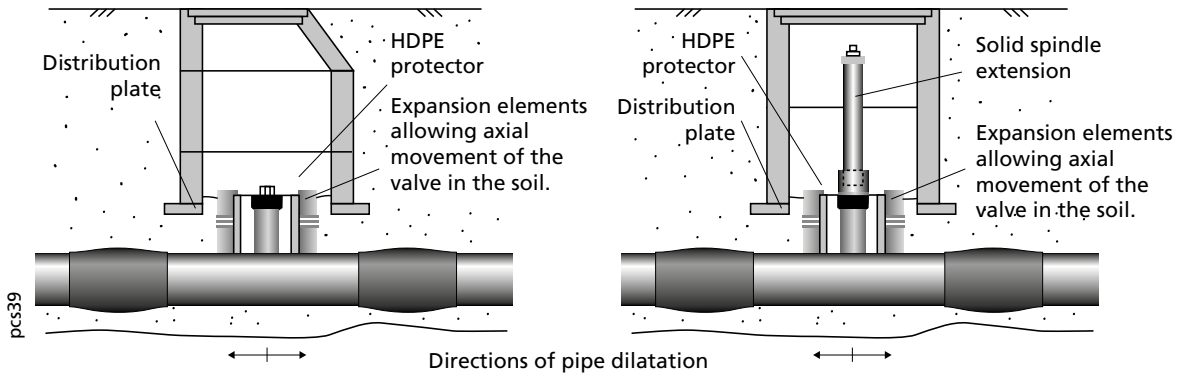
The valve spindles can be adjusted relative to each other in the shaft (see fig. above), but it is always necessary to ensure enough space for control using the T-wrench.

7. Installation of Pipe Fittings

Another option is the construction of chambers made of concrete, concrete rings or panels and brick on site.



If the pre-insulated pipe enters a chamber with a solid bottom,, the chamber should be waterproofed to prevent ingress of external ground water.



HDPE protector must be centred with respect to the valve spindle.

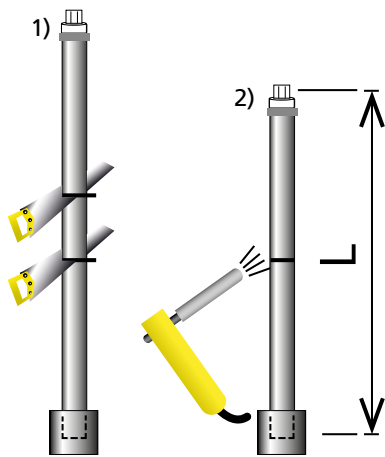
7. Installation of Pipe Fittings

7.2 Spindle valve extender

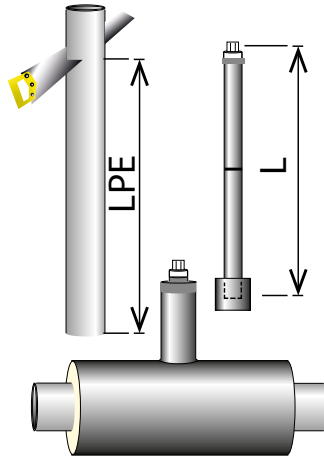
An extender is used where the spindle of a pre-insulated valve is too short. The pre-defined versions are supplied at the lengths of 1 and 2 metres. The length can subsequently be adjusted directly on site. The extender also includes a protective PE pipe and shrink sleeve, incl. sealing tape for attachment to the casing pipe of the valve spindle.



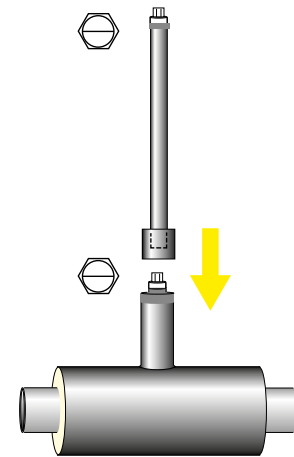
The expansion movement of the valve in the shaft (incl. the extender) must be ensured at all times. If laid in the ground, the whole of the extender must be lined with expansion pads.



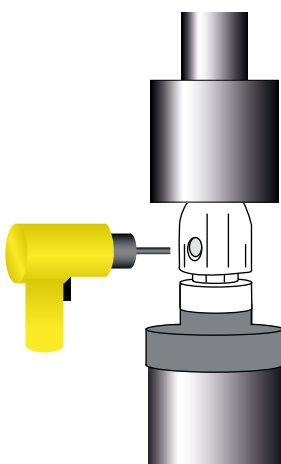
1) If necessary, shorten the stainless steel extender to the required length by cutting a section from the middle of the extender and re-welding the extender.



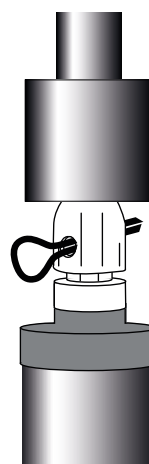
2) When shortening the PE protective pipe, make sure that there is enough margin to cover the spindle of the pre-insulated valve.



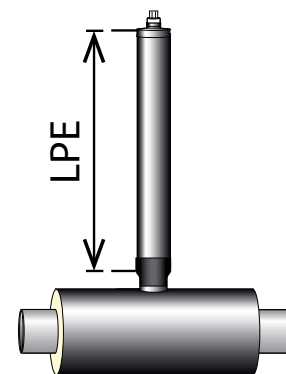
3) Attach the spindle extender on the valve hexagon socket so that the marked valve position (closed/open) matches the marked position on the spindle extender.



4) Drill hole in the hexagonal socket of the valve for the supplied split pin or flexible pin at the point of the pre-drilled hole in the extender.



5) Insert the supplied split pin or flexible pin into the hole and secure it.

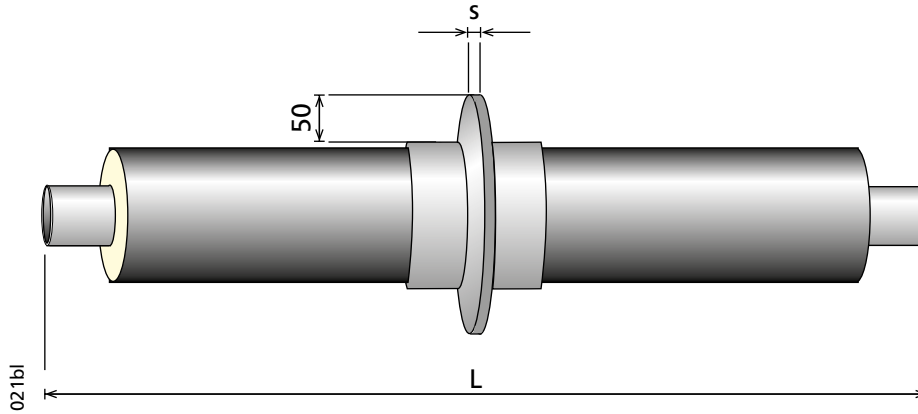


6) Attach the PE protective pipe to the foot of the spindle of the pre-insulated valve with a shrink band. Then place the expansion elements.

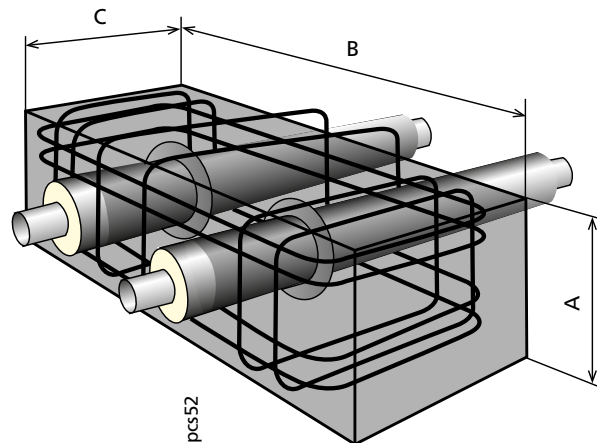
7. Installation of Pipe Fittings

7.3 Anchors

Anchors are used to capture the forces and linear movements directed to parts that may not be exposed to these effects. These are, for instance, chambers with valves, walls of buildings, etc. Anchors should be embedded in a reinforced concrete structure or attached to a support structure.

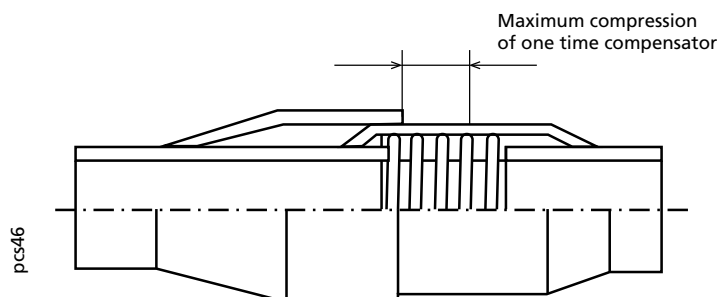


The dimensions of anchors and the method of their installation to the reinforced concrete structure are based on structural analysis and must be stated in the design documents and strictly observed. The location of an anchor is specified in the installation plan.



7.4 One Time Compensators

One time compensators are used to provide permanent pipe prestressing and they are installed in the pipeline at a point specified in the installation plan.

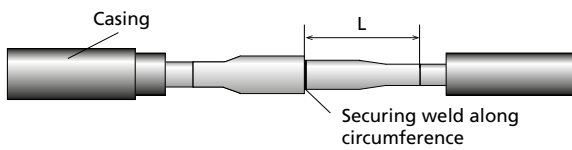


7. Installation of Pipe Fittings

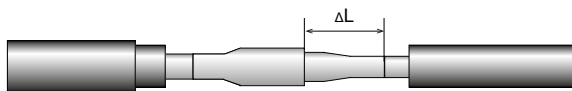


Please note:

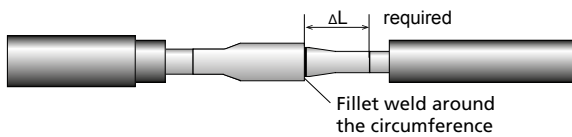
- The compensator's position is stabilized with welds during transport.
- For pressure testing, the compensator must be secured against expansion (destruction) with temporary weld joints around the circumference.
- The one time compensators must not be shortened.
If a one time compensator contains a control screw with sealing, it must be released during welding to ensure the escape of hot gases. After cooling, the screw must be tightened again and welded.
- The one time compensators must not be exposed to bending stress and therefore must be in a single axis in the pipeline (no angular deviations in the weld are permissible). The one time compensators must not be installed close to long bends or otherwise elastically bent pipe sections.
- The achieved values of compression (expansion) of a one time compensator must be stated in the final report that will be filed at the pipeline operator after the completion of the construction.



1) Before installing the compensator, the compensator casing must be pulled on the pipe. The one time compensator is installed in the connection (in its full length). For pressure testing it is necessary to make temporary securing welds.



2) After the start of the pipe preheating, the securing welds of the compensator must be ground off at the moment of reaching the mounting temperature and subsequently continue with gradual compression (about 5-10°C/h).



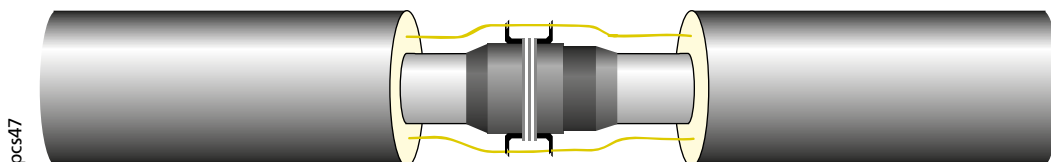
3) Having reached the desired preheating temperature and required expansion (determined by the designer), the final welding of the one time compensator with the fillet weld may be carried out.



4) The compensator is covered with the casing and the final insulation of the joint is carried out chapter 6.2.
The recommended pipe temperature for foaming joints is 15°C to 45°C.

pcs53

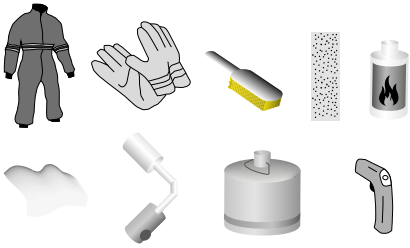
To ensure proper functioning of the detection systems, a uniform distance of the detection wire from the pipe must be maintained in the place of already welded shrunk one time compensators.



pcs47

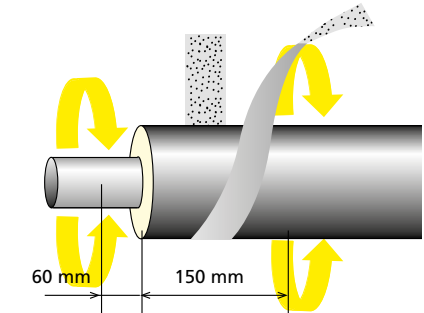
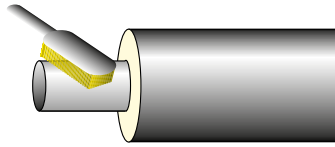
7. Installation of Pipe Fittings

7.5 End Sealing of Insulation

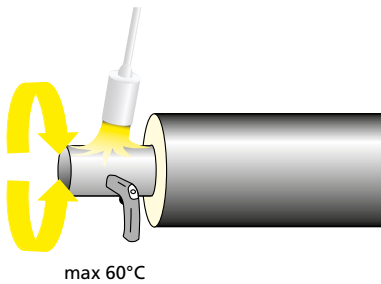


1) Prepare your working clothes and gloves, wire brush, alcohol, cloth, sandpaper, torch, propane bottle and contactless thermometer

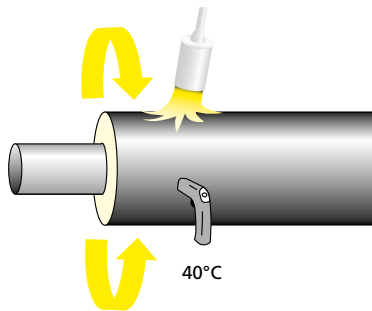
2) Clean the steel pipe of any dirt with a wire brush. Clean also the foam at the end of the tube.



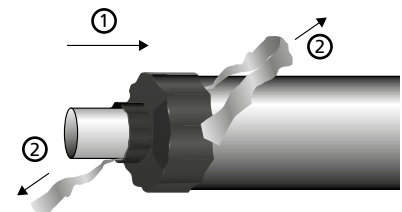
3) Roughen the media-carrying and casing pipes with the sandpaper in lengths as shown in the figure. Then clean the surface with the cloth soaked in alcohol. Prepare the detection wires for their termination.



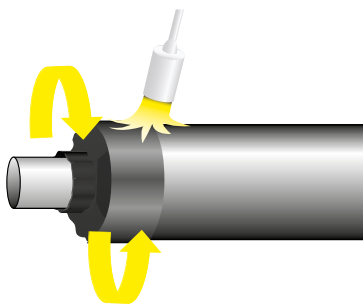
4) Heat the media-carrying pipe with soft flame at a maximum temperature of 60°C. Avoid any contact of the flame with the foam.



5) Activate the surface of the casing by heating it at 40°C using the soft flame.

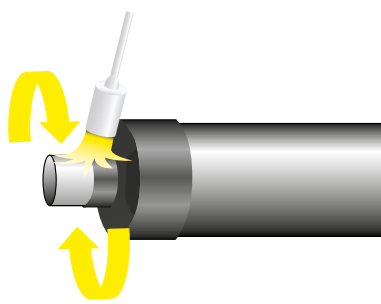


6) Fit the end sealing on the pipe and remove the protective paper from the inside of the end sealing, which is then pressed to the end of the pipe.

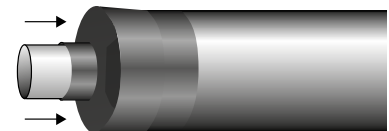


7) Shrink the end casing on the casing tube with the flame evenly around the circumference.

Please note:
Local overheating may damage the end sealing.



8) Then shrink the part of the end casing on the media-carrying pipe evenly around the circumference until the end sealing perfectly adheres over the entire circumference.



9) Press the pipe end sealing to the face striking it with your hand in a glove so that it completely flushes with the shapes of both pipes and does not contain air bubbles.

Before welding the next steel pipe, let the end sealing of the insulation cool down.

7. Installation of Pipe Fittings

7.6 Inlets to Buildings and Existing Ducts

The inlets into the building must be designed to prevent the penetration of ground water and moisture along the insulated pipe. Different bushings, sleeves and pressure sealings are used to this purpose.



The joint the pre-insulated pipe must not be situated in the wall or in its vicinity.

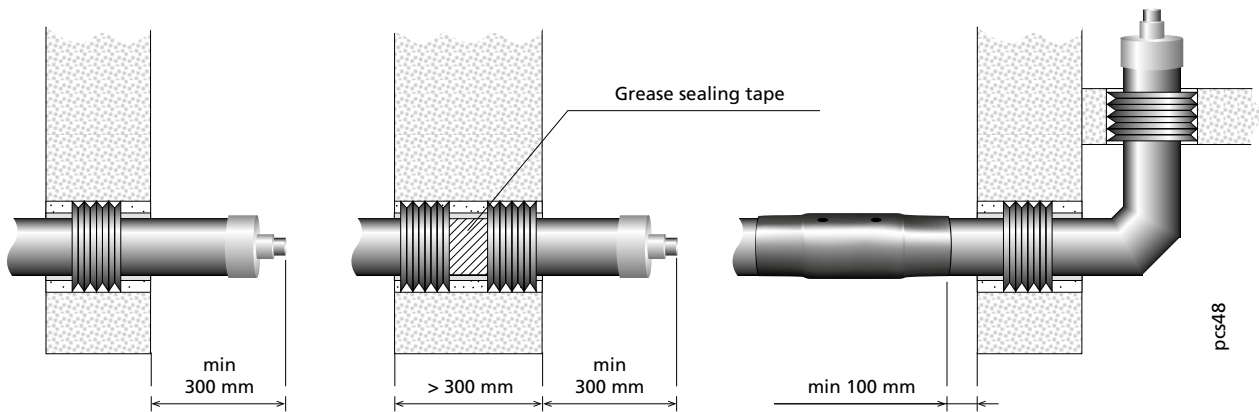
Bends with extended arms are intended for the inlets into buildings.

7.6.1 Wall Channel Rubber

The channel rubber is used as sealing against ground water and allows for a small expansion movement of the pipe (several mm). The channel rubber is fitted on the casing before the pipe is welded and the passage through the wall is closed with cement mortar. If the wall thickness is greater than 300 mm, it is necessary to install two channel rubbers.



The channel rubbers do not guarantee tightness against pressure water.



In case of a requirement for the channel rubber resistance against pressure water or radon radiation, the appropriate solution should be agreed with the technical support of FINThERM a.s.

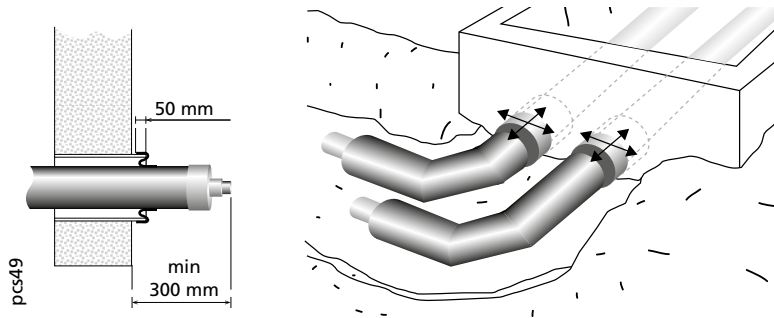
7.6.2 Inlets in buildings provided with a steel pipe protector and sleeve

The inlets with steel pipe protectors and sleeves are used where it is necessary to allow for greater pipe expansion and avoid any adverse influence of the structure of the building. The inlets with steel pipe protectors and sleeves are also intended for the transition between an existing duct and a sand bed without a duct.

Rubber sleeves fitted to the steel protector and pre-insulated pipe by stainless steel tapes prevent penetration of ground water and other contaminants into the inner parts of the pipe protector. The sleeves are pulled on the pipe prior to welding the steel pipe; separate sleeves can be used, if it is not technically possible.

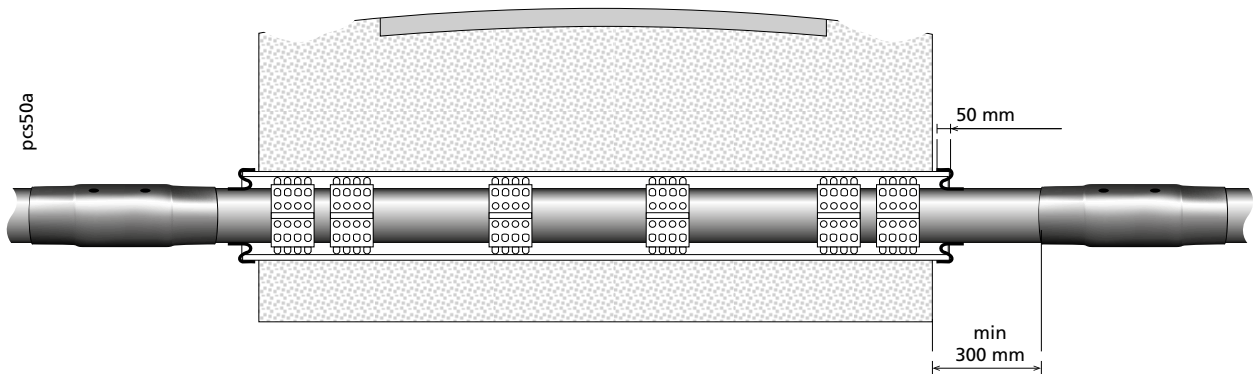
Steel pipe protectors in the wall are mounted approximately in lengths from 0.7 to max. 1 m. Sliding sleeves shall be used on the pipe for greater lengths of steel protectors at the inlet into the building.

7. Installation of Pipe Fittings



Bursting under the roads and other steel pipe protectors must be adapted to the conditions on site at the time of the design preparation. Possible expansion movements of the pipe in the protectors must be ensured (by selecting the appropriate diameter of the steel protector, type of sliding sleeve, number of sliding sleeves and the distances between them) to avoid damage to the pre-insulated pipe casing.

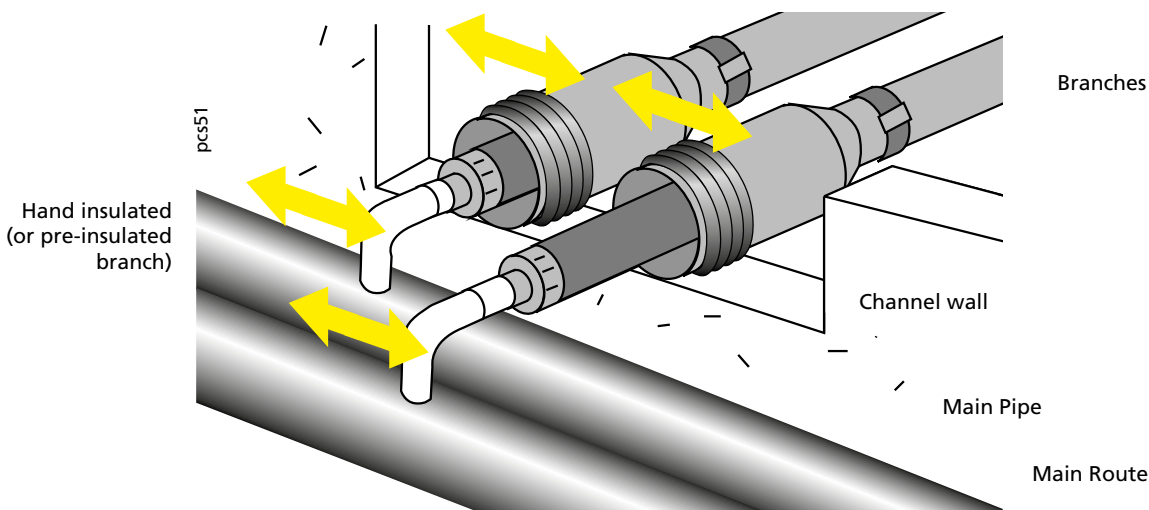
The pipe protector shall be sealed well at both ends.



7.6.3 Connecting pipes to channel distribution systems

To allow transverse movements of branches of the pre-insulated pipe depending on the displacement of the main pipeline installed in concrete channels, connecting pipes to channel distribution lines are used. The connecting pipe to the channel distribution lines is supplied as a set together with a shrink band, closing patch and wall channel rubber.

Installation: The connecting pipe to the channel distribution lines is attached to the casing of the pre-insulated pipe by a shrink closing patch, while the other end towards the channel remains free. A standard channel rubber shall be fitted at the place of the passage through the wall of the channel.



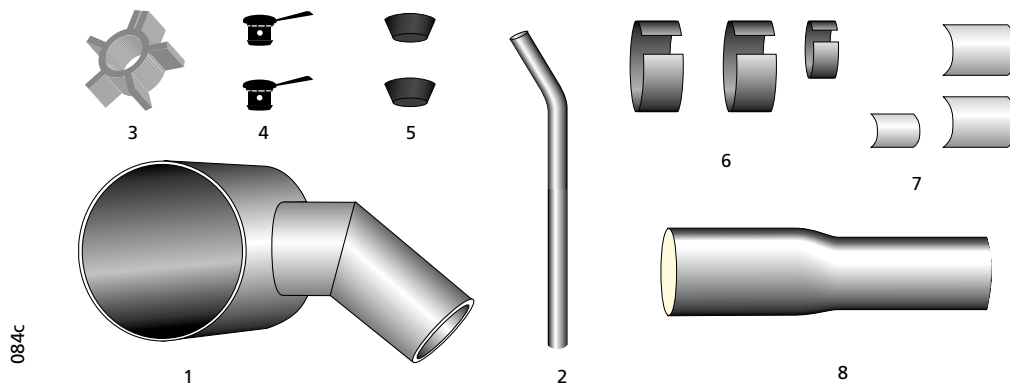
7. Installation of Pipe Fittings

7.7 Branch set (installation with tapping)

The **FINTHERM** T-branch kit is used when there is a need for atypical branching or for repairs. The most common atypical solution is hot tapping installation, which allows branching on an already existing in-operation pipeline. The hot tapping may only be conducted by properly trained FINTHERM employees based on an individual assessment of the location, while taking into account other requirements.



A plastic welding extruder is required for T-branch kit installation.



The branch kit includes:

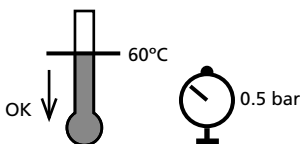
1. Saddle	1 piece	6. Narrow shrink sleeves	2+1 pieces*
2. Branch carrying pipe	1 piece	7. Closing patches	2+1 pieces*
3. Centring ring	1 piece	8. Reduction piece	1 piece*
4. Venting plugs	2 pieces	PUR components	(quantity according to the dimensions)
5. Welding plugs	2 pieces		

* Items so marked are included in the branch kit only if the branching off pipe is in the first insulation class (due to larger tapping valves and lesser insulation thickness it is typical to use a casing branch pipe with a larger diameter, which must be then reduced).

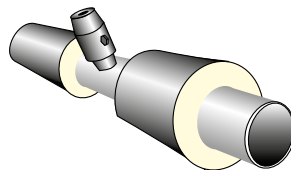


Branch installation also requires ordering the tapping valve, which is not included in the branch set.

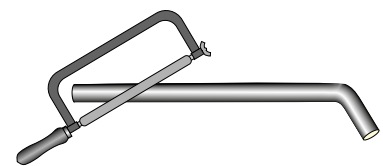
Assembly procedure:



1) Reduce the tapped pipe temperature and pressure below 60°C and 0.5bar.

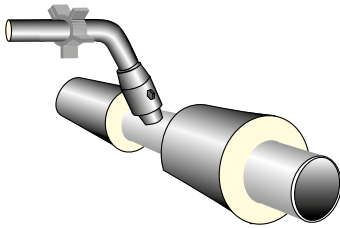


2) Before the medium-carrying branch pipe is welded on the tapping valve, adjust its length as required.

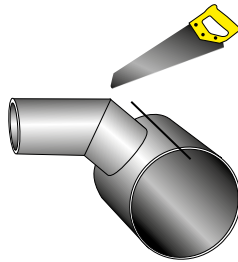


3) Weld the branch pipe onto the welded valve.

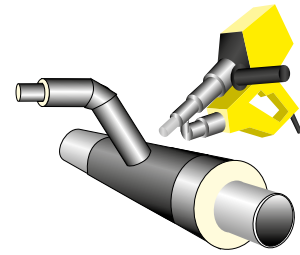
7. Installation of Pipe Fittings



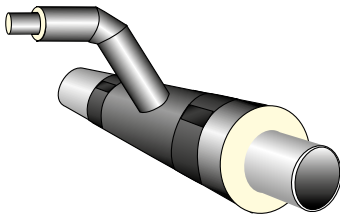
4) Weld the branch pipe onto the welded valve and fit the centring ring



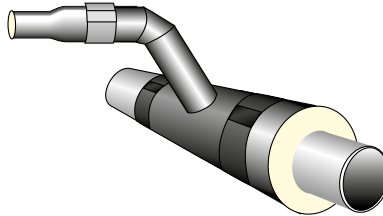
5) Cut the saddle lengthwise (in a place accessible to the welding extruder), put it on the branch centred with a centring ring, wrap the saddle tightly around the pipe, and pull it tight with straps.



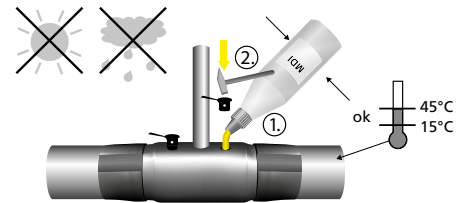
6) Weld the lengthwise slit seat with the extruder for plastic welding.



7) Secure the connection on both sides with shrink sleeves and sealing tape (see section 6.2 for the joint fitting)



8) If the branch is in the first insulation class, pull the diameter reducer on the end of the branch and secure it in position with shrink bands and a closing strap.



9) Foam with the use of supplied bottles (see section 6.2 for the joint fitting)



When tapping piping of large diameters, you do not have to remove the insulating sheath all around the circumference but you only need to make an installation hole, according to which the shape of the branch seat is then adjusted. Contact your representative of Fintherm® a.s. for more information.

8. Installation with Preheating

**8.1 Installation in an open trench
with stabilization using only
preheating**

**8.2 Installation with preheating
and one time compensators**

**8.3 Installation with preheating,
one time compensators
and anchors**

8. Installation with Preheating

Installation with preheating is a state-of-the-art and efficient method of pre-insulated piping installation, which significantly reduces the number of standard expansion pieces and "L", "Z" and "U" shape compensators.

The preheating of the pipeline by hot water during installation reduces axial stress in straight sections, loading of branches and other piping parts, all without the need for additional special elements (possibly using only one time compensators).

In practice, this solution reduces the requirements for the area (land needed to build the network), facilitates simple layout solutions, speeds up installation and, last but not least, reduces overall costs.

The installation with preheating can be used only with pipeline routes where a heat source (mostly hot water) can be provided to heat up pipes to the preheating temperature specified by the designer.

The installation (described in more detail in the following chapters) is based on achieving the preheating temperature and the required extension determined by the designer (depending on the environment conditions) for all pipe sections before they are backfilled with sand and earth.

Installation methods

1. Installation in an open trench with stabilization using only preheating
2. Installation with preheating and one time compensators
3. Installation with preheating, one time compensators and anchors

8.1 Installation in an open trench with stabilization using only preheating

Fast installation without the use of special compensating elements. This method is based on the reduction of axial stress and loading of pipes by means of hot water preheating in an open trench with pipeline stabilization. Complete backfilling of the piping is carried out after the preheating temperature and the extension specified by the designer have been achieved.

- + Without any additional compensation elements
- + Reduction of axial stress and loading of individual elements
- + Lower number of expansion pads required
- + Lower space requirements (land occupation)
- + Lower implementation costs

- Preheating hot water source incl. temperature control
- The trench must be left unfilled during preheating
- Technologically more demanding installation (preheating)

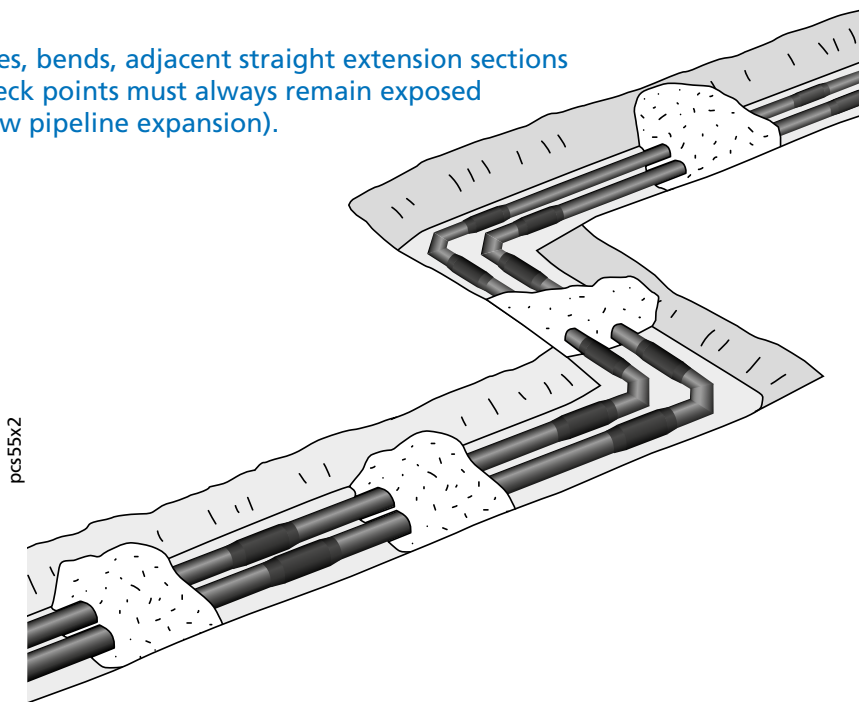
8. Installation with Preheating

Procedure:

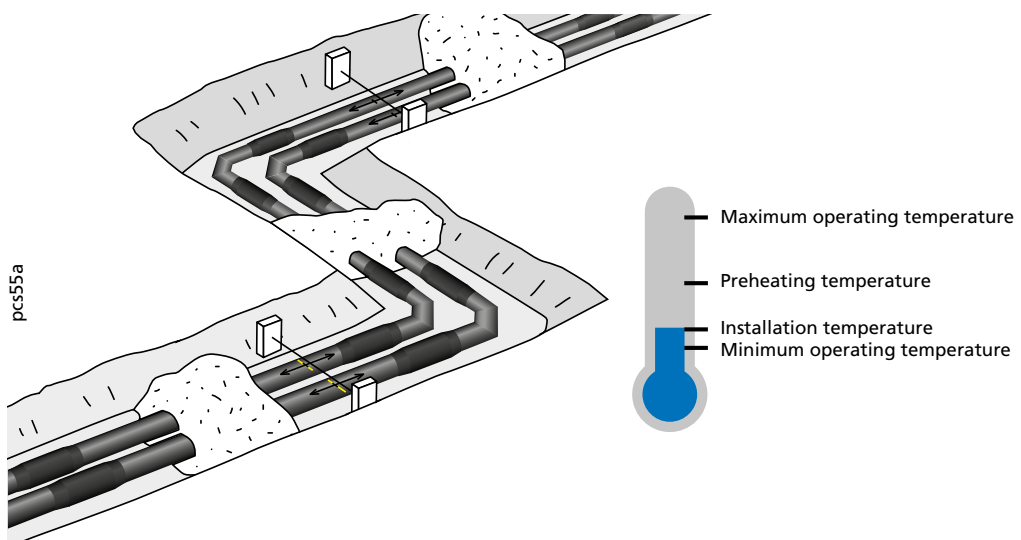
- 1) Laying pre-insulated pipeline into a prepared trench (sanded, compacted, cleaned) and welding the joints of the steel pipeline.
- 2) Cold water pressure test according to ČSN 13 941 (alternatively with air) to 1.3 times the design pressure (can be increased to 1.5 times the pressure, depending on the project significance) incl. pressure test report.
- 3) Insulation of joints including the connection of the detection system, see chapters Detection System and Assembly of Joints.
- 4) Stabilization of the pipeline in the trench (sufficient sand backfill of 2-3m length in the middle of each 12m pipe) and partial backfill of longer sections at fictitious anchors (in the middle of the route, between L, Z and U compensators, etc.).



Branches, bends, adjacent straight extension sections and check points must always remain exposed (to allow pipeline expansion).



- 5) Creation of control points for expansion measurement (installation temperature) - wire, string, pipe mark.

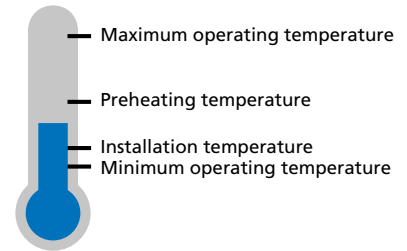
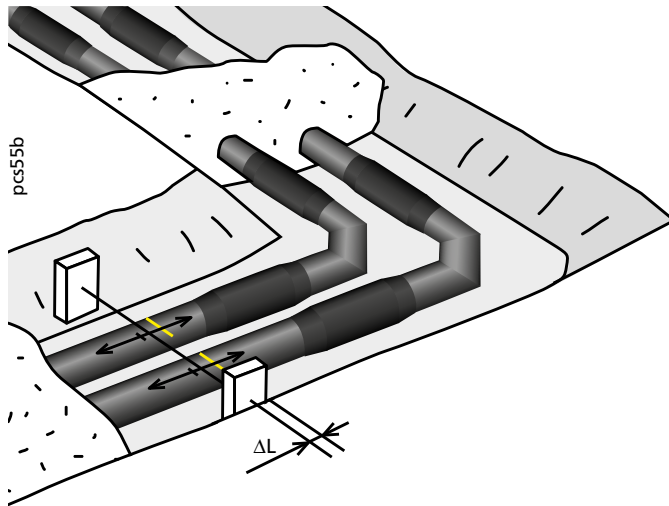


8. Installation with Preheating

6) Start of gradual hot water preheating. The medium temperature is increased by 5-10°C/h. The response of the piping shall be checked continuously (correct direction and expansion).



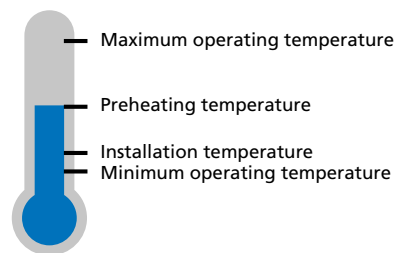
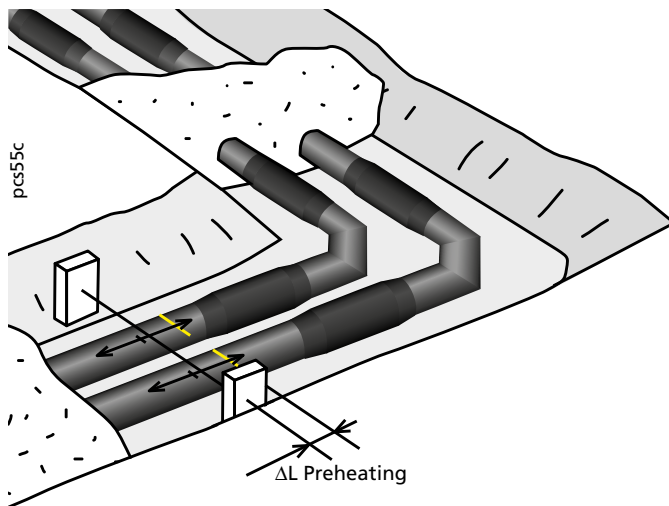
If there is no shift at the check points, preheating shall be ceased, the temperature decreased by 10°C and corrective measures taken (partial backfill, extraction, stabilization, etc.).



7) Continuous gradual preheating after reaching the preheating temperature.

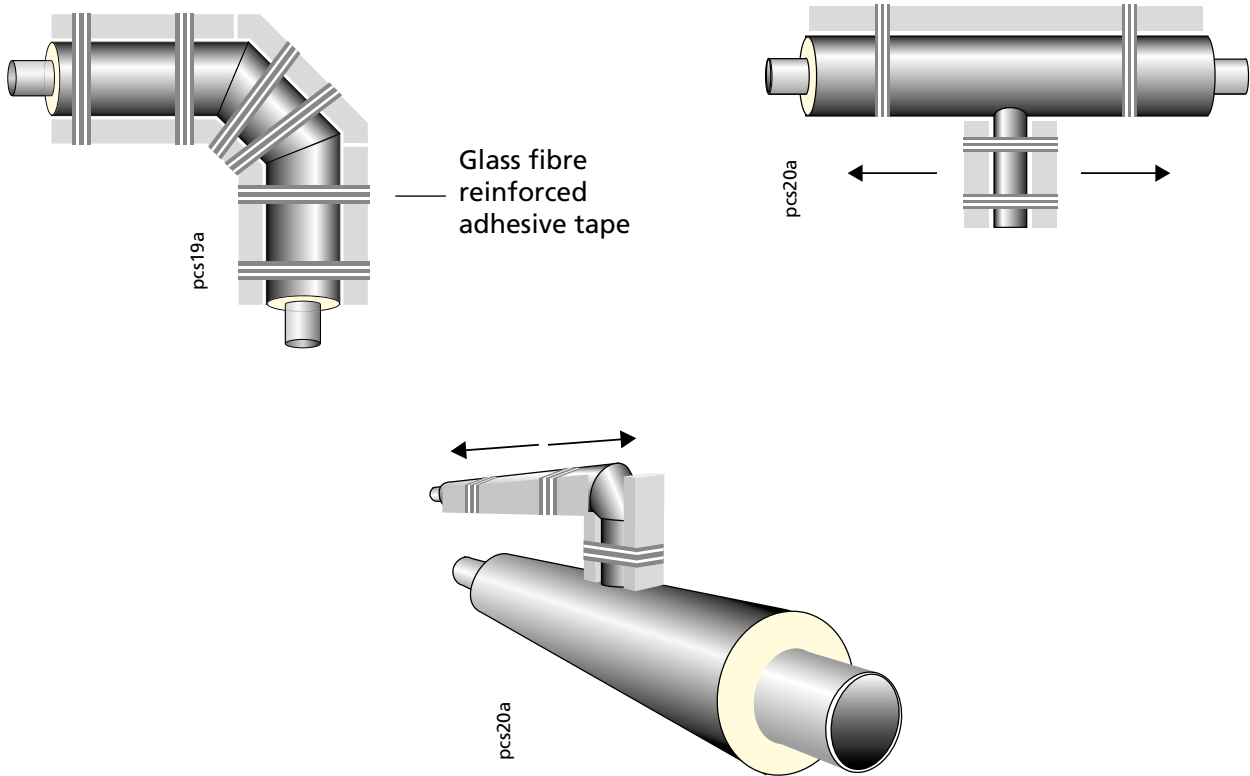


If the installation temperature (outdoor ambient temperature, normally +10°C) differs from the calculated temperature by approx. 10°C or more, the required expansion shall be recalculated.



8. Installation with Preheating

- 8) When the desired preheating temperature in the entire preheated section and the required expansions have been achieved, the bends and branches made of expansion profile plates are installed according to the design documentation.



- 9) Fill and compact the trench backfill, see the chapter Excavation, Pipe Laying and Backfilling.



Before backfilling the trench, surveying of the welds (joints) and plotting the actual locations of the expansion pads is recommended.

8. Installation with Preheating

8.2 Installation with preheating and one time compensators

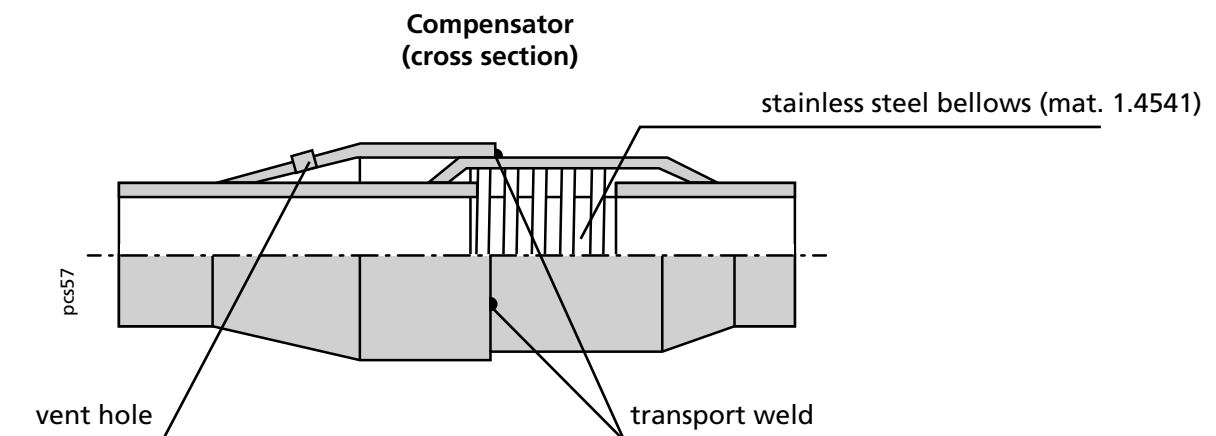
Currently, the most commonly used method of the installation of hot-water pre-insulated lines, which complements the hot water preheating method with one time compensators. The biggest advantage of this method is the possibility of larger partial backfilling before heating up the piping. In addition, the one time compensators allow reducing axial stress where standard expansion elements cannot be used.

- + Possibility of partial backfilling of longer sections immediately after their connection
- + Reduction of axial stress even in highly loaded lines
- + Lower expansion
- + Lower space requirements (land occupation)
- + Lower implementation costs

- Preheating hot water source incl. temperature control
- Technologically demanding installation (preheating, compressing of compensators)

Procedure:

- 1) Laying pre-insulated pipeline into a prepared trench (sanded, compacted, cleaned) and welding the joints of the steel pipeline.
- 2) Removal of transport welds of the one time compensator and subsequent securing by welding seals, their size depending on the pipe diameter (the length of the welds must be calculated, larger and always around the circumference for DN150).



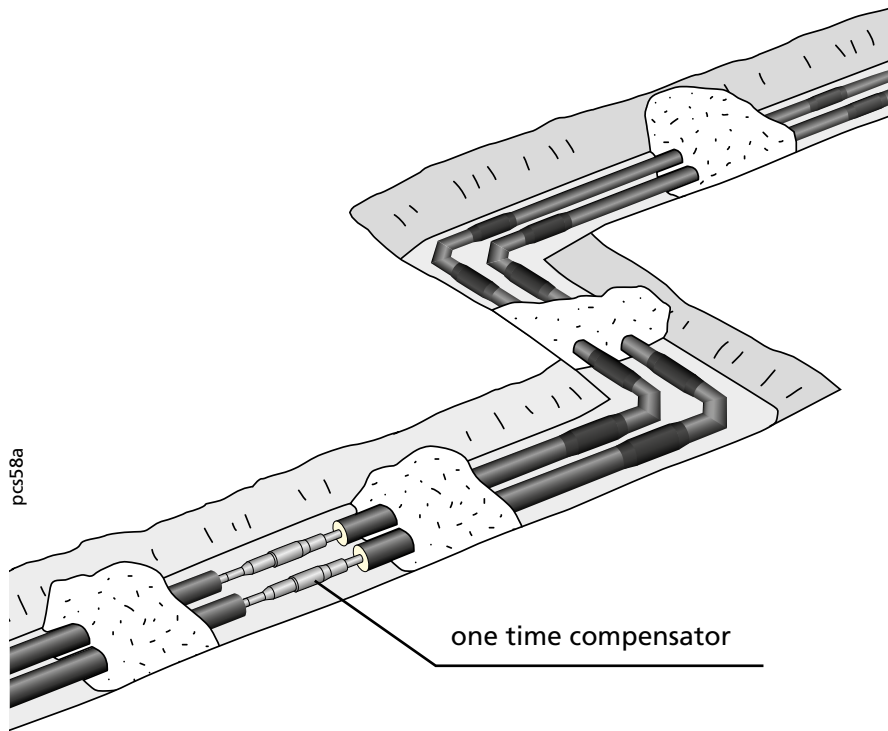
- 3) Cold water pressure test according to ČSN 13 941 (alternatively with air) to 1.3 times the design pressure (can be increased to 1.5 times the pressure, depending on the project significance) incl. pressure test report.
- 4) Insulation of joints including the connection of the detection system, see chapters Detection System and Assembly of Joints.

8. Installation with Preheating

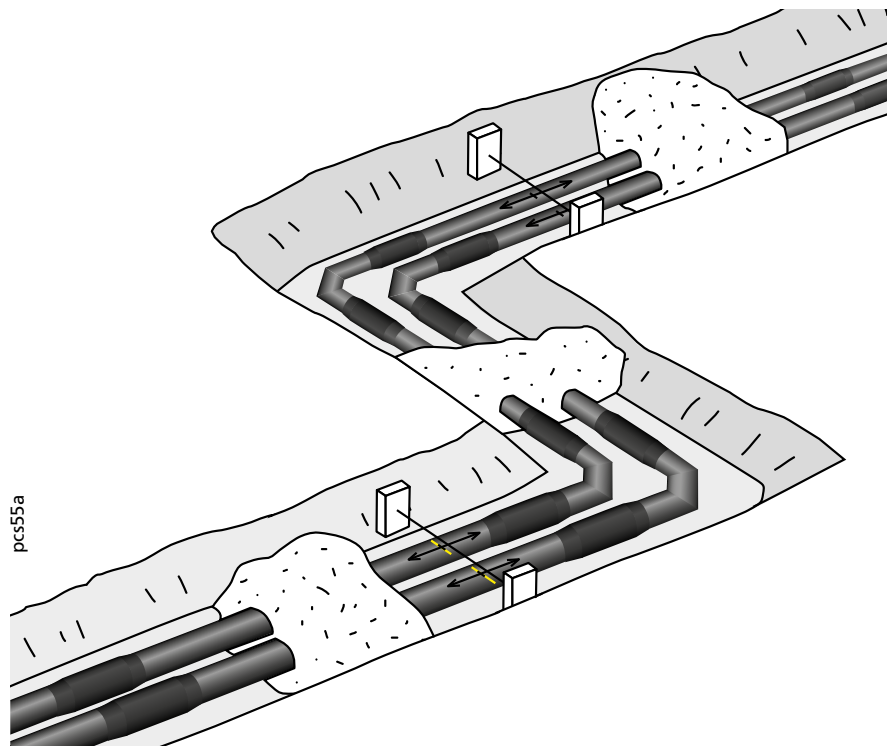
- 5) Stabilization of the pipeline in the trench (sufficient sand backfill of 2-3m length in the middle of each 12m pipe) and partial backfill of longer sections (around fictitious anchors - in the middle of the route, between compensators, etc.), but leaving branches and bends uncovered (to allow inspection of expansion elements) In special case (approved by the manufacturer), the whole line (except for the compensator) can be backfilled.



Please note that the line is exposed to increased residual stress after complete backfilling.



- 6) Creation of control points for expansion measurement (installation temperature) - wire, string, pipe mark.

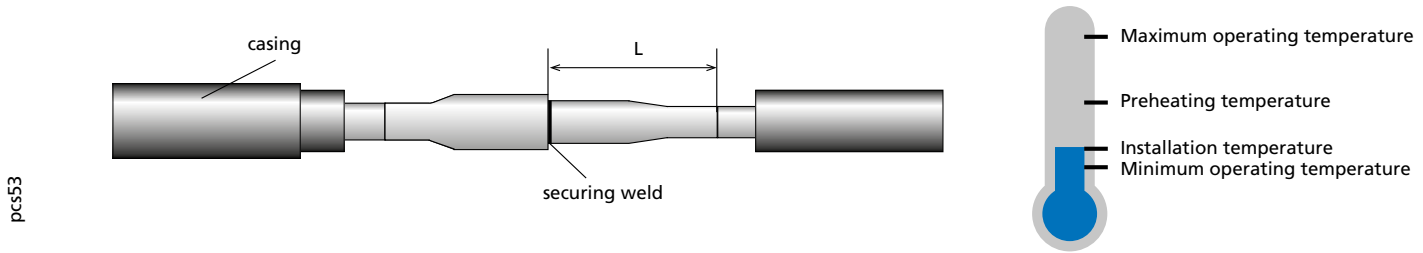


8. Installation with Preheating

- 7) Start of gradual hot water preheating. The medium temperature is increased by 5-10°C/h.
- 8) When the temperature of the medium (heating control over the entire heated route) achieves the installation temperature (outdoor ambient temperature), the securing welds shall be removed.



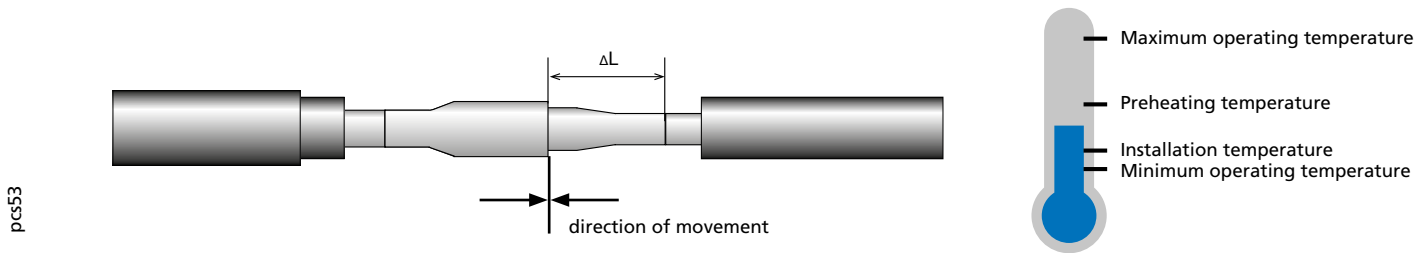
Prior to removing the securing welds, check marks shall be made on the one time compensators for subsequent expansion measurements.



- 9) Piping preheating is continued (continuously increasing temperature by 5-10°C/h). Continuous check the pipeline response is required (the pipeline expands in the desired direction with desired expansion lengths).



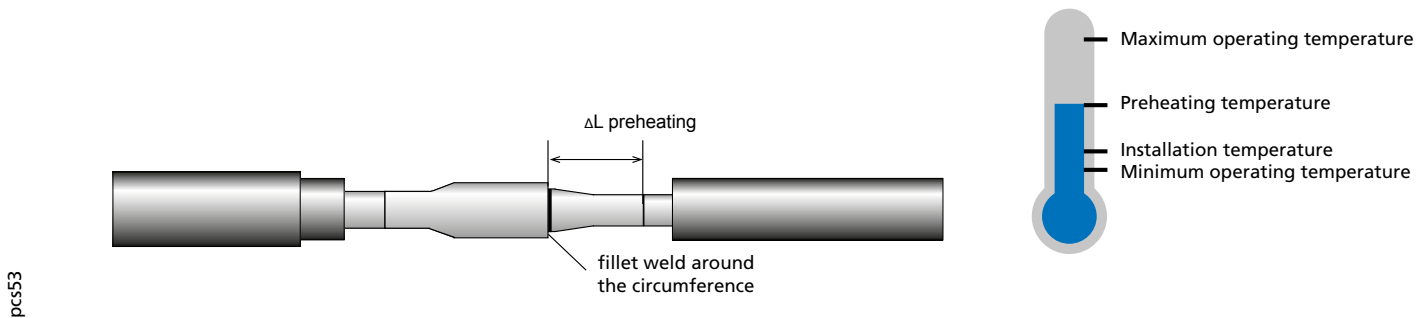
If there is no shift at the check points, preheating shall be ceased, the temperature decreased by 10°C and corrective measures taken (partial backfill, extraction, stabilization, etc.).



- 10) Once the desired preheating temperature and expansions have been achieved, the final welding of the one time compensator is performed at the points of the removed securing welds (always around the circumference).

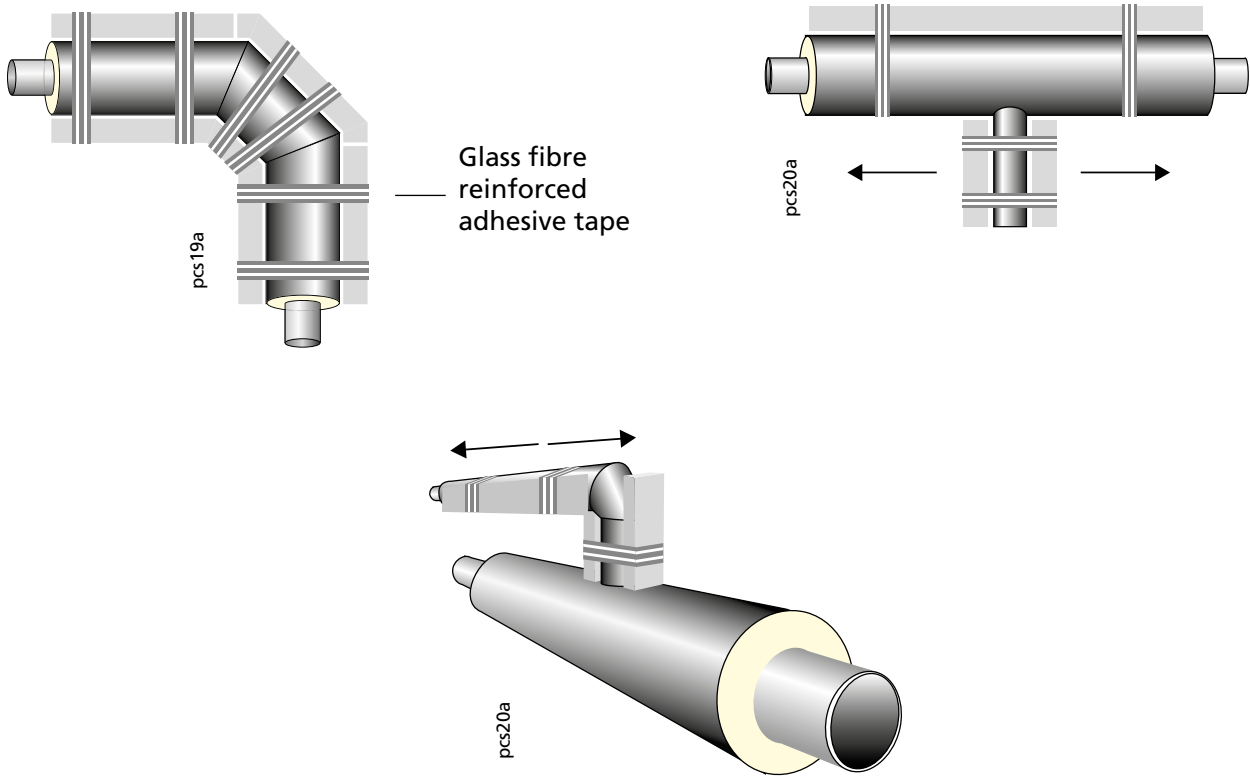


If the installation temperature (outdoor ambient temperature, normally +10°C) differs from the calculated temperature by approx. 10°C or more, the required expansion shall be recalculated.



8. Installation with Preheating

11) Once the required preheating temperature and expansions have been achieved, install the bends and branches with expansion profile plates according to the design documentation.



12) Final insulation of the one time compensator, final backfilling and compaction of the excavation, see chapter Trench, Pipe Laying and Backfilling.



Before backfilling the trench, surveying of the welds (joints) and plotting the actual locations of the expansion pads is recommended.

8. Installation with Preheating

8.3 Installation with preheating, one time compensators and anchors

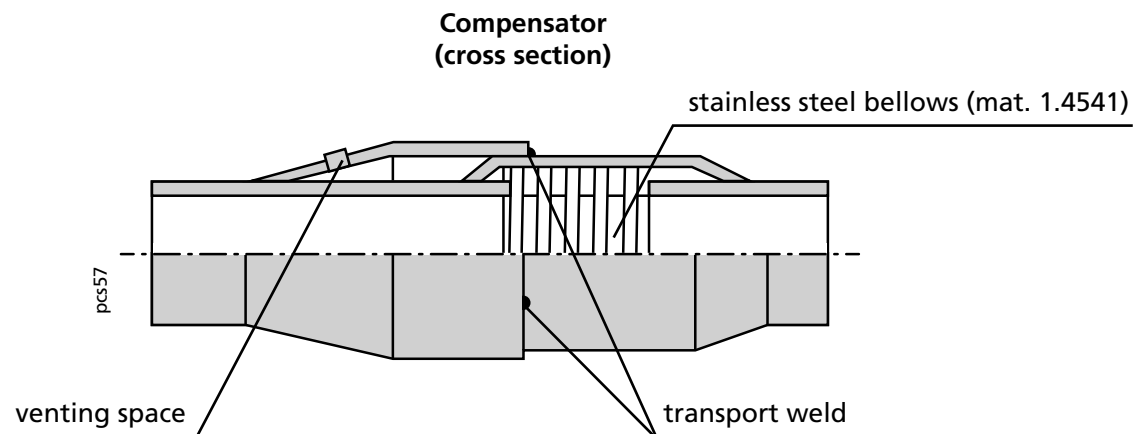
Specific method of the installation of pre-insulated hot-water lines complementing the preheating method and one time compensators with the use of reinforced anchors. This method is mainly used in cases where standard expansion elements or standard installation with pre-heating and one time compensators cannot be applied, for example for technological reasons, to protect structures against expansion, multi-stage construction, etc.

- + Easy construction in stages
- + Possibility of partial backfilling of longer sections immediately after their connection
- + Reduction of axial stress in highly loaded lines
- + Lower space requirements (land occupation)

- Preheating hot water source incl. temperature control
- Technologically rather demanding installation (preheating, installation of compensators, construction of anchors)
- Time-consuming (construction of anchors- concrete curing)
- Higher implementation costs

Procedure:

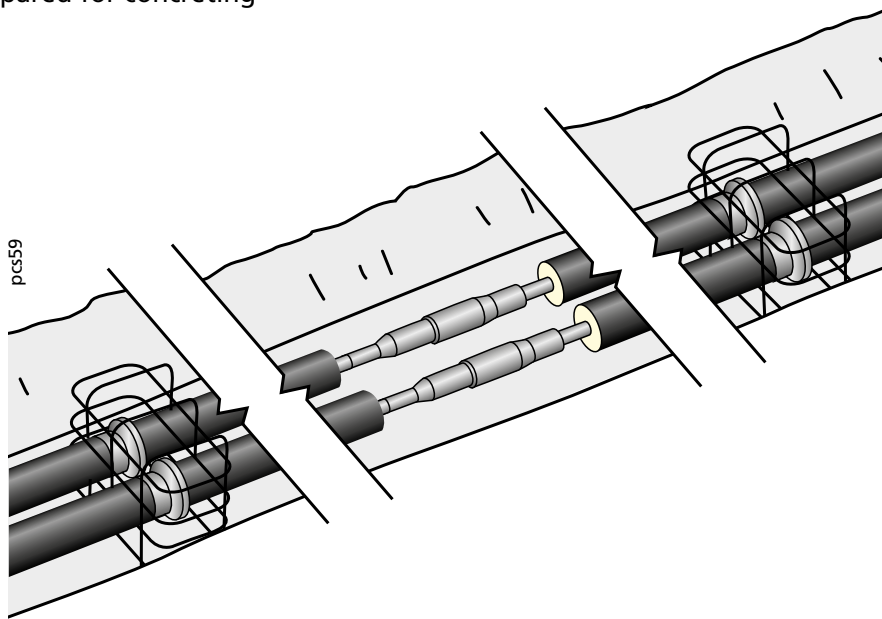
- 1) Laying pre-insulated pipeline into a prepared trench (sanded, compacted, cleaned) and welding the joints of the steel pipeline.
- 2) Removal of transport welds of the one time compensator and subsequent securing by welding seals, their size depending on the pipe diameter (the length of the welds must be calculated, larger and always around the circumference for DN150).



- 3) Cold water pressure test according to ČSN 13 941 (alternatively with air) to 1.3 times the design pressure (can be increased to 1.5 times the pressure, depending on the project significance) incl. pressure test report.

8. Installation with Preheating

4) Anchors prepared for concreting



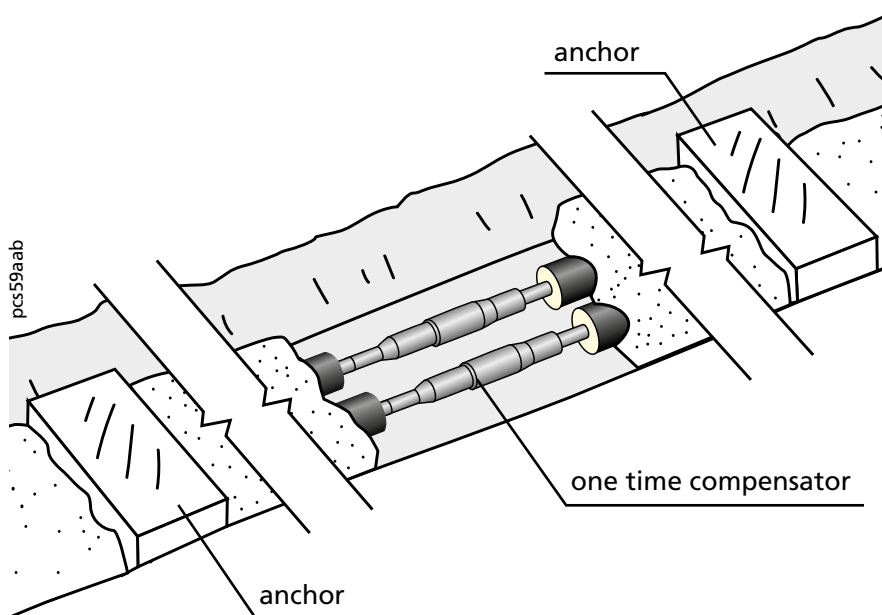
5) Insulation of joints including the connection of the detection system, see chapters Detection System and Assembly of Joints.

6) Concrete the anchors.

7) Stabilization of the pipeline in the trench (sufficient sand backfill of 2-3m length in the middle of each 12m pipe) and partial backfill of longer sections (around fictitious anchors - in the middle of the route, between compensators, etc.), but leaving branches and bends uncovered (to allow inspection of expansion elements) In special case (approved by the manufacturer), the whole line (except for the compensator) can be backfilled.

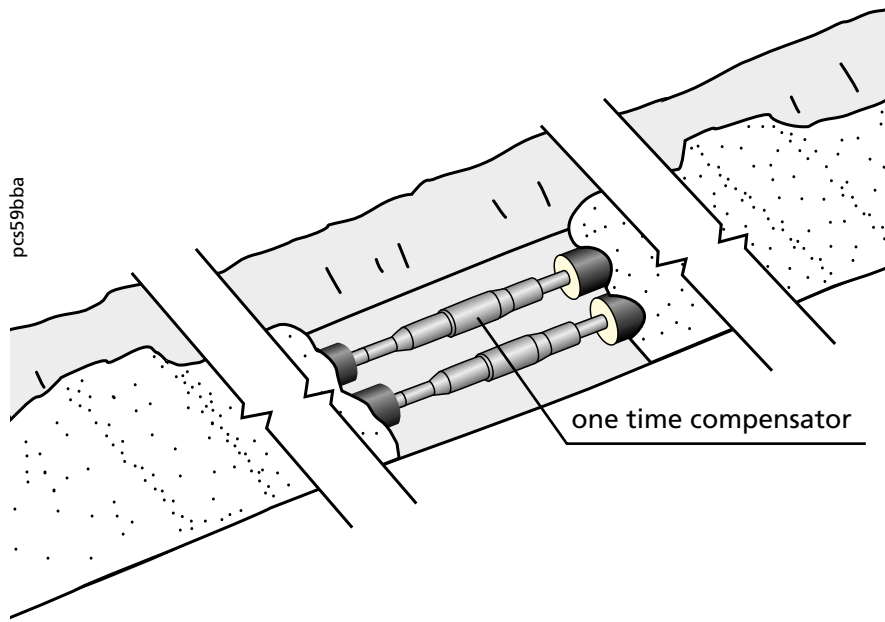


Please note that the line is exposed to increased residual stress after complete backfilling.



8. Installation with Preheating

8) Once the anchors are cured, backfilling with soil and compact...

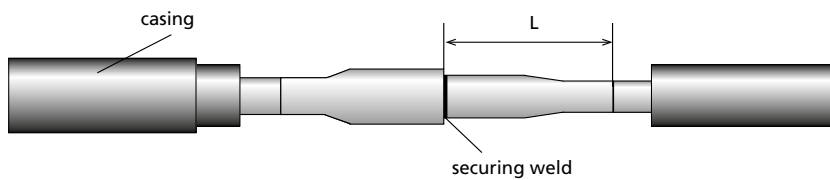


9) Start of gradual hot water preheating. The medium temperature is increased by 5-10°C/h.

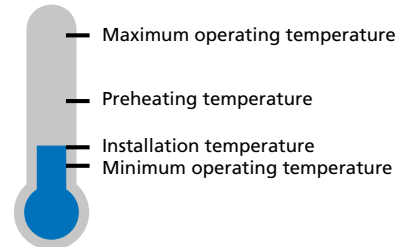
10) When the temperature of the medium (heating control over the entire heated route) achieves the installation temperature (outdoor ambient temperature), the securing welds shall be removed.



Prior to removing the securing welds, check marks shall be made on the one time compensator for subsequent expansion measurements.



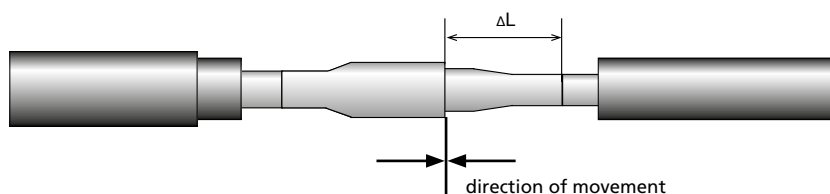
pcs53



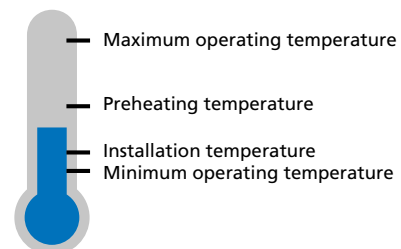
11) Piping preheating is continued (continuously increasing temperature by 5-10°C/h). Continuous check the pipeline response is required (the pipeline expands in the desired direction with desired expansion lengths).



If there is no shift at the check points, preheating shall be ceased, the temperature decreased by 10°C and corrective measures taken (partial backfill, extraction, stabilization, etc.).



pcs53

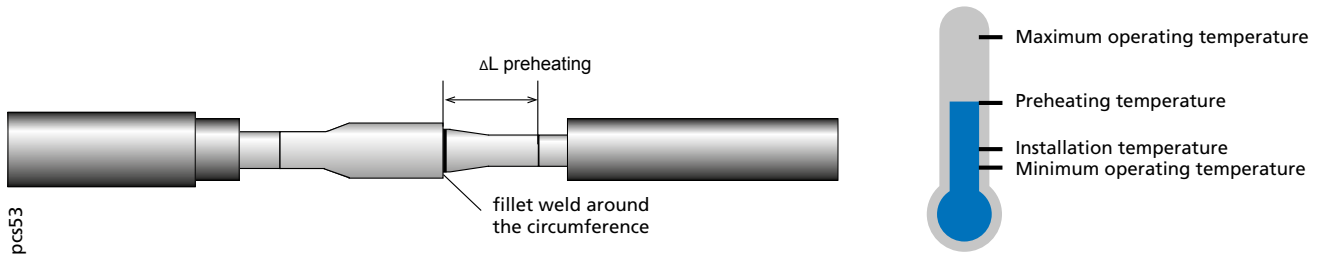


8. Installation with Preheating

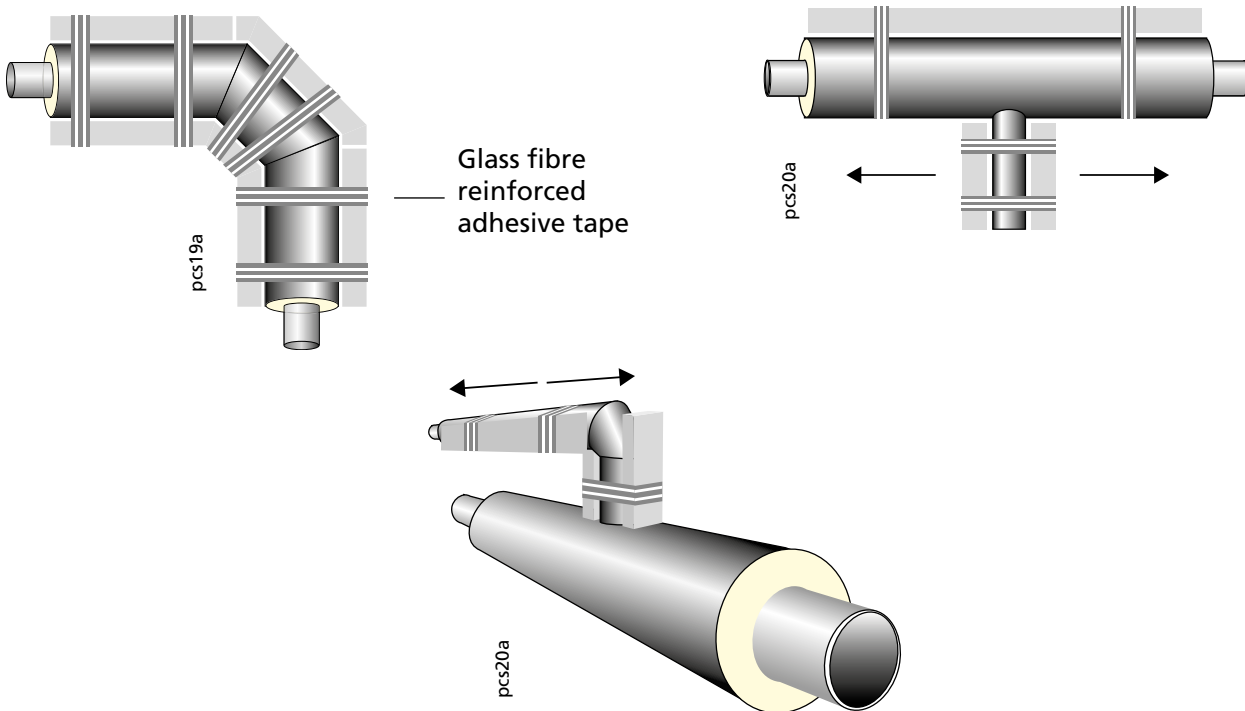
12) Once the desired preheating temperature and expansions have been achieved, the final welding of the one time compensator is performed at the points of the removed securing welds (always around the circumference).



If the installation temperature (outdoor ambient temperature, normally +10°C) differs from the calculated temperature by approx. 10°C or more, the required expansion shall be recalculated.



13) Once the required preheating temperature and expansions have been achieved, install the bends and branches with expansion profile plates according to the design documentation.



14) Final insulation of the one time compensator, final backfilling and compaction of the excavation, see chapter Trench, Pipe Laying and Backfilling.



Before backfilling the trench, surveying of the welds (joints) and plotting the actual locations of the expansion pads is recommended.

9. Installation of Fintherm® Standard Spiro Casing Overhead System

9.1. Piping Installation

9.1.1. Pipe Mounting

9.1.2. Support Distances

9.1.3. Types of Installation

9.2 Valves (Air Venting and Draining)

9.2.1. Air Venting/Draining in Joint

9.2.2. Standard pre-insulated air-venting/draining

9.3 Points of Entry to Buildings

9.4 Connection Point Between Overhead and Underground Pipeline

9.5 Assembly of Joints

9.6 Dilatation Compensation

9.6.1. Natural Compensation

9.6.2. Pipeline Prestressing

9. Installation of Fintherm® Standard Spiro Casing Overhead System

The Fintherm® Standard Spiro Casing pipe system is designed for overhead media transport. Its advantages include UV-resistance and non-flammability, thanks to the fact that the casing is made of spirally folded galvanized steel sheet. In this system, pre-insulation is used not only in straight pipes and angle pieces, but also in other elements based on an order (anchors, branches, valves, etc.). The pre-insulated system can also be combined with the manual on-site insulation of some elements.

During the installation of the Fintherm® Standard Spiro Casing systems, it is necessary to follow safety regulations with regard to the movement of assembly staffs within the pipeline bridges. The assembly staff must follow the fire prevention principles regarding the flammability of the PUR foam, and also respect the applicable regulations concerning sound and thermal insulation.

9.1 Piping Installation

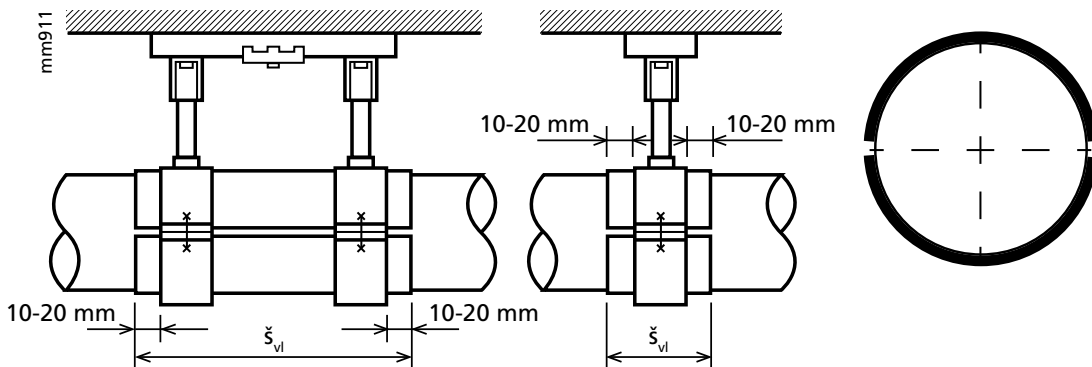
The pre-insulated Fintherm® Standard Spiro Casing pipeline is installed on overhead structures, similarly to the conventional pipeline without pre-insulation. The difference against conventional pipeline is that the pre-insulated pipeline is installed into an insulating sheet, with the exception of anchors (supports or suspensions).

9.1.1. Pipe Mounting

Pre-insulated pipeline is usually mounted using split steel sleeves (single or double), in which the casing pipe is fixed along its whole perimeter. The pre-insulated pipe casing must be protected from damage (crushing) by steel sleeves, using inserts. For example, rubber with a textile cord, a longitudinally cut PEHD pipe or another material with corresponding characteristics can be used as an insert. The distance, width and number of individual sleeves is always specified in the project documents, reflecting the load-bearing capacity of individual supports, the maximum pipeline deflection, etc. The following section provides a table with the minimum widths of sleeves or their inserts (w_{ins}), depending on the distance of supports.



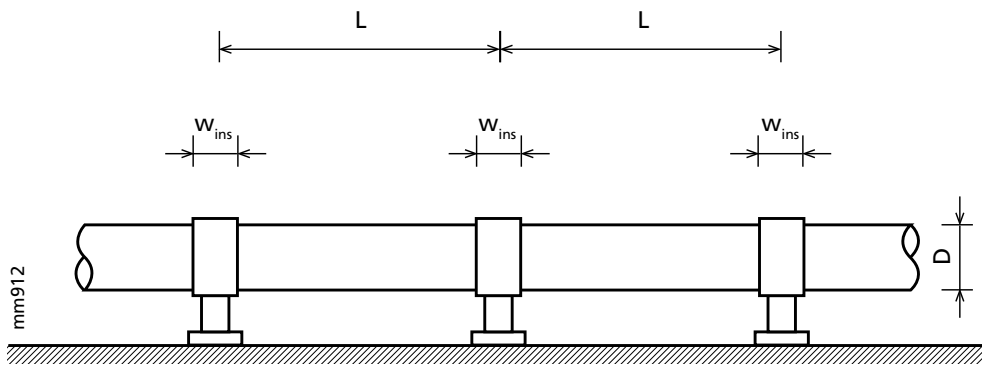
The sleeve insert must always be positioned so that it covers most of the lower and upper halves of the pipe at the point of contact with the sleeve, and that it exceeds the sleeve width by at least 10-20 mm on each side.



9. Installation of Fintherm® Standard Spiro Casing Overhead System

9.1.2. Support Distances

The maximum distance between the bearing reflects the load-bearing capacity of the supporting steel pipes, the pipe slope of 2 % and the load-bearing capacity of the PUR insulation incl. housing to which the mounting sleeves are attached.



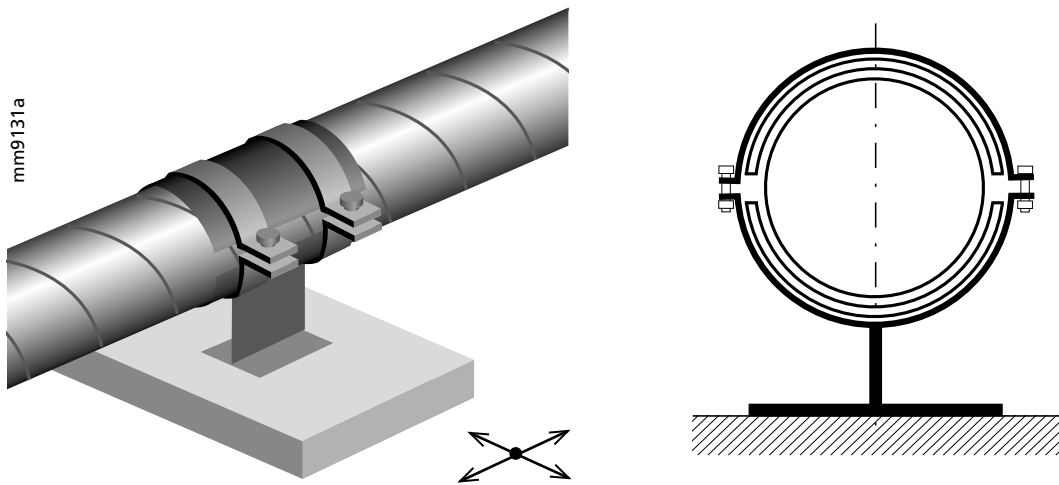
DN	Insulation class 1			Insulation class 2			Insulation class 3		
	D [mm]	L [m]	w _{ins} [mm]	D [mm]	L [m]	w _{ins} [mm]	D [mm]	L [m]	w _{ins} [mm]
DN25	90	3,4	20	110	3,3	20,0	125	3,3	20
DN32	110	3,8	20	125	3,7	20,0	140	3,7	20
DN40	110	4,1	20	125	4,0	20,0	140	4,0	20
DN50	125	4,6	30	140	4,5	20,0	160	4,5	20
DN65	140	5,1	40	160	5,0	30,0	180	5,0	30
DN80	160	5,5	40	180	4,4	40,0	200	5,4	40
DN100	200	6,1	60	225	6,1	50,0	250	6,0	50
DN125	225	6,6	70	250	6,6	60,0	280	6,5	60
DN150	250	7,3	90	315	7,2	80,0	315	7,1	80
DN200	315	8,1	130	355	8,1	110,0	400	8,0	110
DN250	400	8,9	170	450	8,8	140,0	500	8,7	140
DN300	450	9,6	220	500	9,7	190,0	560	9,5	190
DN350	500	9,9	240	560	9,8	200,0	630	9,7	200
DN400	560	10,6	290	630	10,5	250,0	670	10,5	250
DN450	560	11,1	360	630	11,0	300,0	710	10,9	300
DN500	630	11,5	400	710	11,4	340,0	800	11,3	340

9. Installation of Fintherm® Standard Spiro Casing Overhead System

9.1.3. Types of Installation

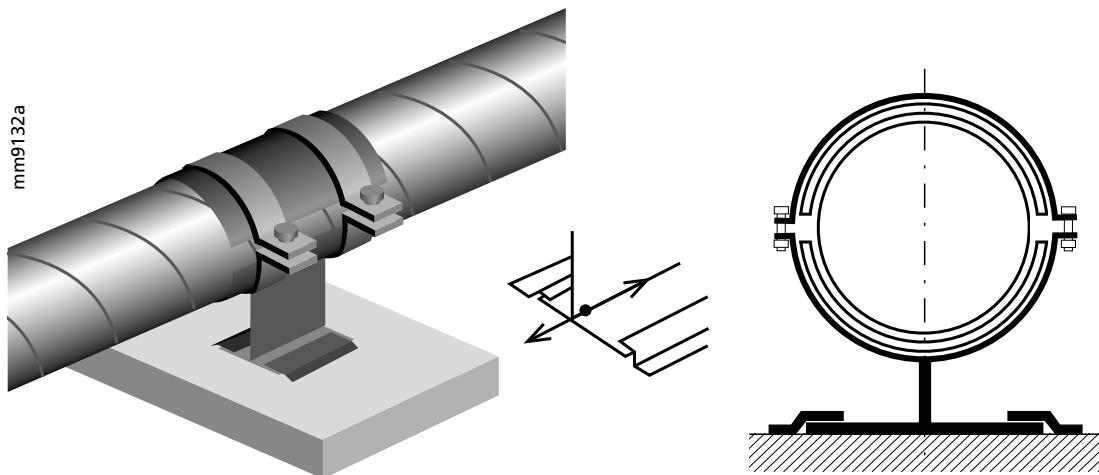
9.1.3.1. Sliding

The sliding connection consists of sleeve mounting, where each sleeve is completed with a web which is placed on a horizontal support plate providing free horizontal movement. The plate dimensions must be set to guarantee that the web is supported even with maximum possible pipeline dilatation, to prevent their displacement.



9.1.3.2 Sliding with Axial Guide

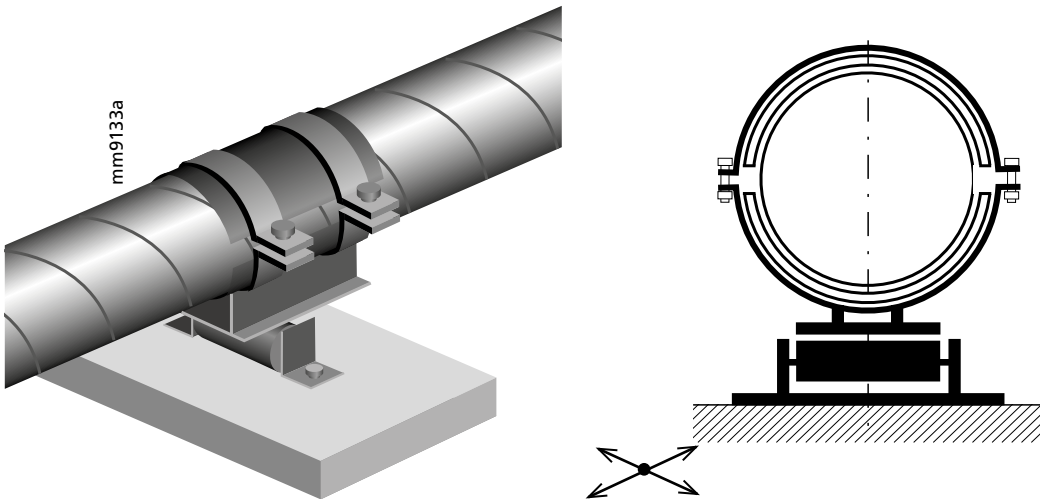
This type of installation is based on the conventional sliding installation, with the difference that the horizontal supporting plate is followed by profiled stripes or steel profiles, to ensure axial guidance. As regards profiled stripes, the web is secured not only in the cross horizontal direction but also in the vertical direction.



9. Installation of Fintherm® Standard Spiro Casing Overhead System

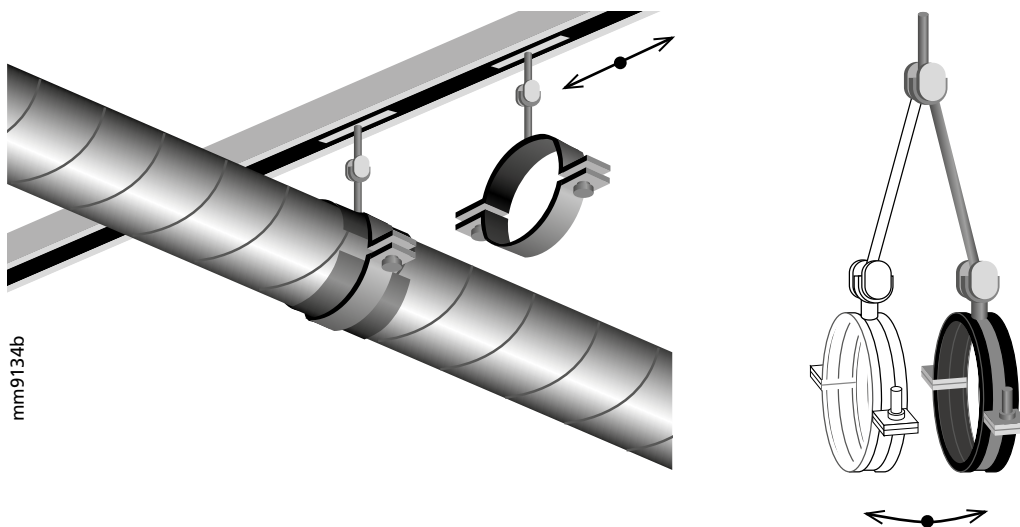
9.1.3.3. Roller Installation

This is essentially a sliding installation, where the axial movement is secured using rollers mounted on the supporting structure. The radial movement is a standard shift. The solutions include one or more rollers, depending on the pipe diameter. The design must take into account the large installation dimensions.



9.1.3.4. Swinging

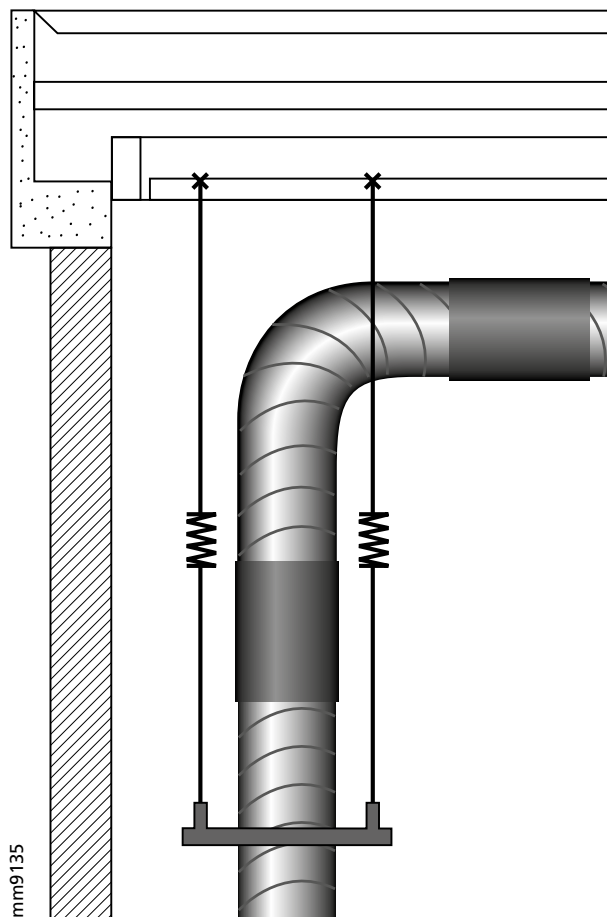
Similar to the sliding installation, the casing pipe is clamped in divided steel sleeves throughout the perimeter; these are suspended under the supporting structure, using a swinging suspension system. The axial movement of the pipe is made possible by a pair of joints forming part of the swinging suspension. If needed, this solution can also be completed with a sliding bar for transverse movement.



9. Installation of Fintherm® Standard Spiro Casing Overhead System

9.1.3.5. Spring Installation

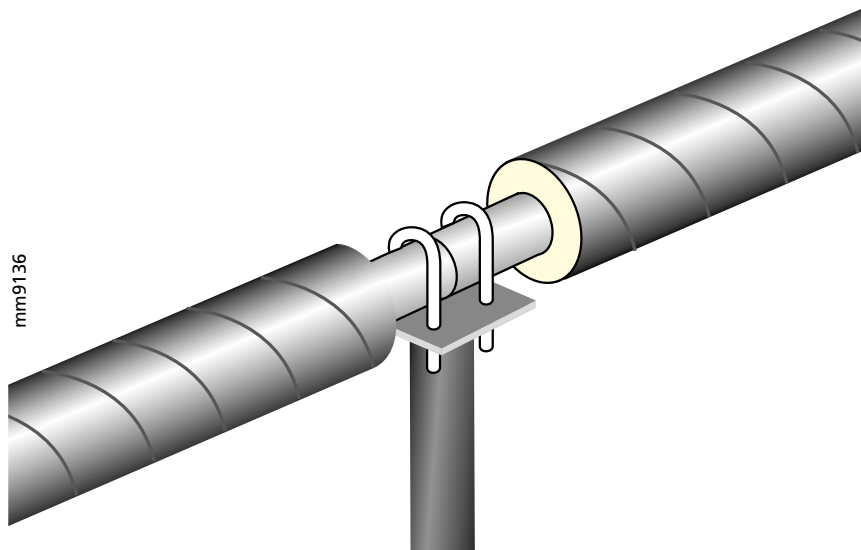
In these cases, the piping is suspended on spring hinges to enable the vertical axis movement. This type of installation is mostly used in vertical shafts or in buildings where pipeline is suspended vertically under the ceiling. Also, where overhead pipeline enters ground and continues underground, this method can be used to reduce the load of the bottom angle piece by the weight of the vertical load.



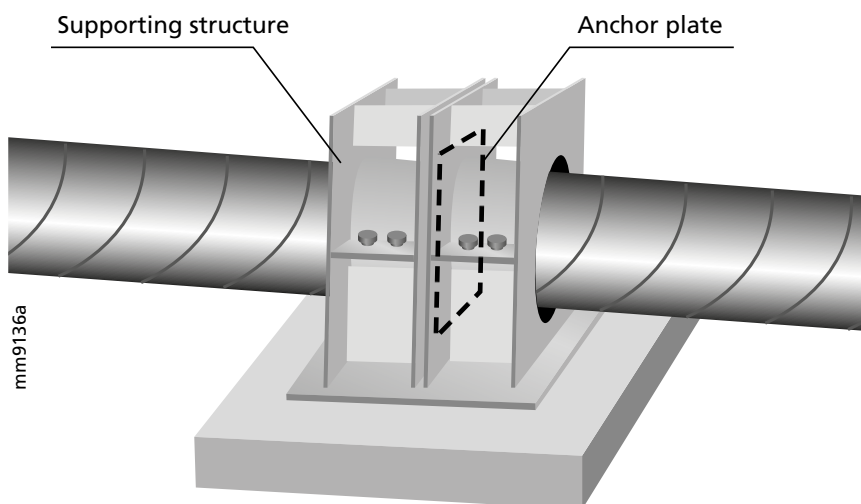
9. Installation of Fintherm® Standard Spiro Casing Overhead System

9.1.3.6. Anchors

One of the following two alternative solutions is mostly used for the dilatation using anchors. The first one, which is implemented directly within the site, consists of anchors in the form of steel brackets mounted in the joints. The brackets can be connected to the support structure directly or using a web. If steel brackets do not provide the required strength, it is necessary to use anchors with steel webs welded directly to the medium-carrying pipe.



The second alternative is the use of standard prefabricated anchors based on the same principle as anchors for underground pipelines. These anchors are attached to the support structure (clamped) behind the anchor plate.

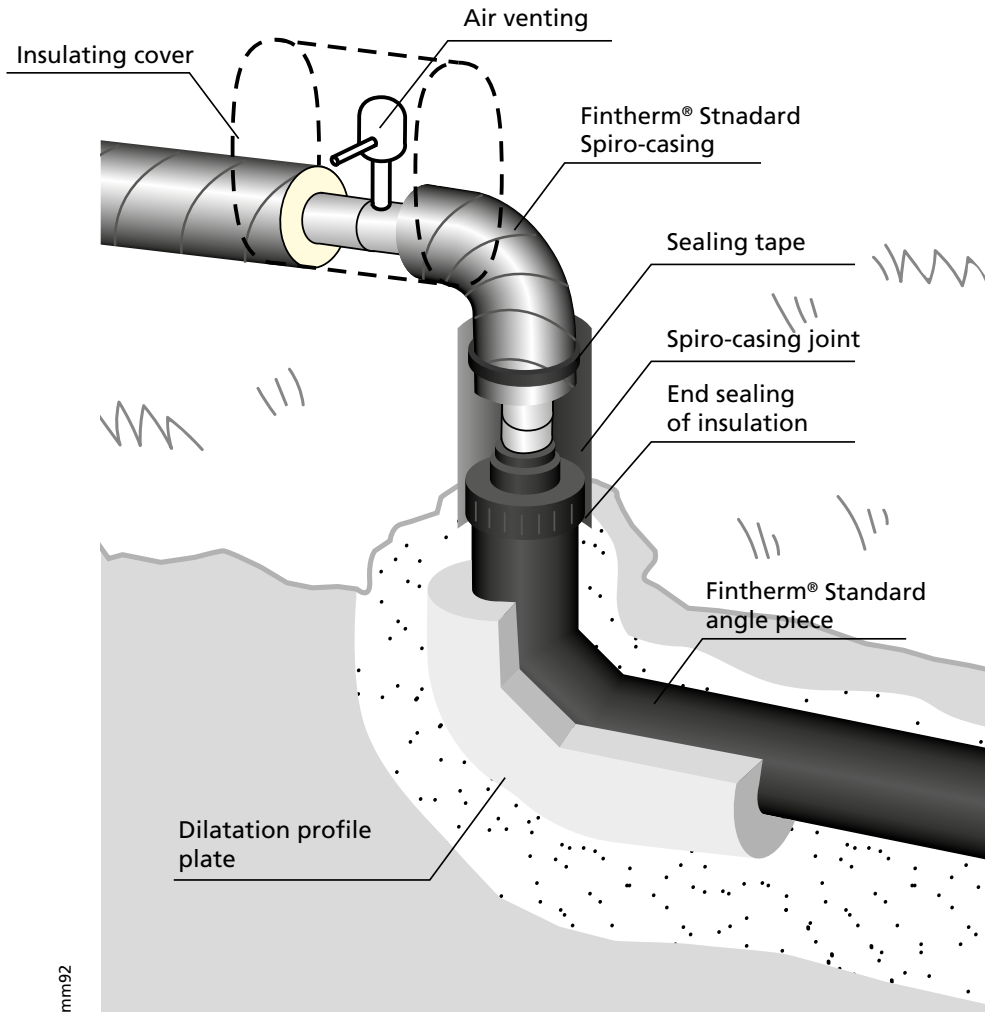


9. Installation of Fintherm® Standard Spiro Casing Overhead System

9.2 Valves (Air Venting and Draining)

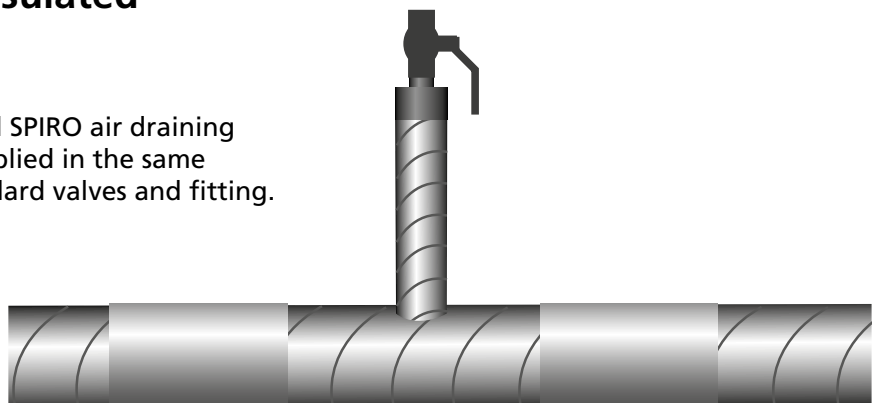
9.2.1. Air Venting/Draining in Joint

Air venting and drainage is usually done at the position of the pipe joints; after the installation, and additional installation is provided using mineral wool.



9.2.2. Standard pre-insulated air-venting/draining

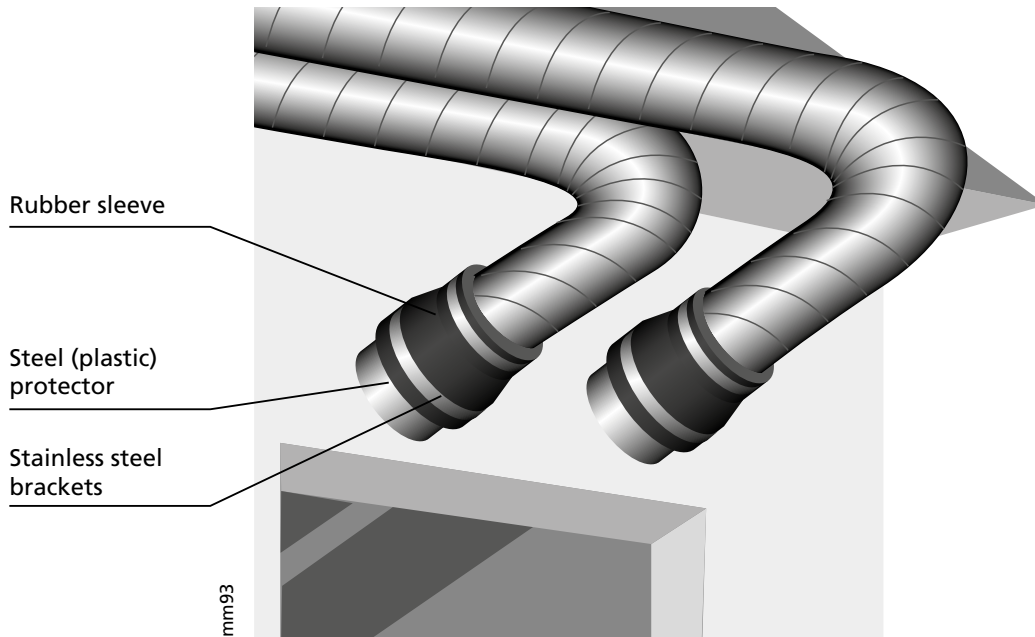
It is also possible to use standard SPIRO air draining and venting valves, that are supplied in the same dimensions as Wehotherm Standard valves and fitting.



9. Installation of Fintherm® Standard Spiro Casing Overhead System

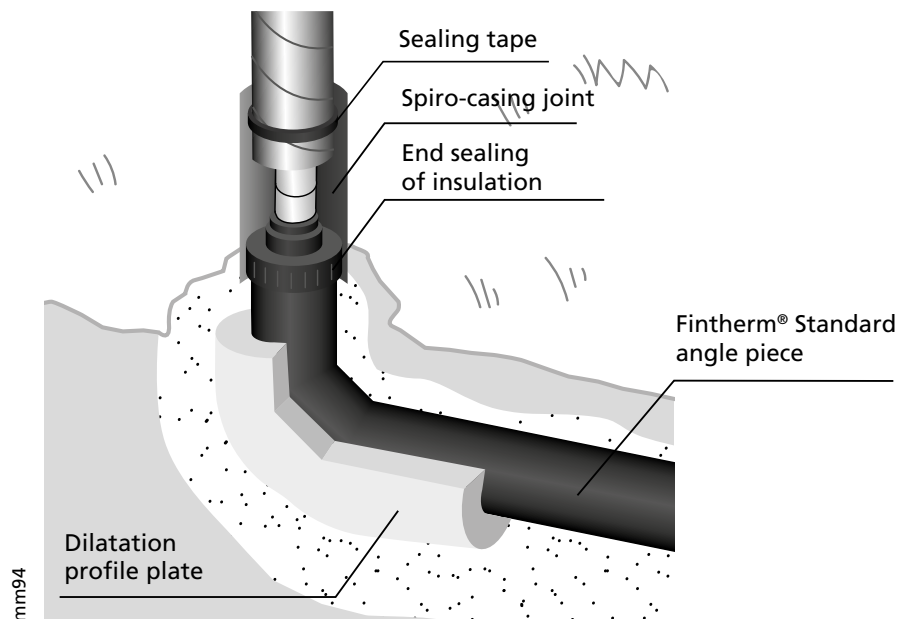
9.3 Points of Entry to Buildings

An ideal solution for the entry of the SPIRO pipeline through the perimeter building structure is to use plastic or steel sleeve protectors. The sealing between the protector and the SPIRO casing pipeline is provided by a rubber sleeve piece enabling both axial and radial movement, fitted using stainless steel brackets.



9.4 Connection Point Between Overhead and Underground Pipeline

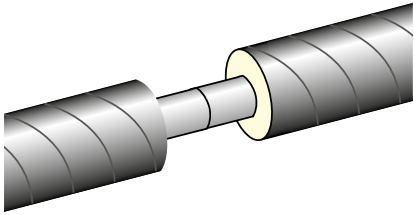
If such a connection needs to be made, the underground pipeline needs to be separated using the end insulation sealing (see section 7.4), which will separate the foam in the PE-HD casing and the foam in the SPIRO casing. The actual connection between the underground and overhead lines, above the ground, is made as an overhead (SPIRO) connection with an additional sealant (see section 9.5).



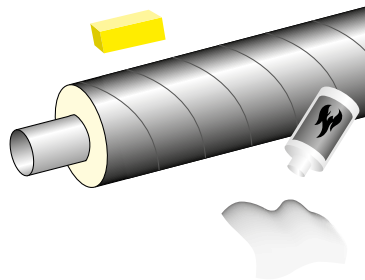
9. Installation of Fintherm® Standard Spiro Casing Overhead System

9.5 Assembly of Joints

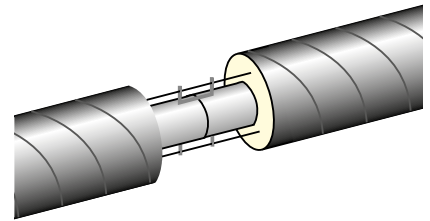
The installation of the Fintherm® Standard Spiro Casing pipeline system joints is in many ways similar to the installation of Wehotherm Standard double-sealed joints, i.e. the general instructions specified in section 6.1 apply. The difference lies primarily in the use of a different joint casing, requiring a special assembly procedure which is explained in more detail in the following steps:



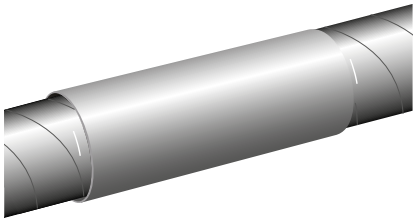
1) Weld the medium-carrying pipes according to the applicable regulations and relevant standards.



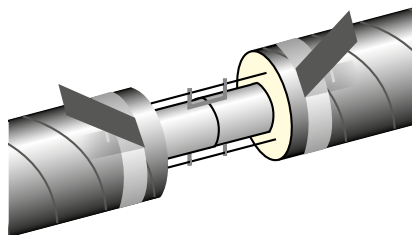
2) Clean mechanical impurities from the pipe ends and then thoroughly clean with alcohol up to a distance of 15-20 cm from both ends of the casing pipe.



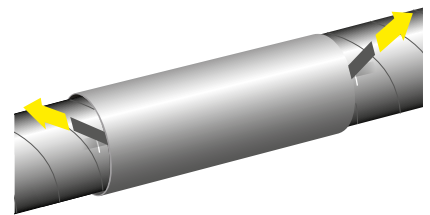
3) If detection wires are used (not included in the delivery of this system by default), connect them, see section 5.2.



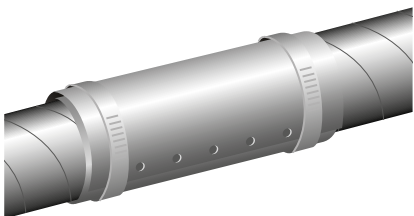
4) Use a marker to mark both end positions of the centred round plate (casing housing).



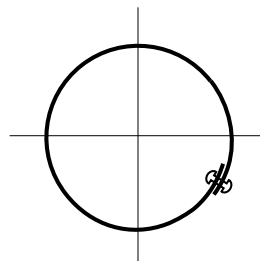
5) Wrap the pipe ends with a sealing tape in the area of their future contact with the casing, i.e. approx. 20 mm from the end position mark. Cover 50 mm of the tape at the end and then peel off and fold a piece of the protective foil so that it can be removed by pulling, after the casing is inserted.



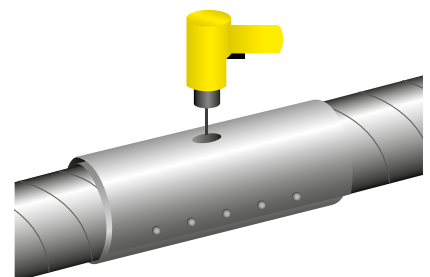
6) Insert the joint casing to the joint position, centre it using the marks and remove the protective foil of the sealing tape.



7) Tighten the cover sheet using tightening stripes so that it is pressed as much as possible to the pipe casing. The sheet must always overlap in the bottom half, ideally at the position of 4 or 8 o'clock. The tightening is sufficient if some of the packing material is pressed out from under the cover sheet.

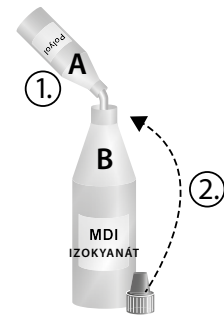
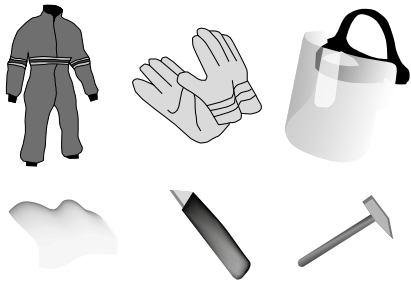


8) Drill the holes at a distance of 5 cms between each other at the overlap area and connect the two ends of the sheet using rivets. The overlap and the connection of the cover plate must be done in such a way that rainwater cannot flow into the joint area.



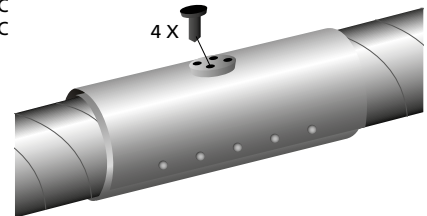
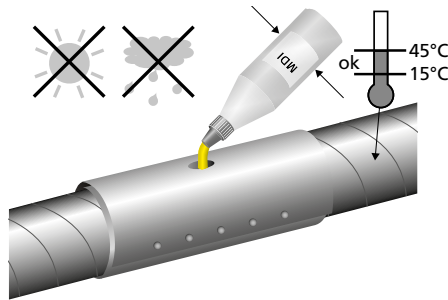
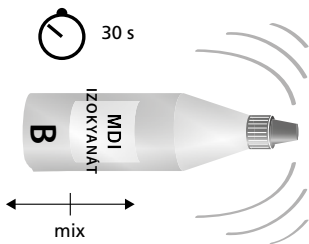
9) Remove the tightening stripes from the joint and drill a filling/air venting hole (with the diameter of 20 - 25 mm) in the middle of the upper surface of the joint cover plate.

9. Installation of Fintherm® Standard Spiro Casing Overhead System



10) Prepare all the necessary foam aids and components which must be tempered to 20-25°C. The table of bottled PUR foam doses is available in section 6.4.2

11) First, shake both components separately to mix any deposits. Then carefully pour component A (polyol) into component B (isocyanate MDI). Close the mixture with a lid with a pouring piece.



12) Shake thoroughly and quickly for 30 sec (max. 40 sec in colder months). Immediately after mixing, cut off the tip of the pouring piece.

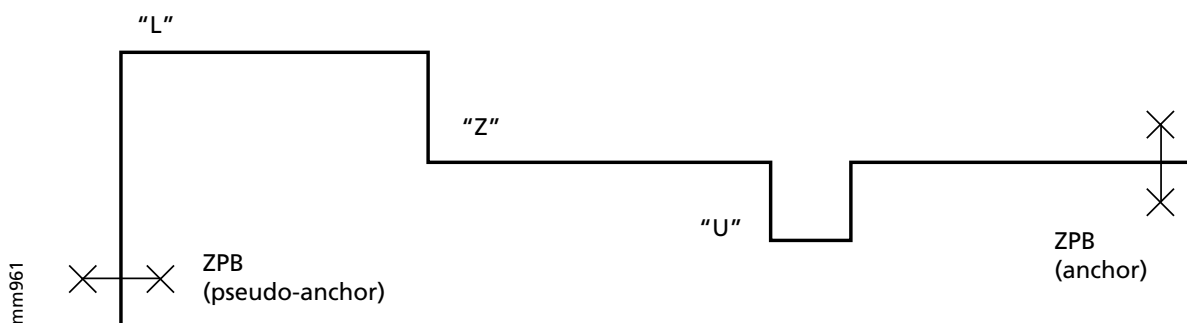
13) Pour the entire mixture immediately through the opening into the space of the joint.

14) Allow the foam to cure, remove any excess foam and seal the hole using a cover cap and rivets. The joint can be additionally sealed using a plumbing sealant, especially if done vertically.

9.6 Dilatation Compensation

9.6.1. Natural Compensation

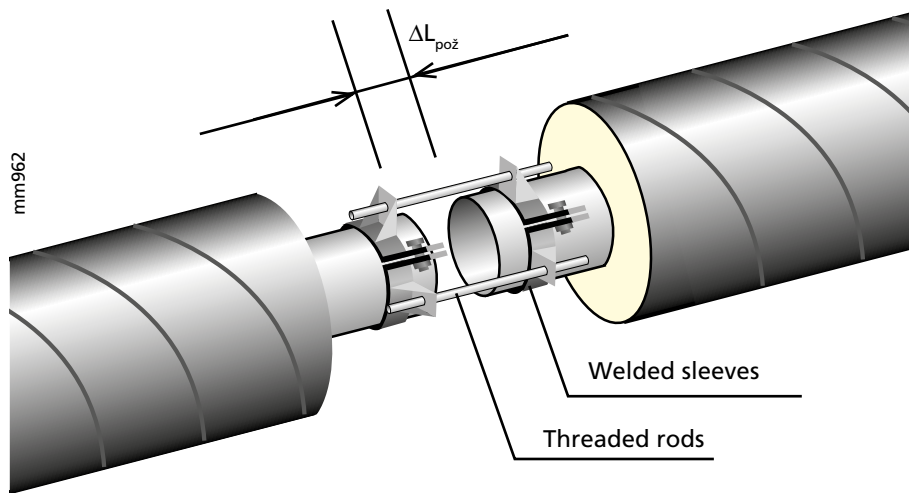
The installation of the WEHOTEK piping system is usually done as cold installation. Similarly to underground mounting, dilatation compensation is done using natural "L", "U" and "Z" pieces. Around these pieces, it is necessary to use a form of piping that will enable the pipeline to move in radial directions.



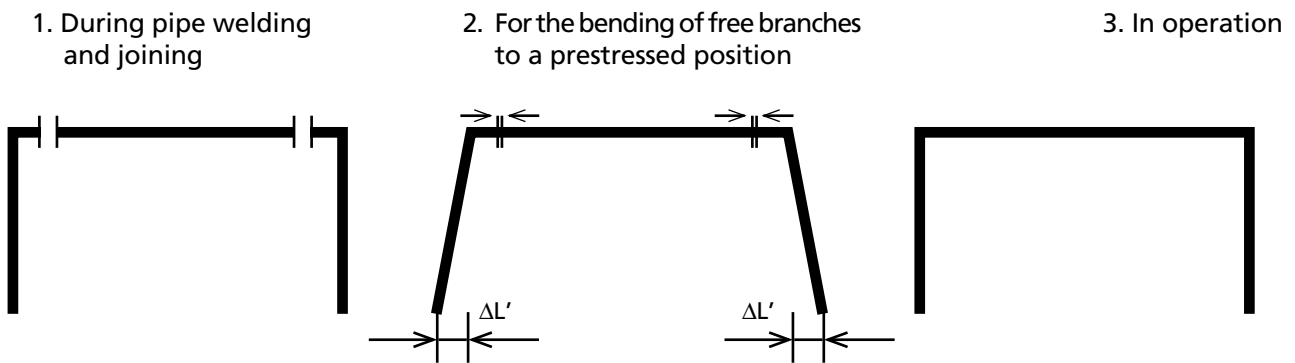
9. Installation of Fintherm® Standard Spiro Casing Overhead System

9.6.2. Pipeline Prestressing

If it is necessary to prestress any pipeline section, this is mostly done using the method of mechanical prestressing. This method is most commonly used for arcs that are part of "U" compensators. This consists in the attachment of sleeves to the ends of the medium-carrying pipeline at the points of the future joints, and their connection using threaded rods, for the subsequent tightening of the sleeves together for the desired prestressing. Depending on the pipeline dimension, 3 or 4 threaded rods are used, placed in the sleeves evenly along the pipe perimeter. The level of the prestressing (pre-bending) of the angle pieces by ΔL_{req} is always determined by the designer!



Pre-bent Arm



The pipeline must be welded and connected without angular displacements at joints, and then bent to the prestressed position. If the movement from the straight dilated section is too large, it is possible to use an anchor or split the route into more sections with "L", "U" and "Z" pieces.

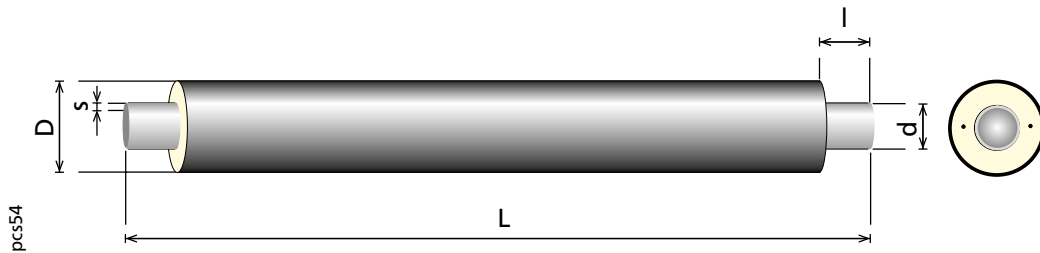
10. Basic Technical Data

10.1 Dimensions and Weight of Pre-Insulated Fintherm® Standard Pipe

10.2 Flammability of the pipe insulation according to DIN 4102 and ČSN 73 0862

10. Basic Technical Data

10.1 Dimensions and Weight of Pre-Insulated Fintherm® Standard Pipe



DN	d . s (mm)	Volume of water (l/m)	Insulation class 1		Insulation class 2		Insulation class 3	
			D (mm)	Weight with- out water (kg/m)	D (mm)	Weight with- out water (kg/m)	D (mm)	Weight with- out water (kg/m)
25	33,7 . 2,6	0,64	90	3,2	110	3,6	125	4,0
32	42,4 . 2,6	1,09	110	4,1	125	4,5	140	4,9
40	48,3 . 2,6	1,46	110	4,5	125	4,8	140	5,2
50	60,3 . 2,9	2,33	125	5,9	140	6,3	160	6,9
65	76,1 . 2,9	3,88	140	7,3	160	7,8	180	8,5
80	88,9 . 3,2	5,35	160	9,1	180	9,7	200	10,4
100	114,3 . 3,6	9,01	200	13,2	225	14,1	250	15,2
125	139,7 . 3,6	13,79	225	16,0	250	17,1	280	18,5
150	168,3 . 4,0	20,18	250	20,7	280	22,2	315	23,9
200	219,1 . 4,5	34,67	315	30,4	355	32,8	400	35,7
250	273,0 . 5,0	54,30	400	35,9	450	47,0	500	51,9
300	323,9 . 5,6	76,80	450	47,9	500	61,0	560	67,0
350	355,6 . 5,6	93,20	500	64,1	560	70,1	630	77,8
400	406,4 . 6,3	121,80	560	81,7	630	89,3	670	91,4
450	457,0 . 6,3	155,10	560	87,0	630	94,6	710	102,8
500	508,0 . 6,3	192,80	630	99,6	710	106,8	800	124,1
600	610,0 . 7,1	276,70	710	128,8	800	143,6	900	162,1

The above weight values apply for standard products and they are stated for 1 m of the pipe length.

10.2 Flammability of the pipe insulation according to DIN 4102 and ČSN 73 0862

Material	Flammability deg.
Polyethylene casing pipe PE -80 (DIN 4102)	B3 (easily flammable)
PUR foam - insulation (DIN 4102)	B2 (normally flammable)

11. Waste Generated during Installation

11. Waste Generated during Installation

The waste generated during the installation of pre-insulated pipes shall be disposed of in an environmentally friendly manner and in accordance with applicable laws, standards, regulations and legislation.

Effective construction planning and management enables the reduction in the amount of produced waste and eventually also environmental pollution. Specific methods of the disposal of waste and its quantity must be addressed already in the construction technical documentation and its complete disposal is the responsibility of the construction company.

According to the applicable legislation, all types of waste must be sorted already in the place of origin and stored separately according to the type of waste. The collection points and means must be labelled in accordance with the requirements of the applicable legislation.

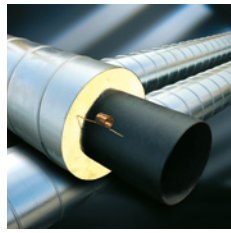
Waste commonly generated during construction:

- Waste consisting of building materials and their non-returnable packaging
- Excess excavated soil which cannot be returned to the trench
- Existing steel piping and rubble from the original distribution systems, where appropriate

An overview of common types of waste generated in the installation of pre-insulated piping systems according to Waste Catalogue issued in Decree No. 381/2001 Coll.

Waste description	Group according to the Waste	Description of the waste catalogue group according to No.100/2001 Coll. (Act on Environmental Impact)	Category
Steel pipe sections	17 04 05	Iron and steel	O
Cuttings and residues of pre-insul. pipe - PUR foam	15 01 06	Mixed packaging	O
LBottles, canisters or mixing vessels with the remains of polyol, or those where PUR foam is stirred joints	15 01 02	Plastics	O
Bottles or canisters with the remnants of isocyanate (which were not with polyol during joint assembly)	15 0110	Packaging containing residues of hazardous substances or packages polluted with these substances	N
Plastic joint packaging	15 01 02	Plastics	O

Meaning of abbreviations in the table below: "N" - hazardous waste, "O" - other waste



FINTHERM is the largest Czech producer and supplier of pre-insulated pipes and accessories. Pre-insulated pipes are mainly used for underground and overhead heat, cold, condensate, hot water and other media distribution systems.



Please find the current technical information on our website: www.fintherm.cz

Fintherm reserves the right to make changes without prior notice



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