

Assembly instructions for LK PE-X, PAL and PE-RT pipes

GENERAL

These assembly instructions relate to installations implemented using LK PE-X, LK PAL and LK Heat pipes in the PE-X and PE-RT execution.

- The designation “LK Universal PE-X pipe” refers to pipes of homogeneous PE-Xa.
- The designation “LK Heat pipe” is available in two variants, homogeneous PE-Xa or homogeneous PE-RT.
- The designation “LK Universal PAL pipe” refers to composite pipes of PE-RT/Aluminium/PE-RT.

All types of pipes are diffusion-tight for use in heating and cooling systems. Refer to the table on page 2 for designation, pipe dimension, pipe material, design, pressure class, temperature range as well as manufacturing standard.

STORAGE AND HANDLING

LK pipes may not be stored or installed in a way that they are exposed to direct sunlight (max. 3 months). This is also applicable to LK Pipe-in-pipe. Packaging provides sufficient protection against UV radiation. Once installation is complete the pipes should not be exposed to direct sunlight other than occasionally. Window panes provide sufficient protection against UV radiation and so do not affect the good long-term properties of the pipe.

PIPE RANGE

For the complete range of pipes, see each respective product range for Underfloor Heating and Universal on our website www.lksystems.se

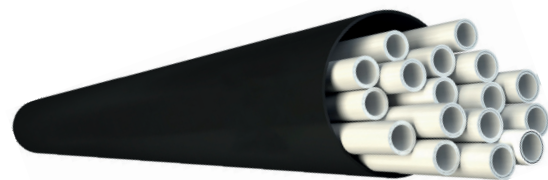
The LK PE-X Pipe-in-Pipe system, with component parts as stated in installation solutions NT VVS 129, is tested and approved in accordance with NT VVS 129 and the Sintef Test method for conduits. More information is available at: www.lksystems.se (support/dokumentation/lkuniversal)



LK Heat pipe / LK Universal PE-X pipe



LK PE-X Universal pipe with conduit and extra insulated conduit



LK PAL Universal pipes A, in straight lengths

TABLE OF CONTENTS

General	1
Storage and handling	1
Pipe range	1
Pipe properties	2
Marking and identification	2
Bending	2
Joining	3
Assembly of LK Universal System	4
Pipelaying	5
Cleaning the inside of the pipes	8
Replacement of pipes in conduits	8
Checks	9
Assembly of LK Underfloor Heating System	9
Tightness testing	9
Excess materials/recycling	10



PIPE PROPERTIES

Designation	Pipe dim. (mm)	Material	Application		Pipe range, design				Pressure class	Temperature range			Standard
			Tap Water	Heating/cooling-system	Except conduit	PiP	PiP Extra	Insulation		Max. continuous temperature	Max. momentary temperature	Minimum permitted temperature	
LK Under Floor Heating Pipe	8x1.0 12x2.0	PE-Xa		X X	X X				PN6	70 °C	95 °C	-20 °C	EN ISO 15875 (DIN16892/3)
LK Under Floor Heating Pipe	16x2,0	PE-Xa		X	X				PN10	70 °C	95 °C	-20 °C	EN ISO 15875 (DIN16892/3)
LK Under Floor Heating Pipe	16x2.0 20x2.0	PE-RT		X X	X X				PN6	60 °C	70 °C	-20 °C	EN ISO 22391 (DIN16833/4)
LK Heating pipe	25x2.3 32x2.9	PE-Xa		X X		X X			PN6	70 °C	95 °C	-20 °C	EN ISO 15875 (DIN16892/3)
LK Universal Pipe PE-X	16x2.0 20x2.5 25x3.5	PE-Xa	X X X	X X X	X X X	X X X	X X X		PN10	70 °C	95 °C	-20 °C	EN ISO 15875 (DIN16892/3)
LK Universal Pipe PAL	16x2.0 20x2.5 25x3.5 32x3.0 40x3.5 50x4.0 63x4.5 75x7.5	PE-RT/ Al/ PE-RT	X X X X X X X X	X X X X X X X X	X X X X X X X X	X X X X X X X X	X X X X X X X X		PN10	70 °C	95 °C	-20 °C	EN ISO 15875 (DIN16892/3)



LK Pal Universal Pipe A16 (16x2,0) 10 bar 95°C Oxygen barrier acc. to DIN 4726 Certification body Date Time Metre

Example of markings for identification of a pipe

MARKING AND IDENTIFICATION

LK pipes can always be identified as they are marked repeatedly at every metre.

BENDING

Bending of LK PE-X and PE-RT

Minimum recommended bend radii:

Bending method	Minimum bend radius at pipe dim.			
	16	20	25	32
Cold bending without fixture	80	130	180	260
Cold bending with fixture	55	110	140	210
Hot bending with bending support	34	45	60	95



Precautions must be taken when installing PE-X and PE-RT pipes at temperatures below -5 °C, particularly when bending.

Cold bending without fixture

Where space permits large bend radii, we recommend that the pipe bends be formed without a fixture/support. Large radii facilitate any replacement of the pipe in inner pipe (pipe-in-pipe) without causing structural damage. See section *Replacement of pipes in conduits*.



NOTE!

The instructions concerning clamping and fixing in the section entitled **Pipe laying in timber frames** on page 5 must be followed for pipes in inner pipes that are to be replaced. Bending PE-X pipes directly after press fitting is not recommended. The distance between the coupling and the PE-X pipe should be a 1 x the pipe's diameter before the bending, at a minimum. This instruction is provided due to the risk of stress corrosion.

Cold bending with fixture

Pipe bending supports are recommended where PE-X and PE-RT pipes are to be secured in bent position and where the space requires small bend radii. The product range includes a number of different bend fixtures for e.g. connection of radiators, installations against floor heating distributors or for pipe exits from walls.

Hot bending PE-X pipes

Hot bending is recommended if small radii are required. The pipe must be heated using a hot air gun, not a naked flame. The pipe is heated at the bend location until it becomes colourless and transparent. This occurs at a temperature of between 120 °C and 130 °C.

LK Bending springs are threaded outside the pipe, which is then bent to the preferred angle. The pipe is cooled in water or air, the bending spring is pulled off and bending is complete. The oxygen diffusion-sealing layer on the pipe is affected during heating and bending, but this is only of significance in terms of appearance.

Thanks to the thermal memory of the PE-X material, a finished hot bend can easily be straightened out again by reheating the pipe.



NOTE!

LK PE-RT and LK PAL pipes should not be hot bent.

Bending of LK PAL Universal pipes

The bends are made by using a LK Bending Spring (Bockfjäder) (up to 40 mm dimension) or a LK Bending Tool (Bockverktyg) (up to 40 mm dimension). Larger dimensions up to dim 75 can be bent using special bending tools; contact an LK representative.



LK Bending Spring INV, LK Bending Spring UTV, LK Bending Tool 16-32 and LK Bending Tool PAL Multi 16-32.

Minimum recommended bend radii:	
When bending with LK bending tools	2,4 - 4 x OD
When bending manually	5 x OD

Precautions must be taken when installing PAL pipes at temperatures below -5 °C, particularly when bending.

JOINING

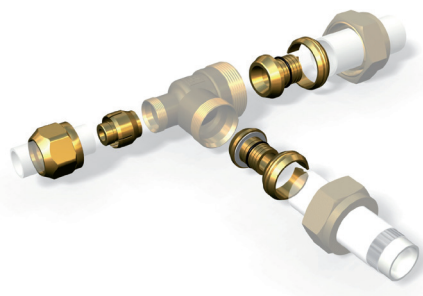
LK PE-X, LK PE-RT and LK PAL pipes for PN10 are joined with couplings as follows:

- LK PressPex press fitting coupling system. *See separate assembly instructions.*
- LK Compression fittings. *See separate assembly instructions.*
- LK PushFit couplings. *See separate assembly instructions.*

Please note the choice of couplings for LK PE-X and LK PE-RT, pipes intended for pressure class PN6.



LK PressPex, LK PushFit and LK PI Tube adapter AX.



Example of jointing PE-X and PAL pipes using a LK PI Tube Adapter.



ASSEMBLY OF LK UNIVERSAL SYSTEM

The following headings primarily relate to LK Universal Systems however relevant parts are also applicable for LK Floor Heating Systems. See also the separate heading *Assembly of LK Under-floor Heating System*.

Suspension, clamping and fixing

LK PAL Universal pipes in straight lengths are used for visible installation. PE-X Universal pipes on rings are recommended for concealed installation and for installation on cable racks, for example.

Suspension must take place using rubber-coated clips, LK Clip PE-X/PAL, and be tightened to “sliding position”, i.e. so that axial movements are possible. Pendulum-type roof brackets are used for attachment to the building structure. Pendulum lengths should not exceed 150 mm.

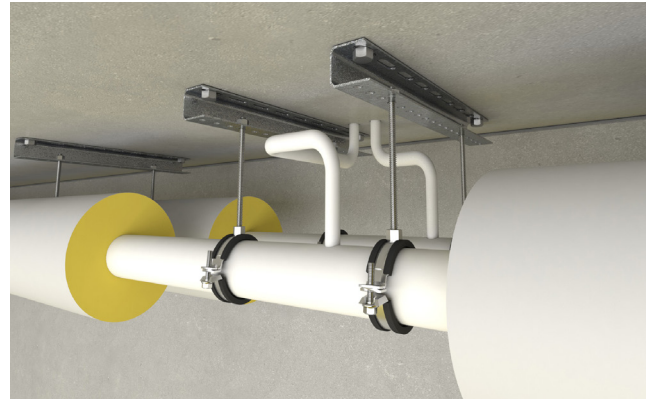
LK Clip PE-X/ PAL is also used for fixing, but with the clip tightened to “fixed position” to prevent the pipe moving axially. Please see the pipe wholesalers’ ranges for parts for robust, movement-inhibiting mounting to the building structure.

Clamping between suspension and fixing points must be made if there is a risk of movement in the piping network, for instance upon rapid shut-off of e.g. mixers and closing of solenoid valves. Clamping is intended to prevent damage to the piping and to prevent movement noise spreading to the building structure.

Horizontal laying

With horizontal installation, fixing must be located at branch pipes unless the shank length of the branch pipe is sufficient according to the section entitled *Expansion-absorbing devices* in the project planning and design guidance.

However, it is always recommended to make the shank long enough to provide room for expansion, this is accomplished for example by making extra bends on the branch as shown in the example below.



Fixings must also be made at points where expansion movements need to be directed to special expansion loops. When laying in cable racks or similar, we only recommend clamping between any fixed points.



Example of clamping, horizontal installation.

Suspension between fixed points must take place as follows.

Visible installation:	
LK Universal Pipe	Maximum distance between suspension points
X16 - X25	0.5 m
A16 and A20	1.0 m
A25 and A32	1.5 m
A40 to A75	1.8 m

Concealed installation (in pipe recesses, etc.):	
LK Universal Pipe	Maximum distance between suspension points
X16 - X25	1.5 m
A16 - A75	2.0 m



Vertical laying

With vertical installation, fixing must be located at T-junctions unless the shank length of the branch pipe is sufficient according to the section entitled *Expansion-absorbing devices* in the project planning and design guidance.



Example of clamping, vertical installation.

Suspension between fixed points must take place as follows.

Visible installation:	
LK Universal Pipe	Maximum distance between suspension points
X16 - X25	0.5 m
A16 - A25	1.5 m
A32 - A75	2.0 m

Concealed installation:	
LK Universal Pipe	Maximum distance between suspension points
X16 - X25	2.5 m
A16 - A75	2.5 m



Example of clamping, visible installation

PIPELAYING

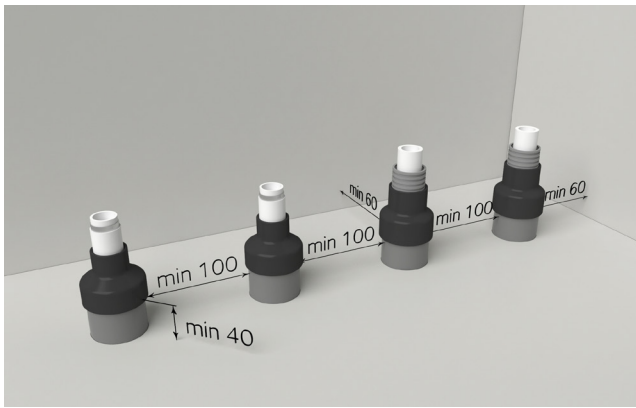
- Always use the system products in the LK range and never mix different product makes.
- There must be no unused outlets for cold water, hot water or hot water circulation pipes
- Cold and hot water pipes must be installed such that they do not come into contact with one another.
- Hot water circulation pipes must not be adjacent to cold tapwater without the requisite insulation.
- Pipes for heating systems must not be adjacent to cold tapwater without the requisite insulation.
- No water pipes may be placed in uninsulated areas such as crawl space foundations or attics. Pipes may be laid in special installation areas in floors, exterior walls or loft floor structures on the warm side of the structure, inside the airtight foil, or in a frost-free space below ground level.
- See the relevant section in the project planning and design guidance with regard to heat emission from pipelines.

Pipe lead-throughs in floors

There must be no pipe lead-throughs in floors with sealing layers in bathrooms or shower rooms.

Pipe lead-throughs in the floors of laundry rooms, equipment rooms or other areas for water heaters, heat pumps or similar may be installed using grommets. In smaller houses, without a laundry room or other utility rooms, the pipe inlets to the water heater, heat pump, etc. can be fitted with a pipe sleeve in the bath or shower room floor, though not at the location of the bath or shower.

Use grommets with OD 40 and 50 mm (e.g. drainage pipes). Install a LK Sealing sleeve on the outside of the grommet and the inner pipe or against protective pipes if this is used. Suitable for both corrugated and smooth inner tubes with OD 20, 25, 32 and 34 mm.



Pipe routing in timber frames/stud work

When installing Pipe-in-Pipe in timber frames, the conduit must always be fixed against wall studs or floor joists as follows:

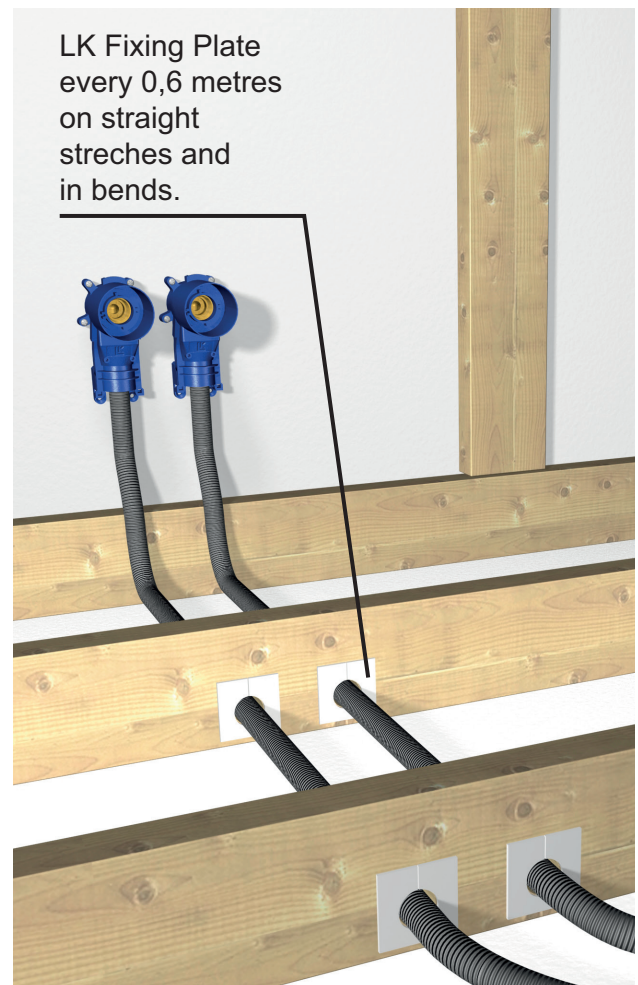
- At the beginning and at the end of each bend.
- In straights with at least 1 fixing every two metres for PAL pipe-in-pipe.
- For PE-X pipe-in-pipe, fixings must be provided every 0.6 m so that they can be replaced. The pipes should not be drawn completely straight between the connection points. Soft curves give the inner tubes the required expansion space, thereby reducing expansion movements at the tube ends.

In addition to fixing, clamping must take place so that any movements in the pipe network, for instance due to rapid pressure changes, do not cause disruptive noise or abrasion of the conduit.

Conduit fixing and clamping must take place using LK Fixing Plate, LK Plastic Clip for Sleeve Pipe, LK Metal Clip for Sleeve Pipe 25, coil, LK Fixing Plate metal or LK Wall Support. LK Nail Protection Plate are recommended to protect against nailing damage. To protect ducts from sharp sheet edges when laying in a sheet metal walls, LK Tube Protector can be used. Always insulate potable water pipes from any underfloor heating or hot tap water by placing the pipes deep in the floor insulation. However, make sure that the tapwater pipes are laid in compliance with the requirements for laying to prevent damage due to freezing



LK Fixing Plate, LK Plastic Clip for Sleeve Pipe, LK Metal Clip for Sleeve Pipe 25 coil, LK Feed-through Holder, Sleeve Pipe Support, and LK Sleeve Pipe protection.



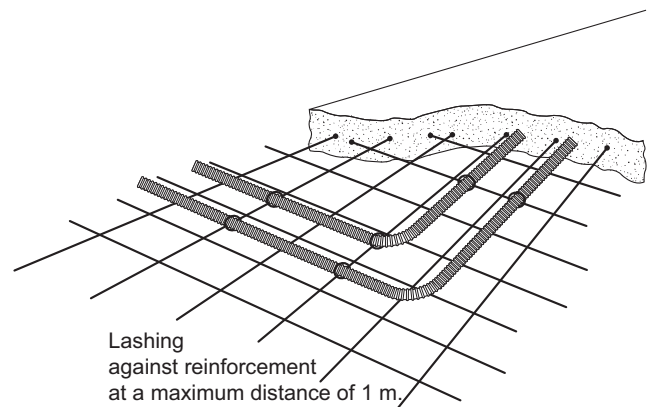
Fixing of Pipe-in-Pipe in timber frames.



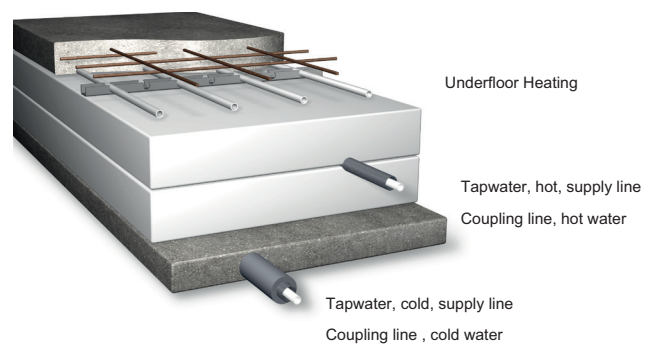
Pipe installation in concrete structures

In concrete structures, conduits may be clamped to reinforcements using cable ties or similar. The distance between the attachment points should not exceed 1 m to prevent the risk of the pipes moving up during casting. The cable ties must not be tightened excessively in a manner that would deform or damage the conduit. When using LK PE-X pipes for concealed Pipe-in-Pipe laying in concrete, it is extremely important to consider expansion-absorbing devices.

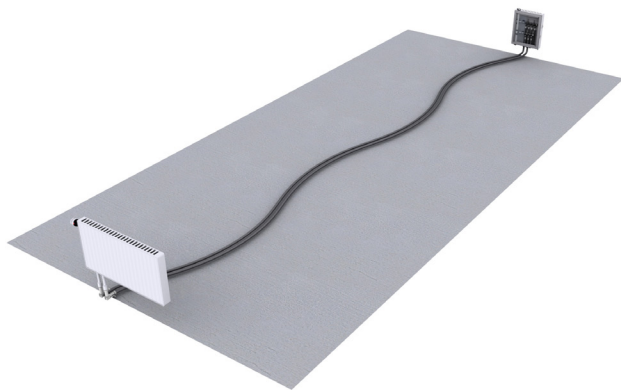
If the pipes are not laid with sufficient enough room to expand, radiators/mixers may come loose from their brackets in the event of high temperature differences between the time of installation and when the system becomes fully operational. Pipe expansion may also occur at manifolds, leading to a risk of the pipes coming loose from their couplings. Ensure that the PE-X pipes are pulled up into the couplings to the manifolds or radiators/mixers in order to provide space for expansion in the conduit/sleeve pipe. No expansion-absorbing devices are needed for concealed laying of "naked" LK PE-X and LK PAL pipes in concrete as the pipes are secured in position in the concrete.



Clamping against reinforcement.



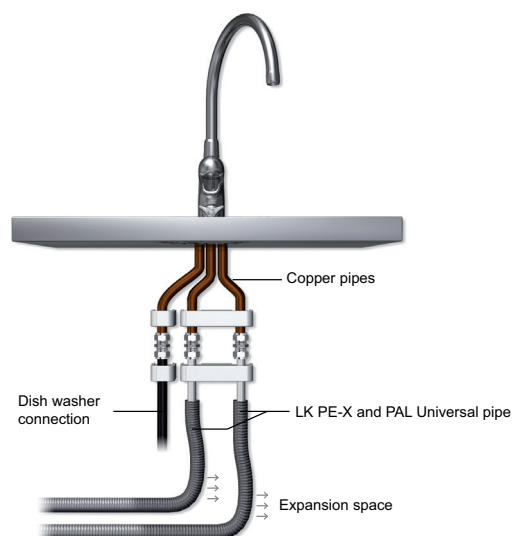
Laying of Pipe-in-Pipe in a concrete slab with underfloor heating.



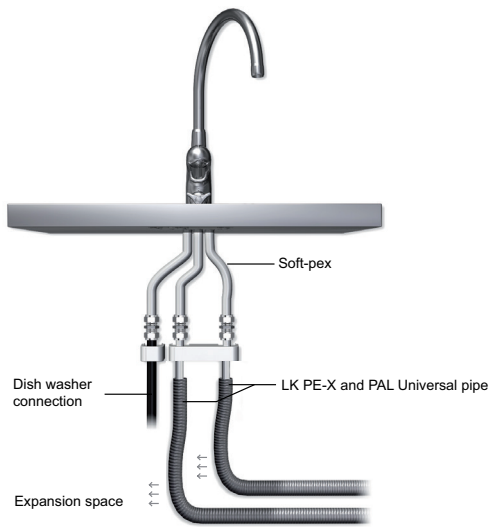
Example of expansion-absorbing bends for concealed laying of Pipe-in-Pipe.

If underfloor heating is installed in the concrete slab, the tapwater pipes must be placed at least 100 mm beneath the top edge of the topmost layer of insulation. Alternatively, Pipe-in-Pipe Extra (insulated pipes) may be laid beneath the insulation. Tap water pipes and hot water circulation pipes which are installed in concrete constructions without floor heating should be placed in the insulation or alternatively as Pipe-in-Pipe Extra above the insulation.

Pipe laying using LK PE-X and LK PAL to kitchen faucet



Acceptable solution when installing kitchen mixers with copper connecting pipes with LK PE-X and PAL Universal pipes Pipe-in-Pipe.



Acceptable solution when installing kitchen mixers with Soft-plex with LK PE-X and PAL Universal pipes Pipe-in-Pipe.



When penetrations for LK PE-X and PAL Universal pipes Pipe-in-Pipe without a wall box are to connect to a kitchen or washbasin mixer, for example, the angle at the transition between the LK PE-X – LK PAL pipe and the mixer's connecting pipe must be fixed. This is preferably done using a wall washer fitted with thread connection.

CLEANING THE INSIDE OF THE PIPES

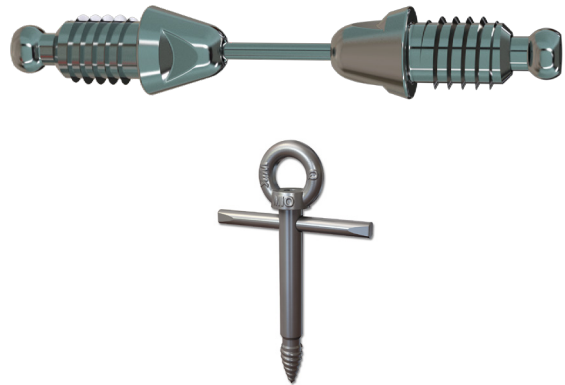
During cutting and installation of the PE-X and PAL pipes, there will be residue such as chips, grades and flakes that end up inside of the pipes. Flush the inside of the pipes with drinking water to remove these items. The water must be of drinking water quality.

REPLACEMENT OF PIPES IN CONDUITS

A damaged LK Universal PE-X pipe (size 16x2.0 mm) can usually be replaced without causing structural damage. Provided that installation has been carried out according to the instructions and that LK Fixing plates and LK Clip for Sleeve Pipe have been used to the extent prescribed by the assembly instructions.

LK recommends a maximum of 4 bends from manifold to termination/tap location; up to 2 of these may have a radius of less than 100 mm.

LK PAL Pipe-in-Pipe is generally regarded as not replaceable; however it can be replaced if only 2 bends with a radius of 100 mm are to be installed.



Replacement of pipe in conduit using LK Exchange nipple. LK Pipe extractor PE-X 16.

Use LK PiP 16 Exchange Nipple V3, RSK 188 26 82 for 16 mm PE-X pipes, to secure the damaged pipe to the new pipe. Screw LK Pipe extractor, RSK 188 07 73, into the other end of the pipe, then pull out the damaged pipe and replace it with the new pipe. Replacement of Pipe-in-Pipe PE-X dim. 20 to 32 mm normally requires a maximum of 2 bends of large radius. Note that Pipe-in-Pipe PE-X of dim. 20 mm fixed with LK Angle Wall box 20 mm cannot be replaced.

Extracting a damaged inner pipe is facilitated by means of the following measures:

- Softening of the pipe by flushing through with hot water or hot air.
- Lubrication between media carrier pipes and empty pipes with a mineral oil solution or similar lubricant which reduces the friction.



Note that the conduit/sleeve pipe must be blown clean after the change of the pipe.

CHECKS

The following must be checked:

- laying of pipes and pipe connections
- location of joints and pipes
- connecting of mixers/taps and appliances to the pipe system
- pipe lead-throughs
- attachments of connecting parts in walls with watertight seals
- freezing-safe installation (freeze protection)
- leak tightness of the installation.

ASSEMBLY OF LK UNDERFLOOR HEATING SYSTEM

See the respective floor heating system's installation instructions, for example LK Floor Heating Strip 16, LK HeatFloor 22 and LK Heat circuit distributor RF , etc.

TIGHTNESS TESTING

Tightness testing of press fittings

To check that a press fitting is compressed, a tightness test must be performed before the final pressure test takes place. Pressurise the pipe to a test pressure of 3 bar for at least 30 minutes. All joints must be inspected. The pressure must not drop during the inspection period.

NOTE! This tightness test is not a substitute for the mandatory pressure and tightness test described below.

Tapwater and heating pipes

When carrying out pressure and tightness tests on pipes carrying water, the water pipe must be filled slowly up to the control pressure. The pipes must be completely filled with water and air bled. To facilitate air bleeding, the pipe should be filled from its lowest point. The tapwater system must be tested with water of drinking water quality. The temperature difference between the room temperature and the water temperature may not exceed 10 °C.

Once a tapwater system has undergone pressure and leak testing with water, this must be put in to use within seven days at the latest or completely emptied of water in order to reduce the risk of bacterial growth.

Guidance

During tightness testing all joints should be inspected for hidden leaks. This inspection is important because such leaks cannot always be identified by the manometer on the pressure equipment.

Pressure and tightness testing of plastic pipe systems and pipe systems involving a mix of plastic and metal pipes

Phase 1

Pressurize the pipe system to a test pressure of 1.43 x the calculation pressure for at least 30 minutes. The test pressure must be 14.3 bar for tapwater systems and 8.6 bar for heating systems. The test pressure should be maintained for 30 minutes.

Phase 2

After 30 minutes, the test pressure is reduced rapidly to 7.5 bar for tapwater systems and 4.5 bar for heating systems. This pressure must be maintained for at least 90 minutes. The pressure should normally increase somewhat during the test period. The entire pipe system must be inspected.

Pressure and tightness testing with air.

Pressure and tightness testing with air or another gas must be performed by a Swedac-accredited company as per the requirements in AFS 2006.

Tightness testing with air, low pressure

- A method devised by VVS Företagen (the Swedish Association of Plumbing and HVAC Contractors) and Säker Vatten AB

If there is a risk of freezing or bacterial growth before a pipe system is to be commissioned, carrying out tightness testing using water is impractical. Industry regulations Säker Vatteninstallation displays on its website www.sakervatten.se how a simplified tightness test with air can be performed.



NOTE! Under no circumstances may this method be performed with a test pressure higher than 1.1 bar, and it does NOT replace the mandatory tightness test.

LK Universal system, with type-approved products, is ideal for this procedure. LK's Type approvals can be used as certificates showing that they have been tested in respect of strength.

LK Underfloor heating pipes (6 or 10 bar) can be used for this method together with LK Underfloor heating manifolds as they are manufactured for a pressure of 6 bar. Manufacturer certificates can be obtained from LK Systems AB.

Carefully follow the document "Förenklad täthetsskontroll med luft för vissa rörsystem" (Simplified tightness testing with air for certain piping systems). Use testing protocols, that are available to download from www.sakervatten.se.

NOTE! The system must be depressurized immediately when tightness testing is complete.

Overmolding of underfloor heating pipe

The pipe system must be pressurised when embedding the pipes in screed and concrete. This is to ensure that no damage occurs during the work. Pay attention to the danger of freezing when embedding PE-X pipes in concrete.

NOTE!

While the concrete cures, high temperature are present in the concrete. In order to avoid damage to the pipe caused by excessive high pressure in connection with the curing of the concrete, a 10 bar safety valve must be mounted on the manifold/distributor. It is suggested that a LK 514 Multisafe G15, 10 bar is used, which is a mounted where a manual air vent is located/fitted. Prior to commissioning, remove the safety valve from the manifold/distributor.



- Appoint a qualified person to lead the work and set up testing protocol.
- Ensure that the installation and all fasteners, fixings, supports, etc. are capable of withstanding the loads during the test.
- Freezing risks must be eliminated.
- All joints must be visible and dry.
- Make sure that the measuring equipment is working correctly.

LEFTOVER EXCESS MATERIALS/RECYCLING

LK does not accept the return of packaging materials or surplus materials, except for materials in unbroken and undamaged packaging.

Within the framework and scope of the producer's responsibility, we are affiliated with to Packaging and Newspaper Collection (FTI), which is the industry's collection system for recycling of packaging.



No pipes in the LK Universal System and the LK Floor Heating Systems are classified as hazardous waste, but rather these are handled as combustible waste.

Existing tapwater and heating system

Guidance

Existing tapwater systems should undergo pressure and tightness testing with the existing water pressure of the tapwater system. Existing heating systems should undergo pressure and tightness testing with the existing operating pressure of the heating system.

