



These directions complement what is specified in EN 13941 and procedures produced by the local government.

### 10.1 Transportation and storage

Normally the pipes and fittings are delivered to the site on a truck and the consignee is responsible for unloading of the same.

For unloading and further handling, wide nylon web slings are to be used. Chains, ropes or other round lifting equipment may not be used. If unloading and handling are carried out with a fork lift, flat forks are to be used. Pipes or fittings must not be dropped or thrown off the truck as the outer jacket and the insulation may be damaged.

**NOTE!** T-pieces should not be lifted by the branch pipe only. Particular care must be taken, to ensure that the jacket pipe is not damaged.

Storage of pipes and fittings should be on level and dry ground. The insulation should not be allowed to come into contact with water. The steel pipes shall be protected from corrosion.

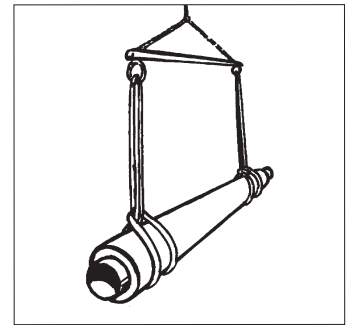
Pipe work larger than DN 125 should be stored with spacers between lengths. Maximum stacking height is 2 m. Width and distance between spacers are to be arranged so that the pressure on the jacket does not exceed 400 kPa (4 kg/cm<sup>2</sup>).

Permanent compressive stress on the polyurethane foam should not exceed 50 kPa.

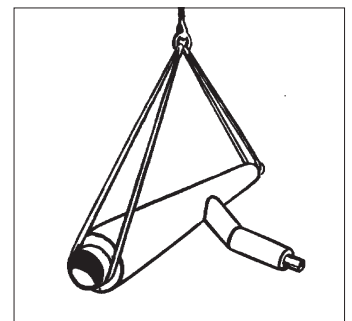
It is recommended to use the spaces that are delivered together with the pipes. These spacers make the stacking safer as well as preventing accidents due to collapse of the pipe stack.

Fittings are to be stored with the steel pipe ends facing down.

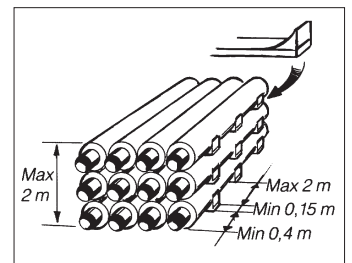
Pipes with an outer jacket diameter  $\geq 560$  mm are to be handled with special care at temperatures between 0°C and -20°C. At temperatures below -20°C, ask Powerpipe Systems for advice.



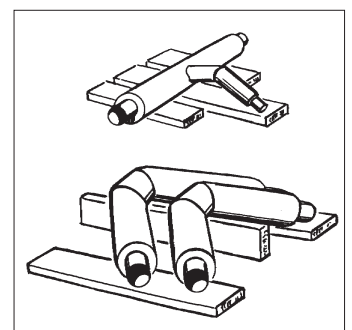
For unloading and further handling wide nylon web slings shall be used. Chains, ropes or other round lifting equipment may not be used.



T-pieces may not be lifted by branch of pipe only.



It is recommended to use the spaces that are delivered together with the pipes. These spacers make the stacking safer as well as preventing accidents due to collapse of the pipe stack.



Fittings are to be stored with the steel pipe ends facing down.



## Transportation and handling of flexible pipes

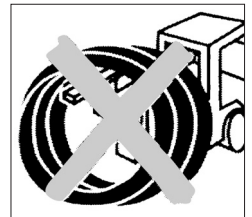
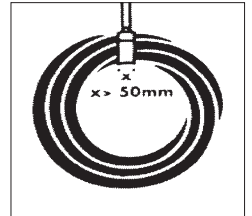
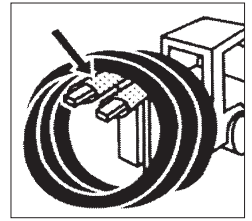
### Loading, unloading

Flexible pipes are delivered in large rolls.

The rolls may not be lifted with narrow straps or unprotected forks.

Minimum width of the strap is 50 mm.

Fork protection may consist of steel pipes or pressure water pipes.

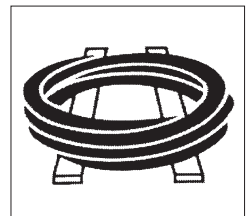


### Storage, unwinding

- The rolls are stored horizontally on a pallet to avoid soil moisture / sharp-edged objects.
- The rolls may be stored standing on a totally flat surface. The storage area must then be entirely free from foreign / sharp-edged materials.

Unwinding can occur from:

1. Vertical roll which is rolled out.  
Make sure that the roll will not roll over sharp-edged materials.
2. Laying rotating roll, for example on a unwinding device.
3. Laying fixed roll. In this situation, the pipe is wrapped off the roll.





## 10.2.1 Dimensions

The pipe lengths from Powerpipe are laid directly on the prepared pipe bed (2). A recommended typical section of a trench is shown in the figure. The draining layer (2) and draining pipe (1) decrease the heat losses from the mains since dryer conditions around the pipe work gives better insulation.

The top of the trench must be refilled with a covering height of minimum of  
500 mm for roads with heavy traffic  
300 mm for other places

## 10.2.2 Pipe bed

The bed is to be a minimum of 150 mm thick, and to be formed by material free from stones and with a maximum particle size of 20 mm. If material with sharp edges is used, the bed must have a 50 mm thick top layer consisting of stone-free material.

The bed is performed according to the type section with dimensions:

- A=C= 200 mm for  $\leq D_y$  180 mm
- A=C= 250 mm for  $200 \leq D_y \leq 560$  mm
- A=300 mm for  $D_y \leq 630$  mm
- C= 400 mm for  $D_y \leq 630$  mm

When mounted at the pagee of the pipe trench A-dimension may be reduced to 100 mm.

Excavation at the casing, or build-up of the pipes shall be executed to obtain a free space around the joint location at a length of 2 m - see Figure!

The space shall be min 200 mm to dim <500 and 300 mm in dim > 560 mm.

At joints where the pipes can not be rolled, the free installation space is increased to 400 mm at a width of 2 x 600 mm (from the welding point) so that the welding work can be performed.

## 10.2.3 Drainage

Trenches should always be kept drained. Dry trenches during the installation period decrease the risk of damp in the insulation. During operation of the system a dry trench will decrease the heat losses and reduces the risk of moisture coming from outpagee in the insulation. Rigid drainage pipes of an approved type must be used. The drain pipes should not be connected to crossing drain water pipes. Instead, they are to be connected at a low point to an existing pipe.

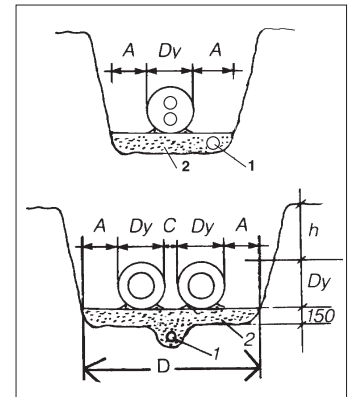
Surrounding filling for drainage pipe is executed according to drainwater local standards.

## 10.2.4 Installation Prerequisites

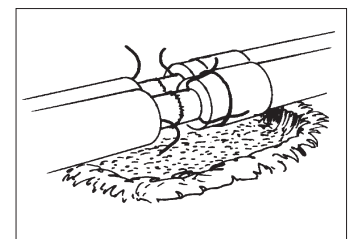
The assembly will be performed and guaranteed according to the providers documented instructions. To perform a proper joint the following general installation conditions must be met:

- The pipe trench shall have a functioning drainage so that the joint location is dry. In addition, it must be free from snow and ice.
- Before jointing and insulation are carried out, the carrier pipe must be installed and finally tested.
- Alarm and signal wires are connected according to prepared drawings .
- At the joint location, shall the joint casing, jacket pipe end, steel pipe ends and free foam surfaces be dry and clean.
- Surfaces against which the polyurethane foam is molded, shall normally maintain the temperature 15-40°C. In cold weather this can be achieved through circulation of hot water through the pipes.

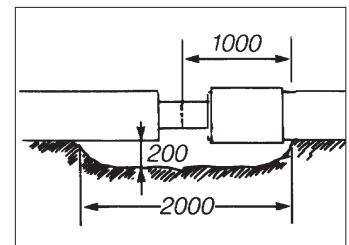
Joint sites must be protected from rainfall between different operations and when foaming and joining.



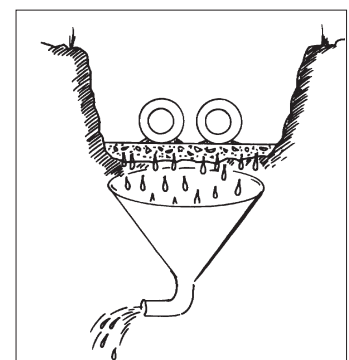
1: Draining pipe  
2: Pipe bed.



Excavation at the sleeves, or lift of pipes shall be made so that a free-mounting space is obtained



Space for installation



Trenches should always be kept drained.



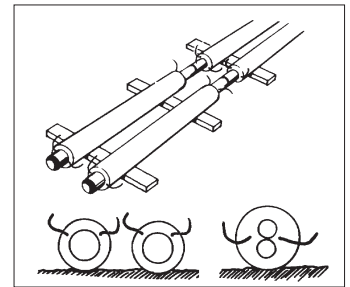
## 10.3.11 Pipe laying

Before pipe laying is started, the pipe bed should be checked to ensure that it has been constructed in accordance with 10.2.2 and is free from foreign material. The full length of the pipe should rest on the bed. The pipes can also be laid on special stacking wood or on rollers.

The size of the stacking wood should be at least 150x150 mm. The wood or rollers are to be aligned before the pipe is laid.

Check that the alarm wires in each pipe and detail are faced upwards. In curved pipes and profile bends, however alarm wires of manufacturing reasons layes otherwise.

Throughout the assembly period be ensured that no water is collected at some point in the pipe trench bottom. The insulation must be kept dry. Wet insulation in the pipe ends are causing problems at the joint insulation and gives alarm-errors.



*District heating pipes placed on special pallets or on rolls. Palets or roll are positioned before the pipe is layed. Make sure the alarm wires in pipes and fittings is facing upwards.*

## 10.3.12 Welding, testing and control of weld

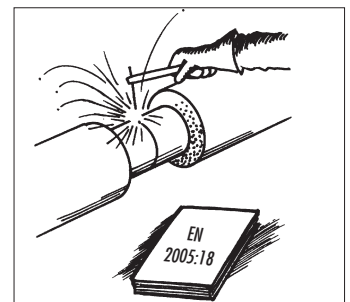
Welding of steel pipes is to be performed, where specified, by a company which is certified for welding. The welder shall have a valid certificate showing his qualifications. Each weld is to be marked so that the welder can be traced. At welding of straights pipes, the pipes are gradually turned around on rollers/wooden foundation. This will minimize the problematic welding. "Hatch-welds" shall be avoided.

Testing is performed in accordance to standards. Pressure test and leak detection is carried out with cold water by 1.3 times maximum allowable operating pressure. The pressure shall be held one hour prior to inspection. All joints shall be visible.

Leak test can also be carried out with air whereby leak detection is done by brushing with soapy water or similar. Maximum pressure 3 kPa (0,03 kp/cm2).

Radiography shall be made in the extent the program documents specifies.

Before starting daily operation, the pipeline is cleaned with a cleaning-plug or pressure cleaning tools.



*Non-destructive testing executed in the amount which is specified in manuals.*

## 10.3.13 Pipes for cutting to length

When short pipe sections are required pipes for cutting to length are to be used. The construction of the pipe makes it easy to remove the insulation from the steel pipe which gives a totally clean surface. This assists the installation and eliminates the risks of generation of unhealthy gases from insulation while welding or soldering.

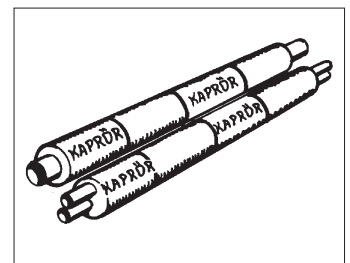
The particular pipes that are for cutting to length are marked "Pipes for cutting to length".

The "pipe for cutting to length" piece is to be located where the friction movement is as small as possible, which means as far as possible from a change of direction.

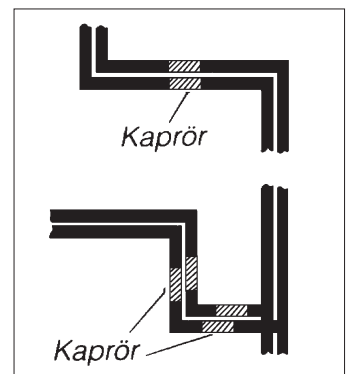
The cutted piece may not be cast into a wall or the similar on a straight length.

**At cutting of the HDPE-pipe it is essential to start with tangential cuts to avoid scratches or damages in axial direction in order to avoid cracks in the jacket pipe.**

**This is specially essential at low temperature. At very low temperature it is recommended to preheat the jacket pipe before cutting**



*The part of the pipeline forming cut-to-length pipes is labeled*



*The "pipe for cutting to length" piece is to be located where the friction movement is as small as possible, which means as far as possible from a change of direction.*

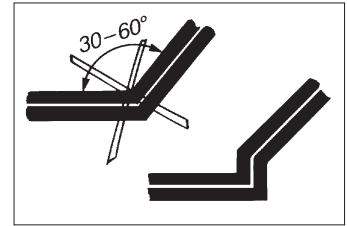


## 10.3.14 Angles of alteration

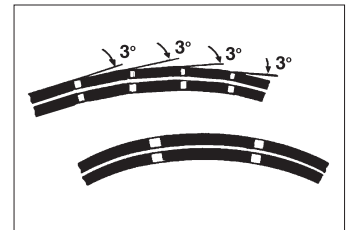
Where a change of direction is needed, standard bends are to be used if possible. Bends with an angle less than 60° and more than 30° are only allowed to be used if at least one of the legs is kept short.

For stress reasons, changes of direction 10°–30° are not allowed to move sideways if the bend has long straight sections before and after. The packing around these changes of direction has to be done particularly carefully.

For angles of alteration smaller than 3°, the completely joined service pipe can be pulled in a wide curve. Several mitres after each other are acceptable. Mitring can be substituted with the completely joined service pipe being pulled in a wide curve. The angle of alteration can also be done with the help of specially bent pipes. These are fabricated in 12- or 16-metre sections and shaped as a curve with a maximum angle of alteration equal to 35°. For further information, please see page 3:105 or 4:105. Mitring may not be used at cold installations.



*For stress reasons, changes of direction larger than 10°–30° are not allowed to move sideways if the bend has straight sections before and after.*



*Bends with an angle less than 60° and more than 30° are only allowed to be used if at least one of the legs is kept short.*

## 10.3.15 Branch pipes

### Single pipes

The tee-pieces from Powerpipe have equal strength i.e. the tee-piece has the same strength as a straight pipe. Although the single pipe tee-piece is reinforced, it cannot withstand large forces from the branched off pipe. The main pipe must then be released from the load from the branch pipe with a bend or an anchor point and due consideration taken of possible axial movements in the main pipe.

### Double pipes

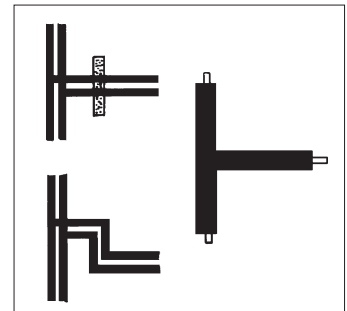
Tee-pieces for double pipes are fabricated to withstand full force from branched off pipes. Stress releasing bends or anchor points are not needed.

### Flexible pipes

For instruction on the flexible pipes, see page 5:402-403.

### Direct connection

Direct connection is allowed on non-pressurized main pipe, without specific permission.



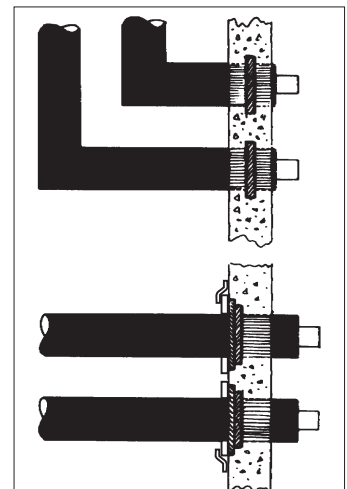
*The main pipe must be released from the load from the branch pipe with a bend or an anchor point.*

## 10.3.16 Wall penetrations

Wall penetrations must be made with care in order to avoid locking of pipes or penetration of ground water.

In cases where the pipes have no axial movement and where the ground water pressure is normal, the embedment ring 6520 (see page 8.101) is to be used. The grouting ring is to be located in the centre of the wall, and the hose clip is tightened before casting.

Where movement can be expected and where the probability of ground water pressure is high wall embedment ring 6510 is used- see 8:101.



*The grouting ring is to be located in the centre of the wall, and the hose clip is tightened before casting.*



## 10.3.17 Valves, drain and air release devices

### Valves

Valves must be located in such a manner that they are not exposed to bending forces or pageeway movements. Axial movements must be kept to a minimum. When installing the valves shall always be in fully open position.

The valve stem is protected for example by concrete pipes  $\varnothing$  600 mm, standing on a concrete slab or equivalent. These are placed so that concrete pipe will not damage the District heating pipes. The concrete pipe ends on the ground level with adjustable well covering

In streets or other areas with a heavy traffic load, valve pits must be constructed, to avoid forces from the traffic load being transmitted to the stem sleeves.

The sleeve must be located so that the valve can move longitudinally without forcing load to the valve stem extension.

### Drain and air release units

Low- and high points with corresponding drain and air release units are preferable to be fitted where the main pipe has no movement, i.e. at least one friction length from a 90° bend.

Air release should be fitted on branch pipe if possible.

### Prefabricated components

Tee-pieces for single pipes are connected to valve fitting, see 3:402–408 (single pipes) or 4:402–408 (double pipes), As an alternative, air release/drain, see 3:402 (single pipes) or 4:404 (double pipes).

With single pipes a joint can be avoided by use of Extended t-piece, see 3:302. By using the Combination valve, see 3:406, air release/drain are coordinated.

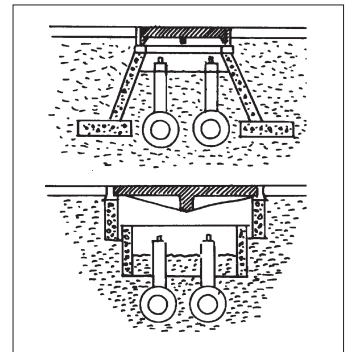
### Fittings built on site

Drain and air release fittings for use in descentable concrete chambers and in buildings, are fitted on site.

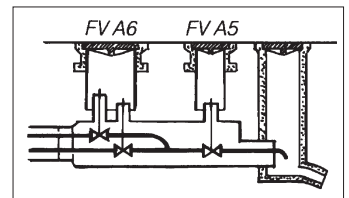
After welding, the valves and pipes are to be painted with rust protective coating. The valves must be insulated up to the connecting service pipe. In order to avoid freezing damage a by-pass pipe with choke valve can be installed. The choke valve is adjusted to a low flow rate. If possible, the valve shall be fitted with a thermostat.

## 10.3.18 Pipe anchor points

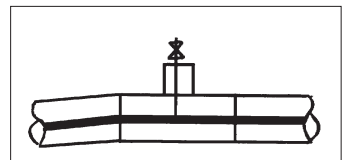
The thermal forces occurring in the pipe are normally transmitted to the ground via friction at certain small movements of the service pipe. In most cases these movements are absorbed in bends. In certain cases, however, the pipe must be anchored in order to prevent, limit or guide the expansion movement.



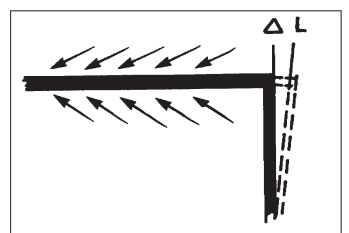
The spindle is protected by Concrete pipes standing on a concrete pad or equivalent. In streets or in soil with traffic loads use adjustable well covering for relief, so that the traffic load is not transferred to the concrete pipes.



Prefabricated drain and air release units.



Drain and air release detail.



The thermal forces occurring in the pipe are normally transmitted to the ground via friction at certain small movements of the service pipe. In most cases these movements are absorbed in bends.



## Ground anchoring

In case of preheating it may be desirable to guide the expansion movement in a certain direction. This can be achieved by backfilling on top of one or two pipe lengths (ground anchoring).

## Anchor point

An Anchor point is used when it is desirable to limit the axial movement or to ensure that a length of service pipe does not slide from one expansion point to another, for example by strong slope, or when using compensators.

The anchor point is assembled in such a way that the distance between the respective anchor point flange is 100-200 mm. The flange package is cast in a re-inforced concrete block. This should be designed to allow the transfer of anchor forces and the pressure to the ground.

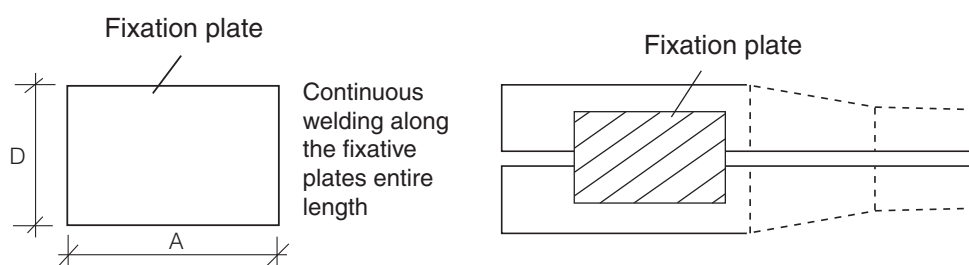
## Anchor pipes

For double pipe systems two pipes are connected to each other in bends, anchoring points, tee-pieces, valves and transition pipes.

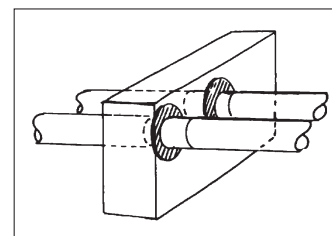
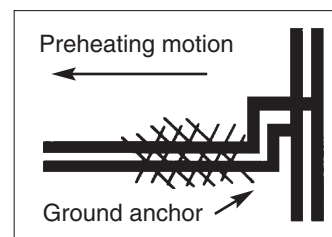
If a long length of pipe is not terminated with any of these fittings, for instance after passing a ground wall, or on a long run of pipe work, anchor pipes are to be used in order to prevent the insulation from being ripped off from the steel pipes when there are different temperatures in the flow and return pipes.

## Alternative for ancor pipes

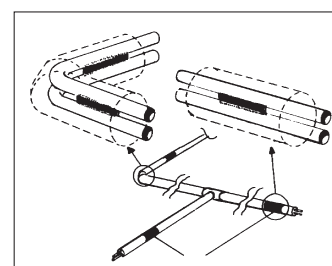
Steel plates with the following dimensions and assembled as shown in Figure substitute for ancor pipes



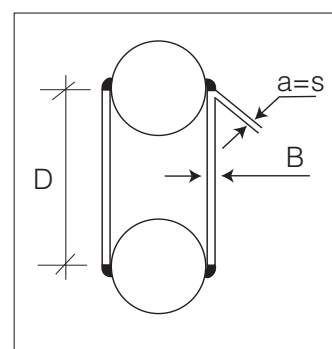
DN	DY X S	D	A	B
<b>Fixation plate</b>				
20	26,9 X 2,3	38	65	5
25	33,7 X 2,3	48	65	5
32	42,4 X 2,6	58	80	5
40	48,3 X 2,6	64	90	5
50	60,3 X 2,9	76	115	5
65	76,1 X 2,9	92	115	8
80	88,9 X 3,2	100	140	10
100	114,3 X 3,6	134	165	10
125	139,7 X 3,6	165	200	10
150	168,3 X 4,0	203	260	10
200	219,1 X 4,5	260	300	12



The anchor point is assembled in such a way that the distance between the respective anchor point flange is 100–200 mm. The flange package is cast in an reinforced concrete block.



For double pipe systems two pipes are connected to each other in bends, anchoring points, tee-pieces, valves and transition pipes.





## 10.3.19 Preheating and expansion absorption

When the temperature changes during operation, thermal forces are created in the steel pipe. Natural bends and expansion devices transfer these forces wholly or partly to linear movements. The size of the movement depends mainly on the dimension of the pipe, temperature differential and depth of laying.

### Preheating

In order to minimize movements, the pipe can be prestressed by heating to a temperature in the range between the lowest surrounding and the highest operational temperature. The prestress temperature is stated in the project documents.

Prestress heating is normally done with water and often with the same water as that used for pressure testing. The water is heated by means of either an electrical boiler or water from the existing heating network. If water from an existing system is used, the water must be introduced into the new system via a shunt, in order to avoid fast temperature changes.

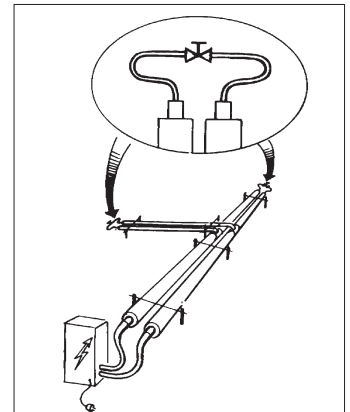
In cases of large dimensions and long runs, the pipes can be preheated with air. Ask Powerpipe for advice.

Before preheating is executed, the expansion movements must be calculated and control points must be defined. This is in order to make it possible to check calculated expansion movements in a practical way. During preheating the pipes must be free to move.

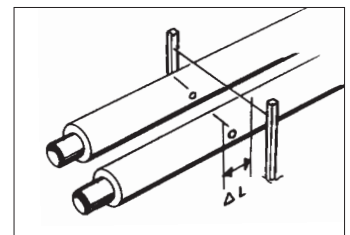
When the correct preheat temperature is reached, the expansion movements must correspond to the calculated ones. If this is not achieved, the preheat temperature may be increased a few degrees in order to reach the correct expansion.

The pipes can also be mechanically helped to correct the expansion by means of lifting and stretching at certain points.

The preheat temperature must be kept constant during packing and refill work.



*In order to minimize movements, the pipe can be prestressed by heating to a temperature in the range between the lowest surrounding and the highest operational temperature. The prestress temperature is stated in the project documents.*



*Before preheating is executed, the expansion movements must be calculated and control points be defined. This to make it possible to check calculated expansion movements in a practical way.*



## Expansion absorption

Since the temperature varies during operation, movements occur in expansion parts, bends etc. These movements can be absorbed by the surrounding backfill. If the temperature difference between installation temperature (preheat temp.) and max/min temp. is larger than about 50°C and if the surrounding soil is compressed, bends must be protected against arising ground pressure by use of cushions e.g. mineral wool, or soft plastic material.

The movement is simplified if the pipes in the expansion zone is surrounded by mineral wool or foam pads - see Figure 2 on the right.

In case of large movements the protecting cover can be formed as a concrete duct or as a special steel structure. These must be ventilated in order to avoid too high temperatures. When using concrete ducts or steel structures, special installation instructions must be used.

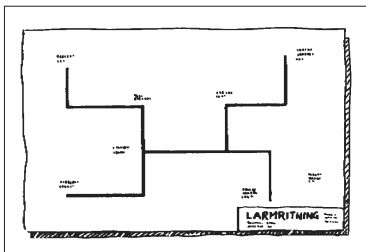
For large movements (cold laying) the expand-devices (90° bends) are protected when these parts are backfilled after operation startup.

## 10.3.20 Monitoring systems

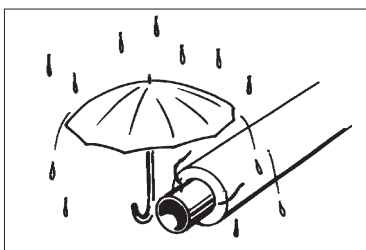
All pipes and pipe fittings from Powerpipe are delivered with two separately premoulded alarm wires. These shall be connected as joints and finally to a monitoring system.

The pipe net is divided into sections of max. 2 x 1000 m service lengths (1000 m flow and 1000 m return). For further information please see chapter no. 7. Each section makes one alarm circuit and is connected to the Powerpipe alarm unit. The unit can be utilized either as a separate alarm circuit or as a part in a larger monitoring system.

## 10.3.21 Monitoring system drawings and installation instructions



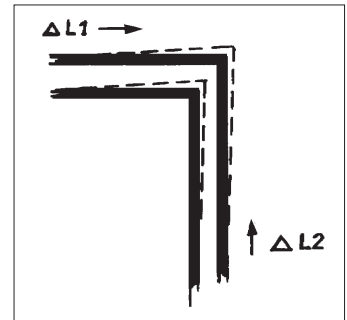
The alarm wire connections must be made in accordance with the alarm system connection diagram. The drawing shows the extent of the system, the connection of the alarm wires and how the sections should be divided. It also shows where the signal wires terminate and what part of the system that is connected to the various alarm units. The position of alarm wires in fittings is shown on page 7:301, 7:302. Lengths of alarm wires in these fittings are shown on page 7:303.



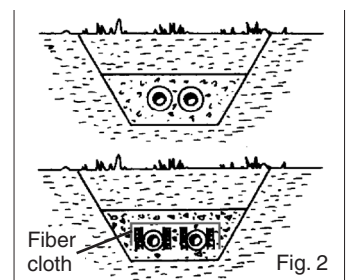
*In order to get a proper alarm function, i.e. that the system works and does not give false alarms, make sure that no water has penetrated into the insulation of the pipes during transport and installation.*

In order to get a proper alarm function, i.e. that the system works and does not give false alarms, the following is required:

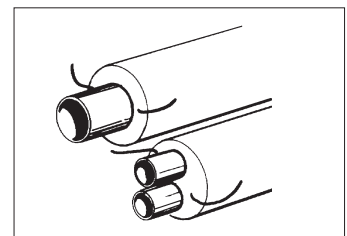
- The pipes for the steel pipes are welded/soldered in such a way that the alarm wires are oriented like digits 2 and 10 on a watch.
- No water has penetrated into the insulation of the pipes during transport and installation.
- The alarm wires are installed in a straight line from end to end of the pipe without crossing one another.
- The alarm wires are installed parallel to the pipe.



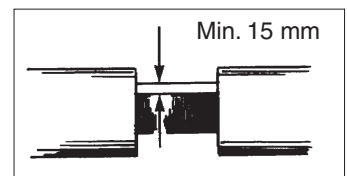
*When the temperature change during operation, movements of expansion occurs in expansion devices, bends etc. These movements can be absorbed by the surrounding sand.*



*The pipes in the expansion zone can be surrounded with pads made of mineral wool or foam.*



*Pipes and pipe fittings from Powerpipe are delivered with two separately premoulded alarm wires.*

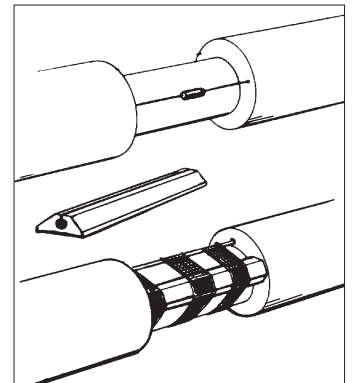


*The position of alarm wires in fittings are shown on pages 7:301–7:302.*



## 10.3.22 Connection of alarm wires

1. Straighten out the alarm wires carefully. Pull the wires carefully and check that they are continuous and undamaged.
2. Clean the alarm wires with emery cloth.
3. Cut off excessive length of the stretched wire.
4. Join the wire in a stretched condition, with approved splicing sleeve (Art. No. 6890-100-000-000) using the approved special tool (Art. No. 6890-100-100-000).
5. Slide the alarm spacer of PUR under the stretched wires and press the wires into position in the alarm distance pieces.
6. Fasten the alarm spacer pieces abrasive felt with tape.
7. Insulation should be executed as soon as possible after the alarm wire installation.



Slide the alarm distance pieces under the stretched wires and press the wires into position. Tape the alarm spacers.

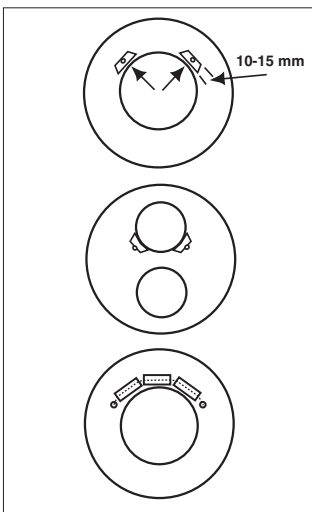
### Abrasive felt

Abrasive felt can be used as an alternative to alarm spacer for single pipe and is recommended for use at double pipes.

### Looping of alarm wire

Unless otherwise stated in the alarm drawing, the wire must always be connected in a loop at the termination of a section length.

When looping, the alarm wire is joined and installed according to figure below. The uninsulated wire must be insulated with an insulation cartridge or alarm distance piece. The alarm distance piece is cut and put in segments around the steel pipe. The distance between alarm wire and pipe must not be less than 15 mm. Unless otherwise indicated in the alarm drawing, insulated wire type EK 1.5 sq mm must be used in chambers or similar walls, where two ends are connected together.



At those termination points, that will be connected to the Powerpipe section unit, an earthing boss shall be welded to the steel pipe for earthing, see figure 2.

*The uninsulated wire must be insulated with an insulation cartridge or alarm distance piece. The alarm distance piece is cut and put in segments around the steel pipe. The distance between alarm wire and pipe must not be less than 15 mm.*

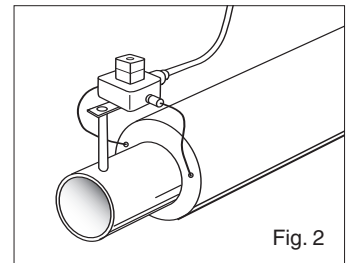
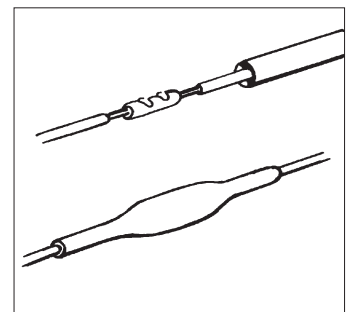


Fig. 2

An earthing boss shall be welded to the steel pipe for earthing at the termination point.



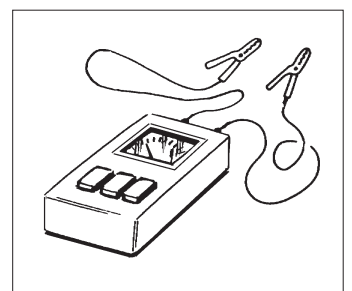
The uninsulated part of the signal wire and the joining cartridge must be insulated with a shrink tube sleeve.

### Signal wire

The Powerpipe system has pipes with insulated signal wire embedded in the insulation available to special order. This wire should be joined as mentioned above. However, the uninsulated part of the wire and the joining cartridge must be insulated with a shrink tube sleeve. Where pipes are terminated without further continuity of the wires, the ends must be insulated with shrink sleeves.

## 10.3.23 Testing of alarm connections

Testing of circuit continuity and insulation resistance must be performed **after every connection** of wires and after foaming work has been completed as well as before refilling of trench is started.



OHM-meter.



**Insulation resistance** measured with the ohmmeter. The resistance is the benchmark to be 1.3 ohms per 100 m connected alarm wire. Other values are not allowed. Low values indicate a short circuit and high levels of bad contact in the joints.

**Insulation resistance** after the completion of the work to be lowest 10MΩ/1000 m alarm wire (500 m pipe). Temporarily lower values can occur, especially during foaming of cold pipes. Approved value must be achieved at least 4 weeks after system-start.

Note that the indication of moisture leaking in by stating that insulation resistance decreases at any point.

Test of insulation resistance should be made not earlier than 1 hour after foaming is completed.

These values should be documented in consultation with the inspector.

NOTE! Check the instrument and the batteries before each measurement.

## 10.3.24 Installation of alarm and information units

The joined alarm wires shall be connected to the Powerpipe alarm unit or cableradar. This unit is installed in a suitable position along the system section.

The alarm unit is powered with 220 V or via signal wire.

The alarm wires and earth wire are connected to the section unit with a 3x1.5mm<sup>2</sup> cable. The signal wires are connected either through an external signal cable or through signal wires fitted in the service pipes to a alarm unit.

Different alarm units and their capacities are shown in chapter 7.

Propagation Velocity Factor (PVF) is 0.90 – 0.92.

## Function test

When the alarm and information unit are connected, a function test shall be performed as follows:

### 1. Test of alarm limit

When testing the alarm limit a resistor with a value 10% below the set point of the alarm unit is to be connected.

### 2. Test of open circuit

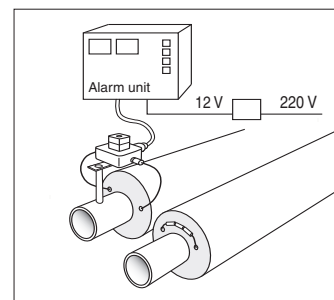
Open circuit is to be simulated as far from the alarm unit as possible.

### 3. All alarm functions are to be tested

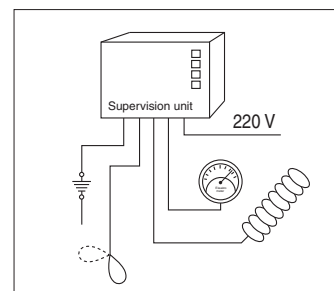
All function tests carried out shall be documented in consultation with the inspector. Circuit loop resistance and insulation resistance are

measured separately for each loop and shall be documented in consultation with the inspector. Establish a protokoll.

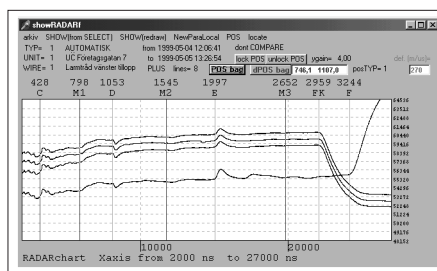
*Monitors 5000 m/ channel.  
Registers changes.  
Reports errors from computer by cable, telephone, GSM. 4 channels for alarmcircuits.*



The joined alarm wires must be connected to Powerpipes alarm unit or cable radar.



Alarm centrals can accommodate inputs from water level indicator, detector units, etc.



*Monitors 2500 m/ channel  
Records the alarm (on/off) by signal-cable in the trench.  
Errors reported bu pulsecometer 2 channels of alarm wires.*



## 10.3.30 Installation instruction - insulation of joints

### General

The insulation of a district heat system shall not have any weak points. Each joint must be carefully insulated on site. Insulation material shall consist of Powerpipe freon-free foam.

Normally the insulation shall be made by trained staff, equipped with a mobile foaming machine which has automatic pressure, volume-, and temperature control. In certain cases manual foaming can be performed. With all foaming work the locally valid safety rules e.i. the Swedish regulations AFS 1996:4

When pressure testing of a joint is called for, the joint insulation must be made after the pressure test. Cutting of the jacket pipe must be made so that indications of rupture in the axial direction do not occur. Overlapping of casing- jacket pipe will be about 100 mm.

## Installation Instruction welding, T-pieces

### 1 Required material

- T-piece double/double Art. No. 6530
- T-piece flexibel, Art. No. 6540
- Bend with long radius bend-5S or greater for branch.
- Check that the casing and accessories are intact and has the right dimension.

### 2 Trench

The trench size needs to increase. See fig ①

### 3 Cleaning

Clean the jacket of the branch and main pipe that will touch the casing.

### 4 Peeling

Cut the appropriate amount of the outer mantle and insulation for a branch installation. NOTE Avoid axial cut or wounds in the jacket when peeling.

### 5 Plade the casing

Slice the bottom casing with a straight cut on the upperside (90° from branch) See fig. ③ and ④

### 6A Welding Flex-T-piece

Thread the flexible casing/reduction with tubular shrink sleeve on the branch. See fig. ②  
NOTE the shrinkable end shall be placed far from the main pipe. The bottom casing are pulled over the branch.

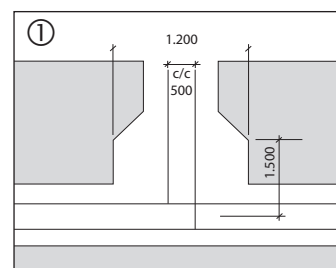
### 7 Mounting bottom casing

Weld the branch with the bend to the main pipe. See fig. ③ NOTE the bend must be 5S or greater. The branch is welded to the welded pipe connection. A adjusted piece of pipe may be needed. For sizes up to DN100 in Series 2 the piece of pipe should be of 200 mm. c-c dimension between branches shall be  $\approx$  500 mm.

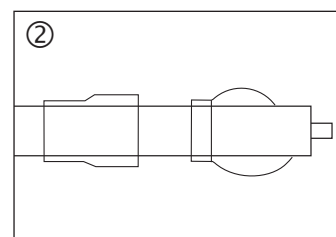
### 6A Welding Straight-T-piece

Bottom casing is pulled over back on the main pipe.  
NOTE The longitudinal cut shall be at the top.

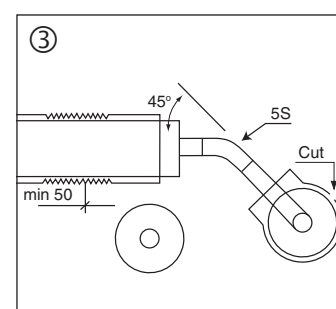
Spread the branches free steels ends so that they can be welded into the main pipe. Weld-in the branch pipes (Art. No. 8205, see 8:303!) against the main pipe. Any reinforcements according to the constructor's instructions.



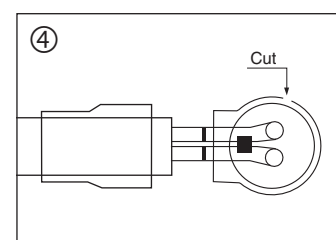
Measure, trench an welding.



Thread casing and sleeves on the branch.



Installation flexible T-piece.



Installation straight T-piece.



## 10.3.31 Weld casing, Mittel

### General

The Mittel method shall be carried out by personnel with special training. Below is a synoptic description of the working method.

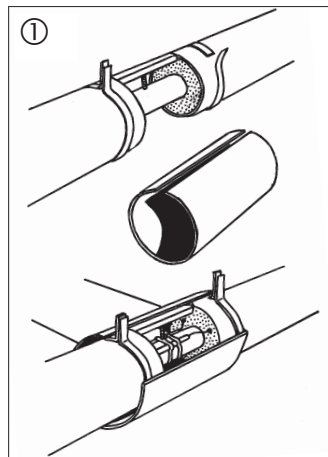
### Material

The required material art. no 6112 (page 6:701) is delivered in batches for each dimension of outer jacket. Alarm Spacers, mastic, plugs and fops are delivered by the casing contractor.

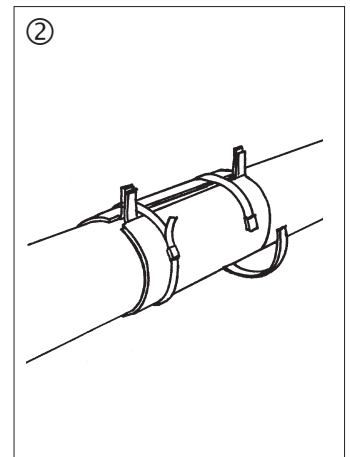
A special electrical equipment is used to weld the Mittel-joint.

### Performance

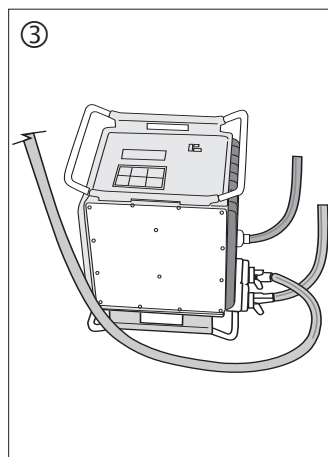
- Sleeve and outer jacket to be cleaned from dirt, grease, moisture etc..
- Connect alarmwires (See § 10.3.22)!
- Roughen the surface of the sleeve and pipe which are to be covered with the casing and the casings inside. Clean with ethanol
- Assemble the guide and welding net. ①
- Cut and assemble the sleeve on the pipe. ②
- Assemble and connect the welding equipment to the electrodes. ③
- Weld the radial weld. ③
- Cut and weld the axial trace. ④
- Drill holes for pressure testing/Foaming/ air release. The holes shall be placed at the edge of the jacket pipe.
- Pressure test ⑤
- Make the foaming of the joint. ⑥
- Foam the air holes and weld to close.



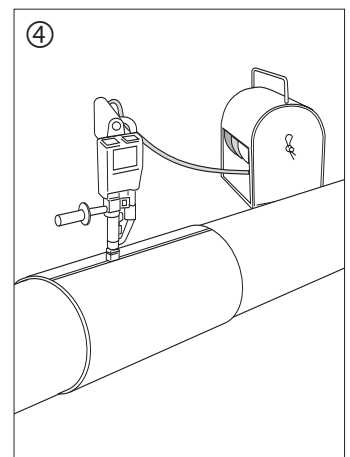
Assemble the welding net around the jacket pipe.



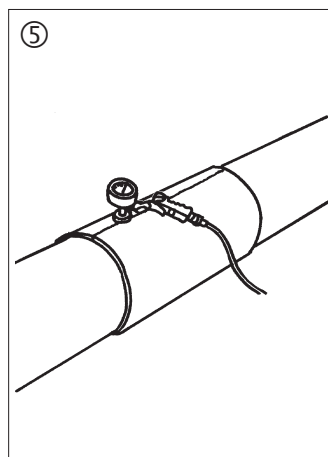
The casing is mounted on the jacket pipe.



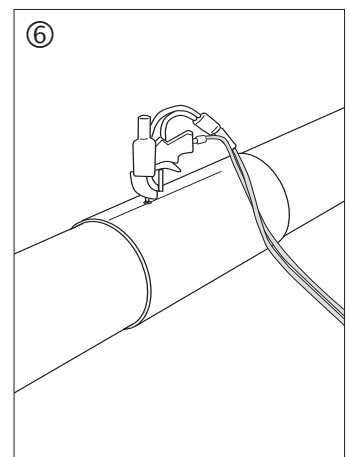
The computer-controlled welding process takes 3-4 minutes.



The longitudinal seam is closed by extruder-welding.



Pressure test



Foaming of the joint



## 10.3.32 Shrinkable sleeve

### General

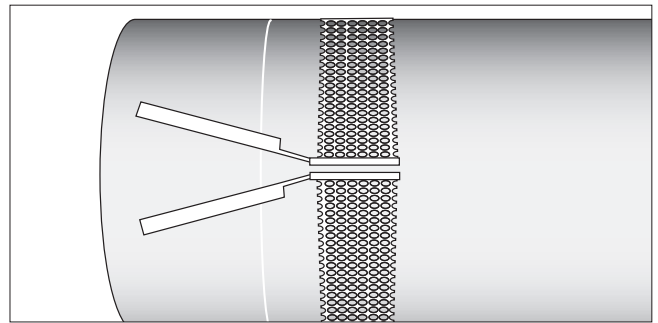
Shrinkable sleeve shall be installed by an authorized company and by personnel with special training. Below is a short description of the work.

### Material

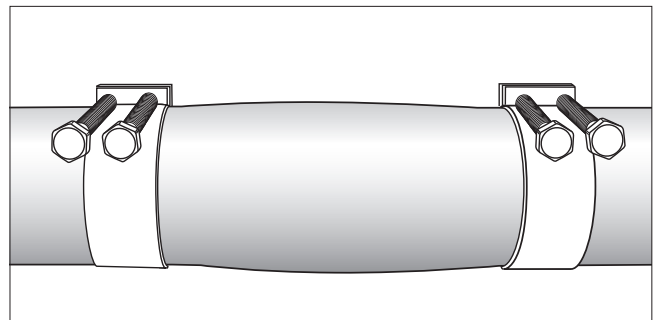
Shrinkable sleeve Article No. 6112 (page 6:602) is delivered in batches for each dimension of outer jacket. casing must be installed on the district heating pipe prior to welding of the steel pipes. Alarm spacers, mastic, plugs and fops are delivered by the casing contractor. A special electrical equipment is used to weld the Mittel-joint.

### Performance

- Sleeve and outer jacket to be cleaned from dirt, grease, moisture etc..
- Connect alarmwires (See § 10.3.22)!
- Roughen the surface of the sleeve and pipe which are to be covered with the casing and the casings inside. Clean with ethanol
- Measure and mark where welding net and casing shall be placed. ①
- Assemble the welding net ②
- Install the clamping tools. ③
- Connect the welding equipment to the electrodes.
- Cut and weld the radial trace. ④
- Drill holes for pressure testing/foaming/ air release. The holes shall be placed at the edge of the jacket pipe.
- Pressure test. ⑤
- Foam the joint ⑥
- Weld the air holes to be closed. ⑦



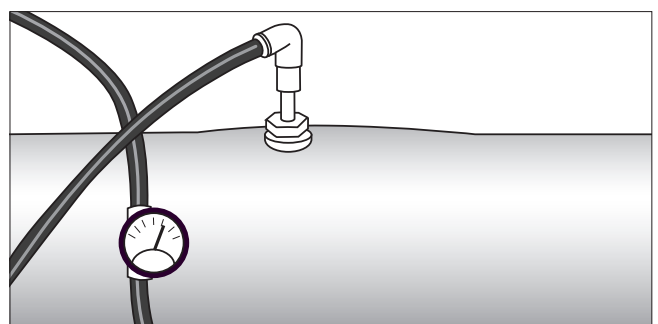
Place the welding net around the jacket pipe.



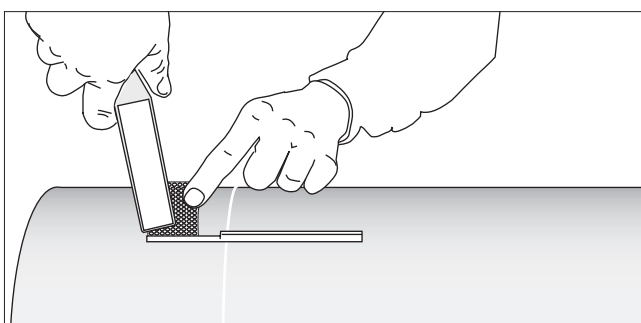
Clamping Tools are installed.

Dimension	110
Dobbelt	NEJ
Sprog	Dansk
Indstil Dato & Tid	
Tilbage	

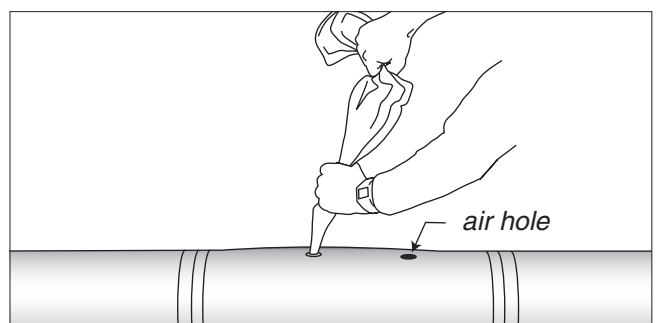
The computer-controlled welding process is started.



Pressure test.



Location of the sleeve and welding net are marked.



The casing is foamed



## 10.3.34 Double expanding sleeve

### General

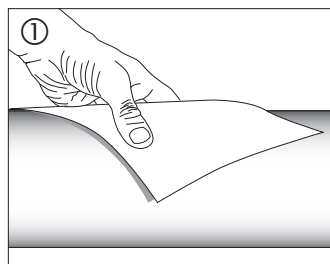
Double expanding sleeve (HDPE) shall be performed by an authorized company and carried out by special trained personnel. Below an overview of the operating.

### Material

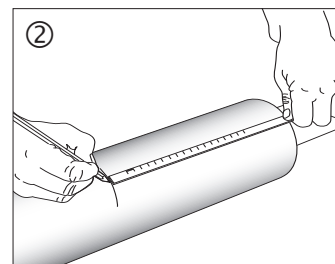
Required materials Art. No. 6361 (page 6:201) is delivered in batch for each dimension of the Jacket pipe. The casing shall be mounted on the district heating pipe before welding of the steel pipes. Alarm Spacers, mastic, plugs and fops are delivered by the contractor.

### Performance

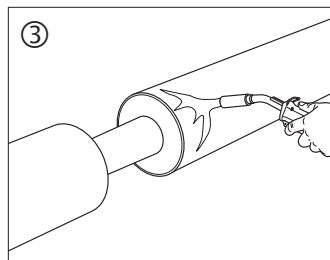
- Casing outer jacket, foam and steel pipe are to be completely cleaned from dirt, grease, moisture etc. with etanol. ①
- Connect the alarm wires (Se page 10.3.16).
- Roughen the surface of the pipe which are to be covered with the casing and the casings inside. ①
- Mark the position of the sleeve and mastic. ②
- Preheat the roughened areas. ③
- Remove the protective plastic around the sleeve and shrink sleeves. ④
- Sweep a wide (about 120 mm) woven mastic around the jacketed pipe. ⑤
- Center the sleeve and remove the outer protective plastic on the mastic band.
- Center the sleeve. Remove remaining protective foil from the mastic. Drill 1 pc hole max dia 20 for pressure test at the jacket pipe edge. ⑤
- Use a soft gas flame and heat one side of the casing. Ensure that the sleeve under side gets enough heat. Use a silicon cloth around the pipe to protect from overheating ⑥
- Check shrinkage around. Mastics shall be visible at the edge of the sleeve ⑦
- Pressure test. Let the casing cool to max to 40° C before pressure testing and foaming.
- Drill holes for pressure testing/foaming/air release. The holes shall be placed at the edge of the jacket pipe. ⑧
- Foam the casing. ⑨
- Foam and air holes are closed by welding. Sand the weld-plug and preheat the surface to 40° C; Preheat the fops pressit over the weldingplug with your hand or a roller. ⑩



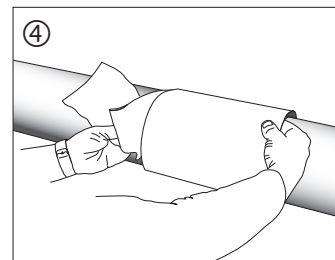
Clean and roughen the jacket and the casings inside.



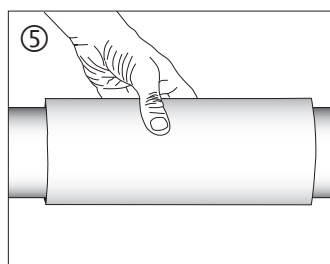
Mark on jacket pipe casing and mastic.



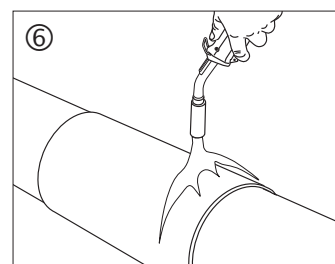
Preheat the jacket pipe to 40-50°C



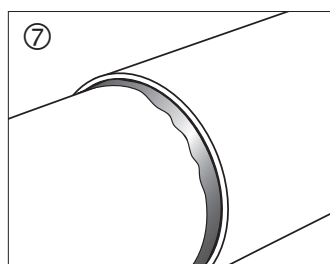
Unpack the casing.



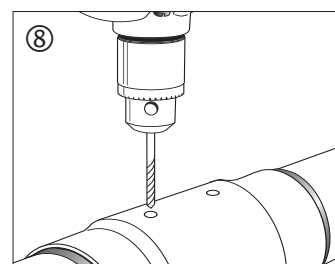
Remove the protective and sweep the mastic around the pipe jacket.



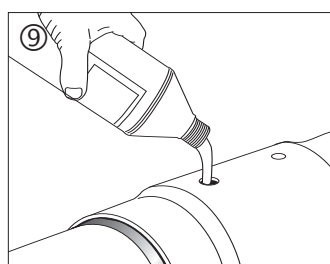
Shrink with a soft gas flame with gentle movements.



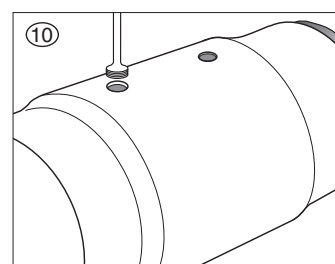
After shrinkage mastic is visible at the sleeve end.



The temperature must not exceed 40° C on the sleeve for pressure testing. Drill holes for foaming.



Foaming of the casing



Weld air- and foaming holes with welding plugs.

NOTE: Ensure that water (snow and rain) can not enter into the casing during installation.



### 10.3.34 Double sealed sleeve (HDPE)

#### General

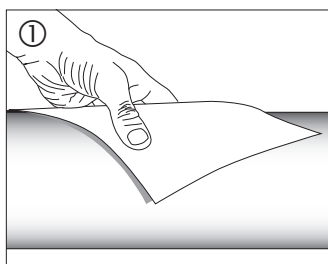
Double sealed sleeve (HDPE) shall be performed by an authorized company and carried out by special trained personnel. Below an overview of the operating

#### Material

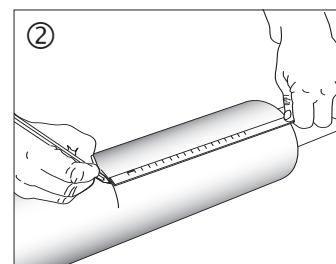
Required materials Art. No. 6364 (page 6:203)  
Delivered in batch for each dimension of the jacket pipe. The casing shall be mounted on the district heating pipe before welding of the steel pipes.  
Alarm spacers, mastic, plugs and fops is delivered by the contractor.

#### Performance

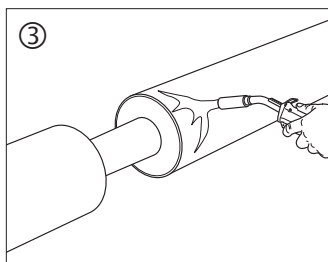
- Sleeve and outer jacket, foam and steel pipe are to be completely cleaned from dirt, grease, moisture etc. with ethanol. ①
- Connect the alarm wires (See § 10.3.22).
- Roughen the pipe surface which shall be covered by the casing and the casings inside ①
- Mark the position of the sleeve and mastic. ②
- Preheat the roughened areas. ③
- Remove the protective plastic around the casing and shrink sleeves. ④
- Sweep the mastic around the jacketed pipe. ⑤
- Center the casing and remove the outer protection on the mastic.
- Drill holes for pressure testing/foaming/air release.
- Center the sleeve. Remove remaining sheet of mastic. Drill 2 x 20 dia holes ⑤
- Use a soft gas flame and heat one side of the casing. Ensure that the sleeve under side gets enough heat. Use a silicon cloth around the pipe to protect from overheating ⑥
- Check the shrinking ⑦



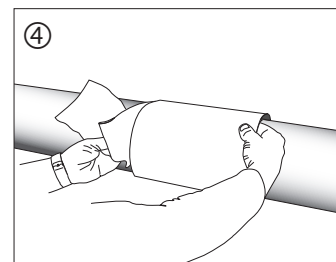
Clean and roughen the jacket and the casings inside.



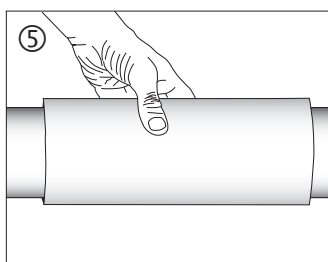
Mark on jacket pipe casing and mastic.



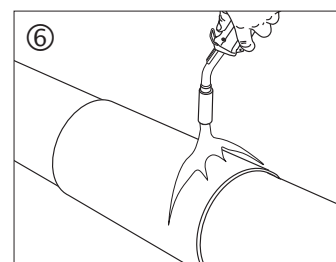
Preheat the jacket pipe to 40-50°C



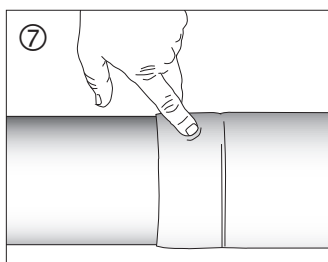
Unpack the casing.



Remove the protective and sweep the mastic around the pipe jacket.



Shrink with a soft gas flame with gentle movements.



Check the shrinking.  
After shrinkage is mastic visible at the sleeve end.

See next page!

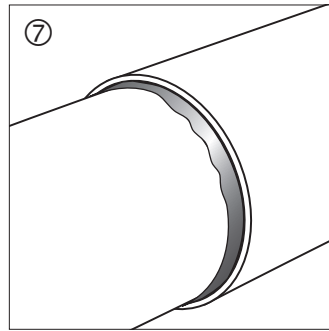


# Installation

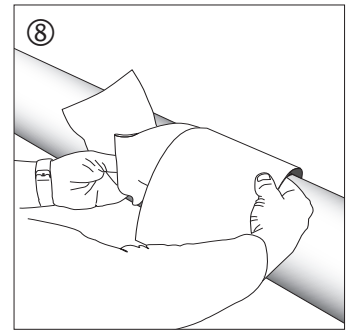
## 10.3.24

- Check the shrinking work. The mastic should be visible at the edge of the sleeve. ⑦
- Unpack the shrink sleeves, centre the sleeve over the edge of the casing. ⑧
- Shrink the sleeve/tubular sleeve with a soft flame. Use gentle movement from the center and outwards ⑨
- Check the result. ⑩
- Pressure test. Let the casing cool to max to 40° C before pressure testing and foaming.
- Drill holes for pressure testing/foaming/air release. The holes shall be placed at the edge of the jacket pipe. ⑪
- Foam the joint. ⑫
- Foam and air holes are closed by welding. Sand the weld-plug and preheat the surface to 40°C. Preheat the fops and press them over the welding plug with your hand or a roller. ⑬

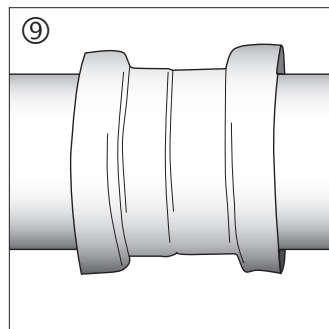
NOTE: Ensure that water (snow and rain) can not enter into the casing during installation.



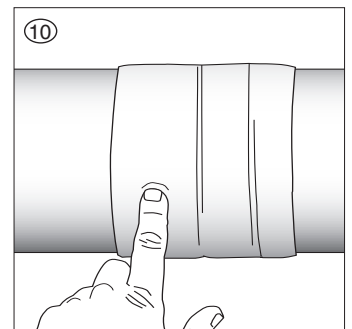
⑦ After shrinkage mastic is visible at the sleeve end.



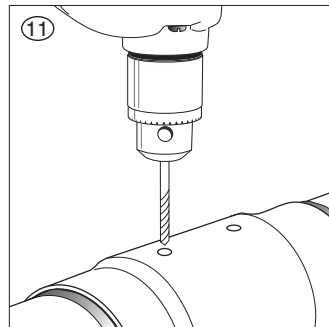
⑧ Remove the protective plastic from the shrinking sleeves.



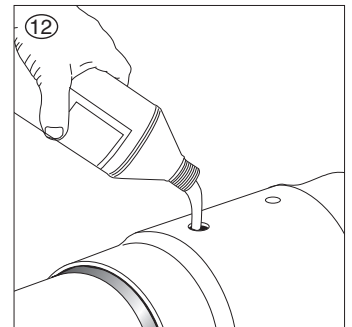
⑨ Shrink from the center.



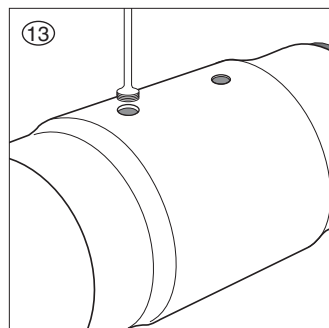
⑩ Check the result



⑪ The temperature must not exceed 40° C on the sleeve for pressure testing.  
Drill holes for foaming.



⑫ Foam the casing



⑬ Weld air- and foaming holes with welding plugs.



## 10.3.32 Shrinkable sleeve (PEX)

### General

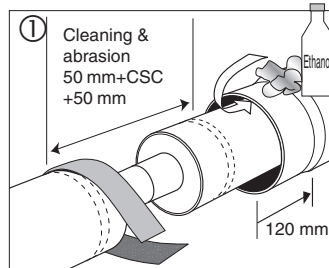
Shrinkable sleeve shall be installed by an authorized company and by personnel with special training. Below is a short description of the work.

### Material

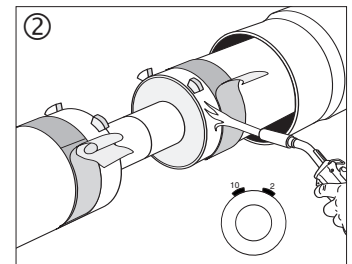
Required materials including mastic (page 6:203) is delivered in batch for each dimension of the Jacket pipe. The casing shall be mounted on the district heating pipe before welding of the steel pipes. Alarm Spacers, mastic, plugs and fops are delivered by the contractor.

### Performance

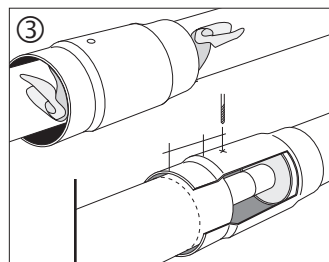
- Sleeve and outer jacket are to be completely cleaned from dirt, grease, moisture etc.
- Connect the alarm wires (See page 10.3.16)
- Positioning the sleeve and mark for sand-papering as well as for the mastic ①
- Sand the surfaces of the pipe covered with PEX casing and the casings inside. Clean with ethanol ①
- Preheat the roughened areas to 40-50°C. Place spacers (for dimensions greater than 200 mm) at 10 and 2 o'clock. ②
- Remove the protective and sweep the mastic around the jacket pipe. ②
- Center the sleeve and remove the outer protection on the mastic band ③
- Drill 2 pc holes dia 20 mm for pressure testing/foaming/air release. Holes shall be located at jacketed pipe edge. ③
- Use a soft gas flame and begin to shrink the casings one end. Move the flame gently around the casing. Ensure that the underside gets enough heat. Use the supplied protective foil to protect the pipe against overheating (for sizes greater than 355 mm) ④
- Check shrinkage around.
- Let the casing cool down to max. 40°C before pressure testing and foaming. ⑤
- Drill an additional hole for air release.
- Foam the casing ⑤
- Drill conical holes and weld air- and filling hole with welding plugs.



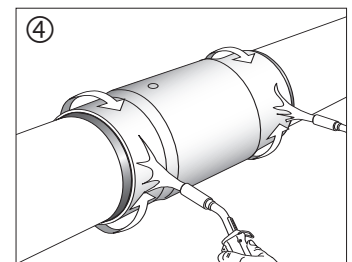
Clean, mark out and grind.



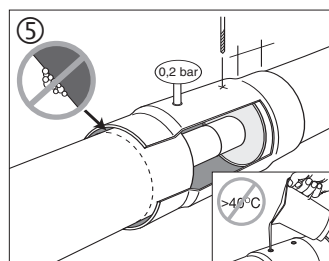
Preheat to 40-50° C. Place spacers.



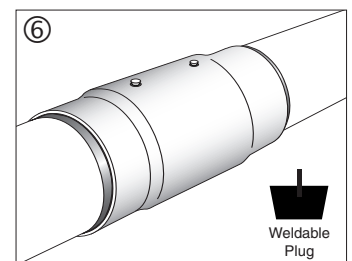
Center the casing. Drill holes for pressure test/foaming/air release.



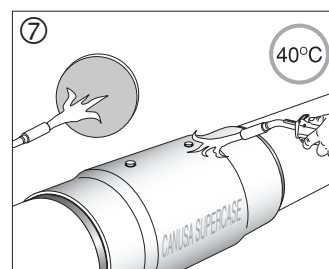
Shrink with a soft gas flame with gentle movements.



Pressure test. Injection of foam in the casing.



After foaming conical drill the holes and seal the holes by welding.



Foam and air release holes are sealed.

- Sand the weld-plug and preheat the surface to 40°C. Preheat the fops and press them over the welding plug with your hand or a roller. ⑥ ⑦



## 10.3.35 Oversized casing with shrinkable sleeve/tubular sleeve

Casing (HDPE) with heat shrinkable sleeves shall be performed by an authorized company/staff with special training. Below an overview of operating procedure.

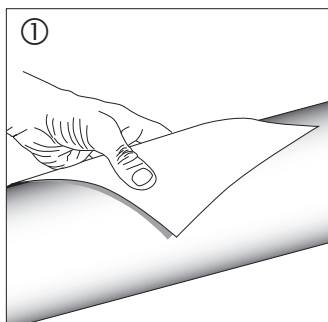
### Material

Required materials Art. No. 6110 (page 6:301) is delivered in sets for each dimension of outer mantle. Tubular shrinking sleeve, Art. No. 6241 must be installed when welding of steel pipe. Shrinkable sleeve Art. No. 6240 is cut to length = circumference of the sleeve + 100 mm. Shrinking sleeve is closed with locjk patch. Alarm Spacers, mastic, plugs and fops are delivered by the contractor.

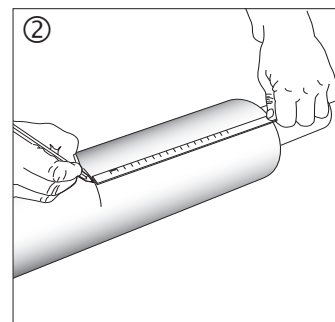
### Performance

- Oversized casing outer jacket, and steel pipe are to be completely cleaned from dirt, grease, moisture etc. with etanol. ①
- Install the alarm wires (See page 10.3.16).
- Roughen the pipe surface which shall be covered by the casing and the casings inside ①
- Mark the jacket pipe ②
- Place the sleeve at marking and insert wedge to center the sleeve. ③
- Drill holes for foaming. The holes should be placed at the jacket edge. ④
- Foam. ⑤
- Remove the protective plastic around the shrinkable sleeve/tubular sleeve ⑥
- Make sure that the shrinkmaterial is clean and undamaged.
- Preheat the jacket pipe to +60°C. Use a temperature indicator. ⑦
- Add mastic in the gap between the jacket and sleeve.
- Shrink the sleeve/ tubular sleeve with a soft gas flame with smooth movements from the center and outwards. Be sure that the underside also gets necessary heat ⑦ ⑧
- Controll the result. ⑨
- Foam- air holes are welded/closed.

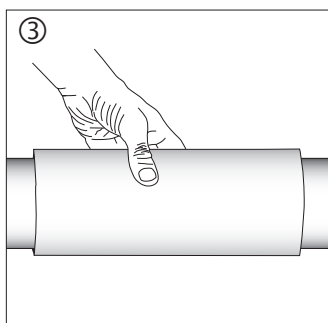
**NOTE!** Ensure that the water (snow and rain) can not enter into the casing during installation work.



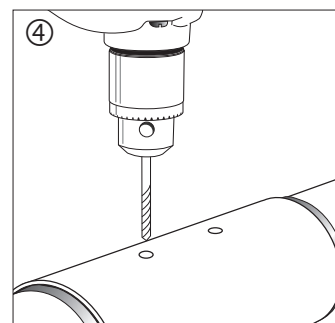
① Clean and roughen the pipe surface.



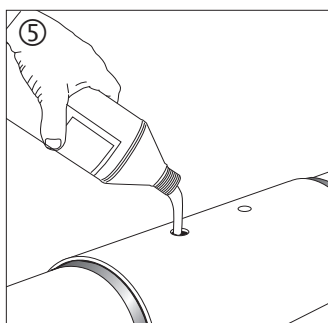
② Mark on jacket pipe to center the casing.



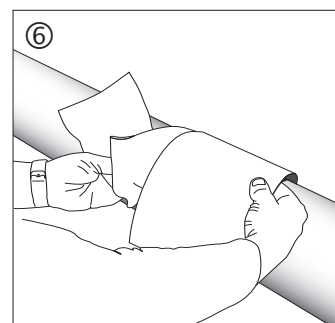
③ Center the sleeve an insert the wedge.



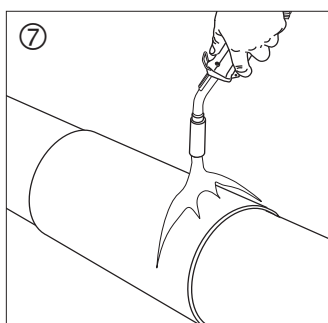
④ Drill hole for foaming



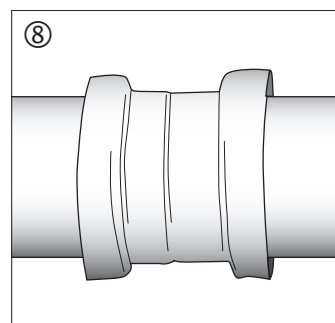
⑤ Foam.



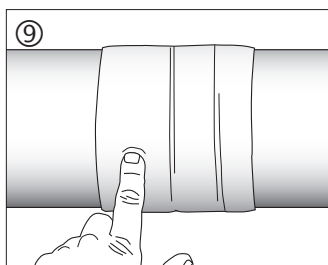
⑥ Unpack the shrink sleeve.



⑦ Shrink with a soft gas flame.



⑧ Shrink the sleeve from the middle and outwards.



⑨ Check the shrinking.



### 10.3.35 End cap

#### General

The end cap is designed to be used inside ground walls, in chambers or wells and where it might be continuously under water.

#### Material

end cap, see 6:401.

#### Performance

- Outer jacket, foam and steel pipe are to be completely cleaned from dirt, grease, moisture etc. at least 150 mm from the end of the pipe.
- Roughen the pipe surface that shall be covered by the termination cover. Install the alarm according to special instructions.
- Apply correct size cover.
- Heat shrink the part of the cover that is over the outer jacket until mastic creeps out.
- Heat shrink the rest of the cover until mastic creeps out and closes tight.

### 10.3.36 Termination casing

#### General

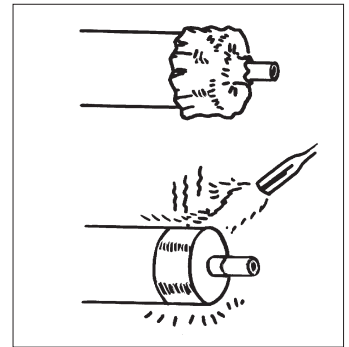
The termination sleeve is used as mechanical protection and insulation for a pipe end in a chamber inside a wall or in the ground.

#### Material

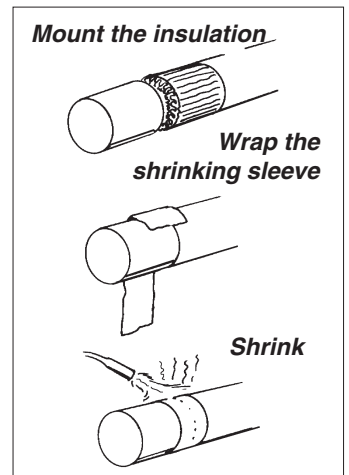
Termination casing, see 6:207.

#### Performance

- Outer jacket, foam and steel pipe to be completely cleaned from dirt, grease, moisture etc. at least 150 mm from the end of the pipe.
- Roughen the casing and the pipe surface that will be covered by the shrink tape.
- Install the alarm according to separate instructions.
- Fit insulation on the pipe:
  - a) Pipe insulation with a length of 300 mm, an insulation plug at the end of the insulation, or
  - b) Prefabricated insulation casing.
- Fit the termination casing.
- Seal with shrink sleeve using a suitable method according to item 10.3.33.
- Please also see instructions 10.3.34



*End cap: Heat and shrink the part of the cover that is outside the jacket pipe until mastic seeps out around the edges.*



*End cap and shrink-sleeve.*



### 10.3.37 Insulation of joints

#### Machine foaming

- Check that the surfaces concerned are dry and clean.
- In order to achieve the best results, the temperature of the surfaces to which the insulation is to be applied should be between + 15°C and + 40°C. The ideal temperature is 22°C. In order to reach the correct temperature, the steel pipe can be heated with circulating hot water, air or a gas flame. The sleeve can be gently heated with a soft gas flame.
- The sleeve shall be centred over the joint.
- If necessary, centre the sleeve with a wedger
- Drill filling- and air release holes if the insulation shall be performed after installation of joint materials.
- Fill with required amount of foam. Fit a tightening plug.
- Let the sleeve cool down minimum 1 hour before the sleeve fitting is completed.

If the temperature is lower than + 15°C or higher than + 40°C, foaming is still possible under certain circumstances. Please ask Powerpipe for advice.

#### Handfoaming

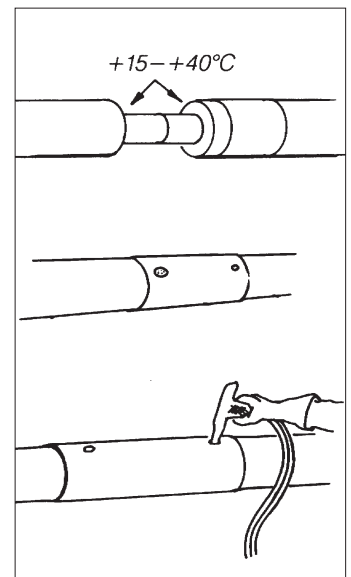
This can be done in two ways. By using the foam portion, see 8:401-402 or manual mixing in a bowl. Portion Foam is recommended from the security point of view.

Common to both methods are that they are difficult to carry out when insulating larger dimensions. Machine foaming is recommended.

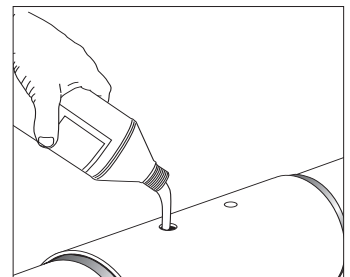
- The same preparations as for machine foaming as above.
- Check that the temperature of the foaming liquids is 20°C
- Measure the correct amount of "Polyol" and "Isocyanat" in separate bowl according to the table below or choose the correct size one-way package.
- Mix and stir thoroughly until the mixture gets a uniform colour (approx. 15-20 sec.).
- Pour the mixture into the filling hole.
- Continue with the same procedure as for machine foaming.

#### Sealing of filling- and air release holes

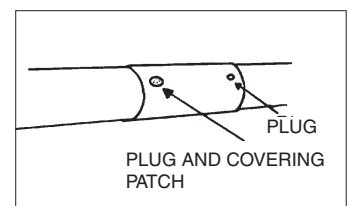
- Roughen
- Use a soft gas flame
- Preheat the area around the plug to about 60°C.
- Check the temperature with a temperature indicator
- Preheat the melt-glue surface on the cover patch 2-3 sec. until it gets a shiny semi-liquid nature
- Press the cover patch in place, centered over the plug.
- Heat the patch until the structure of the patch disappears and the glue seeps out around the edge.
- Press the cover patch from the center outwards.
- Check that the patch is in total contact with the surface without air bubbles.



The ideal temperature is 22°C  
Fill with the required amount  
of foam. Fit a tightening plug.



Manual foaming.



The plugs must be sealed  
with a special covering sheet  
with a sealing surface of  
melt-adhesive.



## 10.3.39 Table for needed foam by machine and bottles for joints

### Double pipe

DN	DOUBLE STANDARD			DOUBLE +			DOUBLE++		
	PEH DY	Polyuretán kg/casing	Foam bottles	PEH Dy	Polyuretán kg/casing	Foam bottles	PEH Dy	Polyuretán kg/casing	Foam bottles
2 x 20	140	0,72	5	160	0,94	6	180	1,15	7
2 x 25	140	0.70	5	160	0.92	6	180	1.12	7
2 x 32	160	0.89	6	180	1.14	7	200	1.36	8
2 x 40	160	0.84	6	180	1.09	7	200	1.32	8
2 x 50	200	1.27	8	225	1.68	9	250	1.90	10
2 x 65	225	1.52	8.1	250	1.94	10	280	2.40	10.1
2 x 80	250	1.80	10	280	2.37	10.1	315	2.90	11.1
2 x 100	315	2.75	11.1	355	3.45	9+9	400	4.60	10.1+10.1
2 x 125	400	4.47	10.1+10.1	450	5.20	13	500	7.10	11.1+12
2 x 150	450	5.34	13	500	6.55	13.1	560	8.60	12+12
2 x 200	560	8.03	12+12	630	10.2	13.1+12			

### Single pipes

DN	SERIES 1			SERIES 2		
	PEH DY mm	Polyuretán kg/casing	Foam bottles	PEH Dy mm	Polyuretán kg/casing	Foam bottles
20				110	0,50	3
25	90	0.32	2	110	0.46	3
32	110	0.45	3	125	0.58	4
40	110	0.43	3	125	0.55	4
50	125	0.51	4	140	0.65	5
65	140	0.60	4	160	0.81	6
80	160	0.75	5.1	180	0.98	6.1
100	200	1.04	6	225	1.47	8.1
125	225	1.21	7	250	1.68	9
150	250	1.34	8	280	1.97	10
200	315	1.98	10	355	2.99	11.1
250	400	3.21	11.1	450	4.84	13
300	450	3.09	11.1	500	5.52	13.1
350	500	4.63	13	560	7.08	13.1+10
400	560	5.60	13.1	630	8.77	13.1+11
450	560	4.31	12	630	7.42	13.1+10
500	630	5.62	13.1	710	9.56	13.1+11.1

The amount is based on:

*Series 3 and 4, see next page!*

- Free casing length 2 x 250 = 500 mm.
- Shrink casing dimensions
- Temperature +15°C – +40°C on casing and steel pipe.
- The table above has added (≈ 10%) included for fluid remaining in the mixing vessel.

**NOTE!** Cold pipes may require an increased amounts of foam. (Proposal is the next larger size bottle).  
Hot pipes requires a smaler amount of foam. Leakage may be allowed.

**Portion foam, see 8:401-402.**



## 10.3.40 Table for needed foam by machine and bottles for joints

### Single pipes part 2

DN	SERIES 3			SERIES 4		
	PEH DY mm	Polyuretan kg/casing	Foam bottles	PEH Dy mm	Polyuretan kg/casing	Foam bottles
20	125	0,57	4	140	0,71	6
25	125	0.56	4	140	0,70	6
32	140	0.73	5	160	0,89	6.1
40	140	0.70	5	160	0,92	6.1
50	160	0.88	6	180	1,12	6.1
65	180	1.04	6.1	200	1,35	8
80	200	1.25	8	225	1,65	9
100	250	1.88	10	280	2,50	11
125	280	2.24	10.1	315	3,0	11.1
150	315	2.69	11.1	355	3,65	9.1+9.1
200	400	3.93	12	450	5,70	11+11.1
250	500	6.05	13.1	560	8,10	12+12
300	560	7.26	13.1+8	630	10,0	12+13.1
350	630	9.34	13.1+11.1	710	12,2	13.1+13
400	710	11.65	13.1+13.1			
450	710	9.70	12+13			
500	800	12.44	13.1+13.1			

The amount is based on:

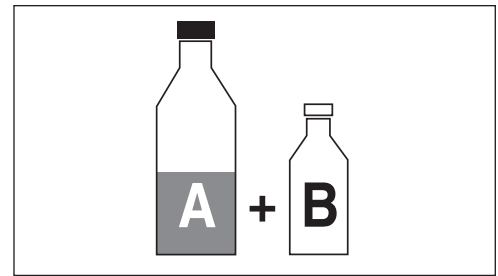
- Free casing length 2 x 250 = 500 mm.
- Shrink casing dimensions
- Temperature +15°C – +40°C on casing and steel pipe.
- The table above has added (≈ 10%) included for fluid remaining in the mixing vessel.

**NOTE!** Cold pipes may require an increased amounts of foam. (Proposal is the next larger size bottle). Hot pipes requires a smaler amount of foam. Leakage may be allowed.

**Portion foam, see 8:401-402.**

## Foam liquids for hot tappings/ connections, single pipe

Assessment of the need for foam liquids can be made with guidance of the following tables



Bottle set for foaming 6480

### Branch (single pipes)

Dimension	Series 1 kg	Series 2 kg	Series 3 kg	Series 4 kg	Amount kg	Bottle No.
DN 25	0,40	0,55	0,70	0,80	0,2–0,25	1
DN 32	0,56	0,65	0,85	1,0	0,25–0,35	1
DN 40	0,52	0,62	0,80	1,0	0,35–0,45	2
DN 50	0,60	0,80	1,0	1,2	0,45–0,55	3
DN 65	0,71	1,0	1,1	1,4	0,55–0,70	4
DN 80	1,09	1,2	1,4	1,7	0,70–0,75	5
<b>Main pipe:</b>					0,75–0,85	5.1
					0,85–1,00	6
					1,00–1,15	6.1
					1,15–1,30	7
					1,30–1,60	8
					1,60–1,75	8.1
					1,75–1,90	9
					1,90–2,30	10
					2,30–2,60	10.1
					2,60–3,0	11
DN 80	0,75	0,98	1,25	1,65	3,0–3,5	11.1
DN 100	1,04	1,47	1,88	2,50	3,5–4,8	12
DN 125	1,21	1,68	2,24	3,00	4,8–6,0	13
					6,0–7,0	13.1
DN 150	1,34	2,97	2,69	3,65		
DN 200	1,98	2,99	3,93	5,70		
DN 250	3,21	4,84	6,05	8,10		
DN 300	3,09	5,52	7,26	10,0		
DN 350	4,63	7,08	9,34	12,2		
DN 400	5,60	8,77	11,65	15,6		
DN 450	4,31	7,42	9,70	14,4		
DN 500	5,62	9,56	12,44	18,3		

**NOTE!** Table values are calculated for:

- An opening about 500 mm on the main pipe. At a smaller opening the amount is reduced.
- Shrink casing dimensions.

Calculate and add together the needs for main pipe and branch. The table above has added ( $\approx 10\%$ ) included for fluid remaining in the mixing vessel.

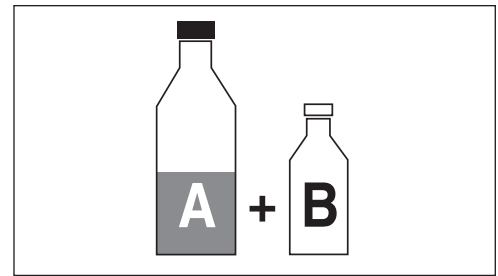
Article No. 6480-flasknr.-000-000

**NOTE:** When pipes are cold an increased amount foam is needed.

**Proposal:** use next larger bottle size.

## Foam liquids for hot tap-pings/ connections, double pipes

Assessment of the need for foam liquids can be made with management of the following tables



Bottle set for foaming 6480

### Branch (double pipes)

Dimension	STANDARD Kg	DOUBLE+ Kg	DOUBLE++ Kg	Amount kg	Bottle No.
DN 25	0,55	0,70	0,90	0,2–0,25	1
DN 32	0,70	0,90	1,10	0,25–0,35	1
DN 40	0,67	0,87	1,10	0,35–0,45	2
DN 50	1,11	1,45	1,60	0,45–0,55	3
DN 65	1,60	2,05	2,50	0,55–0,70	4
				0,70–0,75	5
				0,75–0,85	5.1
				0,85–1,00	6
				1,00–1,15	6.1
				1,15–1,30	7
				1,30–1,60	8
				1,60–1,75	8.1
				1,75–1,90	9
				1,90–2,30	10
				2,30–2,60	10.1
				2,60–3,0	11
				3,0–3,5	11.1
				3,5–4,8	12
				4,8–6,0	13
				6,0–7,0	13.1

Main pipe: (double pipes)			
Dimension	STANDARD Kg	DOUBLE+ Kg	DOUBLE++ Kg
DN 32	0,89	1,14	1,36
DN 40	0,84	1,09	1,32
DN 50	1,27	1,68	1,90
DN 65	1,52	1,94	2,40
DN 80	1,80	2,37	2,90
DN 100	2,75	3,45	4,60
DN 125	4,47	5,20	7,10
DN 150	5,34	6,55	8,60
DN 200	8,03	10,2	

**NOTE!** Table values are calculated for:

- An opening about 500 mm on the main pipe. At a smaller opening the amount is reduced.
- Shrink casing dimensions.

Calculate and add together the needs for main pipe and branch. The table above has added ( $\approx$  10%) included for fluid remaining in the mixing vessel.

Article No.. 6480-flasknr.-000-000.

**NOTE:** When pipes are cold an increased amount foam is needed.

**Proposal:** use next larger bottle sizr.



## 10.3.43 Foam liquids for hot tapping/connection

If the correct bottle size is unavailable, the table below can help

Bag	Can be replaced by the bottles		
4	1+1		
5	1+2	2+2	
5.1	2+2	3+1	
6	2+3	3+3	1+4
6.1	3+4	5+2	5.1+1
7	4+4	3+4	6+1
8	5+5.1	6+4	6.1+2
8.1	5.1+5.1	6+5	6.1+3
9	6+6	6.1+5.1	7+5
9.1	6+6.1	7+5.1	7+6
10	6.1+6.1	7+6	8+5.1
10.1	7+7	8+6	8.1+5.1
11	8.1+7	9+6.1	9.1+5.1
11.1	8.1+8.1	9+8	9.1+7
12	10+10	10.1+9.1	11+8.1
13	11+11	11.1+8	12+8.1
13.1	11.1+11.1	12+10	13+6



## 10.4. Backfilling of trenches

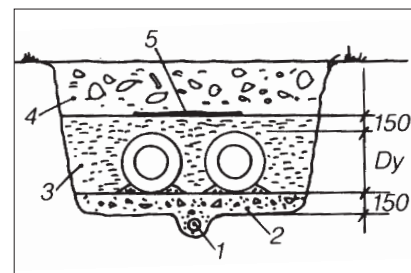
### Surrounding refilling

Surrounding filling is performed with material 0-16 mm, stone-free gravel materials regarding Construction AMA 2007 CEC. 3131. Surrounding backfill is compressed according to Class 2, Table CE / 4.

Single particles with maximum grain size of 50 mm may be present - but not near the mantle pipe joints without an approval from Powerpipe.

Underlay filling is to be made with the same material as for the pipe bed and to be evenly packed. Special care to be taken when filling and packing material **under** the pipes. Care is to be taken when filling material is packed around **at angles between 10° and 30°**.

If temporary base work has been used, it is necessary that this is removed before refilling. Warning tape or net is to be laid on top of the surrounding filling material



1. Draining pipe
2. Pipe bed
3. Surrounding filling
4. Top fill
5. Warning tape/net.

### Refilling with alternative materials

See complete information page 9:104!

### Warning Tape

The use of warning tape in order to ease location of the pipes is recommended. Performance according to AMA 07. Warning tape and nets must have purple color, see 8:301.

### The remaining filling

Construction is performed according to AMA 2007 CEC. 413. Maximum stone size of 100 mm may be evenly distributed in the filling.



### 10.5. Safety rules and directions

The service pipes from Powerpipe are insulated with a high quality rigid polyurethane cellular plastic. This is produced by a reaction and a fermentation process when mixing "Polyol" and "Isocyanate".

#### Working environment risks

Three working procedures can cause particular risks when working with service pipes if safety precautions are not taken.

When:

- Welding/soldering of the pipes creates a high temperature (above 150°C) in some part of the insulation whereby harmful vapours are produced.
- Mixing of the agents "Polyol" and "Isocyanate" for insulation at joints.
- Joining of the outer jacket which gives a high temperature (above 150°C) in a part of the insulation whereby harmful vapours are produced.

#### Guide and protection

Work with polyurethane foam insulation creates a risk to the staff involved. These risks can be eliminated when using the right method and the right protective equipment.

As a general rule no smoking is allowed when working with polyurethane. Personnel involved in work with polyurethane products must have special training regarding, among other things, safety work legislation and handling of the products. The personnel must also be in good health and have received permission from a doctor to work with polyurethane.

Work environment issues are governed by the "Arbetskyddsstyrelsens författning AFS 2005:18 "Hård plaster".

### 10.5.1 Welding

#### Welding/soldering of pipes and pipe fittings

Check that the uninsulated pipe (min. 150 mm) is completely free from polyurethane remains.

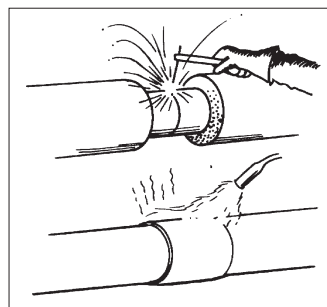
1. When welding/soldering, keep the flame away from the insulation.
2. Do not heat the pipe more than necessary in order to make a good joint.

#### Welding/soldering of pipes and fittings cut on the work site

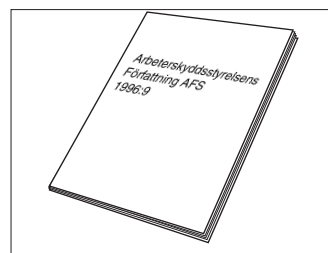
1. Cut and remove outer jacket and insulation over a length of min. 150 mm from the end.  
If work is done using a cutting wheel when removing insulation, a breathing mask is required.
2. The pipe (min. 150 mm) is to be scrapped/emery grounded in order to remove all remains of insulation.
3. If small remains of insulating are left, a breathing mask with charcoal filter is to be used when welding/soldering. In restricted areas a fresh air breathing mask is re-commended. Alternatively, smaller remains can be burnt away – using a breathing/fresh air mask – before the welding/soldering work starts.
4. When welding/soldering: Do not put the flame against the insulation.  
Do not heat the pipe more than necessary in order to get a good joint.



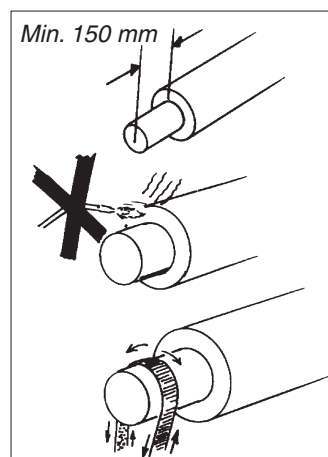
No smoking while working with Polyuretan



**Use protective equipment:**  
Welding/soldering of the pipes which creates a high temperature (above 150°C) in a part of the insulation whereby harmful vapours are produced.



Working environment risks are regulated in: Standard Health and Safety procedures produced by Government and Industry.



The gas flame must not be directed towards the free insulation. Jacket pipe (min. 150 mm) is sanded so that all remnants of the insulation is removed.



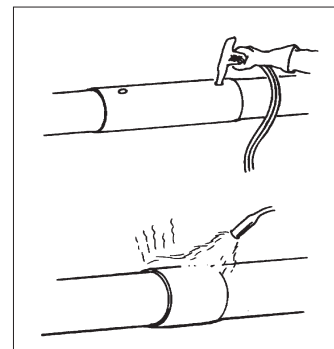
### 10.5.2 Joint insulation

Closed handling of the foaming agents minimize the risk of leakage of harmful vapours. A certain amount will, however, leak out from the sleeve when the foam is fermenting. Good ventilation is necessary in restricted and badly ventilated areas. A breathing mask with gas filter and dust filter class II against organic vapour must be used.

Water must not be added to vessels which have contained "Isocyanat" if they are later closed otherwise, high development of carbon dioxide will occur.

#### Joining of outer jacket

The outside and the edge of HDPE-pipes are to be fully cleaned so that possible remains of insulation material are completely removed before all joining of the outer jacket is made. The gas flame must not be directed towards the free polyurethane cellular plastic.



*A certain amount will however leak out from the sleeve when the foam is fermenting. Good ventilation is necessary.*

### 10.5.4 In case of an accident

"Isocyanat" on the skin is to be washed off immediately with water.

"Isocyanat" in the eyes is to be washed off immediately with large amounts of water. Thereafter consult a doctor.

If "Isocyanat" has been swallowed, large amounts of warm, clean water or milk are to be drunk. Thereafter consult a doctor.

Polyurethane cellular plastic on naked skin is to be scraped away and washed off with soap and water.

#### Decontamination solvent for "Isocyanat":

5% ammonia

50% alcohol

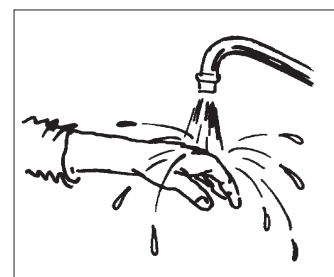
45% water

#### Decontamination powder for removal of "Isocyanat":

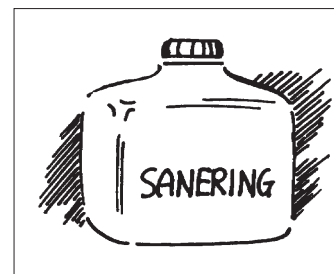
25% saw dust            4% triethanolamin

37% kieselguhr        4% ammonia

20% alcohol            10% water



*"Isocyanat" on the skin is to be washed off immediately with water.*



**Wear protective equipment:**  
Welding/soldering of jacket pipes develops a high temperature.



## 10.5.3 Instructions for installation, operation and maintenance of ball valves

### Installation

Make sure that the product with ball valve/s have the right dimension and that it is free of dirt or foreign particles in valve/pipe. The valve must be mounted in a place that is not exposed to uncontrolled thermal forces or high bend-tensions. The valve must be open when welding and may not be operable before the fitting has cooled.

### Pressure testing

When the valve is installed in the network, you can perform prussure test  $1.1 \cdot P_N$  against a closed valve and  $1.5 \cdot P_N$  with a open valve. After pressure testing valve can be leak tested.

### Usage

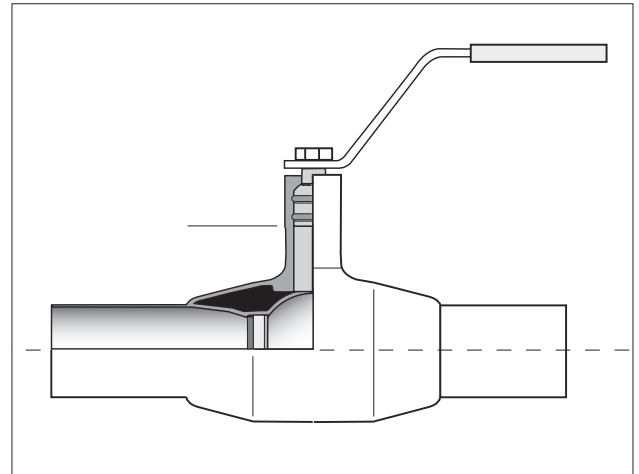
In order to avoid pressure surges, close the valve slowly. For larger dimensions > DN200 a gear is recommended.

### Maintenance

The valve must be exercised twice a year. At that time also check that the spindle tip is not soaked or contaminated with dirt.

### Stem Leakage

If necessary, the spindle O-ring replaced according to special instruction.



# ORDER



Order customer		Customer code	Date				
Reference (name)		Telephone					
Delivery address							
Postcode		City		Country			
Announces the		Telephone					
Goods marking		Best delivery date					
Your reference No.		Latest delivery date					
ARTICLE NO.		DESCRIPTION		DN	Length	Number	Price
1							
2							
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**Please fax to +46 31 57 78 99**