

SINTEF Technical Approval

TG 20312

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Provided listed on
www.sintefcertification.no

SINTEF confirms that

LK Universal pipe in tube system

has been found to be fit for use in Norway and to meet the provisions regarding product documentation given in the regulation relating to the marketing of products for construction works (DOK) and regulations on technical requirements for building works (TEK), with the properties, fields of application and conditions for use as stated in this document



1. Holder of the approval

LK Systems AB
 Box 66
 161 26 Bromma
 Sweden
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2. Product description

LK Universal pipe in tube system is a system for distribution of cold and hot water inside buildings, see Fig. 1-5. Table 1 shows LK Universal pipe in tube system's main components. Complete list of components is found in the Control Description for SINTEF Technical Approval no. 20312. The Control Description is a formal part of the Approval, and the valid version is held by SINTEF.

3. Fields of application

The approval concerns cold and hot water distribution inside buildings. The system can also be used for heating or cooling plants, but these plants are not a part of this approval.

4. Properties

PEX-pipes

The use of PEX-pipes has the following limitations:

- Maximum allowed pressure is 1,0 MPa (10 bar)
- Maximum allowed temperature for a short period is 95 °C
- Maximum continuous operating temperature is 70 °C

If the water temperature from the water heater is higher than 70 °C, or if there is uncertainty about the water temperature, it is recommended to use a copper pipe of at least 0,5 m between the water heater outlet and the PEX.

Watertightness

The pipe in tube system has passed type testing for watertightness in accordance with NT VVS 129 *Pipe in tube systems* for PEX-pipes as described in Table 1. PEX-pipes and fittings are certified in accordance with current product standards.

Exchangeability

PEX-pipe dimension 16 x 2.0 mm (25 mm protection tube) is documented to be exchangeable for up to 10 meters length, included three bends plus wall box. See Chapter 6 regarding dimensioning.

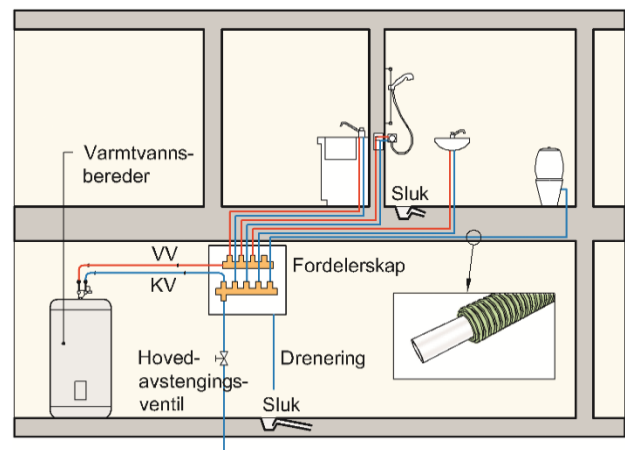


Fig. 1
 Principle sketch of a pipe in tube system

Acoustic characteristics

The pipe in tube systems acoustic characteristics depends on how it is installed, noise levels of taps, water hammer levels etc. The noise levels from technical installations shall be in accordance with limit values given in TEK and NS 8175, Class C.



Fig. 2
 LK Manifold UNI-Valve
 Figure: LK Systems AB

SINTEF is the Norwegian member of European Organisation for Technical Assessment, EOTA, and European Union of Agrément, UEAtc



Fig. 3
LK Wallbox UNI
Figure: LK Systems AB



Fig. 4
LK SmartBox AX16
Figure: LK Systems AB



Fig. 5
LK Manifold cabinet UNI
Figure: LK Systems AB

Table 1
Product specifications for LK Universal pipe in tube system

Component	Description
LK PE-X Universal Pipe with protection tube	Dimension 16 x 2.0 mm (25 mm), 20 x 2.5 mm (34 mm) and 25 x 3.5 mm (34 mm). External diameter of the corrugated PE protection tubes is given in parenthesis. SINTEF Product Certificate no. 3532 and 3673.
LK PressPEX and LK PressPEX ECO	Fitting system for LK PE-X Universal Pipe. SINTEF Product Certificate no. 3532 and 3673.
LK Compression fittings PEX	Fitting system for LK PE-X Universal Pipe. SINTEF Product Certificate no. 0077.
LK PushFit AX	Fitting system for LK PE-X Universal Pipe. SINTEF Product Certificate no. 3532 and 3673.
LK Wall Box UNI	Wall box for 16 mm PEX-pipe and 25 mm protection tube.
LK Pipe Membrane 48	Water tightening between LK Wall Box UNI and liquid membrane and watertight boards in wet zones. Outside diameter 120 mm. Hole diameter 48 mm.
LK SmartBox	Wall box with LK PushFit for 16 mm PEX-pipe and 25 mm protection tube
LK Membrane for SmartBox	Water tightening between LK SmartBox and liquid membrane and watertight boards in wet zones. Outside diameter 135 mm. Hole diameter 25 mm.
LK Manifold UNI and LK Manifold UNI ECO	Nickel-plated manifold - DR brass.
LK Manifold UNI-Valve	Nickel-plated manifold with valve - DR brass.
LK Manifold UNI PushFit AX	Nickel-plated manifold with Push fittings - DR brass.
LK Manifold UNI Push Fit AX-Valve	Nickel-plated manifold with Push fittings and valves - DR brass.
LK PressPEX Ball valve	Ball valves with PressPEX fittings. KIWA Type Approval no. 0808.
LK Manifold Cabinet UNI 350, 450, 550 and 700	Enamelled steel cabinet included splash protection and bracket for fastening of manifolds.
LK Frame with lid for UNI INB for cabinet 350, 450, 550 and 700	Enamelled steel frame with lid and key for use together with LK Manifold Cabinet UNI.
LK Frame with lid for UNI TAK 350 and 550	Enamelled steel frame with lid with drainage holes, for cabinets mounted in ceiling.
LK Pipe grommet 25 LP	Bushings to obtain watertight connection between manifold cabinet and 25 mm protection tubes.
LK Pipe grommet 20-25 LP	Bushings to obtain watertight connection between manifold cabinet and 25 mm protection tubes.
LK Pipe grommet 32- 34 LP	Bushings to obtain watertight connection between manifold cabinet and 34 mm protection tubes.
LK Sealing Plug 40 LP	Sealing plugs for unused pipe inlets in manifold cabinets.
LK Replacement plate pipe inlet	Fixing plate for 25 mm protection tubes. Must be used inside the manifold cabinet to obtain exchangeability of PEX-pipes.
LK Drainage Elbow complete	Set of components for draining water from manifold cabinet to wet room with floor gully. Set includes drainage elbow, bellow sleeve and outlet plate.
LK Pipe Membrane	Membrane for drainage component. Water tightening between 25 mm LK protection tube or LK Drainage Elbow and liquid membrane and watertight boards in wet zones. Outside diameter 97 mm. Hole diameter 17 mm.
LK Plastic Clip	Clamping of protection tubes (25 and 34 mm).

Component	Description
LK Fixing Plate	Metal fixing plate for securing conduit pipes laid in wooden joists, stud walls etc.
LK Jointing Sleeve LP	Jointing of 25 mm LK protection tubes.
LK End Protection PIP	Water tightening between PEX-pipe and protection tubes with dimension 16 x 2.2 mm (25 mm).
LK Wall Box tool UNI	Used when mounting and demounting of the inside plastic nut in LK Wall Box UNI. Can also be used to open the wall box cover.
LK Extraction tool UNI	Tool for LK wall boxes, to be used when exchanging PEX pipes.
LK Pipe Exchange Nipple	Tool intended to be used when replacing PEX pipes. Connects the ends of the old and new pipe.

5. Environmental aspects

Substances hazardous to health and environment

The products included in LK Universal pipe in tube system contain no hazardous substances with priority in quantities that pose any increased risk for human health and environment. Chemicals with priority include CMR, PBT or vPvB substances.

Effect on drinking water

The products included in LK Universal pipe in tube system are evaluated to not release compounds to drinking water in amounts that can cause taste, odour or be dangerous to human health.

Waste treatment/recycling

The products included in LK Universal pipe in tube system shall be sorted as metal, plastic and residual waste. The products shall be delivered to an authorized waste treatment plant for energy and/or material recycling.

Environmental declaration

An environmental declaration (EPD) has been worked out according to EN 15804 for LK Manifold cabinet UNI (S-P-06381), LK PushFit AX (S-P-06423), LK PE-X Universal Pipe (S-P-06048) and LK protection tubes (S-P-05809). For complete documentation see EPD no. in parenthesis, www.environdec.com

6. Special conditions for use and installation

Design considerations

The PEX-pipes shall be easily accessible for replacement after installation. The protection tubes shall be installed so that damaged PEX-pipes can be replaced without damaging any building constructions. Leakages shall be easily discovered and shall not damage other installations or building parts. The protection tubes shall lead potential water leakages to a manifold cabinet. From the manifold cabinet the leakage water shall be drained through the manifold cabinet's draining tube to a wet room with watertight floor and gully. The leakage water shall be drained to a visible spot, not into the floor gully directly.

Installation

LK Universal pipe in tube system shall be installed as described in Building Research Design Guide 553.117 *Rør-i-rør-systemer for vannforsyning* and in accordance with the manufacturer's installation instructions. Only system components, as described in Table 1, shall be used when installing LK Universal pipe in tube system. The internal control form, accompanying the manifold cabinet, shall be completed before commissioning.

Dimensioning

Chosen pipe dimensions shall give enough water to the sanitary equipment. The PEX-pipes shall be easily accessible for replacement after installation. The following factors affect the exchangeability: pipe dimension, pipe length, fixation and number of bends. The exchangeability of the PEX-pipe must be controlled

before finishing the building construction if the pipe lengths are more than 10 meters.

Table 2 shows suggested water flow capacity for different sanitary equipment with recommended pipe dimensions and maximum pipe length with respect to exchangeability. The water pressure must be at least 5 bars upstream of the manifold for Table 2 to be valid.

Table 2
PEX-pipe dimensioning

Sanitary equipment	Water flow [l/s]	Recommended external diameter for PEX-pipe ¹⁾ [mm]
		16 x 2,0
Water closet	0,10	X
Basin mixer	0,20	X
Kitchen mixer	0,20	X
Shower mixer	0,20	X
Washing and dishwashing machines	0,20	X
Bath mixers	0,30	X ²⁾

¹⁾ X is recommended pipe dimension

²⁾ Pipe lengths > 5 meter should be controlled regarding capacity.

Manifold Cabinet

When LK Manifold Cabinet UNI is installed in a wet room, the cabinet must be placed in a dry zone.

Protection tubes must be fastened to the cabinet by using LK Pipe Inlets. The protection tubes must be cut above the sill height in the bottom of the cabinet.

When exchanging PEX-pipes, LK Replacement plate pipe inlet must be used inside the manifold cabinet to fix the protection tube to the pipe inlet.

Manifold cabinets for wall installation shall be mounted at a height that ensures the protection tubes come straight into the cabinet.

For draining of water leakage from the cabinet, LK drainage set shall be used. The set includes drainage elbow, bellow sleeve, outlet plate and LK protection tube (25 mm). LK Pipe Membrane for drainage must be used when drainage components penetrate a wall in a wet zone. The manifold cabinets have a drainage capacity of ≥ 0.25 l/s. The drain tube cannot be longer than 1.5 meters.

When LK Manifold Cabinet UNI is installed in the ceiling, it must be mounted in a wet room with draining ability to a watertight floor

with gully. The cabinet frame and lid must be installed level with the ceiling and the water splash protector must be removed. Water shutoff valves should not be located inside cabinets in ceilings. If the valve has to be located inside, then it must be easily accessible.

LK Pipe Inlets in the cabinet shall be controlled for water tightness before completion of the building construction. The water capacity of the drain tube shall also be controlled before finishing the wall.

The water splash protector shall always be placed inside LK Manifold Cabinet UNI, with exception of when the cabinet is mounted in a ceiling.

It is important that the manifolds are clamped inside the cabinet to avoid bothersome noise from water hammers when closing of taps.

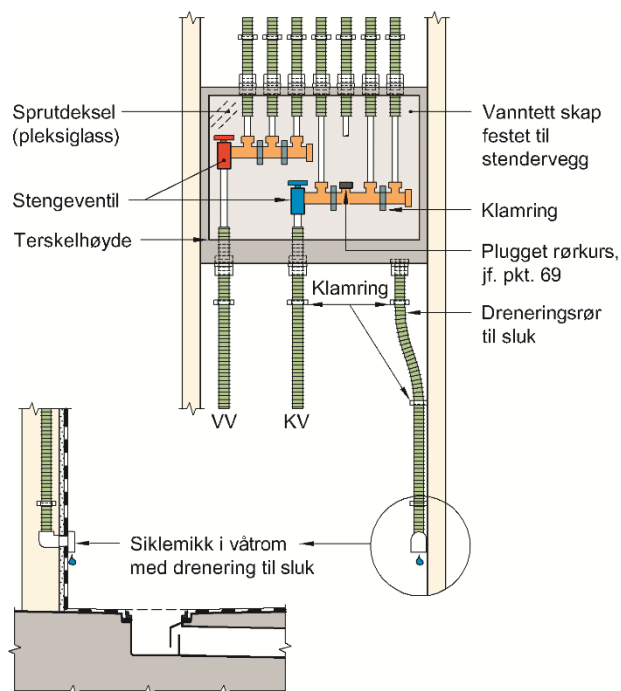


Fig 6.
Correct installation of LK Manifold Cabinet UNI in wet rooms

Manifold cabinets should preferably be installed in rooms with watertight floor and gully. If this is not an option, cabinets must be installed with a leakage detector as described in Fig. 7. LK VannStopp with SINTEF Technical Approval no. 20598 may be used. This solution may be relevant if the cabinets must be installed in offices, toilet room or kitchens without floor gullies.

Manifolds without cabinet

Manifolds should preferably be installed inside a manifold cabinet. In wet rooms with floor gully and watertight membrane on floor and walls, manifolds can be installed without manifold cabinet. The installation should be in an easily visible spot, either on a wall, at floor level or under the ceiling. It is important to fix manifolds securely to the building construction.

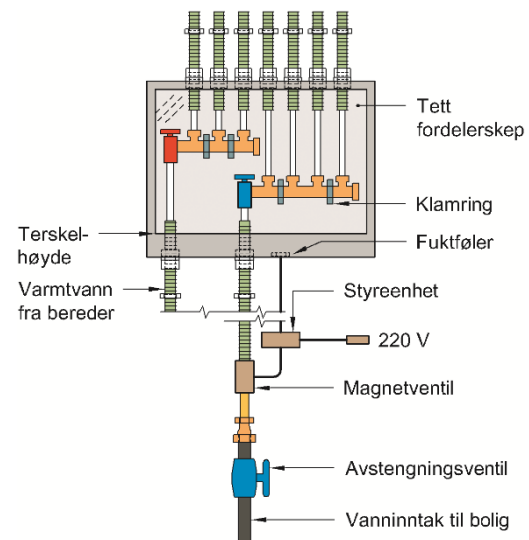


Fig. 7
Manifold cabinet without draining must be installed with a leakage detector which shuts off the water supply immediately if leakages occur

Clamping of protection tubes

Fixations, in accordance with Table 1, that fixes the protection tubes securely to the building construction shall be used.

Correct fixation of protection tubes is vital for ensuring easy exchangeability of PEX pipes. Fixation of protection tubes is especially important before and after a bend, in the middle of a bend, and also where tubes pass through a building part and in conjunction with wall boxes and manifold cabinets.

Protection tubes should be clamped in conjunction with wall boxes and manifold cabinets with a distance of 150-300 mm. The space between clamps on straight pipes should not exceed 0.6 m.

Installation of wall boxes

LK Wall Box UNI shall be installed as described in installation instruction NO.29.C.14 and LK SmartBox shall be installed as described in installation instruction NO.29.C.46.

Installation of wall boxes in wet zones

Wall boxes must be used when penetrating walls in wet zones, to ensure a watertight connection to the construction and a fixation point for pipes.

LK wall boxes and belonging wall box membranes shall always be used in wet zones made of liquid membrane, bathroom panels or watertight boards. The wall box membrane must be installed as described in the installation instruction from LK Systems AB.

In wet zones with bathroom panels, water-tightening of LK wall boxes shall follow the procedure given in the technical approval of the panels.

Water leakages protection in kitchen and toilet rooms

Kitchens and toilet rooms are considered dry zones, i.e., rooms without gully and watertight floor. It is not required to use wall boxes in dry zones, but it is highly recommended. The wall box ensures a watertight connection between box and protection tube, and a good fixation to avoid trouble with expansion forces.

Floors in toilet rooms or the bottom floor inside the kitchen sink unit should have a watertight covering and a leakage detector to avoid damages from potential water leakages, see Fig. 8.

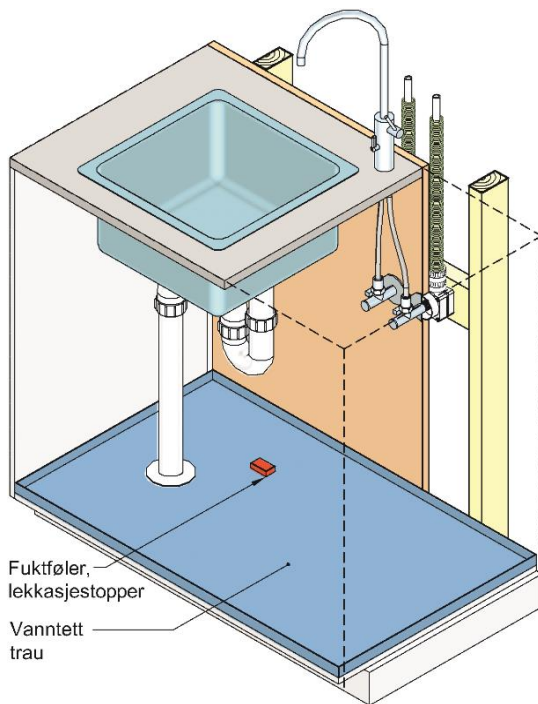


Fig. 8
Main principles for water leakage protection in dry zones.

Special tools

Special tools for installation of LK Universal pipe in tube system shall be used if specified in the installation manual.

Expansion forces

Expansion forces shall not cause damage to the pipe in tube system, taps or the building constructions the system is fastened to. The pipe expansion with regard to temperature must be considered when installing the system. PEX- pipes have 0.18 mm/(m°C) length expansion, i.e., 90 mm per 10 m pipe, at 50 °C temperature difference. If the pipes are installed with small curves with clamp spacing 0.6 meter as described in Building Research Design Guide 553.117 and 553.185, much of the expansion will be picked up between the space of the PEX- pipe and the protection tube.

Water hammer

Water hammer can cause noise from the pipe in tube system due to movement (strokes) between PEX-pipes and protection tubes. This movement can be avoided if the pipes are installed with small curves with clamp spacing 0.6 meter as described in Building Research Design Guide 553.117 and 553.185. It is also recommended to use special taps that have a water hammer reducing closing mechanism installed.

Pipe protection

Pipe protection is not included in LK Universal pipe in tube system. It is recommended to install pipe protection in stud partitions where there is a risk of penetrating the pipes with nails, screws etc. Protection tubes that go through steel partitions should have protection that stops movements caused by expansion forces and water hammers from damaging the tubes.

PEX-pipes must not be exposed to sunlight (UV- radiation) for a long period of time and tape must not be used on the outside of the pipes. The pipes have good durability against all water qualities, but should not be exposed to solvents, tar or oil-based products.

Cold and hot water insulation

Outer insulation of protection tubes must be considered in installations that may need insulation of hot and cold water, for example when pipes are cast in concrete.

See also recommendations regarding prevention of microbial growth and Legionellosis below.

Protection against frost

To avoid risk of freezing, pipes should not be installed in an outer wall, floor or roof. If installing pipes in outer walls, floor or roof cannot be avoided, the pipes must be placed on the warmest side of the construction, well protected from cold drafts. This means on the inner side of heat insulation and vapor barrier.

Penetration of fire walls

Penetrations through building parts must not weaken the fire resistance of fire rated building constructions. Penetrations with plastic pipes with an external diameter no more than 32 mm are allowed through bricked or cast building constructions classified with fire resistance up to class EI 90 A2-s,d0, and through insulated non-loadbearing walls classified with fire resistance up to class EI 60 A2-s1,d0. The penetrations must be sealed with a sealant that is classified with the same fire resistance as the construction. Penetration of fire rated walls shall be carried out as described in Building Research Design Guide 520.342.

Pressure testing of the system

All systems must be pressure tested after installation. Pressure testing of the pipe system should preferably be done with water. The test is performed with a water pressure of 1.3x the dimensioning pressure. The dimensioning pressure is the highest pressure that will occur in the system. It is important to consider the risk of freezing if the pressure test is performed during winter.

Marking of water circuits

The water circuit should be marked inside the manifold cabinet with exact length and where it delivers water to. A circuit form, accompanying the cabinet, should be used.

Protection against Legionellosis

Water in pipes that are rarely or never used may after a time be at risk of bacterial growth. A pipe in tube system should therefore not have unused water circuits. Unused circuits should be drained of water and plugged or closed at the manifold.

Cold and hot water pipes should not be in contact with each other to avoid heat transmission when installed. Cold water pipes should not be laid in areas with high temperature, for example in timberwork with floor heating.

7. Factory production control

LK Universal pipe in tube system is produced mainly in Sweden, Italy and China for LK Systems AB.

The holder of the approval is responsible for the factory production control in order to ensure that LK Universal pipe in tube system is produced in accordance with the preconditions applying to this approval.

The manufacturing of the products and the manufacturer's system for factory production control (FPC) is subject to continuous surveillance in accordance with the contract regarding SINTEF Technical Approval.

8. Basis for the approval

The evaluation of LK Universal pipe in tube system is based on reports owned by the holder of the approval.

The evaluation of design and technical solutions are based on recommendations given in SINTEF Building Research Design Guides.

9. Marking

System components should be marked with the producer's name or logo.

The approval mark for SINTEF Technical Approval no. 20312 may also be used.

10. Liability

The holder/manufacturer has sole product responsibility according to existing law. Claims resulting from the use of the product cannot be brought against SINTEF beyond the provisions of Norwegian Standard NS 8402

for SINTEF



Susanne Skjervø
Approval Manager