

LOGSTOR Handling & Installation



Handling & Installation

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Introduction

This section contains a presentation of the Handling and Installation Manual and some of the most essential conditions for handling, adaption and installation of pre-insulated pipes under different installation situations and conditions.

Contents

The Manual

Storage and transport

Excavation, installation and backfilling of trench

Cutting and adaption of pipes

Winter measures

Manuals

The LOGSTOR manuals consist of:

- Product Catalogue
- Design Manual: Single and TwinPipe
- Handling and Installation Manual
- Surveillance Manual
- Weld Joint Manual

This manual

The Handling and Installation Manual is a tool, serving the following purposes:

- Enable the contractor to carry out trenches, anchors and the like, so pipes, joints etc. are correctly installed and the system protected against unintentional influences.
- Enable fitters to install pipes and other components so the system works unproblematic during its service time.
- Enable supervisors to make quality checks so the system which the customer buys is made in accordance with LOGSTOR's general guidelines.

Naturally, requirements from local authorities must be taken into account.

If nothing else is stated, the instructions of this manual are based on the conditions in the Product Catalogue, e.g. stress levels, installation methods, temperature ranges etc.

The manual describes general installation instructions. If the installation situation deviates from the conditions in the manual, please contact LOGSTOR's technicians.

Please note! The manuals are independent works. Consequently, the numbering of the manuals lacks coherence.

**Use of the
manual**

No part of the manual may be reproduced for external use without the express written permission of LOGSTOR.

The information/instructions are general. Application and implementation must take place with due respect to local conditions.

Additional/specific information can be achieved from our technicians.

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General Storage and transport

Delivery

Delivery takes place in accordance with the sales and delivery terms of the supplier.

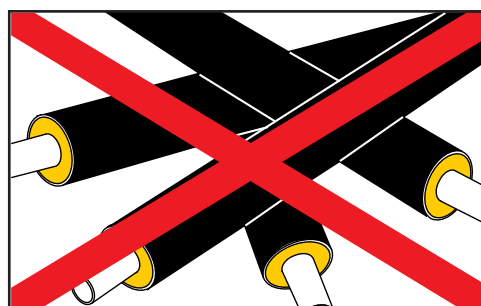
If the buyer arranges the collection, delivery has taken place when the products have been loaded in the factory area.

The driver receives instructions with requirements to truck body, straps etc.

Other methods of delivery may be arranged.

Storage

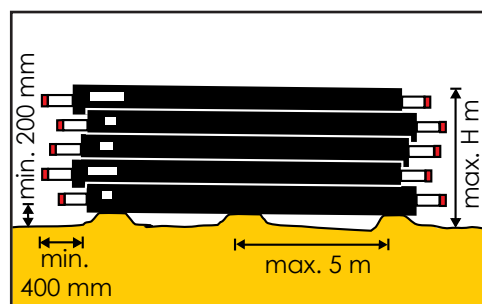
Stock pipes in such a way that they are not damaged.



Stack the pipes on a level surface of stoneless sand with cushions of sand with a min. width of 0.5 m as it appears from the illustration.

Instead of cushions of sand sleepers with a min. width of 100 mm and a max. distance of 2 m may be used.

Place the pipes so the labels are at the same end in order to facilitate the wire connection, when installing pipes.



For safety reasons as regards trench or local stock for, a project pipes are stacked according to EN13941-2 to a maximum height is in accordance with the shown table.

FlexPipes in coils ; $H_{\max} = 2 \text{ m}$

Max stacking height

Dimension	H (m)	
	Sand cushions	Sleepers
90-160	1.5	1.5
180-1400	2	1.5

General Storage and transport

Storage, continued

Store pallets with foam liquids indoors at 18-24°.

Likewise store shrink materials, sealing strip and parts for the surveillance system indoors or under cover.

All casing joints of plastic materials must be stored vertically, resting on one end in order to avoid ovalization.

Unloading

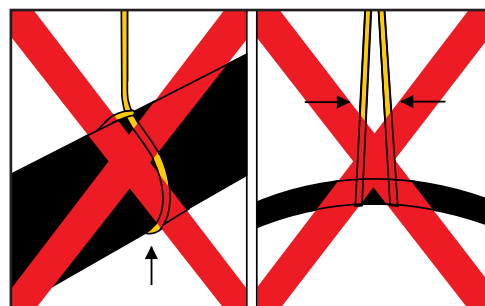
The consignee makes material and personnel available for unloading, unless otherwise arranged.

Do not throw or roll pipes and other components directly on to the ground.

Handling straight pipes

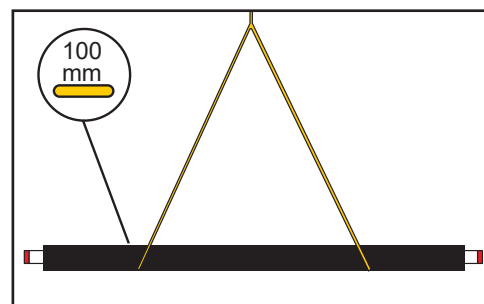
Avoid damage to the outer PE-casing and the PUR-foam insulation.

Do not lift the pipes at only one spot and take care when using double straps in wet weather. They may slide together and unbalance the lift.



Only use lifting straps with a width of min. 100 mm.

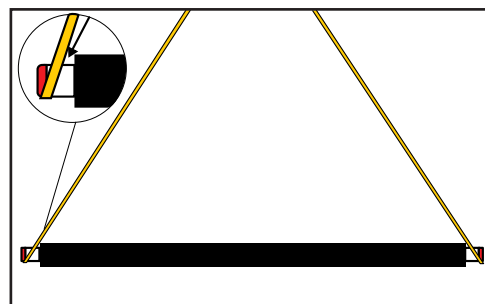
Max. pressure on the outer casing
< 300 kPa/ (0.3 N/mm²).



Only use chain or steel wire when lifting at the steel pipe ends.

Note! This handling may deform or damage the outer casing, if the strap is not long enough.

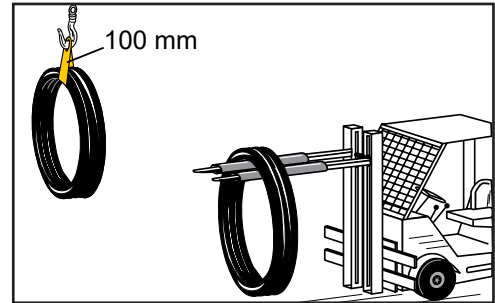
Take the necessary precautions to ensure the outer casing end is not damaged.



General Storage and transport

Handling FlexPipes Only use lifting straps with a width of min. 100 mm.

When using a truck protect the forks with casing pipe, rubber pads etc.



Excavation, installation and backfilling of trench

Basis

To obtain a good friction between soil and outer casing the trench should be made so there is minimum 100 mm stoneless friction material around the pipes to protect the casing against sharp stones and to establish a homogeneous friction between outer casing and the backfill material.

It must be ensured that pipes and components are not completely or partly flooded during storage and installation.

Cross section

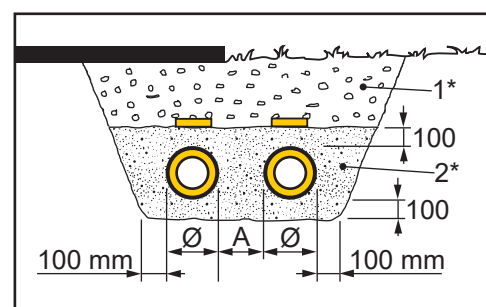
The cross section of the trench must as a rule be designed according to the requirements in EN13941-2 as well as local rules and regulations as regards safety and work environment.

To ensure sufficient friction material around the pipes the measurements in the illustrated cross section must be complied with.

Place 2 warning tapes or a warning net which covers the pipes minimum 100 mm over the pipes.

1*) Backfill material for the upper zone

2*) Backfill material (friction material)



LOGSTOR recommends the distance A between pipes according to the table.

Existing cables and pipes already in the ground and possible need for trench drainage should be taken into account.

In areas with poor soil quality, it may be necessary to replace a major quantity of the soil to avoid settlement/displacement.

Distance A

Outer casing	Distance A between casings
Ø mm	mm
90-225	150
250-560	250
630-1400	300

Excavation, installation and backfilling of trench

Friction material

The backfill material in the friction zone (zone 2) must comply with below requirements, and a sieve analysis must lie e.g. like the blue curve between the two red limit curves according to EN 13941-2:

Maximum grain size:

$$\leq 10 \text{ mm}$$

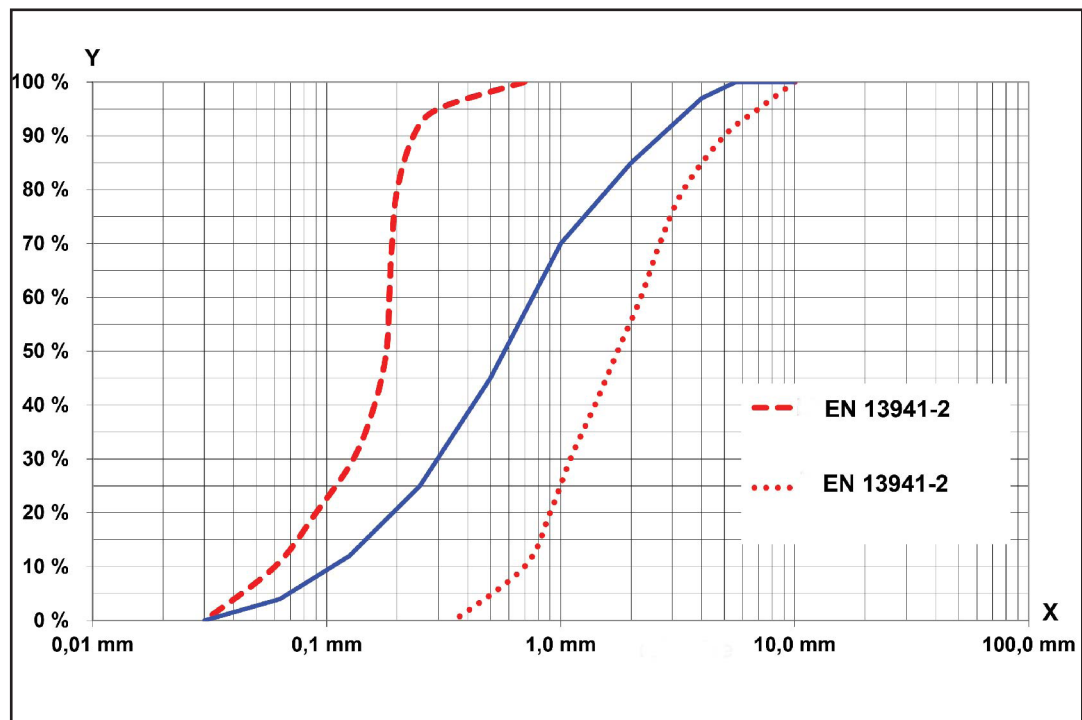
Coefficient of uniformity:

$$\frac{d_{60}}{d_{10}} \geq 1.8$$

The coefficient is found by means of a sieve test.

d_{60} is the grain size, where 60% fall through the sieve.

d_{10} is the grain size, where 10% fall through the sieve.



x-axis: Grain size in mm

y-axis: Amount passing in weight percent

The material should not contain harmful quantities of plant residues, humus, clay or silt lumps.

Especially, in connection with major pipes it is important to pay attention to the amount of fine-grained material in the backfill to prevent the risk of a tunnelling effect, when the pipes are cooled.

Excavation, installation and backfilling of trench

Compacting

Fill all around the pipes, and pay special attention that an even and well-compacted backfilling is obtained.

Compact the gravel between and at the sides of the outer casings.

The friction is based on a mean compaction of 97% standard proctor with no values less than 94% standard proctor.

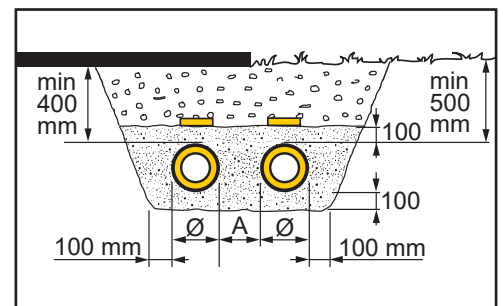
Please note that special requirements from e.g. road builders must be taken into account.

As regards expansion zones be aware of special requirements.

Minimum soil cover

It is recommended to have a minimum soil cover of 400 mm from the bottom of the road asphalt / concrete to the top of the outer casing.

From the top of unpaved areas to the top of the outer casing a minimum soil cover of 500 mm is recommended.

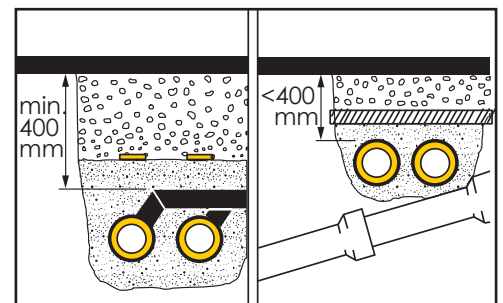


At branches the 400 mm are measured from the top of the branch pipe.

If the minimum soil cover cannot be achieved, the pipes must be protected against overload e.g. by means of a reinforced concrete plate or a steel plate

If the groundwater level is above the top of the pipe, it is necessary to check the global stability as regards the high axial stress level used.

For further information contact LOGSTOR.



Traffic load

If the minimum soil cover complies with the above recommendations, the pipes are safe for heavy traffic loads (100 kN wheel load) up to DN 600.

If the soil cover is minor, it is necessary to use e.g. a steel plate or a reinforced concrete plate.

Excavation, installation and backfilling of trench

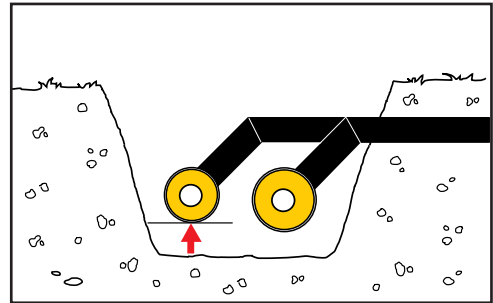
Trench profile Branching with different insulation thicknesses

If the insulation thickness of the flow pipe and the return pipe differs, this must be taken into account in connection with perpendicular branching, so the tops of the main pipes are level.

This can be achieved by:

- Adjusting the trench profile
- Stepwise filling
- Support with styrofoam chocks

In connection with parallel branches the adjustment is most often achieved by adjusting the parallel pipe run.



Installation in trench

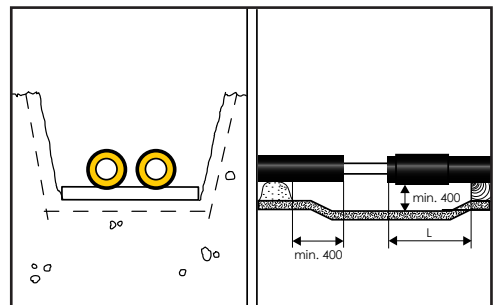
The pipes can be installed in the trench, supported by sand cushions or styrofoam chocks which are removed before the trench is filled with sand.

According to EN 13941-2 at joints there must be min. 400 mm from the casing to the bottom and 500 mm to the side in the trench to ensure sufficient space for the weld and installation work with casing joints.

Distance to the support in connection with preinstalled casing joints:

$$L = L_{\text{casing joint}} + 300 \text{ mm.}$$

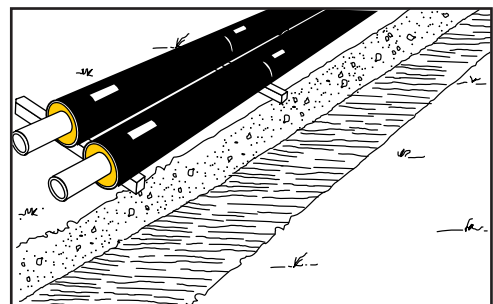
There may be national and local regulations, defining other minimum measurements.



Connection above trench

A simple and quick installation is achieved by connecting several pipes alongside the trench.

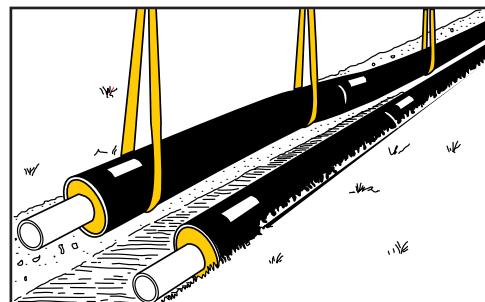
Support the pipes by sleepers, made from square timber e.g. 100 x 100 mm, with suitable distance between them.



Excavation, installation and backfilling of trench

Lowering into trench

When a pipe length has been welded together, the pressure test has been carried out and the joints installed and insulated, lower the section into the trench with wide straps by means of cranes. The number of straps and cranes depends on the length and dimension of the pipe section, see below table.



Max. distance between straps and min. width for series 1, 2, and 3.

Strap distance and width

Steel pipe	Max. distance between straps	Min. width of straps	
		Single pipe	TwinPipe
ø out. mm	m	mm	mm
26.9	6	100	100
33.7	6	100	100
42.4	6	100	100
48.3	8	100	100
60.3	8	100	100
76.1	8	100	100
88.9	12	100	150
114.3	12	100	150
139.7	16	100	200
168.3	16	100	200
219.1	18	150	300
273.0	18	150	
323.9	18	150	
355.6	18	200	
406.4	18	200	
508.0	25	300	
610.0	25	300	
700.0	25	300	
800.0	25	350	
900.0	25	350	

Make sure that the pipes are not curved more than the minimum radius $500 \times d$ for single pipes and $1200 \times d$ for TwinPipes.

Excavation, installation and backfilling of trench

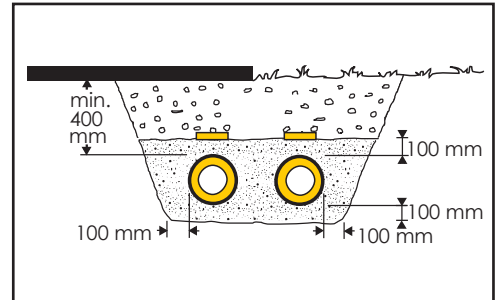
Backfilling

Fill the bottom of the trench with friction sand in accordance with the above. Level and compact the sand.

Remove all sleepers after installation of the pipes and cover in layers of max. 300 mm. Compact each layer separately. Place warning tape/net min. 100 mm over the pipes.

Make a final backfilling and compaction with an optional stonefree material.

The sand surrounding the pipes is important - not just to protect the pipes, but also to ensure the friction between the outer casings and the sand which restrains the expansion of the pipes as provided in the installation rules.



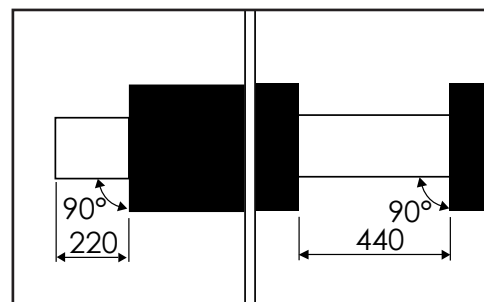
Cutting and adaption of pipes

Cutting and adaption of pipes

When pipes are cut or adapted it is necessary to remove part of the outer casing and the PUR-foam insulation for a certain length from the steel pipe.

It is essential that the bare steel pipe end is thoroughly cleaned and free from foam remnants.

Also see the valid installation instructions for the casing joint in question.



Cutting the outer casing

Cut the outer casing around the entire circumference with a saw - never an angle grinder, except for the cases, mentioned in the following.

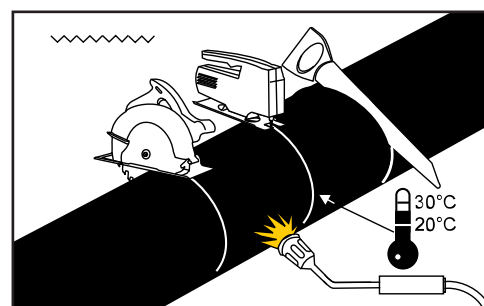
Mind the alarm wires.

Hand saw and electric jig saw are preferable. Use electrical circular saw with caution.

In cold periods/areas at temperatures below +10°C preheat the PE-outer casing, before cutting, with a soft gas flame to 20-30°C (lukewarm).

Notice that the heat relatively slowly penetrates the plastic material; but do not superheat, especially not on locations where plastic weldings are later carried out.

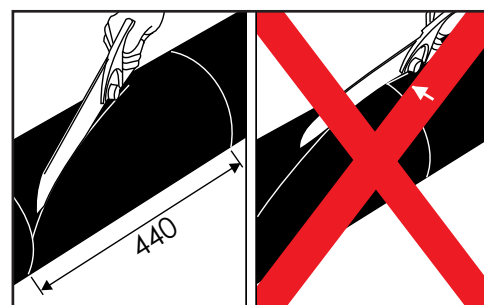
Use a tent and a heating gun, if large wall thicknesses and diameters are to be preheated. Also see Winter measures.



Removal of outer casing

Remove the outer casing by making a diagonal cut.

Do not damage the remaining outer casing, because it can cause a notch effect which might start cracks at casing pipe ends.



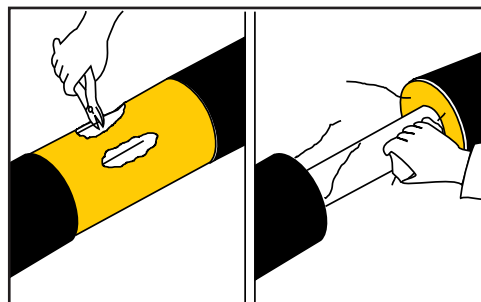
Cutting and adaption of pipes

Removing foam from possible alarm wires

When cutting and adapting pipes with integral copper wires for the surveillance system avoid to stress these wires during the removal of the foam insulation.

Remove the foam around the wires and cut them.

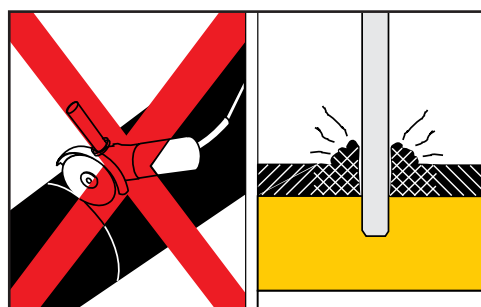
Then carefully pull the loosened foam insulation from the wire ends.



Using an angle grinder

An angle grinder should not be used for anything else than for the cutting of straight preinsulated pipes which are later prepared with bare steel pipe ends for jointing.

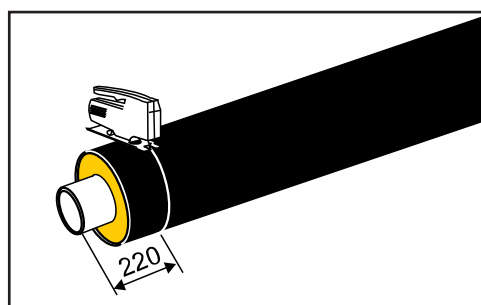
An angle grinder in use creates high temperatures in the cut and burns through the polyethylene material, creating beads and making the cutting area brittle, thus creating ground for notches and crack propagation



Cutting straight pipes

Make two circumferential cuts with the jig saw as described under "Cutting the outer casing" and remove the outer casing and foam insulation.

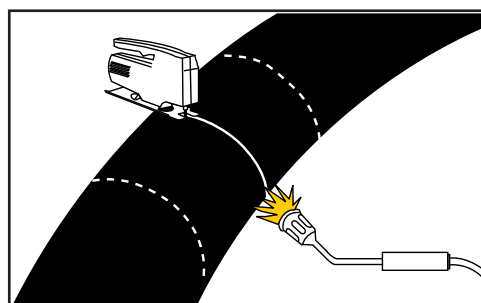
Cut the steel pipe and prepare the pipe ends for welding.



Cutting curved pipes

When cutting curved pipes start with a relieving circular cut in the middle of the cut in order to relieve the outer casing.

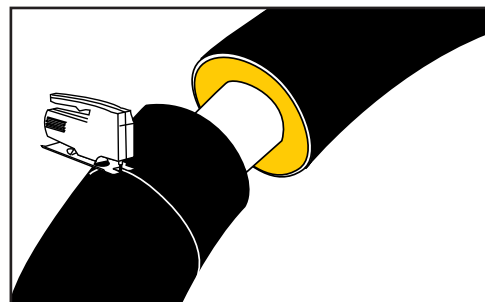
In cold periods/areas preheat the outer casing as previously described.



Cutting and adaption of pipes

Cutting curved pipes, continued

Then make two normal circular cuts and follow the same rules as for straight pipes.

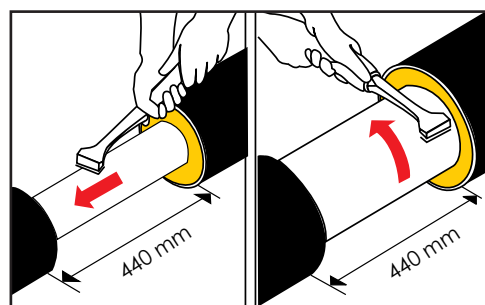


Removing foam

Carefully remove any foam remnants as well as the hard PUR film from the steel pipe surface. Use a scraper.

Scrape steel dimensions $\leq \varnothing 139.7$ mm longitudinally and dimensions $> \varnothing 139.7$ mm transversely.

Clean the entire circumference of the pipe and remove possible labels from the outer casing where the joints are to be installed.



Welding

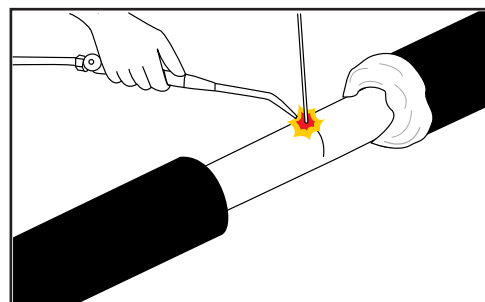
The welder must ensure that the necessary precautions have been taken, to ensure correct working conditions for the current welding.

If hardened PUR-foam is heated to temperatures $> 150^{\circ}\text{C}$, isocyanate vapour will be released.

It is therefore of great importance that the pipes are cleaned thoroughly as described above.

Also remove any foam remnants below the immediate welding area so they are not heated or burning. If the cleaning and welding is carried out correctly the isocyanate release will be much lower than the allowable hygienic marginal value.

If the pipes are welded under unfavourable conditions, e.g. short distance between weld and pipe insulation, protect the foam surface with moist cloths etc.



Cutting and adaption of pipes

Cleanup

Before backfilling it must be ensured that all waste such as foam remnants, plastic waste, packaging, granulate from grinding casings etc. has been collected and handled according to local regulations.

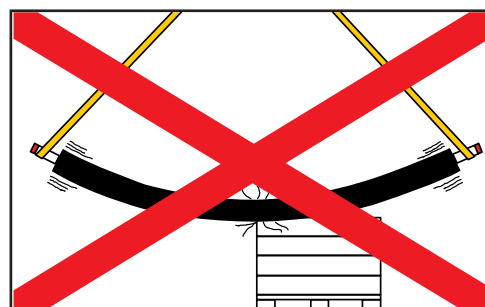
General

Winter measures

Winter measures	<p>At outer casing temperatures lower than +10° C the measures, described below should be regarded, when</p> <ul style="list-style-type: none"> - handling - cutting and adapting - removing insulation from · bending <p>preinsulated pipes must be focused upon in addition to the other statements in the manual.</p> <p>The reason:</p> <p>All plastic materials become more rigid/sensitive towards wrong treatment at low temperatures. During the foaming process inner stresses have been induced to the outer casing which are affected by handling and working.</p> <p>Note! When working with pipes in cold periods/areas follow the given instructions, even though the sun is shining. A frozen pipe is not heated to summer conditions, just because the temperature suddenly rises.</p> <p>The preheating rules at outdoor temperatures below +10°C apply to foaming and application of mastic etc.</p> <p>Also see general preparation rules under "Preparations for joint installation".</p>
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Absolute minimum temperature	<p>According to EN 13941-2 it is not permitted to work with preinsulated pipes and components at outdoor temperatures below -15°C.</p>
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Handling	<p>Do not expose the outer casing to extreme influences - e.g. impacts, shocks, large deflections and strong compressive forces - when handling it in cold periods/areas.</p>
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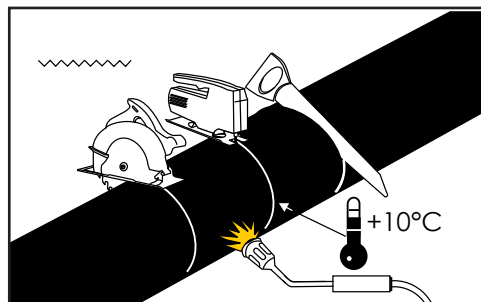
General Winter measures

Cutting and adaptation

Prior to cutting preheat the outer casing with a soft gas flame to frostfree condition.

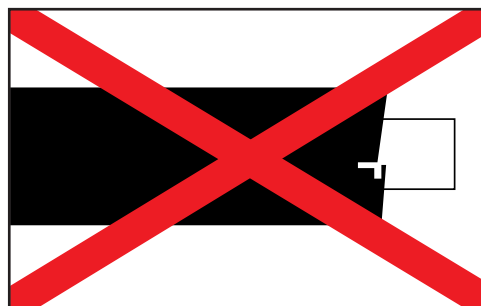
Notice that the heat relatively slowly penetrates the plastic material, on the other hand do not superheat, especially not on locations where plastic weldings are later carried out.

Use a tent and a heating gun, if large wall thicknesses and diameters are to be preheated.



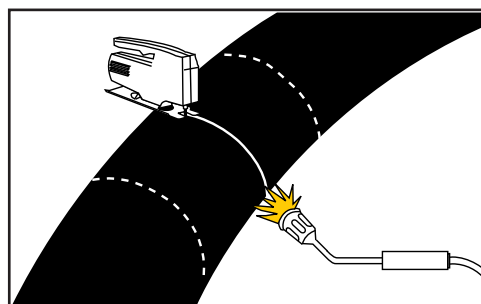
Especially at low temperatures sharp notches e.g. when making a diagonal cut must be avoided.

Always neutralize possible notches before installing a joint.

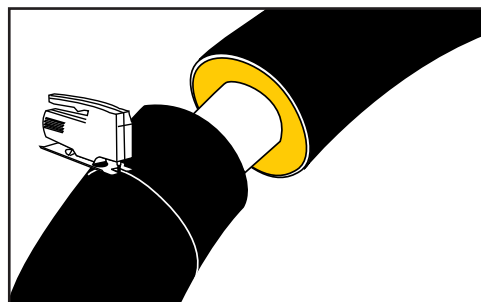


Cutting curved pipes

The same rules as those for straight pipes apply, but here it is important to start with a circular cut in the middle of the cut in order to relieve the outer casing.



Then make the two normal circular cuts.

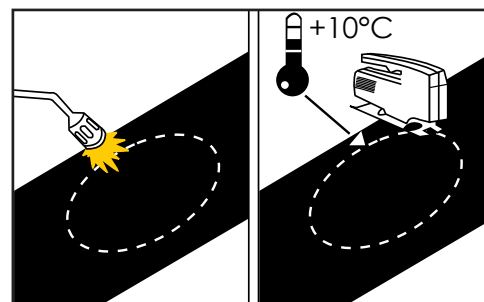


General Winter measures

Cutting for saddle-T-joint

Before cutting, preheat the outer casing with a soft gas flame to lukewarm like with straight and curved pipes.

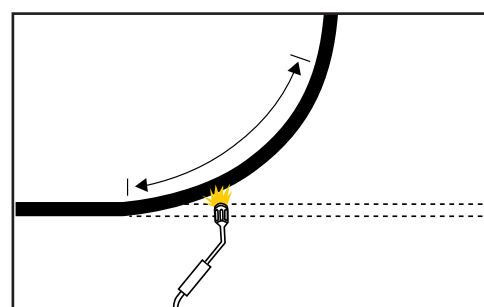
Then follow the other directions in the manual.



Bending FlexPipes and FlextraPipes

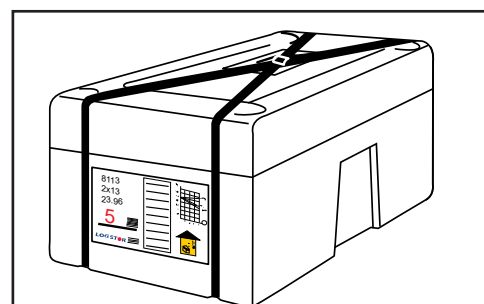
At temperatures below 10°C the outer casings should be preheated to lukewarm.

Bend the pipe slowly and smoothly, not jerkily.



Storage and use of foam packs

See "Insulating Joints" later in this manual.



The Bonded Single Pipe Expansion and Anchoring - Overview

Introduction	This section contains instructions and conditions for installing expansion and anchor elements.
Contents	E-Comps Sand pads Foam pads Anchors

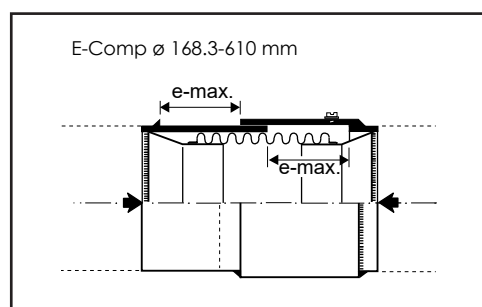
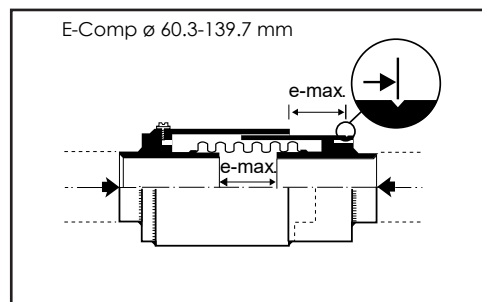
The Bonded Single Pipe Expansion and Anchoring - E-Comp

Application	The E-Comp is a compensator which operates only once and is used, where temperature variations are absorbed as stresses in the steel pipe instead of being converted into expansion movements.
Requirements to the joint area.	Requirements to the joint area, see excavation and installation. Also see Preparations for joint installation.
Tools	The compression tool is used to install E-Comps <div data-bbox="1019 680 1506 981" data-label="Image"> </div>
Determining the e-measurement for the standard E-system	The E-Comp is a component which is preset to absorb once and for all a movement corresponding to the expansion of a certain pipe length the first time hot water runs through the pipes.
e-measurement	<p>The e-measurement is so to speak the gap, required for the E-Comp to be able to absorb the coming expansion.</p> <p>Before presetting the E-Comp make sure that the actual installation temperature T_{ins} and the actual prestressing temperature T_{pr} on installation comply with the system drawing and the actual soil cover corresponds to the conditions, stated in the system drawings.</p> <div data-bbox="1019 1344 1506 1644" data-label="Image"> </div>

The Bonded Single Pipe Expansion and Anchoring - E-Comp

If the actual parameters differ from those in the system drawing, the LOGSTOR Design Team shall check the e-measurements.

The actual measurements can also be calculated after the instructions in the Design Manual.

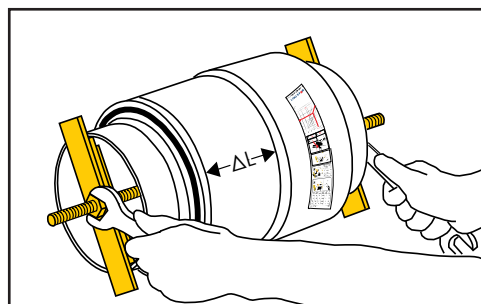


Adjusting the E-Comp

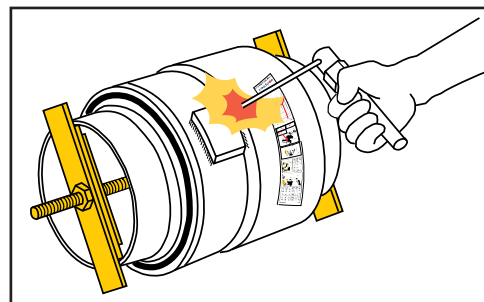
Adjust the E-Comp by means of the compression tool.

Mark the e-measurement from the stop marking and compress the E-Comp.

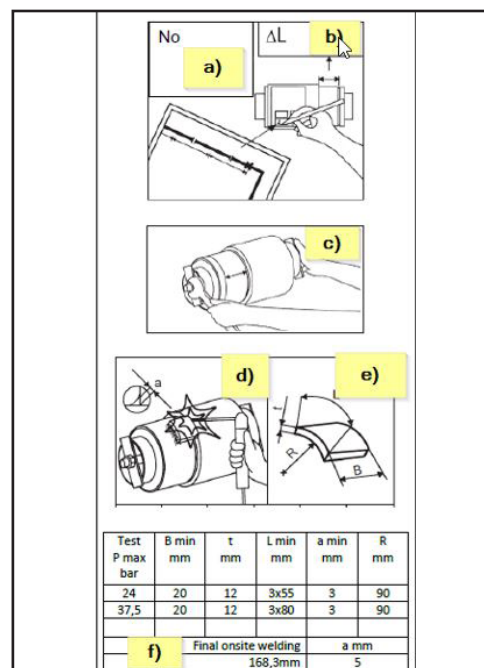
The distance between the two pipe ends in the E-Comp will then be exactly the same.



Due to the later removal of the tacks fixing bars are recommended, as possible burrs from the welding may otherwise hamper the compression.



- a. Reference to system drawing
- b. e-measurement
- c. Presetting
- d. Fixing by means of tack welding
- e. Fixing by means of fixing bars and tack weldings
- f. Final g-measurement on site



The Bonded Single Pipe Expansion and Anchoring - E-Comp

Welding-in the E-Comp

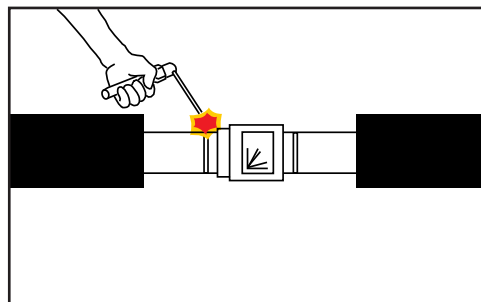
Weld the E-Comp into the pipeline as an ordinary piece of pipe on the side of the trench, on sleepers or at the bottom of the trench.

The E-Comp must not be exposed to bending strain during handling.

Always weld the E-Comp in between two pipe lengths without change of direction.

All welds must comply with the same welding requirements as the rest of the pipe system.

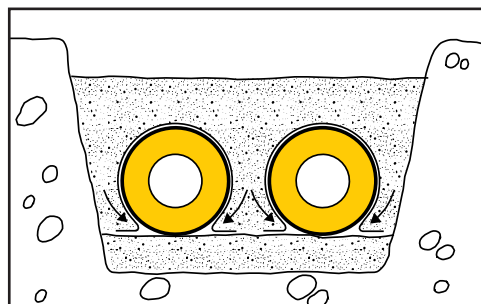
A temporary casing joint must be established over the E-Comp to protect against corrosion, until the final casing joint is installed.



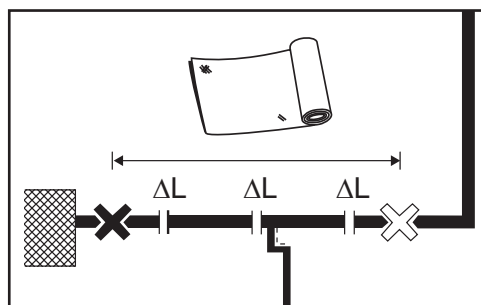
Plastic film

If the design requires the use of polyethylene film, it is installed as stated in the system drawing.

Press it well under the outer casing from both sides immediately before they are covered by sand.

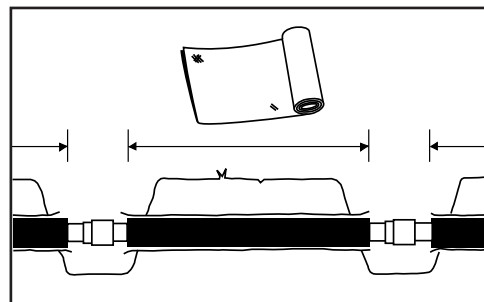


In the sections where the system drawing indicates use of plastic foil, a reduced friction during installation and the best possible optimization of the system design are ensured. Also see LOGSTOR Design Manual.



The Bonded Single Pipe Expansion and Anchoring - E-Comp

Plastic film,
continued



Film width

The width of the film which is rolled out along the pipes varies dependent on the outer casing dimension.

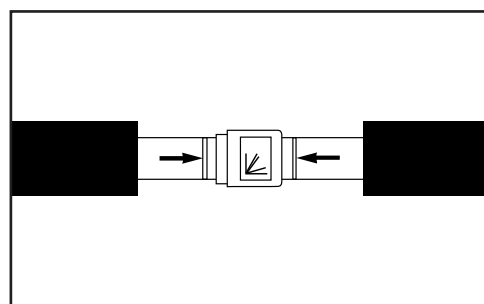
Outer casing ø out. mm	Width mm	Length m
110-160	500	100
200-315	1000	100
355-450	1500	100
500-630	2000	100
710	2500	50
≥800	3000	50

Preparations for final welding

Remove the tack welds and any fixing bars on the E-Comps with an angle grinder.

All welding burrs must be removed to ensure correct compression of the E-Comp when the pipes are heated.

Please note! If there is a E-Comp on the flow- as well as the return pipeline, the presetting is the same i.e. a sufficiently high circulation must be established to ensure the same temperature in the entire system

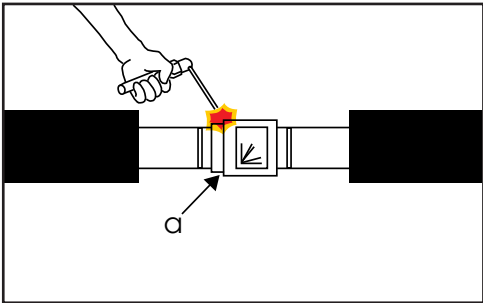


The Bonded Single Pipe Expansion and Anchoring - E-Comp

**Preparations for
final welding,
continued**

Now fully weld the compressed E-Comp by means of gas or arc welding with below a-measurement, which must also appear from the label on the E-Comp.

When the E-Comp is fully welded, all future temperature variations in the system will be converted into tensile or compressive stresses in the pipes and E-Comps.



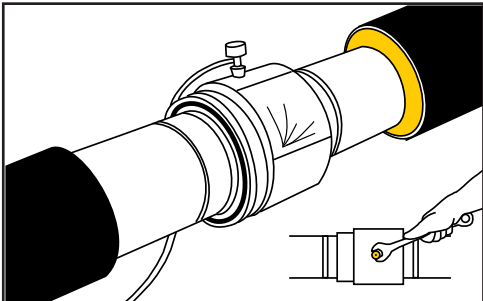
E-Comp - a-measurement

Steel pipe ø out. mm	a-measurement mm
60.3	2.6
76.1	2.5
88.9	3.3
114.3	3.5
139.7	4.0
168.3	5.0
219.1	6.0
273.0	7.0
323.9	9.0
355.6	9.2
406.4	11.0
457.0	11.0
508.0	11.0
610.0	11.0

Pressure testing

Remove the iron plug from the E-Comp.
Carry out the leakage test.

Screw in the iron plug again and seal it
with a weld.

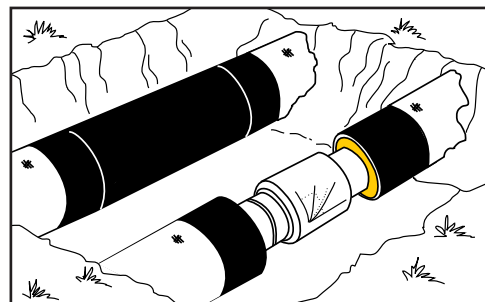


The Bonded Single Pipe Expansion and Anchoring - E-Comp

Insulation

Insulate the joint as usual.

In general use longer casing joints,
when insulating E-Comp joints.



The Bonded Single Pipe Expansion and Anchoring - Sand pad

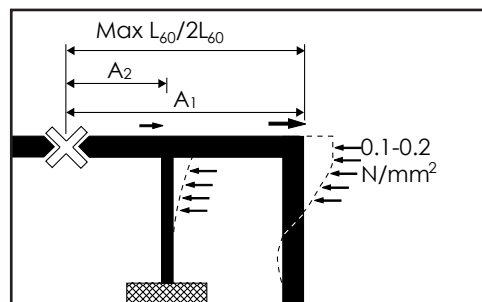
Application

In a bonded pipe system there are movements between the sand and the outer casing.

The movement can be absorbed in a sand pad at bends and branches.

Sand pads are used, when it appears from the project drawing.

Please note! When using sand pads, the PUR compressive stress will often exceed the limit value, established in EN13941-1. If sand pads are used, an assessment/ calculation of the load on the PUR foam must therefore be made in each case.



Sand pads

To reduce the influences on the pipe the sand pad placed between pipe and trench side must have an adequate thickness, i.e. a normal trench width (K) is extended in the expansion zone to additional trench width (K+).

The measurements in the subsequent tables are nominal widths without taking possible inclined walls into consideration.

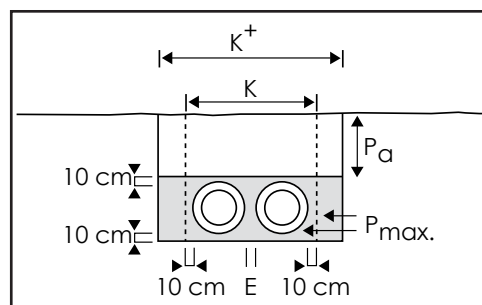
The sand pad relieves the pressure, because the pipes are strong enough to make the necessary space in the sand pad.

The compression of the sand layer (P) around the pipes in the sand pads must not exceed the following values:

- Standard proctor max. 98 at heterogeneity figure < 4
- Standard proctor max. 94 at heterogeneity figure < 8
- Heterogeneity figure = grain size at an amount passing of 60% : grain size at an amount passing of 10%
- The material must be clay-free sand with grain size 0-8 mm (max. 15% 8-20 mm can be allowed).

Above this zone compression must be as required (P_a).

The thickness of the sand pad depends on the installation method which appears from the project drawing.

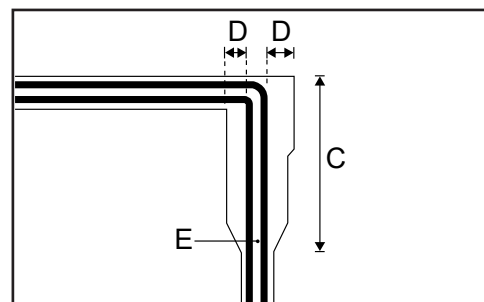


The Bonded Single Pipe Expansion and Anchoring - Sand pad

Sand pads, continued

The thickness and length of the sand pad appear in the table.

Special measures must be taken in connection with major dimensions and large installation depths.



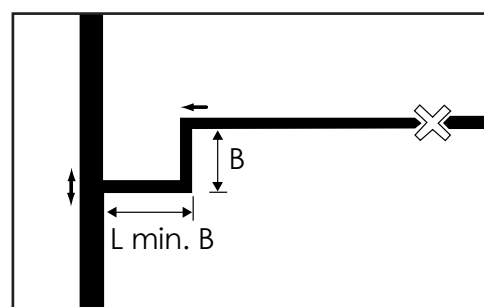
Sand pads - Installation method I

Thickness of sand layer			Length
Service pipe dimension ø out. mm	Outer casing/wall D mm	Between outer casings E mm	Expansion zone C mm
26.9	100	150	0.8
33.7	100	150	0.8
42.4	100	150	1.0
48.3	100	150	1.0
60.3	150	150	1.2
76.1	150	150	1.3
88.9	200	150	1.5
114.3	200	150	1.8
139.7	250	150	2.0
168.3	250	150	2.2
219.1	300	150	2.7
273.0	400	200	3.1
323.9	450	250	3.5
355.6	500	250	3.6
406.4	500	250	4.3
457.0	550	300	4.7
508.0	600	300	5.0
610.0	800	400	6.0

Branches

The thickness and length of the sand pad "L" is carried out according to the dimension of the main pipe.

The thickness and length of the sand pad "B" is carried out according to the dimension of the branch pipe.

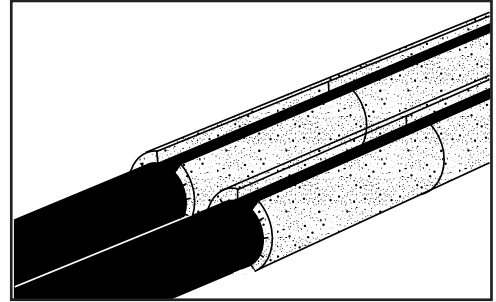


The Bonded Single Pipe Expansion and Anchoring - Foam pad

Application

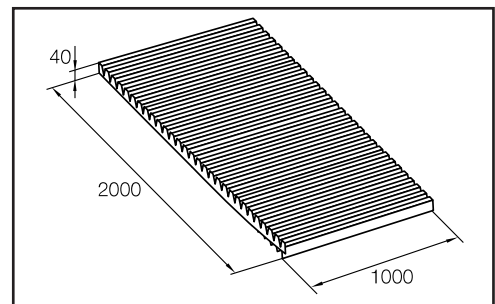
Foam pads can be used to absorb expansion movements when the first movement does not exceed the following intervals:

- $5 < \Delta L \leq 28$ mm (1 layer = 40 mm)
- $28 < \Delta L \leq 56$ mm (2 layers = 80 mm)
- $56 < \Delta L \leq 84$ mm (3 layers = 120 mm)



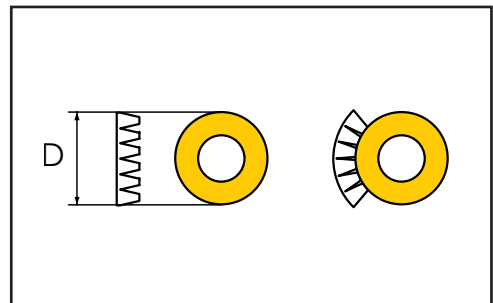
Square measure of foam pads

The foam pads are available in one size which is adjusted to the actual casing diameter.



Actual foam pad measurement

The casing diameter determines the height of the foam pad, which again determines the number of foam pads.



The Bonded Single Pipe Expansion and Anchoring - Foam pad

Installing foam pads

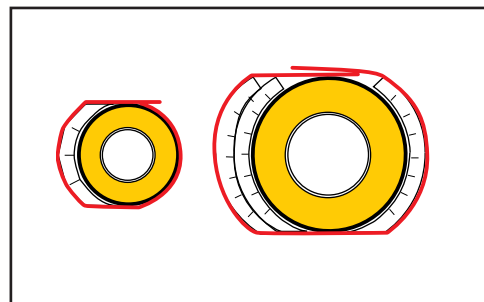
Install the pads on one or both sides of the outer casing in accordance with the project drawing.

Fix the pads with filament tape, min 3 pcs. per m foam pad.

To prevent sand from entering between the foam pads and the outer casing, the foam pads can be wrapped in e.g. geotextile or cross-linked foam foil laminate, which is secured by means of filament tape.

For major dimensions and several layers it is recommended to wrap the pads in geotextile or cross-linked foam foil laminate.

In systems with many large temperature cycles (e.g. solar panel plants) a geotextile or cross-linked foam foil laminate must always be used, ensuring that no backfill material comes between the pads and the outer casing.



The trench

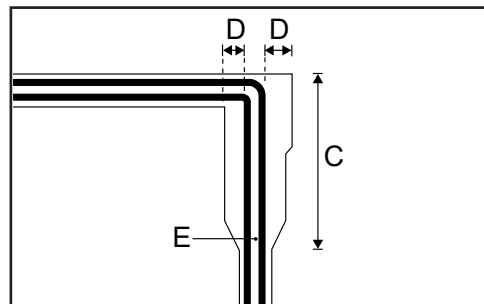
When using foam pads the trench dimension must be increased in order to be able to absorb the movement from the pipes.

$C = 1, 2 \text{ or } 3 \text{ m}$

$D = \text{Total pad thickness: } 40, 80 \text{ or } 120 \text{ mm} + 200 \text{ mm}$

$E = 150/250/300 \text{ mm}$ according to Trench excavation

When the same number of foam pads are installed on the inside and outside of the pipes, the distance between the pipes must be increased with the total thickness of the foam pads between the pipes.



The Bonded Single Pipe Expansion and Anchoring - Foam pad

Stating the number of foam pads

To determine the necessary number of foam pads, see the sections "Directional changes" and "Branches".

From the system drawing the necessary number of foam pads to absorb the expansion appears.

1st layer:

The length of the inner 40 mm foam pads, stated in meters, appears from the first number - here 4 m. This corresponds to 4 foam pads, as they are each 1 m long.

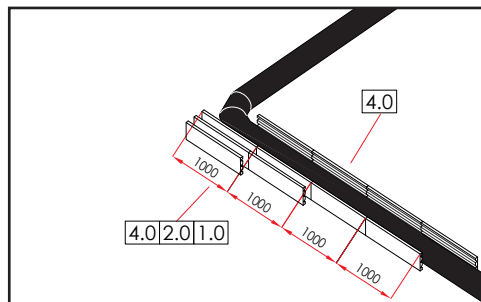
2nd layer:

If an additional layer of foam pads is required, the length of this layer, measured from the bend, appears from the 2nd number - here 2 m.

3rd layer:

A 3rd layer of foam pads, if required, appear from a 3rd number - here 1 m.

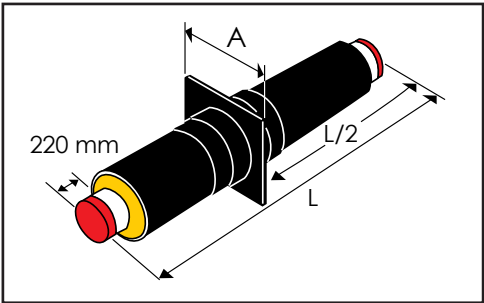
On the inside of the bend a similar statement may be found, see illustration.



The Bonded Single Pipe Expansion and Anchoring - Anchor

Application

Prefabricated anchors are installed in order to fix the pipeline for absorption of the expansion movements occurring in connection with pressure and temperature influences in the pipe system, if the design so requires.



Prefabricated anchor, measure

Steel pipe ø out mm	Series 1			Series 2			Series 3		
	Casing ø mm	L mm	A mm	Casing ø mm	L mm	A mm	Casing ø mm	L mm	A mm
26.9	90	2000	140	140	2000	160	125	2000	160
33.7	90	2000	140	110	2000	160	125	2000	165
42.4	110	2000	170	125	2000	180	140	2000	190
48.3	110	2000	170	125	2000	180	140	2000	190
60.3	125	2000	200	140	2000	200	160	2000	220
76.1	140	2000	220	160	2000	225	180	2000	250
88.9	160	2000	235	180	2000	260	200	2000	275
114.3	200	2000	300	225	2000	310	250	2000	340
139.7	225	2000	320	250	2000	350	280	2000	370
168.3	250	2000	370	280	2000	390	315	2000	425
219.1	315	2000	450	355	2000	480	400	2000	525
273.0	400	2500	550	450	2500	590	500	2500	630
323.9	450	2500	600	500	2500	650	560	2500	710
355.6	500	2500	650	560	2500	710	630	2500	780
406.4	560	2500	730	630	2500	800	710	2500	880
457.0	630	3000	800	710	3000	880	800	3000	980
508.0	710	3000	880	800	3000	980	900	3000	1100
610.0	800	3000	1000	900	3000	1100	-	-	-

The Bonded Single Pipe Expansion and Anchoring - Anchor

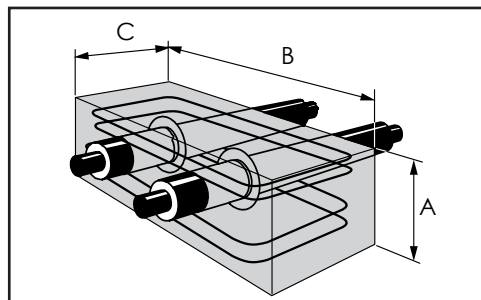
Installation

The following information can be used as a guideline.

A concrete anchor block is cast on solid ground, and the backfilling around it compacted.

If the ground is impermeable, drainage must be provided to avoid damming up the trench at the anchor.

The concrete anchor block must be cured and backfilled before the system is heated.



Concrete anchor block

From below table the necessary dimensions of the concrete anchor blocks appear based on the following conditions:

Compressive strength of the soil:

150 kN/m²

Reinforcement:

Tentor B 500

Re = 500 MPa

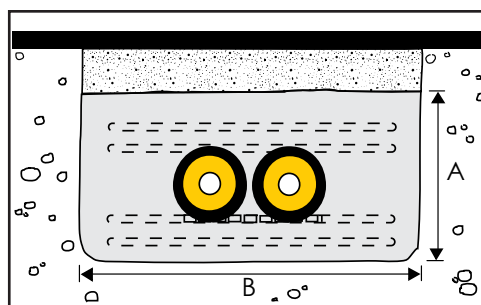
Quality of the concrete:

Compressive strength = 25 MN/m²

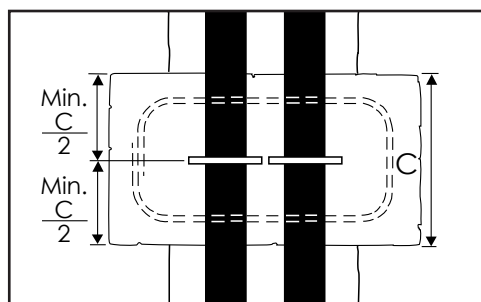
Load:

The concrete anchor block is loaded on one side only.

Anchor blocks for large pipe dimensions often become very large. Contact LOGSTOR for alternative solutions.



It lies with the design person to calculate the required size of the concrete anchor block on the basis of the actual conditions.



The Bonded Single Pipe Expansion and Anchoring - Anchor

Concrete anchor block, continued

Steel pipe ø out. mm	Concrete anchor block			Reinforcement bar	
	A m	B m	C m	No.	ø mm
26.9/33.7	0.45	0.8	0.75	4	8
42.4/48.3	0.50	1.0	0.75	6	8
60.3	0.60	1.2	0.75	6	8
76.1	0.80	1.1	0.75	4	12
88.9	0.80	1.5	0.75	4	12
114.3	0.80	2.1	0.75	4	12
139.7	1.00	2.1	0.75	4	12
168.3	1.10	2.5	0.75	6	12
219.1	1.30	3.2	0.85	6	12
273.0	1.50	3.8	1.10	6	16
323.9	1.70	4.5	1.30	4	20
355.6	1.80	4.7	1.20	4	20
406.3	2.00	5.4	1.40	6	20
457.0	2.10	5.8	1.50	6	20
508.0	2.30	5.9	1.60	8	20
610.0	2.60	7.1	1.90	8	20

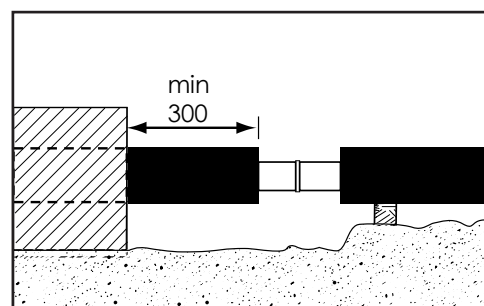
Room for joint installation

If the anchor block is concreted prior to joint installation, it must be ensured that there is sufficient room for welding tools or overlap at shrink joints.

Recommended minimum = 300 mm.

In case of outer casing dimension $\geq \varnothing 450$ mm joint installation prior to concreting may be necessary.

The pipes must be blocked-up on sand pads or foam blocks.



The Bonded Single Pipe Casing joints - Overview

Introduction

This section contains a description of the essential measures to take in connection with each joint installation.

Specific measures for the different joint types are described under the installation instructions for the joint type.

As for weld joints see the Weld Joint Manual.

Contents

Preparations for joint installation

Crosslinked PE shrink joints:

- SX-WPJoint ø 90-450 mm
- SX-WPJoint ø 500-710 mm
- BXJoint
- BXSJoint

PE shrink joints:

- B2SJoint
- BSJoint

Repair joints:

- C2LJoint with insulation shells

The Bonded Single Pipe

Preparations for casing joint installation

Preparations for joint installation

After the pipes have been welded together a number of conditions must be fulfilled in order to ensure a correct installation of the joint.

Room for installation

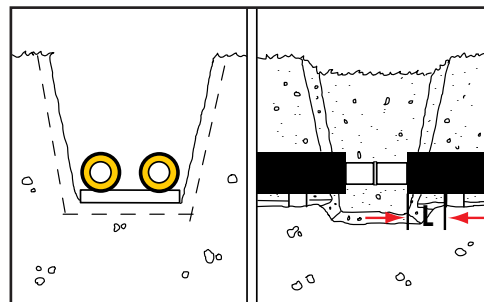
1. Support/excavate the pipes
2. Place styrofoam chocks min. 400 mm from the outer casing end or excavate to a corresponding extent.

In connection with preinstalled casing joints:

$$L = L_{\text{casing joint}} + 300 \text{ mm}$$

Sufficient room is necessary to make a correct and proper installation.

See "Excavation, installation and back-filling of trench" regarding trench dimensions.

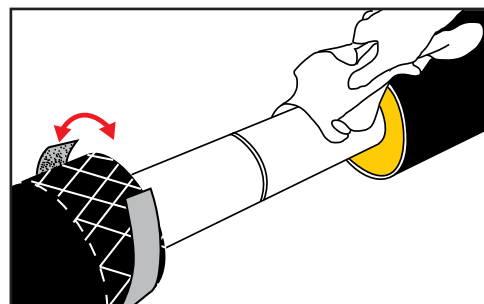


Clean surfaces

3. All surfaces in the joint area must be clean and dry. Afterwards clean them with alcohol.

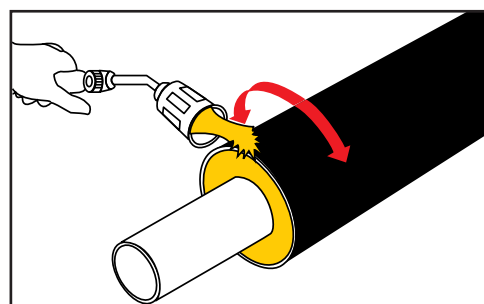
At temperatures $< +10^{\circ}\text{C}$ the surface must be preheated to lukewarm. Grind around the outer casing from both ends and inwards according to the individual installation instructions for each casing joint, until the surface becomes mat. Grind minimum 30 mm outside the rim of the joint.

Clean and dry surfaces are a condition of good sealing and adhesion of the joint installation.



Moist joint areas

4. Cover the joint area in moist and rainy weather.
5. Wipe the pipe ends dry and remove moist with a soft propane gas flame.

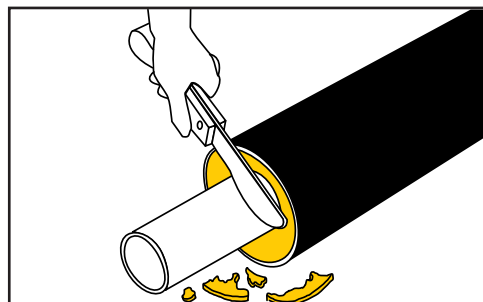


The Bonded Single Pipe

Preparations for casing joint installation

Wet foam

6. Remove any wet and dirty PUR-foam from the pipe ends with a knife, e.g. if the pipe ends have been flooded.



Joint packaging

7. Keep the joints in their original packaging, until they are to be installed.

All casing joints must be stored upright in order to avoid deformation.

Leave the packing foil on the outer casing for later use as a shield against strong sunlight and during foaming of the sleeve.

The packaging ensures that the joints are clean and dry. Wipe possible condensed moisture off and/or remove it with a soft propane gas flame. The surface must be lukewarm in order to obtain the required effect.

The 5 Golden Rules

1. Preparation:

All materials must be at hand and in the original packing, when the installation work starts.

2. Cleaning:

All surfaces must be cleaned with alcohol.

3. Activation:

All plastic surfaces (outer casings) must be activated by means of grinding and a gas flame in order to remove the plastic oxides.

4. Installation:

All parts of the joint must be installed in one work routine without interruptions. Foaming must take place the same day as the casing joint installation.

5. Inspection:

Leakage test must be carried out before foaming. Checkpoints from the installation instructions must be followed.

The Bonded Single Pipe

Casing joints - SX-WPJoint ø 90-450 mm

Application

SX-WPJoint is a closed shrink sleeve which is installed, before the service pipe is welded together.

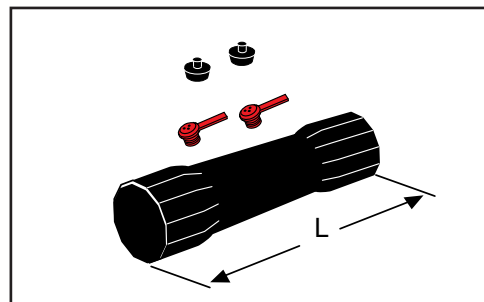
SX-WPJoint is used for joining pipes in dimensional range ø90 - 450 mm.

The foam hole is sealed with a weld plug.

As for connection of alarm wires, see LOGSTOR Detect.

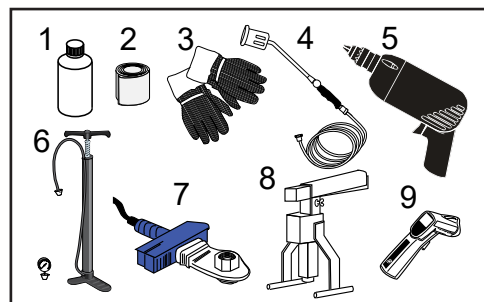
Foam pack:

- size, see Foam Pack Folder.
- more information, see Insulating joints



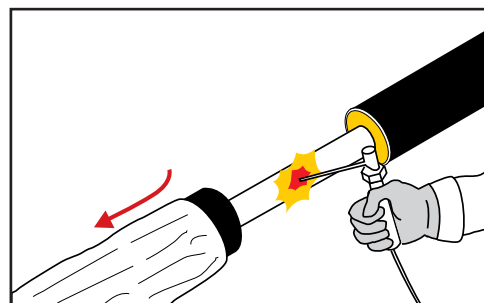
Tools

1. Alcohol, min. 93%
2. Emery cloth:
Grain size 36-40: ø 90-450 mm
3. Gloves
4. Gas burner:
ø 50 mm: ø 90-280 mm
ø 60 mm: ø 315 - 450 mm
5. Drilling machine with a ø 35 mm conical drill bit
6. Leakage test equipment
7. Plug welding tool
8. Retaining tool for weld plug
9. Temperature measuring device



Preinstallation of casing joint

1. Place the shrink sleeve with packing on one of the pipes, before the service pipes are joined.



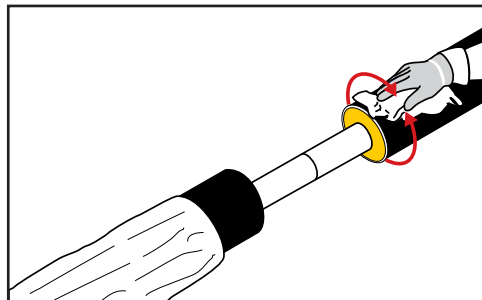
The Bonded Single Pipe

Casing joints - SX-WPJoint ø 90-450 mm

Cleaning

2. All surfaces in the mounting area must be CLEAN and DRY.

Afterwards clean them with alcohol.



Activation

3. Remove the packaging from the shrink sleeve.

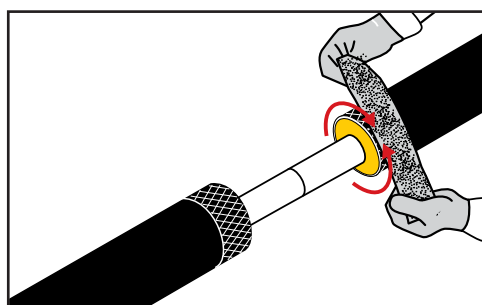
Check that the sleeve is DRY and CLEAN inside and out.

Leave the packing foil on the outer casing for later use as a shield against strong sunlight and during foaming of the sleeve.

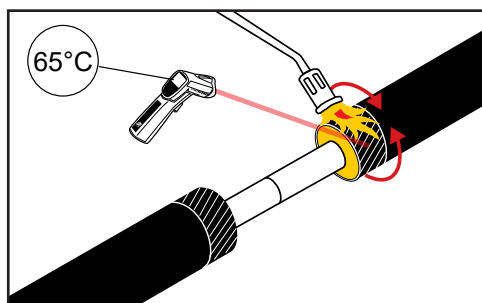
4. Grind the contact surfaces of the shrink sleeve with emery cloth, so grind marks are visible 30 mm outside the sleeve rim (This enables visual control of the grinding by the inspection).

Remove grind dust, if any.

Avoid touching the ground contact surfaces.



5. Activate the contact surfaces with a gas burner to a surface temperature of min. 65°C.



The Bonded Single Pipe

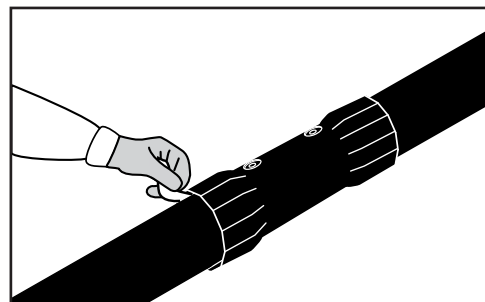
Casing joints - SX-WPJoint ø 90-450 mm

Centering sleeve

6. Centre the shrink sleeve on the joint.

Remove the mastic covering in the shrink sleeve.

Make sure that all the foil has been removed.

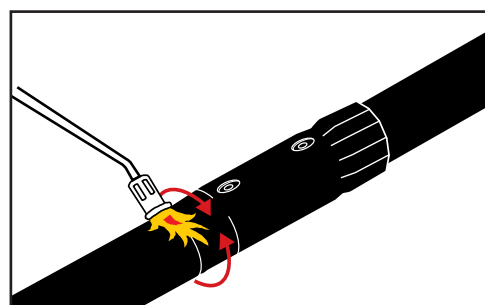


Shrinkage

7. Shrink the ends of the sleeve. Avoid heating directly on the casing.

Shrink the sleeve starting at the top to ensure centering.

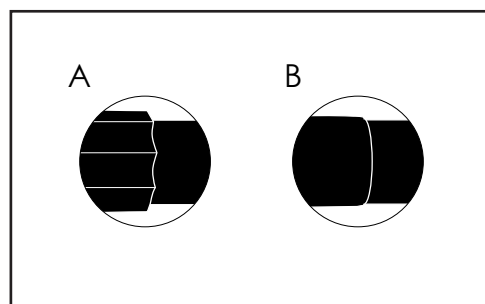
Large dimensions can be supported at the middle to ease centering.



8. Shrink until all expansion marks have vanished and the end of the sleeve forms an almost straight encircling edge.

A. Before

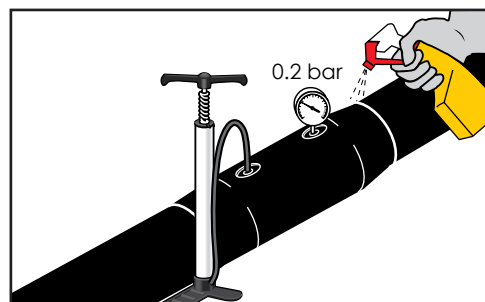
B. After



Leakage test

9. Wait until the sleeve has cooled off to handwarm. Leakage test at 0.2 bar.

Visually test that the sleeve ends are leakproof with a soap solution.



The Bonded Single Pipe

Casing joints - SX-WPJoint ø 90-450 mm

Foaming

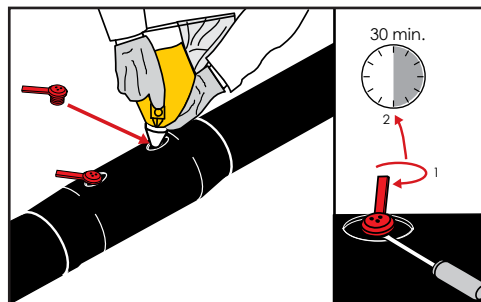
10. Pull the packaging foil back onto the sleeve and make a hole in the foil and install a venting plug in one hole and foam the sleeve through the other hole. Install the other venting plug.

11. 10 minutes after foaming the venting plug can be turned half round what facilitates the later removal of the venting plug.

Wait min. 30 min. for degassing to complete.

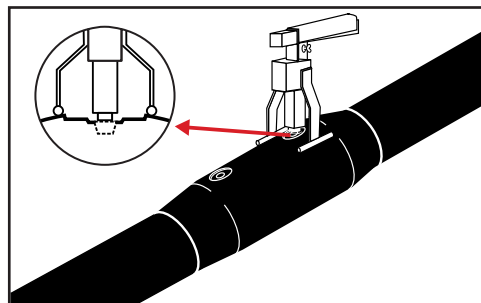
Remove the venting plugs.

Remove excess foam or spillage, if any.



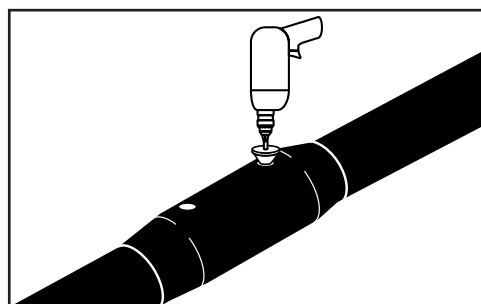
Weld plug

12. Adjust the retaining tool to the rim of the hole.



13. Drill the hole with a conical drill bit ø 35 mm:

Remove any milling residues.



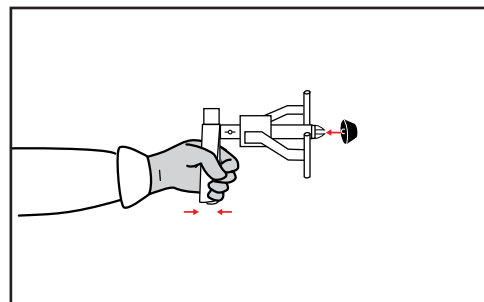
The Bonded Single Pipe

Casing joints - SX-WPJoint ø 90-450 mm

Weld plug, continued

14. Clean the rim and the casing surface around the hole with alcohol.

Insert the weld plug in the retaining tool and clean with alcohol.

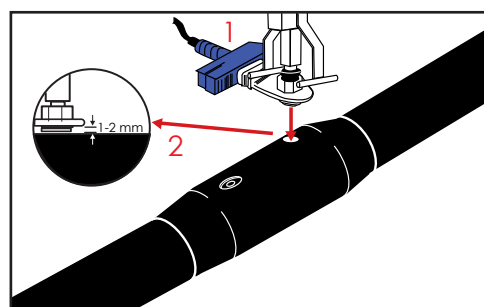


15. Heat the socket welder to 250°C.

16. Place the weld plug in the conical hole of the socket welder.

Keep it under a light pressure, until the rim of the plug starts to form a bead.

Now place the opposite side of the tool in the foam hole.

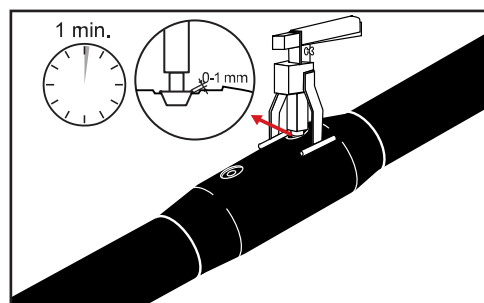


17. Remove the socket welder and immediately press the weld plug into the hole, until the legs rest on the casing and the upper rim of the plug is flush with the casing rim around the foaming hole (Max. approx. 1 mm above).

Hold the pressure constant at least 1 minute, until the welding zone has cooled down to handwarm, before the retaining tool is removed.

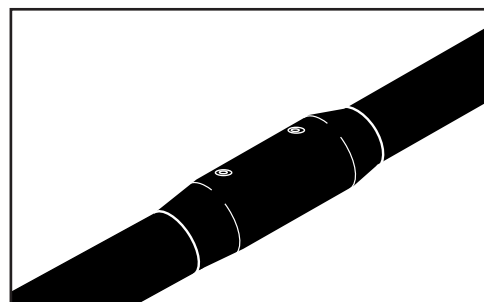
There has to be a visible bead.

Repeat the process with the other plug.



Finished joint

18. The joint is complete.



The Bonded Single Pipe Casing joints - SX-WP ø 500-710 mm

Application

The SX-WPJoint is a closed shrink joint to be installed, before the service pipes are welded together.

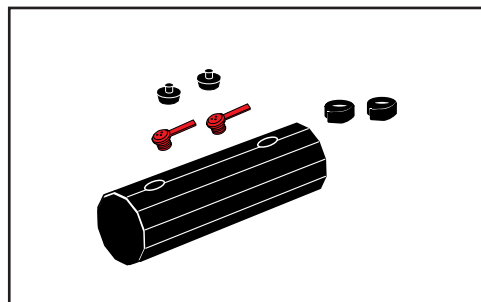
The SX-WPJoint is used to join pipes with outer casing dimensions ø 500-710 mm.

The two foam holes are sealed with weld plugs.

As for connection of alarm wires, see LOGSTOR Detect.

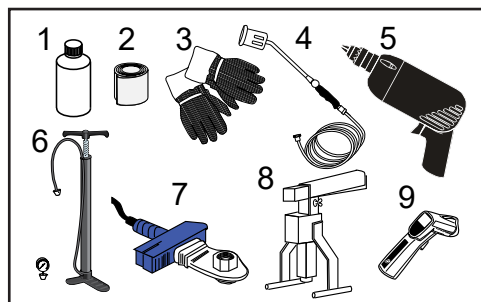
Foam packs:

- size, see Foam Pack Folder
- more information, see Insulating joints.



Tools

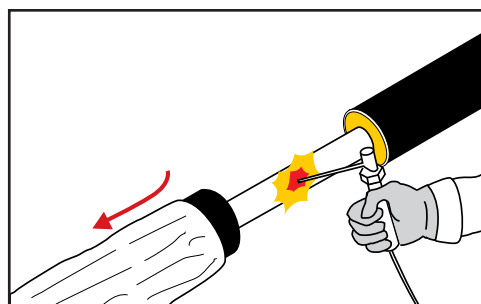
1. Alcohol, min. 93%
2. Emery cloth:
Grain size 36-40: ø 500 - 710 mm
3. Gloves
4. Gas burner:
ø 60 mm: ø 500 - 710 mm
5. Drilling machine with a ø 17.5 drill bit
and a ø 35 mm conical drill bit
6. Leakage test equipment
7. Plug welding tool
8. Retaining tool for weld plug
9. Temperature measuring device



Preinstallation of casing joint

Remove the loose components of the joint from the packing and store them in a dry environment, until later installation.

1. Place the shrink sleeve with packaging on one of the pipes, before the service pipes are joined.



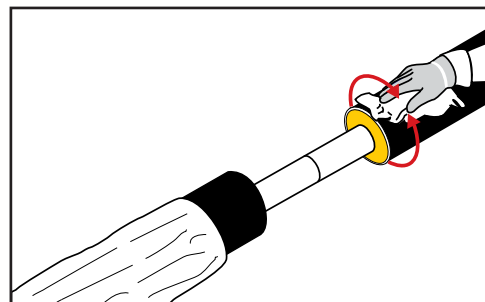
The Bonded Single Pipe

Casing joints - SX-WP ø 500-710 mm

Cleaning

2. All surfaces in the mounting area must be CLEAN and DRY.

Afterwards clean them with alcohol.

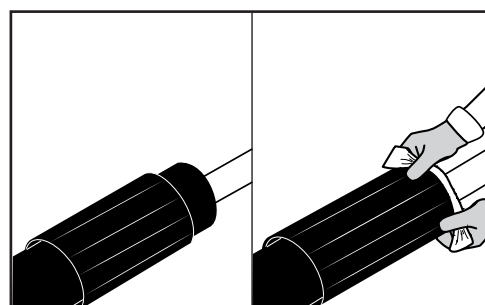


3. Remove the packaging from the shrink sleeve.

Leave the packing foil on the outer casing for later use as a shield against strong sunlight and during foaming of the sleeve.

Check that the sleeve is DRY and CLEAN inside and out.

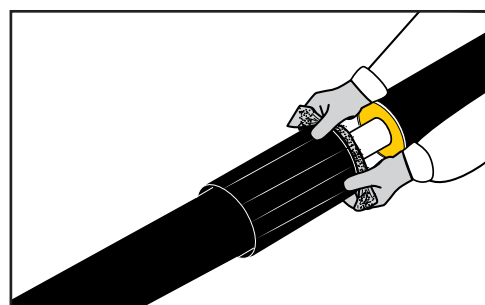
Afterwards clean the sleeve with alcohol.



Activation I

4. Grind the contact surfaces of the shrink sleeve and open shrink wrap with emery cloth, so grind marks are visible 30 mm outside the rim of the shrink wrap (This enables visual control of the grinding by the inspection). Remove grind dust, if any.

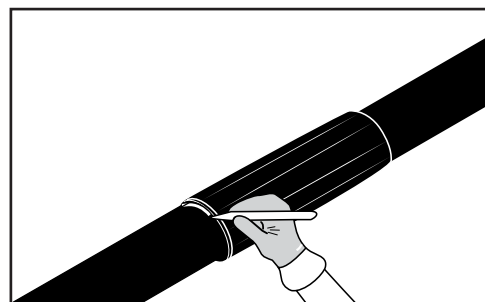
Avoid touching the ground contact surfaces.



Marking the position of the sleeve

5. Centre the sleeve over the joint.

Mark both ends of the sleeve on the casing pipes.

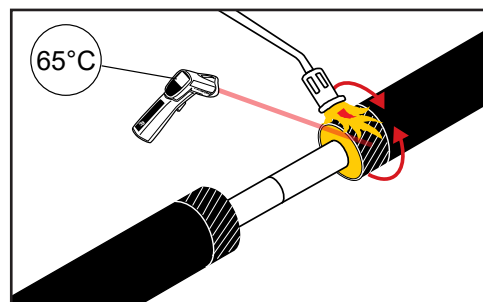


The Bonded Single Pipe

Casing joints - SX-WP ø 500-710 mm

Activation II

6. Activate the contact surfaces with gas burner to a surface temperature of min. 65°C.

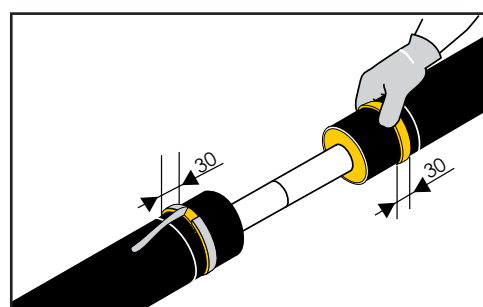


Applying sealing tape

7. Wind sealing tape around the casing pipes approx. 30 mm from the markings.

8. Unfold the protective foil towards the casing pipe.

Press the tape ends together.



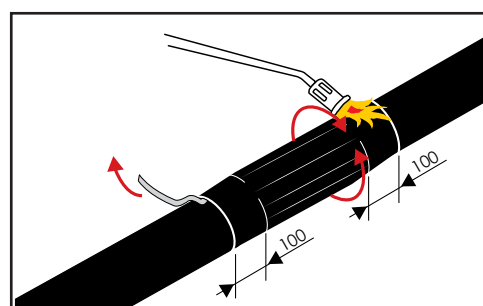
Shrinkage

9. Centre the shrink sleeve on the joint. When the sleeve is correctly positioned, remove the mastic cover.

Place two wooden blocks under the sleeve in 10 and 2 o'clock position to center the sleeve before shrinking it.

10. Shrink the outer 100 mm of the shrink sleeve at both ends.

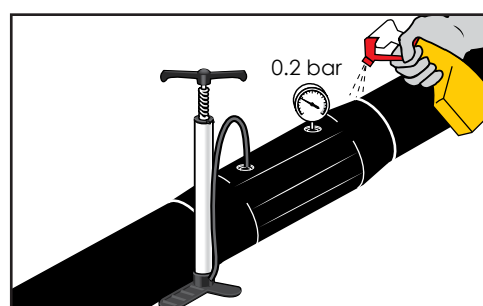
Remove the wooden blocks, when the rear edge of the shrink zone is down on the casing.



Leakage test

11. When the shrink sleeve has cooled to handwarm leakage test with 0.2 bar.

Test the sleeve ends visually with soapy water.



The Bonded Single Pipe

Casing joints - SX-WP ø 500-710 mm

Foaming

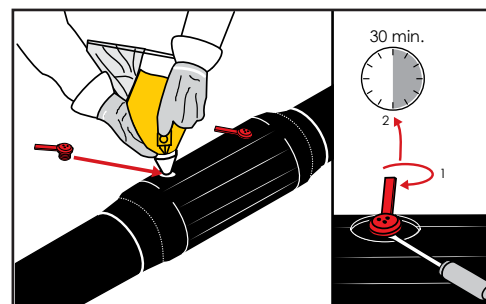
12. Pull the packaging foil back onto the sleeve and make a hole in the foil and install a venting plug in one hole and foam the sleeve through the other hole. Install the other venting plug.

13. 10 minutes after foaming the venting plug can be turned half round what facilitates the later removal of the venting plug.

Wait min. 30 min. for degassing to complete.

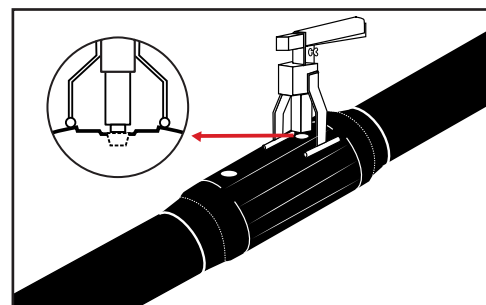
Remove the venting plugs.

Remove excess foam or spillage, if any.



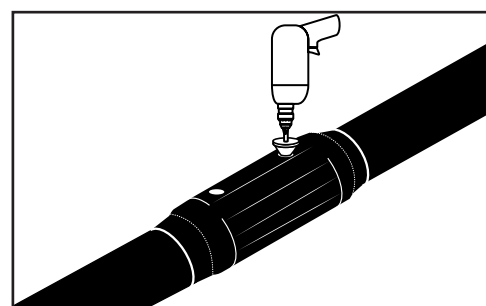
Weld plug

14. Adjust the retaining tool to the rim of the hole.



15. Drill the hole with a conical drill bit ø 35 mm.

Remove any milling residues.



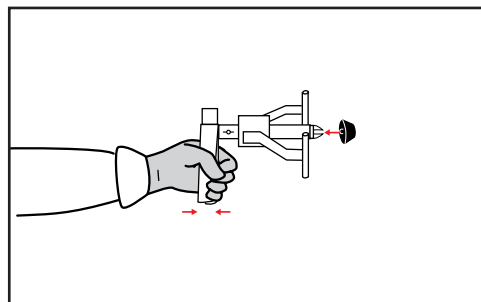
The Bonded Single Pipe

Casing joints - SX-WP ø 500-710 mm

Weld plug, continued

16. Clean the rim and the casing surface around the hole with alcohol.

Insert the weld plug in the retaining tool and clean with alcohol.

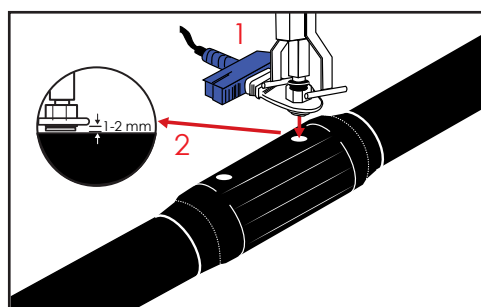


17. Heat the socket welder to 250°C.

18. Place the weld plug in the conical hole of the socket welder.

Keep it under a light pressure, until the rim of the plug starts to form a bead.

Now place the opposite side of the tool in the foam hole.

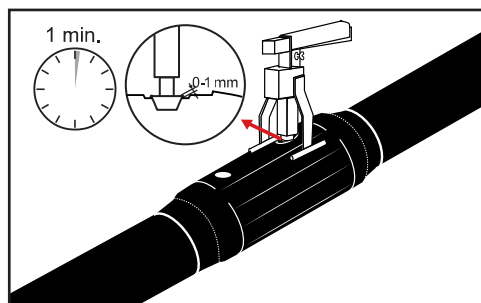


19. Remove the socket welder and immediately press the weld plug into the hole, until the legs rest on the casing and the upper rim of the plug is flush with the casing rim around the foaming hole (max. approx. 1 mm above).

Hold the pressure constant at least 1 minute, until the welding zone has cooled down to handwarm, before the retaining tool is removed.

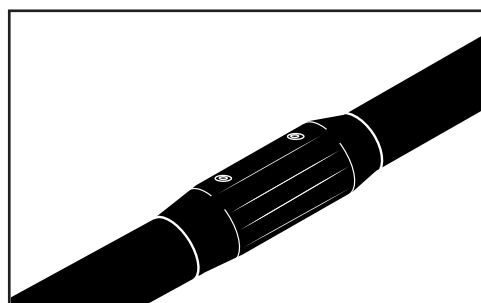
There has to be a visible bead.

Repeat the process with the other plug.



Finished joint

20. The joint is complete.

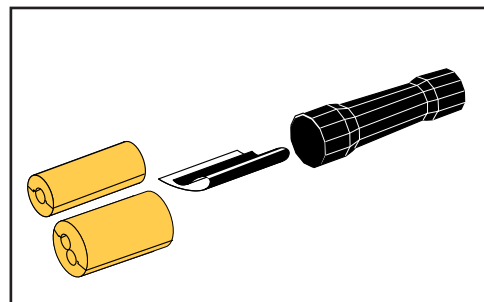


The Bonded Single Pipe Casing joints - BXJoint

Application

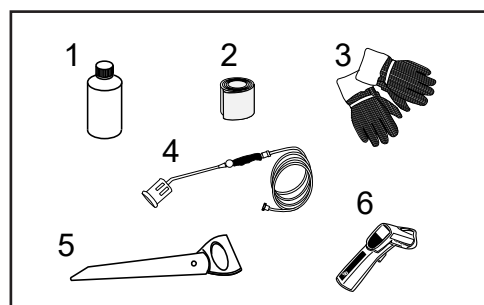
The BXJoint is a closed shrink joint, installed prior to welding the service pipe together. It is used to join pipes with outer casing dimensions \varnothing 90-630 mm.

Connecting alarm wires, see LOGSTOR Detect.



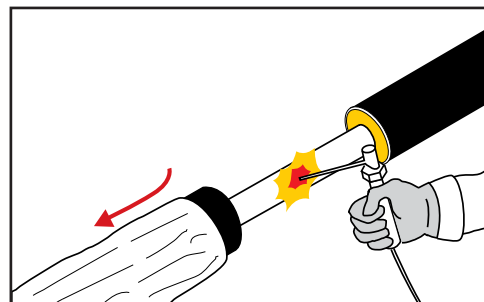
Tools

1. Alcohol, min. 93%
2. Emery cloth:
Grain size 36-40: \varnothing 90-630 mm
3. Gloves
4. Gas burner:
 \varnothing 50 mm: \varnothing 90-280 mm
 \varnothing 60 mm: \varnothing 315 - 630 mm
5. Saw
6. Temperature measuring device



Preinstallation of casing joint

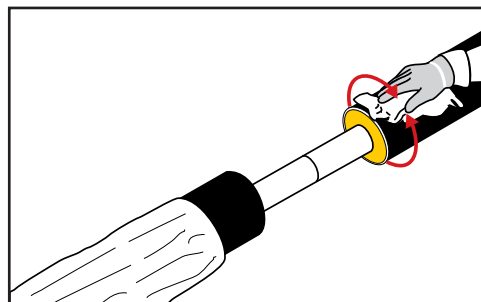
1. Place the shrink sleeve with packing on one of the pipes, before the service pipes are joined.



The Bonded Single Pipe Casing joints - BXJoint

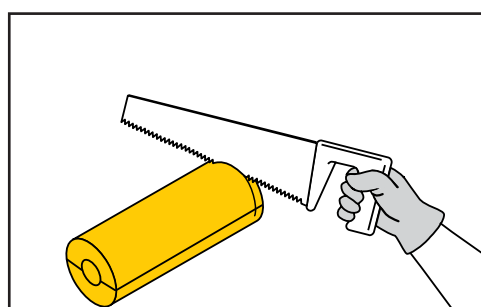
Cleaning

2. All surfaces in the mounting area must be CLEAN and DRY.



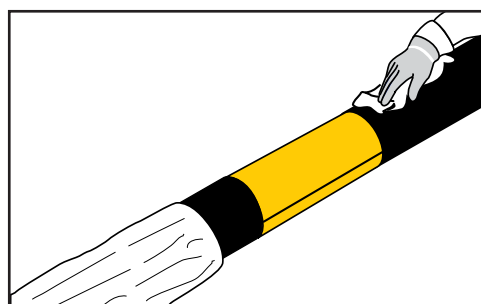
Adjusting insulation shells

3. Shorten the insulation shells to make them fit tightly between the casing pipes.



4. Fit the insulation shells tightly between the casing pipes, using adhesive tape, if required. All surfaces must be CLEAN and DRY.

Afterwards clean the casing surface with alcohol.

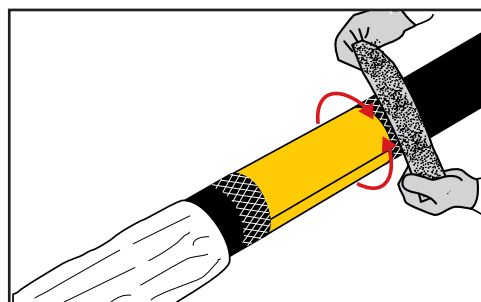


Activation

5. Grind the contact surfaces of the shrink film and shrink sleeve with emery cloth, so grind marks are visible 30 mm outside the rim (This enables visual control of the grinding by the inspection).

Remove grind dust, if any.

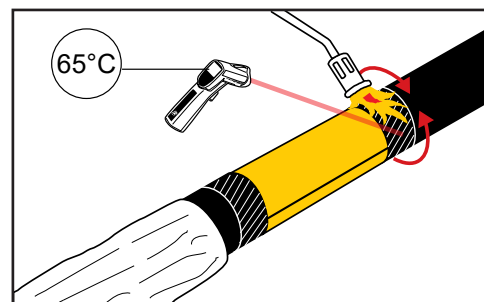
Avoid touching the ground contact surfaces



The Bonded Single Pipe Casing joints - BXJoint

Activation, continued

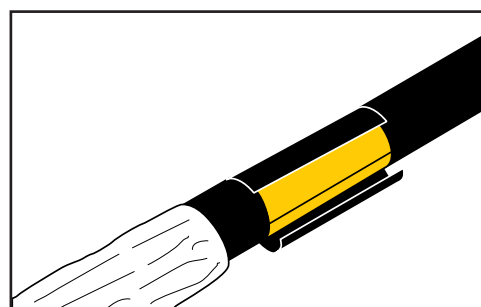
6. Activate the contact surfaces with gas burner to a surface temperature of min. 65°C.



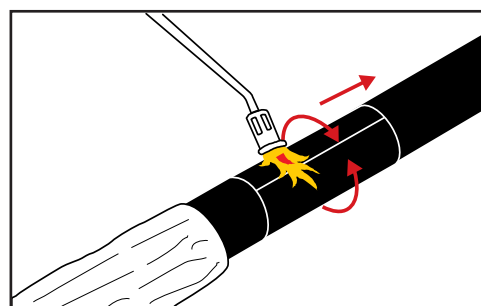
Installing shrink film

7. Centre the shrink film on the joint and place it around the pipe. Attach one edge of the shrink film in "10 o'clock" position.

8. Pull the film around the pipe by removing the adhesive paper so that the film adheres to the surface beneath it.



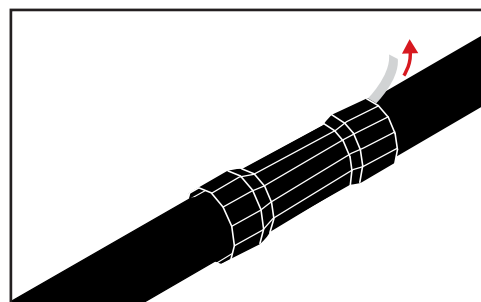
9. Heat the whole film from the centre towards the sides, ensuring that the shrink film is tightly fitted.



Positioning shrink sleeve

10. Remove the packing from the shrink sleeve. Check that the sleeve is CLEAN and DRY, inside and out.

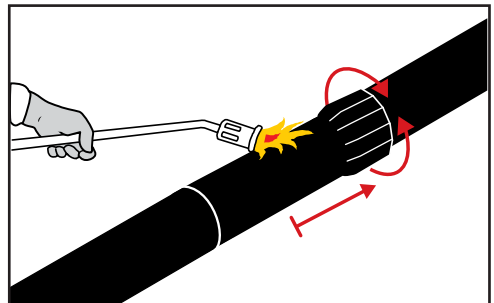
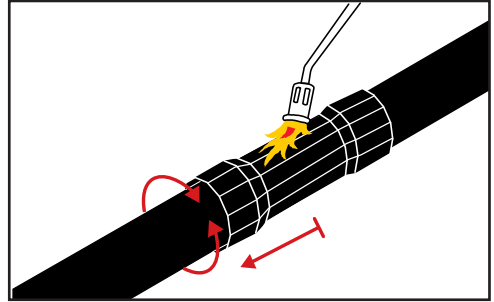
11. Centre the shrink sleeve on the joint. Remove the mastic cover in the shrink sleeve and make sure that all the foil has been removed.



The Bonded Single Pipe Casing joints - BXJoint

Shrinkage

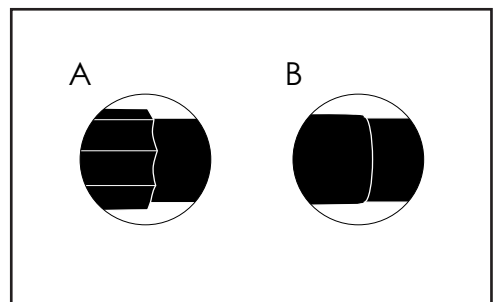
12. Shrink the sleeve from the middle towards one end, then from the middle towards the other end. Avoid heating directly on the casing.



13. Shrink until all expansion marks have vanished and the end of the sleeve forms an almost straight encircling edge.

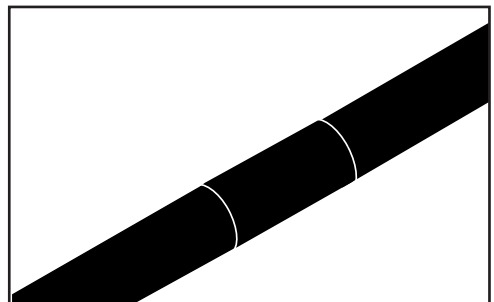
A. Before

B. After



Finished joint

14. The joint is complete.



The Bonded Single Pipe Casing joints - BXSJoint

Application

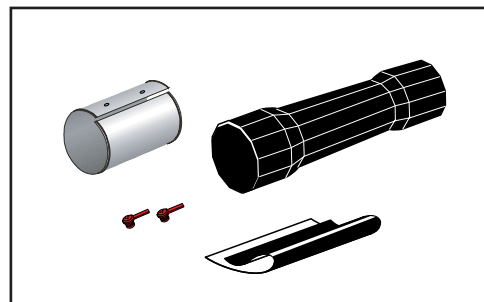
The BXSJoint is a closed shrink joint which is installed before the service pipe is welded together.

The BXSJoint is used to join pipes with outer casing dimensions \varnothing 90-630 mm.

Connection of surveillance wires, see LOGSTOR Detect.

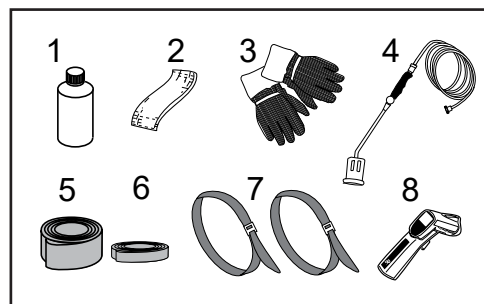
Foam pack:

- size, see Foam Pack Folder.
- more information, see Insulating joints.



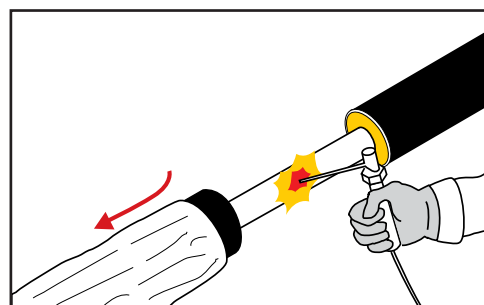
Tools

1. Alcohol, min. 93%
2. Emery cloth:
Grain size 36-40: \varnothing 90 - 630 mm
3. Gloves
4. Gas burner:
 \varnothing 50 mm: \varnothing 90 - 280 mm
 \varnothing 60 mm: \varnothing 315 - 630 mm
5. Masking tape
6. Filament tape
7. Straps
8. Temperature measuring device



Preinstallation of shrink sleeve

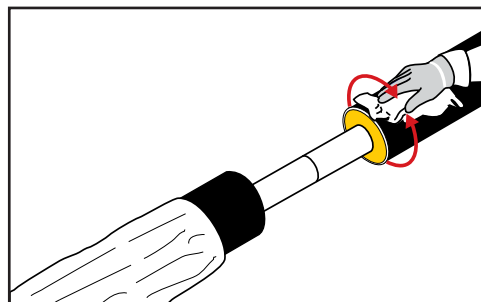
1. Place the shrink sleeve with packing on one of the pipes, before the service pipes are joined.



The Bonded Single Pipe Casing joints - BXSJoint

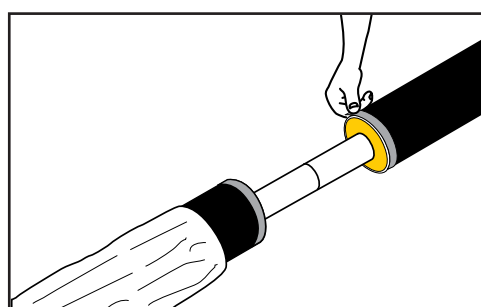
Cleaning I

2. All surfaces in the mounting area must be CLEAN and DRY.



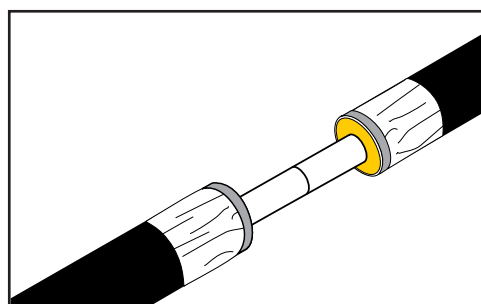
Applying tape

3. Apply masking tape around the casing pipe, so it is flush with the pipe end.



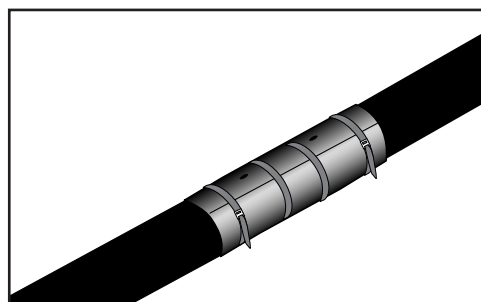
Covering casing pipe ends

4. Cover the casing pipe ends with the protective plastic film of the sleeve and fix it with masking tape.



Installing wrap

5. Install the wrap with the foaming hole turning upwards and fix it with straps and filament tape.



The Bonded Single Pipe Casing joints - BXSJoint

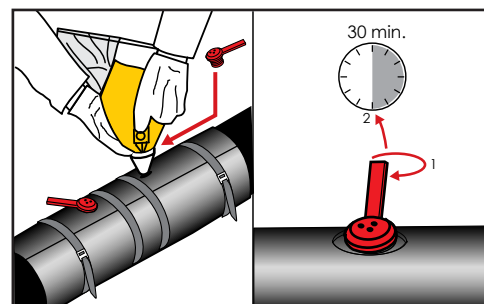
Venting and foaming

6. Foam the joint and install the venting plug.

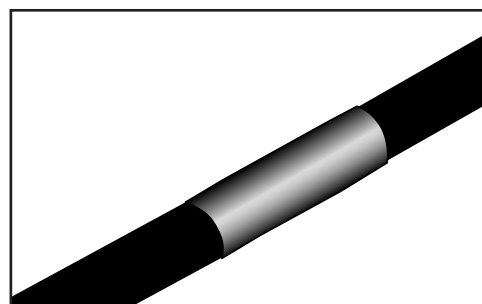
Wait at least 30 min. until degassing has taken place.

Remove the venting plug by turning and lifting it.

If the alu wrap is removed before installing the shrink film, wait 60 minutes before installing the shrink film.

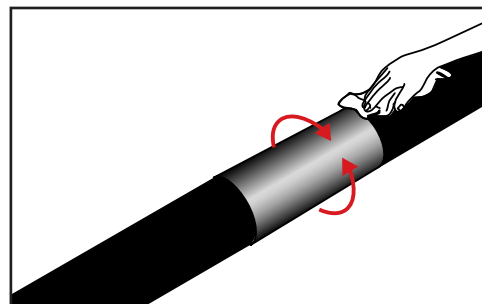


7. Remove the plastic film and excess foam from the casing.



Cleaning II

8. Clean all surfaces in the mounting area with alcohol.

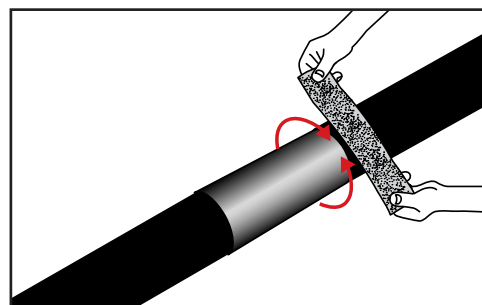


Activation

9. Grind the contact surfaces of the shrink film and shrink sleeve with emery cloth, so grind marks are visible 30 mm outside the rim (This enables visual control of the grinding by the inspection).

Remove grind dust, if any.

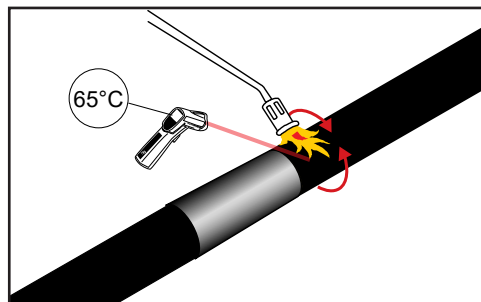
Avoid touching the ground contact surfaces



The Bonded Single Pipe Casing joints - BXSJoint

Activation, continued

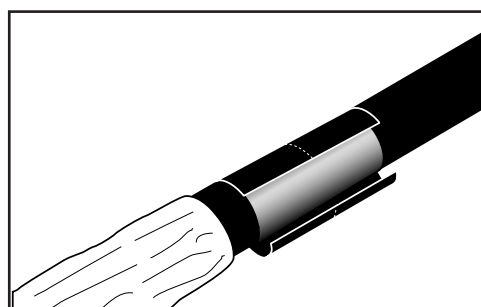
10. Activate the contact surfaces with gas burner to a surface temperature of min. 65°C.



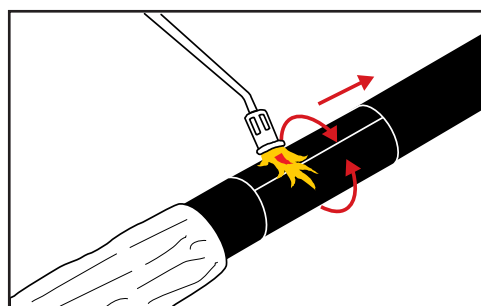
Installing shrink film

11. Centre the shrink film on the joint and place it around the pipe. Attach one edge of the shrink film in "10 o'clock" position.

12. Pull the film around the pipe by removing the adhesive paper so that the film adheres to the surface beneath it.



13. Heat the whole film from the centre towards the sides, ensuring that the shrink film is tightly fitted.

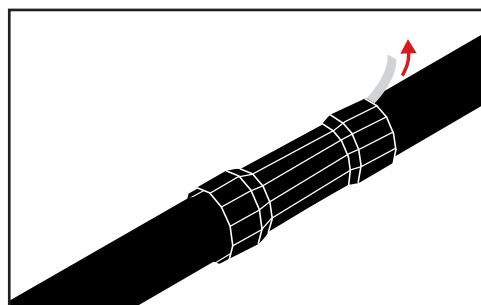


Positioning shrink sleeve

14. Remove the packing from the shrink sleeve.

Check that the sleeve is CLEAN and DRY, inside and out.

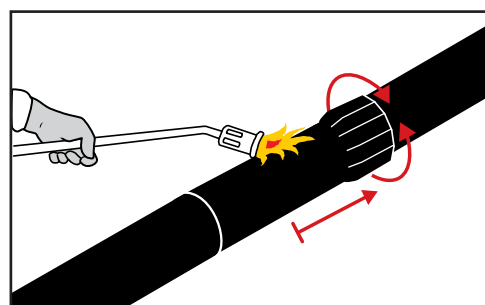
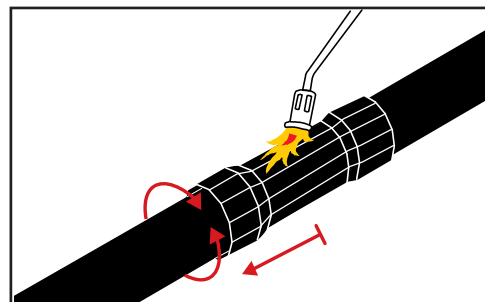
15. Centre the shrink sleeve on the joint. Remove the mastic cover in the shrink sleeve and make sure that all the foil has been removed.



The Bonded Single Pipe Casing joints - BXSJoint

Shrinkage

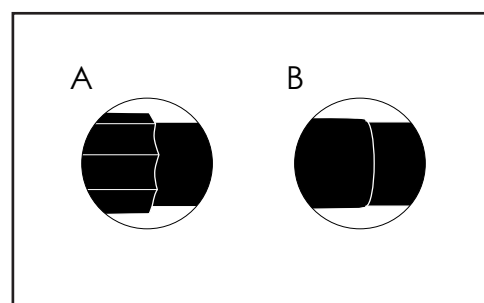
16. Shrink the sleeve from the middle towards one end, then from the middle towards the other end. Avoid heating directly on the casing.



17. Shrink until all expansion marks have vanished and the end of the sleeve forms an almost straight encircling edge.

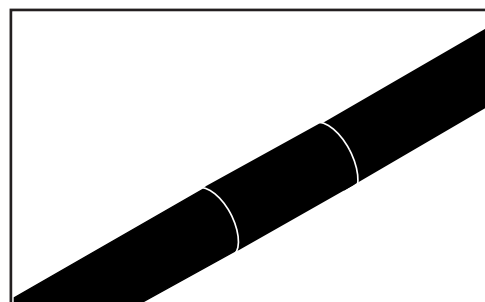
A. Before

B. After



Finished joint

18. The joint is complete.



The Bonded Single Pipe Casing joints - B2SJoint

Application

The B2SJoint is a closed joint to be installed before the service pipes are welded together.

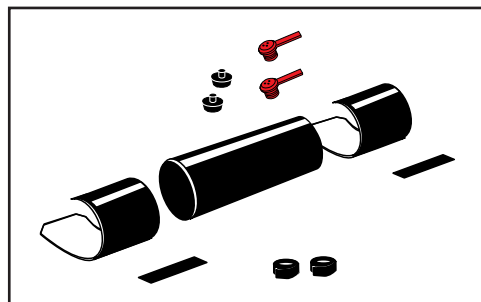
B2SJoints are used to join pipes, when a double sealing shrink joint is required in the dimensional range \varnothing 90-1000 mm.

The foam hole is sealed with a weld plug.

As for connection of alarm wires, see LOGSTOR Detect.

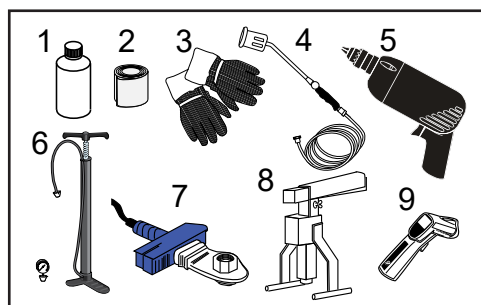
Foam packs:

- size, see Foam Pack Folder
- more information, see Insulating joints.



Tools

1. Alcohol, min. 93%
2. Emery cloth:
Grain size 36-40: \varnothing 90-1000 mm
3. Gloves
4. Gas burner:
 \varnothing 50 mm: \varnothing 90-280 mm
 \varnothing 60 mm: \varnothing 315 - 1000 mm
5. Drilling machine with a \varnothing 17.5 drill bit and a \varnothing 35 mm conical drill bit
6. Leakage test equipment
7. Plug welding tool
8. Retaining tool for weld plug
9. Temperature measuring device

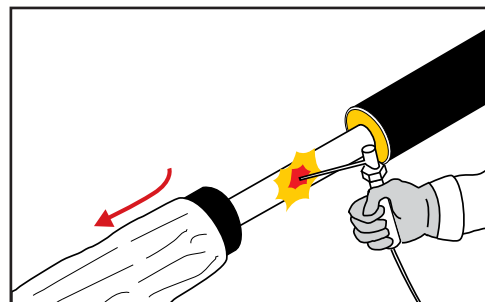


The Bonded Single Pipe Casing joints - B2SJoint

Preinstallation of casing joint

Remove the loose components of the joint from the packing and store them in a dry environment, until later installation.

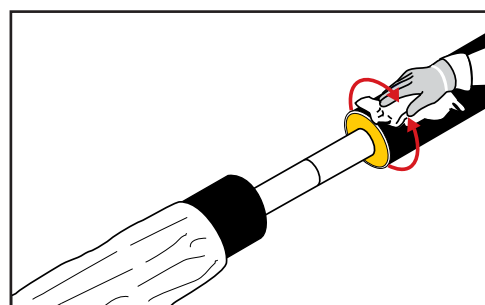
1. Place the shrink sleeve with packaging on one of the pipes, before the service pipes are joined.



Cleaning

2. All surfaces in the mounting area must be **CLEAN** and **DRY**.

Afterwards clean them with alcohol.

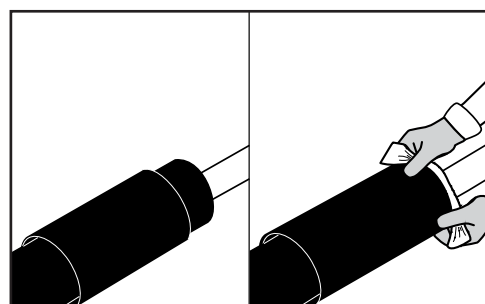


3. Remove the packaging from the shrink sleeve.

Leave the packing foil on the outer casing for later use as a shield against strong sunlight and during foaming of the sleeve.

Check that the sleeve is **DRY** and **CLEAN** inside and out.

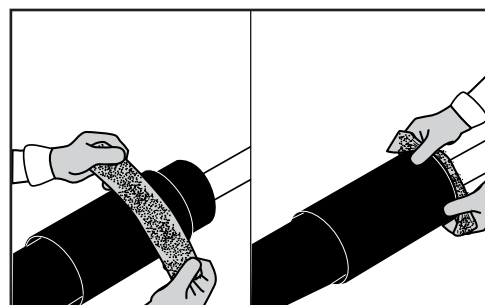
Afterwards clean the sleeve with alcohol.



Activation I

4. Grind the contact surfaces of the shrink sleeve and open shrink wrap with emery cloth, so grind marks are visible 30 mm outside the rim of the shrink wrap (This enables visual control of the grinding by the inspection). Remove grind dust, if any.

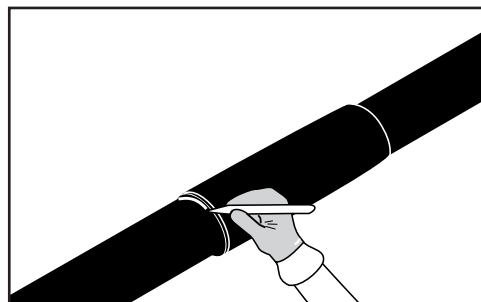
Avoid touching the ground contact surfaces.



The Bonded Single Pipe Casing joints - B2SJoint

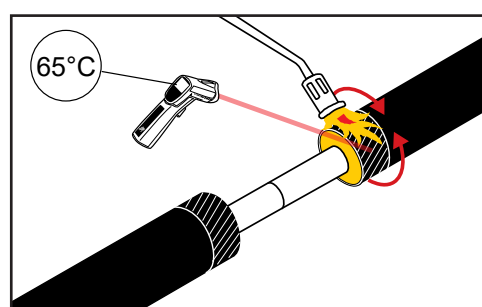
Marking the position of the sleeve

5. Centre the sleeve over the joint.
Mark both ends of the sleeve on the casing pipes.



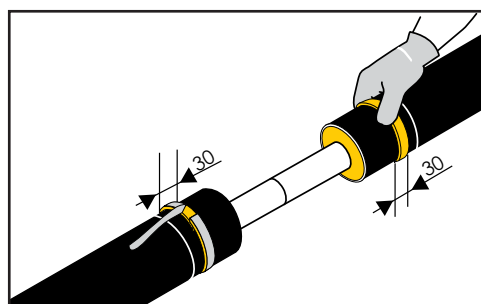
Activation II

6. Activate the contact surfaces with gas burner to a surface temperature of min. 65°C.



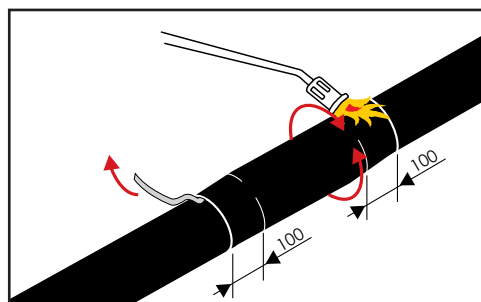
Applying sealing tape

7. Wind sealing tape around the casing pipes approx. 30 mm from the markings.
8. Unfold the protective foil towards the casing pipe.
Press the tape ends together.



Shrinkage

9. Centre the shrink sleeve on the joint.
When the sleeve is correctly positioned, remove the mastic cover.
10. Shrink the outer 100 mm of the shrink sleeve at both ends.



The Bonded Single Pipe Casing joints - B2SJoint

Shrinkage, continued

11. Centre a shrink wrap (bevelled corners) on one shrink sleeve end, so the fat end of the symbol faces the sleeve.

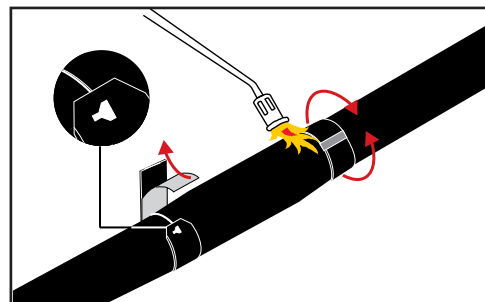
Install the shrink wrap around the sleeve end with an overlap of 50 mm.

Centre the closure patch over the joint of the shrink wrap.

Heat the closure patch, until the net structure can be seen on the upper side. Press down the closure patch.

12. Shrink the wrap with a gas burner, moving from the shrink sleeve towards the casing pipe. The sealing compound must be visible at both sides in the entire circumference. After shrinkage the surface structure must be smooth.

Repeat with the other shrink wrap over the other sleeve end.

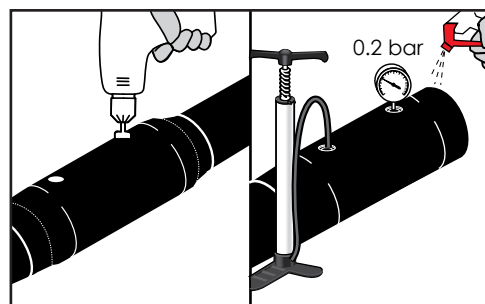


Leakage test

13. Drill two $\varnothing 17.5$ mm holes - one at each sleeve end at the summit as close to the casing ends as possible.

When the shrink sleeve has cooled to handwarm leakage test with 0.2 bar.

Test the sleeve ends visually with soapy water.



The Bonded Single Pipe Casing joints - B2SJoint

Foaming

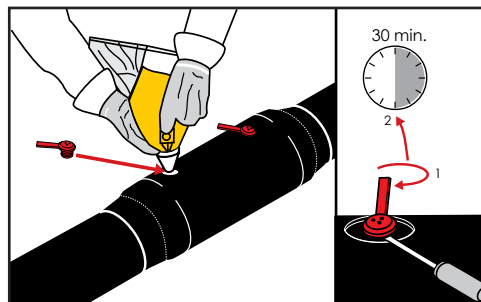
14. Pull the packaging foil back onto the sleeve and make a hole in the foil and install a venting plug in one hole and foam the sleeve through the other hole. Install the other venting plug. .

15. 10 minutes after foaming the venting plug can be turned half round what facilitates the later removal of the venting plug.

Wait min. 30 min. for degassing to complete.

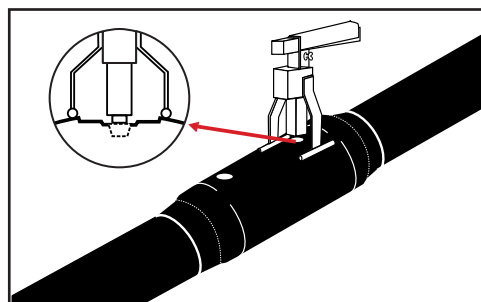
Remove the venting plugs.

Remove excess foam or spillage, if any.



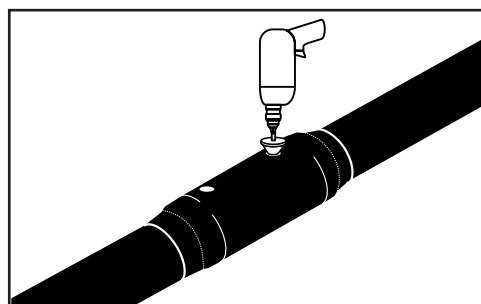
Weld plug

16. Adjust the retaining tool to the rim of the hole.



17. Drill the hole with a conical drill bit \varnothing 35 mm:

Remove any milling residues.

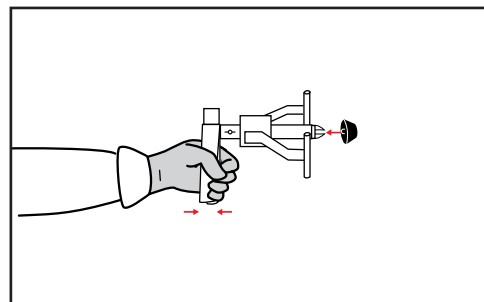


The Bonded Single Pipe Casing joints - B2SJoint

Weld plug, continued

18. Clean the rim and the casing surface around the hole with alcohol.

Insert the weld plug in the retaining tool and clean with alcohol.

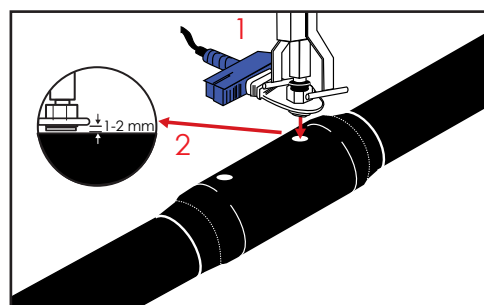


19. Heat the socket welder to 250°C.

20. Place the weld plug in the conical hole of the socket welder.

Keep it under a light pressure, until the rim of the plug starts to form a bead.

Now place the opposite side of the tool in the foam hole.

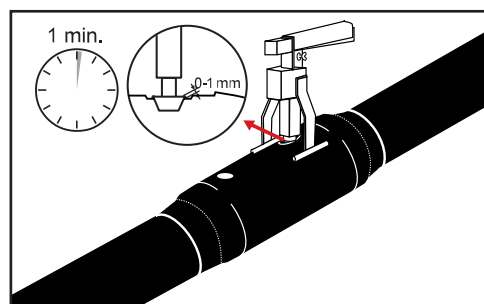


21. Remove the socket welder and immediately press the weld plug into the hole, until the legs rest on the casing and the upper rim of the plug is flush with the casing rim around the foaming hole (max. approx. 1 mm above).

Hold the pressure constant at least 1 minute, until the welding zone has cooled down to handwarm, before the retaining tool is removed.

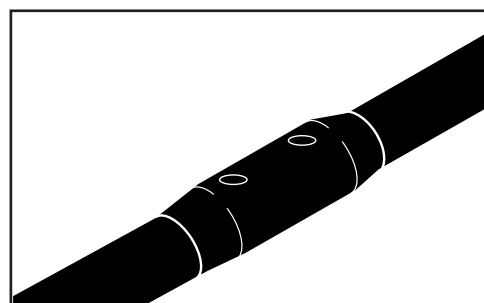
There has to be a visible bead.

Repeat the process with the other plug.



Finished joint

22. The joint is complete.



The Bonded Single Pipe Casing joints - BSJoint

Application

The BSJoint is a closed shrink joint to be installed, before the service pipes are welded together.

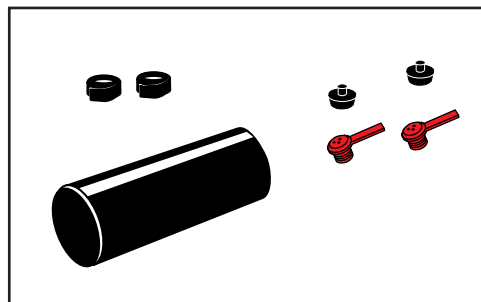
The BSJoint is used to join pipes with outer casing dimensions \varnothing 90-560 mm.

The two foam holes are sealed with weld plugs.

As for connection of alarm wires, see LOGSTOR Detect.

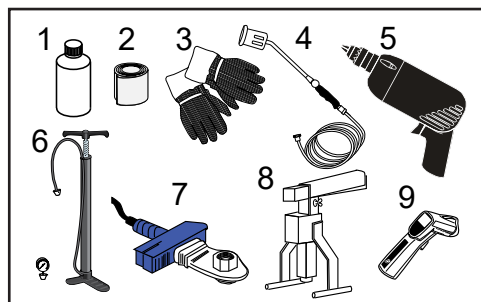
Foam packs:

- size, see Foam Pack Folder
- more information, see Insulating joints.



Tools

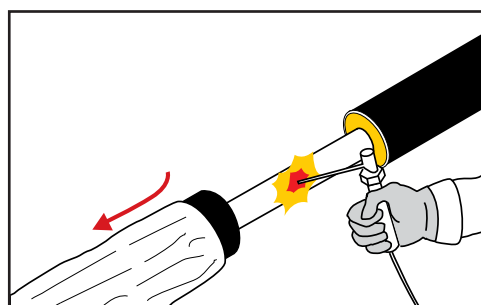
1. Alcohol, min. 93%
2. Emery cloth:
Grain size 36-40: \varnothing 90-560 mm
3. Gloves
4. Gas burner:
 \varnothing 50 mm: \varnothing 90-280 mm
 \varnothing 60 mm: \varnothing 315 - 560 mm
5. Drilling machine with a \varnothing 17.5 drill bit and a \varnothing 35 mm conical drill bit
6. Leakage test equipment
7. Plug welding tool
8. Retaining tool for weld plug
9. Temperature measuring device



Preinstallation of casing joint

Remove the loose components of the joint from the packing and store them in a dry environment, until later installation.

1. Place the shrink sleeve with packaging on one of the pipes, before the service pipes are joined.

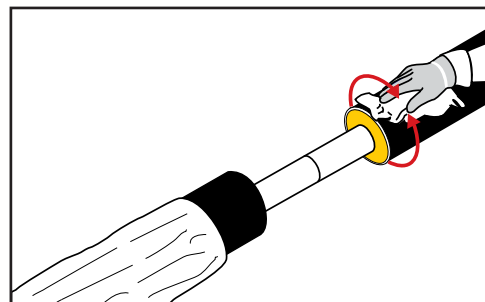


The Bonded Single Pipe Casing joints - BSJoint

Cleaning

2. All surfaces in the mounting area must be CLEAN and DRY.

Afterwards clean them with alcohol.

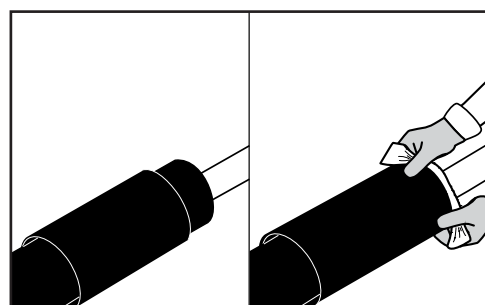


3. Remove the packaging from the shrink sleeve.

Leave the packing foil on the outer casing for later use as a shield against strong sunlight and during foaming of the sleeve.

Check that the sleeve is DRY and CLEAN inside and out.

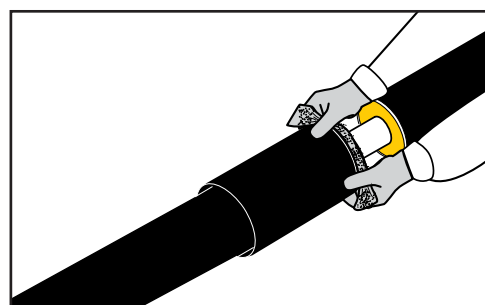
Afterwards clean the sleeve with alcohol.



Activation I

4. Grind the contact surfaces of the shrink sleeve and open shrink wrap with emery cloth, so grind marks are visible 30 mm outside the rim of the shrink wrap (This enables visual control of the grinding by the inspection). Remove grind dust, if any.

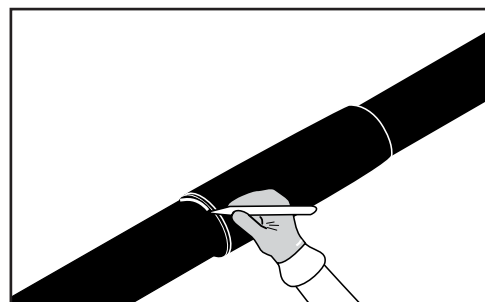
Avoid touching the ground contact surfaces.



Marking the position of the sleeve

5. Centre the sleeve over the joint.

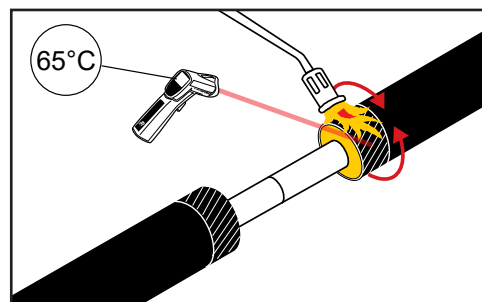
Mark both ends of the sleeve on the casing pipes.



The Bonded Single Pipe Casing joints - BSJoint

Activation II

6. Activate the contact surfaces with gas burner to a surface temperature of min. 65°C.

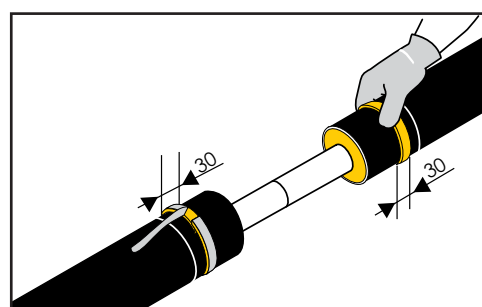


Applying sealing tape

7. Wind sealing tape around the casing pipes approx. 30 mm from the markings.

8. Unfold the protective foil towards the casing pipe.

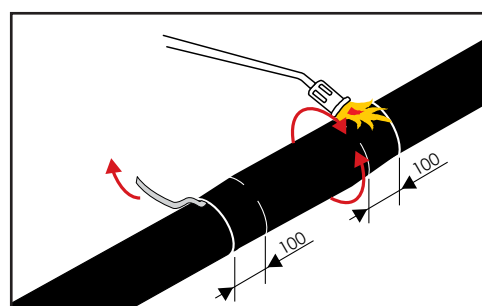
Press the tape ends together.



Shrinkage

9. Centre the shrink sleeve on the joint. When the sleeve is correctly positioned, remove the mastic cover.

10. Shrink the outer 100 mm of the shrink sleeve at both ends.

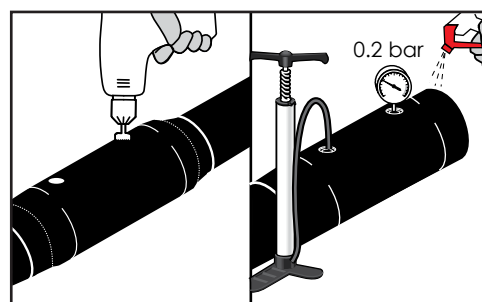


Leakage test

11. Drill two $\varnothing 17.5$ mm holes - one at each sleeve end at the summit as close to the casing ends as possible.

When the shrink sleeve has cooled to handwarm leakage test with 0.2 bar.

Test the sleeve ends visually with soapy water.



The Bonded Single Pipe Casing joints - BSJoint

Foaming

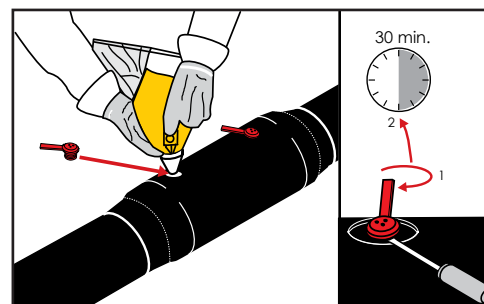
12. Pull the packaging foil back onto the sleeve and make a hole in the foil and install a venting plug in one hole and foam the sleeve through the other hole. Install the other venting plug. .

13. 10 minutes after foaming the venting plug can be turned half round what facilitates the later removal of the venting plug.

Wait min. 30 min. for degassing to complete.

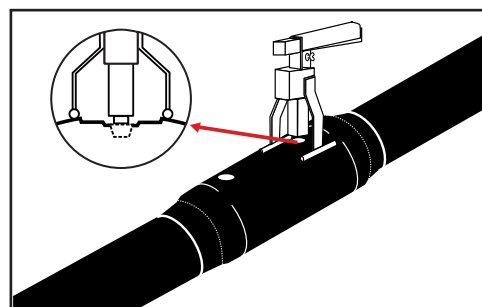
Remove the venting plugs.

Remove excess foam or spillage, if any.



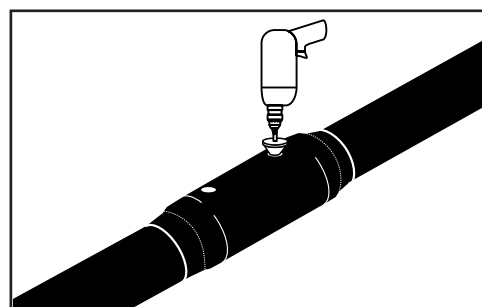
Weld plug

14. Adjust the retaining tool to the rim of the hole.



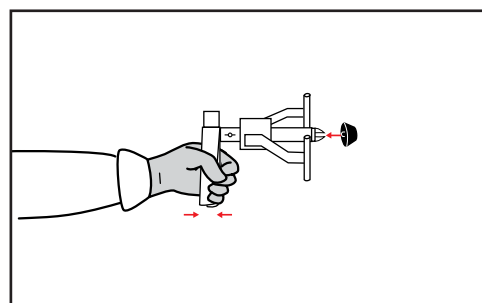
15. Drill the hole with a conical drill bit \varnothing 35 mm:

Remove any milling residues.



16. Clean the rim and the casing surface around the hole with alcohol.

Insert the weld plug in the retaining tool and clean with alcohol.



The Bonded Single Pipe Casing joints - BSJoint

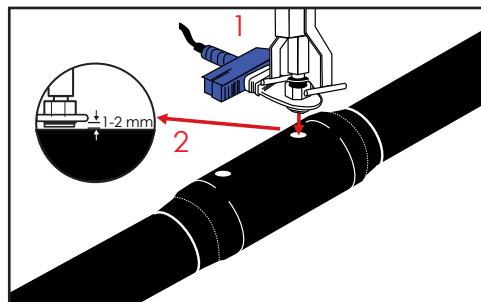
Weld plug, continued

17. Heat the socket welder to 250°C.

18. Place the weld plug in the conical hole of the socket welder.

Keep it under a light pressure, until the rim of the plug starts to form a bead.

Now place the opposite side of the tool in the foam hole.

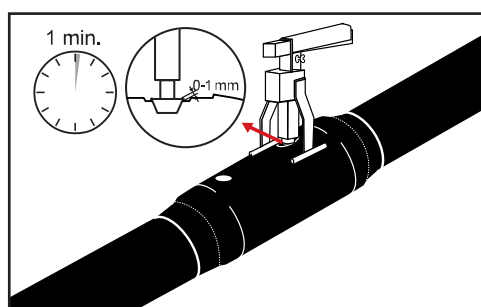


19. Remove the socket welder and immediately press the weld plug into the hole, until the legs rest on the casing and the upper rim of the plug is flush with the casing rim around the foaming hole (max. approx. 1 mm above).

Hold the pressure constant at least 1 minute, until the welding zone has cooled down to handwarm, before the retaining tool is removed.

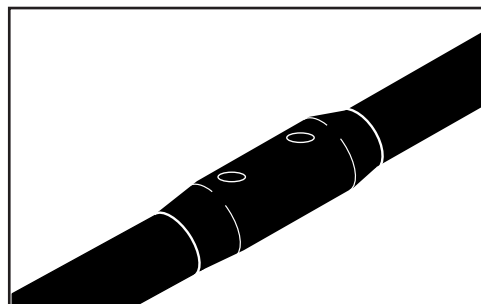
There has to be a visible bead.

Repeat the process with the other plug.



Finished joint

20. The joint is complete.



The Bonded Single Pipe Casing joints - Repair joints

Joints suitable for repair	All open joint types are suitable for repair within their dimensional range.
	Welded joints:
	BandJoints, \varnothing 90-1400 mm. See Weld Joint Manual.
	Shrink joints:
	C2LJoint, \varnothing 90-630 mm

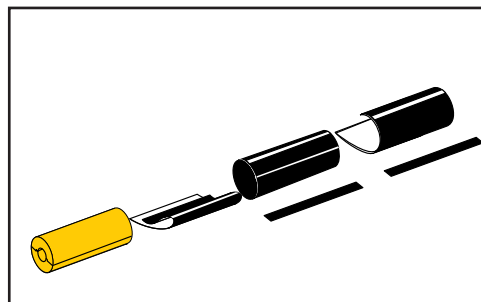
The Bonded Single Pipe

Casing joints - C2LJoint with insulation shells

Application

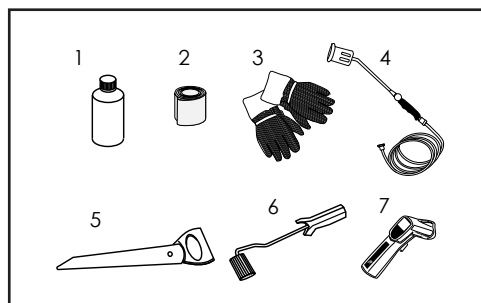
C2LJoints are used, when there is not enough space to pre-install a shrink joint, e.g. where two short bends are used immediately after each other or as a repair joint. C2LJoint are as a standard used with insulation shells for outer casing dimensions \varnothing 90-630 mm.

As for connection of alarm wires, see LOGSTOR Detect.



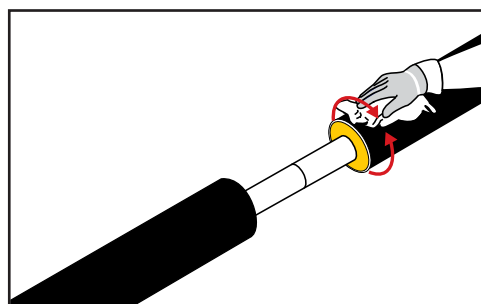
Tools

1. Alcohol, min. 93%
2. Emery cloth:
Grain size 36-40: \varnothing 90-630 mm
3. Gloves
4. Gas burner:
 \varnothing 50 mm: \varnothing 90-280 mm
 \varnothing 60 mm: \varnothing 315 - 630 mm
5. Saw
6. Roller
7. Temperature measuring device



Cleaning

1. All surfaces in the mounting area must be CLEAN and DRY.

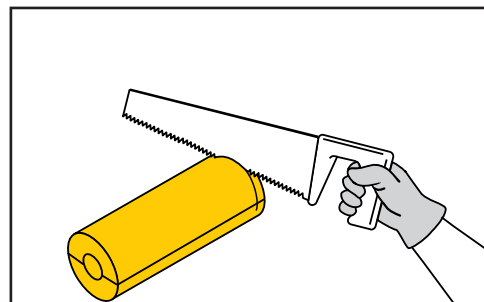


The Bonded Single Pipe

Casing joints - C2LJoint with insulation shells

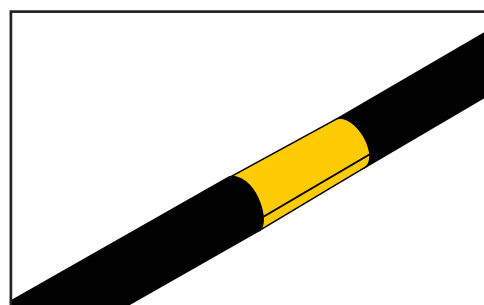
Adjusting insulation shells

2. Shorten the insulation shells to make them fit tightly between the casing pipes.



3. Fit the insulation shells tightly between the casing pipes, using adhesive tape if required. All surfaces must be CLEAN and DRY.

Afterwards clean the casing surfaces with alcohol.

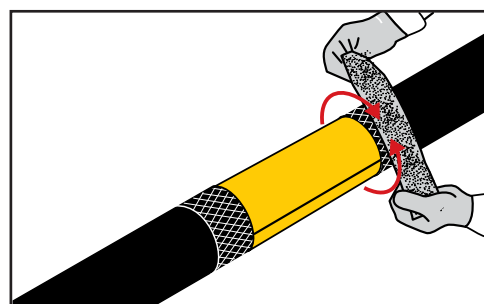


Activation

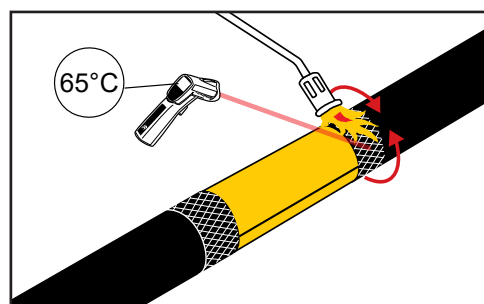
4. Grind the contact surfaces of the shrink sleeve and wrap with emery cloth, so grind marks are visible 30 mm outside the rim. (This enables visual control of the grinding by the inspection).

Remove grind dust.

Avoid touching the ground contact surfaces.



5. Activate the contact surfaces with gas burner to a surface temperature of min. 65°C.



The Bonded Single Pipe

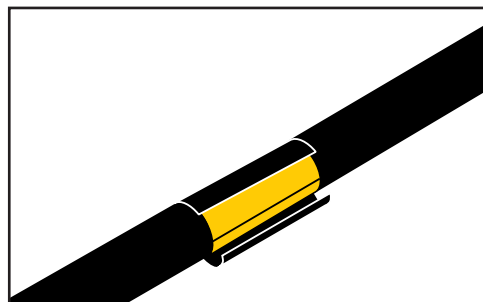
Casing joints - C2LJoint with insulation shells

Installing shrink film

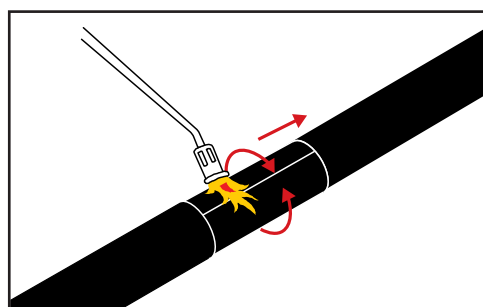
6. Centre the shrink film on the joint and place it around the pipe.

Attach one edge of the shrink film in the "10 o'clock" position.

Pull the film around the pipe by removing the adhesive paper so that the film adheres to the surface beneath it.



7. Heat the whole film from the centre towards the sides, ensuring that the shrink film is tightly fitted.



Installing shrink sleeve

8. Remove the packaging from the shrink sleeve.

Check that the sleeve is DRY and CLEAN inside and out.

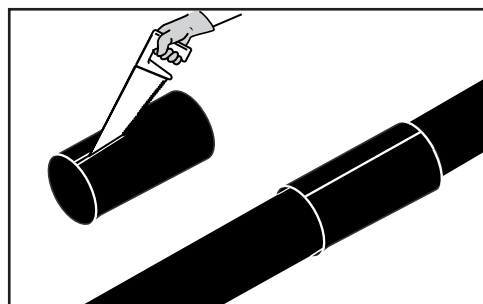
Open the shrink sleeve by cutting it longitudinally.

Clean the sleeve with alcohol.

Degrease the closure patch with alcohol. Now place the shrink sleeve over the joint.

Centre the shrink sleeve on the joint.

The longitudinal cut of the sleeve must be on the top and its edges must adjoin.



The Bonded Single Pipe

Casing joints - C2LJoint with insulation shells

Installing shrink sleeve, continued

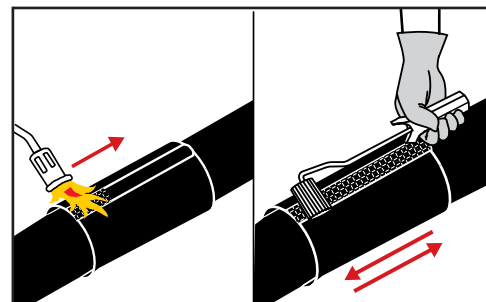
9. Centre the closure patch on the shrink sleeve cut with the hotmelt facing downwards. The side with the hotmelt has visible reinforcement.

Heat the closure patch until the structure of reinforcement becomes visible on the topside.

Press down the closure patch.

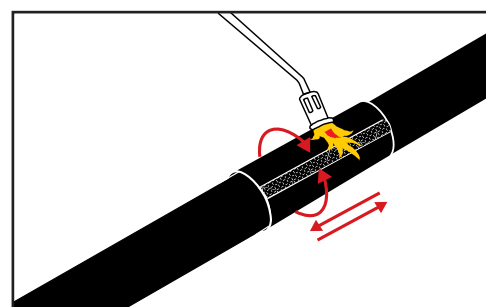
Then roll on the closure patch with the roller to ensure a good adhesion.

Alternatively, a patch press or a clean cloth may be used.



10. If necessary, turn the sleeve, so that the closure patch is in a "10 o'clock position".

Shrink the sleeve with longitudinal sweeping movements from one end to the other.

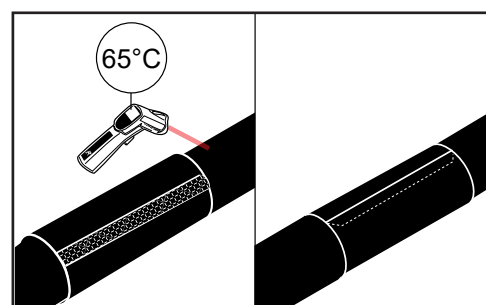


Installing shrink wrap

11. Check the activation temperature of the contact surfaces prior to installing the shrink wrap. The temperature must be min. 65°C.

Remove the protective foil from the shrink wrap, while pulling the wrap into position. Make sure that the text on the wrap encircles the pipe and that the wrap closes at the top.

The wrap must fit loosely around the pipe with an overlap of min 50 mm.

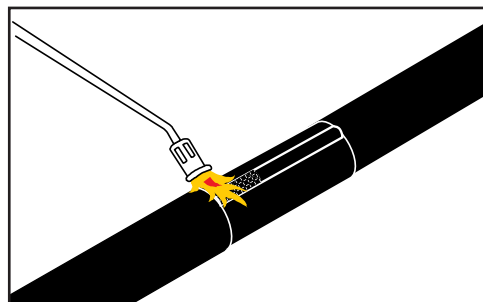


The Bonded Single Pipe

Casing joints - C2LJoint with insulation shells

Installing shrink wrap, continued

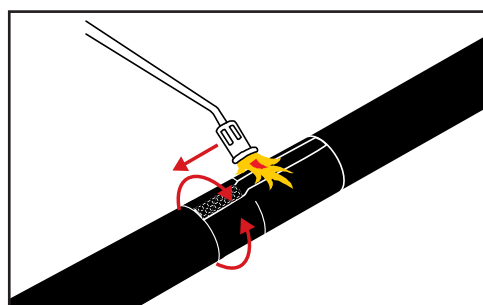
12. Centre the closure patch right above the wrap seam. Fasten as described under item 9.



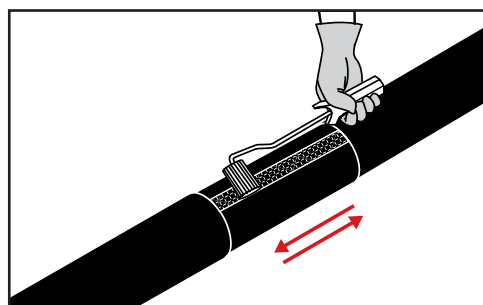
13. Shrink the wrap from the centre towards the ends.

Shrink until the mastic becomes visible at all edges and the entire wrap adheres to the underlying surface.

After shrinkage the surface structure of the shrink wrap must be smooth and the green heat indicators must be heated, until they disappear.

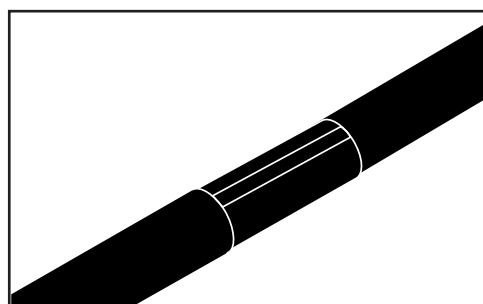


14. Lightly roll along the overlapping edge, ensuring that any tunnel at the edge is sealed with mastic.



Finished joint

15. The joint is complete.



The Bonded Single Pipe

Directional changes - Overview

Introduction	This sections contains rules for carrying out directional changes by mean of the SXB-WPJoint and curves.
Contents	<ul style="list-style-type: none">SXB-WPJointCurved pipesUtilizing elastic curves

The Bonded Single Pipe Directional changes - SXB-WPJoint

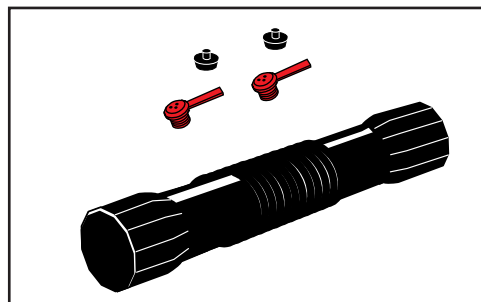
Application

SXB-WPJoints are used for casing dimensions \varnothing 90-315 mm in bending angles 0-90°.

As for connection of alarm wires see LOGSTOR Detects

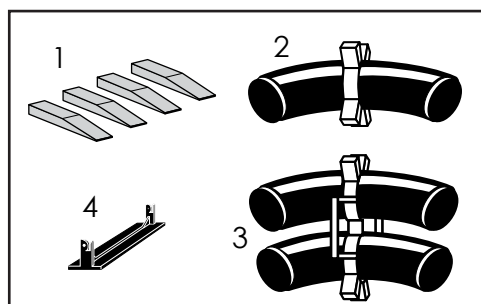
Foam pack:

- size, see foam pack folder
- more information, see Insulating joints



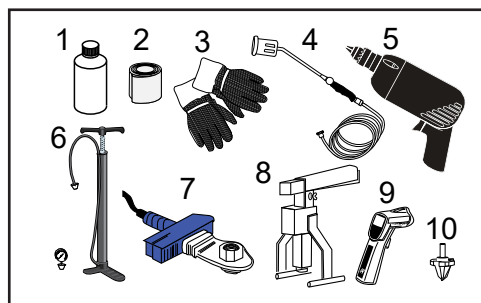
Accessories

1. Big/small wooden wedges
2. SXB-WP steel elbow
3. SXB-WP steel elbow for TwinPipe
4. Wire holders



Tools

1. Alcohol, min. 93%
2. Emery cloth:
Grain size 36-40: \varnothing 90-315 mm
Grain size 60 for flexible pipes
3. Gloves
4. Gas burner:
 \varnothing 50 mm: \varnothing 90-280 mm
 \varnothing 60 mm: \varnothing 315 mm
5. Drilling machine with a \varnothing 35 mm conical mill bit
6. Leakage test equipment
7. Plug welding tool
8. Retaining tool for weld plug
9. Temperature measuring device
10. Conical drill bit

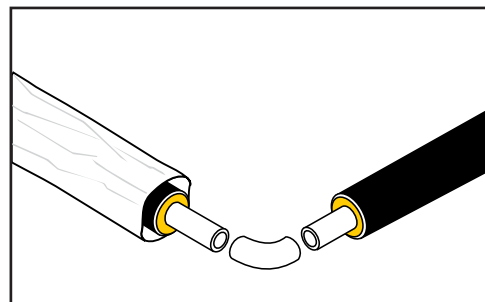


The Bonded Single Pipe

Directional changes - SXB-WPJoint

Preparations

1. Place the bend sleeve with packing on one of the pipes.

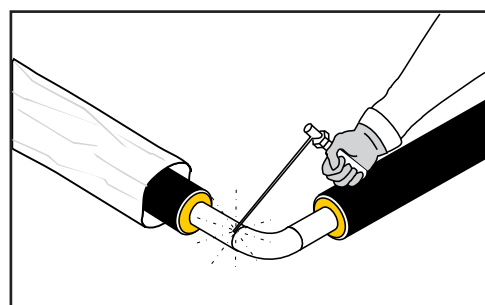


Weld elbow

2. Cut the steel elbow at the wanted angle and weld it in between the two pipe ends.

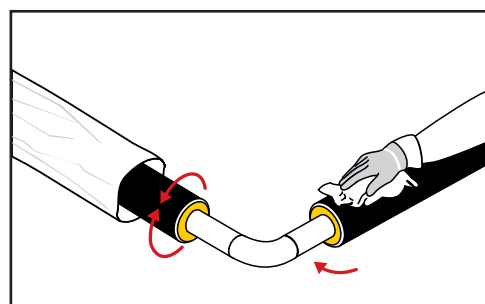
TwinPipe: It is important to mount the two steel elbows parallel to each other.

Important: Use only special steel elbow from LOGSTOR.



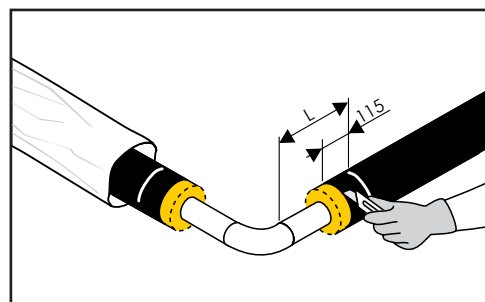
Cleaning

3. All surfaces must be CLEAN and DRY.
Clean with alcohol.



Marking and adjustment

4. Measure from the welds and mark the length L clearly on both casing pipes.
L is found in the table for the relevant series on the last pages of this section.
Measure 115 mm back from the marking L and cut off insulation.



The Bonded Single Pipe Directional changes - SXB-WPJoint

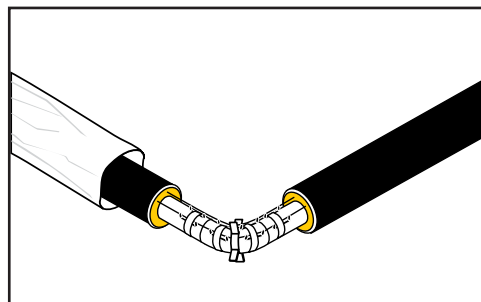
Alarm wires

5. Place the spacer in the middle of the bend to ensure correct centering of the service pipe in the foam. The beveled edge must face the bend sleeve.

6. Place the wire retainers and the alarm wires in 12 and 2 o'clock position on the outside of the service pipe as stated in the LOGSTOR Detect section under "Connecting alarm wires"

Make sure the wires are not in contact with the service pipe.

Take care not to damage or displace the alarm wires, when positioning the sleeve.



Activation

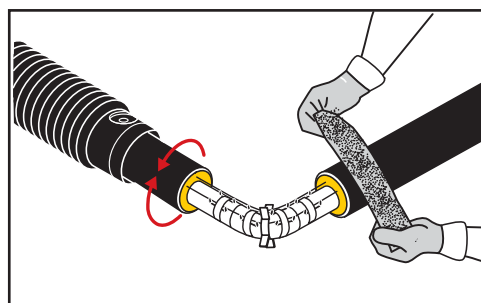
7. Remove the packaging from the shrink sleeve. Leave the packing foil on the outer casing for later use as a shield against strong sunlight and during foaming of the sleeve.

Check that the sleeve is DRY and CLEAN inside and out.

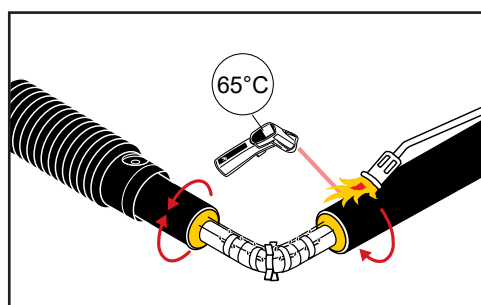
Grind the contact surfaces with emery cloth, so grind marks are visible 30 mm outside the sleeve rim (This enables visual control of the grinding by the inspection).

Remove grind dust, if any.

Avoid touching the ground surfaces.



8. Activate the contact surfaces with a gas burner to a surface temperature of min. 65°C.



The Bonded Single Pipe

Directional changes - SXB-WPJoint

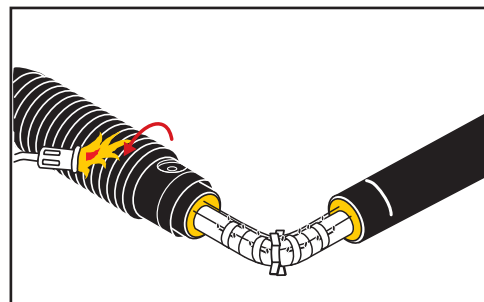
Preheating

9. Heat the corrugation with a gas burner.

Avoid heating on the smooth ends.

Continue until the corrugation is so flexible that it can easily be compressed manually.

Extend it again.

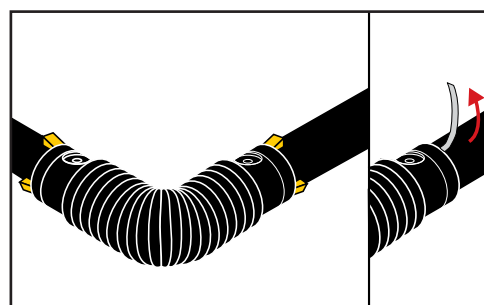


Positioning bend joint

10. Place the sleeve above the elbow with the the ends at the marks. Pull and push the sleeve around the elbow. Press the corrugation opposite the spacer if it gets stuck. Be careful not to damage or displace the alarm wires, if any.

Check that the foaming holes are not covered by the outer casing.

Place the wedges under the ends of the sleeve to ensure centering. Take care not to damage the foil on the mastic in the sleeve. Let the bend cool down, until it is stiff. Remove wedges and covering from the sleeve ends.



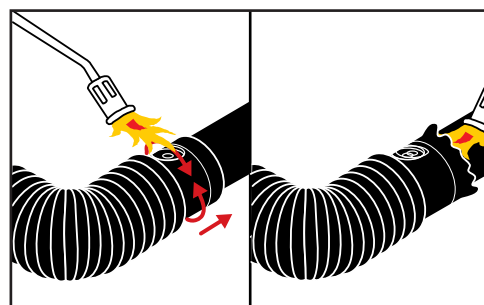
Shrinkage

11. Shrink the end of the sleeve so that it reaches the mark.

Start shrinking from the foam hole towards the end of the sleeve.

Before shrinking the end completely, activate the outer casing.

Repeat with the other end of the sleeve.



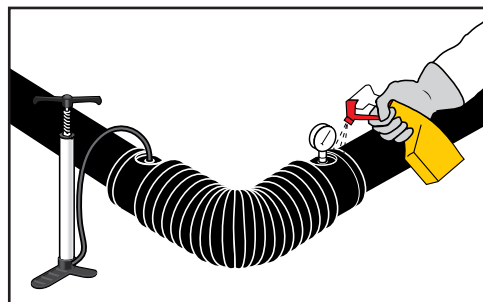
The Bonded Single Pipe

Directional changes - SXB-WPJoint

Leakage test

12. Wait until the sleeve has cooled off to lukewarm.

Leakage test at 0.2 bar and test the ends with a soap solution.



Foaming

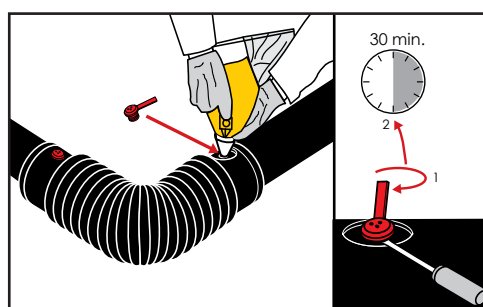
13. Pull the packaging foil back onto the sleeve and make a hole in the foil and install a venting plug in one hole and foam the sleeve through the other hole. Install the other venting plug.

14. 10 minutes after foaming the venting plug can be turned half round what facilitates the later removal of the venting plug.

Wait min. 30 min. for degassing to complete.

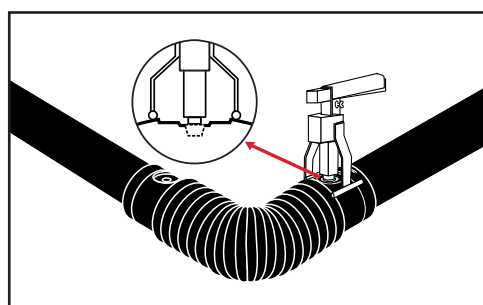
Remove the venting plugs.

Remove excess foam or spillage, if any.



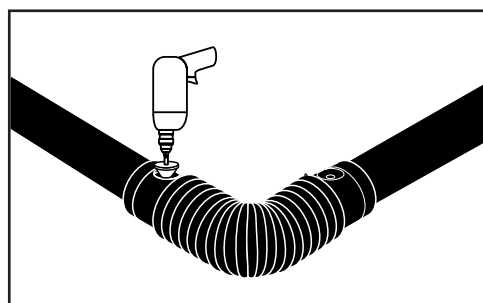
Weld plug

15. Adjust the retaining tool to the rim of the hole.



16. Mill the plug hole with a $\varnothing 35$ mm conical drill bit.

Remove any milling residues.



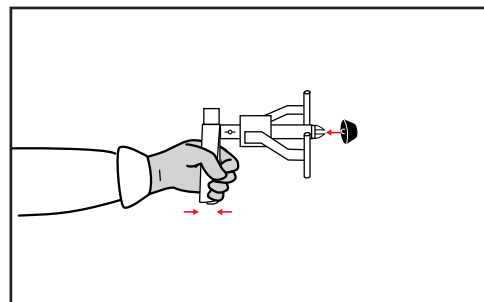
The Bonded Single Pipe

Directional changes - SXB-WPJoint

Weld plug, continued

17. Clean the rim and the casing surface around the hole with alcohol.

Insert the weld plug in the retaining tool and clean with alcohol.

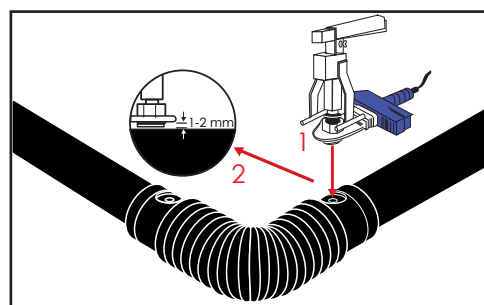


18. Heat the socket welder to 250°C.

19. Place the weld plug in the conical hole of the socket welder.

Keep it under light pressure, until the rim of the plug starts to form a bead.

Now place the opposite side of the tool in the foam hole.

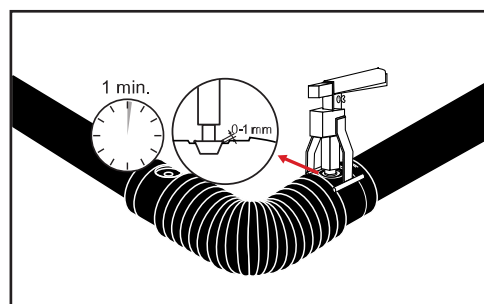


20. Remove the socket welder and immediately press the weld plug into the hole, until the legs rest on the casing and the upper rim of the plug is flush with the casing rim around the foaming hole (max. approx. 1 mm above).

Hold the pressure constant at least 1 minute, until the welding zone has cooled down to handwarm, before the retaining tool is removed.

There has to be a visible bead.

Repeat the process with the other plug.



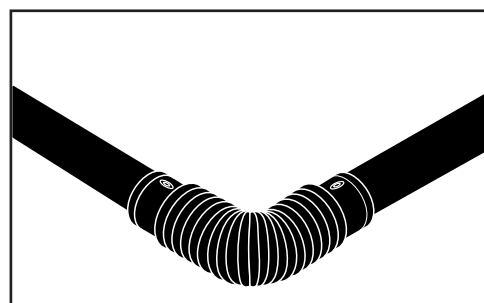
Finished joint

21. The joint is complete.

Visual inspection:

No visible finger marks at the end of the casing joint.

Visible grinding marks outside the casing joint.



The Bonded Single Pipe

Directional changes - SXB-WP Joint

Marking length, Single pipe, series 1

Casing pipe ø out. mm	Bend angle						
	0°	15°	30°	45°	60°	75°	90°
90	430	410	390	370	350	330	310
110	445	425	405	385	365	345	325
125	445	425	405	385	360	335	310
140	445	420	395	370	345	330	310
160	485	460	430	400	385	370	350
200	480	455	430	405	390	370	360
225	485	460	430	400	385	370	350
250	485	460	430	400	385	370	360
315	610	565	520	470	435	400	360

Marking length, Single pipe, series 2

Casing pipe ø out. mm	Bend angle						
	0°	15°	30°	45°	60°	75°	90°
110	445	425	405	385	365	345	325
125	445	425	405	385	360	335	310
140	445	420	395	370	345	330	310
160	445	420	395	370	345	330	310
180	445	425	405	385	365	345	320
225	485	450	415	395	375	355	335
250	485	460	430	400	385	370	350
280	560	525	490	450	420	390	360

Marking length, Single pipe, series 3

Casing pipe ø out. mm	Bend angle						
	0°	15°	30°	45°	60°	75°	90°
125	445	430	410	390	370	350	330
140	445	425	405	385	365	345	320
160	445	420	395	370	345	320	310
180	610	560	510	460	420	380	340
200	445	425	405	385	365	345	320
250	485	450	415	395	375	355	335
280	610	560	510	460	420	380	340
315	560	525	490	450	420	390	360

The Bonded Single Pipe

Directional changes - SXB-WPJoint

Marking length, TwinPipe, series 1

Casing pipe ø out. mm	Bend angle						
	0°	15°	30°	45°	60°	75°	90°
125	445	425	405	385	365	345	320
140	445	425	405	385	365	345	320
160	445	425	405	385	360	335	310
200	480	455	430	405	390	370	350
225	485	450	415	380	370	360	345
250	445	425	405	385	365	345	320
315	610	570	530	485	450	410	370

Marking length, TwinPipe, series 2

Casing pipe ø out. mm	Bend angle						
	0°	15°	30°	45°	60°	75°	90°
140	445	425	405	385	365	345	320
160	445	425	405	385	365	345	320
180	480	455	430	405	390	370	350
225	480	455	430	405	390	370	355
250	485	450	415	380	370	360	345
280	610	565	520	475	430	390	350

Marking length, TwinPipe, series 3

Casing pipe ø out. mm	Bend angle						
	0°	15°	30°	45°	60°	75°	90°
160	445	425	405	385	365	345	320
180	480	455	430	405	390	370	350
200	480	455	430	405	390	370	350
250	485	455	430	405	390	370	355
280	610	570	530	485	450	410	370
315	610	565	520	475	430	390	350

The Bonded Single Pipe

Directional changes - Installing curved pipes

Curved pipes

Preinsulated pipes in dimensions \varnothing 76.1-610.0 mm are delivered from our production plant bent to the project requirements.

When ordering state the required angular deviation each 12/16 m from the centre line of the trench.

In some cases more curved pipes are necessary to obtain the required angle. This will appear from the pipe drawing.

Information from the label of the curved pipe

From the label on the curved pipe the design radius appears.



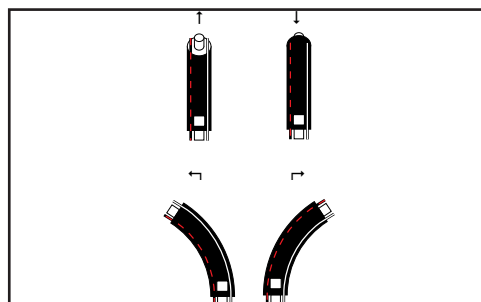
Installation instructions, Positioning of alarm wire

In relation to surveillance wires it will appear from the label whether the pipe is bent

- ↑ up
- ↓ down
- ← left
- right

The direction is defined on the basis of the pipe position where tinned wires are always to the right and bare copper wires to the left.

This refers to the symbols of the surveillance diagram; full-drawn and dotted line respectively



The Bonded Single Pipe

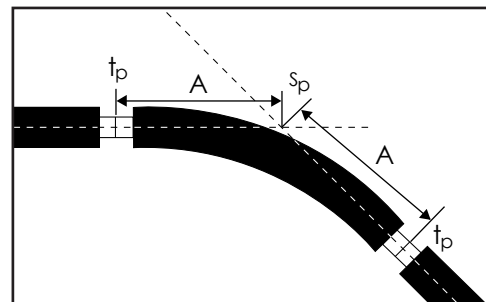
Directional changes - Installing curved pipes

Marking curved pipe

To ensure that the trench of the pipe system is correctly designed the point where the tangents of the curved pipe intersect can be marked in the system drawing and on site respectively.

In practice this means that the casing joints are placed at point t_p in the system drawing.

The distance A from the point where the tangents intersect s_p to the tangent point t_p is marked to place the joints correctly.



The distance A is calculated after the following formula:

$$A = R_p \cdot \tan \left(\frac{V_p}{2} \right)$$

where

R_p : Design radius

V_p : Design/bending angle

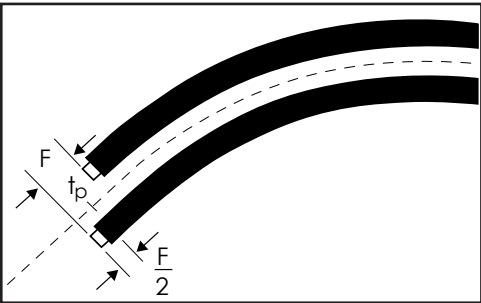
Flow and return pipe are usually bent in the same angle, because for minor dimensions the deviations are in practice without significance for the installation.

The Bonded Single Pipe

Directional changes - Installing curved pipes

Marking curved pipe, continued

In connection with major dimensions and angles it may be appropriate to mark the displaced ends of the flow and return pipe, so the pipe curves have the same distance to each other in the curve.



The displacement measurement (F) is determined as:

$$F = \frac{(D + A) \cdot V_p}{115}$$

where

D: Outer casing diameter

A: Distance between outer casings

Vp: Design/bending angle

Adjustment "Elastic curves"

If the radius of the trench and that of the delivered curved pipes differ, an adjustment is obtained in accordance with the table of elastic radius/angle.

Elastic curves

d mm	Angle over 12 m °	Angle over 16 m °
76.1	18	24
88.9	15	21
114.3	12	16
139.7	9.8	13
168.3	8.2	11
219.1	6.3	8.4
273.0	5.0	6.7
323.9	4.2	5.7
355.6	3.9	5.2
406.4	3.4	4.5
457.0	3.0	4.0
508.0	2.7	3.6
610.0	2.3	3.0

The Bonded Single Pipe

Directional changes - Installing curved pipes

Example of adjustment

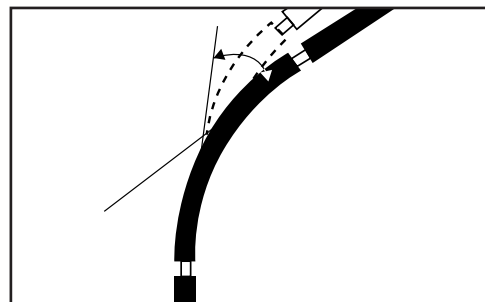
Trench. excavated with an angle of 32° .

Ordered curved pipe: $\varnothing 168.3$ right curve 36°

Elastic angle for $\varnothing 168.3 = 7^\circ$ - the curves can be adjusted or bent additionally.

The curved pipes are welded together with straight lengths on each side.

Do not forget the displacement measurement at each end of the curve (calculated at 32°).

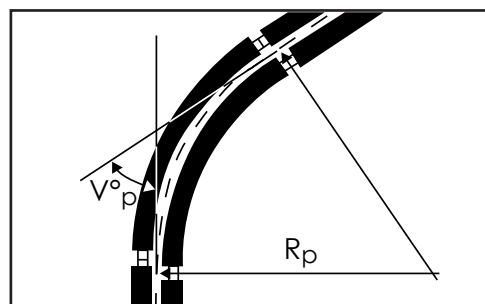


During installation the curves absorb the 4° difference from delivered to actual angle.

R_p : Design radius in m to the centre line of the trench.

v°_p : Design angle.

Contact LOGSTOR's technicians. if the difference is larger than the surrounding elastic angles.



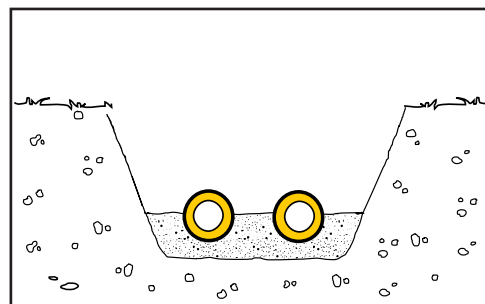
Backfilling with thermal prestressing

When installing curved pipes, the trench is backfilled and the surrounding sand compressed like is the case with straight pipe lengths.

If curved pipes are used in pipe runs, which require thermal prestressing, i.e. in open trench, it must be ensured that the pipes do not deflect in the curves.

1. Half-filling of trench

- straight pipe runs
- no vertical changes

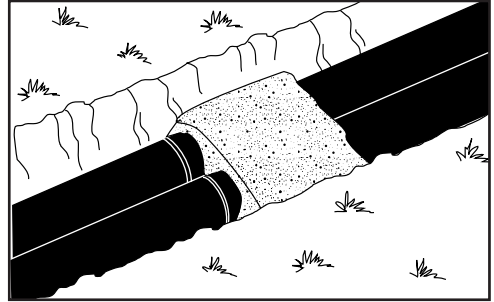


The Bonded Single Pipe

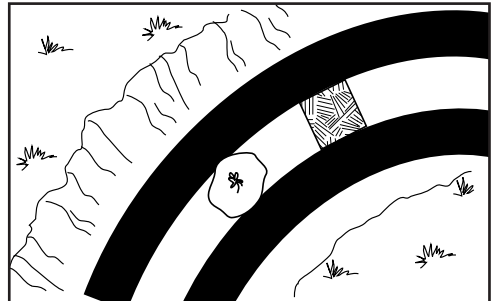
Directional changes - Installing curved pipes

Backfilling with thermal prestressing, continued

2. Sporadic filling
 - straight pipe runs
 - vertical changes



3. Control in the curve
 - Styrofoam blocks or air cushions
 - Sand bags. Alternatively, fill the outside of the curve half with sand



The Bonded Single Pipe

Directional changes - Utilizing elastic radius

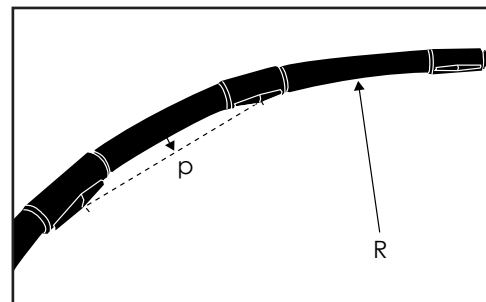
Application

Pipes can be installed as elastic curves in road curves with large radii of curvature in accordance with the values in the table (max. bend stress = 210 N/mm²).

$R_{\text{min allowable}}$ is 500 x the steel pipe outer diameter.

Weld the pipes together into one straight section and then install them in a curved trench.

Note! The natural elasticity of the pipes may also be used for small adjustments in connection with other pipe systems e.g. curved pipes.



Elastic radius

d mm	Min. allowable radius m	Angle over 12 m °	Angle over 16 m °
26.9	13.5	51	
33.7	16.9	41	
42.4	21.2	32	
48.3	24.2	28	
60.3	30.2	23	
76.1	38.1	18	
88.9	44.5	15	
114.3	57.2	12	16
139.7	69.9	9.8	13
168.3	84.2	8.2	11
219.1	110	6.3	8.4
273.0	137	5.0	6.7
323.9	162	4.2	5.7
355.6	178	3.9	5.2
406.4	203	3.4	4.5
457.0	229	3.0	4.0
508.0	254	2.7	3.6
610.0	305	2.3	3.0

The Bonded Single Pipe

Directional changes - Utilizing elastic radius

Angular displacements are found by:

$$V = \frac{180 \cdot L}{R \cdot \pi}$$

Where:

V = Angular displacement in °

L = Length in mm

R = Actual radius in mm

p = 3.14

The arc height of a given curve is found by:

$$P = R - R \cdot \cos\left(\frac{V}{2}\right)$$

Where:

P = Arc height

The Bonded Single Pipe Branches - Overview

Introduction	<p>This section contains instructions for the installation of the branch joints and fittings which are included in standard pipe systems.</p> <p>As for installation of TSJoint branch and BandJoint branch Flextra, see Weld Joint Manual.</p>
Contents	<p>Reinforcement plate</p> <p>45° BandJoint or 90° parallel branch</p> <p>SXT-WPJoint</p> <p>Hot tapping</p> <p>Adaptor pipe</p>

The Bonded Single Pipe Branches - Reinforcement plate

Application

In connection with branch fittings it may be necessary to reinforce the main pipe when making cut outs for branches e.g. when the branch dimension is one or two dimensions smaller than the main pipe dimension.

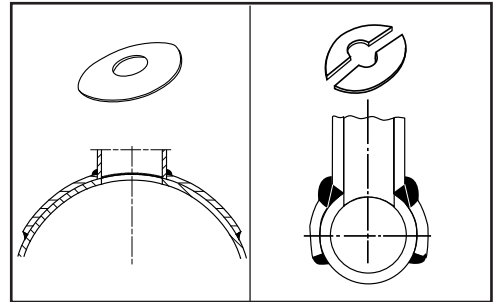
This must appear from the design drawing, see the Design Manual.

In case of doubt please contact a LOGSTOR technician.

Description

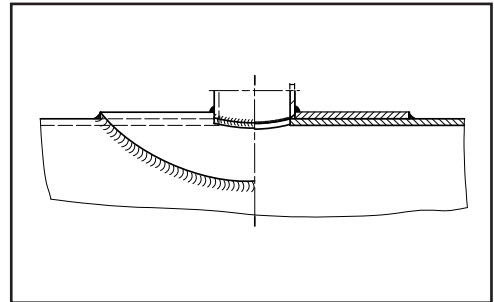
LOGSTOR supplies reinforcement plates, adjusted to relevant combinations of main pipe and branch pipe. See Product Catalogue.

The reinforcement plate is either one plate or - when the curvature of the plate exceeds the center line of the pipe - 2-part.



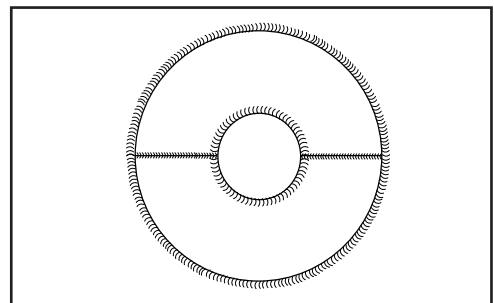
Welding on the reinforcement plate

The purpose of the reinforcement plate is to reinforce the main pipe.



The reinforcement plate must be fully welded to the main pipe and the branch.

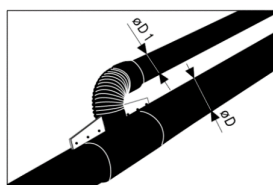
The parts of a 2-part reinforcement plate must be welded together.



The Bonded Single Pipe Branches - 45° BandJoint or 90° parallel branch

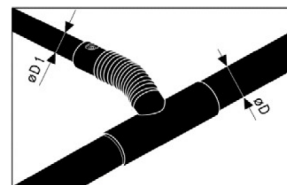
Installing con-
necting piece for
T-joint

SXT-WPJoint

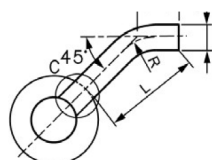


øD: 90-315
øD1: 77-200

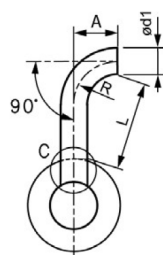
TSJoint/BandJoint Flextra



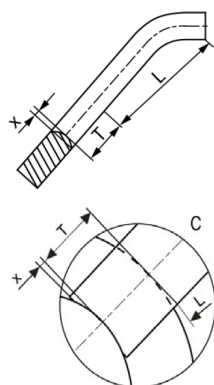
øD: 125-450
øD1: 90-160



Branch	ød1	20/25	28	26,9	33,7	42,4	48,3	60,3	76,1	88,9	114,3
		R	A	125	160	140	140	140	150	190	222
SXT-WPJoint 45°	L	320	320	320	320	320	320	370	370	380	380
TS / BandJoint Flextra 45°	L	320	320	320	320	320	320	350	370	380	-



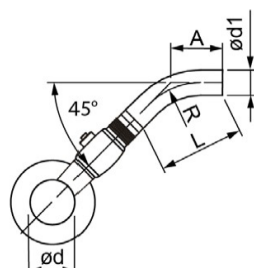
Branch	ød1	20/25	28	26,9	33,7	42,4	48,3	60,3	76,1	88,9	114,3
		R	A	125	160	140	140	140	150	190	222
SXT-WPJoint 90°	L	270	280	280	280	290	300	310	320	350	360
TS / BandJoint Flextra 90°	L	250	250	250	250	250	250	250	320	350	-



ød1	20/25	28	26,9	33,7	42,4	48,3	60,3	76,1	88,9	114,3
33,7	3	5	4							
42,4	2	4	3	6						
48,3	-	3	3	5	9					
60,3	-	2	2	4	6	9				
76,1	-	-	-	3	5	7	11			
88,9	-	-	-	2	4	6	9	17		
114,3	-	-	-	-	3	4	7	12	18	
139,7	-	-	-	-	3	3	6	9	13	25
168,3	-	-	-	-	2	3	5	8	11	19
219,1	-	-	-	-	-	2	3	6	8	14
273	-	-	-	-	-	-	3	-	-	-
323,9	-	-	-	-	-	-	2	-	-	-

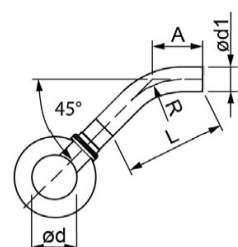
The Bonded Single Pipe Branches - 45° BandJoint or 90° parallel branch

Installing connect-
ing piece and hot
tapping



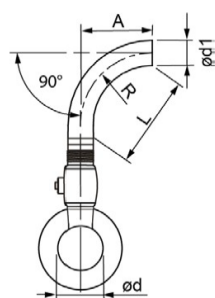
Danfoss hot tapping 45°

Branch	ød1	26,9	33,7	42,4	48,3	60,3	76,1	88,9	114,3
R	140	140	140	140	150	190	222	170	
A	100	100	90	90	160	145	120	123	
SXT-WPJoint 45°	L	230	230	230	200	250	230	250	190
TS / BandJoint Flextra 45°	L	200	200	200	200	210	230	250	-



Tonisco hot tapping 45°

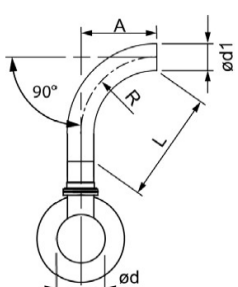
Branch	ød1	26,9	33,7	42,4	48,3	60,3	76,1	88,9	114,3
R	140	140	140	140	150	190	222	170	
A	100	100	90	90	160	145	120	123	
SXT-WPJoint 45°	L	-	240	240	240	280	280	300	300
TS / BandJoint Flextra 45°	L	-	230	250	250	270	280	300	-



Danfoss hot tapping 90°

Branch	ød1	26,9	33,7	42,4	48,3	60,3	76,1	88,9	114,3
R	140	140	140	140	150	190	222	170	
A	100	100	90	90	160	145	120	123	
SXT-WPJoint 90°	L	200	200	220	200	215	*245	235	210
TS / BandJoint Flextra 90°	L	190	190	190	190	200	*245	235	-

*) Important: The free ends of the branch ø76,1/140 (series 1) are shortened 50 mm to 170 mm



Tonisco hot tapping 90°

Branch	ød1	26,9	33,7	42,4	48,3	60,3	76,1	88,9	114,3
R	140	140	140	140	150	190	222	170	
A	100	100	90	90	160	145	120	123	
SXT-WPJoint 90°	L	-	230	230	230	230	*280	280	280
TS / BandJoint Flextra 90°	L	-	200	200	200	210	*280	280	-

*) Important: The free ends of the branch ø76,1/140 (series 1) are shortened 50 mm to 170 mm

The Bonded Single Pipe Branches - SXT-WPJoint

Application

SXT-WPJoints are used to branch from outer casing dimensions \varnothing 90-315 mm.

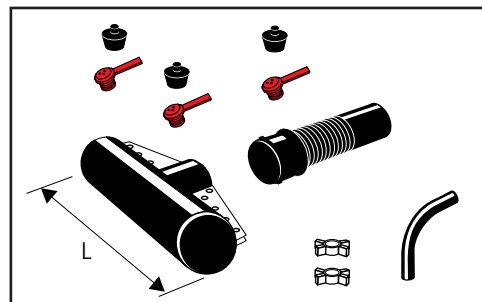
Max. casing dimension of branch:

\varnothing 200 mm.

As for connection of alarm wires, see LOGSTOR Detect.

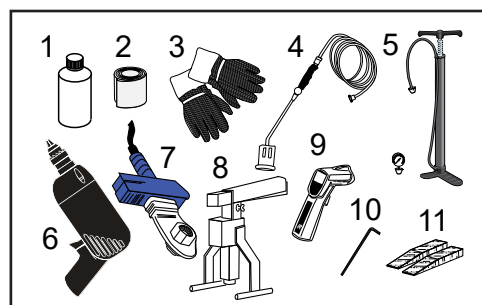
Foam packs:

- size, see foam pack folder
- more information see Insulating joints



Tools

1. Alcohol, min. 93%
2. Emery cloth
Grain size 36-40: \varnothing 90-315 mm
3. Gloves-
4. Gas burner
 \varnothing 50 mm: \varnothing 90-280 mm
 \varnothing 60 mm: 315 mm-
5. Leakage test equipment
6. Drilling machine with a \varnothing 35 mm conical mill bit
7. Plug welding tool
8. Retaining tool for weld plug
9. Temperature measuring device
10. Allen key
11. Wooden wedges

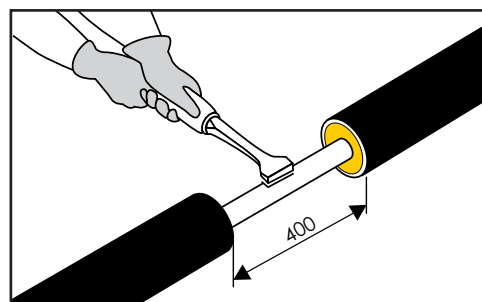


Preparations for branch

1. Cut off max. 400 mm of the casing pipe and insulation.

Mind the alarm wires.

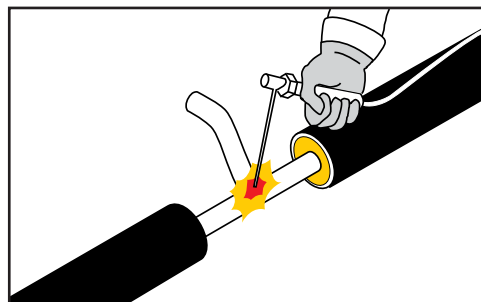
Clean the service pipe of excess insulation.



The Bonded Single Pipe Branches - SXT-WPJoint

Welding on the branch

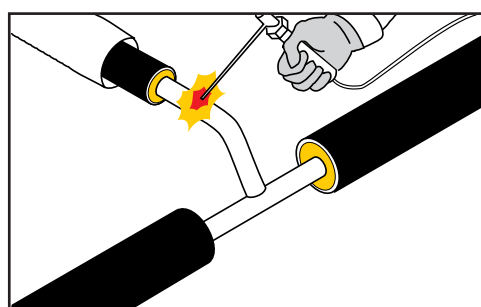
2. Adjust the length of the branch pipe piece according to the installation instruction for it and weld it onto the main pipe.



3. Place the branch sleeve with packing on the branch.

Make sure that the branch sleeve and T-shoe fits correctly.

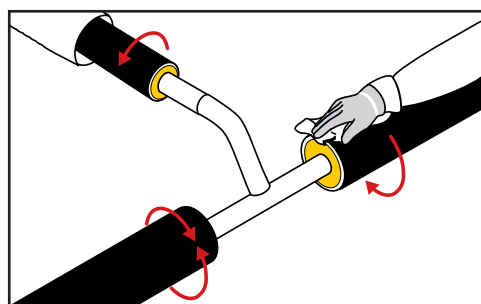
Weld the branch pipe onto the branch pipe piece



Cleaning

4. All surfaces in the connection area must be CLEAN and DRY.

Afterwards clean them with alcohol.

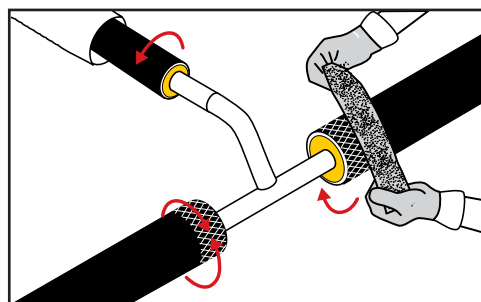


Activation

5. Grind all contact surfaces with emery cloth so grind marks are visible 30 mm outside the sleeve rim (This enables visual control of the grinding by the inspection).

Remove grind dust.

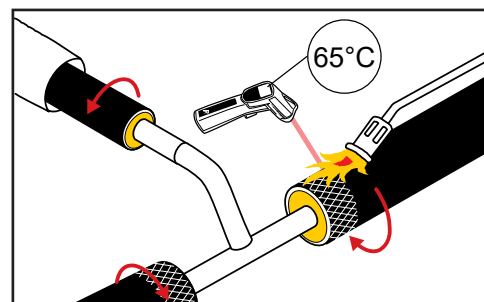
Avoid touching ground contact surfaces.



The Bonded Single Pipe Branches - SXT-WPJoint

Activation, continued

6. Activate all contact surfaces with a gas burner to a surface temperature of min. 65°C.



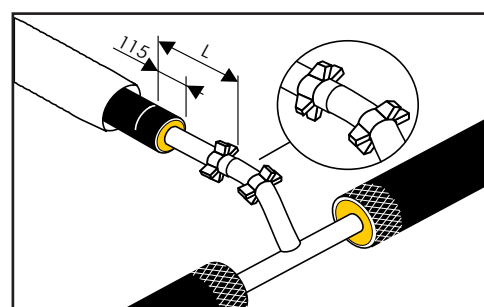
Preparing the branch

7. Place a spacer in the middle of the bend and another in the middle of the straight run of the branch.

Mark the distance L from the welding onto the branch. see below table.

To make foaming possible the free pipe ends generally have to be extended.

Measure 115 mm back from the marking L and cut off the insulation.



Marking length, series 1, 2, and 3

Main pipe ø mm	45° branch							90° branch						
	90	110	125	140	160	180	200	90	110	125	140	160	180	200
90	360							360						
110	355	315						355	335					
125	335	310	335					335	335	335				
140	335	310	330	340				335	330	335	330			
160	335	310	330	335	345			335	335	335	340			
180	-	300	330	335	345			-	350	345	345	350		
200	335	315	330	335	345			335	340	340	335	340		
225	335	315	330	330	345		330	335	340	340	340	340		350
250	335	315	330	330	345		330	335	340	340	340	340		350
280	-	310	340	345	345	335	-	-	350	345	345	350	340	-
315	335	320	335	335	345	-	330	335	340	340	340	340	-	350

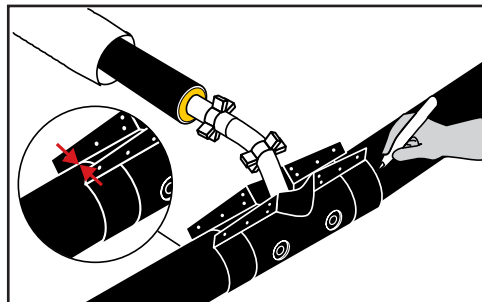
The Bonded Single Pipe Branches - SXT-WPJoint

Installing T-shoe

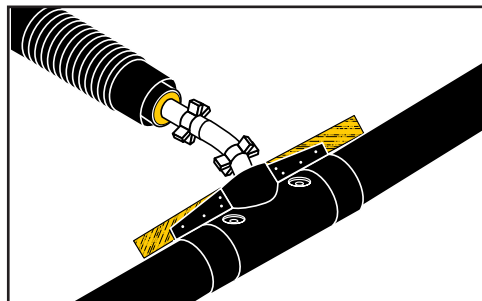
8. Remove the packing from the T-shoe. Make sure that it is **CLEAN** and **DRY** inside.

Pull it over the main pipe. Turn the holes upside.

Centre the T-shoe in relation to the branch pipe piece and mark the position of the flanges on the outer casing.



9. Insert 2 wooden wedges between the flanges over the mastic.

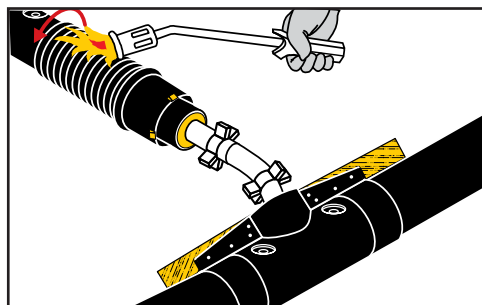


Preparing the branch sleeve

10. Remove the packing from the branch sleeve.

Heat the entire corrugation at the top and bottom with a gas burner. Do not heat the smooth ends.

Continue until the corrugation is so flexible that it can be compressed like a harmonica with the finger tips.



The Bonded Single Pipe Branches - SXT-WPJoint

Preparing the branch sleeve, continued

11. Remove the paper from the outer branch pipe piece. Remove the mastic cover from the inner T-shoe. Pull the branch sleeve over the branch pipe piece and insert the end in the opening of the T-shoe.

The foam holes on the branch must turn upside

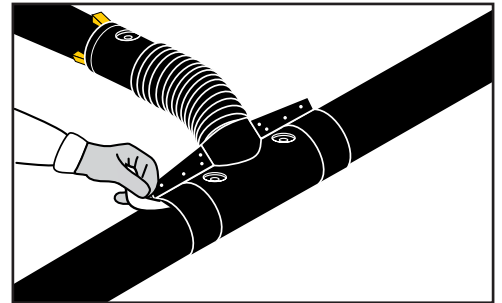
Remove the wooden wedges on the main pipe.

Remove the internal flange cover and pull the two circumferential covers outside the joint ends.

Place the ends of the branch sleeve exactly at the L-mark. Centre the sleeve with wedges.

Place the T-shoe according to the mark on the outer casing.

Mount the screws with washers and fasten the screws loosely with the fingers.



Shrinking the branch joint

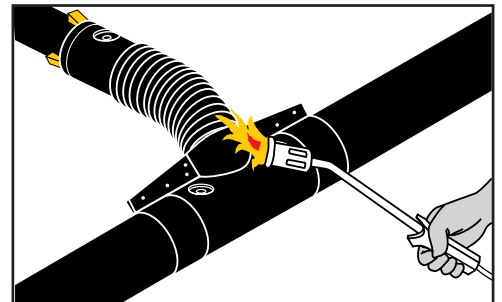
12. Shrink the T-shoe by heating the ends, flanges and collar of the shoe.

Note! Heat takes some time to penetrate and enter the mastic, which is to be softened.

Heat slowly!

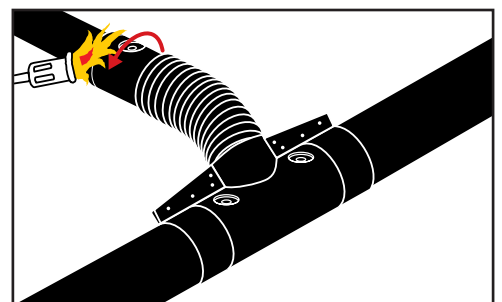
Too hard a flame may result in no or slower shrinkage.

Heat the ends and collar in turn.



13. Remove the wedges and protective foil inside the branch sleeve.

Shrink the outermost 100 mm of the sleeve.



The Bonded Single Pipe Branches - SXT-WPJoint

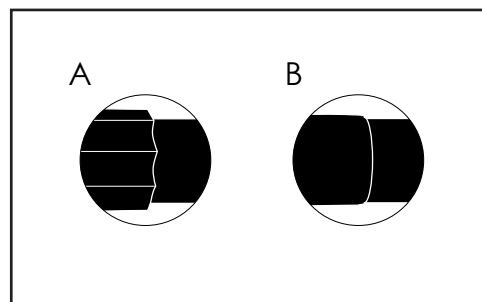
Shrinking the branch joint, continued

14. Shrink until all expansion marks have vanished and the end of the sleeve forms an almost straight encircling edge.

A. Before

B. After

Wait until the sleeve has cooled down to handwarm and tighten up the screws.

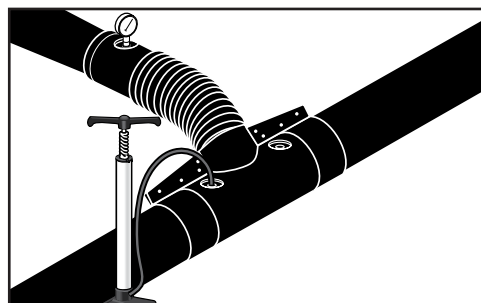


Leakage test

15. Leakage test at 0.2 bar.

Check all joints with a soap solution.

The solution must not get in contact with the plug areas.



Foaming

16. Foam the sleeve via the T-shoe.

Install the venting plugs in two of the holes and foam the sleeve through the third hole.

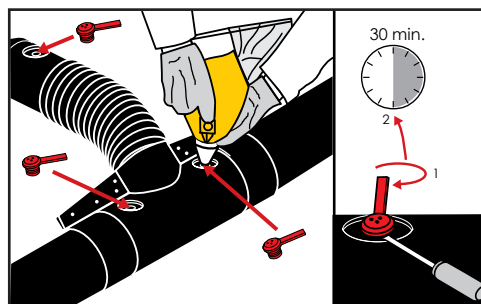
Install the last venting plug.

17. 10 minutes after foaming the venting plug can be turned half round what facilitates the later removal of the venting plug.

Wait min. 30 min. for degassing to complete.

Remove the venting plugs.

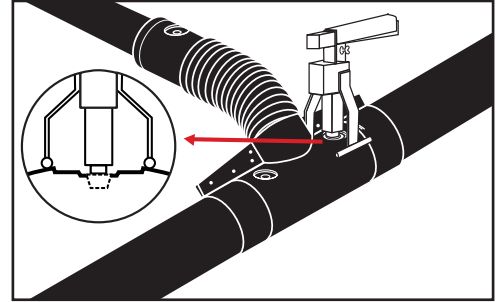
Remove excess foam or spillage, if any.



The Bonded Single Pipe Branches - SXT-WPJoint

Weld plug

18. Adjust the retaining tool to the upper rim of the hole.

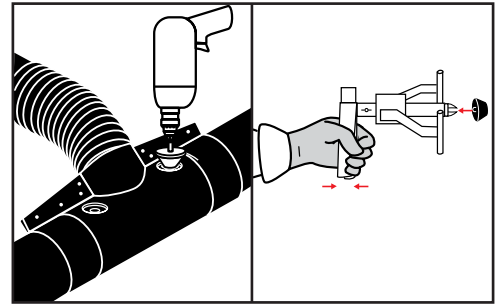


19. Drill the plug hole with a conical drill bit to clean the PE hole rim.

Clean the rim and the casing surface around the hole with alcohol.

Remove any milling residues.

Insert the weld plug in the retaining tool and clean it with alcohol.

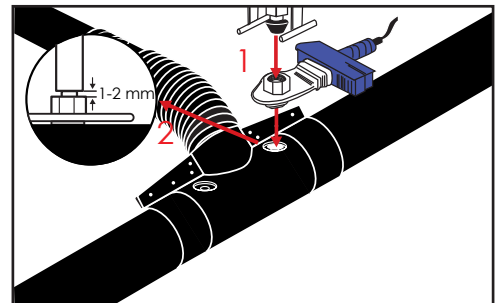


20. Heat the socket welder to 250°C.

21. Place the weld plug in the conical hole of the socket welder.

Keep it under a light pressure, until the rim of the plug starts to form a bead.

Now place the opposite side of the tool in the foam hole.



The Bonded Single Pipe Branches - SXT-WPJoint

Weld plug, continued

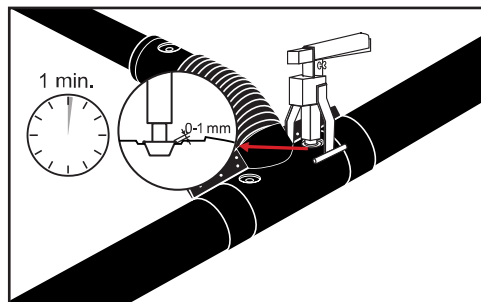
22. Remove the socket welder and immediately press the weld plug into the hole, until the legs rest on the casing and the upper rim of the plug is flush with the casing rim around the foaming hole (max. approx.

1 mm above).

Hold the pressure constant at least 1 minute, until the welding zone has cooled down to handwarm, before the retaining tool is removed.

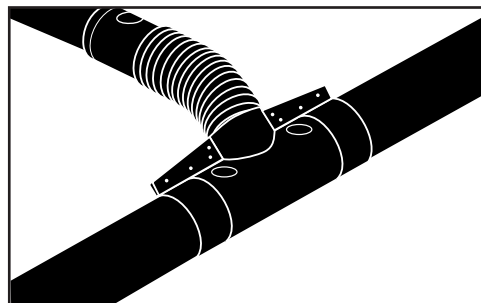
There has to be a visible bead.

Repeat the process with the other plugs in the remaining two holes.



Finished joint

23. The joint is complete.



The Bonded Single Pipe Branches - Hot tapping

**Hot tapping
valves**

Reference is made to the installation instructions of the supplier for the valve in question.

Installation instructions are available on request.

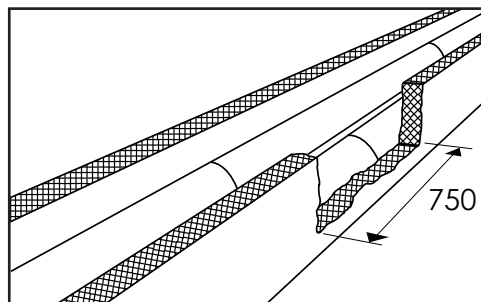
The Bonded Single Pipe Branches - Adaptor pipe

Application

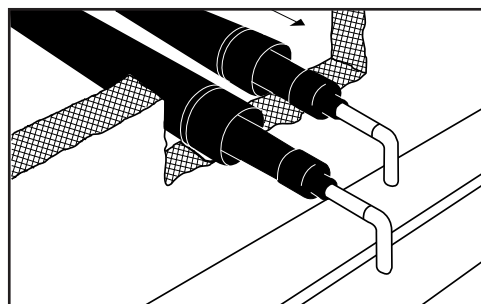
When branches are made with pipes from a concrete duct, a branch adaptor is used to ensure a watertight entry into the duct and to allow the main pipe to expand with the branch.

Branch with outer casing dimensions ø 90-140 mm

1. Make a hole in the concrete wall of approx. 750 mm where the branch will be established.



2. Pull the shrink sleeve and branch adaptor in over the branch pipe.
3. Adjust the height and length of the two branch pipes.
4. Shrink end-caps on. See section 10.3 Installation of end-cap
5. Weld the branch on to the main pipe
6. Pull the branch adaptor into position flush with the concrete wall.



It is very important to pay attention to the temperature conditions and the position of anchors to ensure that the branch can expand.

The Bonded Single Pipe Branches - Adaptor pipe

Branch with outer casing dimensions \varnothing 90-140 mm, continued

7. Pull the shrink sleeve over the end of the branch adaptor and shrink the sleeve.

Activate the contact surface of the branch and the joint with emery cloth, grain size 36-40.

Remove grind dust.

Avoid touching the ground contact surfaces.

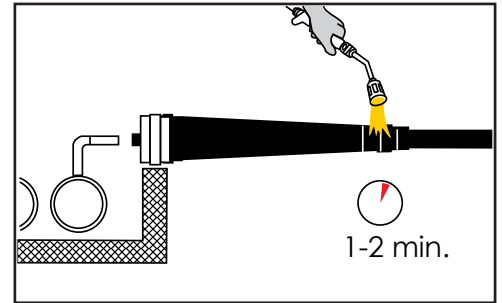
Degrease, using alcohol.

After leakage test, activate the contact surface of the collar with a gas burner to a surface temperature of minimum 65°C.

Remove the packaging and paper from the collar.

Make sure all paper has been removed.

Center the collar over the end of the casing joint and the branch pipe, and shrink it towards the branch.



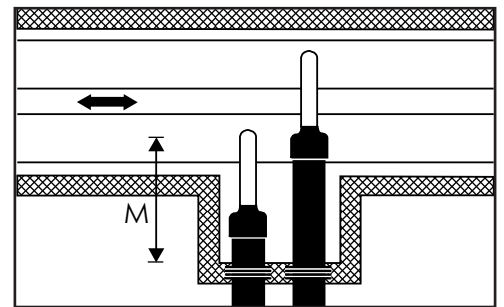
Wait 1-2 minutes before shrinking on the outer casing.

Now the installation is complete and the concrete wall can be repaired.

Branch with outer casing dimensions $> \varnothing$ 140 mm

Prior to installation, the duct is extended.

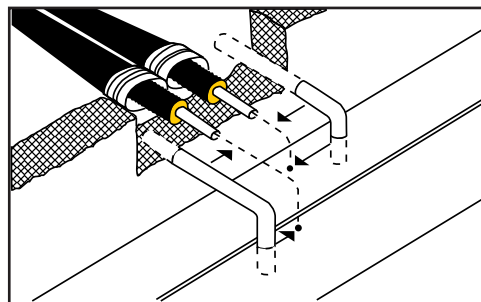
As regards installation of wall entry sleeve and installation of end-cap, see Terminations



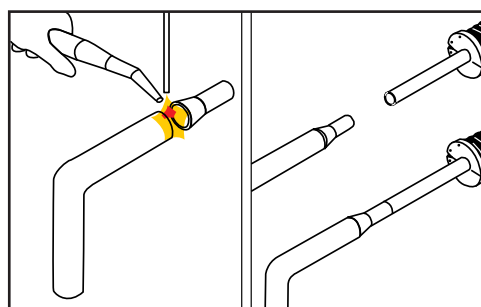
The Bonded Single Pipe Branches - Adaptor pipe

Branching with FlexPipe

1. Pull the shrink sleeve and the branch adaptor in over the branch pipe.
2. Adjust the 90° bend (200 x 300 mm) to fit horizontally and vertically in the installation. Cut the bend at right angles using a hacksaw with small saw teeth.

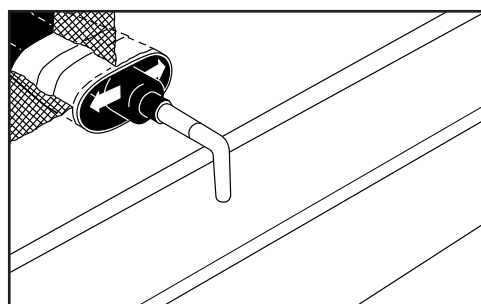


3. Weld the adjusted bend and the welding stub together.
4. Weld the bend pipe on to the reduction piece. See the FlexPipe section.
5. Shrink the end-cap on the FlexPipe end. (See Installing end-cap under Terminations section.)



6. Weld the branch on to the main pipe.
7. Pull the branch adaptor in position flush with the concrete wall.

It is very important to pay attention to the temperature conditions and the position of the anchors to ensure that the branch can expand.



The Bonded Single Pipe Branches - Adaptor pipe

Branching with FlexPipe, continued

8. Pull the shrink sleeve in over the branch adaptor end and shrink the sleeve.

Activate the contact surface of the branch and the joint with emery cloth, grain size 36-40.

Remove grind dust.

Avoid touching the ground contact surfaces.

Degrease, using alcohol.

After leakage test, activate the contact surface of the collar with a gas burner to a surface temperature of minimum 65°C.

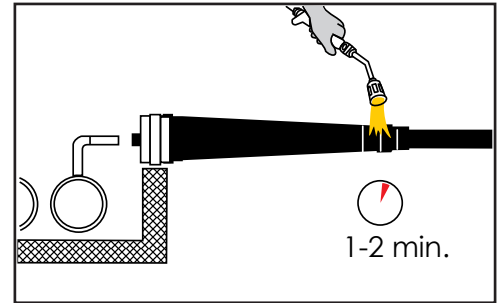
Remove the packaging and paper from the collar.

Make sure all paper has been removed.

Center the collar over the end of the casing joint and the branch pipe, and shrink it towards the branch.

Wait 1-2 minutes before shrinking the outer casing.

The installation is now complete and the concrete wall can be repaired.



The Bonded Single Pipe Valve arrangements - Overview

Introduction	This section describes where and how isolation valves and separate venting/drain- ing can be installed in a pipe run.
Contents	Isolation valve Spindle extension Cover

The Bonded Single Pipe Valve arrangements - Isolation valve

Overview

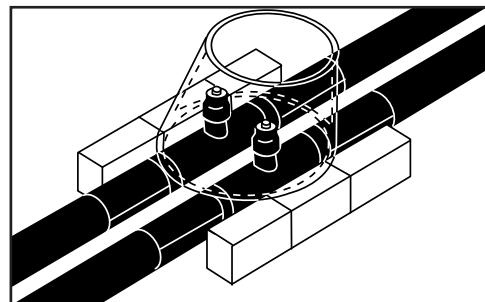
Isolation valves are installed as a part of the pipe system at any required point on the pipe run.

Consequently, expensive, special concrete chambers are not necessary.

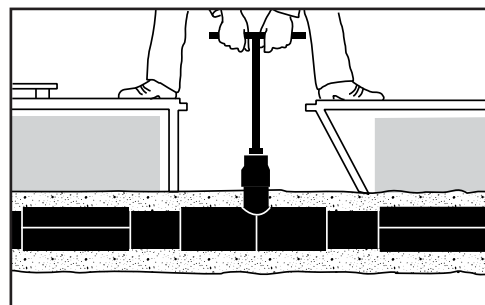
As regards the operation of isolation valves, see the homepage of the relevant supplier (the brand appears from the top of the valve).

Installation

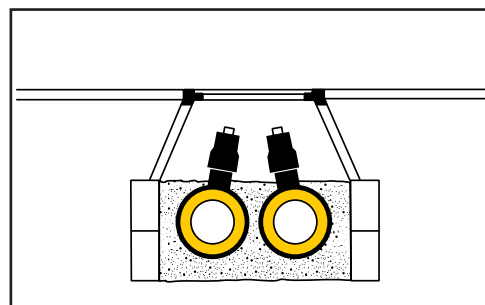
The simplest way to make access chamber to the valves is to place a concrete chamber on two rows of foundation bricks.



This ensures the free expansion of the pipes and the spindle tops are kept free of sand.



The method shown can also be used for major dimensions, provided that the spindles are tilted to enable operation from the chamber opening.



Draining

The pipe system can be drained through the valve on the draining arrangement.

To ensure complete draining use a suction pipe and, if necessary, blow air through the system.

The Bonded Single Pipe Valve arrangements - Isolation valve

Commissioning

Before putting the pipe system into operation, flush it thoroughly with open valves.

On pressure testing with 1.5xPN the valve must be open. Build-up the pressure gradually.

Valves are designed to be either fully closed or fully open. Valves must not be used to reduce the flow.

If the valve is installed at the end of a pipe system, a steel end is welded onto the pipe, and the valve must be open.

Operation

Valves must be operated slowly to prevent pressure surge.

For dimensions $\geq \varnothing 219$ mm gear must always be used.

Valves in not water-filled systems must not be operated.

Maintenance

It is recommended to operate the spindle in connection with the frequent chamber checks to ensure that the valve always functions. Valves must as a minimum be operated twice annually.

Valves for venting and draining are delivered as rustproof ball valves.

Equipment welded on to the valves (and old ball valves) must be protected against corrosion. Valves, spindle tops, and spindles should not be permanently under water.

Protect valves and service vales with a cover, if there is a risk that the groundwater will be on level with the top of the valve.

The Bonded Single Pipe Valve arrangements - Spindle extension

Application

The following instructions are valid for LOGSTOR standard spindle extension.

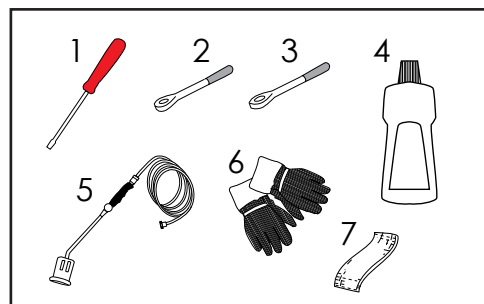
When installing spindle extensions from other valve manufacturers, their instructions must be followed.

Spindle extension is used to increase the height of the isolation valves.

It can be used for valve dimensions \varnothing 26.9 up to and including \varnothing 323.9 mm.

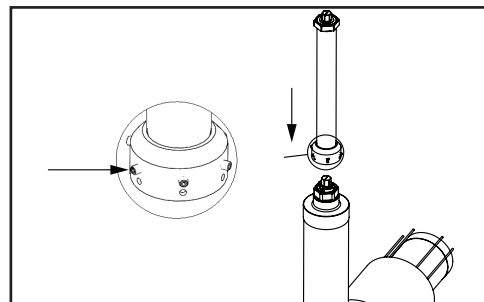
Tools

1. Screwdriver
2. Torque wrench for M6 screw
3. Torque wrench for M8 screw
4. Alcohol min. 93%
5. Gas burner
6. Gloves
7. Tissue



Preparations I

Loosen the screws on the spindle extension.

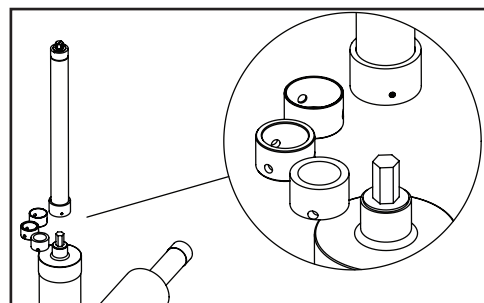


Adaptor

The spindle extension fits all dimensions and types.

For dimensions DN20 - DN80 an adaptor is used.

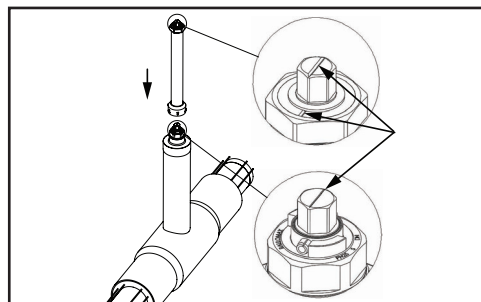
Valve type and dimension appear from each adaptor.



The Bonded Single Pipe Valve arrangements - Spindle extension

Preparations II

Ensure that the open/close position of the spindle and the spindle extension are identical.



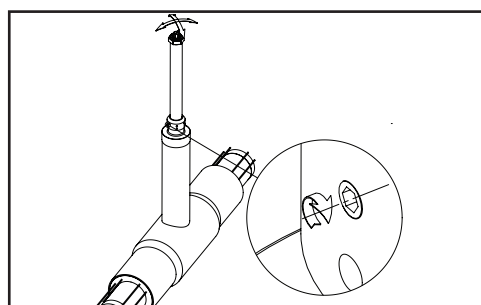
Installation

Place the spindle extension on the spindle and screw the torx screws. Tighten them homogeneously.

Tighten torx screws with:

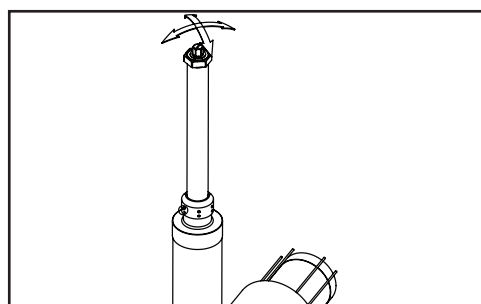
5-7 Nm for M6

9-12 Nm for M8



Check of tightening

Check that the spindle extension is tightened, if the spindle extension can be moved/wriggled or tip, the torx must be tightened again.



The Bonded Single Pipe Valve arrangements - Spindle extension

Sealing single pipe valve

The transition between spindle top on the preinsulated valve and the spindle extension must be protected against water ingress.

For spindle extension for valve $\varnothing 33.7$ -88.9 mm end-cap DHEC No. 2300 is used.

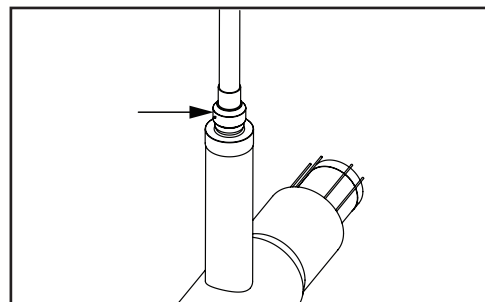
For spindle extension $\varnothing 114.3$ -219.1 mm LOGSTOR collar $\varnothing 63$ -160 mm with mastic, product No. 55500063160000 is used.

For spindle extension $\varnothing 273$ - 323.9 FXJoint, product No. 50570125180000 is used.

All surfaces must be CLEAN and DRY.

Clean all surfaces in the jointing area with alcohol.

Wrap NITTO 57GO around the joint between the valve spindle and valve extension.

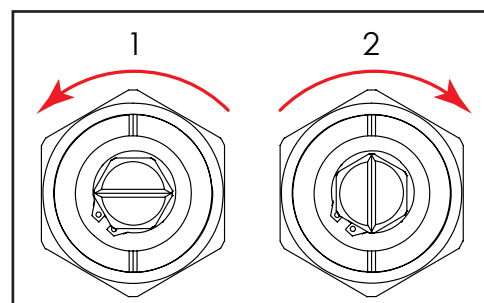


Operation

To open a valve in closed position turn the spindle counterclockwise (1).

To close a valve in open position turn the spindle clockwise (2).

If the valve is operated reversely of the above there is a huge risk of the locking pin breaking.



The Bonded Single Pipe Valve arrangements - Cover

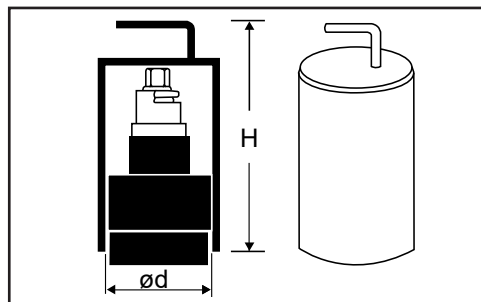
Application

The galvanized cover can be used in flooded areas. At periodic flooding the weight of the cover prevents water from penetrating into the spindle top and valve ends which might result in corrosion.

The cover is not fixed, but simply placed over the spindle top or the venting/dRAINING arrangements.

Measurements: See the Product Catalogue.

Alternatively, a PE sealing cap can be used. The sealing cap must be so long, that it still covers the casing of the spindle, when it comes into contact with the well cover, when the water level rises.



The Bonded Single Pipe Terminations - Overview

Introduction	This section describes how to install different types of terminations in the pipe system.
Contents	<ul style="list-style-type: none">Wall entry sleeveRadon-tight wall entry sleeveStandard end capOpen end capEnd fitting with insulation shells ø 90 - 630 mmEnd fitting for foaming ø 90-1000 mm

The Bonded Single Pipe Terminations - Wall entry sleeve

Application

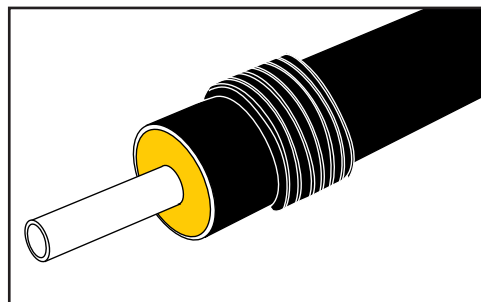
When pipes are led through masonry - at wells, footings etc., wall entry sleeves are installed as a protection against water ingress.

Installing wall entry sleeve

1. Wipe the outer casing clean and dry.
2. Place the sealing ring on the pipe and weld the connecting pipe on to it.

The holes in the base must have a size, enabling to cast the wall entry sleeve in concrete.

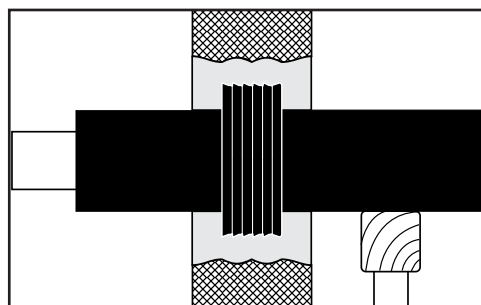
If the holes have been drilled, they must be 1-3% smaller than the outer diameter of the wall entry sleeve.



3. Place the pipe end in the hole in the wall.

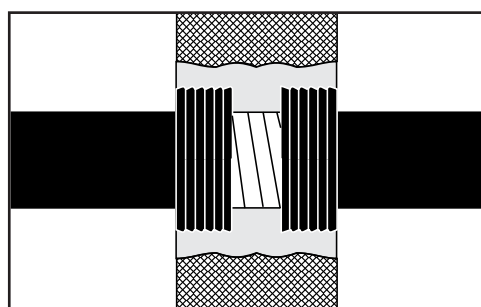
4. Support the pipe so the wall entry sleeve is not deformed.

The sleeve can now be cast in concrete.



Use more wall entry sleeves, when the entry pipe is subject to side loads or in thick walls. This gives a better sealing effect.

Apply grease tape between the wall entry sleeves.



The Bonded Single Pipe Terminations - Radon-tight wall entry sleeve

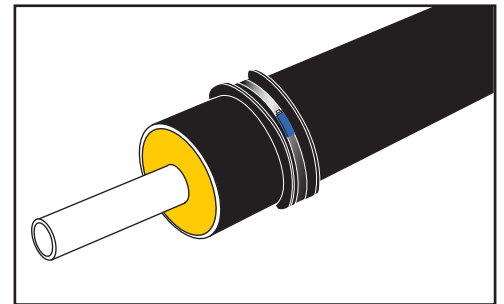
Application

When pipes are led through masonry - at wells, footings etc, wall entry sleeves are installed as a protection against water ingress.

This wall entry sleeve is radon-tight.

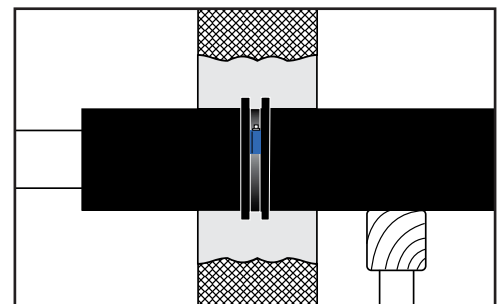
Installing radon-tight wall entry sleeve

1. Mount the sealing ring and strap onto the pipe. The diameter of the rubber ring is a little minor than that of the pipe in question (2-8% depending on diameter). When the rubber seal needs to be pushed along the pipe, it can be rolled along the pipe.



2. Tighten all straps so the ring cannot be moved axially on the pipe and so that good contact is achieved between the pipe and the rubber ring in the entire circumference of the pipe.

3. Ensure that the ring is completely covered by concrete.



4. Vibrate the concrete so it achieves a good connection to the rubber ring.

The Bonded Single Pipe Terminations - Standard end cap

Application

End caps are used to seal the pipes to prevent moisture from penetrating into the foam insulation.

They are e.g. used at terminations in chambers, in connection with branch adaptors to concrete ducts, in cellars etc.

Preparations

1. Clean the outer casing and steel pipe with alcohol and wipe them dry. Now clean them with alcohol.

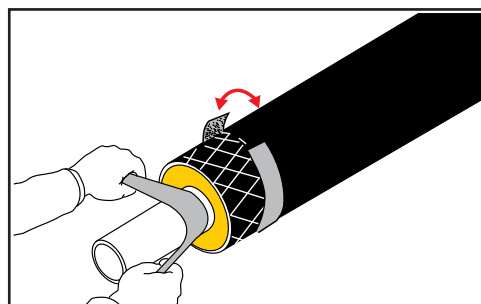
2. Grind the outer casing, using emery cloth:

grain size 36-40: \varnothing 90 - 450 mm,

until the surface becomes mat.

Grind marks must be visible 30 mm outside the rim of the end cap (This enables visual control of the activation by the inspection).

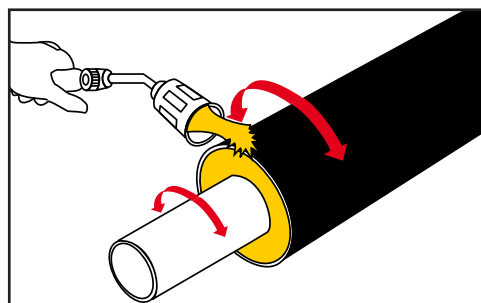
Also grind the steel pipe.



3. Preheat outer casing and steel pipe to approx. 65° C.

Protect the foam from direct flame contact.

Centre the end cap on the clean, pre-heated pipe end.



The Bonded Single Pipe Terminations - Standard end cap

Shrinkage

4. Use a soft gas flame for the shrinking.

Important:

Start with the part of the end cap which is placed on the outer casing.

When it has been shrunk, wait minimum 1-2 minutes, before shrinking the part on the steel pipe.

5. Carry out the shrinking on the steel pipe as shown in the drawings in order to avoid air pockets. If necessary, press out any air pockets with the fingers.

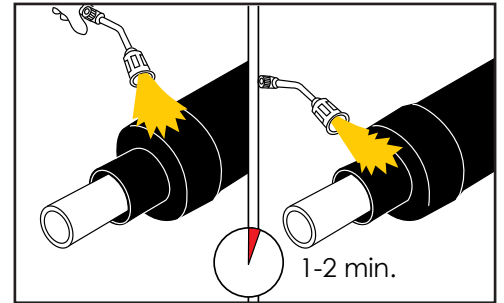
Do not heat directly on the vertical part.

Do not heat the part on the outer casing during the final shrinking, as the end cap might slide off the outer casing.

Max. temperature:

After the installation the part of the end cap on the steel pipe must not be exposed to more than 130° C.

The part on the outer casing must not be exposed to more than 70° C.



The Bonded Single Pipe Terminations - Open end cap

Preparations

The open end cap is used both as a standard end cap and for repairs.

1. Clean the outer casing and steel pipe and wipe them dry. Now clean them with alcohol.

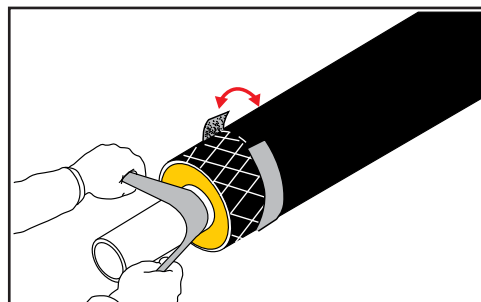
2. Grind the outer casing, using emery cloth:

grain size 36-40: \varnothing 90 -1200 mm,

until the surface becomes mat.

Grind marks must be visible 30 mm outside the rim of the end cap (This enables visual control of the activation by the inspection).

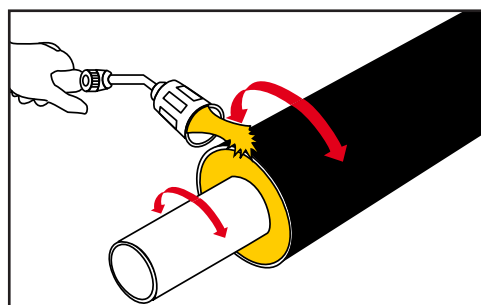
Also grind the steel pipe.



3. Preheat outer casing and steel pipe to approx. 65° C.

Protect the foam from direct flame contact.

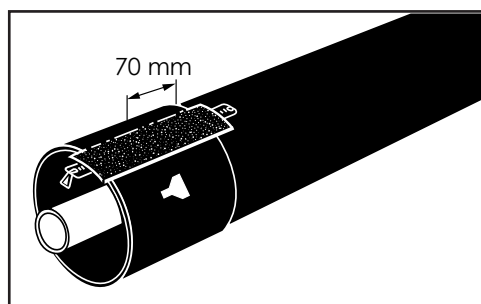
Centre the end cap on the clean, preheated pipe end.



4. Make a mark on the outer casing 70 mm from the edge and centre the open end cap over it, so the fat end of the symbol faces the outer casing.

Remove the protective film.

5. Close the zipper and remove the protection.



The Bonded Single Pipe Terminations - Open end cap

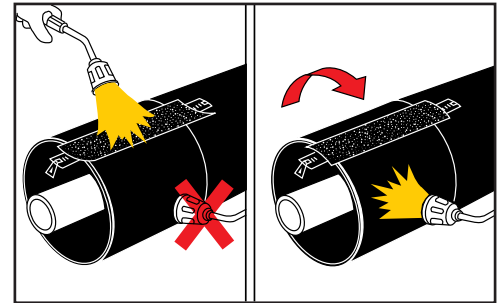
Shrinkage

6. Start the shrinking by heating and pressing down the closure patch until the colour changes from green to black. Avoid direct flame contact with the zipper.

Press the closure patch against the outer casing manually or with a patch press.

7. Start shrinking the end cap over the outer casing. Move the torch in circular movements around the pipe until the end cap has been completely shrunk over the outer casing.

The remaining part of the shrinking is carried out as on standard end caps.



The Bonded Single Pipe

Terminations - End fitting with insulation shells ø 90-630 mm

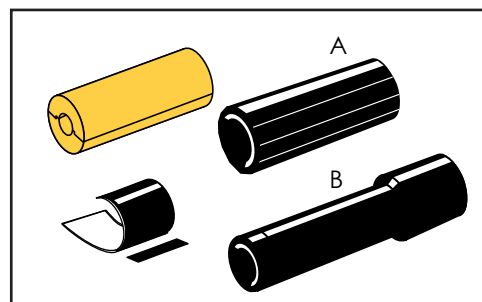
Application

End fittings are used to terminate a pipe in the ground, temporarily or permanently.

End fittings with insulation shells are available in two versions:

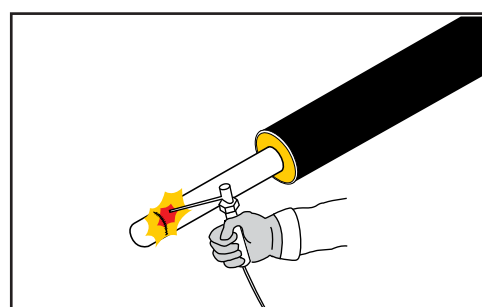
A. ø 90-160 mm, expanded PE

B. ø 180-630 mm, drifted PE



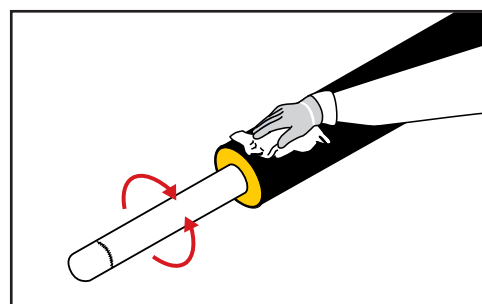
Welding steel end fitting

1. Weld the steel end fitting on the service pipe.



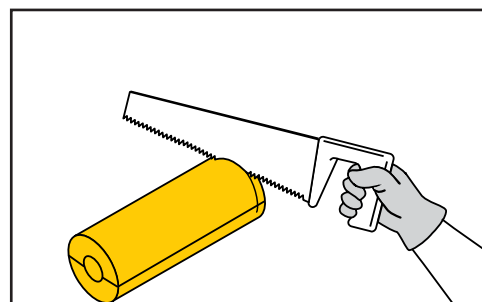
Cleaning

2. All surfaces in the joint area must be clean and dry. Now clean them with alcohol.



Adjusting insulation shells

3. Shorten the insulation shells to the length of the free end including the steel end fitting.



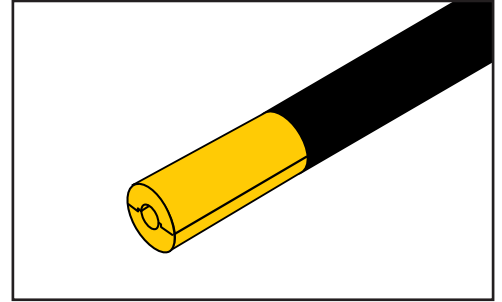
The Bonded Single Pipe

Terminations - End fitting with insulation shells ø 90-630 mm

Adjusting insulation shells, continued

4. Place the insulation shells around the service pipe. Tape, if required.

The pipe end must be CLEAN and DRY.

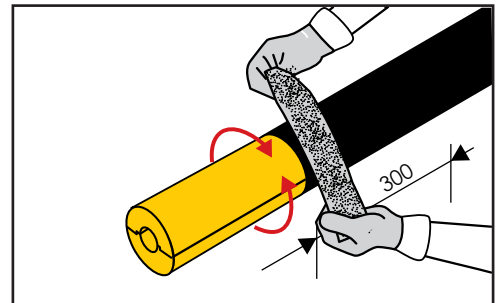


Activation

5. Activate the outer casing with emery cloth:

grain size 36-40: ø 90 - 630 mm

so grind marks will be visible 30 mm outside the rim of the fitting (This enables visual control of the activation by the inspection).

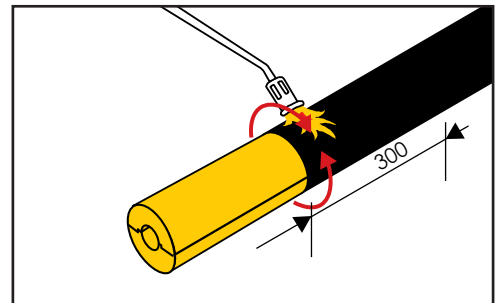


6. Activate the casing pipe with gas burner at least 300 mm from the casing end to a surface temperature of min. 65°C.

Gas burner:

ø50 mm: ø90 - 280 mm

ø60 mm: ø315 - 630 mm.

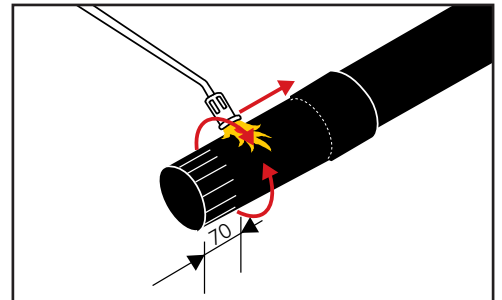


Shrinking type A, ø 90-160 mm

7a. Remove the packing from the shrink sleeve. Check that the sleeve is CLEAN and DRY, inside and out.

Place the shrink sleeve on the insulation shells and the outer casing.

Shrink the sleeve starting approx. 70 mm from the end. Afterwards shrink the end and the rest of the sleeve.



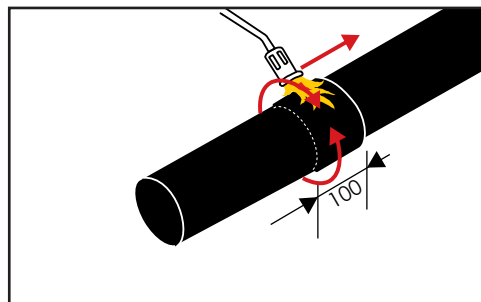
The Bonded Single Pipe

Terminations - End fitting with insulation shells \varnothing 90-630 mm**Shrinking type B, \varnothing 180-630 mm**

7b. Remove the packing from the shrink sleeve. Check that the sleeve is CLEAN and DRY, inside and out.

Place the shrink sleeve on the insulation shells and the outer casing.

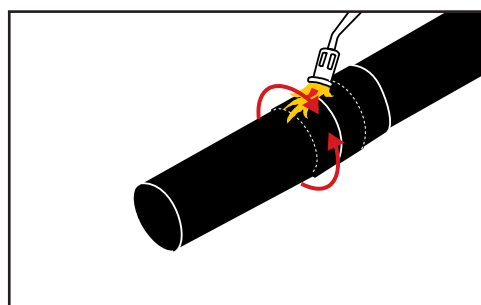
Shrink the sleeve at the casing pipe. Start 100 mm from the end of the shrink sleeve.

**Shrinking shrink wrap and closure patch**

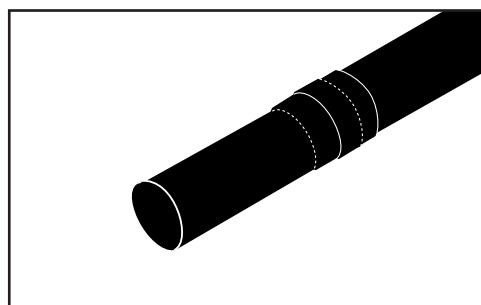
8. Remove the packing and paper from the shrink wrap. Check that all paper has been removed.

Centre the shrink wrap over the shrink sleeve end.

Heat the joint of the shrink wrap with gas burner and place the closure patch so it is centred over the joint. Shrink the shrink wrap.



9. The joint is complete.



The Bonded Single Pipe

Terminations - End fitting for foaming ø 90-1000 mm

Application

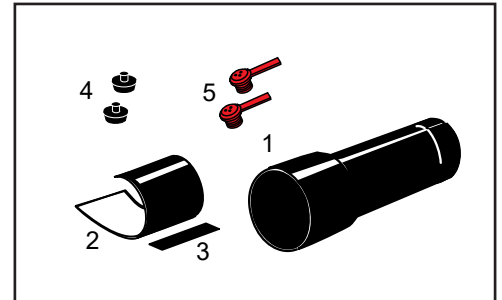
End fitting for foaming.

1. Closed shrink sleeve
2. Open shrink wrap
3. Closure patch
4. Weld plugs
5. Venting plugs

As for connection of alarm wires, see LOGSTOR Detect.

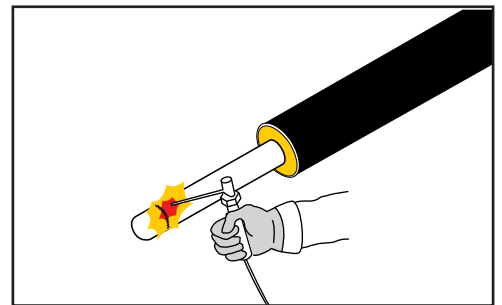
Foam packs:

- size, see foam pack folder
- more information see Insulating joints



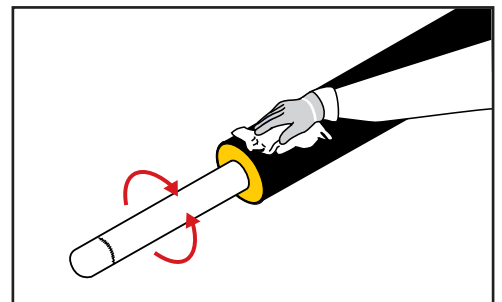
Welding steel end fitting

1. Weld the steel end fitting on the service pipe.



Cleaning

2. All surfaces in the joint area must be clean and dry. Now clean them with alcohol.

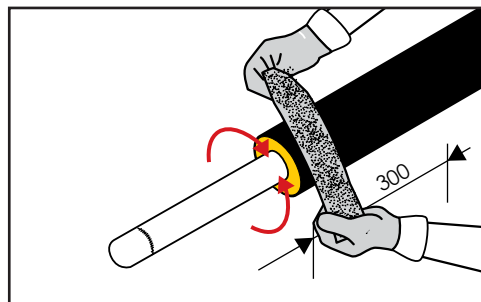


The Bonded Single Pipe

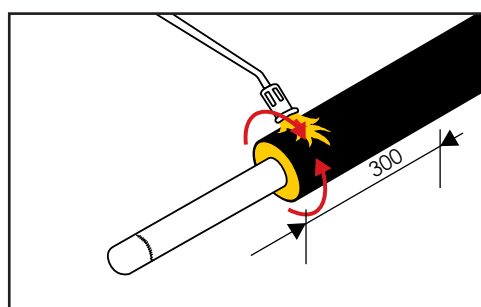
Terminations - End fitting for foaming \varnothing 90-1000 mm

Activation

3. Activate the outer casing with emery cloth, grain size 36-30, so grind marks will be visible 30 mm outside the rim of the fitting (This enables visual control of the activation by the inspection).



4. Activate the casing pipe with a \varnothing 60 mm gas burner at least 300 mm from the casing end to a surface temperature of min. 65°C.

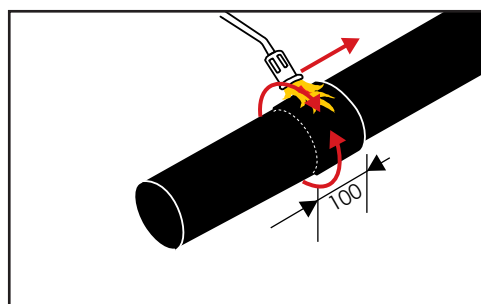


Shrinking sleeve and shrink wrap

5. Remove the packing from the shrink sleeve. Check that the sleeve is CLEAN and DRY, inside and out.

Place the shrink sleeve on the steel pipe end and the outer casing.

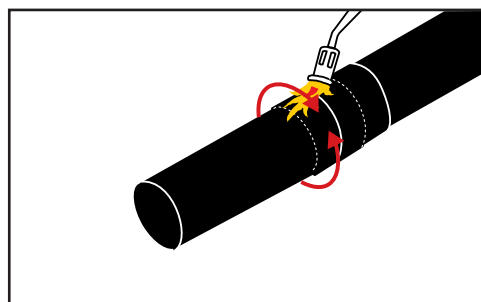
Shrink the sleeve, starting approx. 100 mm from the end.



6. Remove the packing and paper from the shrink wrap. Check that all paper has been removed.

Centre the shrink wrap over the sleeve end.

Heat the joint of the shrink wrap with a gas burner and place the closure patch so it is centred over the joint. Shrink the shrink wrap



The Bonded Single Pipe

Terminations - End fitting for foaming ø 90-1000 mm

Venting and filling holes

7. Drill two ø 17.5 mm holes in the sleeve - one at each sleeve end.

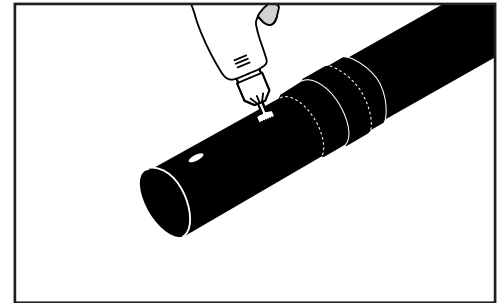
Leakage test the joint with 0,2 bar.

Install a venting plug in one hole and foam the sleeve through the other hole. Install the other venting plug.

Wait at least 30 min. for degassing to complete. Remove the venting plugs by turning and lifting them.

Remove excess foam.

N.B. For size of foam packs, see the Foam Pack Folder.



Installation of weld plug

Weld plugs are installed like weld plugs in straight casing joints.

The Bonded TwinPipe General - Overview

Introduction

This section describes the special installation rules which apply when installing the TwinPipe system.

When the handling and installation instructions coincide with those for the single pipe system, reference is made to the latter.

The Bonded TwinPipe General - Trench

Cross section of trench

The cross section of the trench must as a rule be designed according to the requirements in EN13941 as well as local rules and regulations as regards safety and work environment.

To ensure sufficient friction material around the pipe the measurements in the illustrated cross section must be complied with.

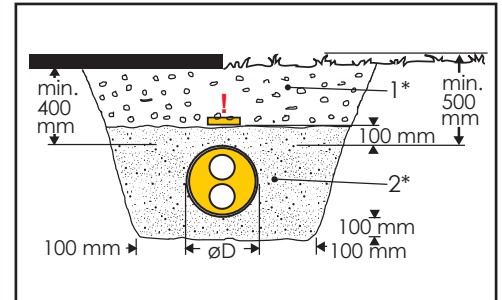
Place a warning tape or a warning net which covers the pipe minimum 100 mm over the pipe.

1*) Backfill material for the upper zone

2*) Backfill material (friction material)

Existing cables and pipes already in the ground and possible need for trench drainage should be taken into account.

In areas with poor soil quality, it may be necessary to replace a major quantity of the soil to avoid settlement/displacement.



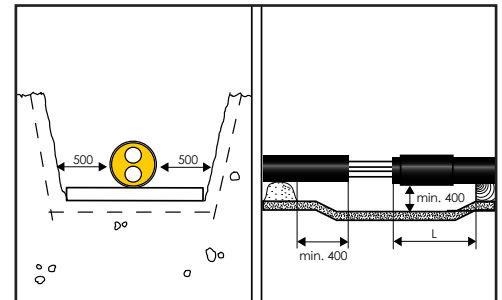
Welds and joints

The pipes can be installed in the trench, supported by sand cushions or styrofoam chocks. Styrofoam chocks must be removed before the trench is filled with sand.

According to EN 13941-2 at joints there must be min. 400 mm from the casing to the bottom and 500 mm to the side in the trench to ensure sufficient space for the weld and installation work with casing joints.

Distance to the support in connection with preinstalled casing joints:

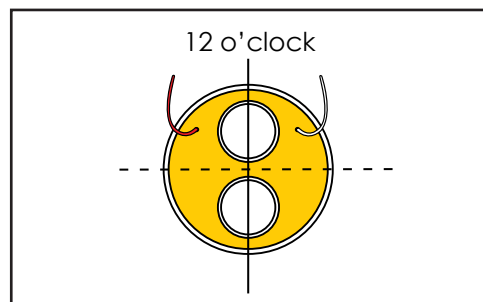
$$L = L_{\text{casing joint}} + 300 \text{ mm.}$$



The Bonded TwinPipe General - Trench

Position in trench Usually place preinsulated TwinPipes and components, so one service pipe is directly over the other (flow pipe at the bottom).

The alarm wires must lie at the top of the joint.



The Bonded TwinPipe
Expansion and Anchoring - Overview

Introduction	As for foam pad, sand pad and anchor please see Expansion and Anchoring under the bonded single pipe system
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The Bonded TwinPipe Expansion and Anchoring - Fixing bar

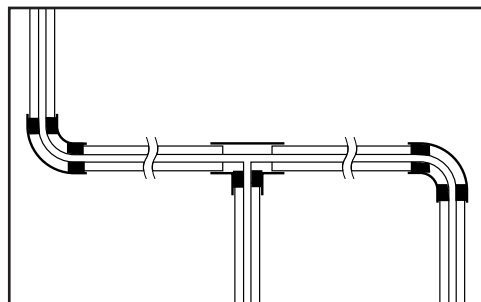
Application

Preinsulated bends, reductions and branches on T-pieces have fixing bars welded onto them to ensure the necessary fixation.

At bend fittings and T-joints fixing bars must be used immediately before and after the bend fitting and on the branch immediately after the T-joint.

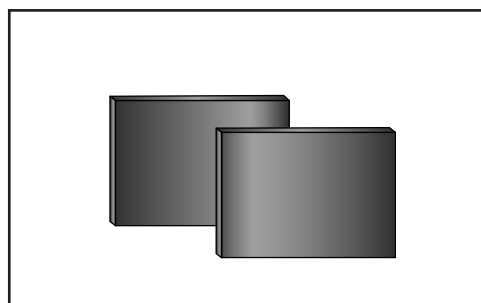
When reductions are made by using reduction joints, fixing bars must be used on the largest dimension.

When straight pipe runs are terminated with an end fitting, fixing bars must be installed at the free end.



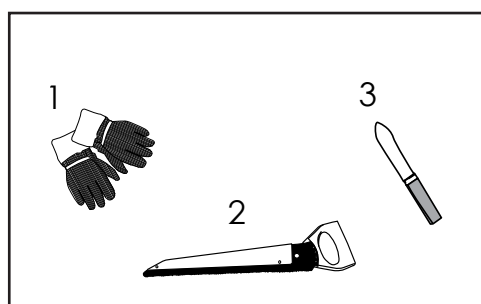
Description

A fixing bar is a steel plate, delivered in a bag with 2 pcs.



Tools

1. Gloves
2. Eclipse saw
3. Knife



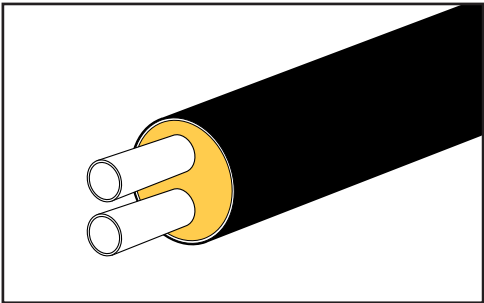
The Bonded TwinPipe

Expansion and Anchoring - Fixing bar

Preparations

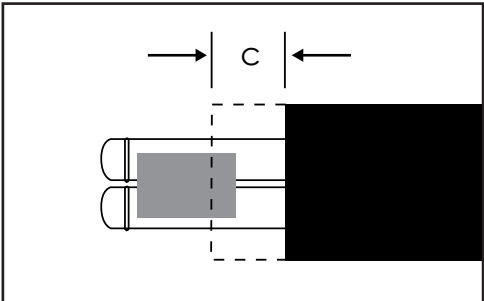
Remove the insulation, using a suitable stripping tool.

Remove foam remnants from the service pipe.



Installation

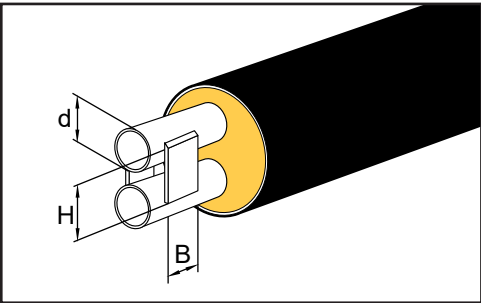
Steel pipe dimensions $\varnothing 139.7$ to 219.1 mm require additional removal of foam to ensure space for the fixing bars.



Steel pipe dimension \varnothing mm	C mm
139.7	30
168.3	60
219.1	120

The Bonded TwinPipe
Expansion and Anchoring - Fixing bar

Installation,
continued



Steel pipediameter d, mm	Fixing bar			α-measure, weld
	Height H, mm	Width B, mm	Thickness t, mm	mm
26.9	46	45	4	3
33.7	53	65	4	3
42.4	61	80	4	3
48.3	67	85	4	3
60.3	80	110	4	3
76.1	96	135	4	3
88,9	114	125	6	4
114.3	139	165	6	4
139.7	170	205	6	4
168.3	208	260	6	4
219.1	264	305	8	6

The Bonded TwinPipe Casing joints - Overview

Introduction

As for BandJoint, EWJoint, SX-WPJoint, BXJoint, BXSJoint, B2SJoint and BSJoint please see Casing joints under the bonded single pipe system

The Bonded TwinPipe

Directional changes - Overview

Introduction

As for installing SXB-WPJoint and curved pipes and utilizing elastic curves see Directional changes under the bonded single pipe system.

The Bonded TwinPipe Branches - Overview

Introduction	<p>This section describes the adjustment measurements and the precautions for various joints.</p> <p>The following T-joints can be used for the TwinPipe system:</p> <p>SXT-WPJoint</p> <p>BandJoint-branch Flextra Twin - Twin</p> <p>BandJoint-branch Flextra Twin - single</p> <p>TXJoint</p> <p>T-joint straight double</p> <p>As for BandJoint-branches please see the Weld Joint Manual.</p> <p>As for SXT-WPJoint the lengths of foam to remove will appear from the following page. All other information about SXT-WPJoint is found under the single pipe system.</p>
Contents	<p>SXT-WP</p> <p>TXJoint</p> <p>T-joint straight double</p>

The Bonded TwinPipe Branches - SXT-WPJoint

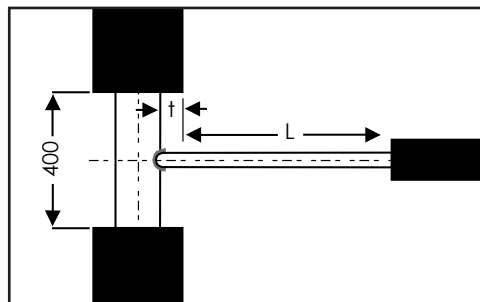
Foam removal

Removal of foam on the main pipe:

Max. 400 mm.

Removal of foam on the branch:

Insulation thickness $t + L$ according to below table.



Branch ø mm	Main pipe ø mm										
	90	110	125	140	160	180	200	225	250	280	315
77	545	550	625	625	625	625	625	625	625	625	625
90	545	550	625	625	625	625	625	625	625	625	625
110		675	670	670	670	670	670	670	670	670	670
125			670	670	670	670	670	670	670	670	670
140				640	640	640	640	640	640	640	640
160						640	645	645	645	645	645
180							720	720	720	720	720
200							720	720	720	720	720

The Bonded TwinPipe Branches - TXJoint

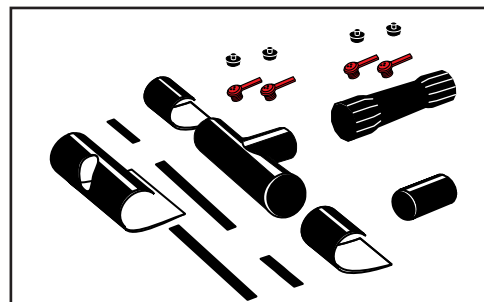
Application

The T-joint "TXJoint" is used to branch from TwinPipe to TwinPipe in outer casing dimensions $\varnothing 125 - 710$ mm and branch dimensions $\varnothing 90 - 280$ mm.

As for connection of alarm wires, see LOGSTOR Detect.

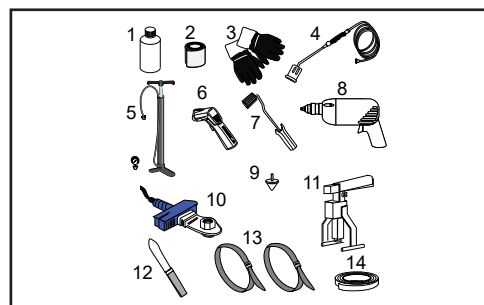
Foam pack:

- size, please see Foam Pack Folder
- additional information, please see Insulating joints.



Tools

1. Alcohol, min 93%
2. Emery cloth:
grain size 36-40: $\varnothing 90 - 710$ mm
3. Gloves
4. Gas burner:
 $\varnothing 50$ mm: $\varnothing 90 - 280$ mm
 $\varnothing 60$ mm: $\varnothing 315 - 710$ mm
5. Leakage test equipment
6. Temperature measuring device
7. Roller
8. Drilling machine with 17.5 mm drill bit
9. 35 mm conical drill bit
10. Socket welder
11. Retaining tool for weld plug
12. Knife
13. Straps
14. Filament tape



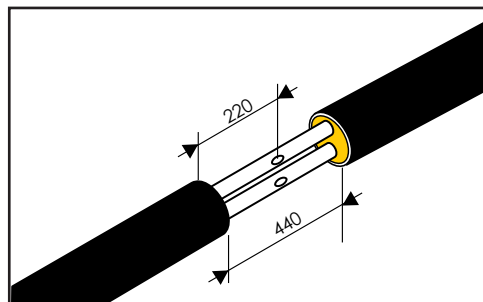
The Bonded TwinPipe Branches - TXJoint

Preparations

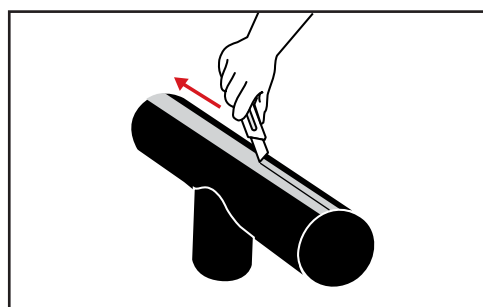
1. Cut off the insulation with a suitable stripping tool.

Mind the alarm wires.

Remove foam remnants from the service pipe.



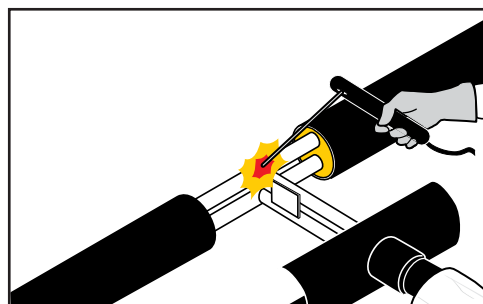
2. Cut the T-shoe open in the middle of the bevelled area.



3. Place SX-WPJoint, wrap, and T-shoe on the branch pipe. In case of a Flextra branch, the collar on the branch is placed first.

Mount the branch on the main pipe.

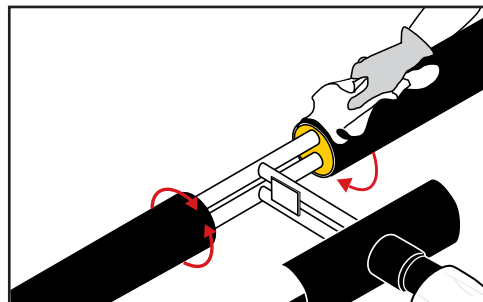
Use transition pipe, component No. 0262, if required.



Cleaning

4. All surfaces in the mounting area including that of the T-shoe must be DRY and CLEAN.

Now clean with alcohol.



The Bonded TwinPipe Branches - TXJoint

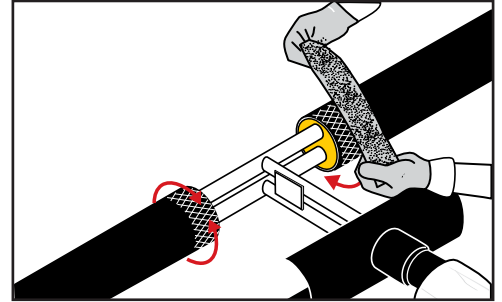
Activating main pipe

5. Grind the contact surfaces of T-shoe and wrap on the main pipe with emery cloth.

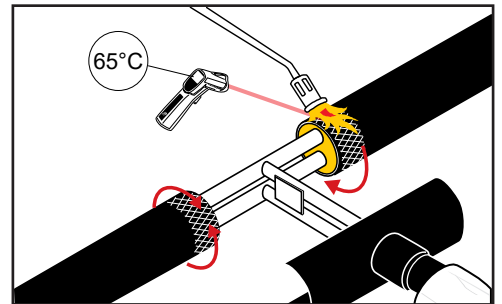
Grind so grind marks will be visible 30 mm outside the rim of the wrap so later visual inspection of the activation is possible.

Remove the grind dust.

Avoid touching the ground contact surfaces.



6. Activate the contact surfaces with a gas burner to a surface temperature of min. 65°C.



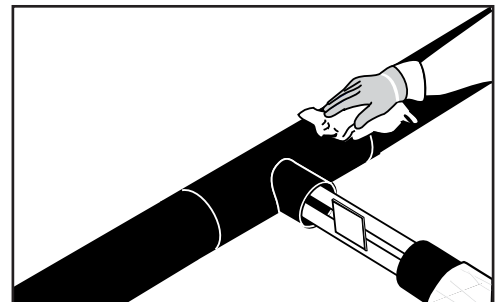
Installing T-shoe

7. Briefly heat the T-shoe and pull it onto the main pipe.

Clean the T-shoe externally with alcohol.

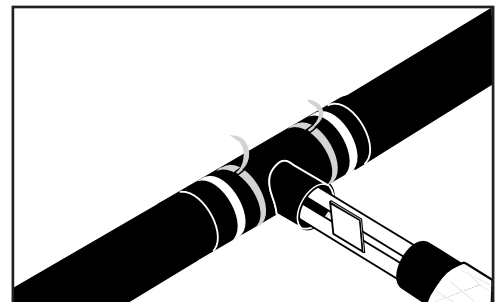
Then grind the T-shoe externally with emery cloth.

Briefly heat the entire T-shoe externally with a gas burner.



Fasten the entire T-shoe tightly around the pipe on each side of the connecting branch with straps.

Wind filament tape around the T-shoe max. 60 mm from the rim of the T-shoe.



The Bonded TwinPipe Branches - TXJoint

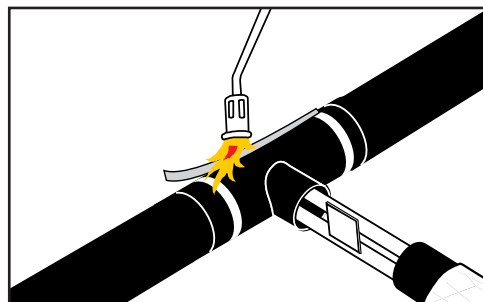
Installing T-shoe, continued

8. Remove the straps. The filament tape is not removed.

Close the longitudinal joint with the PERP tape without reinforcement structure.

Centre the PERP tape on the joint of the T-shoe with the mastic side facing downwards.

Heat the PERP tape, until the mastic becomes visible at its edge, and roll hard on it to fix it.

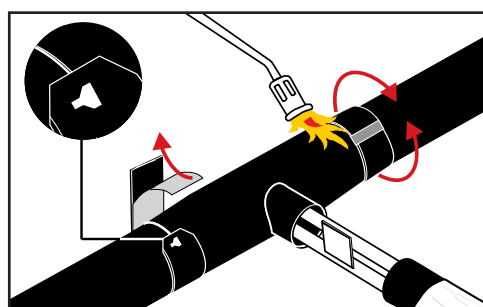


Open shrink wraps

9. Activate the contact surfaces for the open shrink wraps on the T-shoe with a gas burner to a surface temperature of min. 65°C.

Centre a shrink wrap (bevelled corners) on one shrink sleeve end, so the fat end of the symbol faces the sleeve.

Install the shrink wrap around the sleeve end with an overlap of 50 mm.



10. Centre the closure patch over the joint of the shrink wrap.

Heat the closure patch, until the reinforcement structure can be seen on the upper side. Press down the closure patch.

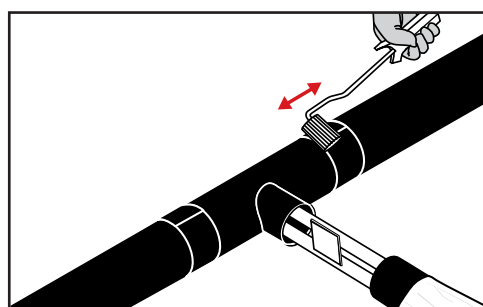
Shrink the shrink wrap with a gas burner, moving from the shrink sleeve towards the casing pipe.

The sealing compound must be visible at both sides in the entire circumference.

After shrinkage the surface structure must be smooth.

11. Lightly roll along the the overlapping edge, ensuring that any tunnel is sealed with sealing compound.

Repeat steps 9, 10 and 11 with the other shrink wrap over the other sleeve end.

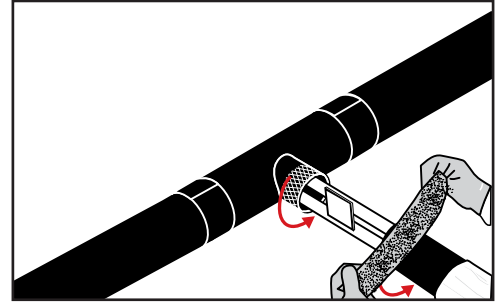


The Bonded TwinPipe Branches - TXJoint

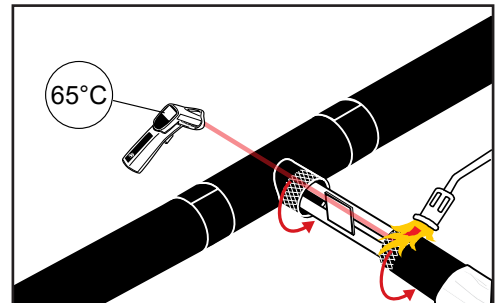
Branch

12. Grind the contact surfaces of the SX-WP shrink sleeve on the outer casing and T-shoe.

Grind so grind marks will be visible 30 mm outside the rim of the joint so later visual inspection of the activation is possible.



13. Activate the contact surfaces for the SX-WP shrink sleeve with gas burner to a surface temperature of min. 65°C.



Shrink sleeve on branch

14. Remove the packing from the shrink sleeve.

Do not use cutting tools with sharp edges.

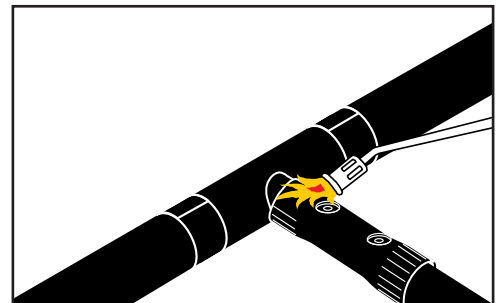
Make sure that the sleeve is CLEAN and DRY inside and out.

Centre the sleeve on the joint and remove the mastic covering in the sleeve.

Make sure that all the foil has been removed.

Shrink the ends of the sleeve. Avoid heating directly on the casing. Shrink the sleeve starting at the top to ensure centering.

At large dimensions support the sleeve at the middle to ease centering.



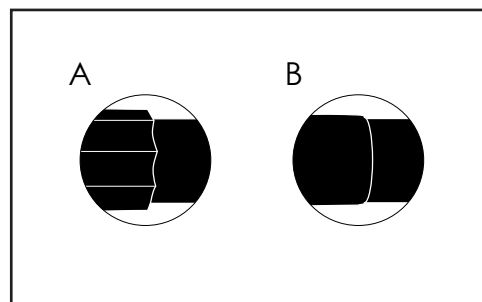
The Bonded TwinPipe Branches - TXJoint

Shrink sleeve on branch, continued

Shrink until all expansion marks have faded and the end of the sleeve forms an almost straight encircling edge.

A. Before

B. After



When connecting to Flextra branch:

A collar must be installed.

Remove the packing and paper from the collar.

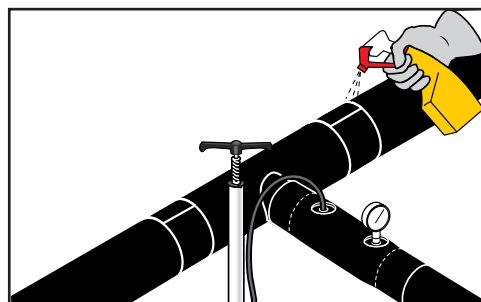
Check that all paper has been removed.

Shrink the collar onto the sleeve end.

Leakage test

15. When the shrink sleeve has cooled off to lukewarm, leakage test the joint at 0.2 bar.

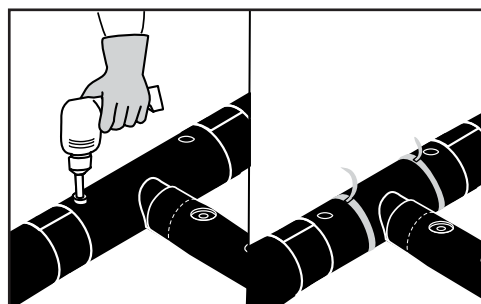
Test the joint ends visually with a soapy solution.



Preparations for foaming

16. Drill two foaming holes (ø 17.5 mm) in the T-shoe.

Prior to foaming install 2 straps on the bottom of the T-shoe. One on each side of the branch.



The Bonded TwinPipe Branches - TXJoint

Venting and foaming

17. Install venting plugs in three of the holes. Two on the branch and one on the main pipe.

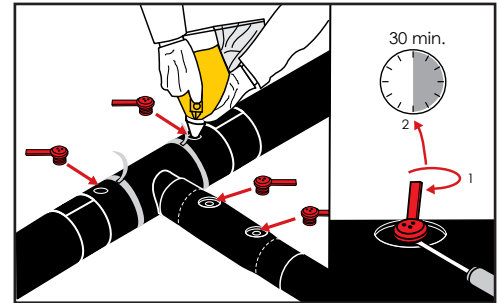
Foam the joint at the lowest point through the fourth hole and install the fourth venting plug. Wait min. 30 min. for degassing.

10 minutes after foaming turn the venting plug 180° to ease the removal of the venting plug.

Remove the venting plugs.

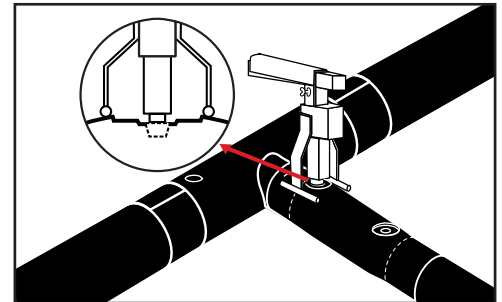
Remove excess foam or spillage.

After cooling remove the straps.



Weld plugs

18. Adjust the retaining tool to the top of the hole.

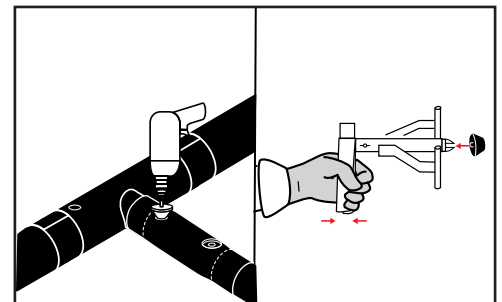


19. Drill the plug hole with a conical drill bit to clean the PE hole rim.

Remove milling residues.

Clean the rim and the joint surface around the hole with alcohol.

20. Insert the weld plug in the retaining tool and clean with alcohol .



The Bonded TwinPipe Branches - TXJoint

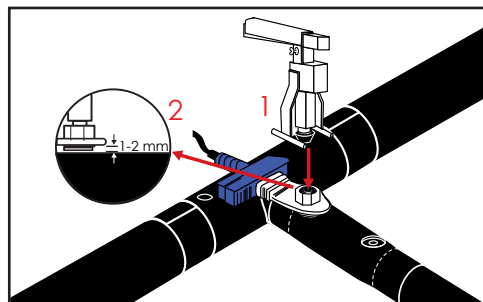
Weld plugs, continued

21. Heat the socket welder to 250°C.

Place the weld plug in the conical hole of the socket welder.

Keep the plug under a light pressure, until the rim of the plug starts to form a bead.

Now place the opposite side of the tool in the foam hole.

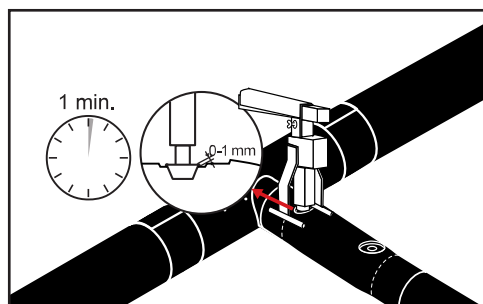


22. Remove the socket welder and immediately press the weld plug into the hole, until the legs rest on the outer casing and the upper rim of the plug is flush with the upper casing rim around the foaming hole (max. 1 mm above).

Hold the pressure constant at least 1 minute, until the welding zone has cooled down to lukewarm, before the retaining tool is removed.

There has to be a visible bead all around the plug.

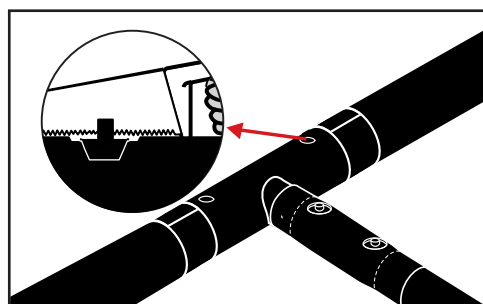
Repeat the process with the other 3 plugs.



23. Wait until the weld plug is lukewarm.

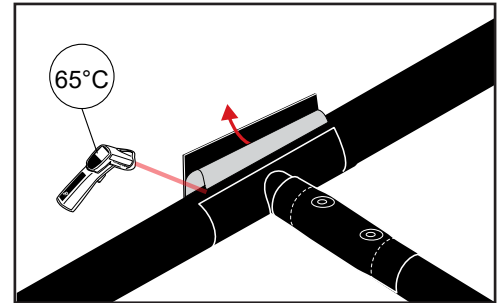
Grind the weld plug, until it is level with the surface of the outer casing of the main pipe.

Take care not to damage the bead.

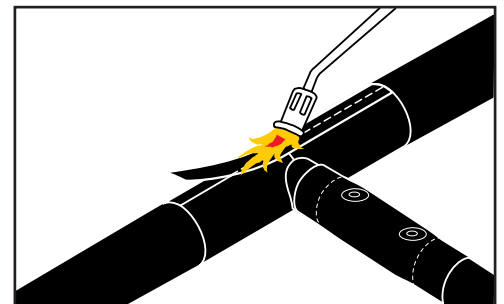


The Bonded TwinPipe Branches - TXJoint

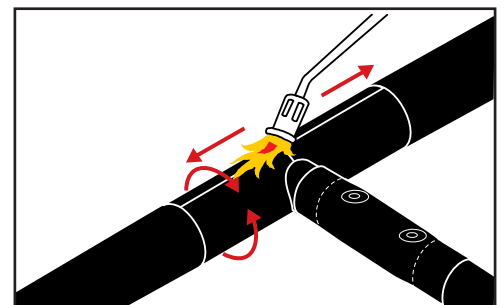
Shrinking the wrap 24. Before placing the wrap activate the contact surface with a gas burner to a surface temperature of min. 65°C. Place the shrink wrap around the main pipe. Remove the paper, while pulling the wrap into position. Turn the wrap so that the text goes around the pipe and the joint is at the top. Pull the shrink wrap tight around the casing joint.



25. Clean the adhesive side of the closure patch with alcohol. Centre the closure patch on the wrap joint with the adhesive side facing down. The adhesive side has visible reinforcement. Heat the closure patch until the reinforcement structure becomes visible on the top side. Press down the closure patch.

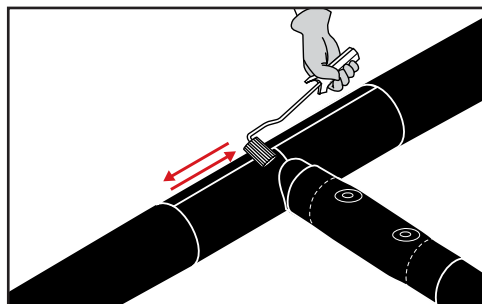


26. Shrink the wrap from the centre towards the ends, ensuring that the sealing compound spreads to all ends and that the full shrinking effect has been utilised.



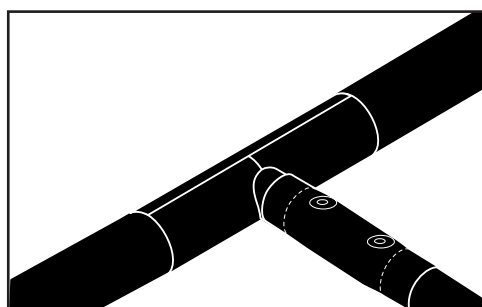
The Bonded TwinPipe Branches - TXJoint

27. Roll along the overlapping edge, ensuring that any tunnel at the edge is sealed with sealing compound.



Finished joint

28. The joint is complete.



The Bonded TwinPipe Branches - T-joint straight double

Application

T-joints straight, double are used to branch from TwinPipes to single pipes, primarily FlexPipes and FlextraPipes.

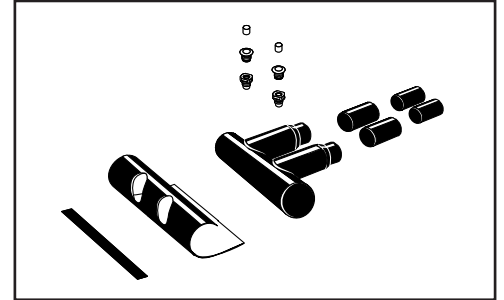
TwinPipe outer casing: \varnothing 125-710 mm.

Branch pipe: \varnothing 90-110 mm

As for connection of alarm wires, see LOGSTOR Detect.

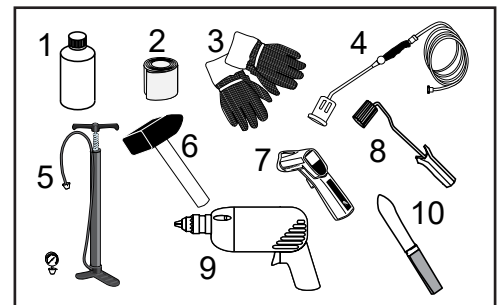
Foam packs:

- size, see foam pack folder
- more information see Insulating joints



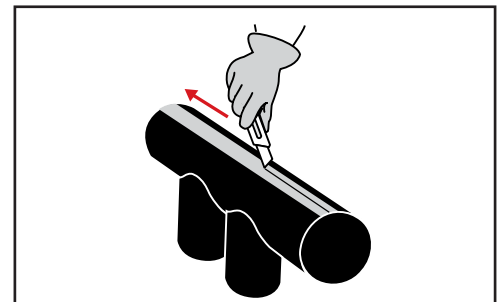
Tools

1. Alcohol, min 93%
2. Emery cloth, grain size 36-40
3. Gloves
4. Gas burner,
 \varnothing 50 mm: Minor dimensions
 \varnothing 60 mm: Major dimensions
5. Leakage test equipment
6. Hammer
7. Temperature measuring device
8. Roller
9. Drilling machine with \varnothing 24 mm drill bit
10. Knife



Preparing T-shoe

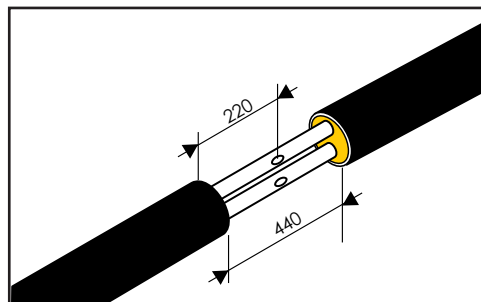
1. Cut the T-shoe open in the middle of the bevelled area.



The Bonded TwinPipe Branches - T-joint straight double

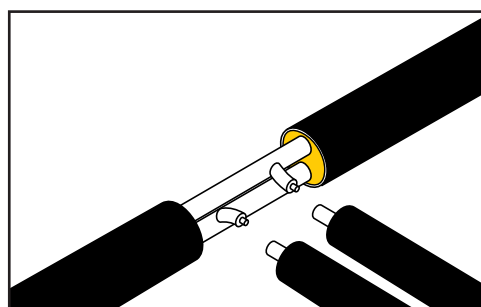
Removing insulation from main pipe

2. Cut off 400 mm of the casing pipe and insulation.
- Beware of alarm wires.
- Clean the service pipe of insulation remnants.



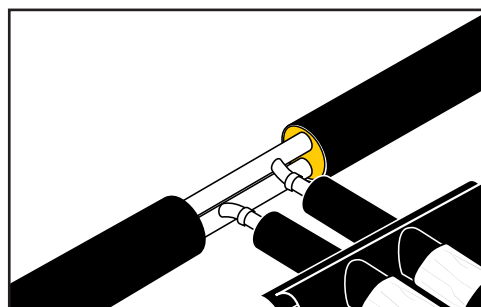
Adaptions on main pipe

3. Weld branch pipe pieces and/or press couplings directly onto the main pipe according to the actual pipe system of the branch.
- Place couplings, so the press end is level with the centre line of the outer casing.
- (As for large dimensions place couplings at the bottom and at the top of the main pipe).
- Remove approx. 150 mm of insulation from the flexible pipe, and 80 mm in connection with hot tapping



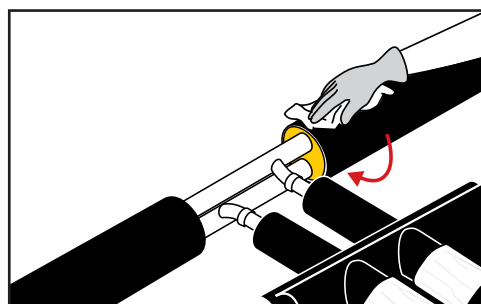
Adaptions on branch pipes

4. Place the shrink collars, shrink wrap and the open T-shoe on the branch pipes with the short wing on the shrink wrap turning up.
- Mount the couplings according to the relevant instructions.



Cleaning

5. All surfaces in the mounting area must be CLEAN and DRY.
- Afterwards clean with alcohol.



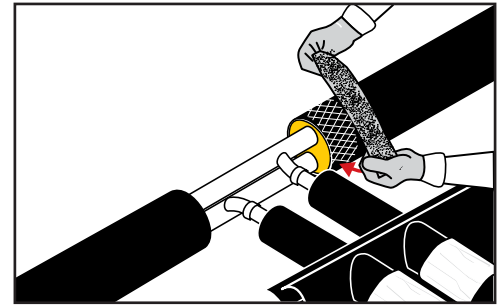
The Bonded TwinPipe Branches - T-joint straight double

Activating main pipe and branch

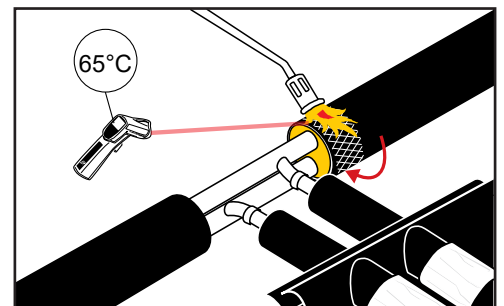
6. Grind the contact surfaces for the T-shoe and the wrap on the main pipe and branch as well as the contact surfaces of the wrap on the T-shoe with emery cloth:

grain size 36-40: \varnothing 90 - 710 mm.

Grind so grind marks are visible 30 mm outside the rim of the final wrap, enabling visual control of the grinding by the inspection.

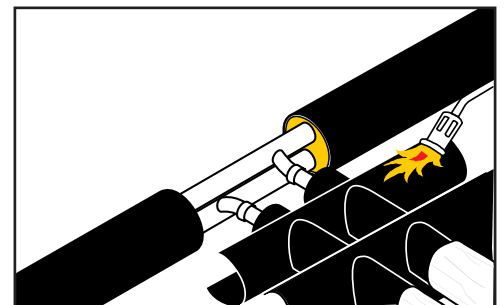


7. Activate the contact surfaces with a gas burner to a surface temperature of min. 65°C.



Installing T-shoe

8. Briefly heat the T-shoe and pull it onto the main pipe.



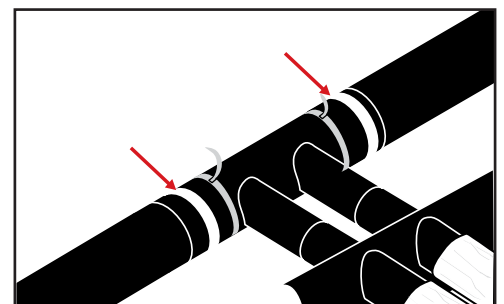
9. Clean the T-shoe externally with alcohol.

Now grind the T-shoe and contact surfaces of the collars on the branch with emery cloth.

Briefly heat the T-shoe externally with a gas burner.

Fix the T-shoe tightly around the pipe with straps on each side of the two branches.

Wind filament tape around the T-shoe max. 60 mm from the rim of the T-shoe.

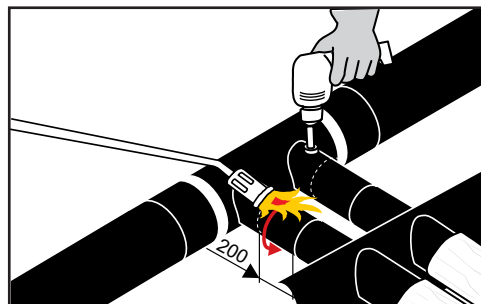


The Bonded TwinPipe Branches - T-joint straight double

Shrinking branch Drilling holes

10. Shrink the outer 200 mm of both branch pipes.

Drill a \varnothing 24 mm hole in each branch.



Venting and foaming

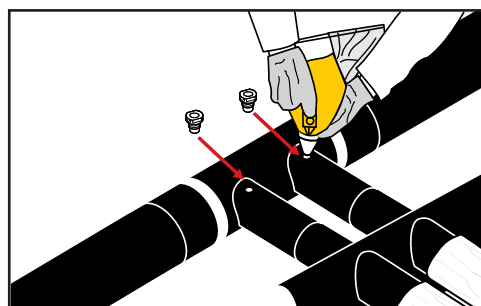
11. Install a venting plug in one of the holes and foam the sleeve through the other one.

Install the other venting plug.

Wait min. 30 min. for degassing.

Remove the venting plugs by turning and lifting them.

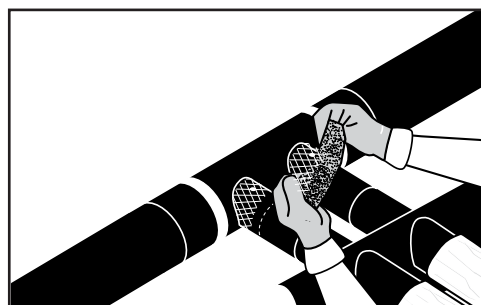
After cooling remove the straps.



Remove excess foam.

Activate the area around the holes with emery cloth.

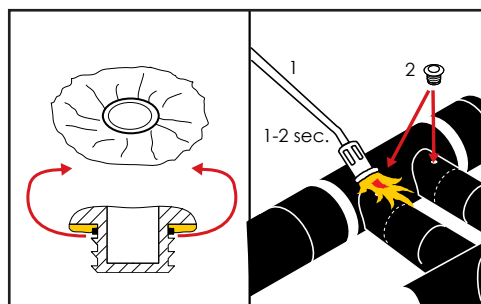
Now clean the T-shoe with alcohol.



Expansion plugs

12. Remove the protective foil from the expansion plugs and check the sealing compound.

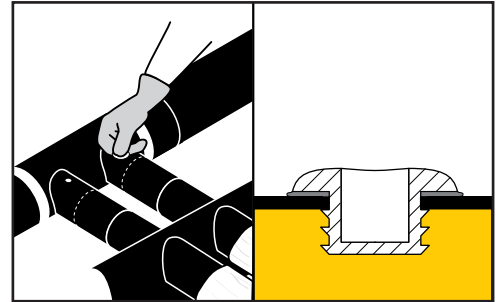
13. Activate briefly the area around the holes with a hard flame.



The Bonded TwinPipe Branches - T-joint straight double

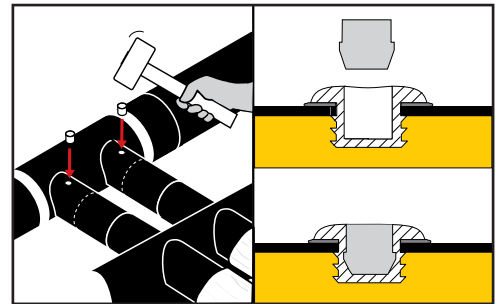
Expansion plugs, continued

14. Mount the expansion plugs in the holes and press, until the sealing compound is spread smoothly under the collar of the plug.



Wedge plugs

15. Centre the wedge plugs in the expansion plugs and drive them completely into the plugs with a hammer.

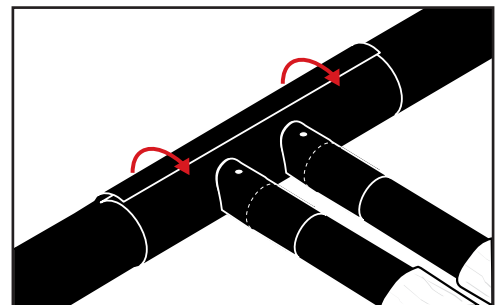


Installing shrink wrap

16. Activate the contact surfaces of the wrap with a gas burner to a surface temperature of min. 65°C.

17. Place the shrink wrap around the main pipe. Remove the protective paper, while pulling the wrap into place.

Make sure that the text on the wrap goes around the pipe and that the wrap is joined on the upper side.



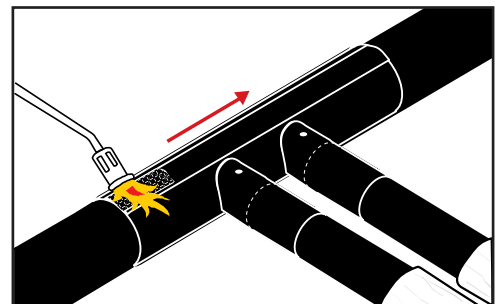
18. Clean the adhesive side of the closure patch with alcohol.

Centre the closure patch over the joint of the shrink wrap with the adhesive side facing down.

The adhesive side has a visible net structure.

Heat closure patch with a strong flame, until the net structure is faintly visible on the upper side.

Press the closure patch in place.

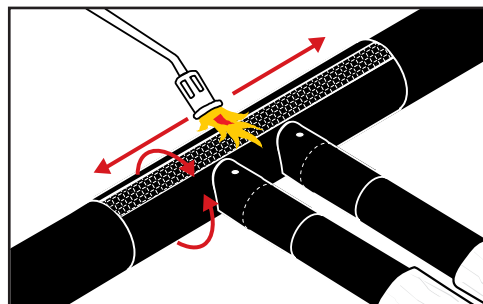


The Bonded TwinPipe Branches - T-joint straight double

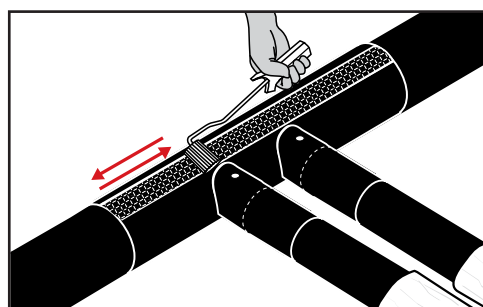
Installing shrink wrap, continued

19. Shrink the wrap from the centre towards both ends.

Shrink until the sealing compound emerges at the edge and the entire shrink effect has been utilized.

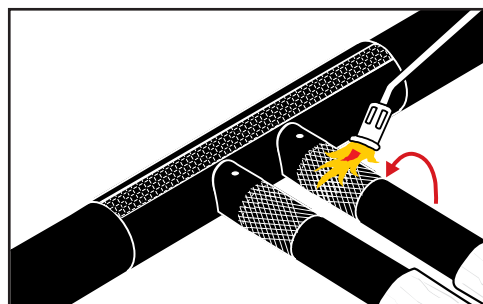


20. Roll on the overlap, ensuring that any tunnel is sealed with sealing compound.



Activating the branch

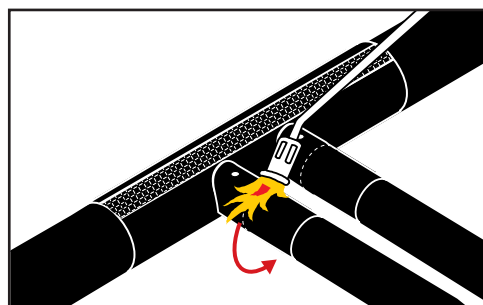
21. Activate the contact surface for the collars with a gas burner to a surface temperature of min. 65°C.



22. Remove wrapping and paper from the collars.

Check that all paper is removed.

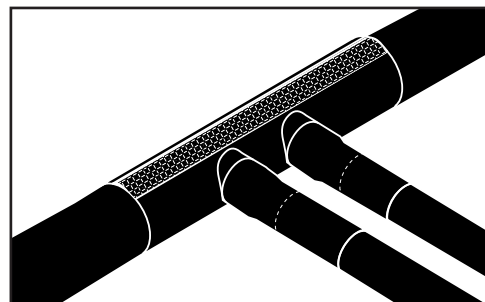
Shrink the first collar over the expansion plug. Then shrink the second collar onto the joint end.



The Bonded TwinPipe Branches - T-joint straight double

**Activating the
branch, continued**

23. The joint is complete.



The Bonded TwinPipe Valve arrangements - Overview

Introduction

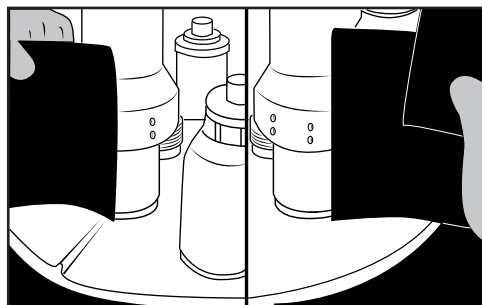
As for the various valves, cover, and spindle extension reference is made to the single pipe system.

Sealing TwinPipe valve

All surfaces must be CLEAN and DRY.

Clean all surfaces in the jointing area with alcohol.

Seal NITTO 57GO with NITTO 51 tape.



The Bonded TwinPipe Reductions - Overview

Introduction

Reference is made to:

- The Weld Joint Manual as for the EWJoint
- the single pipe system in this manual as for SX-WPJoint and B2S-Joint

As for the eccentric reduction please see the following page.

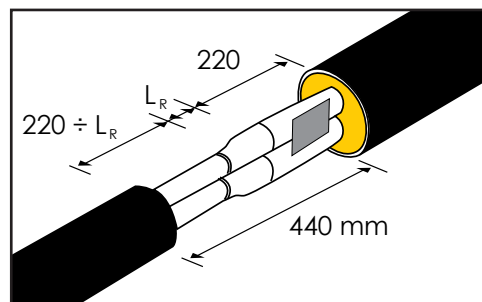
The Bonded TwinPipe Reductions - Eccentric reduction

Installing eccentric reduction

When reducing on TwinPipe by means of reduction joints and an eccentric reduction the distance between flow and return may differ on the two pipe ends to be welded together with the reduction.

If this is the case, the distance between the pipe ends are adjusted on site, to ensure that a girth weld complying with the quality requirements can be carried out. When adjusting the distance between the pipe ends a possible miter between the pipe ends and the reduction must not exceed 2°.

It is the responsibility of the steel welder to ensure that the conditions for a satisfactory weld quality are present, and that the steel pipe is not damaged.

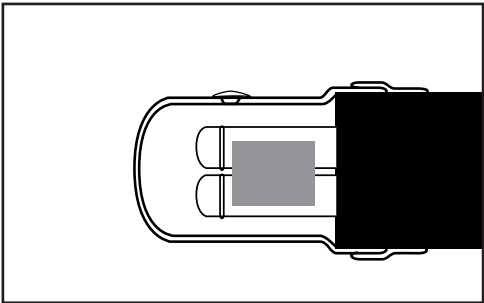


The Bonded TwinPipe Terminations - End fitting

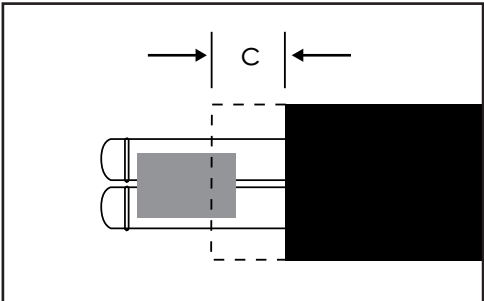
Application

To terminate the TwinPipe system PE-HD end fittings are used.

See installation instructions under the single pipe system, which apply to all TwinPipe dimensions.



Steel pipe dimensions $\varnothing 139.7$ to 219.1 mm require additional removal of foam in order to make space for the fixing bars.



Steel pipe dimension \varnothing mm	C mm
139.7	30
168.3	60
219.1	120

The FlexPipe

General - Overview

Contents

- General
- Pipes
- Couplings
- Casing joints
- Directional changes
- Branches

The FlexPipe

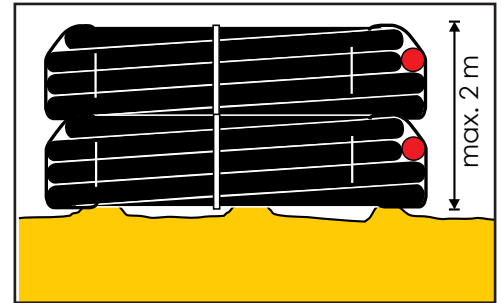
General - Storage and transport

Storage

The pipes must be stocked in such a way that they are not damaged.

Stack the pipes on a level surface of stoneless sand with cushions of sand, as illustrated.

Max. stack height for FlexPipes in coils is 2 meters.



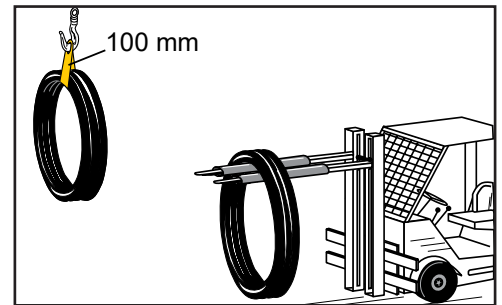
Foam liquids must be stored indoors at 18-24°C.

Likewise shrink materials must be stored indoors or under cover.

All casing joints must be stored vertically, resting on one end, to avoid ovalization.

Handling FlexPipes Only use lifting straps with a width of min. 100 mm.

When using a truck protect the forks with casing pipe, rubber pads etc.



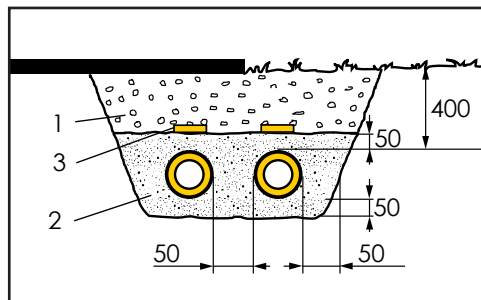
The FlexPipe General - Design

Trench

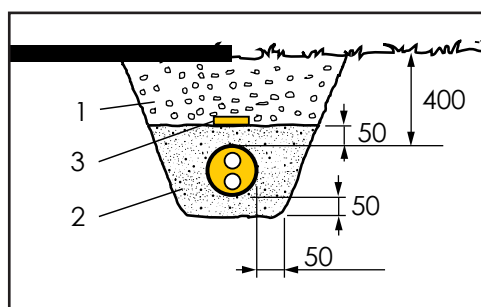
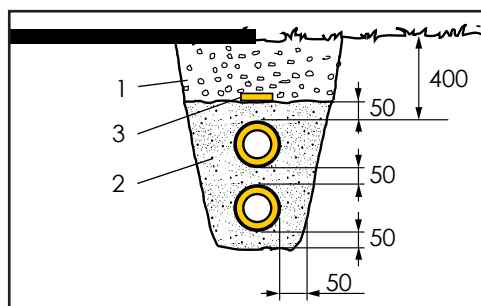
FlexPipe is installed in excavated trenches or by means of tunnelling.

In connection with installation in trench minimum 50 mm compressed friction material must encircle the pipes all the way round.

The trench is filled up with minimum 400 mm backfill material measured from the top of the pipe to the underside of the asphalt/concrete or to unpaved area.



1. Backfill material
2. Friction material
3. Warning tape/net



The FlexPipe General - Design

Friction material

The following specifications apply to the friction material under normal conditions:

Max. grain size:

≤ 10 mm

Purity:

The material must not contain harmful quantities of plant residues, humus, clay or silt lumps(max. 2%).

Grain shape:

Large sharp-edged grains, which may damage pipes or joints, must be avoided.

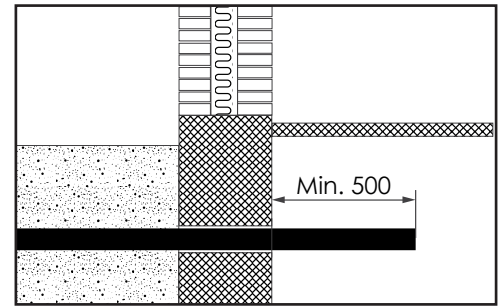
Careful and homogeneous compression is required.

Lead-in through basement

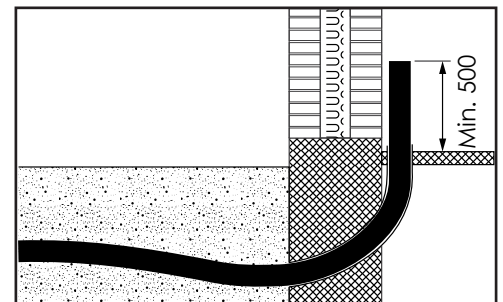
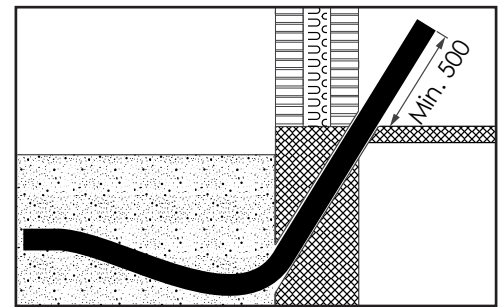
As for house connection through basement the pipe must be led through the basement in the same work procedure as installation and backfilling.

The pipe is terminated min. 500 mm from the interior wall to ensure sufficient length to prepare the pipe end.

As for new build an inlet pipe can be cast, so the FlexPipe can be led through it later without further ado.



As for bore in the basement with wall entry sleeve, the hole diameter must be 4 mm minor than the seal ring diameter. If the construction is subject to water pressure, a type of wall entry sleeve is recommended which is fixed to the inside or outside of the wall, and squeezes the PE casing.



The FlexPipe Installation of FlexPipes

Installation in trench

FlexPipes can be installed in excavated trenches as described under Design.

The cross section of the trench must allow sufficient space for proper installation of pipes and casing joints and compacting of levelling layer and backfilling.

Note! The minimum cover also applies to branches, if any.

Shortening

FlexPipes are delivered in coils.

The required length is cut perpendicularly, using a suitable saw.

The casing of the FlexPipe has a continuous metre indication, facilitating the cutting of exact lengths.

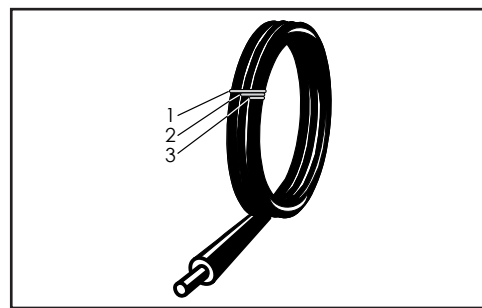
Unwinding

Do not cut all fixation strings at the same time.

Place the coil at the start of the trench.

Cut the first string.

Unwind the pipe till the next string and then cut that etc.

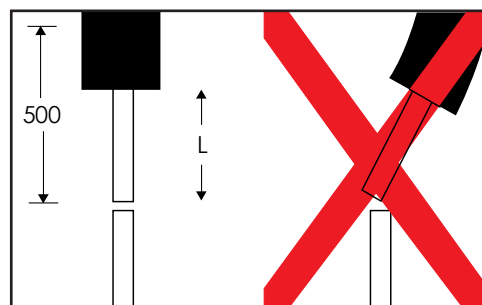


Straightening

Straighten the FlexPipe end, so that min. 500 mm of it is straight and parallel with the opposite pipe end.

This adaptation is important and necessary to ensure that subsequent installation of the casing joint can be carried out according to instructions.

Please keep the bounce effect of the free pipe ends in mind, when cutting.



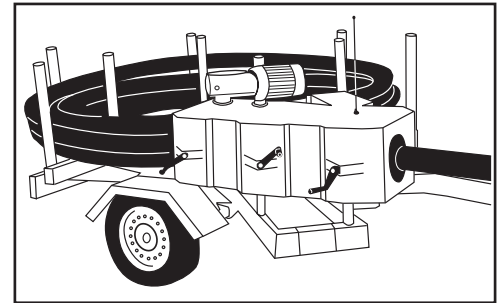
The FlexPipe Installation of FlexPipes

Auxiliary tools

In case of major tasks and major dimensions it is advantageous to use a waggon with motorized straightener. LOGSTOR can refer to relevant suppliers.

NOTE!

1. At temperatures below 10°C the outer casing must be preheated to lukewarm, immediately before it is inserted in the straightener head (soft gas flame during the entire straightening process).
2. It is recommended to store the coil in a heated room at least 24 hours before use.

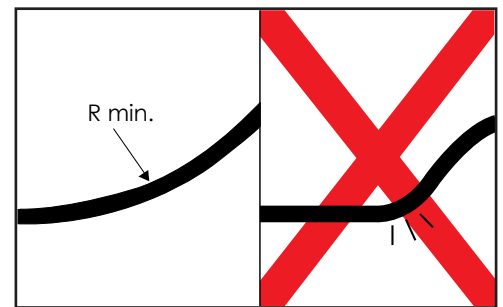


Bending

As described in Design the pipes can be bent to a minimum bending radius.

Never bend the pipes over a sharp edge.

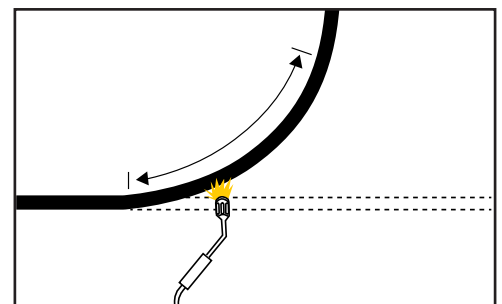
The rigidity of the pipes depends on their temperature. On installation it may be necessary to ensure the pipe position e.g. by partial backfilling.



At temperatures below 10°C the outer casings can be preheated to lukewarm.

Bend the pipe slowly and smoothly, not jerkily.

Avoid to bend the utmost 25-30 cm of the pipe because of the bounce effect.



The FlexPipe Couplings - Overview

Contents

Press coupling, type MP

Press coupling, type JT

Compression coupling Ø16-32 mm

Compression coupling Ø40-110 mm

The FlexPipe

Press coupling, type MP

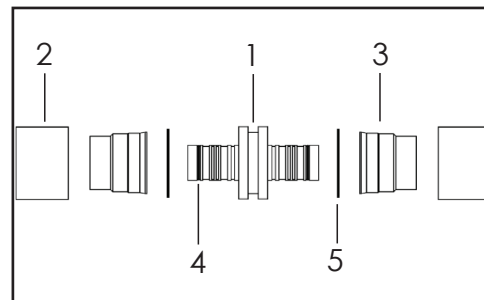
Press coupling

The press coupling consists of:

1. Base unit
2. Press ring
3. Squeezing ring

Only for AluFlextra:

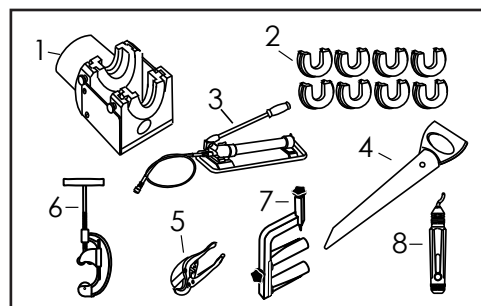
4. O-ring
5. Insulating ring



Tools

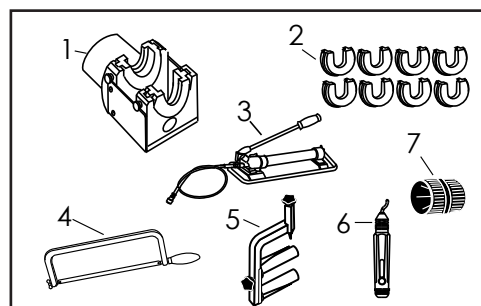
PEX service pipe:

1. Compression tool
2. Exchangeable compression inserts
3. Hydraulic pump
4. Saw
5. PEX scissors for dimensions $\leq \varnothing 63$ mm.
6. Pipe cutter for dimensions $> \varnothing 63$ mm
7. Stripping tool
8. Deburring tool



PE-RT/alu/PE-RT service pipe:

1. Compression tool
2. Exchangeable compression inserts
3. Hydraulic pump
4. Hacksaw
5. Stripping tool
6. Deburring tool, internal
7. Deburring tool, external

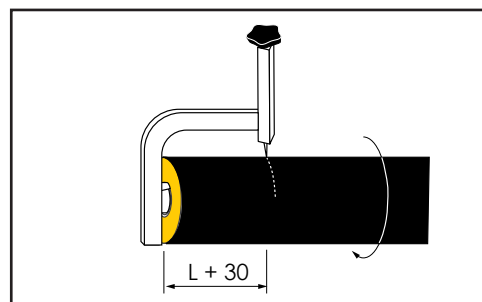


The FlexPipe Press coupling, type MP

Removing insulation and shortening

Remove $L + 30$ mm insulation from the service pipe, using the stripping tool.

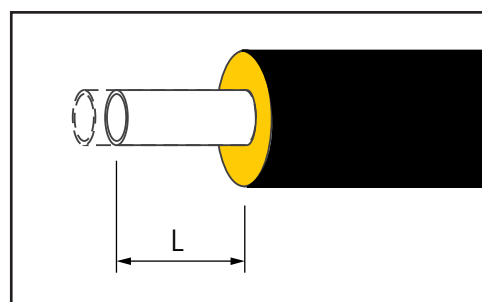
The additional 30 mm is for later trimming of the service pipe, before coupling installation.



Service pipe ø mm	L mm
16-40	90
50	105
63-110	125

Shorten the pipe in a clean and perpendicular cut to the L length, using PEX scissors or hacksaw.

Make sure the pipe end is not damaged.

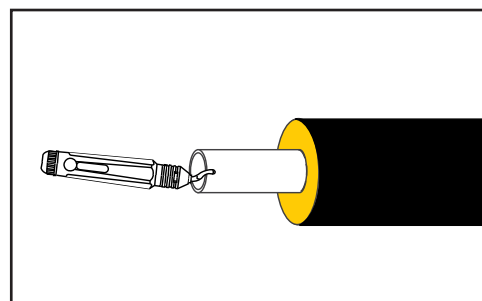


Deburring

Deburr the pipe end in- and externally, using the deburring tool.

Remove foam remnants from the service pipe with emery cloth, grain size 150.

Place shrink sleeve and collars on one pipe.

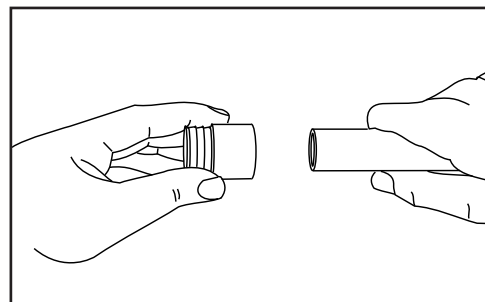


The FlexPipe

Press coupling, type MP

Installing the coupling

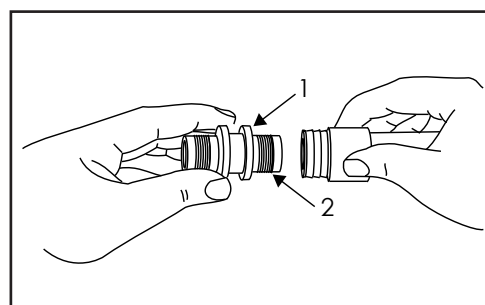
Push the press ring and the squeezing ring on to one of the pipe ends.



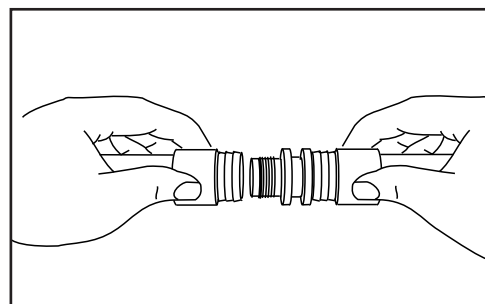
Thrust the base unit into the pipe to stop. Use a rubber hammer, if necessary.

Only AluFlextra:

Make sure that the insulating ring (1) and the O-ring (2) are placed correctly.



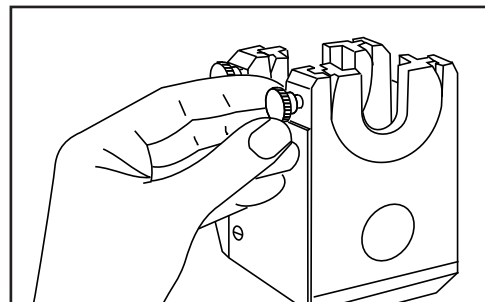
Repeat at the other pipe end.



Preparing compression tool

Prepare the tool according to the instructions for the tool in question.

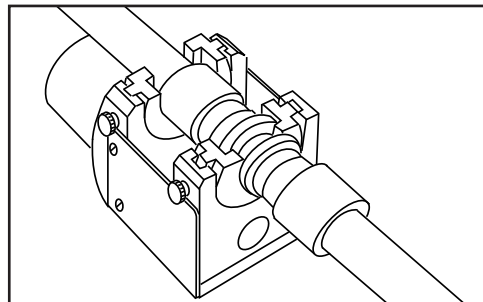
Install compression inserts, corresponding to the actual service pipe dimension.



The FlexPipe Press coupling, type MP

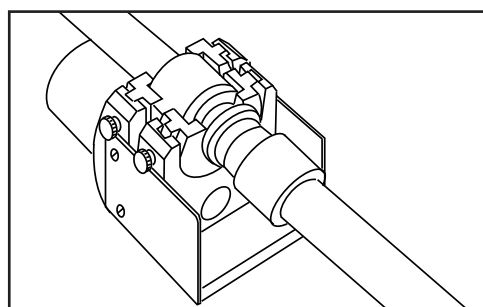
Preparing compression tool, continued

Place the pipe joint in the compression tool. Prior to compression make sure that the joint is placed correctly.

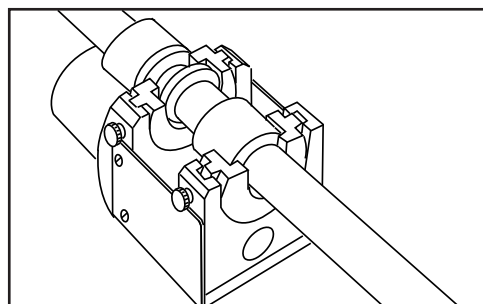


Compressing the coupling

Activate the compression tool, until the press ring comes to a stop.
Avoid excessive compression.

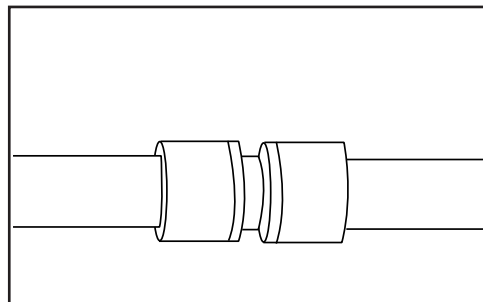


Repeat at the other end.



Finished coupling

Check that both press rings have come to a complete stop.



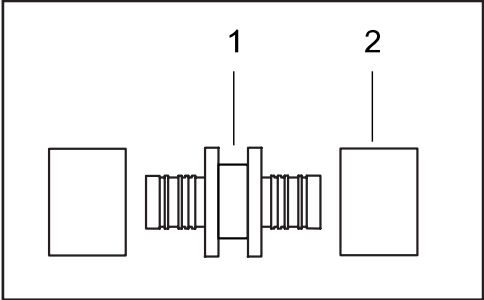
The FlexPipe

Press coupling, type JT

Description

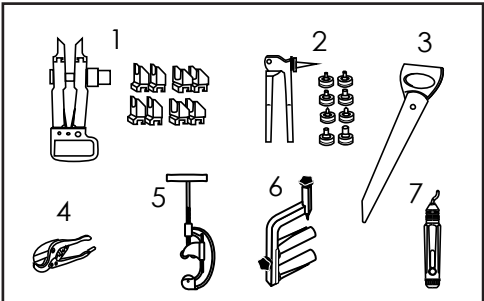
Press coupling, type JT consists of:

1. Supporting bush
2. Press ring



Tools

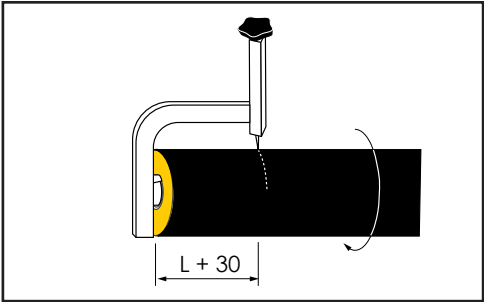
1. Compression tool
2. Expansion tool, incl. adapter for SDR 7.4 service pipe
3. Saw
4. PEX scissors for dimensions $\leq \varnothing 63$ mm
5. Pipe cutter for dimensions $> \varnothing 63$ mm
6. Stripping tool
7. Deburring tool



Removing insulation and shortening

Remove $L + 30$ mm of the insulation from the pipe end, using the stripping tool.

The additional 30 mm is for later trimming of the service pipe, before coupling installation.



Coupling	L, mm
Press coupling straight	140
Press coupling 90°	140
Press coupling with weld end	200
Press coupling tee:	
- main pipe	140
- branch	200

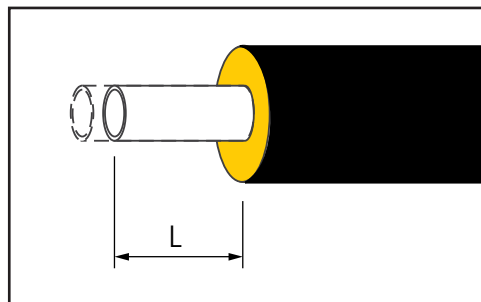
The FlexPipe

Press coupling, type JT

Removing insulation and shortening, continued

Shorten the pipe in a clean and perpendicular cut to the L length.

Check that the pipe end is not damaged.

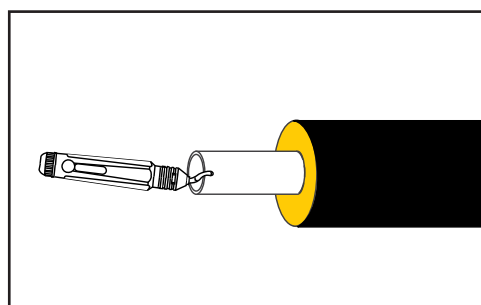


Deburring

Deburr the inside and outside of the service pipe end, using the deburring tool.

Remove foam remnants on the service pipe with emery cloth, grain size 150.

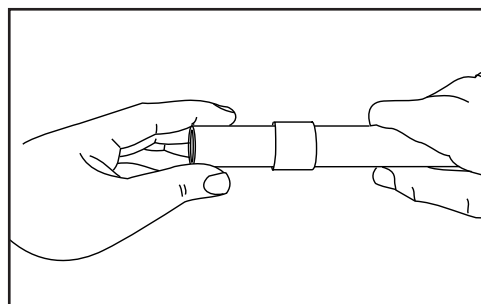
Install shrink sleeves and collars on one of the pipe ends.



Expanding the pipe end

Push the press ring on to one of the pipe ends.

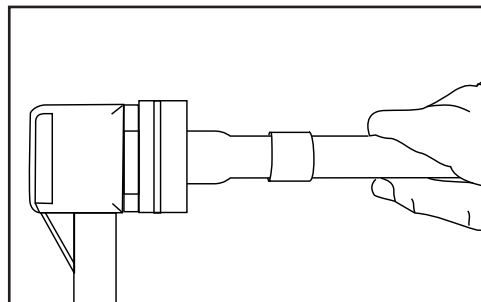
Place the press ring minimum 2 x compression ring length from the pipe end.



Expand the pipe ends with the expansion tool as described in the user instructions of the tool supplier.

Note! The pipe end is expanded twice or more times in a row, rotating the expansion tool 30° after each expansion.

Hold the expansion tool 5 seconds in fully expanded position. Otherwise the pipe may shrink so quickly, that it becomes difficult to insert the supporting bush into the pipe.



The FlexPipe

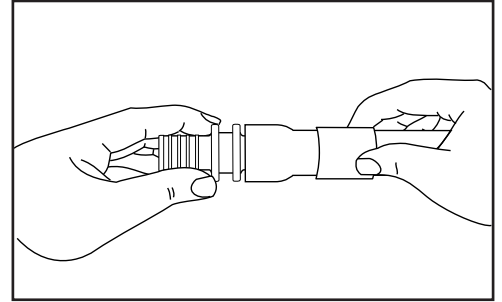
Press coupling, type JT

Installing the coupling

Immediately after using the expansion tool the supporting bush is inserted as far as possible into the pipe.

Check that all the ribs of the supporting bush as a minimum are covered by the pipe. If this is not the case, repeat the expansion process.

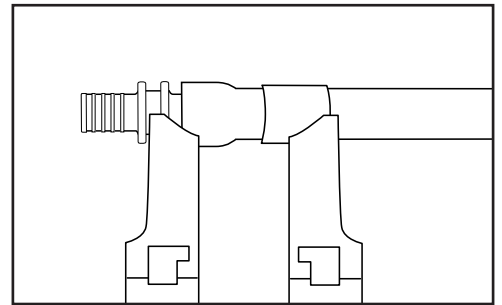
Before compressing the coupling check again that none of the ribs of the supporting bush at the pipe end are visible.



Compressing the coupling

Place the compression tool so the jaws presses against the nipple flange and the compression ring as described in the user instructions from the tool supplier.

Check that the tool is correctly placed, before compressing.

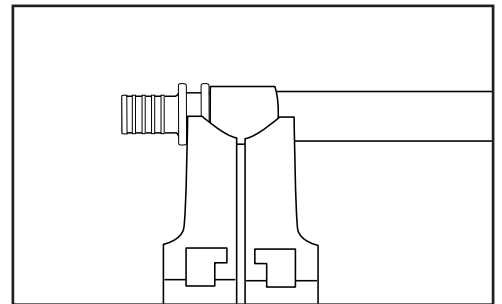


Activate the compressing tool, until the compression ring is flush with the nipple flange.

1 mm split between the press ring and the nipple flange is acceptable.

Avoid excessive compression.

Make sure the compression is perpendicular to the pipe and even around the flanges of the coupling.



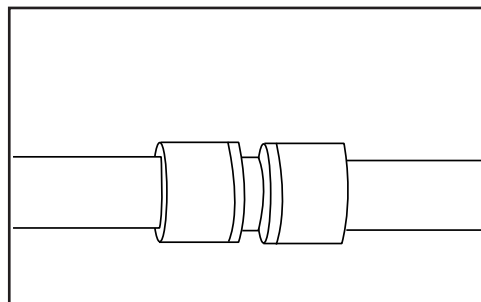
Repeat at the other pipe end

Repeat at the other pipe end.

The FlexPipe

Press coupling, type JT

Finished coupling Check that both press rings have come to a complete stop and that the joint has been compressed evenly all the way round. 1 mm split between the press ring and the nipple flange is acceptable.

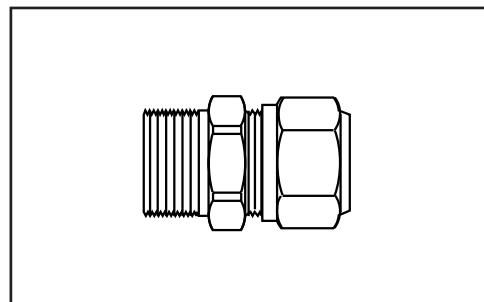


Compression coupling ø 16-32 mm

Description

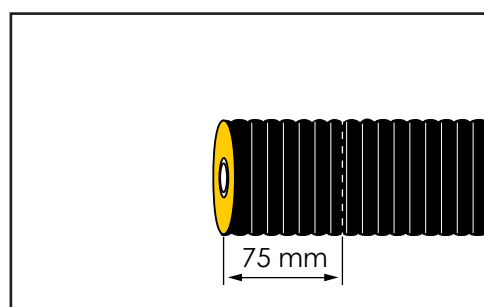
The coupling consists of:

1. Clutch casing with supporting bush
2. Squeezing ring
3. Union nut



Preparing pipe ends

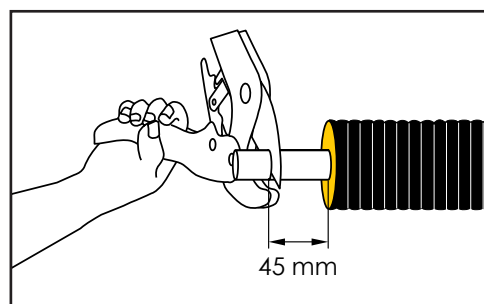
Remove 75 mm insulation from the pipe end with a stripping tool.



Cut the PEX pipe at right angles, using a pair of PEX scissors or a saw.

Free end: 45 mm.

Remove any external burrs and foam remnants.



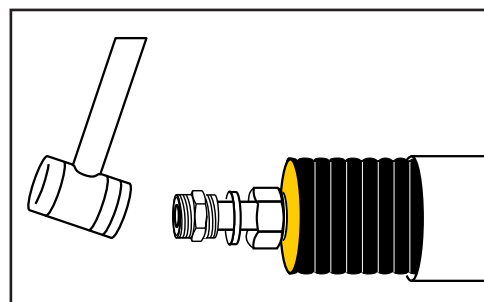
Installing coupling

Disassemble the coupling:

Place the union nut and the squeezing ring on the pipe.

Push the supporting bush into the pipe to full stop. Use a rubber hammer, if necessary.

The pipe end must be in the dish-shaped part.

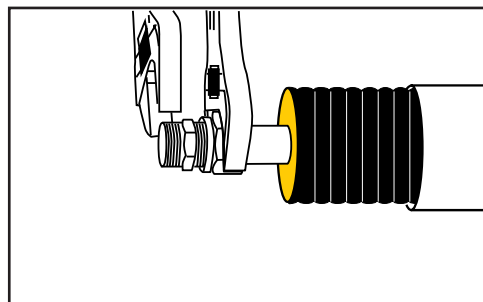


Compression coupling ø 16-32 mm

**Installing coupling,
continued**

Push the supporting bush into the body of the coupling - to the bottom. Tighten the union nut manually. The body must not turn. Retighten approx. 2.5 rounds, until the resistance is firm.

Use a ring spanner or an adjustable spanner, NOT a PIPE WRENCH.



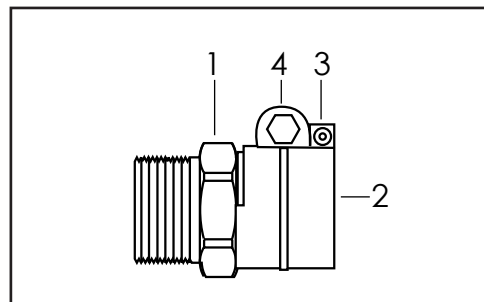
The FlexPipe

Compression coupling ø 40-110 mm

Description

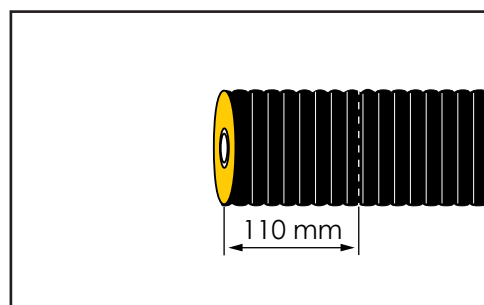
The coupling consists of:

1. Clutch casing with supporting bush
2. Clamping piece
3. Opening screw
4. Tightening bolt



Preparing pipe ends

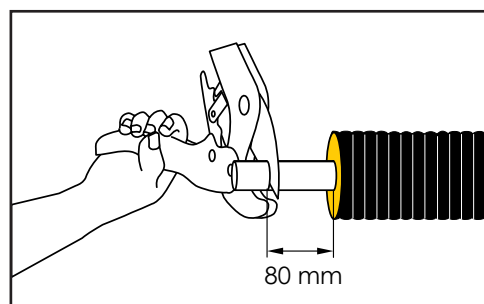
Remove 110 mm insulation from the FlexPipe end with a stripping tool.



Cut the PEX pipe at right angles, using a pair of PEX scissors or a saw.

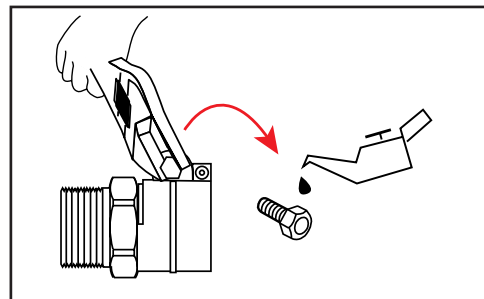
Free end: 80 mm.

Remove any external burrs and foam remnants.



Installing coupling

Unscrew the tightening bolt and lubricate it with mineral oil.

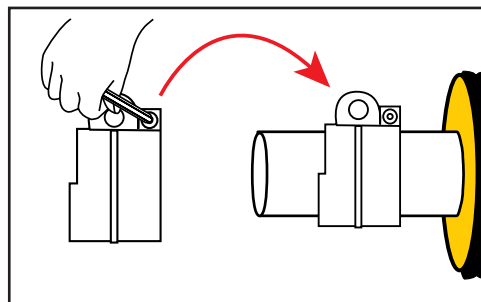


Compression coupling ø 40-110 mm

Installing coupling, continued

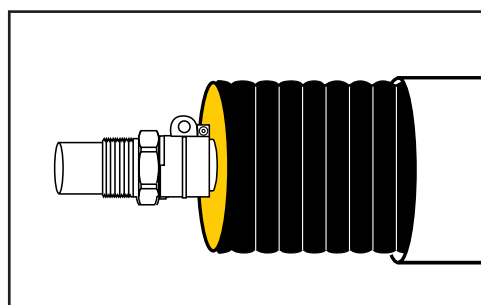
Open the clamping piece with the opening screw.

Push the clamping piece onto the pipe.



Push the clutch casing with supporting bush into the PEX pipe. The PEX pipe must be in full contact with the bottom.

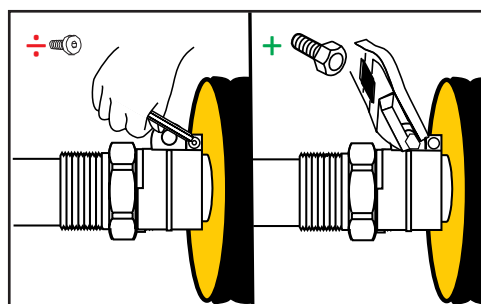
Place the clamping piece over the groove of the supporting bush, so the blades grip the groove.



Remove the opening screw completely.

Slowly tighten the bolt, until the clamping piece is completely joined.

Big dimensions require pausing, so the PEX pipe can take shape after the coupling. It may take up to 30 minutes to connect PEX 63 mm and larger. If necessary, relubricate with mineral oil.



The FlexPipe
Casing joints - Overview

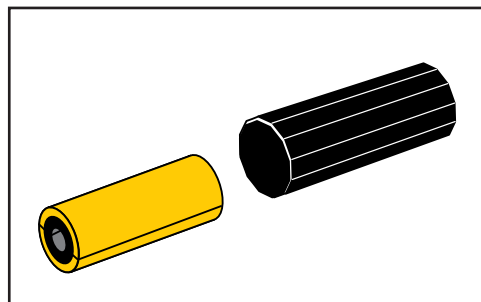
Contents	FXJoint
	SX-WPJoint
	C2LJoint and C2FJoint
	TSJoint, see Weld Joint Manual

The FlexPipe Casing joints - FXJoint

Application

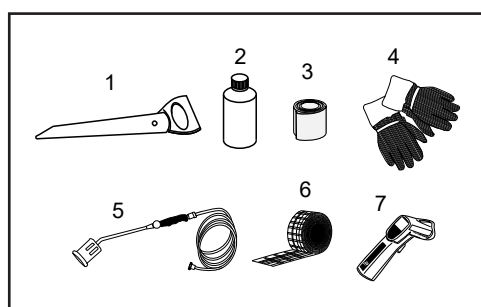
FXJoint is a closed shrink joint which is installed, before joining the service pipe.

The joint is used to join FlexPipes in casing dimension $\varnothing 90 - 180$ mm.



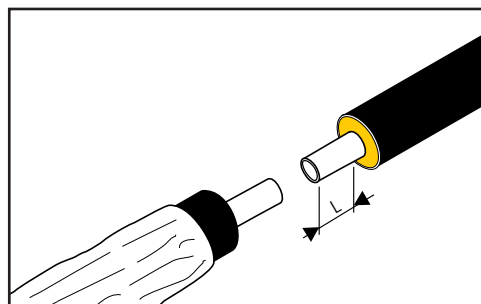
Tools

1. Saw
2. Alcohol, min. 93%
3. Emery cloth, grain size 36-40
4. Gloves
5. Gas burner, $\varnothing 50$ mm
6. Heat shield
7. Temperature measuring device



Preparation

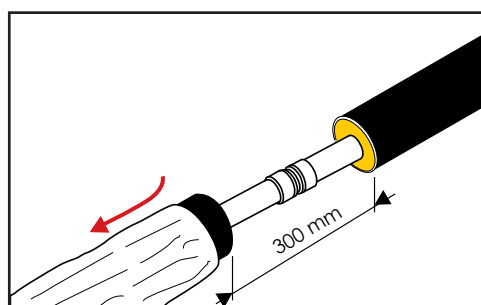
1. Cut off the insulation with a suitable stripping tool in accordance with the installation instructions for the coupling.



Installing coupling

2. Place the shrink sleeve with packing on one of the pipes, before the service pipes are joined.

The total free pipe length is max. 300 mm

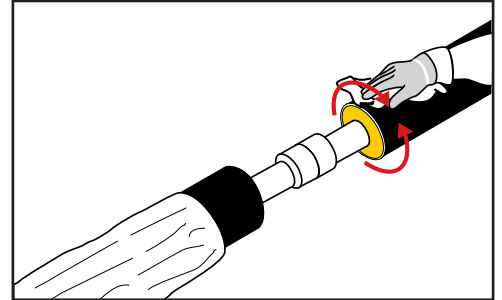


The FlexPipe Casing joints - FXJoint

Cleaning

3. All surfaces in the mounting area must be CLEAN and DRY.

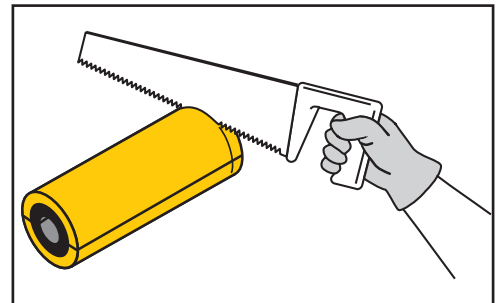
Clean the outer casing with alcohol.



Insulation shells

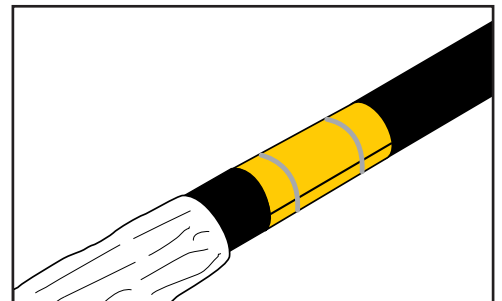
4. Shorten the insulation shells, so they fit tightly between the casing pipes.

Remove any insulation foam to make room for the coupling



5. Fit the insulation shells tightly between the casing pipes, using adhesive tape if necessary.

All surfaces must be CLEAN and DRY at least 150 mm from both casing ends.



The FlexPipe Casing joints - FXJoint

Activation

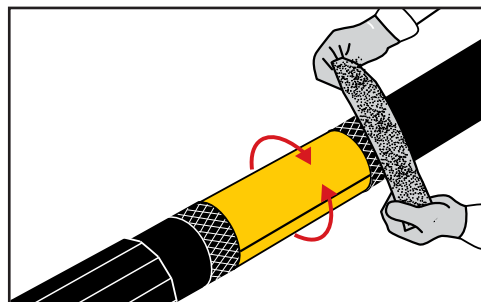
6. Remove the packing from the shrink sleeve.

Check that the sleeve is CLEAN and DRY inside and out.

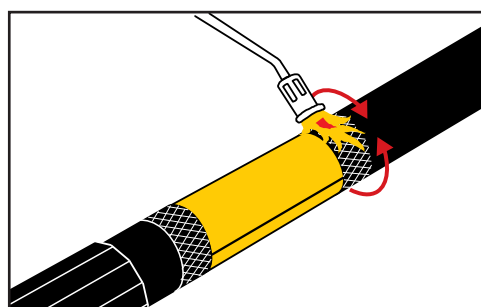
Grind the contact surfaces of the shrink sleeve so grinding marks are visible 30 mm outside the sleeve rim (This enables visual control of the activation by the inspection).

Remove loose grind dust.

Do not touch the ground contact surfaces.



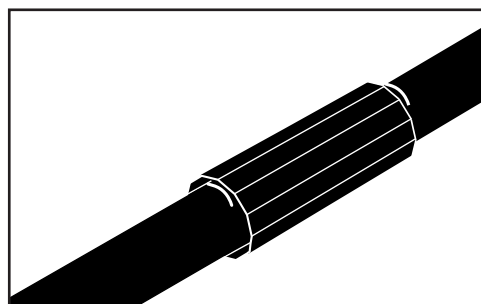
7. Activate the contact surfaces with gas burner to a surface temperature of min. 65°C.



Centring

8. Centre the shrink sleeve over the joint and then remove the mastic cover from the shrink sleeve.

Check that all foil has been removed.



The FlexPipe Casing joints - FXJoint

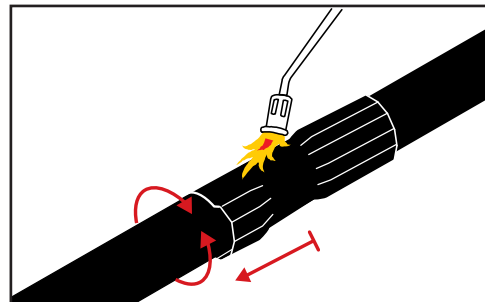
Shrinkage

9. First, shrink from the middle towards one end, then from the middle towards the other end.

Hold the burner head at an angle of approx. 30° towards the middle of the sleeve to avoid unintended heating of the casings.

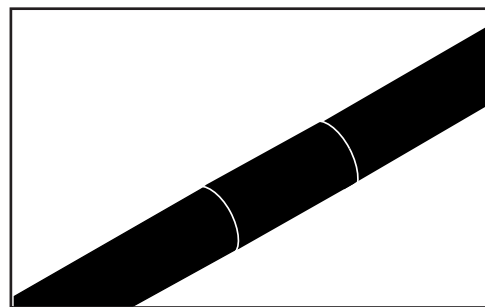
Shrink until the expansion marks have vanished and the sleeve forms an almost straight encircling edge.

NB! Avoid heating directly on the casing. If necessary protect the casing with LOGSTOR heat shield.



Finished joint

10. The joint is complete.



The FlexPipe Casing joints - SX-WPJoint

Application

SX-WPJoint is a closed shrink sleeve which is installed, before the service pipe is welded together.

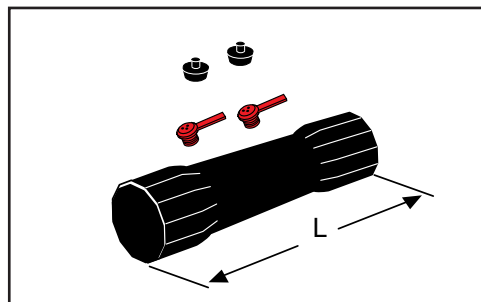
SX-WPJoint is used for joining pipes in dimensional range $\varnothing 90 - 180$ mm.

The foam hole is sealed with a weld plug.

Foam pack:

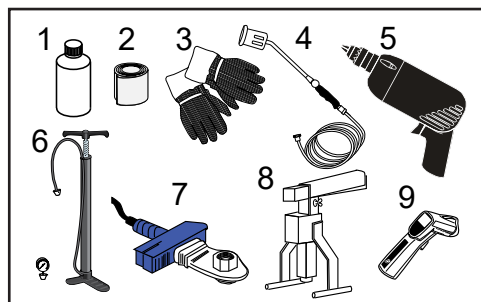
- size, see Foam Pack Folder.
- more information, see Insulating joints.

When installing on FlextraPipe, a collar is installed. The collar is ordered separately.



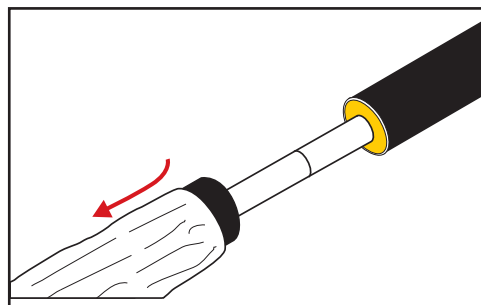
Tools

1. Alcohol, min. 93%
2. Emery cloth: Grain size 36-40: $\varnothing 90-280$ mm
3. Gloves
4. Gas burner: $\varnothing 50$ mm: $\varnothing 90-280$ mm
5. Drilling machine with a $\varnothing 35$ mm conical drill bit
6. Leakage test equipment
7. Plug welding tool
8. Retaining tool for weld plug
9. Temperature measuring device



Preinstallation of casing joint

1. Place the shrink sleeve with packing on one of the pipes, before the service pipes are joined.

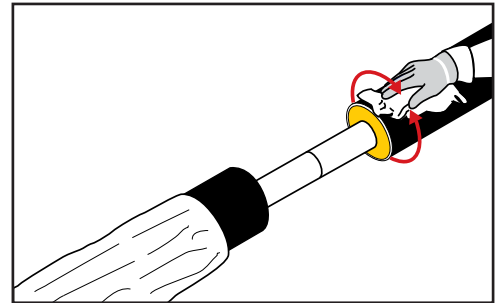


The FlexPipe Casing joints - SX-WPJoint

Cleaning

2. All surfaces in the mounting area must be CLEAN and DRY.

Afterwards clean them with alcohol.



Activation

3. Remove the packaging from the shrink sleeve.

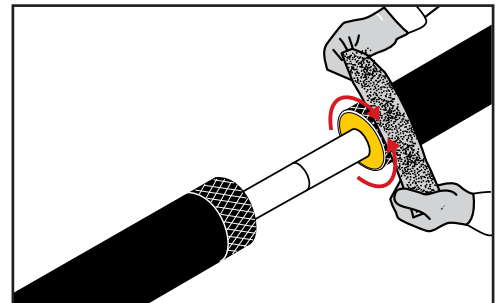
Check that the sleeve is DRY and CLEAN inside and out.

Leave the packing foil on the outer casing for later use as a shield against strong sunlight and during foaming of the sleeve.

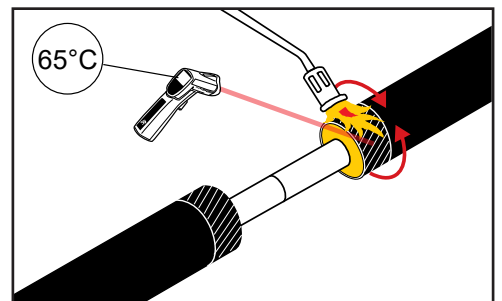
4. Grind the contact surfaces of the shrink sleeve with emery cloth, so grind marks are visible 30 mm outside the sleeve rim (This enables visual control of the grinding by the inspection).

Remove grind dust, if any.

Avoid touching the ground contact surfaces.



5. Activate the contact surfaces with a gas burner to a surface temperature of min. 65°C.



The FlexPipe

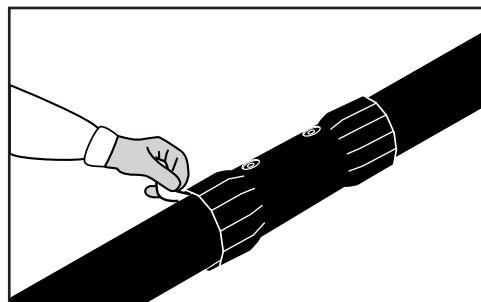
Casing joints - SX-WPJoint

Centering sleeve

6. Centre the shrink sleeve on the joint.

Remove the mastic covering in the shrink sleeve.

Make sure that all the foil has been removed.

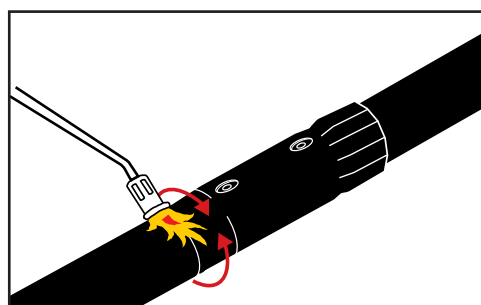


Shrinkage

7. Shrink the ends of the sleeve. Avoid heating directly on the casing.

Shrink the sleeve starting at the top to ensure centering.

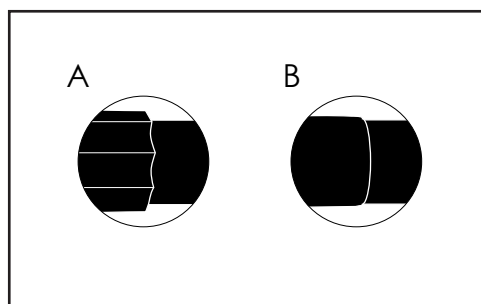
Large dimensions can be supported at the middle to ease centering.



8. Shrink until all expansion marks have vanished and the end of the sleeve forms an almost straight encircling edge.

A. Before

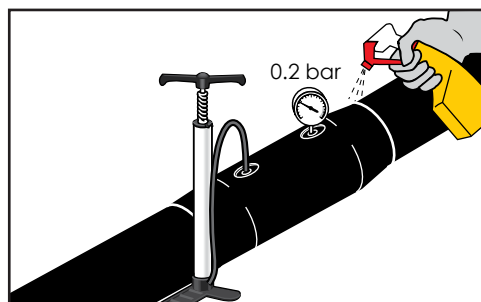
B. After



Leakage test

9. Wait until the sleeve has cooled off to handwarm. Leakage test at 0.2 bar.

Visually test that the sleeve ends are leakproof with a soap solution.



The FlexPipe

Casing joints - SX-WPJoint

Foaming

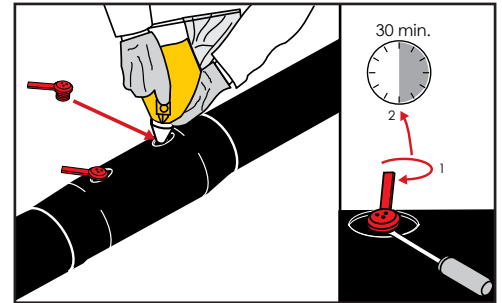
10. Pull the packaging foil back onto the sleeve and make a hole in the foil and install a venting plug in one hole and foam the sleeve through the other hole. Install the other venting plug.

11. 10 minutes after foaming the venting plug can be turned half round what facilitates the later removal of the venting plug.

Wait min. 30 min. for degassing to complete.

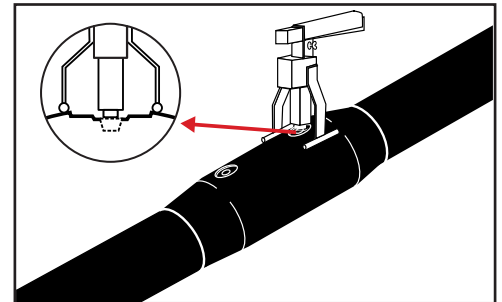
Remove the venting plugs.

Remove excess foam or spillage, if any.



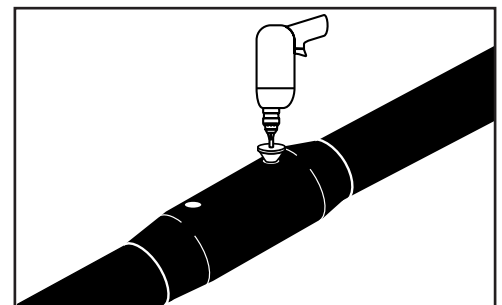
Weld plug

12. Adjust the retaining tool to the rim of the hole.



13. Drill the hole with a conical drill bit \varnothing 35 mm:

Remove any milling residues.

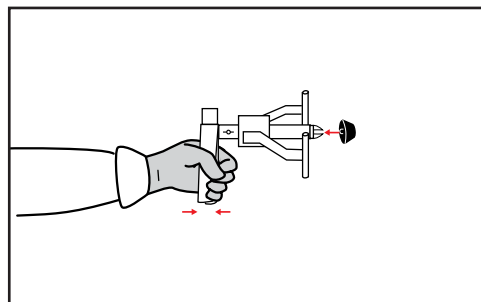


The FlexPipe Casing joints - SX-WP Joint

Weld plug, continued

14. Clean the rim and the casing surface around the hole with alcohol.

Insert the weld plug in the retaining tool and clean with alcohol.

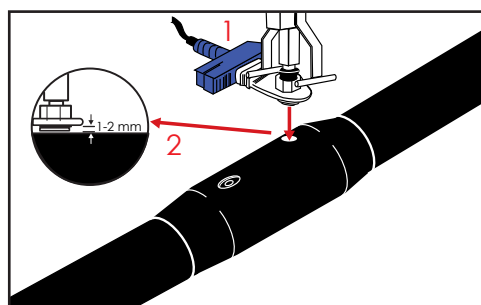


15. Heat the socket welder to 250°C.

16. Place the weld plug in the conical hole of the socket welder.

Keep it under a light pressure, until the rim of the plug starts to form a bead.

Now place the opposite side of the tool in the foam hole.

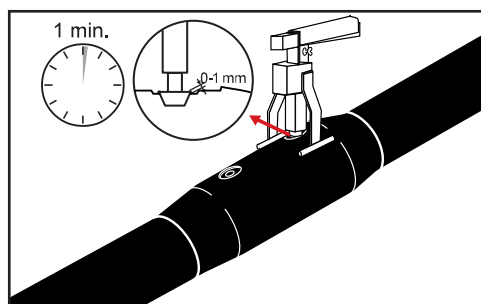


17. Remove the socket welder and immediately press the weld plug into the hole, until the legs rest on the casing and the upper rim of the plug is flush with the casing rim around the foaming hole (Max. approx. 1 mm above).

Hold the pressure constant at least 1 minute, until the welding zone has cooled down to handwarm, before the retaining tool is removed.

There has to be a visible bead.

Repeat the process with the other plug.



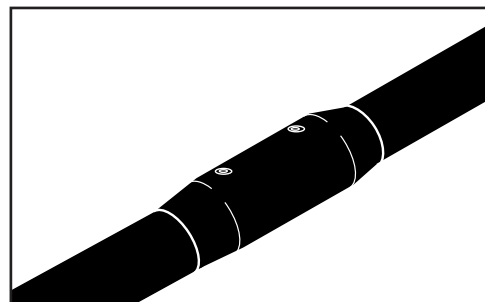
The FlexPipe

Casing joints - SX-WPJoint

Finished joint

18. The joint is complete.

When installing on a FlextraPipe, a collar is installed at the casing joint ends.



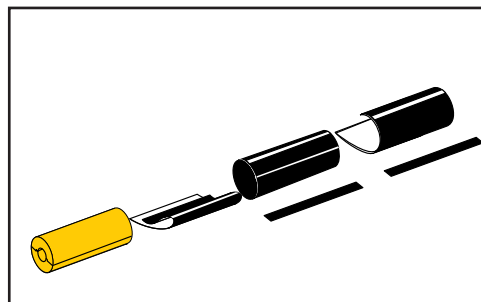
The FlexPipe

Casing joints - C2L and C2FJoint

Application

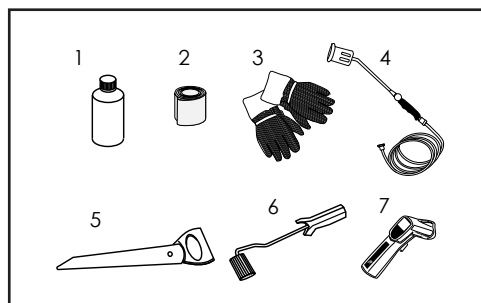
C2LJoint and C2FJoint are used, when there is not enough space to pre-install a shrink joint, e.g. where two short bends are used immediately after each other or as a repair joint.

C2FJoint is used for outer casing dimensions \varnothing 90 - 180 mm and C2LJoint for outer casing dimensions \varnothing 90 - 630 mm with insulation shells.



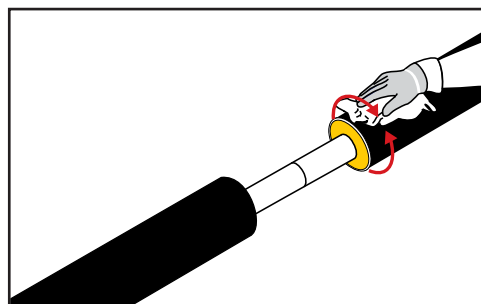
Tools

1. Alcohol, min. 93%
2. Emery cloth, grain size 36-40
3. Gloves
4. Gas burner: \varnothing 50 mm: \varnothing 90-280 mm
5. Saw
6. Roller
7. Temperature measuring device



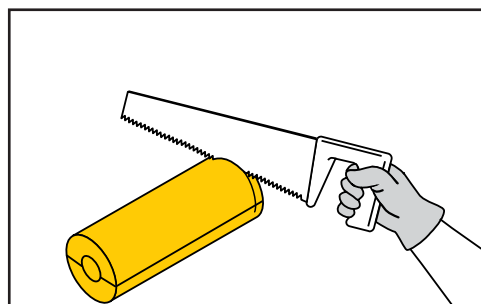
Cleaning

1. All surfaces in the mounting area must be CLEAN and DRY.



Adjusting insulation shells

2. Shorten the insulation shells to make them fit tightly between the casing pipes.



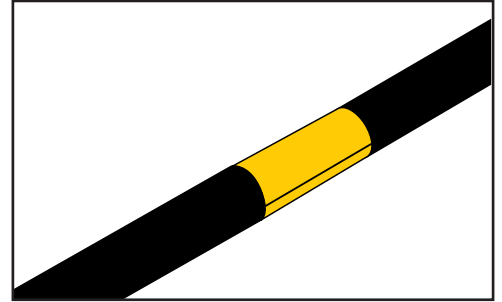
The FlexPipe

Casing joints - C2L and C2FJoint

Adjusting insulation shells, continued

3. Fit the insulation shells tightly between the casing pipes, using adhesive tape if required. All surfaces must be CLEAN and DRY.

Afterwards clean the casing surfaces with alcohol.

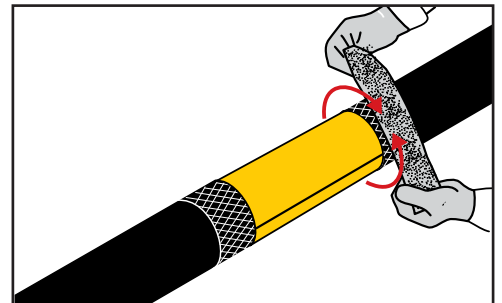


Activation

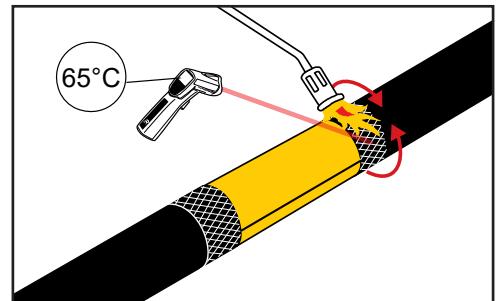
4. Grind the contact surfaces of the shrink sleeve and wrap with emery cloth, so grind marks are visible 30 mm outside the rim. (This enables visual control of the grinding by the inspection).

Remove grind dust.

Avoid touching the ground contact surfaces.



5. Activate the contact surfaces with gas burner to a surface temperature of min. 65°C.

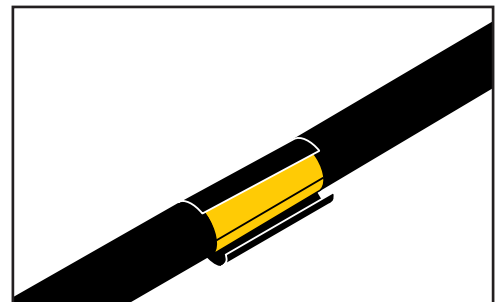


Installing shrink film

6. Centre the shrink film on the joint and place it around the pipe.

Attach one edge of the shrink film in the "10 o'clock" position.

Pull the film around the pipe by removing the adhesive paper so that the film adheres to the surface beneath it.

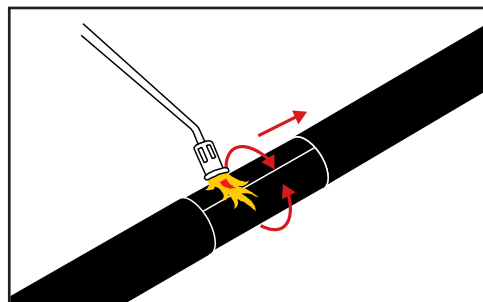


The FlexPipe

Casing joints - C2L and C2FJoint

Installing shrink film, continued

7. Heat the whole film from the centre towards the sides, ensuring that the shrink film is tightly fitted.



Installing shrink sleeve

8. Remove the packaging from the shrink sleeve.

Check that the sleeve is DRY and CLEAN inside and out.

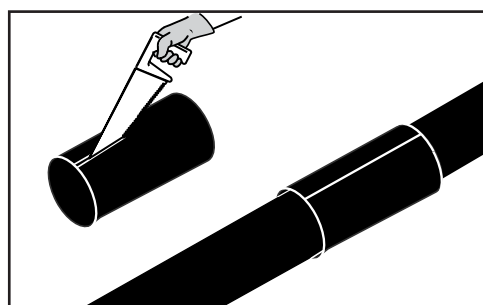
Open the shrink sleeve by cutting it longitudinally.

Clean the sleeve with alcohol.

Degrease the closure patch with alcohol. Now place the shrink sleeve over the joint.

Centre the shrink sleeve on the joint.

The longitudinal cut of the sleeve must be on the top and its edges must adjoin.



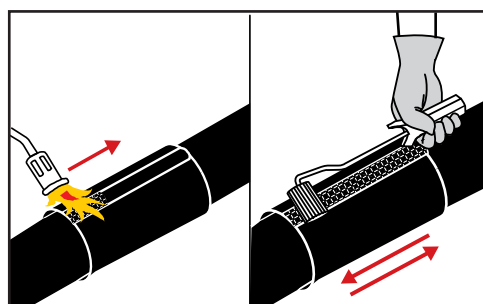
9. Centre the closure patch on the shrink sleeve cut with the hotmelt facing downwards. The side with the hotmelt has visible reinforcement.

Heat the closure patch until the structure of reinforcement becomes visible on the topside.

Press down the closure patch.

Then roll on the closure patch with the roller to ensure a good adhesion.

Alternatively, a patch press or a clean cloth may be used.



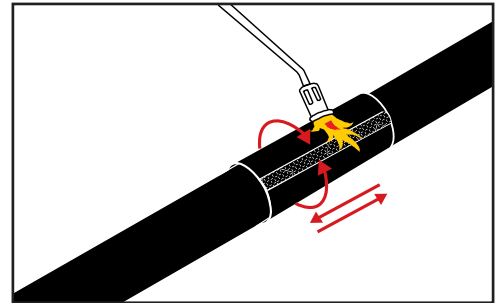
The FlexPipe

Casing joints - C2L and C2FJoint

Installing shrink sleeve, continued

10. If necessary, turn the sleeve, so that the closure patch is in a "10 o'clock position".

Shrink the sleeve with longitudinal sweeping movements from one end to the other.

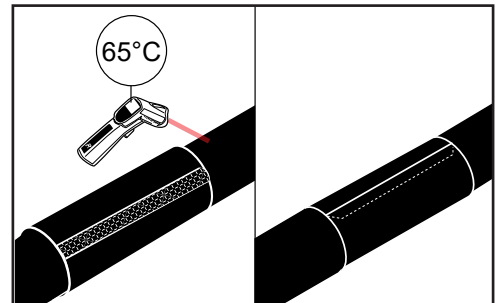


Installing shrink wrap

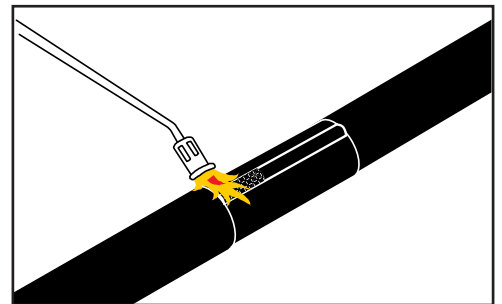
11. Check the activation temperature of the contact surfaces prior to installing the shrink wrap. The temperature must be min. 65°C.

Remove the protective foil from the shrink wrap, while pulling the wrap into position. Make sure that the text on the wrap encircles the pipe and that the wrap closes at the top.

The wrap must fit loosely around the pipe with an overlap of min 50 mm.



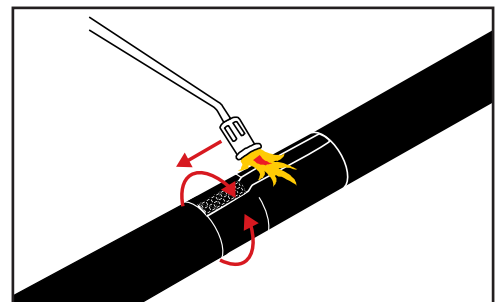
12. Centre the closure patch right above the wrap seam. Fasten as described under item 9.



13. Shrink the wrap from the centre towards the ends.

Shrink until the mastic becomes visible at all edges and the entire wrap adheres to the underlying surface.

After shrinkage the surface structure of the shrink wrap must be smooth and the green heat indicators must be heated, until they disappear.

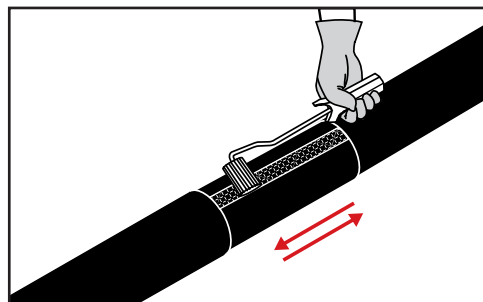


The FlexPipe

Casing joints - C2L and C2FJoint

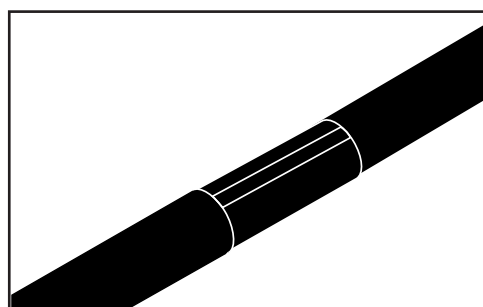
Installing shrink wrap, continued

14. Lightly roll along the overlapping edge, ensuring that any tunnel at the edge is sealed with mastic.



Finished joint

15. The joint is complete.



The FlexPipe
Branches - Overview

Contents

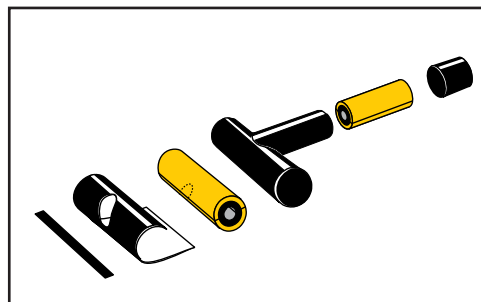
- T-joint straight with insulation shells
- T-joint straight for foaming
- Y-Joint
- References:
 - Installation of TXJoint and SXT-WPJoint, see under "The Bonded TwinPipe" in this manual
 - Installation of TSJoint branch, see Weld Joint Manual.

Branches - T-joint straight with insulation shells

Application

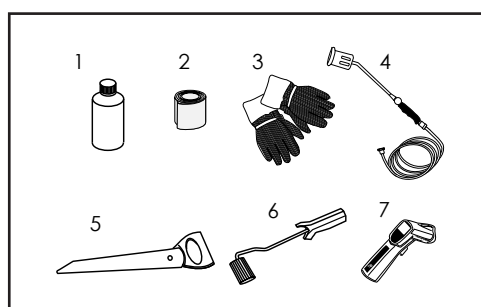
T-joint straight with insulation shells is used for branching on FlexPipes.

It can be used for main pipe dimensions \varnothing 90-180 mm and branch dimensions \varnothing 90-160 mm.



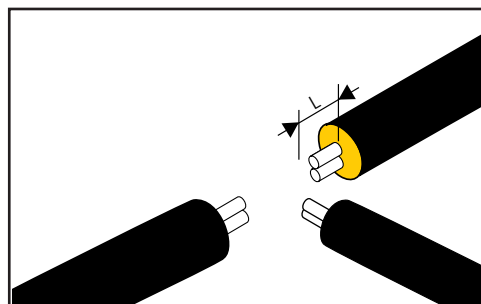
Tools

1. Alcohol, min. 93%
2. Emery cloth, grain size 36-40
3. Gloves
4. Gas burner: \varnothing 50 mm
5. Saw
6. Roller
7. Temperature measuring device



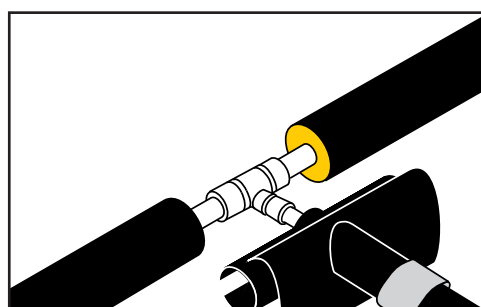
Preparations

1. Cut off the insulation with a suitable stripping tool. L depends on the type of coupling. The total stripped length is max. 300 mm.



2. Place collar, wrap, and T-shoe on the branch, before joining the pipes.

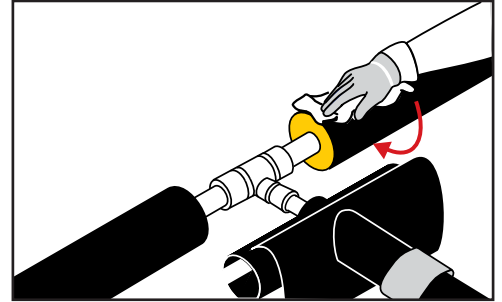
Install the coupling as shown in the relevant instructions.



Branches - T-joint straight with insulation shells

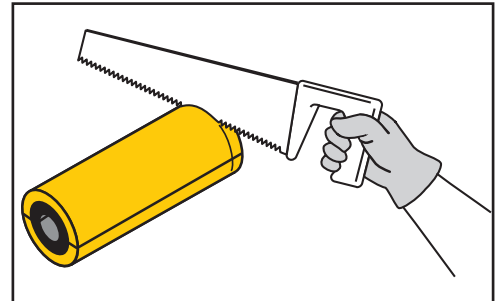
Cleaning

3. Clean all surfaces in the mounting area. Clean all casing pipe ends min. 200 mm from the ends with alcohol.



Adjusting insulation shells

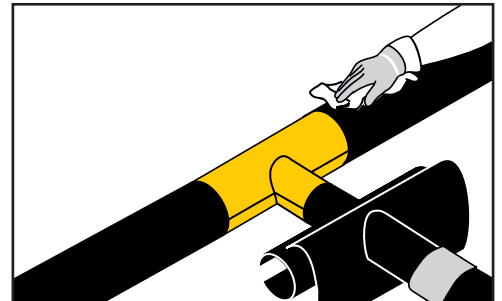
4. Shorten the insulation shells to make them fit tightly between the casing pipes. It can be necessary to remove insulation foam around the coupling.



5. Fit the insulation shells tightly between the casing pipes, using adhesive tape, if required.

All surfaces must be CLEAN and DRY.

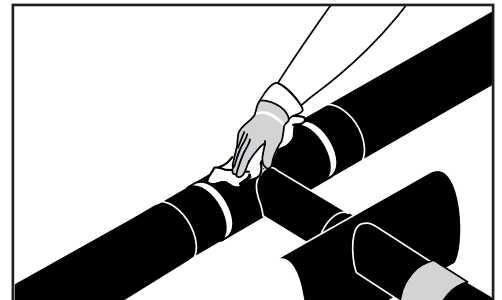
Now clean with alcohol.



T-shoe

6. Heat the T-shoe to 50-60°C.

Pull the T-shoe over the main pipe and fasten with tape.



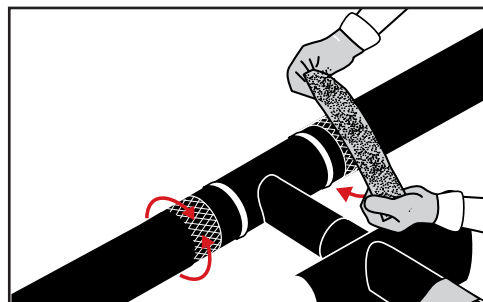
Branches - T-joint straight with insulation shells

Activation

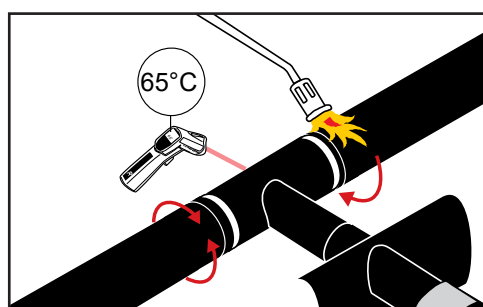
7. Grind the contact surfaces of the T-shoe so grinding marks are visible 30 mm outside the rim (This enables visual control of the activation by the inspection).

Remove loose grind dust.

Do not touch the ground contact surfaces.



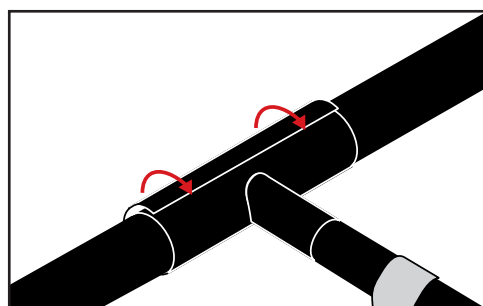
8. Activate the contact surfaces with gas burner to a surface temperature of min. 65°C.



Shrink wrap

9. Remove the paper, while pulling the wrap into position.

Turn the wrap so that the text goes around the pipe and closes at the top.

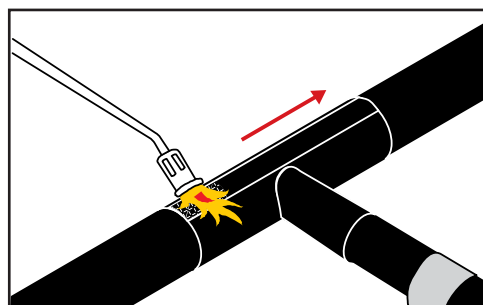


10. Clean the adhesive side of the closure patch with alcohol.

Centre the closure patch on the wrap joint with the adhesive side facing down.

The adhesive side has visible reinforcement. Heat the closure patch until the structure of reinforcement becomes visible on the topside.

Press down the closure patch.

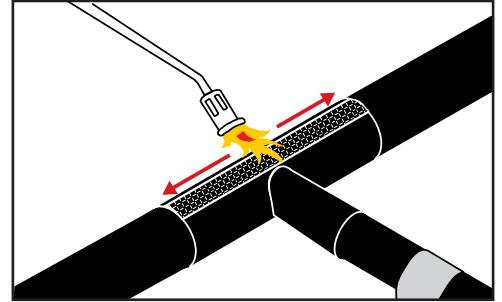


Branches - T-joint straight with insulation shells

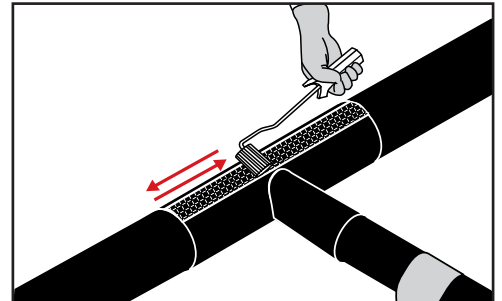
Shrink wrap, continued

11. Shrink the wrap from the centre towards both ends ensuring that the sealing compound becomes visible at both ends and the full shrinking effect has been utilised.

NB! Do not heat directly on the outer casing.



12. Roll along the overlapping edge, ensuring that any tunnel at the edge is sealed with mastic.

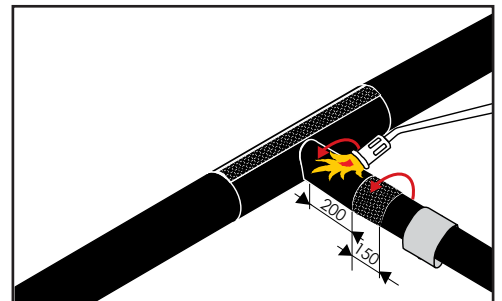


Branch

13. Shrink the outermost 200 mm on the branch.

Activate the casing 150 mm onto the branch.

Surface temperature: approx. 65°C.



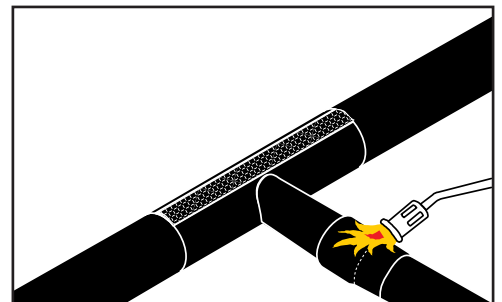
14. Remove the packing and paper from the collar.

Check that all the paper has been removed.

Shrink so the middle of the collar is over the end of the T-shoe.

NB! Do not heat directly on the outer casing.

15. The joint is complete.



Branches - T-joint straight for foaming

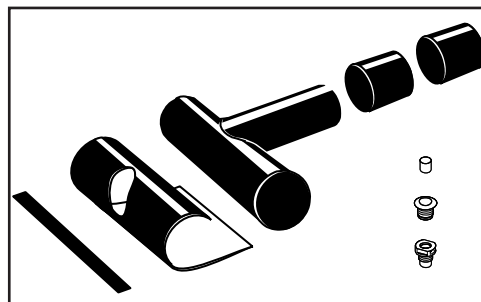
Application

T-joint straight for foaming is used for branching on FlexPipes.

It can be used for main pipe dimensions \varnothing 90-180 mm and branch dimensions \varnothing 90-160 mm.

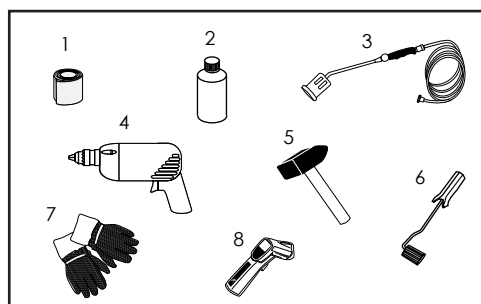
Foam packs:

- size, see foam pack folder
- more information see Insulating joints



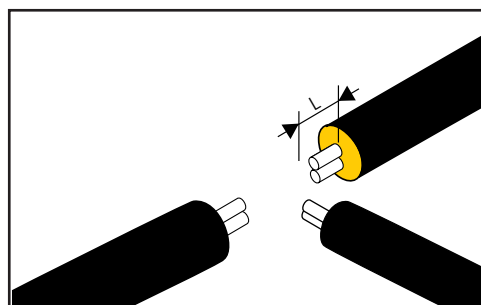
Tools

1. Emery cloth, grain size 36-40
2. Alcohol, min. 93%
3. Gas burner \varnothing 50 mm
4. Drilling machine
5. Hammer
6. Roller
7. Gloves
8. Temperature measuring device

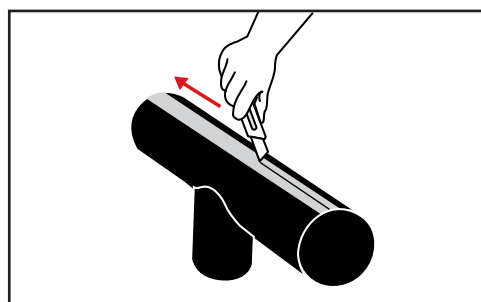


Preparations

1. Cut off the insulation with a suitable stripping tool. L depends on the type of coupling. The total stripped length is max. 300 mm.



2. Cut the T-shoe open in the middle of the bevelled area.



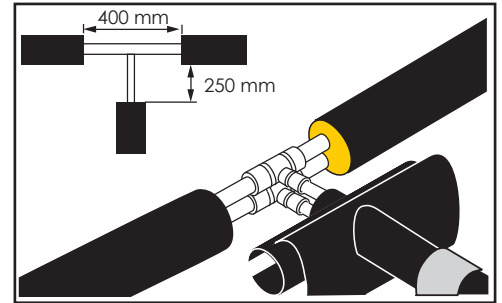
Branches - T-joint straight for foaming

Preparations, continued

3. Preinstall collars, wrap, and T-shoe on the branch.

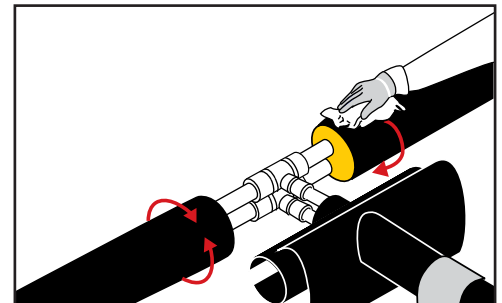
Join the pipes in accordance with the relevant instructions.

Stripping length of main pipes, including coupling length, is max. 400 mm and that of the branch max. 250 mm.



Cleaning

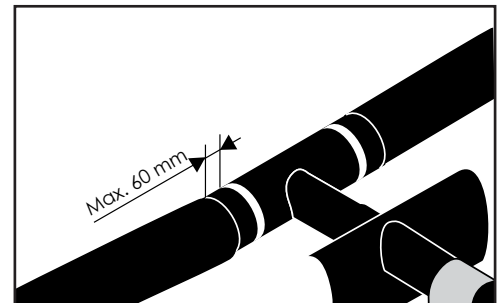
4. Clean all surfaces in the mounting area. Use alcohol on min. 150 mm of the outer casing ends.



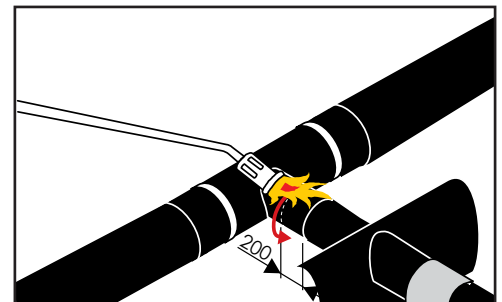
Installing T-shoe

5. Pull the T-shoe over the main pipes.

Fasten the T-shoe tightly around the pipe with straps on each side of the branch. Wrap filament tape around the T-shoe max. 60 mm from the edge of the T-shoe.



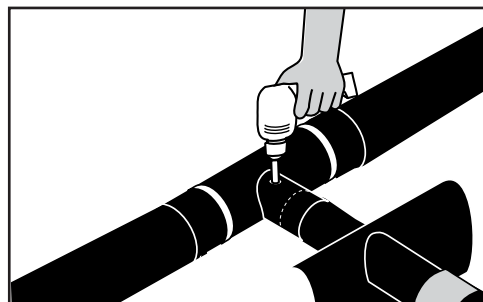
6. Shrink the outmost 200 mm of the branch pipe.



Branches - T-joint straight for foaming

Foaming

7. Drill a $\varnothing 25$ mm hole in the branch pipe.



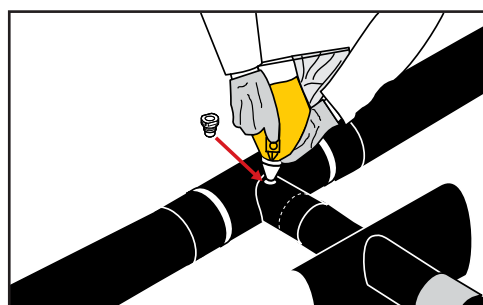
8. Foam the T-shoe and insert a venting plug in the hole.

Wait min. 30 min. for degassing.

Remove the venting plug by turning and lifting it.

Remove excess foam, if any.

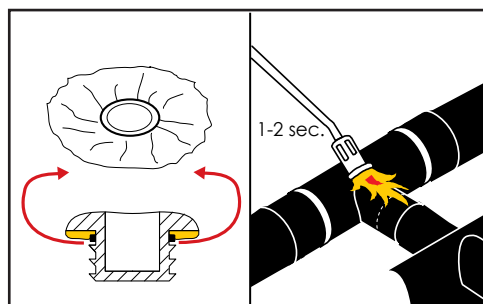
Activate the area around the hole with emery cloth, grain size 36-40.



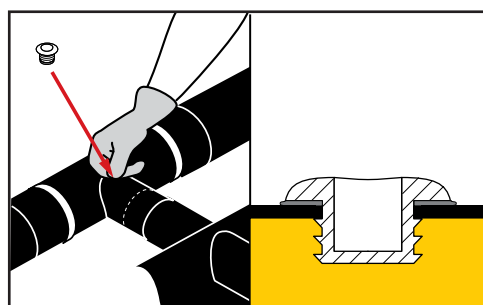
Expansion plug

9. Remove the protective foil from the expansion plug and check the mastic.

Activate briefly the area around the hole with a hard flame.



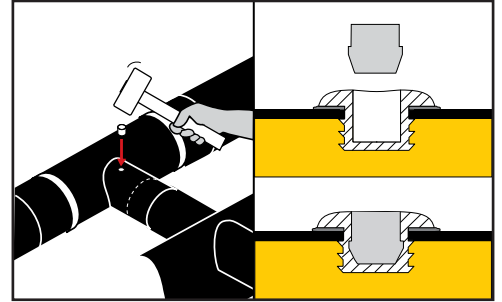
10. Mount the expansion plug in the hole and press, until the mastic is spread smoothly under the collar of the plug.



Branches - T-joint straight for foaming

Expansion plug, continued

11. Centre the wedge plug in the expansion plug and drive it completely into the plug with a hammer.

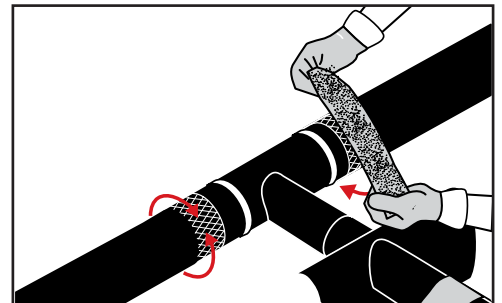


Activating main pipe

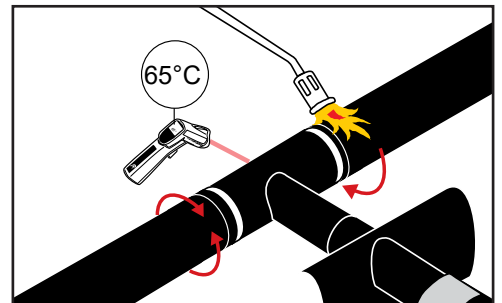
12. Grind the contact surfaces of the T-shoe so grinding marks are visible 30 mm outside the rim (This enables visual control of the activation by the inspection).

Remove loose grind dust.

Do not touch the ground contact surfaces.



13. Activate the contact surfaces with gas burner to a surface temperature of min. 65°C.



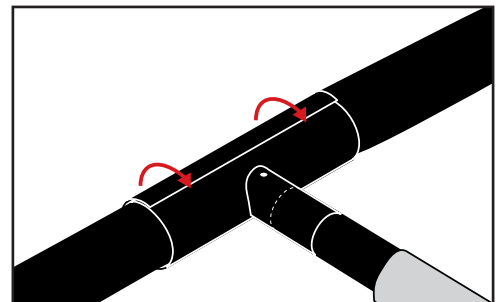
Installing shrink wrap

14. Place the shrink wrap around the main pipe.

Remove the protective paper, while pulling the wrap into position.

Turn the wrap so that the text goes around the pipe and closes at the top.

The wrap must fit loosely around the pipe with an overlap of min. 50 mm.



Branches - T-joint straight for foaming

Installing shrink wrap, continued

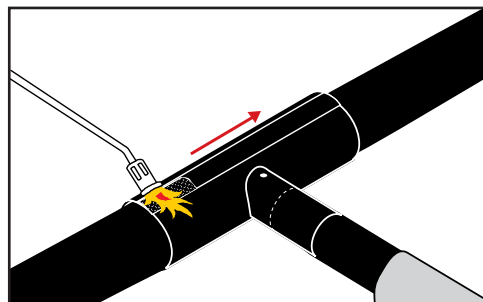
15. Clean the adhesive side of the closure patch with alcohol.

Centre the closure patch on the wrap joint with the adhesive side facing down.

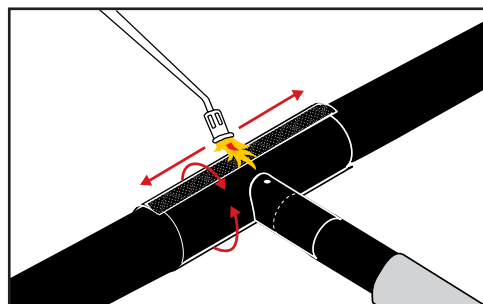
The adhesive side has visible reinforcement.

Heat the closure patch with a strong flame until the structure of reinforcement becomes visible on the topside.

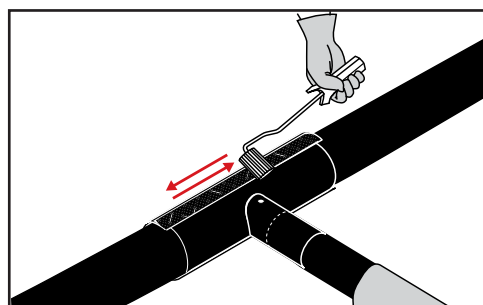
Press down the closure patch.



16. Shrink the wrap from the centre towards the ends, ensuring that the sealing compound spreads to both ends and that the full shrinking effect has been utilised.



17. Roll along the overlap, ensuring that any tunnel at the edge is sealed with mastic.



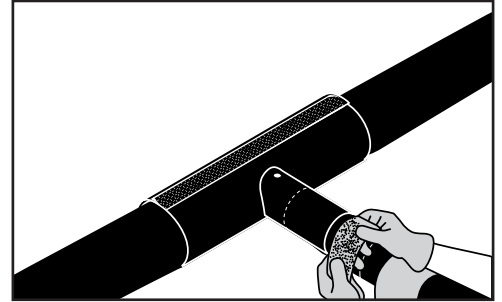
Branches - T-joint straight for foaming

Activating branch 18. Activate branch pipe and outer casing with emery cloth at least 150 mm on to the casing and the joint.

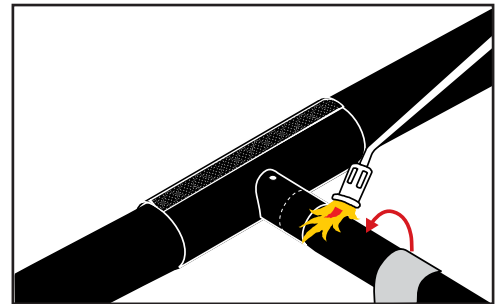
Grind the contact surfaces of the collar on the branch pipe and the outer casing as well as around the foaming hole with emery cloth, so grind marks are visible 30 mm outside the collar and around the foaming hole. (This enables visual control of the activation by the inspection).

Remove loose grind dust.

Do not touch the ground contact surfaces.



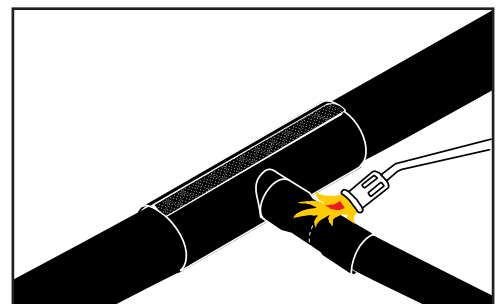
19. Activate the contact surface with a gas burner to a surface temperature of min. 65°C.



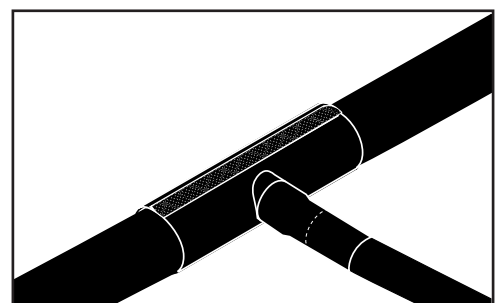
Installing collar 20. Remove packing and paper from the collars.

Check that all paper is removed.

Shrink one collar centered over the plug in the foaming hole, and the other collar centered over the end of the T-shoe.



Finished joint 21. The joint is complete.



The FlexPipe Branches - Y-Joint

Application

Y-Joint is used as a transition from TwinPipe to single pipe.

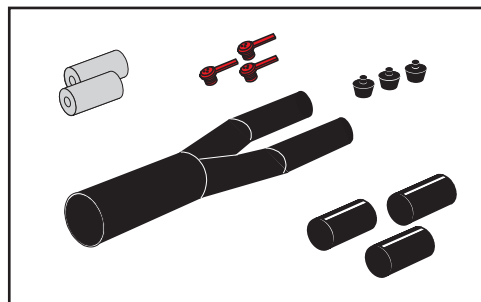
All 3 ends of the joint are shrinkable and embedded with mastic.

The joint is double sealed.

Used for TwinPipe casing dimensions
 \varnothing 90-140 mm and single pipe casing
 dimensions \varnothing 66-140 mm.

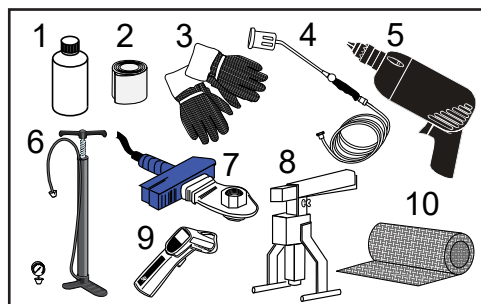
Foam packs:

- size, see foam pack folder
- more information see Insulating joints



Tools

1. Alcohol, min. 93%
2. Emery cloth: Grain size 36-40: \varnothing 90 - 280 mm
3. Gloves
4. Gas burner: \varnothing 50 mm: \varnothing 90-280 mm
5. Drilling machine with \varnothing 17.5 drill bit and \varnothing 35 mm conical drill bit
6. Leakage test equipment
7. Socket welder
8. Retaining tool for weld plug
9. Temperature measuring device
10. Heat shield



Pipe end preparations

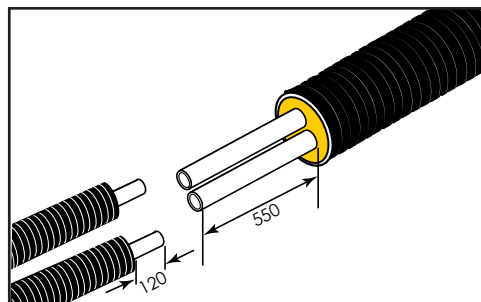
All surfaces in the joint area must be CLEAN and DRY.

Remove insulation from TwinPipe Flex: 580 mm.

Remove insulation from single Flex: 150 mm.

Cut 30 mm off the flexible service pipes.

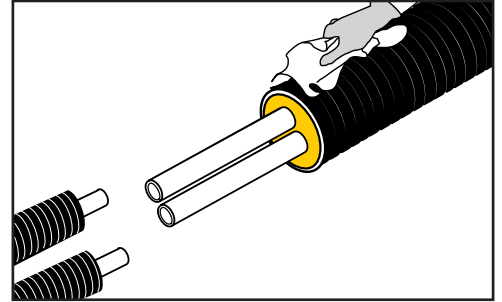
The finished free pipe ends must be 550 mm for TwinPipe and 120 mm for single pipes.



The FlexPipe Branches - Y-Joint

Cleaning TwinPipe

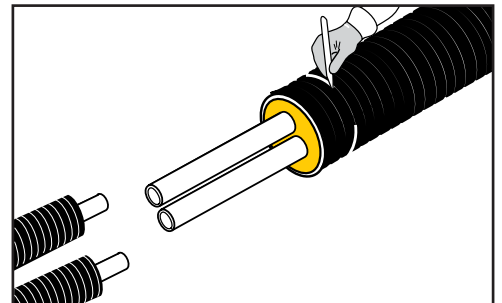
Clean approx. 500 mm of the TwinPipe casing end with alcohol.



Marking TwinPipe

Mark the L-measurement on the TwinPipe casing, measured from the casing pipe end.

115 mm to the rim of the sleeve.

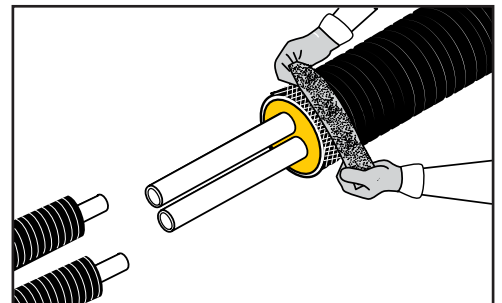


Activation TwinPipe

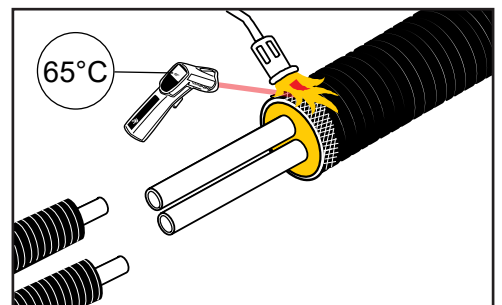
Grind minimum 250 mm of the contact surfaces of the sleeve and collar with emery cloth, so grind marks become visible 30 mm outside the collar rim (This enables visual control of the grinding by the inspection).

Remove grind dust, if any.

Avoid touching the ground contact surfaces.

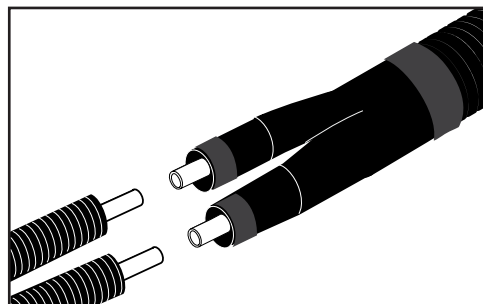


Activate the contact surfaces with a gas burner to a surface temperature of min. 65°C.

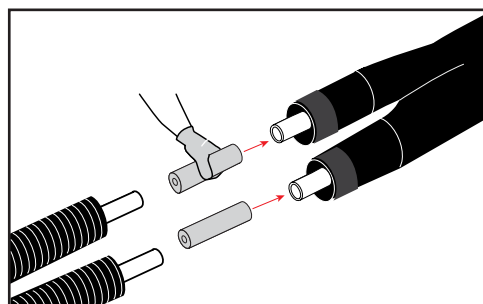


The FlexPipe Branches - Y-Joint

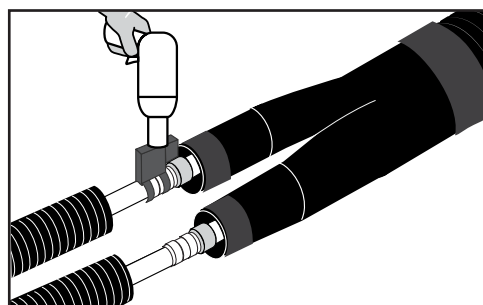
- Placing the sleeve** Check that the sleeve is CLEAN and DRY inside and out.
- Place the sleeve with collars on to the TwinPipe, so couplings can be installed. Check that the sleeve is CLEAN and DRY inside and out.
- Place the sleeve with collars on to the TwinPipe, so couplings can be installed.



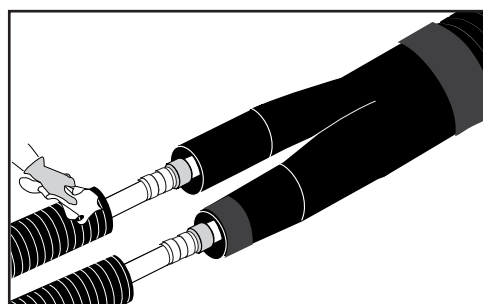
- Pipe insulation** Place the 2 pieces of pipe insulation on to the two single pipes.



- Coupling installation** Install couplings according to the valid instructions.



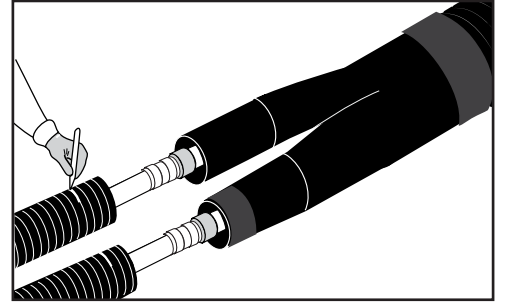
- Cleaning single pipe** Clean minimum 250 mm of the two single pipe casing ends with alcohol.



The FlexPipe Branches - Y-Joint

Marking single pipe

Mark 115 mm on both single pipes, measured from the outer casing end.

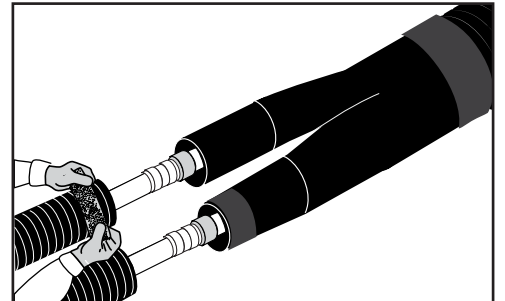


Activation single pipe

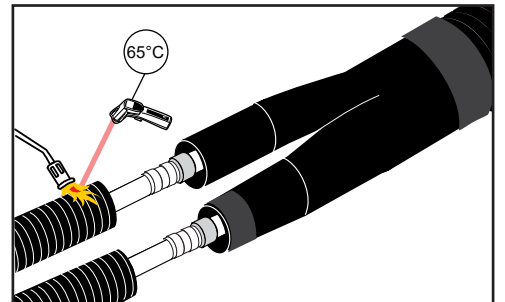
Grind minimum 250 mm of the contact surfaces of the sleeve and collar with emery cloth, so grind marks become visible 30 mm outside the collar rim (This enables visual control of the grinding by the inspection).

Remove grind dust, if any.

Avoid touching the ground contact surfaces.

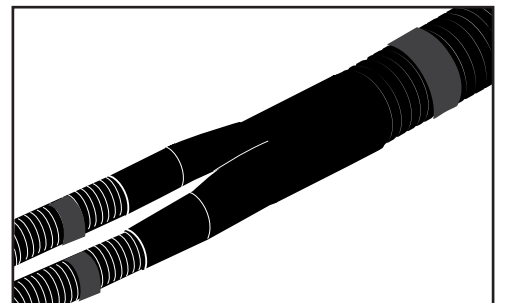


Activate the contact surfaces with a gas burner to a surface temperature of min. 65°C.



Centering the sleeve

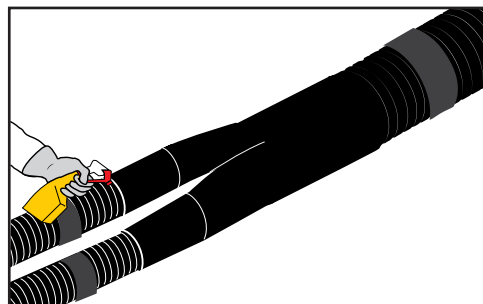
Center the sleeve over the joint according to the marks on the outer casing.



The FlexPipe Branches - Y-Joint

Cleaning

Clean the three shrink ends of the sleeve with alcohol.

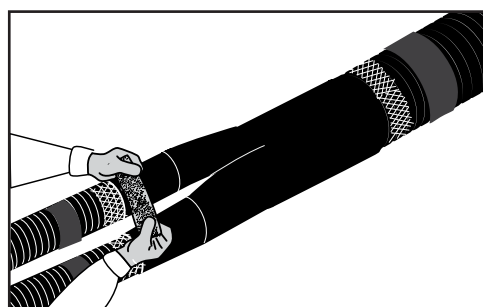


Activation collars

Grind the contact surfaces of the collars on the sleeve with emery cloth, so grind marks become visible 30 mm outside the collar rims (This enables visual control of the grinding by the inspection).

Remove grind dust, if any.

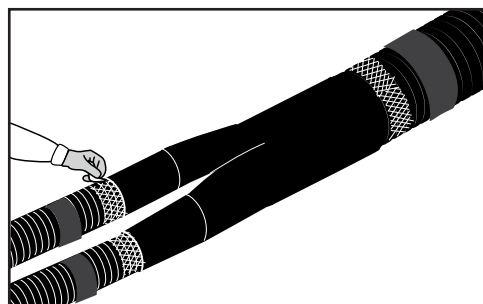
Avoid touching the ground contact surfaces.



Shrinking sleeve ends

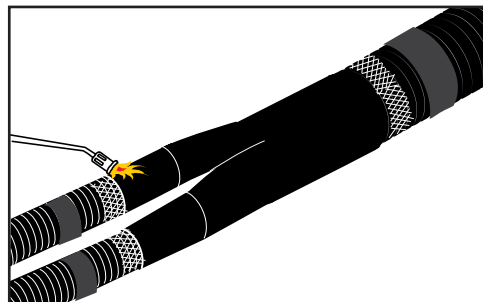
Remove the mastic cover from all sleeve ends.

Check that all cover has been removed.



Shrink the 3 sleeve ends. Avoid to heat the casing directly.

Protect the casing with LOGSTOR heat shield, if necessary.



The FlexPipe Branches - Y-Joint

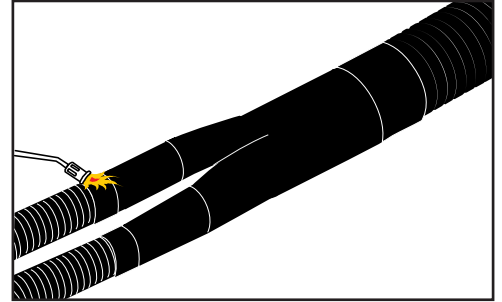
Shrinking collars

Remove the collars from the packaging. Check that all packaging has been removed.

Center the collar over the sleeve end.

Remove the mastic cover and check that all cover has been removed.

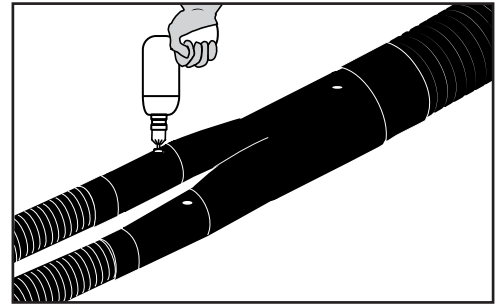
Repeat with the other 2 collars.



Leakage testing

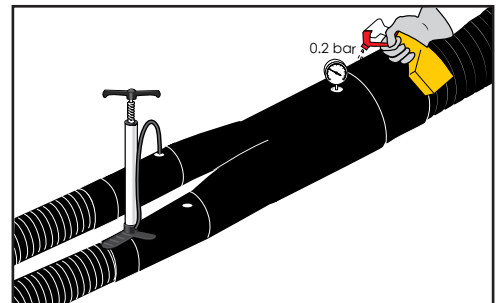
Drill three $\varnothing 17.5$ mm holes – one at each end at the highest point.

For leakage testing it is an advantage first to drill 2 holes and then drill the third hole in connection with the foaming.



When the shrink sleeve has cooled to handwarm, leakage test with 0.2 bar.

Test the sleeve ends visually with soapy water.

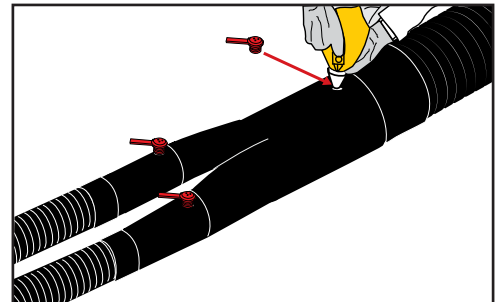


Foaming

Insert 2 venting plugs in the holes in the single pipes and foam the sleeve through the last foaming hole.

Now install a venting plug in the last foaming hole.

10 minutes after foaming the venting plugs can be turned half round, what facilitates the later removal of the venting plugs.



The FlexPipe Branches - Y-Joint

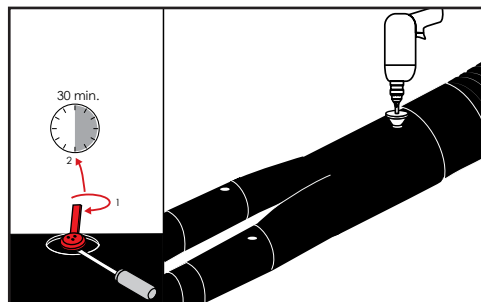
Foaming, continued

Wait at least 30 minutes for degassing to complete.

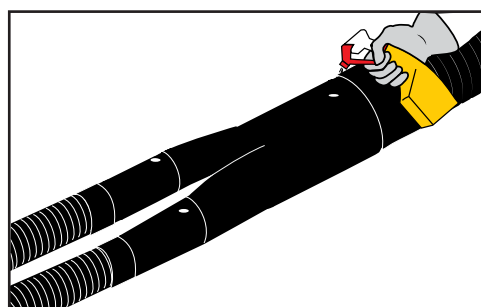
Remove the venting plugs. Remove excess foam or spillage, if any.

Mill the 3 foaming holes with a conical $\varnothing 35$ mm drill bit.

Remove any milling residues.



Clean the rim and surface around the holes using alcohol.

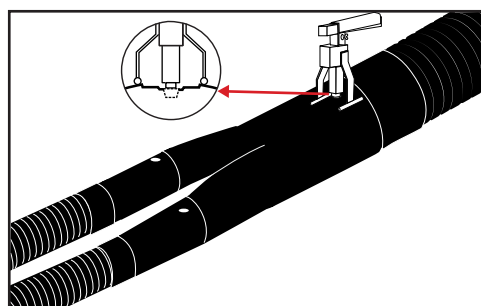


Installing weld plugs

Adjust the retaining tool to the rim of the hole.

Insert the weld plug in the retaining tool and clean it with alcohol.

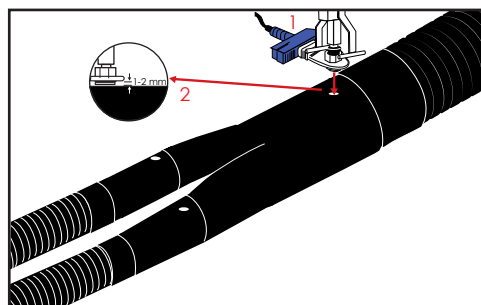
Heat the socket welder to 250°C.



Place the weld plug in the conical hole of the socket welder.

Keep it under light pressure, until the rim of the plug starts to form a bead.

Now place the opposite part of the tool in the foam hole.



The FlexPipe Branches - Y-Joint

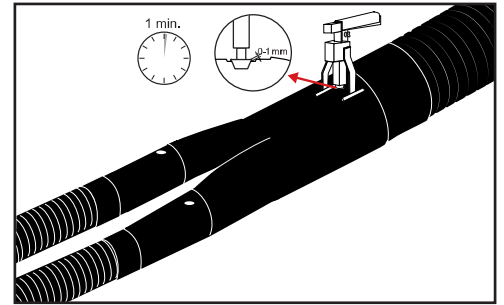
Installing weld plugs, continued

Remove the socket welder and immediately press the weld plug into the hole, until the legs rest on the casing and the upper rim of the plug is flush with the upper rim of the sleeve at the foam hole (approx. 1 mm above).

Hold the pressure constant for at least 1 minute, until the welding zone has cooled down to handwarm, before the retaining tool is removed.

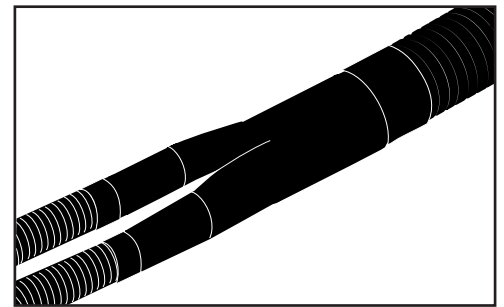
There has to be a visible bead.

Repeat the process with the other 2 plugs.



Finished joint

The joint is complete.

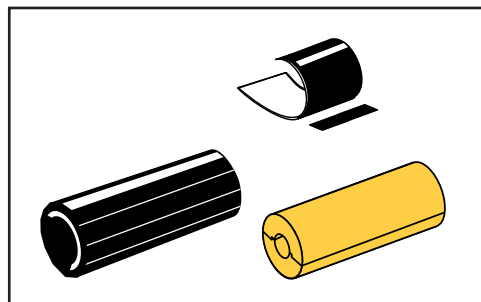


Terminations - End fitting with insulation shells

Application

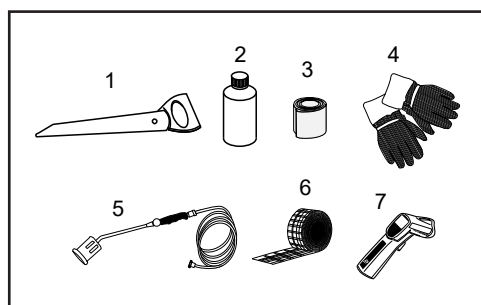
End fittings are used to terminate a pipe in the ground, temporarily or permanently.

End fittings for flexible systems are delivered in dimensions \varnothing 90-180 mm.



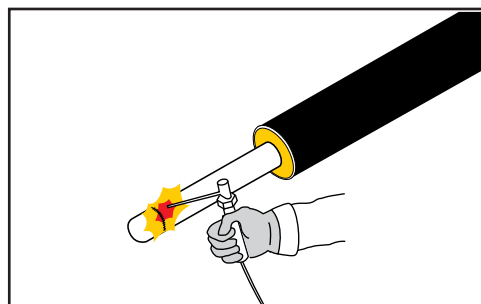
Tools

1. Saw
2. Alcohol, min. 93%
3. Emery cloth, grain size 36-40
4. Gloves
5. Gas burner, \varnothing 50 mm
6. Heat shield
7. Temperature measuring device



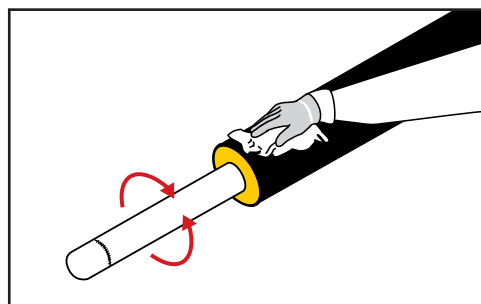
Welding steel end fitting

1. Weld the steel end fitting on the service pipe.



Cleaning

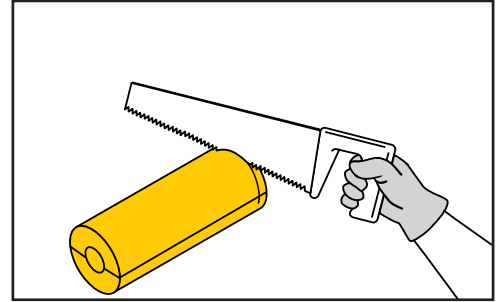
2. All surfaces in the joint area must be clean and dry. Now clean them with alcohol.



Terminations - End fitting with insulation shells

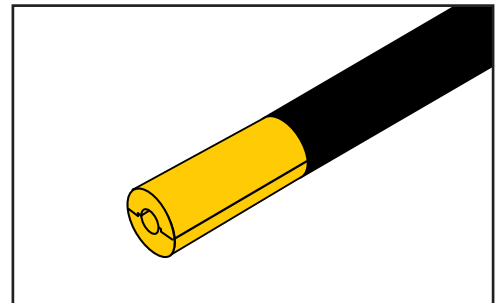
Adjusting insulation shells

3. Shorten the insulation shells to the length of the free end including the steel end fitting.



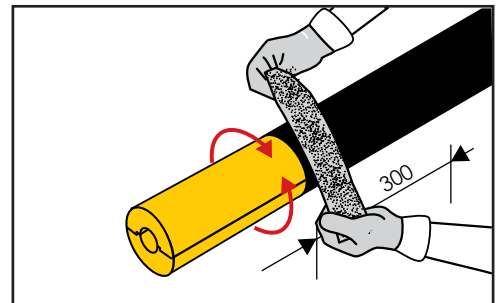
4. Place the insulation shells around the service pipe. Tape, if required.

The pipe end must be CLEAN and DRY.

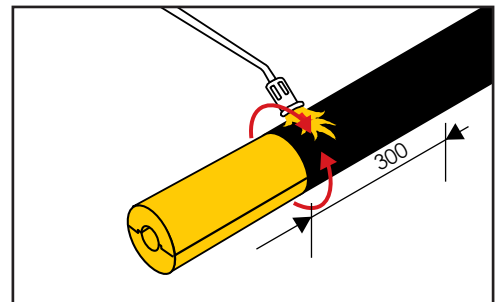


Activation

5. Activate the outer casing with emery cloth, grain size 36-40, at least 300 mm from the casing end.



6. Activate the casing pipe with gas burner at least 300 mm from the casing end, until the surface has a matt, silky look.



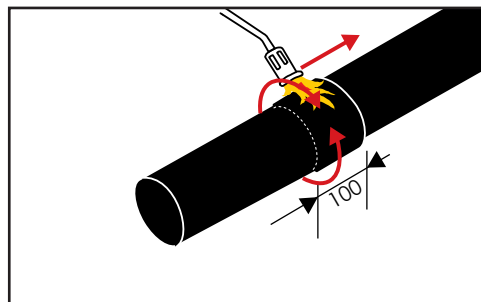
Terminations - End fitting with insulation shells

Shrinking sleeve

7. Remove the packing from the shrink sleeve. Check that the sleeve is CLEAN and DRY, inside and out.

Place the shrink sleeve on the insulation shells and the outer casing.

Shrink the sleeve on to the casing pipe, starting approx. 100 mm from the end of the shrink sleeve.



Shrinking shrink wrap and closure patch

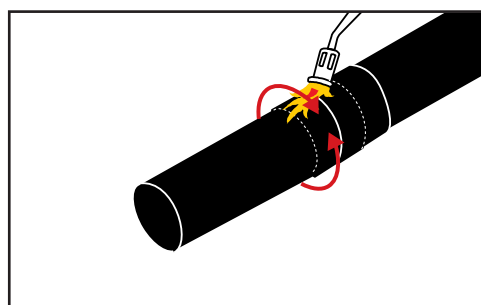
8. Centre a shrink wrap (bevelled corners) on one shrink sleeve end, so the fat end of the symbol faces the sleeve.

Install the shrink wrap around the sleeve end with an overlap of 50 mm.

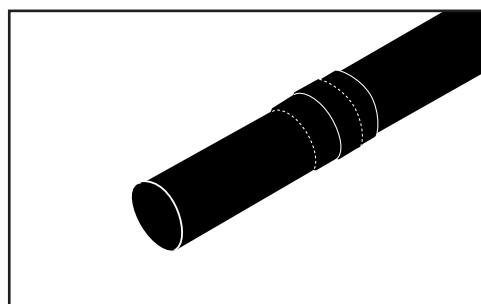
Centre the closure patch over the joint of the shrink wrap.

Heat the closure patch, until the net structure can be seen on the upper side. Press down the closure patch.

9. Shrink the wrap with a gas burner, moving from the shrink sleeve towards the casing pipe. The sealing compound must be visible at both sides in the entire circumference. After shrinkage the surface structure must be smooth.



10. The joint is complete



Terminations - End fitting for foaming

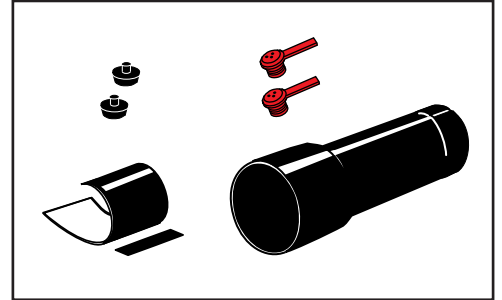
Application

End fittings are used to terminate a pipe in the ground, temporarily or permanently.

End fittings for flexible systems are delivered in dimensions \varnothing 90-180 mm.

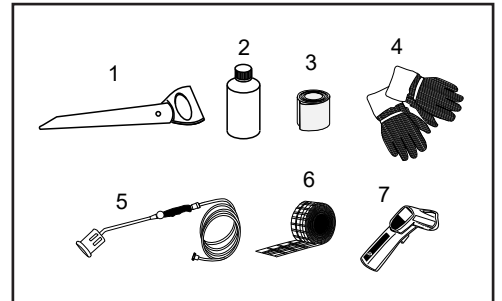
Foam packs:

- size, see foam pack folder
- more information see Insulating joints



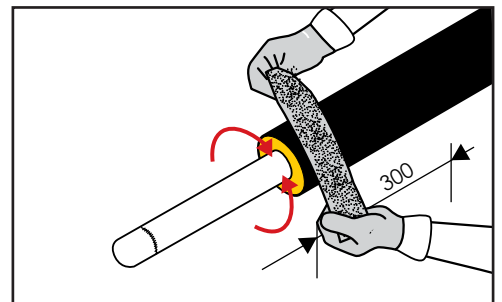
Tools

1. Saw
2. Alcohol, min. 93%
3. Emery cloth, grain size 36-40
4. Gloves
5. Gas burner, \varnothing 50 mm
6. Heat shield
7. Temperature measuring device

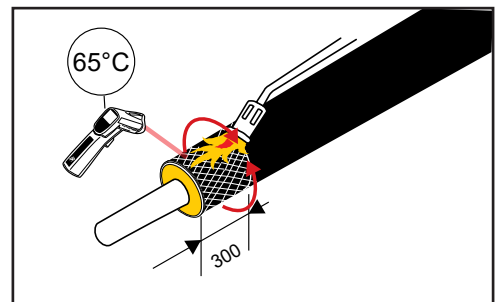


Activation

1. Activate the outer casing with emery cloth, grain size 36-40, at least 300 mm from the casing end.



2. Activate the casing pipe with gas burner at least 300 mm from the casing end, until the surface has a matt, silky look.



Terminations - End fitting for foaming

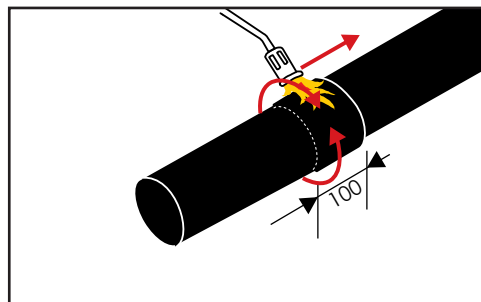
Shrinking sleeve and collar

3. Remove the packing from the shrink sleeve. Check that the sleeve is CLEAN and DRY inside and out.

Place the shrink sleeve on the insulation shells and the outer casing.

Now clean the casing surface with alcohol.

Shrink the sleeve, starting approx. 100 mm from the end of the shrink sleeve.



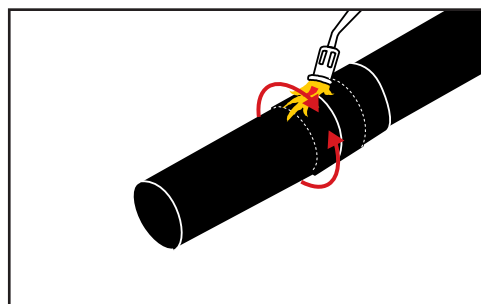
4. Centre a shrink wrap (bevelled corners) on one shrink sleeve end, so the fat end of the symbol faces the sleeve.

Install the shrink wrap around the sleeve end with an overlap of 50 mm.

Centre the closure patch over the joint of the shrink wrap.

Heat the closure patch, until the net structure can be seen on the upper side. Press down the closure patch.

5. Shrink the wrap with a gas burner, moving from the shrink sleeve towards the casing pipe. The sealing compound must be visible at both sides in the entire circumference. After shrinkage the surface structure must be smooth.

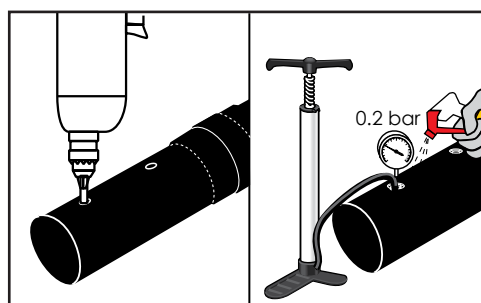


Leakage test

6. Drill one \varnothing 17.5 mm hole in the sleeve.

When the sleeve has cooled to hand-warm leakage test with 0.2 bar.

Test the sleeve end visually with soapy water.



Terminations - End fitting for foaming

Foaming

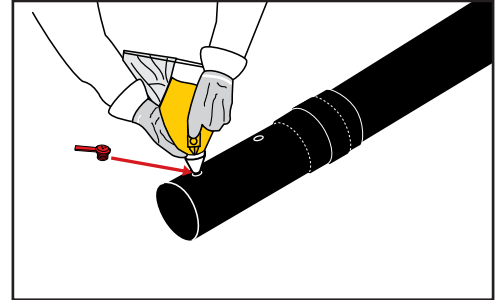
7. Pull the packaging foil back onto the sleeve and foam the sleeve through the hole. Install the venting plug. .

8. 10 minutes after foaming the venting plug can be turned half round what facilitates the later removal of the venting plug.

Wait min. 30 min. for degassing to complete.

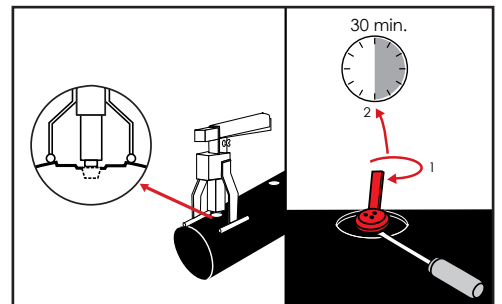
Remove the venting plug.

Remove excess foam or spillage, if any.



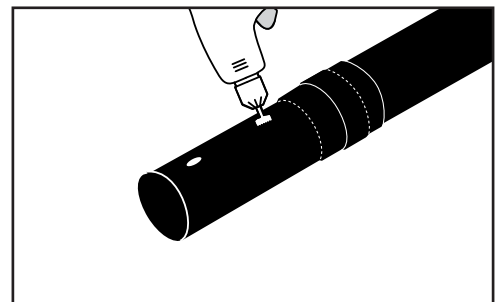
Weld plug

9. Adjust the retaining tool to the rim of the hole.



10. Drill the hole with a conical drill bit \varnothing 35 mm:

Remove any milling residues.



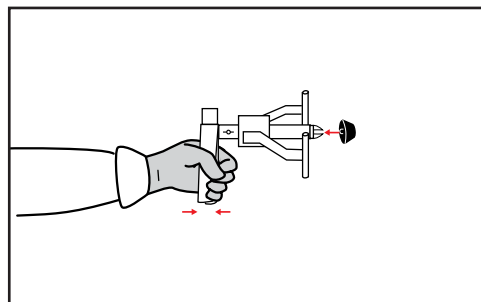
The FlexPipe

Terminations - End fitting for foaming

Weld plug, continued

11. Clean the rim and the casing surface around the hole with alcohol.

Insert the weld plug in the retaining tool and clean with alcohol.

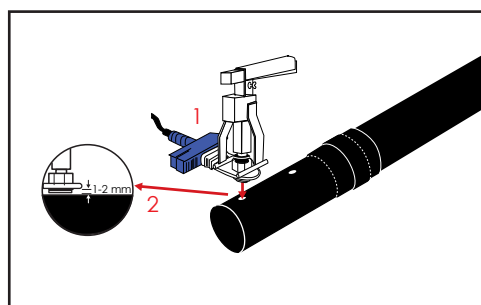


12. Heat the socket welder to 250°C.

13. Place the weld plug in the conical hole of the socket welder.

Keep it under a light pressure, until the rim of the plug starts to form a bead.

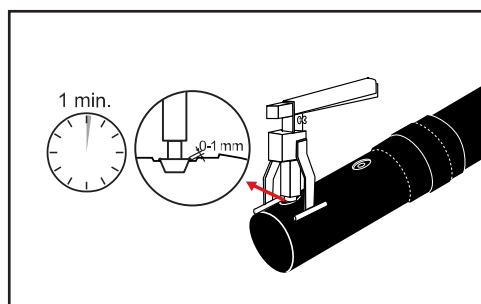
Now place the opposite side of the tool in the foam hole.



14. Remove the socket welder and immediately press the weld plug into the hole, until the legs rest on the casing and the upper rim of the plug is flush with the casing rim around the foaming hole (max. approx. 1 mm above).

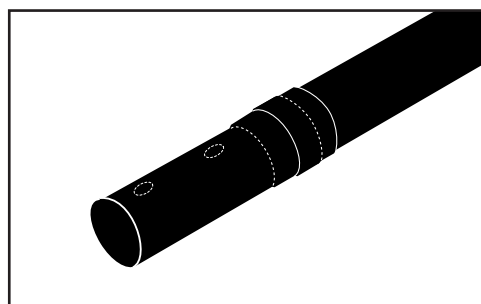
Hold the pressure constant at least 1 minute, until the welding zone has cooled down to handwarm, before the retaining tool is removed.

There has to be a visible bead.



Finished joint

15. The joint is complete.



Insulating joints

Overview

Introduction

Joints in the pipe systems are primarily insulated with our foam packs. It is an easy-to-apply method according to which a two-component foam liquid, after mixing and filling, forms an effective insulation with the same properties as in the rest of the pipe system.

When using foam packs the fitter does not get into contact with the foam liquids.

It is important that the fitter is educated in accordance with national legislation as regards handling of isocyanate and polyol/cyclopentane. Likewise the fitter must use personal protective equipment according to valid legislation.

Other insulation methods may be a possibility in special cases.

Contents

Foam pack:

- General
- Safety information
- Storing and handling
- Use
- Possible combinations

Other insulation methods:

- Insulation shells
- Can foam (not allowed in all countries)
- Machine foam

Insulating joints

Foam pack - General

Application

Joints in our pipe systems are primarily insulated with foam packs.

It is an easy-to-apply method according to which a two-component foam liquid, after mixing and filling, forms an effective insulation with the same properties as in the rest of the pipe system.

When using the foam pack the fitter does not get into contact with the foam liquids.

Foam packs which are stored in accordance with stated rules have a time limit for use of 18 months, counting from the stated production week.

Foam packs are non-refundable.

Description

Foam packs are delivered in insulation boxes. The box i.a. contains a folder with information on which foam pack to use for the different casing joints, as well as a folder with addresses and safety information.

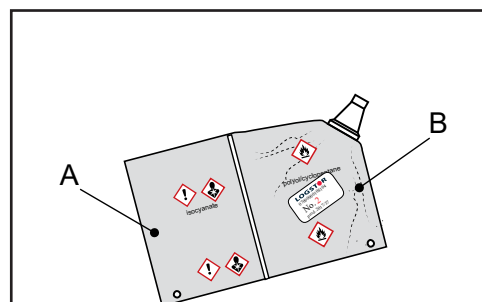
The total weight of the insulation box with foam packs is max. 20 kg.

Foam packs are supplied in pre-dosed packings whose foam liquid quantity and ratio of mixture are controlled by the automatic filling process in the factory.

The bag is a multi-ply plastic bag, divided into two sections which are separated by a clip barrier.

The brown liquid (A) (isocyanate) is in a completely diffusion-tight section, in which aluminium foil forms part of the construction of the bag.

The clear liquid (B) (polyol and cyclopentane) is in a transparent section which makes it possible visually to control that the mixing of the liquids has been carried out correctly.



Foam packs are marked with isocyanate and polyol/cyclopentane respectively, as well as their hazard symbols.

Product No., foam pack No., and production week also appear from the bag.

The clip barrier is removed by pulling at both sides of the bag and then the liquids mingle. The liquids are mixed by shaking the bag thoroughly at the same time as the built-in mixing stick is used for stirring.

Note! Each country poses its specific requirements to education/training and use of personal protective equipment for working with polyurethane foam. The customer or his representative is responsible for the compliance with these requirements.

It is a requirement in all EU countries that persons working with isocyanate must complete a mandatory training according to REACH/ISOPA valid from 23rd August 2023.

Insulating joints

Foam pack - Safety information

Background

It is a requirement in all EU countries that MSDSs are issued when using hazard classified products.

Safety information/folder

One side of the bag contains separate safety information about the polyol/cyclopentane part of the bag and a separate safety information about the isocyanate part of the bag. The safety information is available in multiple languages.

This complies with the requirements in the EU-REACH CLP regulation.

The safety information is in folders, glued onto the bag. The folders can be opened, so the different languages appear.

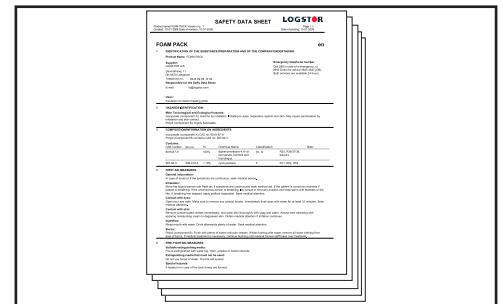
Each insulation box also includes a printed version of the safety information.

Material Safety Data Sheet

A detailed MSDS for foam pack is available on our website www.logstor.com.

The MSDS contains 16 items of information.

Scanning the QR code on the bag with a mobile phone gives direct access to safety information about isocyanate and polyol/cyclopentane respectively on our website www.logstor.com.



Handling foam pack past the expiry date

Foam packs are foamed in a bag and afterwards handled as combustible waste.

The production date is stamped on the bag. Foam packs can be used up to 18 months after the production date.

Handling leaky foam pack on-site

If it is discovered on site that there is a hole in a foam pack, the best solution is that the fitter foam the liquids on site.

Procedure for foaming a damaged foam pack:

1. Use a refuse bag/sack.
2. Cut a hole in the foam pack bag so all liquids from both chambers are filled into the refuse bag. Also throw the empty foam pack into the refuse bag.
3. Carefully shake/mix the chemicals in the bag for approx. 30 seconds, so the foam is mixed optimally.
4. Let the foam complete its reaction in the bag - it takes approx. 5 minutes.
5. The hardened foam in the refuse bag can be disposed of as combustible waste.

*Are there chemicals in the insulation box from the leaky foam pack bags, sand must be filled on the chemicals to absorb them. Afterwards the polystyrene box with sand can also be disposed of as combustible waste.

Foam pack - Safety information

Handling leaky foam packs in the insulation box

If there are holes in some foam pack bags and chemicals (polyol/CP, isocyanate) have leaked out into the insulation boxes, certain precautions must be taken. It is NOT allowed without taking special precautions to transport leaky chemicals by road and it is NOT allowed to expose others to danger.

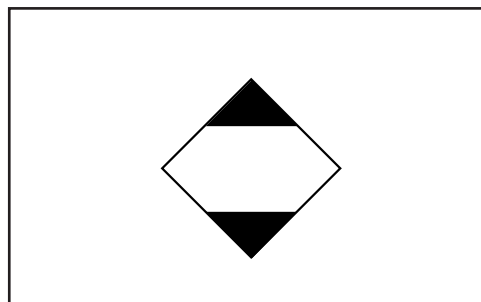
Procedure for transport preparations:

1. Fill absorption material (sand, cat litter or the like) into the insulation box onto the liquid that has leaked into the box.
2. Seal the insulation box with tape around the lid, so no liquid can seep out of the box.
3. Place the insulation box in a big and strong plastic bag and seal the bag with a cable tie or the like.

Black refuse bags easily tear. They are not strong enough.

4. The strong plastic bag must be marked with the Limited Quantity symbol (see illustration).

If you do not have this label, you may draw it on a paper and affix it to the bag. Its dimensions must be 10x10 cm.



Remember it is dangerous goods, so if the chemicals are to be transported by road, the driver must have the required education for transport of dangerous goods by road.

Foam pack - Storing and handling

Introduction

In addition to correct dosing of foam liquids which is ensured through the filling in the factory and through the numbering of foam pack sizes on joints and cartons, there are 5 factors which are important for a correct foaming process:

- Liquid temperature
- Job-site temperature
- Surface temperature of service pipe and casing joint
- Dry joints
- Mixing

Liquid temperature/Storage

It is very important to keep the temperature of the foam liquids within certain limits to obtain a homogeneous foam quality.





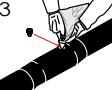

As the reaction time of the foam liquids depends on the storage temperature (1), the mixing (2) and filling times (3) vary.

They appear from the table.

It is best to keep foam liquids in storage rooms at a temperature of 18-24°C. It must be ensured that the foam liquid temperature does not exceed 40°C or fall below 0°C during storage and transport. If the foam liquids shortly have been exposed to temperatures outside this temperature range, please contact LOGSTOR for guidance.

When foaming, the foam liquid temperature must be 15-25 °C. It is therefore optimal to go for a liquid temperature of 20°C.

At the low end of the temperature range the foam liquids must be mixed for a longer time. See the table.

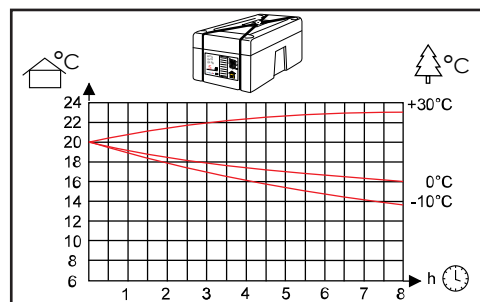
1 	15	20	25	°C 
2 	25	20	20	sec. 
3 	60	50	45	sec. 

Insulating joints

Foam pack - Storing and handling

Liquid temperature in insulation box

On condition that the cover of the insulation box is always replaced immediately after removing a bag from it, the insulation box can keep the foam liquids hot or cold throughout an ordinary working day, i.e. eight hours.



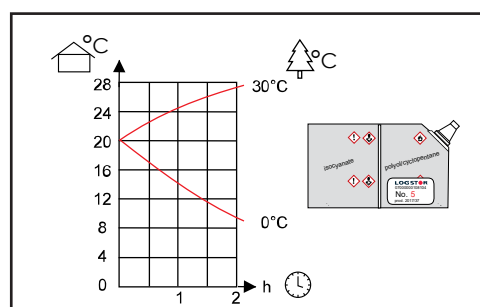
Liquid temperature in bag outside insulation box

When the bag is removed from the insulation box, a correct temperature of application can be kept for less than half an hour at a job-site temperature of 0°C.

Symbol key to the shown figures:

tree = job-site temperature

house = storage temperature



Reheating and cooling

If the actual liquid temperature nears or exceeds the allowable working temperature limits, the liquids must be reheated/cooled by storing them in a storage room at a temperature of 18-24° C.

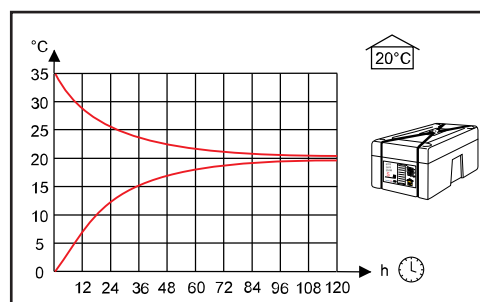
If the liquid temperature is too high, the foam may react too quickly and the joint may not be completely filled with foam. If the liquid temperature is too low, it is difficult to mix the liquids optimally, and the foam will react slowly and the cells will be coarser.

Note that reheating and cooling take a long time because of the insulation box.

From the following diagrams the necessary heating/cooling time appears

Diagrams of heating and cooling times

Heating/cooling time of foam liquids in insulation box

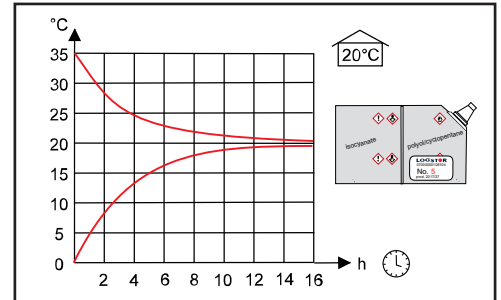


Insulating joints

Foam pack - Storing and handling

Diagrams of heating and cooling times, continued

Heating/cooling time of foam liquids removed from the insulation box.
house = room temperature 20°C
clock = heating/cooling time in hours



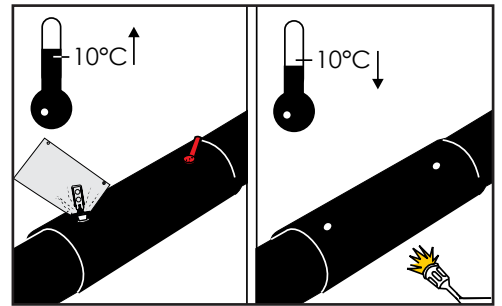
Job-site temperature

At job-site temperatures down to +10° C insulation is carried out as described in this manual.

At temperatures below +10°C the fitting/joint parts - particularly the lower halves - must be preheated with a soft gas flame to 30-40° C.

If hot water is circulating in the pipeline, it suffices that the casing joint parts have reached a temperature of approx. +20°C.

At high job-site temperatures and in strong sunlight the joint temperature may become high (>50°C). In such cases it is necessary to cover the joint prior to foaming to ensure that the joint temperature is not too high. Pull the packing foil back over the casing joint to protect it from strong sunlight.



Dry joints

Moisture in a joint gives a poor foam quality.

Therefore, always see to it that

- the joint area is dry, before the joint is installed
- avoid foaming during rainy weather. If necessary use a tent, umbrella or any other means of cover. Pull the packing foil back over the casing joint to prevent rain from entering the joint.
- foam the joint the same day it has been installed.

Foaming on hot or cold service pipes

If the temperature of the service pipe is < +10°C or > +50°C, wrap the service pipe with 5 mm polyethylene foam (Alveolit) prior to foaming. See Product Catalogue under the section Accessories/Foaming.

Foam pack - Storing and handling

Mixing

Careful mixing ensures a homogeneous foam quality and therefore a correctly filled joint.

Dependent on the liquid temperature (the lower the liquid temperature, the longer the mixing time), the two liquids are carefully shaken and mixed for 20-25 seconds, until the mixture has a homogeneous light brown colour.

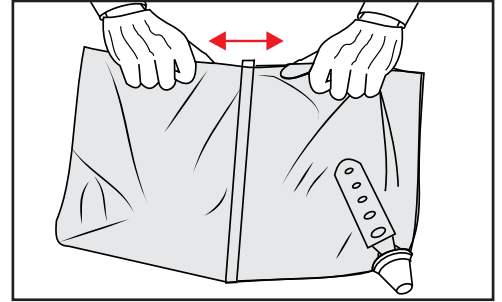
1		15	20	25	
2		25	20	20	
3		60	50	45	

Insulating joints

Foam pack - Use

Mixing foam liquids

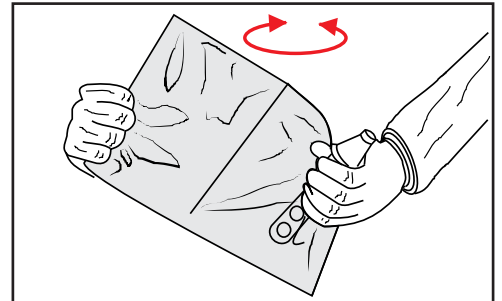
1. Pull at both sides of the bag and remove the clip barrier, so the two liquids mix.



2. Mix the liquids by shaking the bag vigorously and stirring the two liquids with the built-in mixing stick at the same time.

Mix the foam liquids carefully for the number of seconds, appearing from the table, until the liquid mixture is homogeneous light brown.

Hold the mixing stick, not the nozzle.



Filling in foam liquids

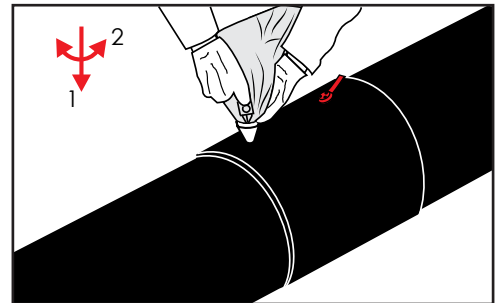
3. Now place the nozzle in the open filling hole - the lower hole of the joint.

4. Press the mixing stick into the nozzle which is supported by one hand.

5. Twist the mixing stick back and forth several times until the plastic membrane breaks.

It is important that the penetration is thorough, so that the liquids can run down into the joint.

Pull the mixing stick back again.



Insulating joints

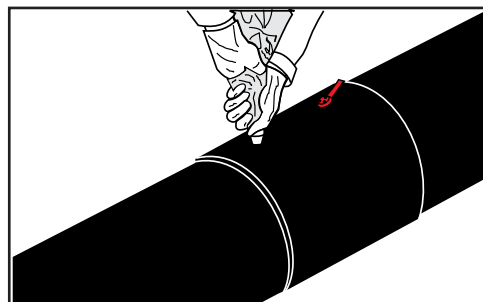
Foam pack - Use

Filling in foam liquids, introduction

6. Squeeze the foam liquid into the joint and flatten/wring the bag during filling, so that no air pockets appear behind the liquid in the bag.

If 2 foam packs are required per casing joint, preparations must be made, so they can be filled into the joint immediately after each other. It may be an advantage to be 2 persons to carry out the task.

If 3 or 4 foam packs are required per casing joint, 2 foam packs must be filled in simultaneously. This requires 2 persons. It also requires that an additional venting hole be drilled. Remember to order an additional plug set.



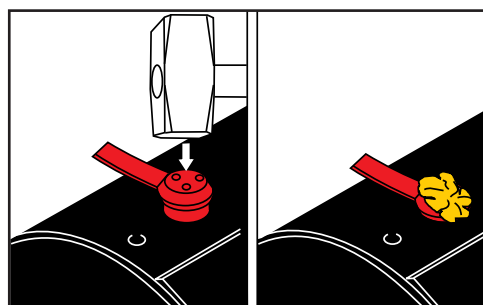
Venting and hardening

7. Fit the venting plugs into the filling holes after filling is completed.

Proceed with the next joint. The foam liquid expands in the joint, forcing the air through the venting plug.

When the ventilation is complete, a little foam will be forced through the venting holes.

The insulation of the joint is complete when the foam appearing at the holes is hard



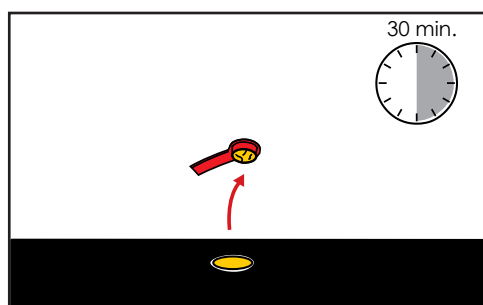
Removing venting plug

8. 10 minutes after foaming the venting plug can be turned half round, what facilitates the later removal of the venting plug.

Remove the plug later the same day, however at the earliest 30 minutes after hardening of the foam.

Now finish the joint installation according to valid instructions.

Foam waste is disposed of in accordance with local regulations.



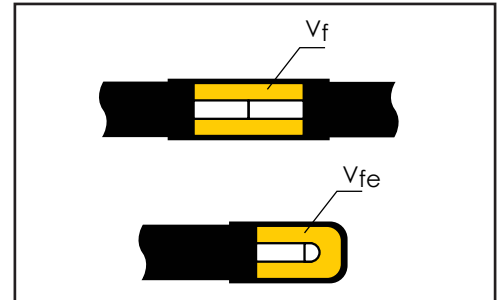
Foam pack - Possible combinations

Foam volume

The volume of the cavity to foam decides which foam pack size to choose.

To ensure the quality of the finished insulation the foam volume limits in below table must be observed.

Size and number of foam packs for a specific casing joint appear from the foam pack folder for single pipe and TwinPipe which is available on LOGSTOR's website www.logstor.com and in the insulation box.



Foam volume

Foam pack No.	Litre per bag	kg per bag	Alternative			Foam volume, litre			
						V _f		V _{fe}	
						min.	max.	min.	max.
0.5	0.21	0.25				1.5	2.6	2.7	4.6
1	0.30	0.34				2.6	3.7	4.6	6.7
2	0.37	0.42				3.7	4.6	6.7	8.3
3	0.45	0.52				4.6	5.8	8.3	10.4
4	0.55	0.64	2x1			5.7	6.9	10.4	12.5
5	0.68	0.78	1+2	2x2		6.9	8.6	12.5	15.4
6	0.83	0.96	2+3	2x3	1+4	8.6	10.6	15.4	19.1
7	1.02	1.17	3+4	1+5	2+5	10.5	12.9	19.1	23.2
8	1.28	1.43	4+5	2+6	3+6	12.9	15.9	23.2	28.6
9	1.52	1.74	5+6	3+7	4+7	15.9	19.4	28.6	35.0
2x6	1.66	1.92	5+7	3+8	0+9	17.3	21.9	34.7	38.2
10	1.88	2.17	6+7	5+8	2+9	19.8	25.1	38.2	43.7
11	2.35	2.71	6+9	3+10	4+10	25.0	32.4	43.7	55.1
2x9	3.04	3.48	8+10	5+11	6+11	31.8	41.2	55.1	70.0
12	3.52	4.06	8+11			38.0	49.2	70.0	83.6
10+11	4.23	4.88	5+12			44.9	58.1	83.6	98.7
13	4.70	5.42	2x11	8+12		51.0	65.9	98.7	112.1
10+12	5.40	6.23	5+13			57.8	74.9	112.1	127.3
10+13	6.58	7.59	2x9+12			70.8	91.6	127.3	155.8
12+13	8.22	9.48				89.0	115.1	155.8	195.7
2x13	9.40	10.84	11+2x12			101.9	131.9	195.7	224.2
2x12+13	11.74	13.54				127.0	164.3	224.2	279.3
3x13	14.10	16.26				152.9	197.8	279.3	336.3
2x12+2x13	16.44	18.96				177.9	230.2	336.3	391.4
4x13	18.80	21.68				203.8	263.8	391.4	448.4

Other insulation methods - Insulation shells

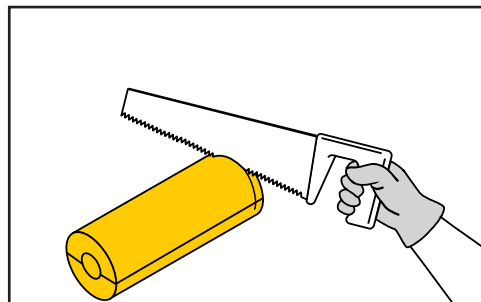
Application

Insulation shells are used in connection with: BXJoints, C2L repair joints.

They may also be used as an alternative to direct foaming. Contact LOGSTOR.

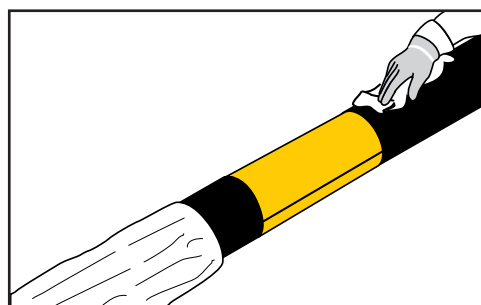
Installing insulation shells

Shorten the insulation shells to make them fit tightly between the casing pipes.



Fit the insulation shells tightly between the casing pipes, using adhesive tape if required. All surfaces must be CLEAN and DRY.

See the LOGSTOR Detect section for installation with alarm wires.



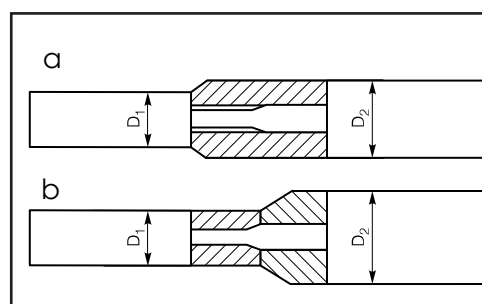
Reductions with insulation shells

Examples of adapting insulation shells in connection with reduction with shrink joints.

a. 1 dimensional offset

b. 2-3 dimensional offsets

Use 2 different sets of shells, fitting the actual casing diameters.



Other insulation methods - Can foam

Overview

Correct dosing of the foam liquids is ensured by measuring out the 2 liquids according to the litre specification in the table under "Liquid quantity", based upon corresponding foam pack Nos.

The following factors are important for a correct foaming process:

- Liquid temperature
- Job-site temperature
- Surface temperature of service pipe and joint
- Dry joints
- Mixing

Pay attention to whether it is legal or not to openly mix foam liquids in your country.
Can foam which is stored in accordance with stated rules have a time limit for use of 12 months, counting from the stated production week.

Liquid temperature

It is very important to keep the temperature of the foam liquids within certain limits to obtain a homogeneous foam quality, because the reaction time of the foam liquids depends on the output temperature (1), the mixing (2) and filling times (3) differ.

	1)		
	15	20	25
	2)		
	25	20	20
	3)		
	60	50	45

Other insulation methods - Can foam

Storage temperature

The foam liquids are stored in storage rooms at a temperature of 18-24°C.

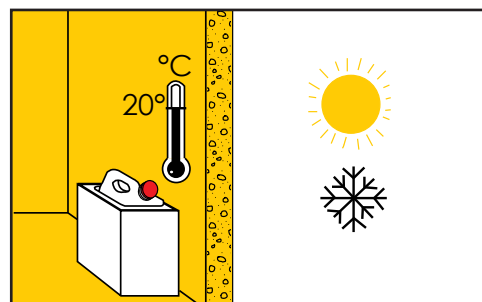
Outside the storage room the liquid temperature will quickly rise/fall, so do not bring the foam liquids to the site before the joint is ready to be foamed

Ensure that the foam liquid temperature during storage and transport does not exceed 40°C or fall below 0°C.

If the foam liquids shortly have been exposed to temperatures outside this temperature range, please contact LOGSTOR for guidance.

When foaming, the foam liquid temperature must be 15-25 °C. It is therefore optimal to go for a liquid temperature of 20°C.

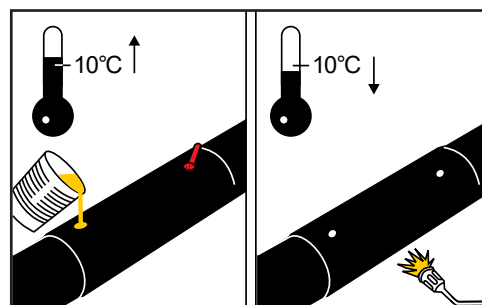
At the low end of the temperature range the foam liquids must be mixed for a longer time. See the table above.

**Job-site temperature**

At job-site temperatures down to +10°C carry out the insulation as described in this manual. At temperatures below +10°C preheat the joint parts - especially the lower part - with a soft gas flame to 30-40°C.

If hot water is circulating in the pipeline, it suffices that the joint parts have reached a temperature of approx. +20°C.

At high job-site temperatures and in strong sunlight the joint temperature may become high (>50°C). In such cases it is necessary to cover the joint prior to foaming to ensure that the joint temperature is not too high. Pull the packing foil back over the casing joint to protect it from strong sunlight.



Other insulation methods - Can foam

Dry joints

Moisture in a joint gives a poor foam quality.

Therefore, always see to it that

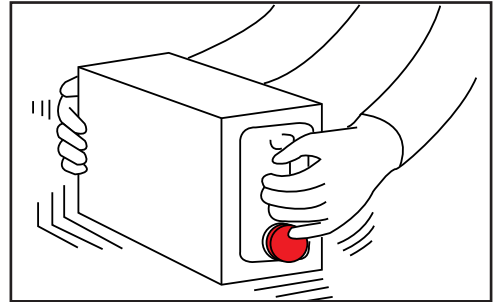
- the joint area is dry, before the joint is installed
- avoid foaming during rainy weather. If necessary use a tent, umbrella or any other means of cover. Pull the packing foil back over the casing joint to prevent rain from entering the joint.
- foam the joint the same day it has been installed.

Foaming on hot or cold service pipes

If the temperature of the service pipe is $< +10^{\circ}\text{C}$ or $> +50^{\circ}\text{C}$, wrap the service pipe with 5 mm polyethylene foam (Alveolit) prior to foaming. See Product Catalogue under the section Accessories/Foaming.

Pre-mixing

Shake the can with polyol/cyclopentane before measuring out the liquids.



Other insulation methods - Can foam

Liquid quantity

To find the correct mixture ratio between component A (isocyanate) and component B (polyol/cyclopentane):

- First find the relevant foam pack No. in the foam pack folder on LOGSTOR's website.

- Then find the foam pack No. in this table.

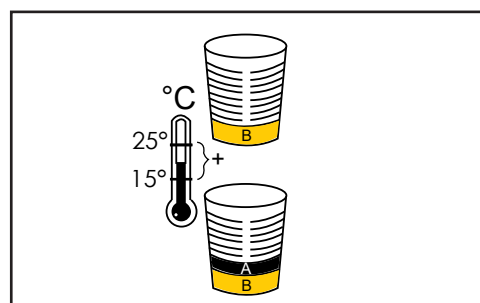
If other foam liquids than LOGSTOR's are used, the supplier must inform you of the correct mixture ratio.

Foam pack No.	Component A Isocyanate		Component B Polyol/cyclopentane	
	litre	kg	litre	kg
0.5	0.12	0.15	0.09	0.10
1	0.17	0.21	0.13	0.13
2	0.21	0.26	0.16	0.16
3	0.26	0.32	0.19	0.20
4	0.32	0.39	0.23	0.25
5	0.39	0.48	0.29	0.30
6	0.48	0.59	0.35	0.37
7	0.59	0.72	0.43	0.45
8	0.72	0.88	0.52	0.55
9	0.88	1.08	0.64	0.68
10	1.09	1.34	0.79	0.83
11	1.36	1.67	0.99	1.04
12	2.03	2.50	1.49	1.56
13	2.71	3.34	1.99	2.08

Measuring out

On the inside of the plastic cup there is a level mark for correct measuring.

First measure out foam liquid B and then foam liquid A.

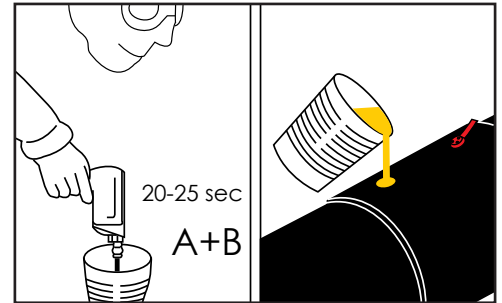


Other insulation methods - Can foam

Mixing

Careful mixing ensures a homogeneous foam quality and therefore a correctly filled joint.

Dependent on the liquid temperature the two liquids are carefully mixed, using the whisk (stir bit) on the drill for 20-25 seconds, until the mixture has a homogeneous light brown colour without trails of liquid A.

**Filling**

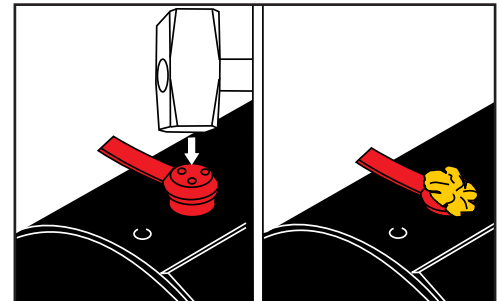
It is important that the filling holes always face upward (12 o'clock position).

Always fill the foam liquid into the lower filling hole of the joint.

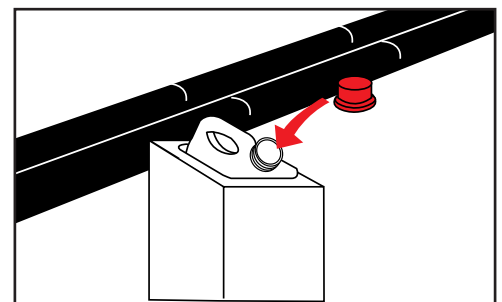
After filling fit venting plugs into the filling holes.

10 minutes after foaming the venting plug can be turned half round, what facilitates the later removal of the venting plug.

Remove the plug later the same day, however at the earliest 30 minutes after hardening of the foam.

**Sealing can**

Seal the cans after use in order to avoid evaporation of gases.



Insulating joints

Other insulation methods - Machine foam

Application

If machine foam is used for additional insulation of the joints the liquids/machine must be approved by LOGSTOR.

The operator must be acquainted with our products in order to ensure a homogeneous insulation with correct foam quality and density.

The use of the foaming machine requires a specific education.

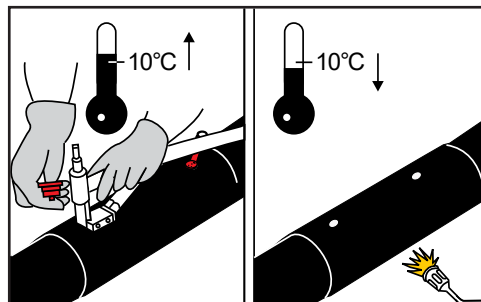
Job-site temperature

At job-site temperatures down to $+10^{\circ}\text{C}$ carry out the insulation as described in this manual.

At temperatures below $+10^{\circ}\text{C}$ preheat the joint parts - especially the lower part - with a soft gas flame to $30-40^{\circ}\text{C}$.

If hot water is circulating in the pipeline, it suffices that the casing joint parts have reached a temperature of approx. $+20^{\circ}\text{C}$.

At high job-site temperatures and in strong sunlight the joint temperature may become high ($>50^{\circ}\text{C}$). In such cases it is necessary to cover the joint prior to foaming to ensure that the joint temperature is not too high. Pull the packing foil back over the casing joint to protect it from strong sunlight.



Dry joints

Moisture in a joint results in a poor foam quality.

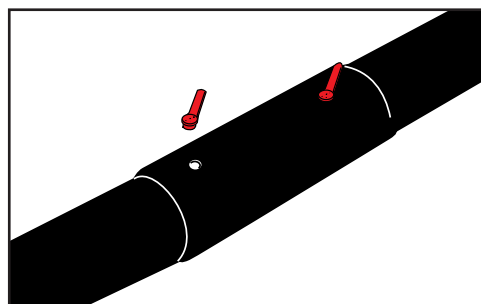
Therefore, always see to it that:

- the joint area is dry, before the joint is installed
- foaming during rainy weather is avoided.

If necessary use a tent.

Pull the packing foil back over the casing joint to prevent rain from entering the joint.

- foaming takes place the same day as the joint is installed



Other insulation methods - Machine foam

Foaming on hot or cold service pipes

If the temperature of the service pipe is $< +10^{\circ}\text{C}$ or $> +50^{\circ}\text{C}$, wrap the service pipe with 5 mm polyethylene foam prior to foaming. See Product Catalogue under the section Accessories/Foaming.

Liquid quantity

To find the correct mixture ratio between component A (isocyanate) and component B (polyol/cyclopentane):

- First find the relevant foam pack No. in the foam pack folder on our website.
- Then find the foam pack No. in this table.

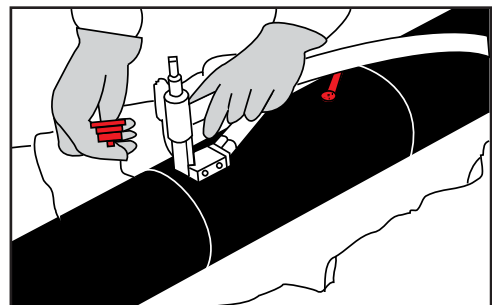
If other foam liquids than LOGSTOR's are used, the supplier must inform you of the correct mixture ratio.

Foam pack No.	Component A Isocyanate		Component B Polyol/cyclopentane	
	litre	kg	litre	kg
0.5	0.12	0.15	0.09	0.10
1	0.17	0.21	0.13	0.13
2	0.21	0.26	0.16	0.16
3	0.26	0.32	0.19	0.20
4	0.32	0.39	0.23	0.25
5	0.39	0.48	0.29	0.30
6	0.48	0.59	0.35	0.37
7	0.59	0.72	0.43	0.45
8	0.72	0.88	0.52	0.55
9	0.88	1.08	0.64	0.68
10	1.09	1.34	0.79	0.83
11	1.36	1.67	0.99	1.04
12	2.03	2.50	1.49	1.56
13	2.71	3.34	1.99	2.08

Filling

Always inject the foam liquid into the lower filling hole of the joint.

Make sure that the foam liquid does not get in touch with the service pipe when it is injected, in order to ensure a correct, homogeneous foaming.

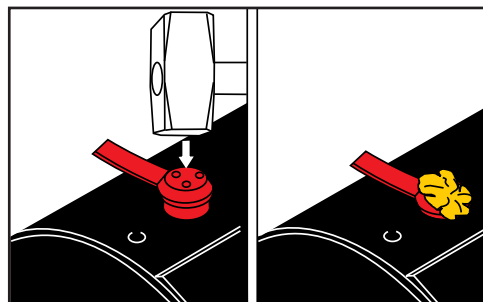


Other insulation methods - Machine foam

Fit the venting plugs into the filling holes after filling.

10 minutes after foaming the venting plug can be turned half round, what facilitates the later removal of the venting plug.

Remove the plug later the same day, however at the earliest 30 minutes after hardening of the foam.



Introduction	Preinsulated pipe systems can be monitored for faults which are due to e.g. excavation, welding, installation and the like. This ensures a good check of the pipe systems during installation as well as operation.
Contents	Principles of measuring, connection etc. Diagrams and symbols Checking alarm wires Connecting alarm wires Earth connection Installing cables Connection and coupling boxes 3dc cable Surveillance components Weatherproof cabinets

Principles of measuring, connection etc.

Application

The LOGSTOR Detect concept for preinsulated pipes makes constant surveillance of the pipe network possible.

Consequently, damages on the outer casing or moisture from the service pipe or casing joints will be detected in due time, before corrosion damages on the service pipe or severe moisture damages to the insulation appear.

There are three phases in the service life of a pipe network where the advantages of the LOGSTOR Detect concept are obvious.

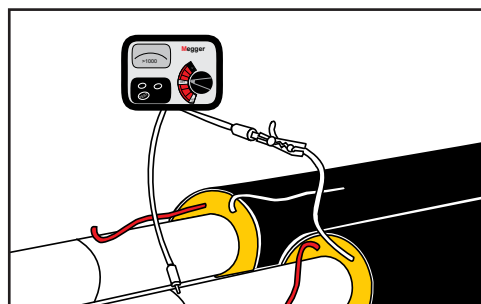
1. Construction phase

The system can be used as an active part of the quality assurance procedure and form the basis of a handover, when the system is put into operation.

At each joint the wire resistance and insulation resistance is measured in order to document compliance with the acceptance criteria.

On handover the following must be documented:

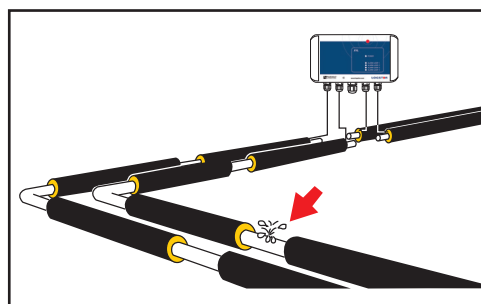
- alarm drawings are updated as-built
- a control measuring of the wire resistance and insulation resistance of the entire system in accordance with the acceptance criterion must be included.



2. Guarantee period

Most malfunctions which may arise can be detected within the guarantee period of the involved parties.

In any case an early detection results in less inconveniences and much lower costs.



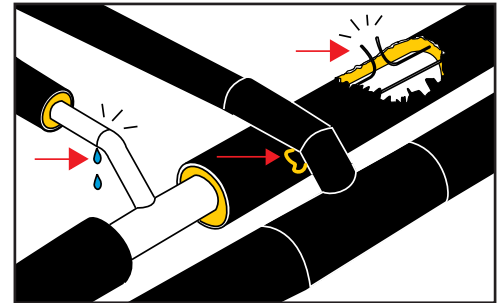
Principles of measuring, connection etc.

3. Operating period

A LOGSTOR Detect setup working well makes it possible to detect and repair damages which arise suddenly, e.g. excavation damages, and to maintain the pipe network systematically, so the operating costs are minimal throughout the entire service life of the system.

The entire pipe network can only be maintained systematically in one way:

To be able to “see” under ground by means of an integrated surveillance system.



System structure

A surveillance system consists of:

- Embedded copper wires in the delivered preinsulated pipes and components
- Components for connection of equipment
- Measuring equipment for permanent surveillance
- Diagram of the total surveillance system. Requirement in EN 14419

Design and documentation of the wire run in a specific surveillance system are therefore an essential factor for the utilization of the surveillance system for fault location.

With a surveillance system a fault is measured by means of the wire length to the fault location independent of the chosen system:

- Passive system with manual detection
 - Active systems with permanent detector surveillance
1. Resistance measuring
 2. Impedance measuring

Diagrams and symbols - Overview

Introduction	This section contains general and specific information on surveillance diagrams and their symbols.
Contents	Diagrams and symbols, general

LOGSTOR Detect

Diagrams and symbols - General

Making diagrams

It is vital that the surveillance diagram has been handed over and examined, before the fitter starts to install casing joints, so the wire position can be correct according to requirement in EN 14419.

Special attention should be paid to wiring, take-off positions, transition from single pipe to TwinPipe as well as cable marking.

It is also vital that all changes of the pipe run are noted, so a correct "as built"-diagram can be made.

Correspondence between diagram and pipe drawing is a condition of correct location of a possible malfunction.

LOGSTOR offers its assistance with the preparation of diagrams for surveillance systems.

Symbols

Reference is made to the symbol key in the Surveillance Manual.

The tinned wire in the pipes is marked on the surveillance diagram with a full-drawn line.

The copper wire in the pipes is marked in the surveillance diagram with a broken line.

Checking alarm wires - Overview

Introduction	This section describes the installation and check of alarm wires in the surveillance system.
Contents	General Megger Using the megger

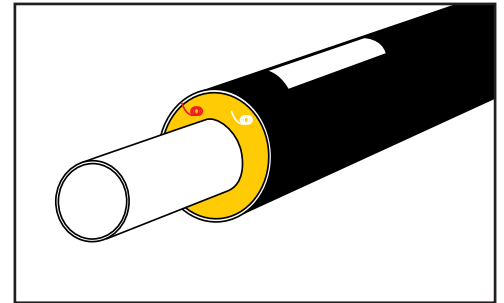
Checking alarm wires - General

Preparations

The two copper wires, embedded in the insulation, are delivered with protection against damage when winding and fixing them to the insulation by means of staples.

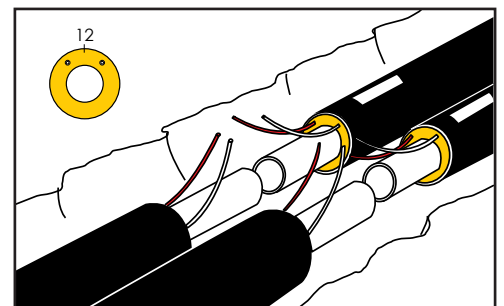
When installing the pipes in the trench follow the specifications of the wire position in the surveillance diagram.

Place the pipes so the wires face upwards (10 and 2 o'clock position), and so the tinned wires and the copper wires are installed in pairs opposite each other. However, this is not required in case of standpipes in solar heating systems.



In the surveillance systems the alarm wires are placed at the top of the pipe in order to achieve i.a.:

- optimum installation conditions
- permanent accessibility of the wires when establishing branches.

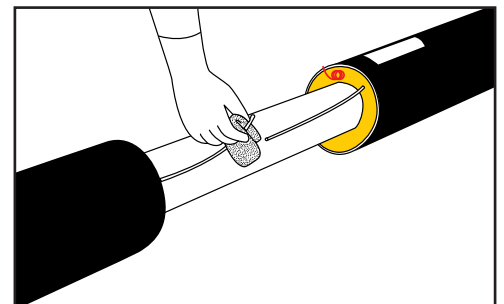


Straightening

Wind the coiled wires from the countersink holes in the insulation, when the pipes have been welded together.

Remove any dirt and moisture from the insulation of the pipe ends.

Straighten the wires and clean the ends with a cloth of synthetic textile or emery cloth.

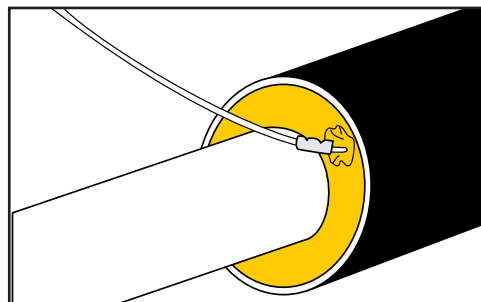


Checking alarm wires - General

Repairing wires

Examine the wires for possible damage. If a wire has been damaged e.g. during removal of the insulation, remove the insulation around the wire end and press and solder a new piece of wire on as described in the following.

Note! When soldering towards the insulation make sure that the foam does not catch fire, resulting in smoke formation. It is recommended to use electric soldering iron.



Checking alarm wires - Megger

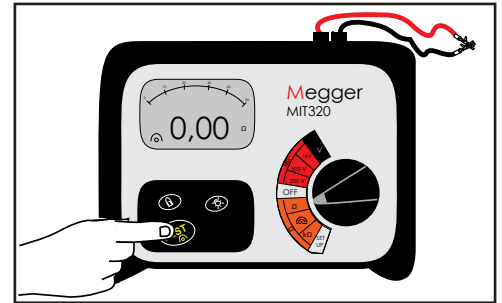
Adjusting the control instrument

Carry out 2 kinds of tests:

1. Measuring the wire resistance to check that there is good electrical connection through the connected wires.
2. Measuring the insulation resistance to check that the wires have been correctly isolated from the steel pipe.

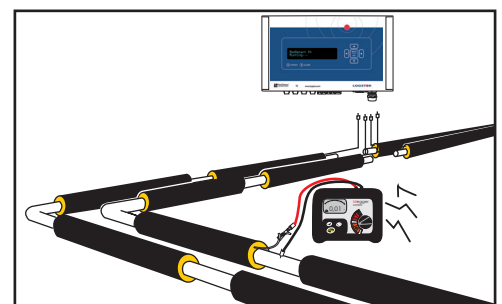
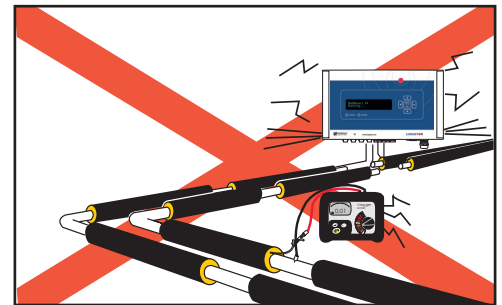
These checks are carried out at each joint with a wire and insulation resistance tester, the megger MIT 320. Make sure the measurements meet the acceptance criteria.

The megger is zero set by connecting the alligator clips and activating "Test" in "Ω" position.



Warning

Never use the megger with connected detectors as the voltage emitted by the megger may damage the exits of the detectors.



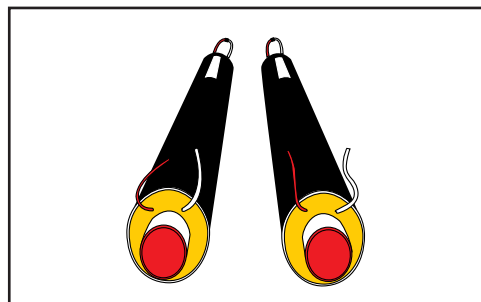
Checking alarm wires - Using the megger

Preparations for checking the joint

When beginning the wire installation, connect the wires in the two pipes as shown in the illustration. Tinned wire to copper wire in each pipe.

Hereby 2 measuring circuits are established which must be used to check the wire connections in the subsequent joints.

Naturally, in TwinPipes there are only 1 measuring circuit.



Test 1, wire resistance

- Connect the instrument wires to the cleaned wire ends

- Place the switch in measuring range "Ω"

The megger shows the actual ohmic resistance in the wires.

At the beginning the deflection is insignificant, but it increases as more metres of wire are connected.

Resistance measurement: Approx. 1.2-1.5 Ω at 100 m wire.

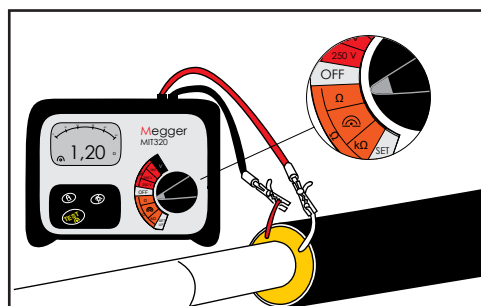
If there is no deflection, there is no connection or the wire is broken.

If the resistance does not correspond to the actual length, a poor wire connection has been made in the previous joint:

- Check this joint and repair it.

- Repeat the test.

Each joint is measured.



Checking alarm wires - Using the megger

Test 2, insulation resistance in MΩ

Before carrying out this test make sure that NO persons are in contact with the alarm wires!

Before carrying out this test make sure that no detectors are connected to the pipe system to avoid damage.

- Place the switch in measuring range: MΩ, 250 V.

- Connect one instrument wire to one of the wires in a pipe.

- Hold the other instrument wire against the steel pipe. Check that there is good electrical connection to the bare steel. Use the weld, if necessary.

- Press the test knob, until the reading appears.

- The actual insulation resistance can now be read

Acceptance value: $\geq 10 \text{ M}\Omega/\text{km}$ wire

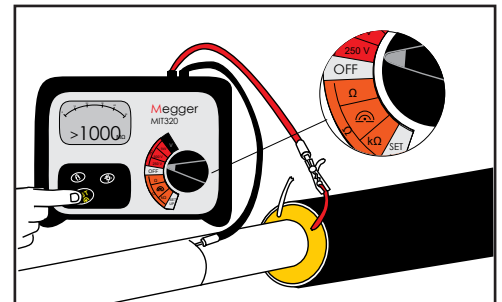
The acceptance criterion for the entire system must however never be $< 1 \text{ M}\Omega$ regardless of the wire length. The acceptance criterion on installation applies to pipe system with as well as without felt in the casing joints.

When using felt in joints, special attention must be paid to keeping the felt dry.

Never mix systems with and systems without felt.

To measure a fault location exactly use a pulse reflectometer.

Each joint is measured and documented.



Checking alarm wires - Using the megger

Example 1

A pipe system with 1 km wire (= 0.5 km pipe) is thoroughly measured on handover. A 10V direct voltage is applied between copper wire and service pipe.

At a given current of 1µA the following insulation resistance is measured:

$$R = \frac{10V}{1\mu A} = 10M\Omega$$

The acceptance criterion is:

$$\text{Acceptance criterion} \geq \frac{10M\Omega}{1 \text{ km wire}} = 10M\Omega$$

The pipe system can be approved as being faultless according to the acceptance criterion.

Checking alarm wires - Using the megger

Example 2

A pipe system with 5 km wire (= 2.5 km pipe) is thoroughly measured on handover. It consists of 10 locations with installation moisture which each has an insulation resistance of $1\text{M}\Omega$. 10V direct voltage is applied between copper wire and service pipe.

The resulting, measured insulation resistance is:

$$\frac{1}{\Sigma R_{\text{iso, tot}}} = \frac{1}{1\text{M}\Omega} + \frac{1}{1\text{M}\Omega} + \frac{1}{1\text{M}\Omega} + \dots + \frac{1}{R_{10}} = 10 \text{ M}\Omega$$

$$R_{\text{iso, tot}} = 0.1 \text{ M}\Omega$$

The acceptance criterion is:

$$\Sigma R_{\text{iso, tot}} \geq \frac{10\text{M}\Omega}{5 \text{ km wire}} = 2\text{M}\Omega$$

The pipe system cannot be approved as being faultless according to the acceptance criterion.

Connecting alarm wires - Overview

Introduction This section contains instructions of wire installation for the various joints and components.

Contents General
 Joints for foaming
 Straight joints with insulation shells

Connecting alarm wires - General

Connecting wires

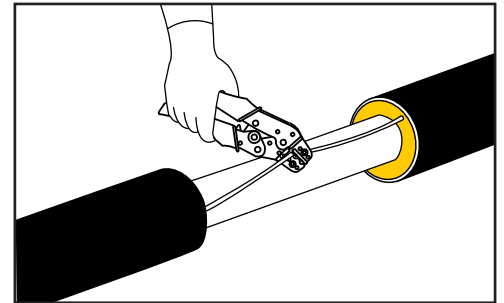
Straighten the wires.

Cut the overlapping ends off.

Clean the wire ends with a synthetic textile or emery cloth.

Place a crimp connector on one of the wires and crimp it with the crimping tool. Always use LOGSTOR standard crimping tool.

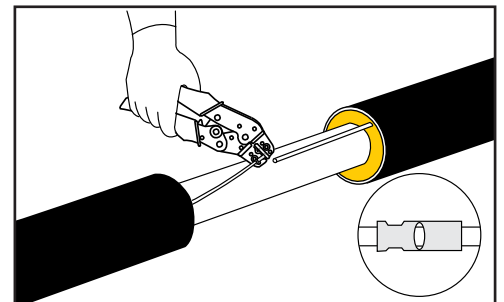
The crimp connector has a stop in the middle and a "window" for visual control that the insertion is correct.



Insert the other wire into the crimp connector and crimp it, so the crimp is centered between the end of the crimp connector and the middle of the crimp connector. The wire must be visible in through the hole in the middle of the crimp connector.

A good mechanical connection is now ensured.

Note! The wires must be tight, i.e. the same length as between the foam ends.

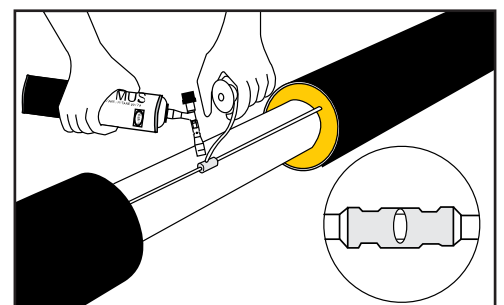


Soldering the wires

Heat the crimp connector with a small gas burner. When its colour changes and becomes shiny the temperature is correct.

Add tin solder with resin flux to both ends of the crimp connector. The soldering has been carried out correctly, when the tin has been absorbed in the ends of the crimp connector and becomes visible.

Now a good electrical connection has also been established.



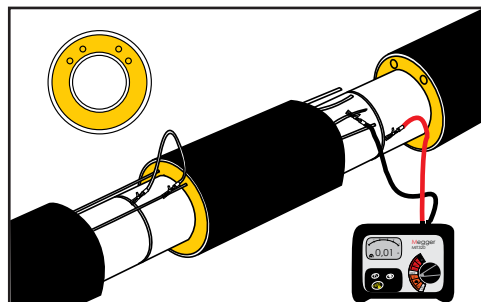
Connecting alarm wires - General

Fitting pieces

When welding fitting pieces the tinned wires and copper wires must of course still be connected in pairs.

In major dimensions there are for productional reasons 4 embedded wires (2 of each) of which only one of each is visible at the pipe ends.

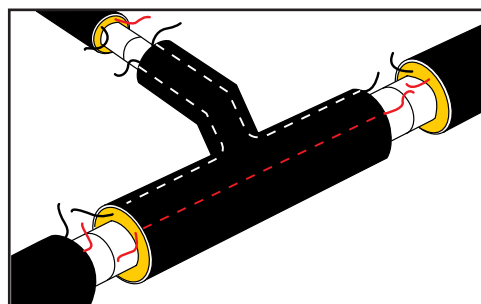
Check with the megger which one to use.



Preinsulated branches

Preinsulated branches are available with 2 embedded wires: 1 tinned and 1 copper wire.

The tinned wire always runs in the branch.



Wiring in branches

As a standard the surveillance diagrams from LOGSTOR always indicate that branches are monitored.

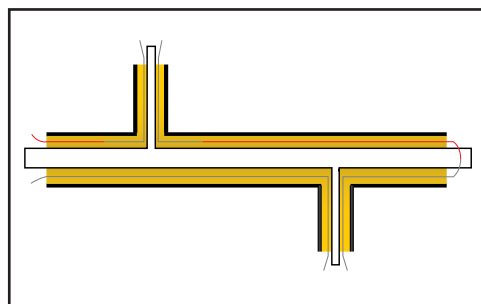
Right and left principle:

Branches to the right are connected to alarm wires to the right, and branches to the left are connected to alarm wires to the left.

Please pay special attention to the wiring in connection with preinsulated, parallel branches. Make a control measurement in case of doubt.

As a standard preinsulated branches have 2 embedded alarm wires, of which the tinned wire is led out through the branch. So there are 2 possibilities of connecting the alarm wires:

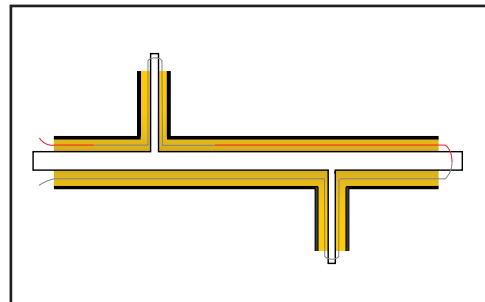
1. Connecting the alarm wires, so main pipe and branch are monitored (standard).



Connecting alarm wires - General

Wiring in branches, continued

2. Connecting alarm wires, so only the main pipe is monitored.



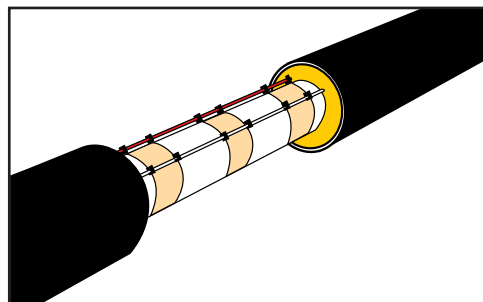
If the wiring is changed compared to the diagram e.g. choosing not to monitor pre-insulated branches (principle No. 2), it is important to update the as-built documentation accordingly, because a correct registered wiring and wire length is essential to a precise fault location.

Connecting alarm wires - Joints for foaming

Straight joints

When the tinned wire and the copper wire have been connected, install each wire in 3 wire holders to ensure correct distance to the pipe.

Fasten the wire holders with a similar number of strips of crepe tape with a good overlap.



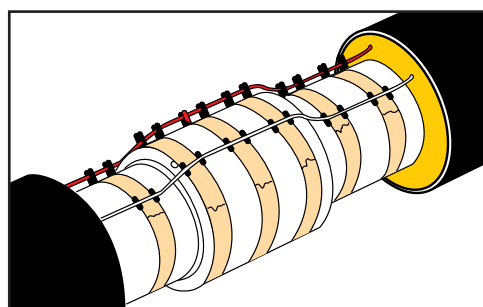
Straight joints with E-Comps

Extend the wires at E-Comps.

Connect the wires, after the E-Comp is in its final position and has been welded.

Place the alarm wires in a suitable number of wire holders, so the distance to the steel pipe is 15 mm everywhere.

Fasten the wire holders with crepe tape.



Bends

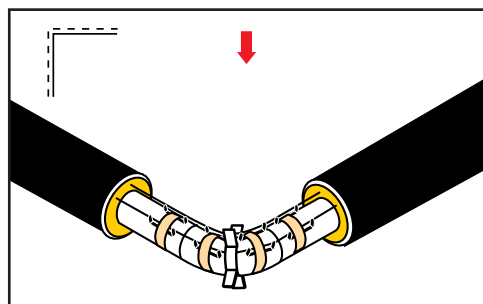
Extend the wires at bends.

Apply so many wire holders to the alarm wire that the wire cannot be pressed against the steel pipe.

Install wire holders on the alarm wires in 12 and 2 o'clock positions on the outside of the service pipe.

Take care not to damage or displace the wires, when installing the bend.

Fasten the wire holders with crepe tape.



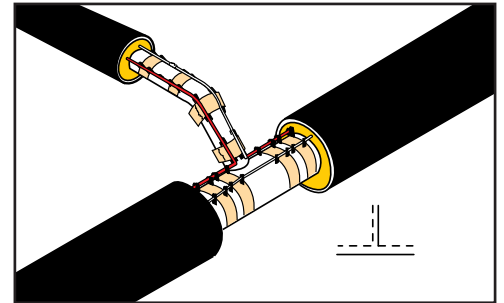
Connecting alarm wires - Joints for foaming

All types of branches

Extend and adjust the wires at the branches, so they have the correct distance to the steel pipe of 15 mm everywhere - also on the branch pipe piece.

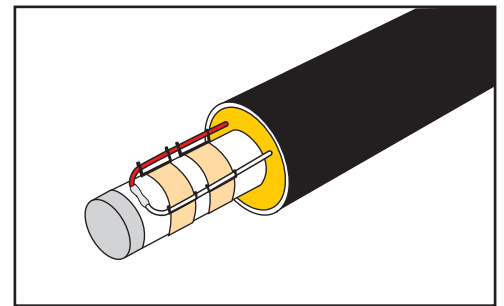
Use a suitable number of wire holders for this purpose and fasten them with crepe tape.

If the wire closest to the branch is not used for surveillance, lead it back behind the branch pipe piece.



End fitting for foaming

Use a suitable number of wire holders for this purpose and fasten them with crepe tape

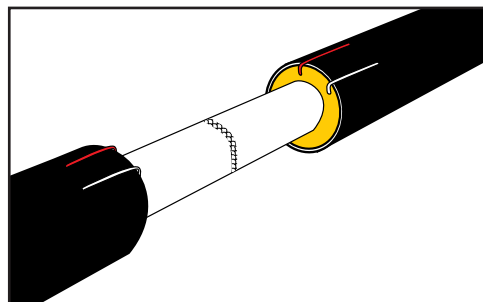


Connecting alarm wires - Straight joints with insulation shells

Preparing installation of insulation shells

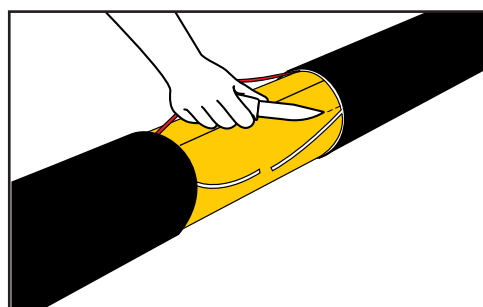
Bend the wires backward to make them rest evenly on the insulation end and to disable contact with the steel pipe.

Adapt the insulation shell in accordance with the instructions for installing the joint type in question.

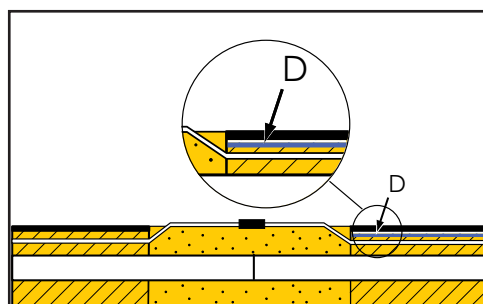


Insertion of wires in the insulation

Place the insulation shells and align the alarm wires on the outside of the shells. Pull the wires so they do not get in contact with the steel pipe.

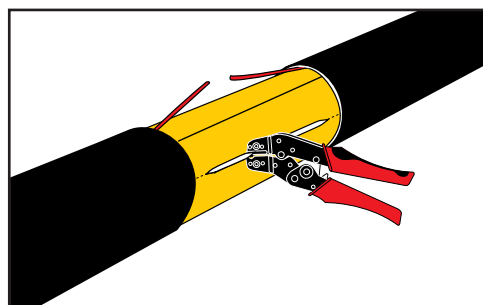


Make a slot in the insulation shells and make sure that the alarm wire does not touch the diffusion barrier, D under the casing.



Connecting and fastening wires

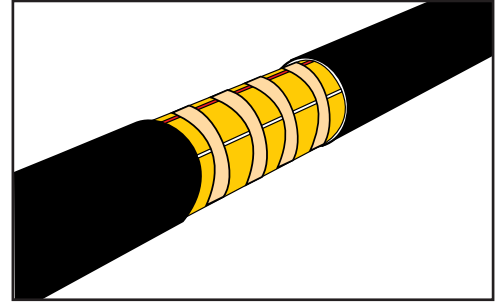
Adjust, connect and solder the wires as described in the general section.



Connecting alarm wires - Straight joints with insulation shells

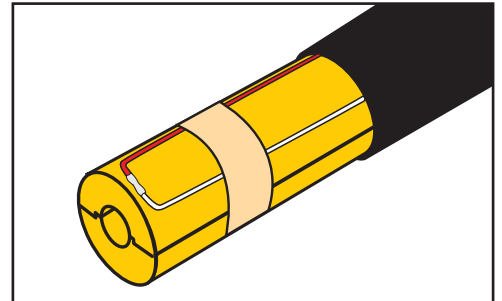
Connecting and fastening wires, continued

Fasten the wires to the insulation shells by means of crepe tape.



End fitting with insulation shells

Fasten the wires to the insulation shells by means of crepe tape.



LOGSTOR Detect

Establishing earth connections

Earth connection/cable take-off and outlet

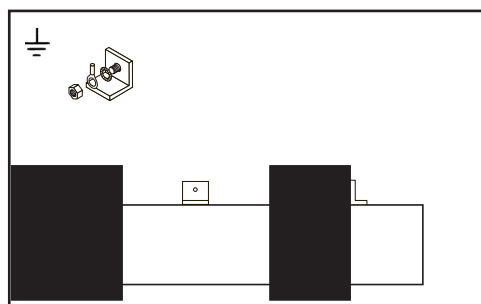
Where the wiring for some reason exits the pipe system, earth connections are welded on to the steel pipe, so the measuring references to the steel pipe are correct.

From the surveillance drawing it shows where to weld the earth connection on to the steel pipe.

Preferably weld the earth connection on at the same time as the pipes are welded together.

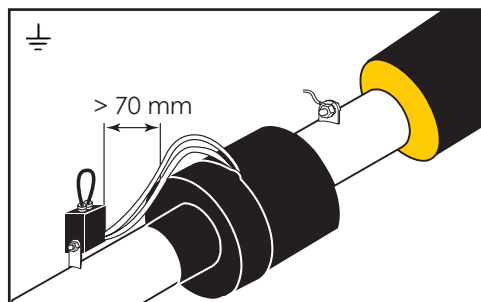
Installation cables:

- In connection with a casing joint, where cable take-off is used, place the earth connection in the middle
- In connection with an end cap, where cable outlet is used, place the earth connection directly at the foam end



Coaxial cables:

- In connection with a casing joint, where twin coaxial cables are used place the earth connection in the middle
- In connection with i.a. an end cap a coupling box 1232 (with earth connection fitted onto it) is placed approx. 70 mm from the foam end



LOGSTOR Detect

Installing cables - Overview

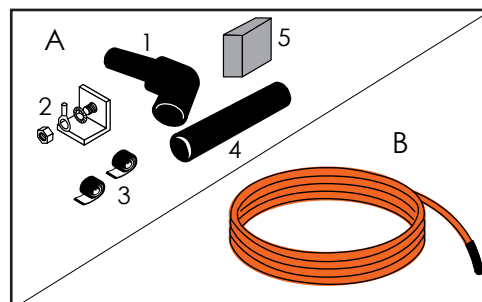
Introduction	This section contains instructions for installing installation cables and coaxial cables dependent on the surveillance principle.
Contents	<p>Installing installation cables with cable take-off</p> <p>Installing installation cables with cable outlet</p> <p>Installing coaxial cables</p> <p>Relieving and protecting cables</p> <p>Installing cables and connecting links</p>

Installing installation cables with cable take-off

Application

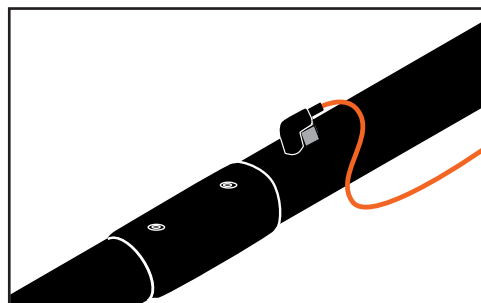
Cable take-off in outer casing is carried out with x meter installation cable B and installation set A which consists of:

1. Cable foot
2. Earth connection
3. Mastic
4. Shrink tube
5. Supporting chock



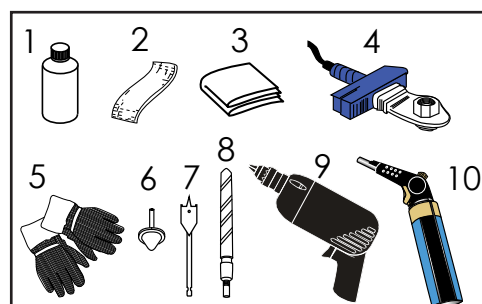
When cable take-off is installed in the outer casing next to the joint, it can be used for all casing joint types.

N.B. If insulation shells are normally used for the system, it is recommended to foam in wrap instead in connection with cable take-off.



Tools

1. Alcohol
2. Emery cloth
3. Tissue
4. Socket welder
5. Gloves
6. Conical drill bit, 35 mm
7. Flat drill bit, 25 mm
8. Ordinary drill bit, 17 mm
9. Drilling machine
10. Heat blower gun/small gas burner



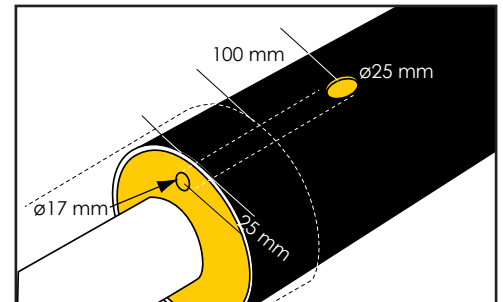
Installing installation cables with cable take-off

Preparing cable installation

Drill a 25 mm hole 100 mm from the marked end of the casing joint.

Mill the hole with a conical milling machine and remove foam remnants and residues after milling from it.

Drill a 17 mm hole approx. 25 mm from the top of the outer casing through the foam to the conic hole.



Welding on cable foot

1. Clean the cable foot and hole edge with alcohol.

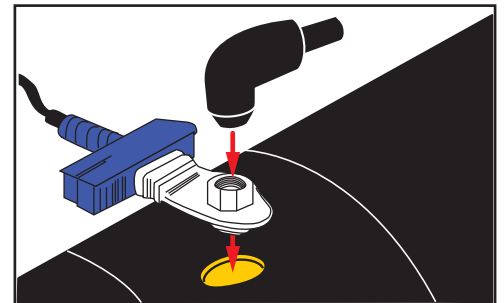
Grind the cable foot with emery cloth.

2. Preheat the socket welder to 250°C.

Place the cable foot in the conical hole of the socket welder. Keep it under a light pressure, until the rim of the cable foot starts to form a bead. Now place the opposite side of the tool in the foam hole. When the rim of the foam hole has formed a bead, remove the socket welder. Immediately press the cable foot into the foam hole, until the two beads melt together.

3. Hold the pressure constant yet soft for 1 minute, until the welding zone is hand-warm.

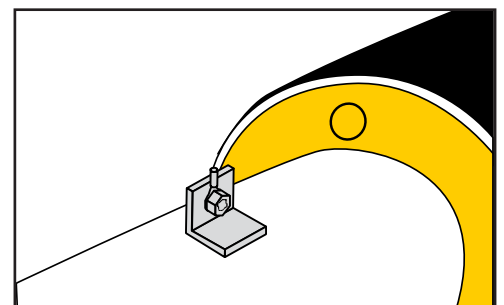
4. 1-2 weld beads must be visible all around the cable foot.



Earth connection

5. It is advantageous to weld the earth connection on at the same time as the pipes are welded.

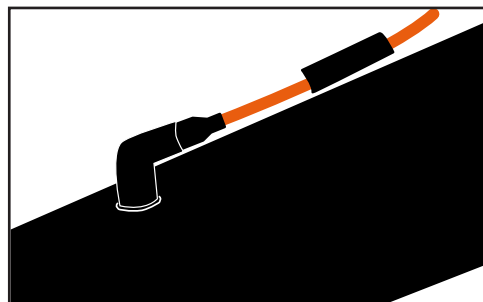
6. Prior to cable installation ensure that the earth connection is rust free.



Installing installation cables with cable take-off

Installing shrink tube

7. Prior to pulling the cable through the cable foot place the shrink tube on the cable.

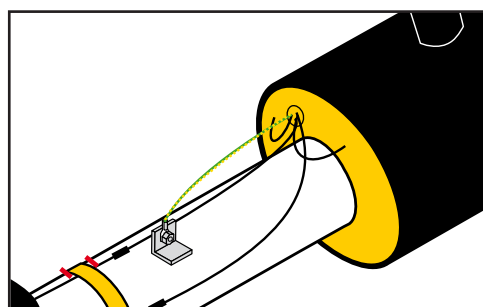


Installing and connecting the yellow/green conductor

8. The yellow/green conductor is installed in the earth connection.

9. The other 4 conductors are connected to the alarm wires as shown and are numbered in the surveillance diagram. Each wire is supported by 3 wire holders.

10. Mark the cable ends flow and return respectively.



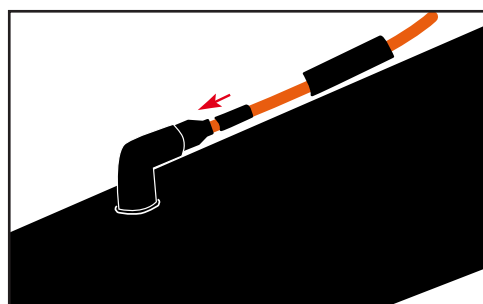
Installing mastic tape No. 1

11. Grind the surfaces with emery cloth, grain size 36-40.

12. Clean the cable and cable foot with alcohol on the entire contact surface of the mastic and shrink tube.

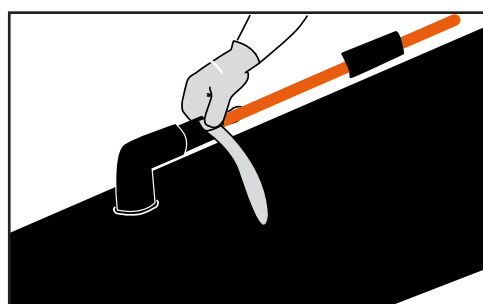
13. Wrap the first mastic tape around the cable as close to the cable foot as possible.

14. Push the cable into the cable foot, so the mastic tape fills and seals the end of the cable foot.



Installing mastic tape No. 2

15. Wrap the second mastic tape around the transition between cable and cable foot.

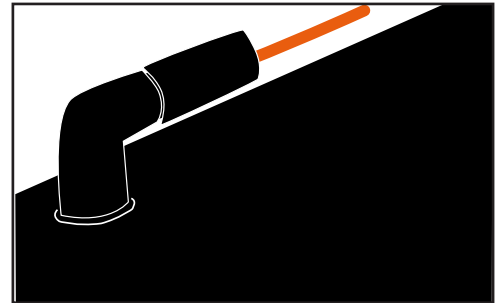


Installing installation cables with cable take-off

Shrinking the shrink tube

16. Centre the shrink tube over the mastic sealing.

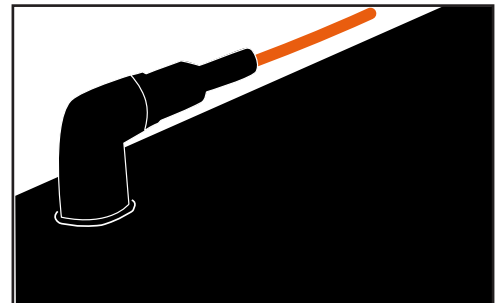
17. Shrink until the tube is in contact with the cable foot.



18. Wait 1 minute before shrinking the shrink tube onto the cable.

NOTE!

Take care that the heat does not damage the cable!

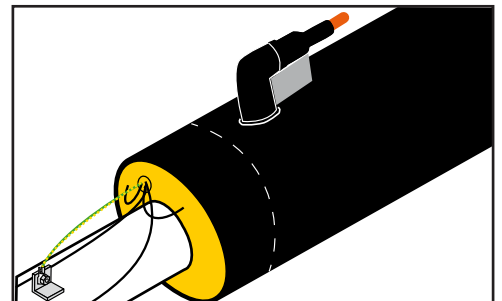


Supporting the cable foot

19. Measure all wire connections prior to joint installation.

20. Place the supporting chock between casing and cable foot.

21. Leakage test the cable foot, when leakage testing the casing joint.



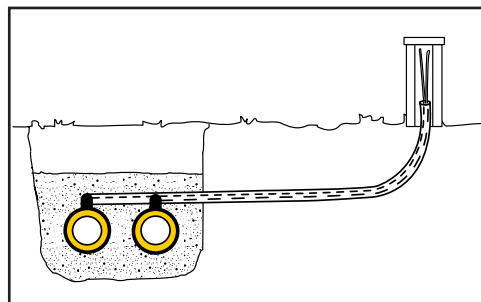
Installing installation cables with cable take-off

Protecting and measuring the connection point

22. The cables between the pipe system and the cabinet must be pulled through a conduit. This gives a good protection and facilitates repairs of excavation and the like or in case of any replacement of cables.

Unprotected cable ends must be protected against moisture. For this purpose use cable end caps, product No. 1210 0008 028 026.

Measure the connecting point on the pipes in relation to fix points in the area.

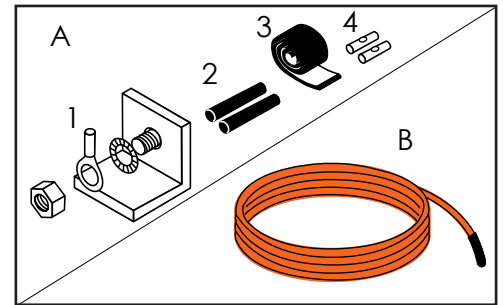


Installing installation cables with cable outlet

Application

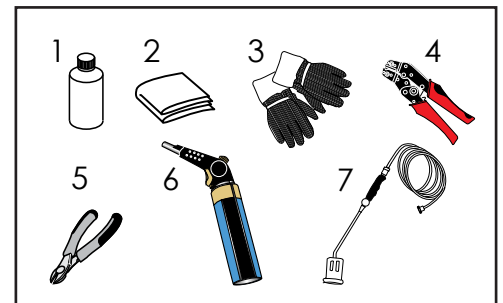
Cable outlet at end-caps is carried out with an installation cable (5-conductor cable) B and an installation set A consisting of:

1. Earth connection
2. Shrink tubes
3. Mastic
4. Crimp connectors



Tools

1. Alcohol
2. Tissue
3. Gloves
4. Crimping tool
5. Diagonal cutter
6. Heat blower gun
7. Gas burner, ø 50 mm

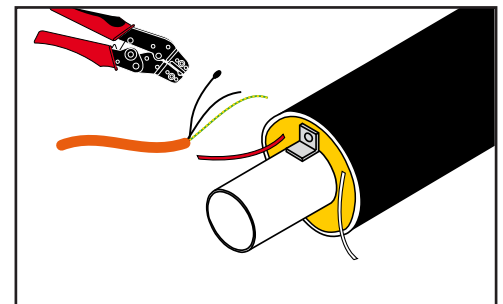


Earth connection

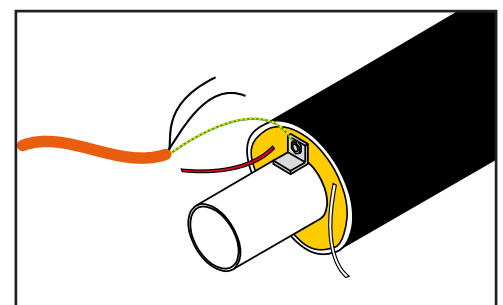
1. Weld the earth connection onto the steel pipe close to the insulation.

It may be advantageous to weld the pipes at the same time.

2. Fix the cable shoe to the yellow/green conductor with the crimp connector.



3. Install the cable shoe in the earth connection and fasten it securely.



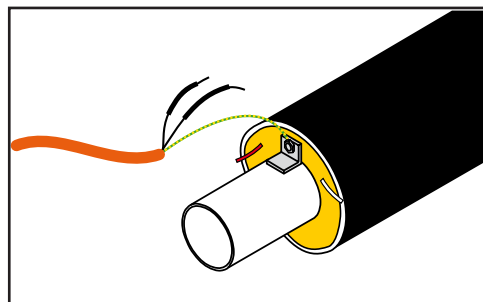
Installing installation cables with cable outlet

Connection to alarm wires

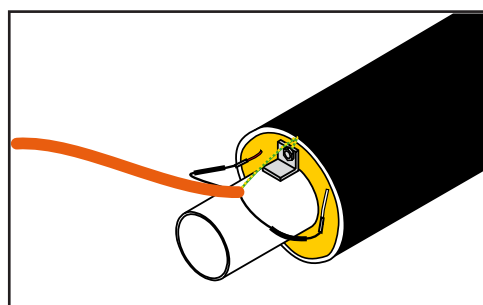
4. Install a shrink tube on the two conductors.

5. Shorten the alarm wires, so the connection is close to the insulation.

NOTE! If there are more than 2 conductors and earth, the rest must be cut.



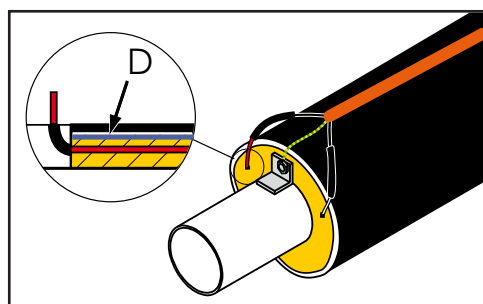
6. Connect e.g. conductor No. 2 of the cable to the tinned wire, and conductor No. 1 to the copper wire by means of crimp connectors. Moreover, as it appears from the surveillance diagram.



7. Place the shrink tubes over the crimp connectors and shrink with a heat blower gun.

8. Pull the cable back along the outer casing, so the conductors lie close to the insulation.

9. Make sure that the shrink tubes cover the uninsulated wires to prevent contact between the wires and the diffusion barrier, D.



Installing installation cables with cable outlet

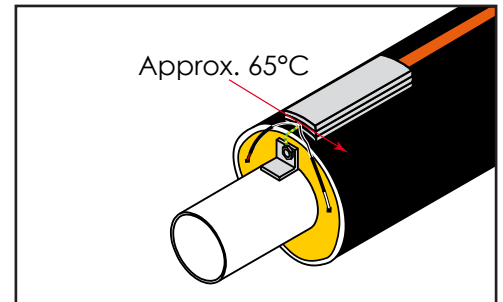
Sealing the cable outlet

10. Clean the cable and casing surface with alcohol.

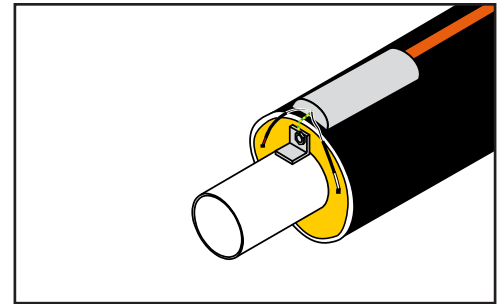
Grind the contact surface of the mastic and the end cap 30 mm outside the rim of the end cap (This enables visual control of the grinding by the inspection).

Activate the contact surface of the outer casing to a surface temperature of approx. 65°C.

Apply mastic to the outer casing and around the cable.



11. Massage the mastic, until it forms a flat curve.

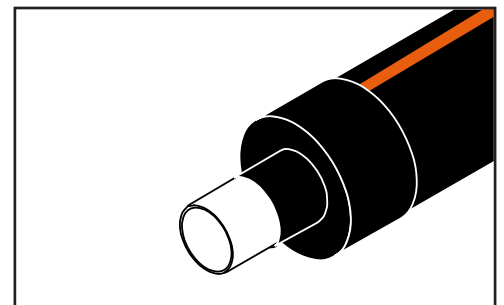


Installing end-caps

12. Place the end-cap in position over the cable outlet and shrink with a gas burner. See the section under Terminations.

NOTE!

Take care that the heat does not damage the cable!

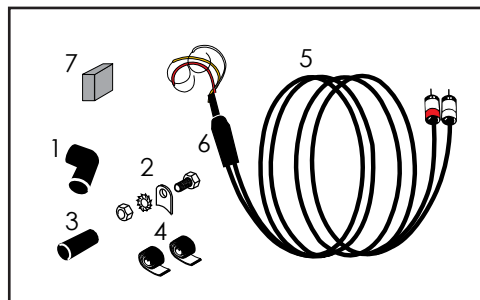


LOGSTOR Detect Installing coaxial cables

Cable take-off in outer casing with closed welding mirror

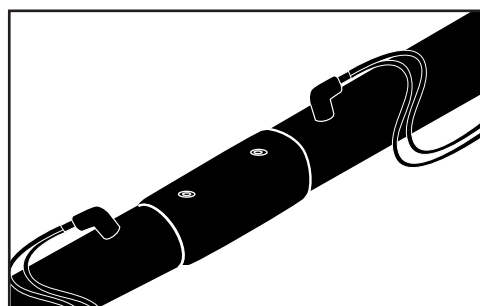
Cable take-off in an outer casing by means of a closed welding mirror is carried out with the shown installation set which consists of:

1. Cable foot
2. Earth connection
3. Shrink tube
4. Mastic
5. Twin coaxial cable
6. PE-part
7. Supporting chock



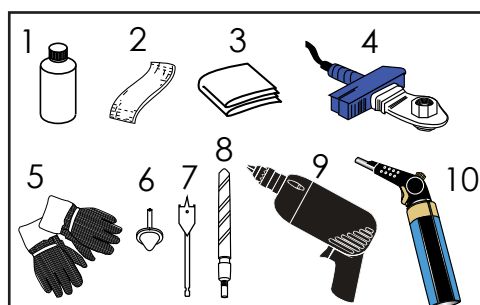
When cable take-off is installed in the outer casing next to the joint, it can be used for all casing joint types.

N.B. If insulation shells are normally used for the system, it is recommended to foam in wrap instead in connection with cable take-off.



Tools

1. Alcohol
2. Emery cloth, grain size: 36-40
3. Tissue
4. Socket welder
5. Gloves
6. Conical drill bit, 35 mm
7. Flat drill bit, 25 mm
8. Ordinary drill bit, 17 mm
9. Drilling machine
10. Heat blower gun/small gas burner



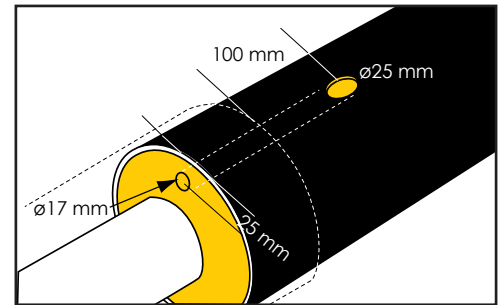
LOGSTOR Detect Installing coaxial cables

Preparing cable installation

Drill a 25 mm hole 100 mm from the marked end of the casing joint.

Mill the hole with a conical milling machine and remove foam remnants and residues after milling from it.

Drill a 17 mm hole approx. 25 mm from the top of the outer casing through the foam to the conic hole.



Welding on cable foot

1. Clean the cable foot and the hole edge with alcohol.

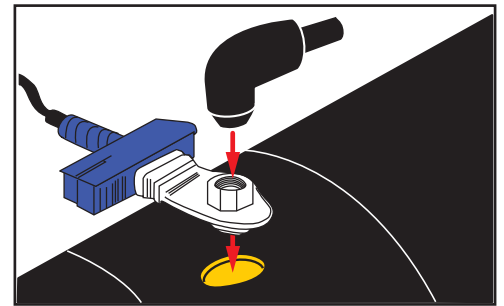
Grind the cable foot with emery cloth.

2. Preheat the socket welder to 250°C.

Place the cable foot in the conical hole of the socket welder. Keep it under a light pressure, until the rim of the cable foot starts to form a bead. Now place the opposite side of the tool in the foam hole. When the rim of the foam hole has formed a bead, remove the socket welder. Immediately press the cable foot into the foam hole, until the two beads melt together.

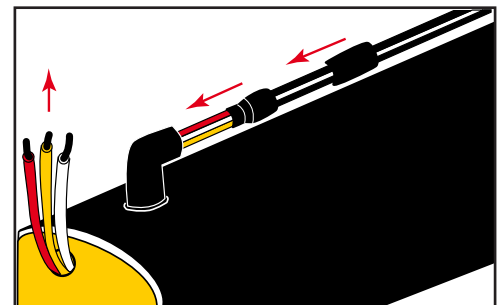
3. Hold the pressure constant yet soft for 1 minute, until the welding zone is hand-warm.

4. There must be 1-2 visible weld beads all around the cable foot.



Introducing the cable into the cable foot

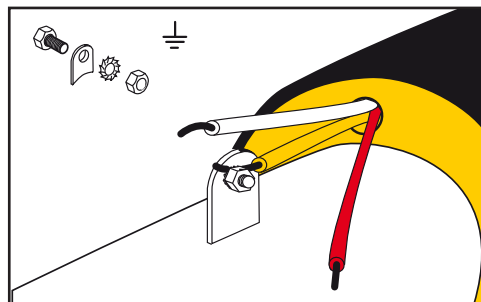
5. Before pulling the cable through the cable foot, place the shrink tube on the cable.



LOGSTOR Detect Installing coaxial cables

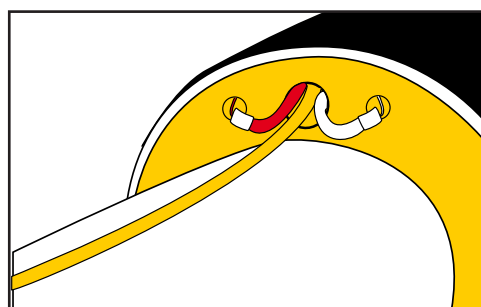
Earth connection in casing joint

6. Connect the yellow conductor from the cable foot to the earth connection, which must be free from rust. Tighten the bolt securely.
7. Weld the earth connection, if any, onto the service pipe at the same time as the pipes are welded.



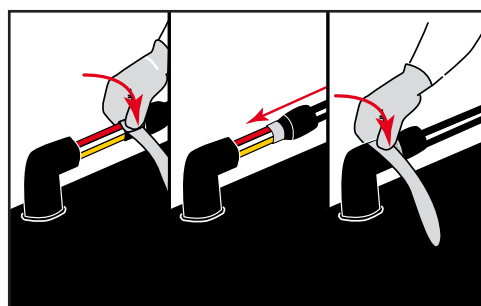
Connecting alarm wires

8. The white and red conductors are connected to the tinned and the copper wire, respectively in accordance with the surveillance diagram.



Sealing cable take-off

9. Clean the inside and outside of the cable foot and the PE-part on the cable with alcohol.
10. Grind the cable foot and the PE-part on the cable.
11. Wrap the mastic tape around the PE-part of the cable and push it into the cable foot. Wrap the second mastic tape around the cable foot so the mastic tapes fill and seal the transition between the cable foot and the PE-part.



LOGSTOR Detect Installing coaxial cables

Sealing cable take-off, continued

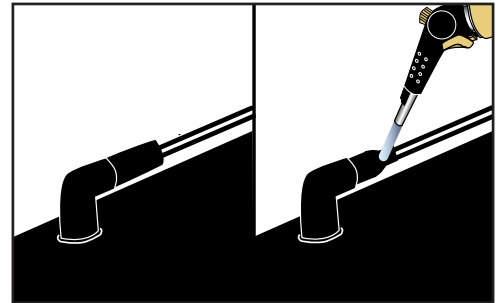
12. Place the shrink tube over the end of the cable foot.

Shrink until the tube is in contact with both cable foot and the PE-part on the cable.

Note!

Take care not to damage the cable by exposing it to heat.

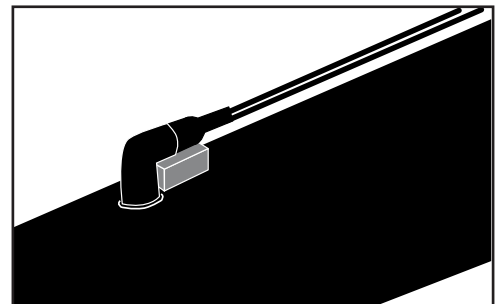
13. Measure all wire connections prior to joint installation.



Supporting the cable foot

14. Place a supporting chock between the outer casing and the cable foot.

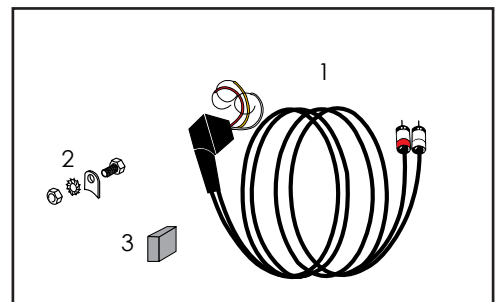
15. Leakage test the cable foot, when leakage testing the casing joint.



Cable take-off in outer casing with opening, welding mirror

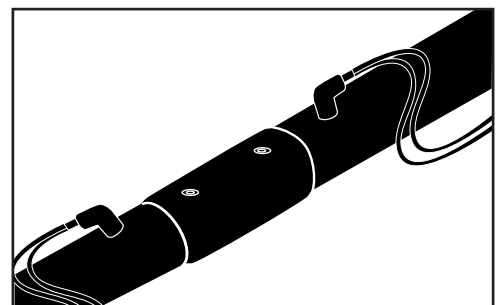
Cable take-off in outer casing with an opening, welding mirror is carried out with the shown installation set, consisting of:

1. Twin coaxial cable
2. Earth connection
3. Supporting chock



When cable take-off is installed in the outer casing next to the joint, it can be used for all casing joint types.

N.B. If insulation shells are normally used for the system, it is recommended to foam in wrap instead in connection with cable take-off.

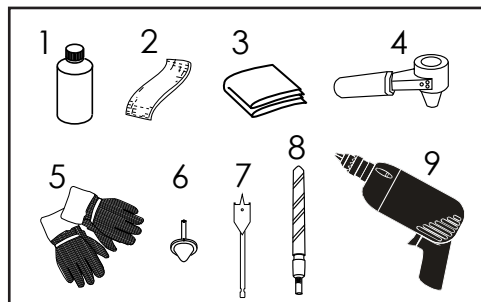


LOGSTOR Detect

Installing coaxial cables

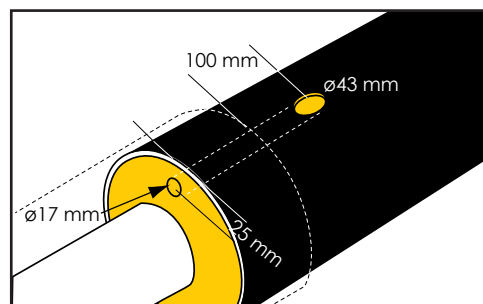
Tools

1. Alcohol
2. Emery cloth, grain size: 36-40
3. Tissue
4. Opening socket welder
5. Gloves
6. Conical drill bit, 43 mm
7. Flat drill bit, 25 mm
8. Ordinary drill bit, 17 mm
9. Drilling machine



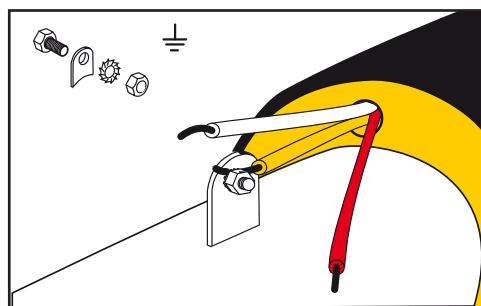
Preparing cable installation

1. Drill a 25 mm hole 100 mm from the marked end of the casing joint.
Mill the hole with a conical milling machine (43 mm) and remove foam remnants and residues after milling from it.
2. Drill a 17 mm hole approx. 25 mm from the top of the outer casing through the foam to the conic hole.



Earth connection in casing joint

3. Weld the earth connection, if any, onto the service pipe at the same time as the pipes are welded.
The earth connection must be free from rust.



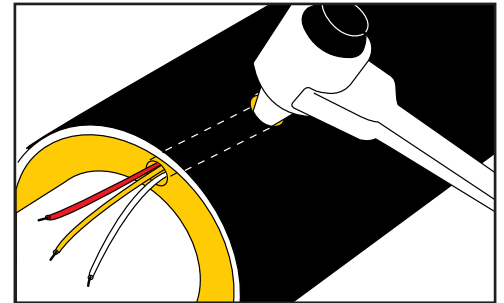
LOGSTOR Detect Installing coaxial cables

Welding in the cable foot

4. Clean the cable foot with alcohol and grind it with emery cloth.
5. Pull the 3 wires from the cable foot through the hole towards the joint.
6. Connect the socket welder and pre-heat it to 250°C. Open the socket welder, insert the cable foot, close and heat.
7. When lips of the HDPE-material have melted on the outer casing and cable foot, open the socket welder and press the cable foot down into the melted material.

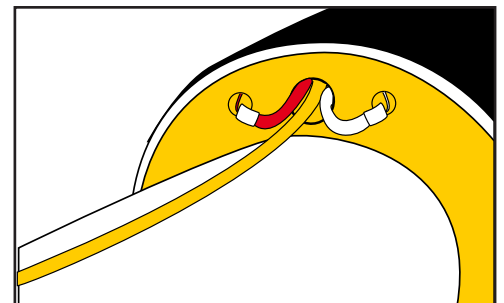
Hold the pressure hard and constant for at least 2 minutes or until the welding zone is handwarm, before releasing your hold of the cable foot.

There must be 1-2 visible weld beads all around the cable foot.



Connecting alarm wires

8. The white and red conductors are connected to the tinned and the copper wire, respectively in accordance with the surveillance diagram.
 9. The yellow conductor from the cable foot is installed in the earth connection as described above.
- Tighten the bolt securely.

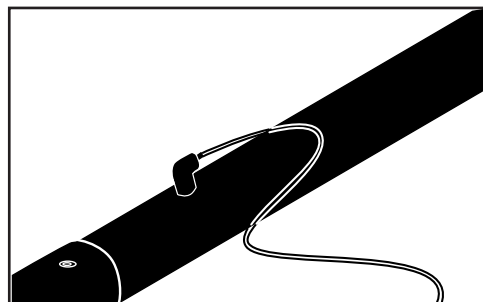


Relieving and protecting cables

Relieving and protecting cables

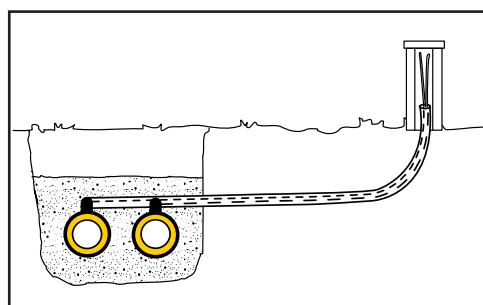
The temperature difference in the pipe system will result in movements of the pipes.

Consequently, relieve the cable with a U-bend before pulling them to the cabinet.



The cables between the pipe system and the cabinet must be pulled through a conduit. This gives a good protection and facilitates repairs of excavation and the like.

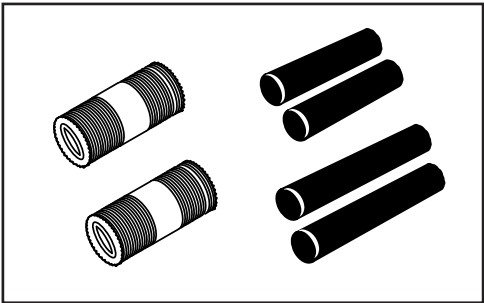
Measure the connecting point on the pipes in relation to fix points in the area.



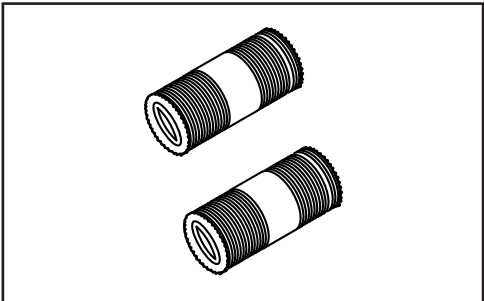
Installing cables and connecting links

Overview

Cables to be extended in the earth are connected with connecting link and sealed with shrink tubes.

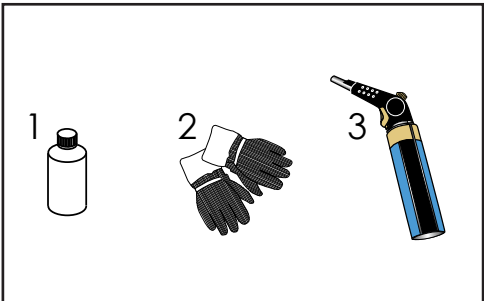


Cables to be connected in a cabinet are connected with connecting links.



Tools

- 1. Alcohol
- 2. Gloves
- 3. Heat blower gun/small gas burner



Installing cables and connecting links

Connection

1. First pull the long shrink tube and then the short shrink tube onto one cable.

2. Mount the couplings of the cables on the connecting link.

NOTE!

The cable colours must correspond.

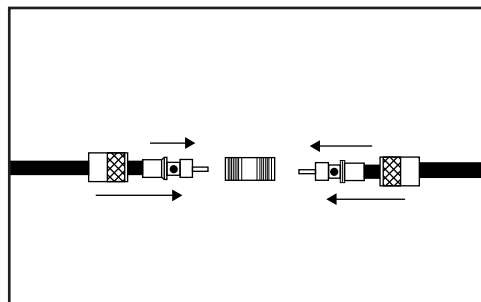
3. Clean the contact surface of the shrink tube and center the short shrink tube over the joint.

4. Shrink the tube until it is in contact with the cable and mastic is visible at the ends.

Repeat the process with the long shrink tube.

NOTE!

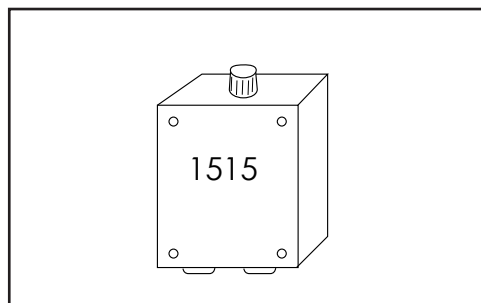
Take care that the heat does not damage the cable!



Transition from coaxial cable to installation cable

To be used when Detector X1L is connected to coaxial cables.

Connection box 1515 has a built-in transient protection, protecting against overvoltage when measuring the electrical resistance at the detector.



Connection and coupling boxes - Overview

Introduction	This section contains installation instructions for connecting boxes and cables dependent on the surveillance principle.
Contents	Coupling in connection with installation cables Coupling in connection with coaxial cables

Coupling in connection with installation cables

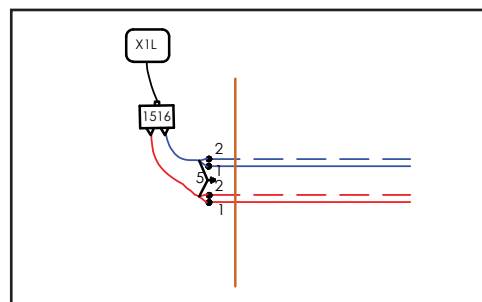
Application

This section describes different ways of connecting boxes in a surveillance system with installation cables.

Connection box, 1516

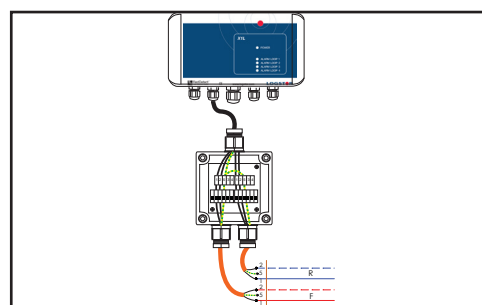
The connection box, 1516, is used for electrical separation between Detector X1L and the pipe system to enable direct resistance measuring on the alarm wires.

Connection box 1516 has a built-in transient protection, protecting against overvoltage when measuring the electrical resistance at the detector.



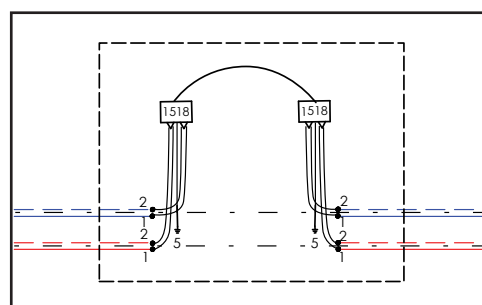
LOGSTOR always supplies 5-conductor cables.

In this case conductors 3 and 4 are cut.



Alternative use of jumper cable box, 1518

The jumper cable box, 1518, may also be used to connect a pair of pipes to another or the same pair of pipes e.g. in a chamber or a building by means of a jumper cable.



Terminal box, 1517

The terminal box, 1517, can be used:

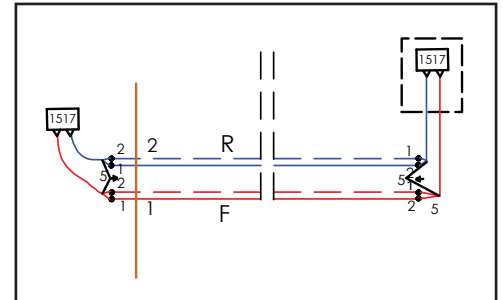
- at the beginning and the end of a system
- as a measuring point along the system
- as a terminal box between two circuits in e.g. a transmission line.

Coupling in connection with installation cables

Box 1517 at the start/end of a system

The terminal box, 1517, used as a measuring point of a pair of pipes in:

- a building
- a chamber
- a cabinet

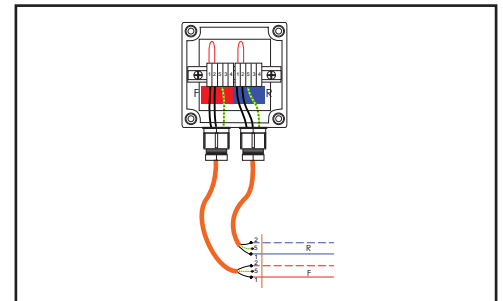


Loops: 1-2

LOGSTOR always supplies 5-conductor cables.

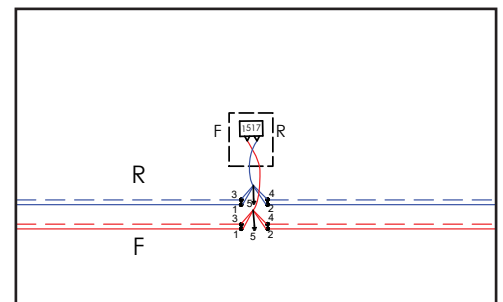
In this case conductors 3 and 4 are cut.

See example of connection in previous section about installation cables with cable take-off.



Box 1517 as a measuring point

The terminal box, 1517, used as a measuring point along the system, dividing it for more accurate measurements.

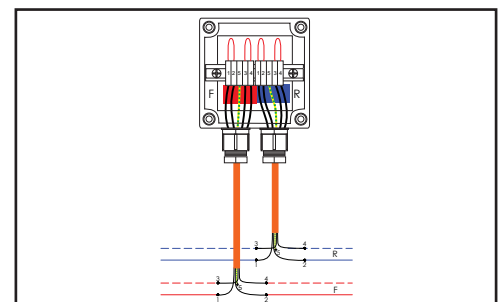


Loops:

1-2

3-4

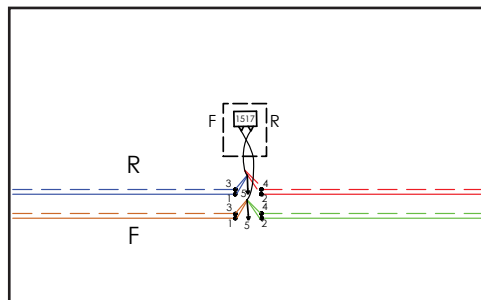
See example of connection in the previous section about installation cables with cable take-off.



Coupling in connection with installation cables

Box 1517 as a double end point

The terminal box, 1517, used as a double end point, separating two individual circuits.

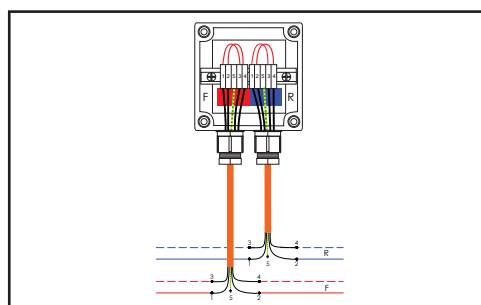


Loops:

1-3

2-4

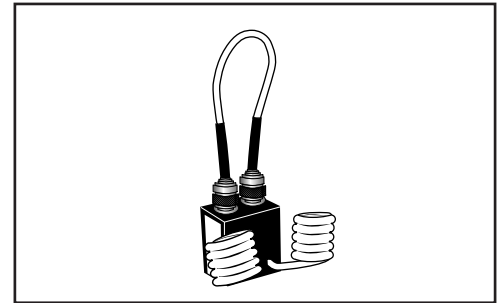
See example of connection in previous section about installation cables with cable take-off.



Coupling in connection with coaxial cables

Application

The UHF connection box is used when connecting Detector X4/X6 and when a jumper cable is installed in cellars or dry inspection chambers and when terminating circuits.



Installation in connection with end-cap

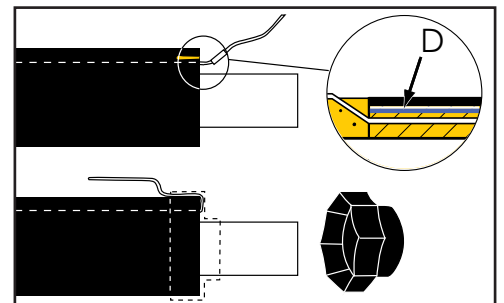
Place a piece of sealing strip or mastic on the outer casing prior to installation.

Shorten the wires from the pipe and extend them with insulated wires.

Make sure that the uninsulated wire does not get in contact with the diffusion barrier. Use shrink or flex tubes

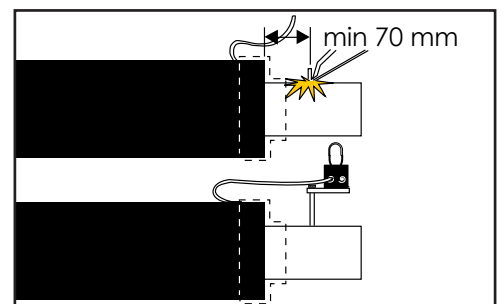
Press the straightened wire into the sealing strip or mastic.

Shrink the end-cap.



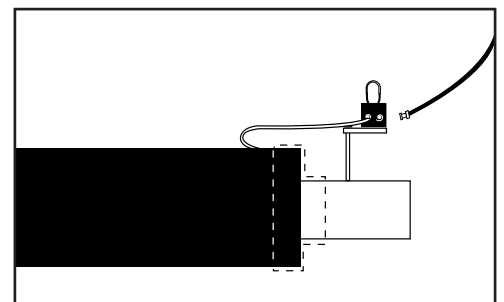
Weld the earth connection on the UHF connection box, 70 mm from the outer casing end.

Adjust the earth connection to raise the box above the insulation.



The wires from the pipe are connected to the alarm wires from the UHF connection box.

Connect the coaxial cables by means of the UHF connection box.



LOGSTOR Detect Installing 3dc cables

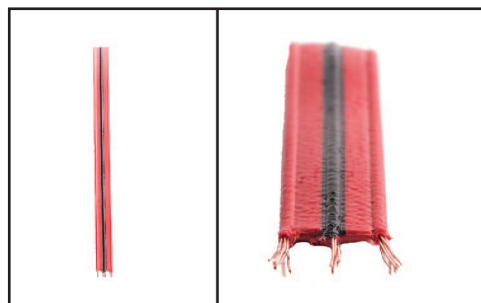
General

3dc cables are connected without loop. However, branches must always be connected in loop.

For 3dc cables the theoretical resistance of the alarm wires is 3.2Ω per 100 m wire.

Wiring in joints

The 3 wires continue through the joint.

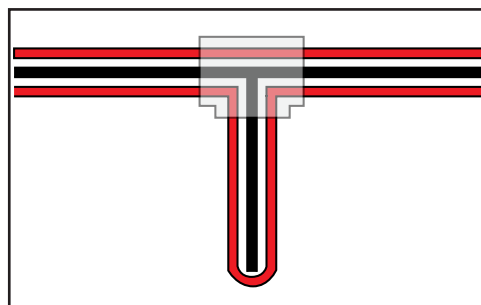


Wiring in branches

Branches are made with an embedded 3dc branch tee coupling where one of the conductors covers the branch.

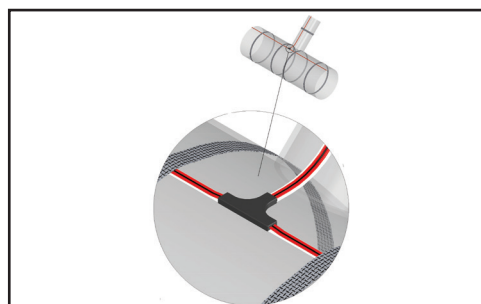
The reference conductor in the branch is connected to the reference conductor in the main pipe.

The conductors in the branch pipe must always be connected in loop.



Wiring T-joint for foaming

The 3dc cable is placed at the top and fixed with tape on all 3 sides as illustrated.



Earth connections

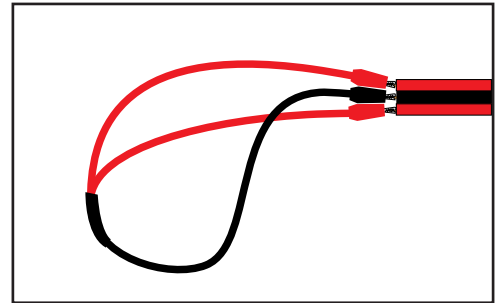
In this system earth connections are not used, because only one reference conductor is used.

LOGSTOR Detect Installing 3dc cables

Loop for control measuring

To create a loop for control measuring during installation, start the cable installation by connecting the two red sensor wires and the black reference wire with the test cable for 3dc.

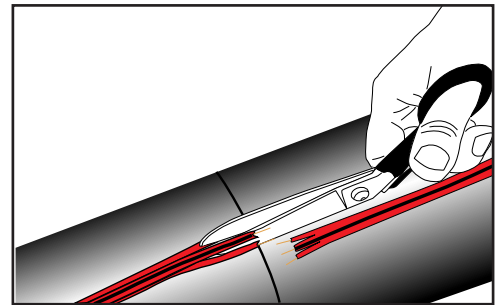
Connect the 2 red adapters on the test cable to the 2 red sensor wires (outer conductors), and the black adapter to the black reference wire (middle reference wire).



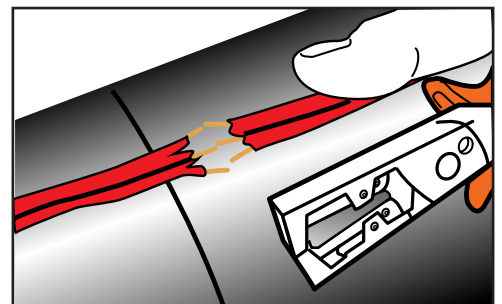
Installation in joints

1. Cut the service pipe to a length, which ensures that the ends of the alarm cable overlap, when the pipe is welded together/connected.

2. Cut the PE insulation between the copper wires.



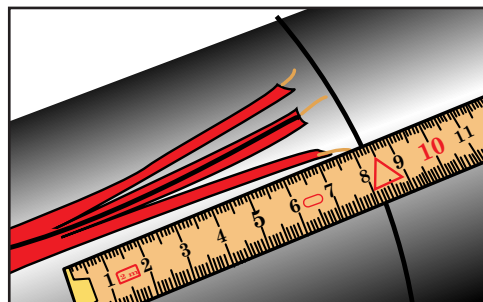
3. Remove approx. 10 mm of the insulation around the wires with a wire stripper.



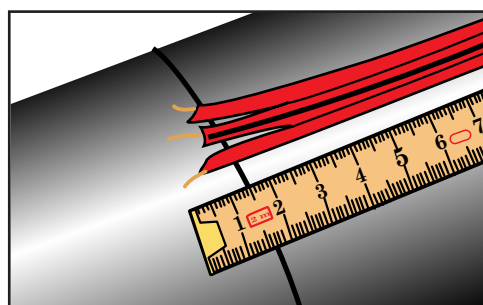
LOGSTOR Detect Installing 3dc cables

4. At one pipe end make a 80 mm long cut between the cable wires.

Take care NOT to cut into the copper wires or the service pipes!



5. At the other pipe end make a 30 mm cut between the cable wires.



6. Loop test of red sensor wires:

Connect the two red sensor wires to the megger.

Place the switch in measuring range "Ω".

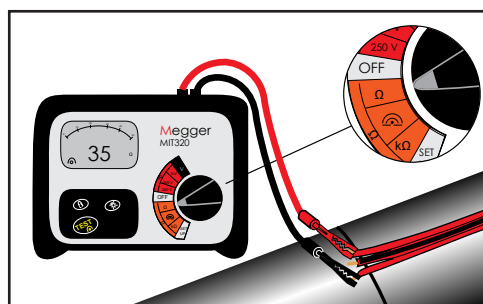
The megger shows the actual resistance in the wires.

Resistance measurement: Acceptance.

1 m wire = 0.032-0.038 Ω.

Example:

500 m pipe = 1000 m sensor wire. The measurement must be between $1000 \times 0.032 = 32 \Omega$ and $1000 \times 0.038 = 38 \Omega$



LOGSTOR Detect Installing 3dc cables

7. Passage in black reference wire:

Now place the switch in measuring range 250V.

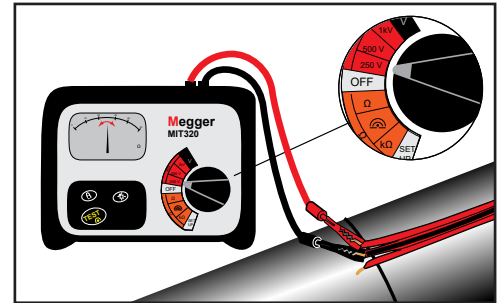
Connect one of the red sensore wires as well as the black reference wire to the megger. It is important that minus (black) on the megger is connected to the black reference wire.

Check that there is good electrical connection.

Press the test knob.

The connection of the black reference wire is not good, if the read value is $>1000 \text{ M}\Omega$.

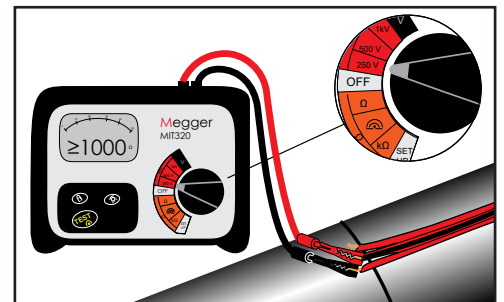
If the deflection is brief, the connection is OK (there is power).



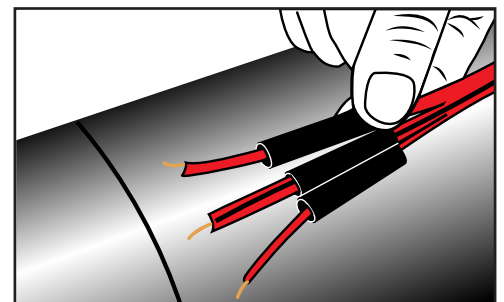
8. Insulation test:

Place the switch in measuring range 250V. Connect the opposite item 7 i.e. one of the red sensor wires are connected to minus (black) on the megger, and the black reference wire is connected to red (plus) on the megger. Press the test knob.

Acceptance value $\geq 1000 \text{ M}\Omega$, then the isolation between sensor wires and reference wire is good.



9. Place a 50 mm long shrink hose on each of the 3 wires.

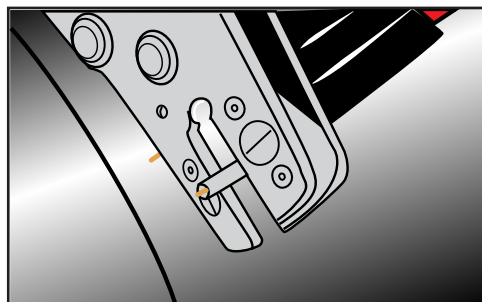


LOGSTOR Detect Installing 3dc cables

10. Place the crimp connector on one of the wires and crimp it with the crimping tool, jaw width 1.5 mm.

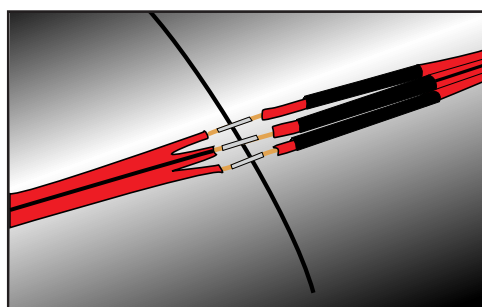
Insert the other wire into the crimp connector and crimp it, and do the same with the third wire.

A good mechanical connection is now ensured.



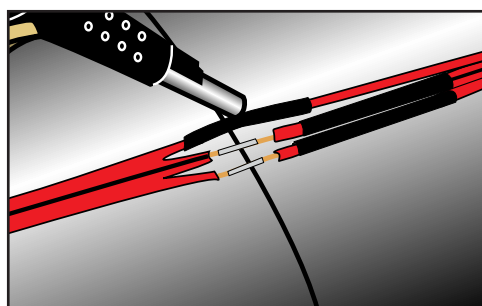
11. After crimping make sure there is a good mechanical connection.

Make sure the wires are not twisted and the black line in the middle turns upwards.

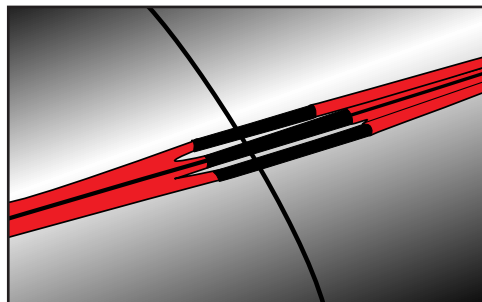


12. Place a 50 mm long shrink hose around the middle of each crimp connector. and shrink the hoses above the joints.

Avoid overheating of the red sensor wires and the service pipe!



13. Shrink until the hoses on the crimp connectors are in contact with the wires

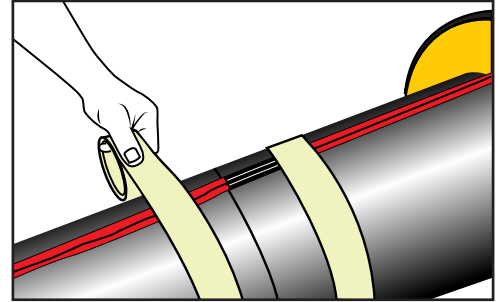


LOGSTOR Detect Installing 3dc cables

14. Fasten the wires with 2 strips of crepe tape and make a good overlap.

The above procedure applies to all joints.

If the 3dc cable rests on something sharp, make sure the cable cannot be damaged during foaming by means of tape or the like.



LOGSTOR Detect 3dc cable - jointing components

Heat resistant tape Product No. 8000 0000 026 000
Roll of 50 m
Use a length equal to the circumference of the service pipe x 6 per joint.
However, for TwinPipes double length must be used.



Crimp connectors Product No. 8000 0000 002 044
100 pcs. per bag
Use 3 pcs. per casing joint



Shrink tubes for 3dc connections Product No. 8000 0000 007 087
100 pcs. per bag
3 pcs. are used per joint



Crimp tongs Product No. 9000 0000 029 001
Special tongs to compress crimp connectors for connection of copper wires.



LOGSTOR Detect
3dc cable - jointing components

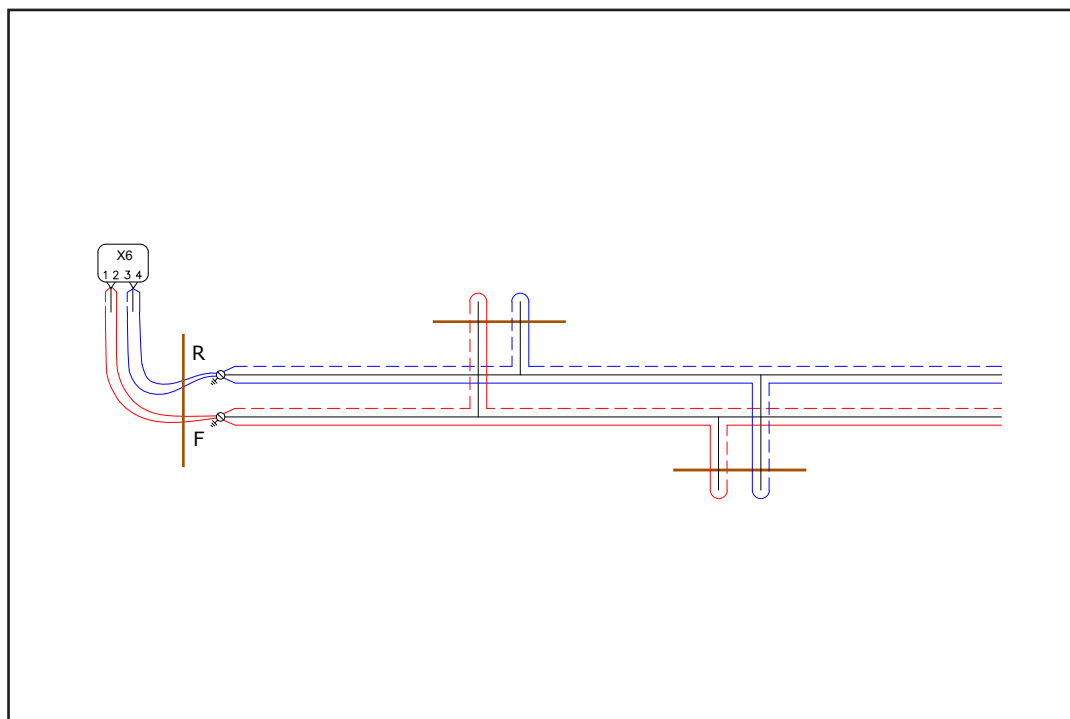
3dc cables for
installation tees

Product No. 8100 0000 007 008



3 dc cable - Example of surveillance diagram

Active system with
X6 for impedance
measuring



LOGSTOR Detect 3dc cable - Measuring tool

Alarm cable

3 parallel insulated copper wires:

- 2 red sensors

- 1 black sensor

(reference conductor)

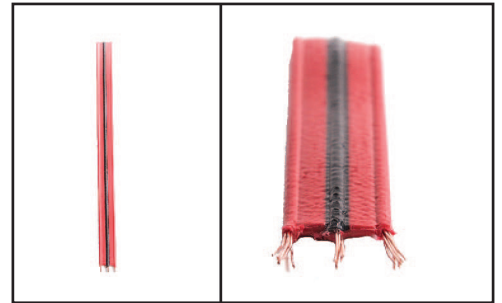
Distance between wires: 5.0 mm

Width: 11 mm

Thickness of PE: 1.6 mm

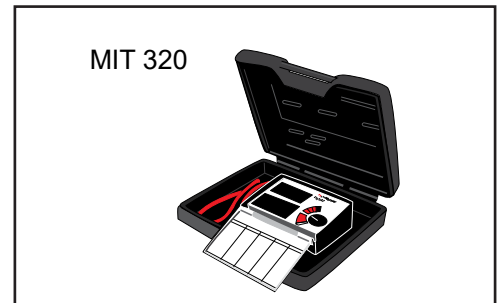
Wire resistance:

1 m = 0.032-0.038 Ω



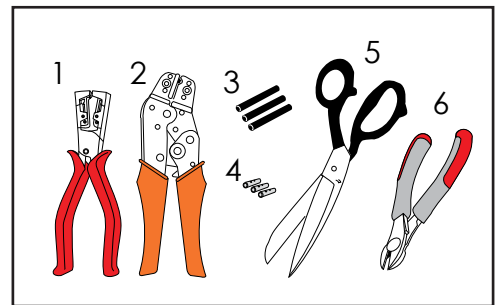
Megger

Megger MIT 320 or a similar megger is used to inspect the wires.



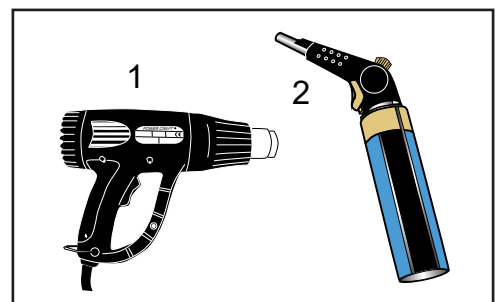
Tools

1. Wire stripper
2. Crimping tool
3. Shrink hoses
4. Crimp connectors
5. Pair of scissors
6. Side-cutting nippers



Gas burner:

1. Heat gun
2. Gas burner



LOGSTOR Detect

Surveillance components - Overview

Reference

User and installation manuals are available for all types of detectors.

User and installation manuals for detectors of the resistance measuring principle are supplied with the detector.

User and installation manuals for X6, CNL1, CNL2, and XPM as well as the XTool software can be ordered from the LOGSTOR Service Department.

Installing weatherproof cabinets

Description

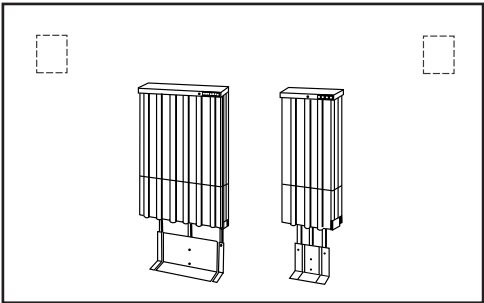
If components cannot be placed in a building or the like, install them in a cabinet.

Cabinet narrow (628 x 303 x 155 mm)

Cabinet wide (628 x 574 x 215 mm)

The weatherproof cabinet is constructed for individual installation or as a uniform system built together.

The single cabinets are connected by means of corrugated nails and a coupling mounting.

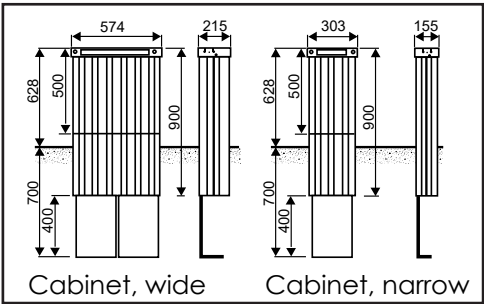


Installing weatherproof cabinets

Adjust the sole plate after the ground or the depth of the cable trench.

Place the cabinet with marking on cabinet in ground.

The cabinet is delivered with moist barrier and installation plate, which are mounted according to the provided instructions.

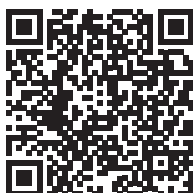


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