



Installation - transport and storage **10.1.1**

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.

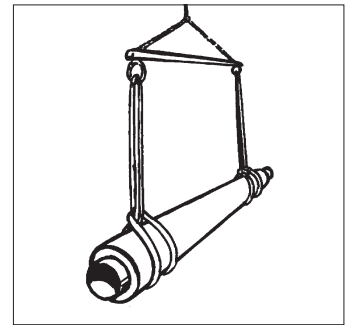
Pipe work larger than DN 125 should be stored with spacers between lengths. Maximum stacking height is 2 m. Width and distance between spacers are to be arranged so that the pressure on the jacket does not exceed 400 kPa (4 kg/cm²).

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

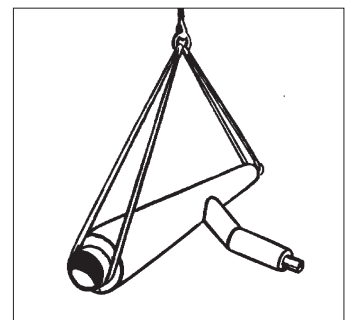
It is recommended to use the spaces that are delivered together with the pipes. These spacers make the stacking safer as well as preventing accidents due to collapse of the pipe stack.

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

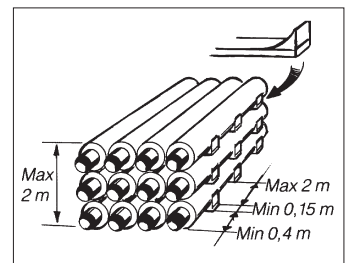
Pipes with an outer jacket diameter ≥ 560 mm are to be handled with special care at temperatures between 0°C and -20°C. At temperatures below -20°C, ask Powerpipe Systems for advice.



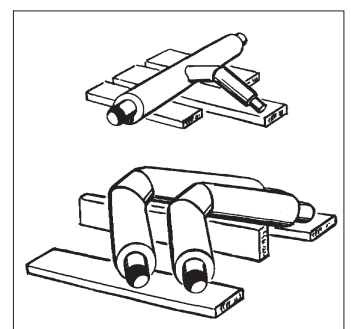
For unloading and further handling wide nylon web slings shall be used. **Chains, ropes or other round lifting equipment may not be used.**



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.



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 material free from stones. Please see type section on your right hand.

$$A = C = 200 \text{ mm for } \leq Dy \text{ 180 mm}$$

$$A = C = 250 \text{ mm for } 200 \leq Dy \leq 500 \text{ mm}$$

$$A = C = 300 \text{ mm } \geq Dy \text{ 560 mm}$$

If the pipes are assembled above ground, the A-C-measure can be reduced to 100 mm. Compression of the pipe bed material is to be done.

10.2.3 Needed space at assembly.

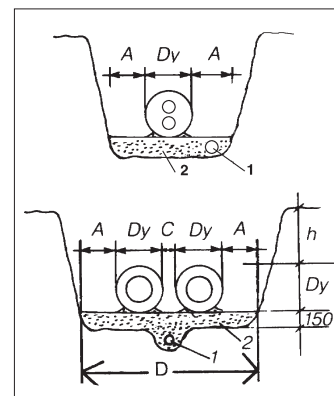
An access space should be dug at pipe joints, or the pipes be raised up from the ground so that there is as free installation space for a length of 2 m around the joint – see figure. The area directly around the joint should not be less than 200 mm for $Dy \leq 500$ mm and 300 mm for $Dy \geq 560$ mm.

At joints for double pipe where it is not possible to roll the pipes the free space between pipe and soil shall be at least 300 mm.

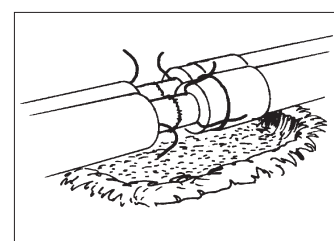
At joints where it is not possible to roll the pipes, the free space should be increased to 400 mm at a length of 600 mm from the place of welding in order to properly do the steel welding work.

10.2.4 Drainage

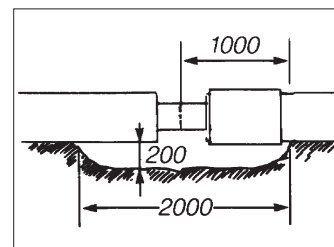
Trenches should always be kept drained. Dry trenches during the installation period decrease the risk of damp in the insulation. During operation of the system a dry trench will decrease the heat losses. Stiff drain pipes of the type DASH are to be used. The drain pipes should not be connected to crossing drain water pipes. Instead, they are to be connected at a low point to an existing DA-pipe.



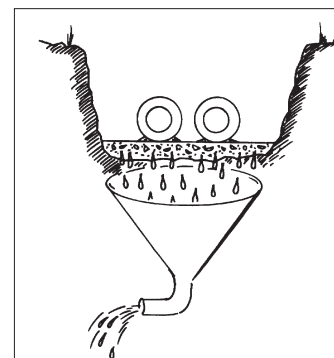
1: Draining pipe
2: Pipe bed.



The pipe length from Powerpipe is to be laid directly on the prepared pipe bed.



An access space should be dug at pipe joints, or the pipes be raised up from the ground so that there is as free installation space for a length of 2 m around the joint.



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.

Water must be prevented from accumulating in the bottom of the pipe trench during the whole installation period. The insulation must be kept dry. Wet insulation in pipe ends causes a problem at the insulation joint, which gives alarm condition.

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.

Leak tightness test can be made with air at 0,2 bar overpressure where the tightness of the weld is checked by application of a suitable indicator fluid.

Hydraulic testing is to be performed in accordance with local standards and requirements. Pressure test is to be performed with cold water using the pressure normally 1.3 x max design pressure is allowed for 1 hour. No loss of pressure.

Non-destructive testing is to be executed in the amount which is specified in manuals, (e.i. EN 13941).

10.3.13 Pipes for cutting to length

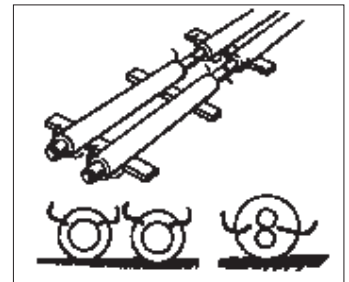
When short pipe sections are required pipes for cutting to length are to be used. The construction of the pipe makes it easy to remove the insulation from the steel pipe which gives a totally clean surface. This assists the installation and eliminates the risks of generation of unhealthy gases from insulation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

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

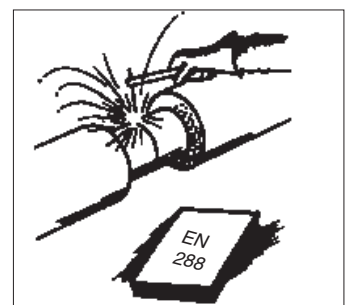
The "pipe for cutting to length" piece is to be located where the friction movement is as small as possible, which means as far as possible from a change of direction.

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.

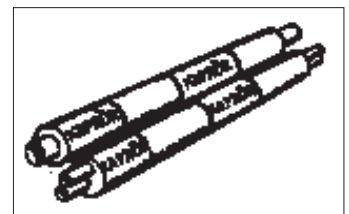
At very low temperature it is recommended to preheat the jacket pipe before cutting.



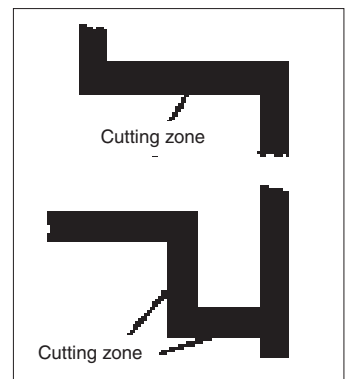
Before pipe laying is started, the pipe bed should be checked to ensure that it has been constructed in accordance with 10.2.1 and is free from foreign material.



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



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.



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.

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.

Direct connection

Direct connection of a branched off pipe is allowed on a pressure free main pipe. Please observe that the main pipe has to be reinforced in most cases. Regarding direct connections to a pressurised pipe, please follow local instructions.

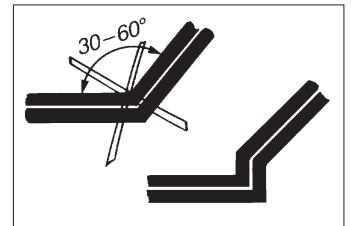
10.3.16 Wall penetrations

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

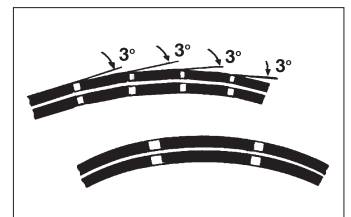
In cases where the pipes have no axial movement and where the ground water pressure is normal, the embedment ring 6520 (see page 8.101) is to be used. The grouting ring is to be located in the centre of the wall, and the hose clip is tightened before casting.

In cases where movement can be expected and if there is a risk of high ground water pressure, wall channel sealing 6510 (see page 8:101) should be used. The unit must be located on the outside of the wall in order to prevent ground water from penetrating the wall.

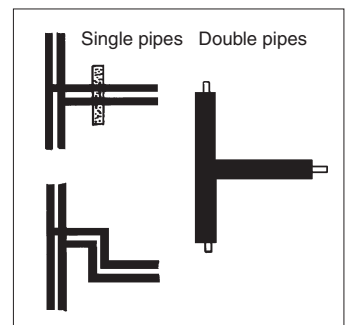
The pipe and penetration unit are to be cleaned before casting.



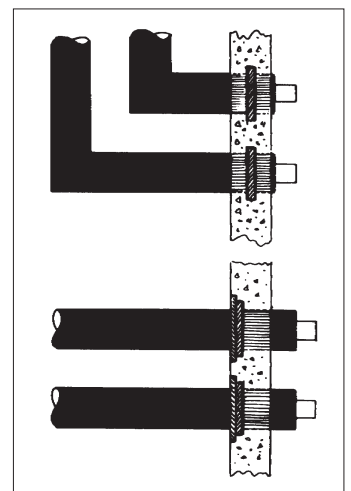
For stress reasons, changes of direction larger than 10°–30° are not allowed to move sideways if the bend has straight sections before and after.



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.



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



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 sideways movements. Axial movements must be kept to a minimum.

The valve stem is to be protected by a suitable sleeve. These are to be located so as not to damage the service pipes. The sleeve is to be completed with a suitable access.

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. For draining of single service pipe, underneath tapping is to be used.

Air release should be fitted on branch pipe if possible.

Prefabricated components

Tee-pieces for single pipes are connected to PE valve fitting 4250 (see page 3:404, 3:405). Tee-pieces for double pipes are connected to valve fitting 4550 (see page 4:402, 4:403).

As an alternative, the air release/drain detail 3280 (3:305) or 3540 (4:303) can be used.

Fittings built on site

Drain and air release fittings for use in fully accessible 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.

10.3.18 Pipe anchor points

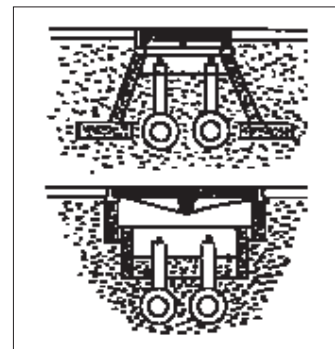
The thermal forces occurring in the pipe are normally transmitted to the ground via friction at certain small movements of the service pipe. In most cases these movements are absorbed in bends. In certain cases, however, the pipe must be anchored in order to prevent, limit or guide the expansion movement.

Ground anchoring

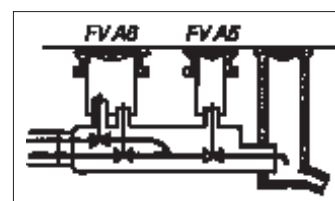
In case of preheating it may be desirable to guide the expansion movement in a certain direction. This can be achieved by backfilling on top of one or two pipe lengths (ground anchoring).

Anchor point

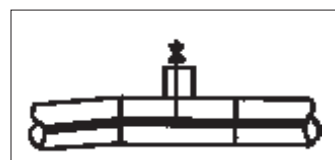
An Anchor point is used when it is desirable to limit the axial movement or to ensure that a length of service pipe does not slide from one expansion point to another. The anchor point is assembled in such a way that the distance between the respective anchor point flange is 100-200 mm. The flange package 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.



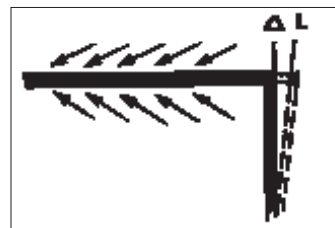
The valve spindle is to be protected by a suitable sleeve. These are to be located so they do not damage the service pipes. The sleeve is to be completed with a suitable access. In streets or other areas with a heavy traffic load, valve pits must be constructed, to avoid forces from the traffic load being transmitted to the spindle sleeves.



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.



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.

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.

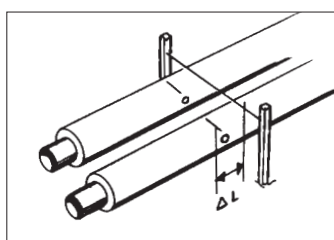
Preheating

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.



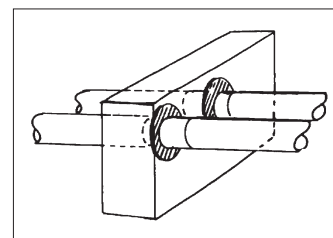
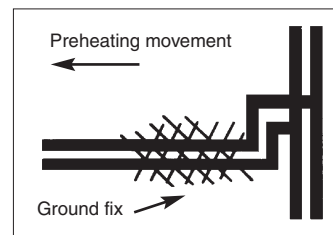
Before preheating is executed, the expansion movements must be calculated and control points be defined.

This to make it possible to check calculated expansion movements in a practical way.

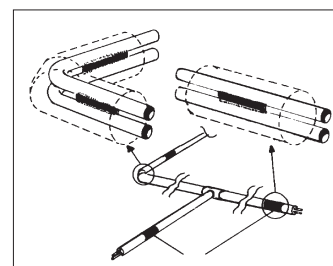
When the correct preheat temperature is reached, the expansion movements must correspond to the calculated ones. If this is not achieved, the preheat temperature may be increased a few degrees in order to reach the correct expansion.

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

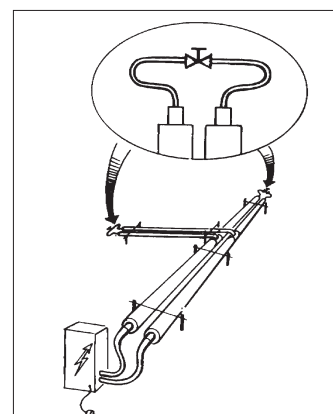
The preheat temperature must be kept constant during packing and refill work.



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.



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



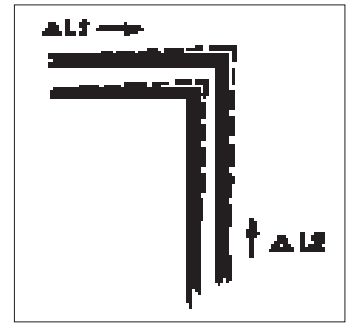
In order to minimize movements, the pipe can be prestressed by heating to a temperature in the range between the lowest surrounding and the highest operational temperature. The prestress temperature is stated in the project documents.



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.

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.

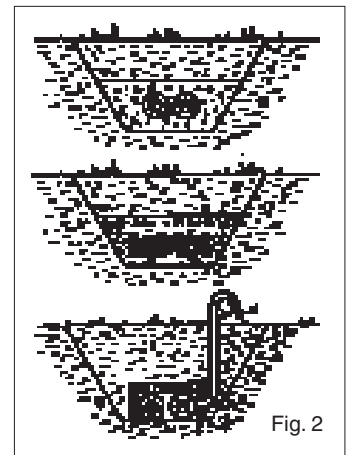


Since the temperature varies during operation, movements occur in expansion parts, bends etc. These movements can be absorbed by the surrounding backfill.

10.3.20 Monitoring systems

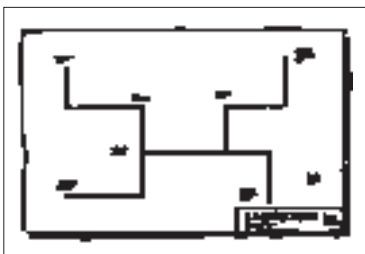
All pipes and pipe fittings from Powerpipe are delivered with two separately premoulded alarm wires. These shall be connected as joints and finally to a monitoring system.

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.



If the surrounding soil is compressed, bends must be protected against rising ground pressure by use of e.g. mineral wool.

10.3.21 Monitoring system drawings and installation instructions



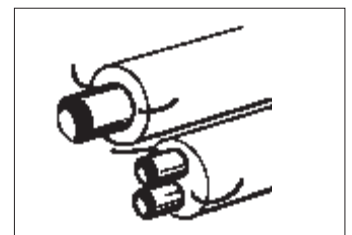
The alarm wire connections must be made in accordance with the alarm system connection diagram. The drawing shows the extent of the system, the connection of the alarm wires and how the sections should be divided. It also shows where the signal wires terminate and what part of the system that is connected 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.



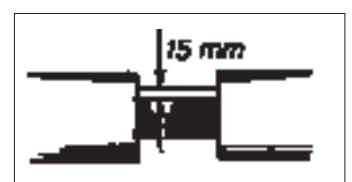
In order to get a proper alarm function, i.e. that the system works and does not give false alarms, make sure that no water has penetrated into the insulation of the pipes during transport and installation.

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 in parallel to the tube.



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 and approved splicing plier (See 8:104)!
- 5a. Slide the alarm distance of PUR under the stretched wires and press the wires into position in the alarm distance pieces.
- 5b. Slide the abrasive felt under the stretched wires. Fold the felt around the wire.
6. Fasten the alarm distance pieces abrasive felt with tape.

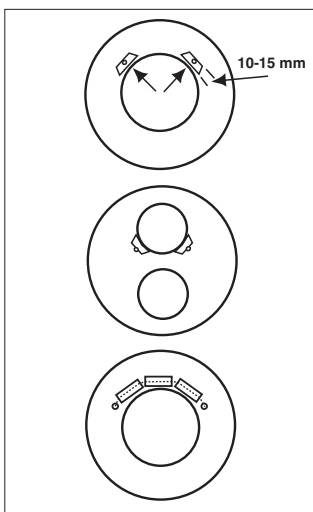
Abrasive felt

Abrasive felt can be used as an alternative to alarm distance made of PUR 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 10 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.



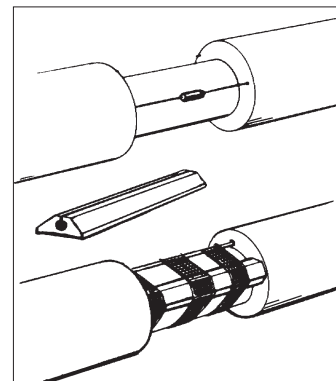
The uninsulated wire must be insulated with an insulation cartridge or alarm distance piece.

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.

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.



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

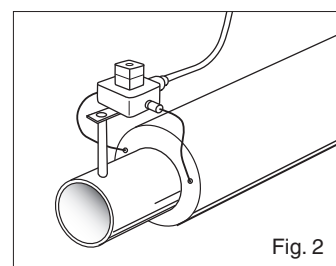
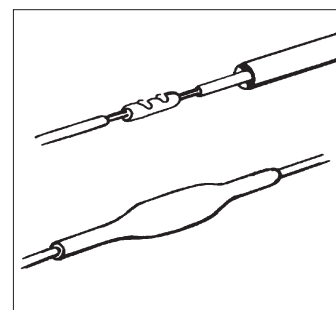


Fig. 2

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.

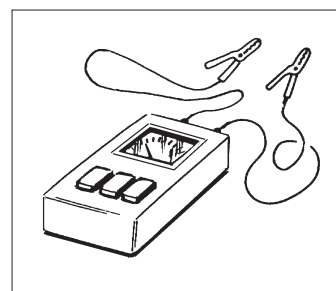


For signal wire. The uninsulated part of the signal wire and the joining cartridge must be insulated with a shrink tube sleeve.

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.

Circuit resistance is measured with an OHM-meter. The resistance shall as a guidance be 1.3 OHMS per 100 m connected alarm wire. Lower values indicate short circuit, and high values bad contact in joints.



OHM-meter.



Insulation resistance is measured with a megger. The resistance must be minimum 5 MΩ for 2000 m alarm wire (1000 m flow return pipe).

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

Approved value shall be metered up to 4 weeks after taking pipes into operation.

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 terminated by 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 3x1.5 sqmm cable. The signal wires are connected either through an external signal cable or through signal wires fitted in the service pipes to a central 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

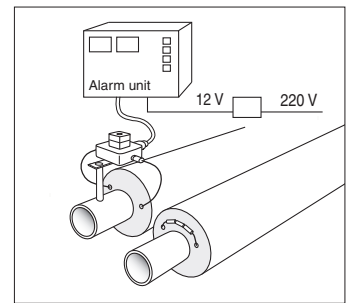
When testing the alarm limit a resistor with a value 10% below the set point of the alarm unit is to be connected.

2. Test of open circuit

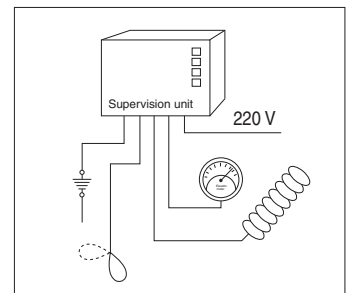
Open circuit is to be simulated as far from the alarm unit as possible.

3. All alarm functions are to be tested

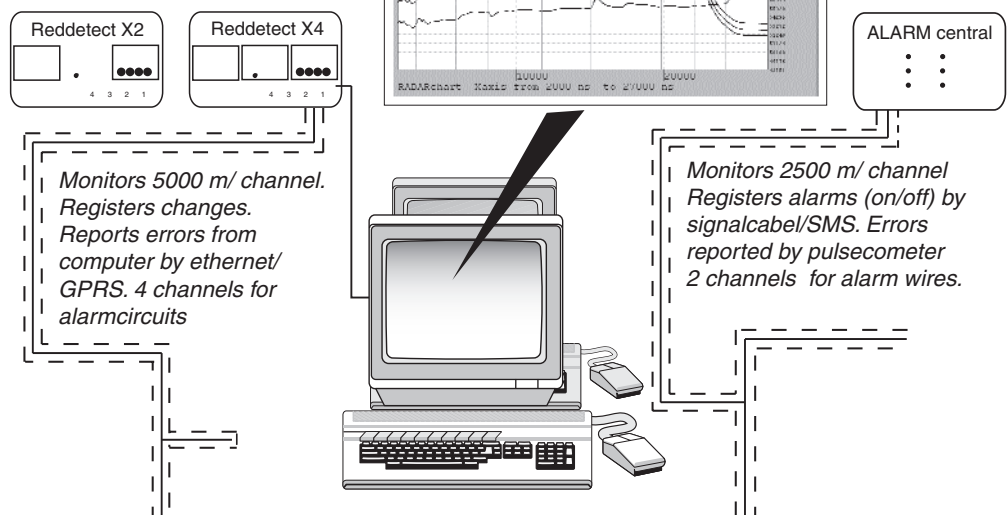
All function tests carried out shall be documented in consultation with the inspector. Circuit loop resistance and insulation resistance are measured separately for each loop and shall be documented in consultation with the inspector.



The joined alarm wires shall be terminated by the Powerpipe alarm unit or cables. Connecting box can be used.



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





10.3.30 Installation instruction - Installation of joints

General

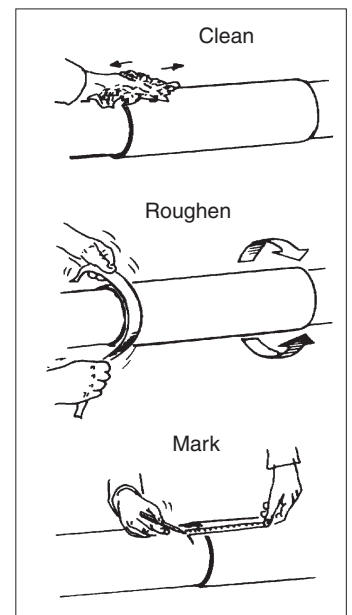
A preinsulated pipe system for district heating must have no vulnerable points. Each joint must therefore be carefully insulated on site. The insulation shall be made by trained personnel, equipped with a mobile foaming machine which has automatic pressure, volume-, and temperature control. In certain cases manual foaming can be performed. With all foaming work the locally valid safety rules e.i. the Swedish regulations AFS 1996:4 with pertinent documents must be followed.

Equipment for joint work can be found at "Accessories" in our catalogue, art. no. 9908-000-000-000

Insulation can be made before as well as after fitting of final joining material.

When pressure testing of a joint is called for, the joint insulation must be made after the pressure test.

- For each joint system there is an installation description in detail available. Please contact Powerpipe Systems AB!
- Installation description in following text shows the main procedures general information.



Sleeve and outer jacket to be cleaned from dirt, grease, moisture etc.



10.3.31 Powerweld

General

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

Material

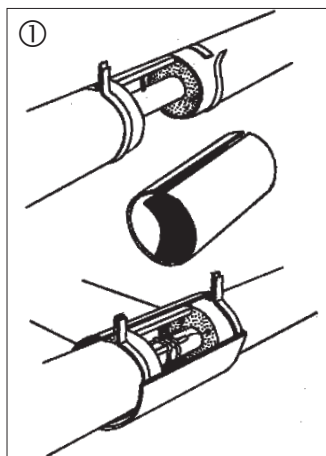
The required material art. no 6112 (page 6:102) is delivered in batches for each dimension of outer jacket together with plugs and covering patches for filling- and air release holes.

(Applicable where pressure testing is anticipated)

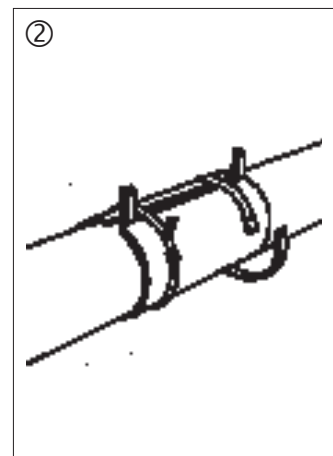
A special electric device is used for welding with Powerweld.

Performance

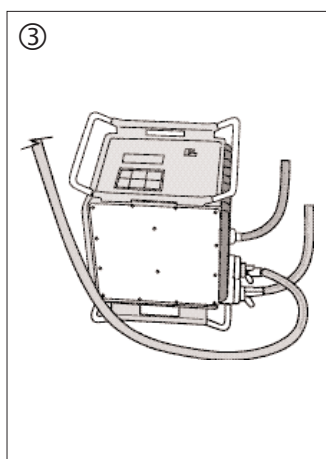
- Connect alarmwires (See § 10.3.22)!
- Sleeve and outer jacket to be cleaned from dirt, grease, moisture etc.
- Roughen the surface of the sleeve and pipe which are to be covered with Powerweld.
- Assemble the guide and welding net. ①
- Cut and assemble the sleeve on the pipe. ②
- Assemble and connect the welding equipment to the electrodes. ③
- Weld the radial weld. ③
- Cut and weld the axial trace. ④
- Pressure test ⑤
- Make the foaming of the joint ⑥



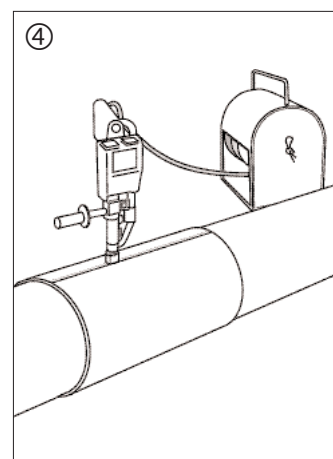
Assemble the welding net around the jacket pipe.



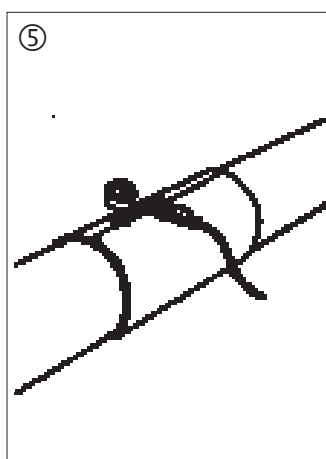
The sleeve is cut and applied on the jacket pipe.



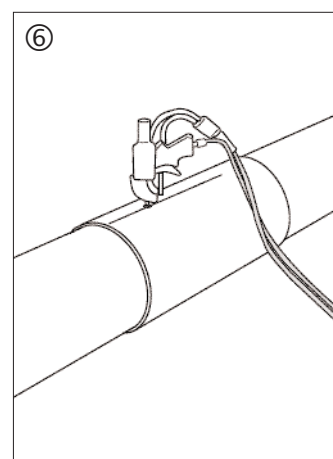
The computerised welding process takes 3-4minutes.



The longitudinal weld is made by an extruder machine.



Pressure test.



Foaming of the joint



Installation - shrinkable casing (PEX) 10.3.32

10.3.32 Shrinkable casing (PEX)

General

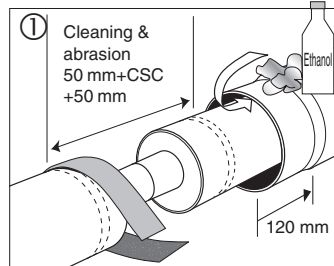
Shrinkable casing shall be installed by an authorized company and by personnel with special training. Below is a short description of the work.

Material

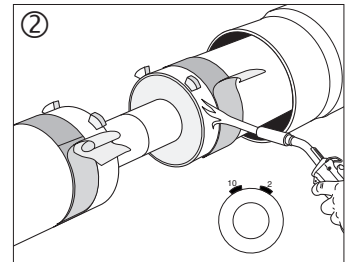
Shrinkable casing Article No. 6362, see page 6:201, a special mastic and welding plugs or fobs for the holes for foaming. Use shrink sleeve Article No. 6240 or 6241 as extra sealing, if necessary.

Performance

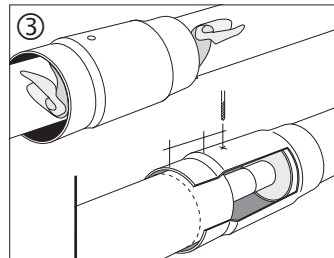
- Casing, outer jacket, foam and steel pipe are to be completely cleaned from dirt, grease, moisture etc.
- Install the alarm wires according to special instruction.
- Positioning the casing and mark for sand-papering as well as for the mastic. ①
- Roughen the pipe surface as well as inside the casing on the mastic area. ①
- Preheat the roughened areas. ②
- Wrap the mastic around the jacket pipe. ②
- Centre the casing and remove the outer protection foil from the mastic strips. ③
- Drill holes for foam injection and air realise. ③
- Shrink the casing with a soft gas flame. ④
- Check shrinking around the casing at sides on top and in bottom.
- Let the casing cool down to max. 40°C before pressure testing and foaming. ⑤
- Foam according to manufacture's guideline. ⑤
- Close the foam holes by welding. ⑥
- Optional put Foam Seals on top of weld plugs. ⑦



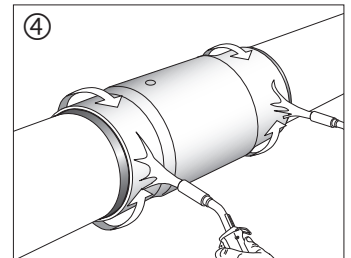
- Clean jacket and inside casing with ethanol.
- Mark position of casing and mastic strip.
- Roughen the surface of jacket pipe on both sides as well as inside the casing using sand-paper (40 to 60°C).



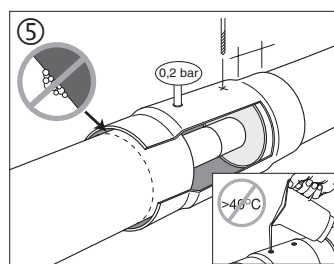
- Preheat mastic area around the jacket to 40 - 50°C.
- Partially peel-back the release liner and wrap it tightly around the jacket pipe.
- Place the rubber spacers at 10 and 2 o'clock.
- On smaller casings 63-200 do not use spacers.



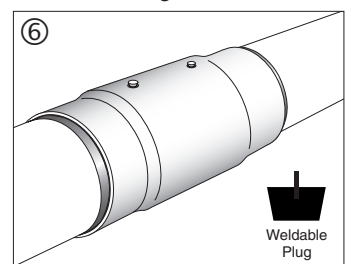
- Centre the casing according marking.
- Completely remove the release liners from the mastic strip. Drill 2 holes appr. 25mm from cut backs for injection and air release.
- On smaller casings 63-200 drill the holes in the circular PE-disks.



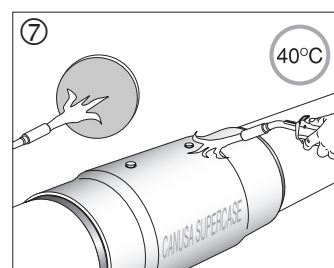
- Use broad strokes and a medium flame, begin shrinking one end of the casing evenly all around.
- Keep the torch moving to avoid overheating any spots; ensure sufficient heat is applied at the bottom.
- For casings 355> wrap the supplied tension tape on the shrink edges to avoid lifting when cooling down.



- The temperature of the shrink joint ends should not be more than 40°C when pressure testing or foaming.
- Foam the joint according to manufacture's guideline.



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



← CFS-Foam Seals

- Trim the welded plugs and sandpaper surface. Preheat surface to 40°C. Heat the foam Seal on adhesive side until it gets shiny and than put it over the plug. Continue heat on the upper side and carefully press by hand or with a roller.



10.3.33 Double sealing joint

General

Double sealing joint shall be carried out by personnel with special training. Below is a short description of the work.

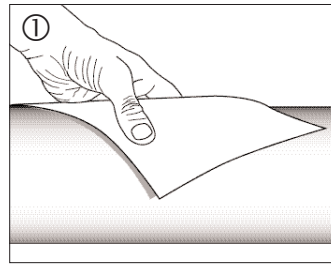
Material

Shrinkable casing Article No. 6364, see page 6:203, a special mastic and welding plugs or fobs for the holes for foaming.

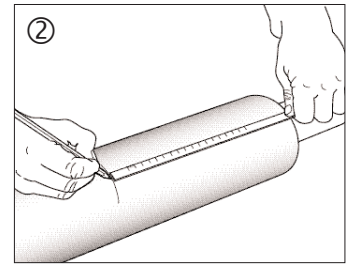
Use shrink sleeve Article No. 6210 as the second sealing.

Performance

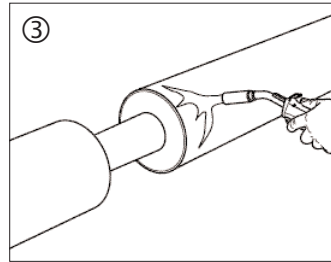
- Casing outer jacket, foam and steel pipe are to be completely cleaned from dirt, grease, moisture etc.
- Roughen the pipe surface which shall be covered by the casing + 50 mm of each side. ①
- Make marks on the jacket pipe in order to centre the casing. ②
- Install the alarm wires according to special instructions.
- Preheat the roughened areas to a hand warm condition. ③
- Unpack the casing. ④
- Put the mastic around the end of the jacket pipe. ⑤
- Centre the shrink casing over the joint.
- Drill holes for air release.
- Take the foil away from the mastic. ⑤
- Wrap silicon cloth around those areas of the casing and jacket pipe which shall not be shrunk in order to protect from overheating. ⑥
- Use a soft gas flame and heat one side of the casing with even movements up and down around the whole sleeve for 1–2 minutes. Continue in the same way on the other side of the casing. Alternate from side to side until the casing is in contact with the jacket pipe.
- Check the shrinking ⑦



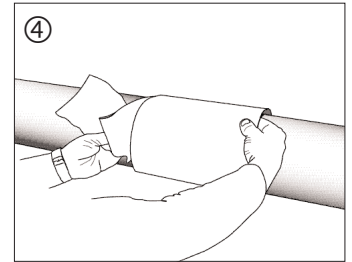
Clean and roughen the pipe surface.



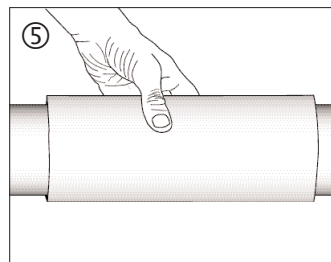
Mark on jacket pipe to center the casing.



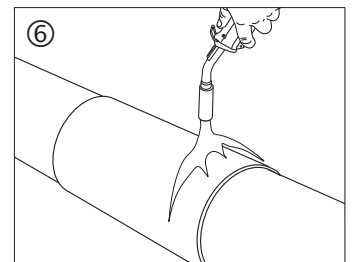
Preheat the jacket pipe.



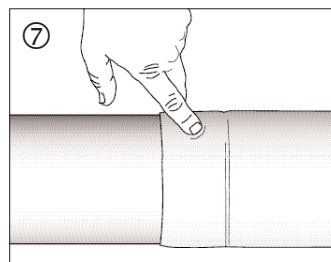
Unpack the casing.



Put mastic on jacket pipe and center the sleeve



Shrink with a soft gas flame after making hole for air release.



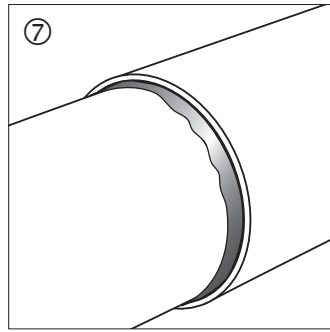
Check the shrinking.

See next page!

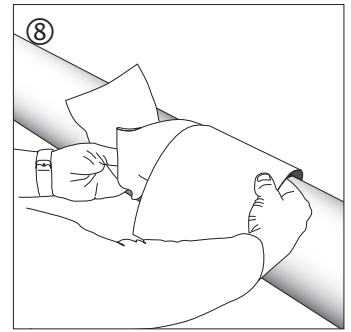


- Check the shrinking work. The mastic should be visible at the edge of the sleeve. ⑦
- Pressure test all joints after the sleeve has cooled down. The pressure test shall be performed with air at 20 kPa.
- Unpack the shrink sleeves, centre the sleeve over the edge of the casing. ⑧
- Shrink the sleeve from the middle and outwards. ⑨
- Check the result. ⑩
- Make holes for injection of foam. ⑪
- Mix the foam according to a separate instruction and pour the foam into the sleeve through the hole. ⑫
Please observe: if the steel pipe is warm (>60°C) a contact between foam and steel pipe should be avoided.
If Temperature of sleeve and steel pipe is low (>10°C) it is recommended to heat the sleeve carefully with a soft gas flame.
- After foaming the edge of the hole be cleaned and a plug welded in the hole. ⑬

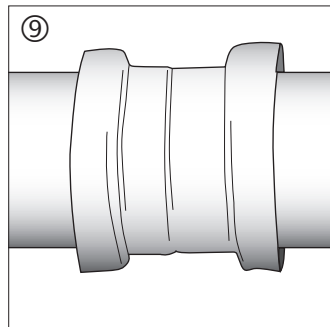
Please observe:
Make sure that water (rain, snow) do not have a possibility to enter the hole in the casing.



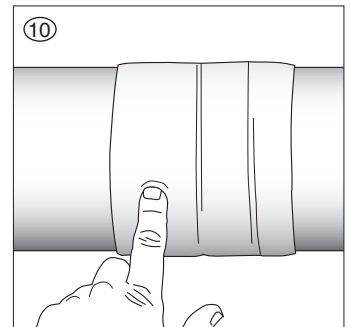
After shrinking the mastic is visible at the end of the sleeve.



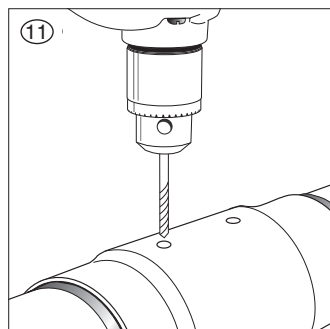
Unpack the shrink sleeve.



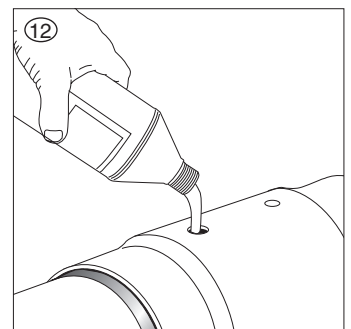
Shrink the sleeve from the middle and outwards.



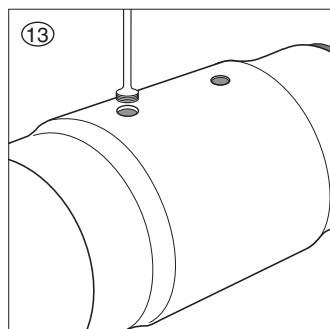
Check the result.



Make hole for injection of foam. Pressure test.



Pour the foam into the hole



After foaming the edges of the hole is cleaned and plug welded



10.3.34 HDPE-casing (oversized casing) with shrinkable sleeves

Material

HDPE-casing Article No. 6110, see page 6:301.
Tubular Shrink sleeve art. no. 6210, to be installed before welding the pipes.

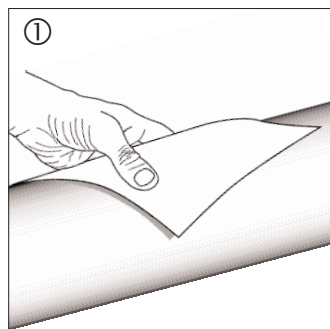
Open shrink sleeve Article No. 6240, cut in lengths = circumference of the sleeve + 100 mm. Is assembled with closure patch.

Insulation of the joint is recommended to be made before installing this type of material.

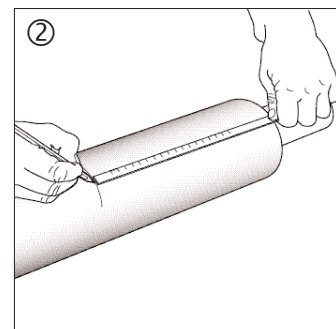
Performance

- Casing outer jacket, foam and steel pipe are to be completely cleaned from dirt, grease, moisture etc.
- Roughen the pipe surface which shall be covered by the casing + 50 mm of each side. ① ②
- Install the alarm wires according to special instructions.
- Preheat the roughened areas to a hand warm condition. ③
- Centre the shrink casing over the joint. ④
- Drill holes for foam injection. The hole should be located close to edge of the foam of the pipe. ⑤
- Mix the foam according to a separate instruction and pour the foam into the sleeve through the hole. ⑥
Please observe that if the steel pipe is warm (>60°C) a contact between foam and steel pipe should be avoided.
If Temperature of sleeve and steel pipe is low (<10°C) it is recommended to heat the sleeve carefully with a soft gas flame.
- After foaming, the edges of the hole shall be cleaned and a plug welded.

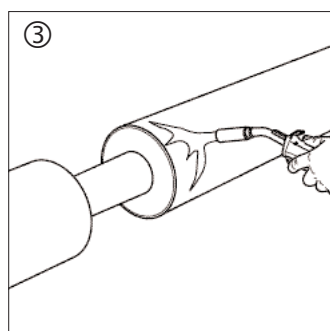
Se next page!



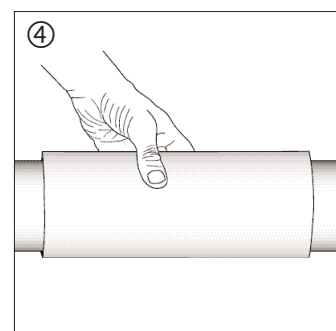
① Clean and roughen the pipe surface.



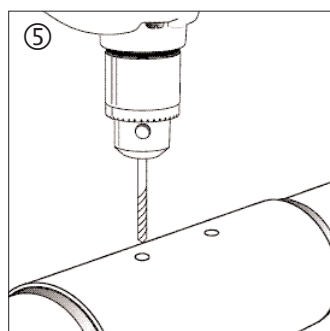
② Mark on jacket pipe to center the sleeve.



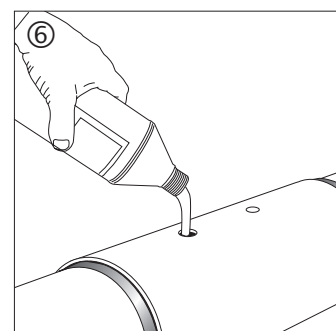
③ Preheat the jacket pipe.



④ Center the sleeve.



⑤ Make hole for injection of foam.



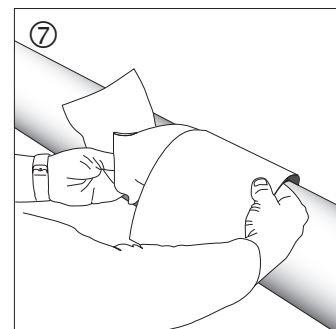
⑥ Pour the foam into the hole.



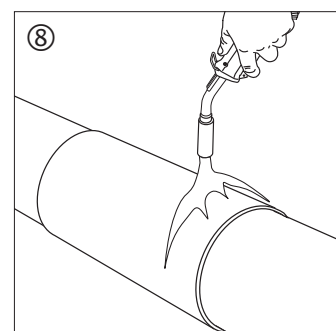
10.3.34 HDPE-casing (oversized casing) with shrinkable sleeves

Joint type 1 – Tubular shrinkable sleeve

- Check that the installed tubular shrink sleeve is clean and undamaged.
- Remove protective plastic film from the sleeve. ⑦
- Preheat the area of sleeve connection to + 60°C. Check the temperature with an indicator. ⑧
- If necessary add mastic in the step between the sleeve and jacket pipe.
- Shrink the sleeve from the middle and outwards. ⑨
- Check the result. ⑩
- The finally shrunk sleeve shall be completely even without upstanding edges, dimples or coldspots. Mastic shall be evident along the total circumference of the sleeves.



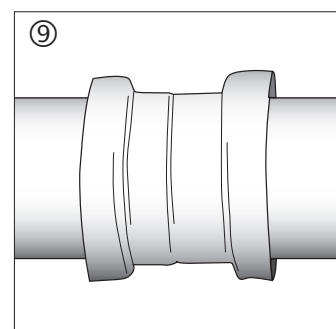
Unpack the shrink sleeve.



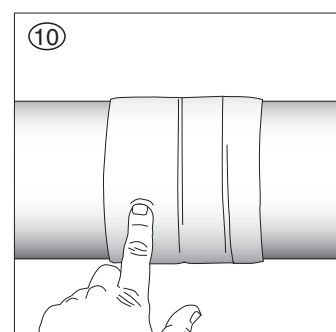
Preheat with a soft gasflame.

Joint type 2 – Wraparound shrinkable sleeve

- Check that the wrap around shrinkable sleeve is clean and undamaged.
- Check that the shrink material has the correct length (circumference + 100 mm) and is undamaged and clean.
- Cut away the edges of shrink material to be applied to the jacket pipe/casing.
- Preheat to 60°C. ⑧
- Check the temperature with an indicator.
- Add mastic even in the step between the sleeve and jacket pipe.
- Remove the protective plastic film from the mastic side of the sleeve gradually when the sleeve is being installed around the joint.
- Centre the closing path over the sleeve. Heat the path with a soft gas flame and press the path to the sleeve.
- Start to heat and shrink the sleeve on the casing side. Heat gently with even movements up and down around the whole pipe. Continue to shrink the sleeve on the jacket side of the joint. ⑨
- Check the result. ⑩
- The finally shrunk sleeve shall be completely even without upstanding edges, dimples or coldspots. Mastic shall be evident along the total circumference of the sleeves.



Shrink the sleeve from the middle and outwards.



Check the result



10.3.35 Termination cover

General

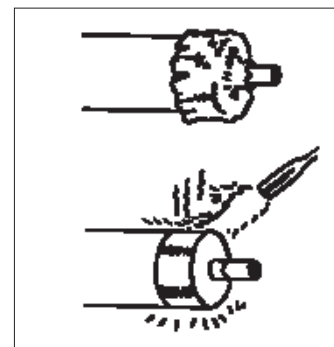
The termination cover is designed to be used inside ground walls, in chambers or wells and where it might be continuously under water.

Material

Termination cover art. nos. 6291, 6292, 6293, see page 6:502.

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. Please also see instructions § 10.3.34 "Installation of oversized casing".



Termination cover: Heat and shrink the part of the cover that is outside the jacket pipe until mastic creeps out around the edges.

10.3.36 Termination sleeve

General

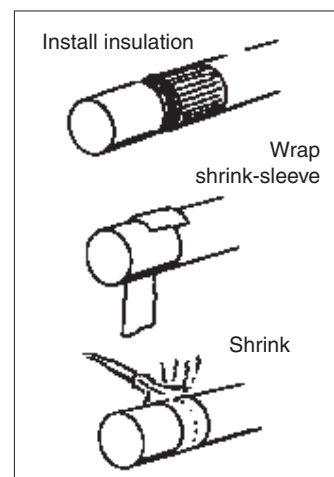
The termination sleeve is used as mechanical protection and insulation for a pipe end in a chamber inside a wall or in the ground.

Material

Termination sleeve Article No. 6134, see page 6:501, open shrink sleeve art. no. 6240 standard, tubular shrink sleeve art. no. 6241

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 sleeve 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 sleeve.
- Fit the termination sleeve.
- Seal with shrink sleeve using a suitable method according to item 10.3.33.
- Please also see instructions § 10.3.34 "Installation of oversized casing".



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 wedging rim or use wedging rims underneath.
- 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.

Manual foaming

This can be done in two ways. By using disposable cans (one-way-package) or by means of mixing in a vessel. One-way packages are recommended from a safety 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 vessels 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

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

Roughen the surface to be sealed.

Use a soft gas flame.

Preheat the surface around the plug to approx. 60°C.

Check the temperature with a tempstick.

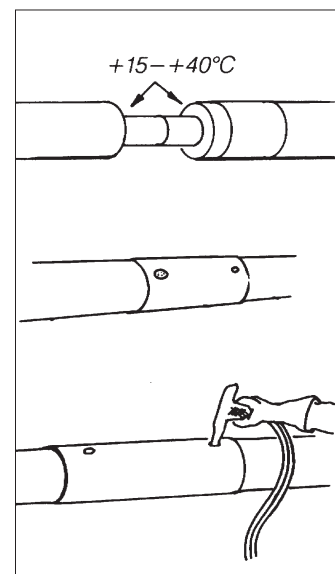
Preheat the adhesive surface of the covering sheet until it gets a glossy half melted look.

Press the covering sheet over the centre towards the plug.

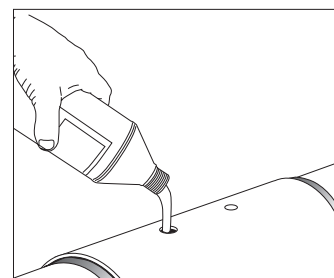
Heat the upper side until the colour changes from green to black and the adhesive starts flowing.

Press the covering sheet from the centre and towards the edges.

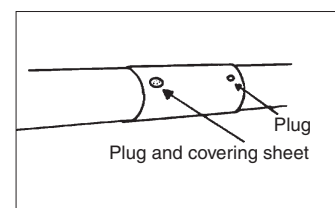
Check that the covering sheet is tight to the underlayer without air bubbles



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.

**Table for mixing of foam by hand****Double pipe**

DN	DOUBLE STANDARD			DOUBLE +		
	PEH DY mm	Polyol + Isocyanat litre	Set of bottles no.	PEH DY mm	Polyol + Isocyanat litre	bottles no.
2 x 25	140	0.30 + 0.41	5	160	0.41 + 0.58	6
2 x 32	160	0.37 + 0.52	6	180	0.51 + 0.71	7
2 x 40	160	0.35 + 0.50	6	180	0.49 + 0.68	7
2 x 50	200	0.54 + 0.75	8	225	0.75 + 1.04	9
2 x 65	225	0.65 + 0.89	8.1	250	0.86 + 1.21	10
2 x 80	250	0.76 + 1.06	10	280	1.05 + 1.48	10.1
2 x 100	315	1.17 + 1.62	11.1			
2 x 125	400	1.89 + 2.64	12			
2 x 150	450	2.26 + 3.14	13			
2 x 200	560	3.30 + 4.60	12+12			

Single pipe

DN	SERIES 1			SERIES 2			SERIES 3		
	PEH Dy mm	Polyol + Isocyanat litre	Set of bottles no.	PEH Dy mm	Polyol + Isocyanat litre	Set of bottles no.	PEH Dy mm	Polyol + Isocyanat litre	Set of bottles no.
25	90	0.14+0.19	2	110	0.19+0.27	3	125	0.23+0.33	4
32	110	0.19+0.26	3	125	0.25+0.34	4	140	0.30+0.43	5
40	110	0.18+0.25	3	125	0.23+0.32	4	140	0.29+0.41	5
50	125	0.22+0.30	4	140	0.28+0.39	5	160	0.37+0.52	6
65	140	0.25+0.35	4	160	0.34+0.47	6	180	0.44+0.62	6.1
80	160	0.32+0.44	5.1	180	0.42+0.57	6.1	200	0.53+0.74	8
100	200	0.44+0.61	6	225	0.63+0.87	8.1	250	0.79+1.10	10
125	225	0.52+0.71	7	250	0.71+0.99	9	280	0.94+1.32	10.1
150	250	0.57+0.79	8	280	0.84+1.16	10	315	1.14+1.58	11.1
200	315	0.84+1.16	10	355	1.27+1.76	11.1	400	1.67+2.31	12
250	400	1.36+1.89	11.1	450	2.05+2.86	13	500	2.56+3.55	13.1
300	450	1.32+1.82	11.1	500	2.33+3.30	13.1	560	3.08+4.28	13.1+8
350	500	1.95+2.75	13	560	3.00+4.17	13.1+10	630	3.96+5.50	13.1+11.1
400	560	2.27+3.30	13.1	630	3.76+5.17	13.1+11	710	4.90+6.85	13.1+13.1
500	630	2.27+3.30	13.1	710	4.05+5.62	13.1+11.1	800	5.27+7.32	13.1+13.1

The above amounts are based on:

- A free steel end of 2 x 250 = 500 mm.
- Shrink sleeve dimensions
- Temperature of +15°C – +40°C on sleeve and steel pipe.
- The amount includes liquids remaining in the mixing bottles (~10%).

Please observe:

- Above mentioned amount may be increased at cool temperature.
- Less amount of foam is needed on hot pipes. Leakage can be accepted.

Regarding foam bottles, please see page 8:201–204.

**Table for mixing of foam by machine****Double pipe**

DN	DOUBLE STANDARD		DOUBLE +	
	PEH Dy	Amount of PUR kg/sleeve	PEH Dy	Amount of PUR kg/sleeve
2x 25	140	0.70	160	0.92
2x 32	160	0.89	180	1.14
2x 40	160	0.84	180	1.09
2x 50	200	1.27	225	1.68
2x 65	225	1.52	250	1.94
2x 80	250	1.80	280	2.37
2x100	315	2.75		
2x125	400	4.47		
2x150	450	5.34		
2x200	560	8.03		

Single pipe

DN	SERIES 1		SERIES 2		SERIES 3	
	PEH Dy mm	Amount of PUR Kg/sleeve	PEH Dy mm	Amount of PUR Kg/sleeve	PEH Dy mm	Amount of PUR Kg/sleeve
25	90	0.32	110	0.46	125	0.56
32	110	0.45	125	0.58	140	0.73
40	110	0.43	125	0.55	140	0.70
50	125	0.51	140	0.65	160	0.88
65	140	0.60	160	0.81	180	1.04
80	160	0.75	180	0.98	200	1.25
100	200	1.04	225	1.47	250	1.88
125	225	1.21	250	1.68	280	2.24
150	250	1.34	280	1.97	315	2.69
200	315	1.98	355	2.99	400	3.93
250	400	3.21	450	4.84	500	6.05
300	450	3.09	500	5.52	560	7.26
350	500	4.63	560	7.08	630	9.34
400	560	5.60	630	8.77	710	11.65
450	560	4.31	630	7.42	710	9.70
500	630	5.62	710	9.56	800	12.44

The above amounts are based on:

- A free steel end of 2 x 250 = 500 mm.
- Shrink sleeve dimensions
- Temperature of +15°C – +40°C on sleeve and steel pipe.
- The amount includes liquids remaining in the mixing bottles (~10%).

Please observe:

- Above mentioned amount may be increased at cool temperature.
- Less amount of foam is needed on hot pipes. Leakage can be accepted.

Regarding foam bottles, please see page 8:201–204.



10.4. Backfilling of trenches

Surrounding refilling

Surrounding filling of pipes is to be made with material 0–16 mm without sharp edges. Surrounding filling is to be packed.

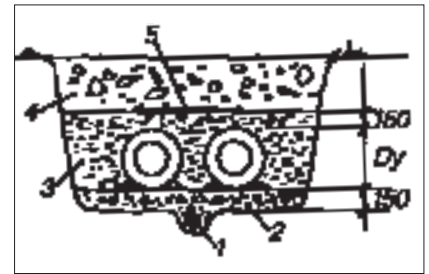
Underlay filling is to be made with the same material as for the pipe bed and to be evenly packed. Special care to be taken when filling and packing material under the pipes. Care is to be taken when filling material is packed around branch pipes. If temporary base work has been used, it is necessary that this is removed before refilling. Warning tape or net is to be laid on top of the surrounding filling material

Top fill

Maximal stone size 100 mm may occur evenly spread in the filling material.

Warning tape/net

Use of warning net art. no 6990-000-000-000 is recommended.



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



10.5.0 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".

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.

Working environment risks

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

They are:

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.

Directions and protection

Work with polyurethane cellular plastic as insulation material involves risks for the personnel. These risks can be eliminated if the proper methods and the proper protection equipment are used.

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

10.5.1 Welding

Welding/soldering of pipes and pipe fittings

Check that the uninsulated pipe (15 cm) is completely free from polyurethane remains.

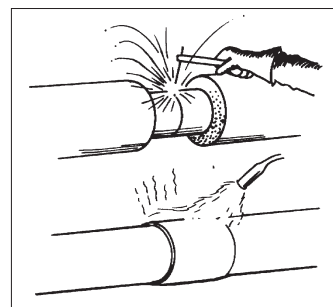
When welding/soldering, keep the flame away from the insulation. Do not heat the pipe more than necessary in order to make a good joint.

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

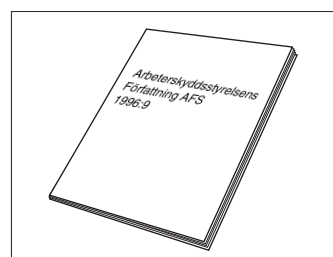
- Cut and remove outer jacket and insulation over a length of 25 cm from the end. If work is done using a cutting wheel when removing insulation, a breathing mask is required.
- The pipe (25 cm) is to be scrapped/emery grounded in order to remove all remains of insulation.
- If small remains of insulating 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.
- 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.



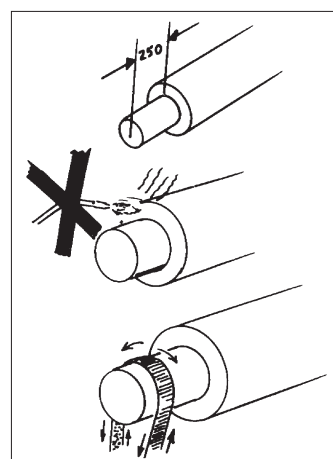
No smoking while working with Polyuretan



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 polyurethane cellular plastic.



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.

10.5.3 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.

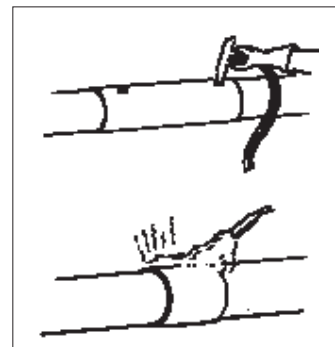
Polyurethane cellular plastic on naked skin is to be scraped away and washed off with soap and water.

Decontamination solvent for "Isocyanat":

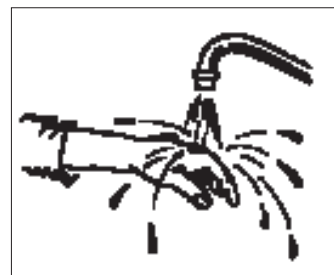
- 5% ammonia
- 50% alcohol
- 45% water

Decontamination powder for removal of "Isocyanat":

- | | |
|----------------|-------------------|
| 25% saw dust | 4% triethanolamin |
| 37% kieselguhr | 4% ammonia |
| 20% alcohol | 10% water |



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.



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



Work with polyurethane cellular plastic as insulation material involves risks for the personnel. These risks can be eliminated if the proper methods and the proper protection equipment are used.

ORDER



Order customer		Customer code	Date				
Reference (name)		Telephone					
Delivery address							
Postcode		City		Country			
Aviseras till		Telephone					
Goods markng		Best delivery date					
Your reference No.		Latest delivery date					
ARTICLE NO.		DESCRIPTION		DN	Length	Number	Price
1							
2							
3							
4							
5							
6							
7							
8							
9							
10							
11							
12							
13							
14							
15							
16							
17							
18							
19							
20							
Others							

Please fax to +46 31 57 78 99