

# PEX-AL-PEX PIPE



Combines the advantages of PE-X technology with the positive features of a metal pipe

Applications:  
Tap water installations  
and radiator connections

**SYSTEM LS**

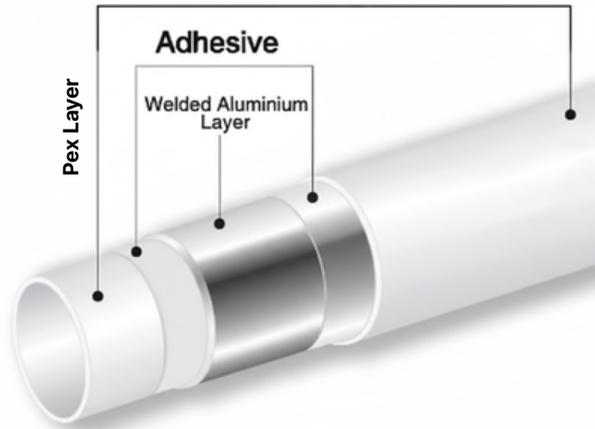
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**Catalogue**

**Technical Information**

## GENERAL INFORMATION

The LS pipe system is the culmination of constant advancements in conventional PEX pipes manufacturing technology that combines the special characteristics of cross-linked polyethylene pipes with the merits of metal pipes. You no longer have to choose between metal pipes and plastic pipes: The LS® system features major pressure resistance and stability during temperature fluctuations without sacrificing elasticity.



The LS multi-layer composite pipe is made of an inner and outer layer of cross-linked polyethylene that not only guarantees high mechanical strength, but is also highly resistant to chemicals and thermal stress. The intermediate aluminium layer welded with the TIG/laser's thermal expansion to make bending easier. This guarantees absolute sealing towards oxygen while preventing the medium in the pipe from being contaminated by the surrounding atmosphere. The material composite is created with two adhesive layers to firmly link the aluminium and polyethylene layers.

## AREAS OF APPLICATION

You can use LS pipes for:

- conducting cold and warm water for drinking water, heating and sanitary system
- conducting other fluid warm in heating systems both in heating elements and floor heating systems
- conducting warm water and other fluid warm for industrial applications
- conducting food liquids

## TOXICITY

This system guarantees compliance with maximum safety requirements for impurities in the liquids conducted. All components used have been selected and engineered to be able to guarantee maximum safety for these systems.

- there are absolutely no toxicity problems
- they are not susceptible to the spread of bacteria
- there are no oxidation or corrosion problems
- they are not susceptible to encrustations.

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## HOW THEY ARE CONNECTED

There are different ways to connect LS pipes:

- series 6000 compression fittings
- series 6400 press fittings

## THE PROPERTIES OF THE MATERIALS USED

### 1.1 CROSS-LINKED POLYETHYLENE

The PEX layer is made of polyethylene cross-linked with PE-X. It is made of linearly structured macromolecules linked by networking via cross-connections to keep the molecules from flowing when exposed to temperature and pressure.

CHEMICAL-PHYSICAL PROPERTIES	
Specific weight (g/cm <sup>3</sup> )	0.943
Tensile strength (Mpa)	20-26
Elongation percentage at break	350-450
Modulus of elasticity at 0°C (Mpa)	1400
Modulus of elasticity at 80°C (Mpa)	600
Yield strength (Mpa)	17-23
Degree of cross-linking	≥65

THERMAL PROPERTIES	
Range of use (°C)	-100°+100°
Thermal expansion coefficient (mm/m°C)	0.15
Specific heat (Kcal/Kg°C)	0.51
Thermal conductivity (Kcal/hm°C)	0.35

ELECTRICAL PROPERTIES	
Dielectric constant	2.2
Volume resistivity (Ohmcm)	>1x10 <sup>16</sup>
Dielectric rigidity (Kv/mm)	20

### 1.2 ALUMINIUM

We chose aluminium due to its low coefficient of thermal expansion and sealing towards oxygen.

CHEMICAL-PHYSICAL PROPERTIES	
Specific weight (g/cm <sup>3</sup> )	2.70
Tensile strength N/mm <sup>2</sup>	200:220
Elongation percentage at break	30
Modulus of elasticity at (Mpa)	60000-65000
Yield strength N/mm <sup>2</sup>	110:125

ELECTRICAL PROPERTIES	
Volume resistivity (Ohmcm)	2.845x10 <sup>6</sup>

THERMAL PROPERTIES	
Thermal expansion coefficient (mm /m°C)	0.0234
Specific heat (Kcal /Kg°C)	0.217
Thermal conductivity (Kcal /hm°C)	178

## 2. TECHNICAL DATA FOR LS® PIPE

Pipe dimensions in mm	1216	1418	1620	2025	2026	2632
Outer diameter, nominal size in mm	16	18	20	25	26	32
Wall thickness nominal size in mm	2.0	2.0	2.0	2.5	3.0	3.0
Internal diameter, nominal size in mm	12	14	16	20	20	26
Pipe weight in g/m	100	119	132	203	240	305
Pipe weight with water in g/m	238	286	358	525	612	924
Internal volume in l/m	0.113	0.154	0.201	0.314	0.314	0.531
Heat conductivity in W/m · K1)	0.43	0.43	0.43	0.43	0.43	0.43
Expansion coefficient in mm/m · K	0.024	0.024	0.024	0.024	0.024	0.024
Surface roughness [inner pipe] in µm	1.5	1.5	1.5	1.5	1.5	1.5
Oxygen diffusion in mg/(m <sup>2</sup> · d)	0	0	0	0	0	0
Max. operating temperature in °C	95	95	95	95	95	95
Max. operating pressure [at 95 °C] in bar	10	10	10	10	10	10
Short-time pressure loads [at 95 °C] in bar	15	15	15	15	15	15
Bend radius, freely bent	≥ 5 x D	≥ 5 x D	≥ 5 x D	≥ 5 x D	≥ 5 x D	≥ 5 x D
Bend radius with bending tools	≥ 3,5 x D					

\*using special bending tool; 1) mean value  
All values are guide values; additional pipe dimensions on request.

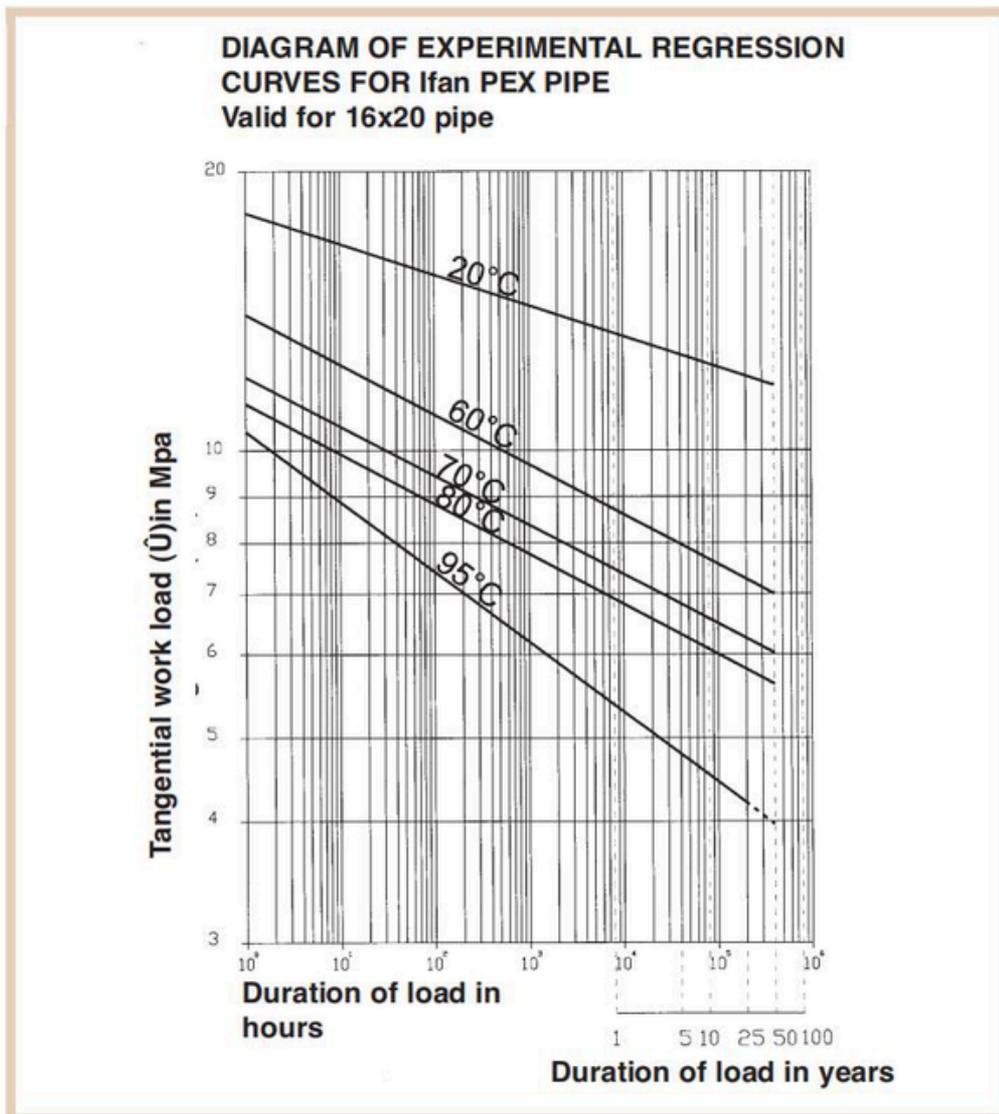
## 2.1 OPERATING PRESSURE RANGE

The LS pipe allows relatively high operating pressure depending upon a wide range of different factors including

- the pipe thickness
- the operating temperature
- the maximum application time.

The general rule is the greater the pipe thickness, the higher the pressure resistance. But in reality, both the temperature of the medium conducted and the time period that the pipe is exposed to this temperature are crucial factors for greater or lower pipe strength at any given pressure.

We have shown a diagram below as an example with the regression curves obtained in tests for the LS® Ref.16-2.0 pipe type.



TAB. 2.1.1

But, the formulas below can also be used to calculate the maximum acceptable pressure for the various pipe types:

$$1) P_{max} = 2 \times S \times \sigma_{max} / (D - S)$$

$$2) P_e = P_{max} / F$$

where:

$P_{max}$  = maximum acceptable pressure

$P_e$  = effective operating pressure

$S$  = pipe thickness

$D$  = outside pipe diameter

$\hat{U}_{max}$  = experimental tangential work load

$F$  = coefficient of safety

Therefore, the calculated maximum pressure  $P_{max}$  (formula 1) should be divided by the correct coefficient of safety  $F$  (formula 2) that depends on operating temperature.

The value calculated for  $P_e$  (formula 2) is the maximum working pressure. In general, 1.5 is set for  $f$  at temperatures below 20° C and 2 should be used for  $F$  at temperatures ranging between 20°

C and 80° C.  $F$  equals 2.5 for temperatures up to 95° C.

## TABLE OF VALUES FOR MAXIMUM WORKING PRESSURE

Reference	mm	14x2.0	16x2.25	16x2.0	18x2.0	20x2.5	20x2.0	26x3	32x3
External diameter	mm	14	16	16	18	20	20	26	32
Thickness	mm	2.0	2.25	2.0	2.0	2.5	2.0	3	3
Max. pressure 20°C	MPa	4	4,45	3,43	3	3,43	2,67	3,135	2,486
Max. pressure 80°C	MPa	1,87	2,1	1,6	1,4	1,6	1,24	1,46	1,16

The maximum pressure values calculated in this fashion clearly prove that the LS® pipe has no problem satisfying the DVGW requirements (70° C / 10 BAR / 50 years of service life in constant operation). The LS® pipe has a service life of >25 years in constantly operation if water is used at temperatures up to 95° C at the maximum acceptable operating pressure and a coefficient of safety of  $F = 2.5$ .

## 2.2 THERMAL EXPANSION

One of LS multi-layer composite pipe's most amazing features is its low coefficient of thermal expansion because it uses an aluminium layer with excellent thermal stability properties and a high-performance adhesive between the PEX layers and the aluminium layer. The adhesive provides a permanent bond between layers making them one single body that cannot warp. That means that you get a pipe made almost entirely of plastic. That makes it lightweight and elastic, although it resembles a metal pipe in its thermal properties.

## 2.5 CHEMICAL RESISTANCE

Since the plastic forming the inner layer of the LS pipe comes directly into contact with the medium flowing through the pipe, the tables below list compatibility or not compatibility with the most common chemicals

### FLUIDS THAT CAN BE CARRIED AT ATMOSPHERIC PRESSURES OF UP TO 60°C

Fluids that can be carried at atmospheric pressures of upto 60°C

FLUIDS	CONCENTRATION
Acetic acid	10%
Vinegar	-
Adipic acid	sat. sol
Allylic alcohol	96%
Alum	sol.
Aluminium chloride	sat. sol
Aluminium fluoride	sat. sol
Aluminium sulphate	sat. sol
Ammonia, gas	100%
Ammonia, liquid	100%
Ammonia, water	dil. sol.
Ammonium chloride	sat. sol
Ammonium fluoride	sol.
Ammonium nitrate	sat. sol
Ammonium sulphate	sat. sol
Ammonium sulphide	sol.
Antimony trichloride	90%
Arsenic acid	sat. sol
Oxygenated water	30%
Water	-
Silver acetate	sat. sol
Silver cyanide	sat. sol
Silver nitrate	sat. sol
Barium sulphate	sat. sol
Hydrobromic acid	100%
Benzoic acid	sat. sol
Beer	-
Borax	sat. sol
Boric acidsat.	sol
Butane gas	100%
Butanol	100%
Calcium carbonate	sat. sol
Calcium chlorate	sat. sol
Calcium chloride	sat. sol
Calcium hydrate	sat. sol
Calcium hypochlorite	sol.
Calcium nitrate	sat. sol
Calcium sulphate	sat. sol
Carbonic anhydride, dry	100%
Carbon monoxide	100%
Chloridric acid	10%

Chloroacetic acid	sol.
Citric acid	sat. sol
Cyclohexanol	sat. sol
Cyanhydric acid	10%
Dextrin	sol.
Dioxane	100%
Ethylene glycol	100%
Ferric chloride	sat. sol
Ferric nitrate	sol.
Ferric sulphate	sat. sol
Ferrous chloride	sat. sol
Fluosilicic acid	40%
Formaldehyde	40%
Formic acid	98%
Phenol	sol.
Fluorohydric acid	4%
Photographic acid	work. sol.
Glucose	sat. sol
Glycerine	100%
Glycolic acid	sol.
Hydrogen	100%
Sulphurated hydrogen	100%
Hydroquinone	sat. sol
Milk	-
Lactic acid	100%
Yeast	sol.
Magnesium carbonate	sat. sol
Magnesium chloride	sat. sol
Magnesium hydrate	sat. sol
Magnesium nitrate	sat. sol
Maleic acid	sat. sol
Mercury chloride	sat. sol
Mercury cyanide	sat. sol
Mercurous nitrate	sol.
Mercury	100%
Methanol	100%
Molasses	work. sol.
Nickel chloride	sat. sol
Nickel nitrate	sat. sol
Nickel sulphate	sat. sol
Nitric acid	25%
Orthophosphoric acid	50%
Oxalic acid	sat. sol
Potassium bromate	sat. sol
Potassium bromide	sat. sol
Potassium carbonate	sat. sol
Potassium chlorate	sat. sol
Potassium chloride	sat. sol
Potassium chromate	sat. sol

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### Fluids that can be carried at atmospheric pressures of up to 60°C

Potassium cyanide	Sol.
Potassium dichromate	Sol. sat
Potassium ferrocyanide	Sol. sat
Potassium fluoride	Sol. sat
Potassium bicarbonate	Sol. sat
Potassium bisulphate	Sol. sat
Potassium bisulphate	Sol. sat
Potassium hydroxide	Sol.
Potassium nitrate	Sol. sat
Potassium orthophosphate	Sol. sat
Potassium perchlorate	Sol. sat
Potassium permanganate	20%
Potassium persulphate	Sol. sat
Potassium sulphate	Sol. sat
Potassium sulphide	Sol.
Propionic acid	Sol. sat
Sodium benzoate	Sol. sat
Sodium bromide	Sol. sat
Sodium carbonate	Sol. sat
Sodium chlorate	Sol. sat
Sodium chloride	Sol. sat
Sodium cyanide	Sol. sat
Sodium ferrocyanide	Sol. sat
Sodium fluoride	Sol. sat
Sodium bicarbonate	Sol. sat
Sodium bisulphate	Sol.
Sodium hydroxide	Sol.
Sodium hypochlorite	15%
Sodium nitrate	Sol. sat
Sodium nitric	Sol. sat
Sodium orthophosphate	Sol. sat
Sodium sulphate	Sol. sat
Sodium sulphide	Sol. sat
Sulphuric acid	50%
Stannic chloride	Sol. sat
Stannous chloride	Sol. sat
Sulphurous anhydride, dry	100%
Sulphurous acid	30%
Photographic developer	work. sol.
Tannic acid	Sol.
Tartaric acid	Sol.
Urea	Sol.
Urine	-
Wine	-
Zinc carbonate	Sol. sat
Zinc chloride	Sol. sat
Zinc oxide	Sol. sat
Zinc sulphate	Sol. sat

### Fluids that cannot be carried

FLUIDS	CONCENTRATION
Acqua regia	HCL/HNO3=3/1
Bromine dry gas	100%
Bromine liquid	100%
Carbon bisulphide	100%
Carbon tetrachloride	100%
Chlorine dry gas	100%
Chlorine water	Sol. sat
Chloroform	100%
Fluorine gas	100%
Nitric acid	> 50%
Ozone	100%
Sulphuric acid	
Sulphuric anhydride	100%
Thionyl chloride	100%
Toluene	100%
Trichloroethylene	100%
Xylene	100%

### Fluids that can be carried at atmospheric pressures of up to 20°C

FLUIDS	CONCENTRATION
Acetaldehyde	100%
Glacial Acetic acid	> 96%
Acetic anhydride	100%
Amyl alcohol	100%
Aniline	100%
Oxygenated water	90%
Benzaldehyde	100%
Benzine	-
Butyric acid	100%
Cromic acid	50%
Cicloesano	100%
Decahydro-naphthalene	100%
Diocetylphthalate	100%
Hepthane	100%
Ethanol	40%
Ethyl acetate	100%
Furfurilic alcohol	100%
Fluoridric acid	60%
Phosphoric trichloride	100%
Nicotinic acid	Sol. dil.
Oils and greases	-
Oleic acid	100%
Orthophosphoric acid	95%
Oxygen	100%
Picric acid	Sol. sat
Lead acetate	Sol. sat
Potassium hypochlorite	Sol.
Propionate acid	100%
Pyridine	100%
Sulphuric acid	98%
Triethanolamine	Sol.

# PROPERTIES

## 2.6 ABRASION RESISTANCE

Thanks to its inside layer consisting of cross-linked polyethylene, the LS pipe is not susceptible either to chemical or electrochemical corrosion. In other words, neither oxygenated particles nor calcium encrustations are detached from the pipe's inner surface. Beyond this, the inner PEX layer has particularly high abrasion resistance, which is especially of importance in curved line sections where the abrasion effect of particles and impurities is increased by the medium's greater velocity.

## 2.7 ACOUSTIC INSULATING PROPERTIES

The LS pipe has excellent sound absorption properties because, in contrast to conventional metal pipes, the low transmission velocity of vibrations in the polyethylene here swallows noises when they are developing.

## 2.8 BURNING PROPERTIES

The metal layer on the inside makes the pipe flame-resistant and the flue gases from burning polyethylene are very low density without any damaging components.

## 3. PRECAUTIONS

We would like to point out that MULTI-LAYER COMPOSITE PIPES may not be used for electrical grounding, even though it is made with an aluminium layer. Due to the flexibility properties you requested, polyethylene pipe lines are also not suited for supporting loads. This is the reason why we recommend not using polyethylene pipes for supporting or hanging objects. If the pipe line freezes, only warm water should be used to restart it while open flames may never be pointed at pipes or pipe connections. In any event, please bear the fact in mind that frozen water in the line system can damage both plastic and brass connections and fittings. To prevent damage from frost, pipe lines should be insulated and line systems should be evacuated especially in frost-prone zones.

### 3.1 SAFETY AND SECURITY

Physical connection, simple, convenient and safe

### 3.2 DURABILITY

The middle aluminum layer is resistant to oxygen, and the outer layer of PE is allowed to add antioxidants and light to prevent secondary pollution of water bodies;

### 3.3 HIGH TEMPERATURE RESISTANCE

High temperature resistance. 95°C -110°C , long term use 95°C, up to 110°C

### 3.4 AGING RESISTANCE

Anti-aging, compared with PPR contains a large number of tertiary carbon atoms, it is susceptible to aging due to the action of light and oxygen impurities;

### 3.5 BENDABILITY

Bendability, temperature change and small deformation, two reasons: one is that the aluminum plastic pipe is flexible coil; the other is that it has aluminum;

### 3.6 HEALTH AND ECOLOGY

microbiologically neutral in drinking water installations; they are friendly to the environment and to health-PZH approved



Piping & Fittings

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## 4. TABLE WITH MASSES AND PACKAGING FEATURES

Description	Bare pipe						Insulated pipe				
	14 mm	16 mm	18 mm	20 mm	26 mm	32 mm	14 mm	16 mm	18 mm	20 mm	26 mm
Dimension	14 mm	16 mm	18 mm	20 mm	26 mm	32 mm	14 mm	16 mm	18 mm	20 mm	26 mm
Roll length	100 m	100 m	100 m	100 m	50 m 100 m	50 m	50 m	50 m	50 m	50 m	50 m
Meters x pallet	2800 m	2600 m	2600 m	2400 m	1000 m 1200 m	1000 m	600 m	600 m	600 m	600 m	500 m
Pallet size	70x 140x200	70x 140x200	70x 140x200	70x 140x200	70x 140x200	70x 140x200	80x 80x200	80x 80x200	80x 80x200	80x 80x200	80x 80x200
Roll weight	Kg. 8,500	Kg. 10,300	Kg. 12,000	Kg. 13,400	Kg. 12,250 Kg. 24,500	Kg. 15,400	Kg. 5,500	Kg. 6,700	Kg. 8,000	Kg. 16,300	Kg. 20,480
Pallet weight	Kg. 251,000	Kg. 280,800	Kg. 325,000	Kg. 321,600	Kg. 122,500 Kg. 294,000	Kg. 308,000	Kg. 66,000	Kg. 80,400	Kg. 96,000	Kg. 195,600	Kg. 204,800
Reel m <sup>3</sup>	0,051	0,051	0,058	0,080	0,082 0,078	0,082	0,077	0,077	0,085	0,085	0,119
Pallet m <sup>3</sup>	1,96	1,96	1,96	1,96	1,96	1,96	1,28	1,28	1,28	1,28	1,28

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## 5. INSTALLATION INSTRUCTIONS

Here are a couple of simple suggestions that should be used for correct installation of systems with LS pipes.

### 5.1 Bending

Pipes can be bent in a variety of ways taking the pipe type and desired bending radius into consideration. The table contains the minimum recommended curving radii and the best technique to bring them about. We especially advise against hand bending small curving radii since this can make the pipes unstable including the defects on the outside pipe surface it causes.

#### BENDING TECHNIQUES

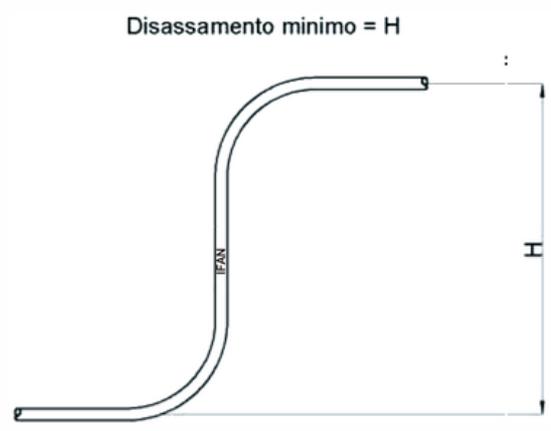
Diameter and Thickness	By hand	With external spring	With internal spring	With portable pipe bender
	Min. curve radius (mm)			
14x2.0	70	55	55	41
16x2.25	80	65	65	49
16x2.0	80	65	65	49
18x2.0	90	75	75	65
20x2.5	100	80	80	80
20x2.0	100	80	80	80
26x3.0	140	—	—	90
32x3.0	160	—	—	120

Tab. 5.1.1

#### MINIMUM MISALIGNMENT (H) BETWEEN TWO CONSECUTIVE PIPE BENDS

Diameter and Thickness	By hand	With external spring	With internal spring	With portable pipe bender
	H (mm)	H (mm)	H (mm)	H (mm)
14x2.0	90	160	160	110
16x2.25	100	170	170	120
16x2.0	100	170	170	120
18x2.0	110	175	175	125
20x2.5	120	180	180	130
20x2.0	120	180	180	130
26x3.0	150	—	—	180
32x3.0	220	—	—	240

Tab. 5.1.2



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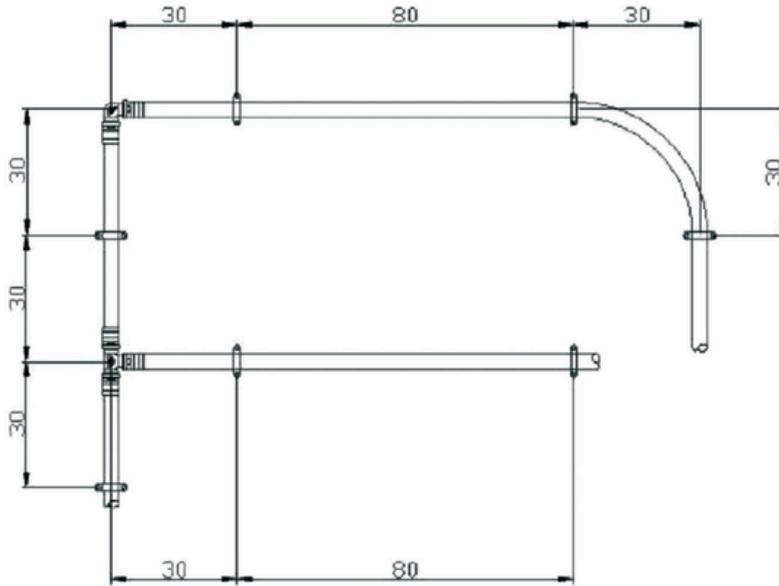
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## 5.2 FLOOR INSTALLATION

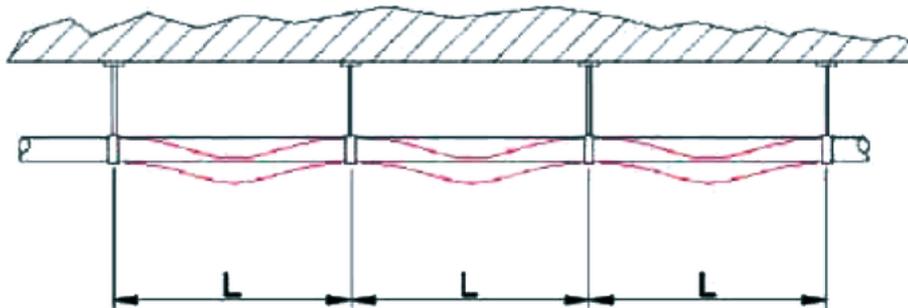
The line should be fastened on the floor with the right rings to ensure correct installation of the LS® pipe. There should be 80 cm between two fastening points on straight line sections. There should be one fastening point 30 cm before and after changing direction.



## 5.3 SUSPENDED INSTALLATION

If you install the LS pipe on the ceiling, retaining sleeves should be installed so the pipe can not bend due to thermal expansion. The distance between two suspension points depends on the pipe diameter.

The table gives the recommended distances between the retaining sleeves for the available pipe diameters.



Reference	14x2	16x2.25	16x2.0	18x2.0	20x2.5	20x2.0	26x3.0	32x3.0
L (mm)	750	1000	1000	1100	1250	1250	1500	2000

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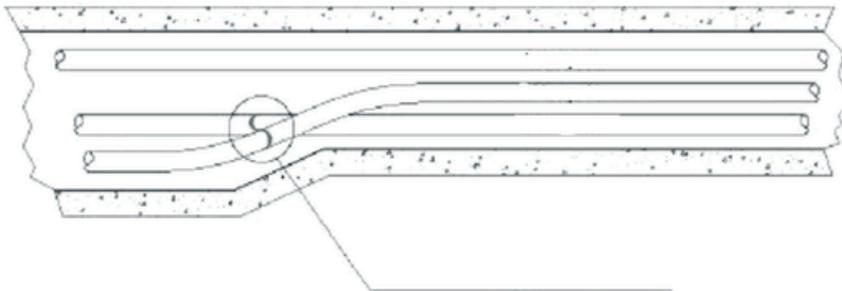
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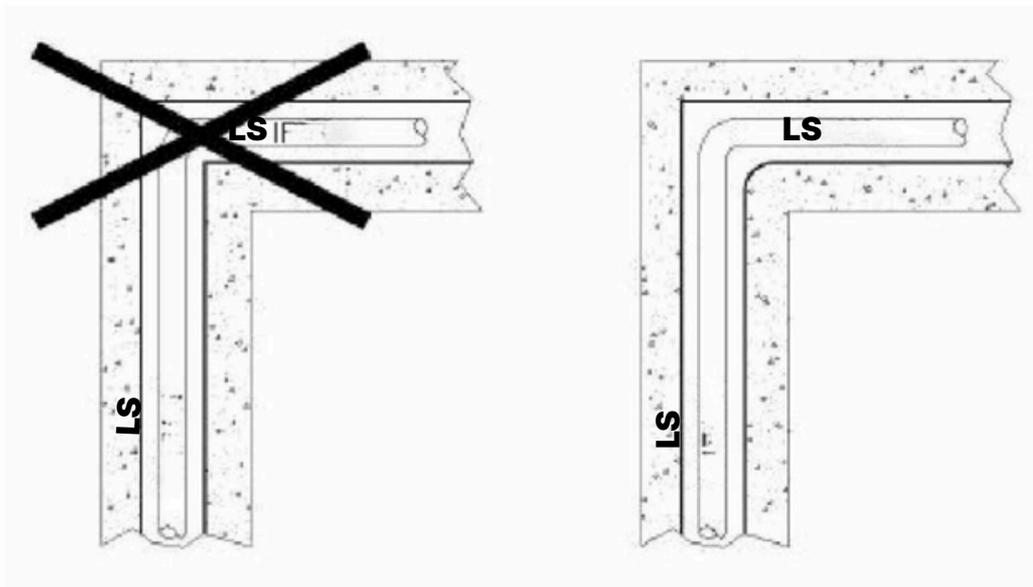
## 5.3 SUSPENDED INSTALLATION

For correct line installation in pipe ducts, they should be arranged systematically and straight fastening any intersections into one another



Fix the intersections

In addition, please make sure that the pipes are not crushed during installation by protecting them from persons walking on them or heavy objects falling on them. If they are installed in pipe ducts and walls, please also make sure that pipes are not bent over sharp edges.

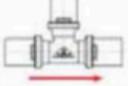
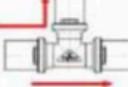


## 5.7 CALCULATING THE CONCENTRATED FLOW LOSS

You can use the table below to calculate the concentrated flow losses caused by such things as connections or pipe bends. They are given in meters as pipe length equivalents so that the concentrated flow loss can be added to the distributed flow loss without requiring any other complicated calculations.

Local flow losses in pipe length equivalents in meters

### CONCENTRATED FLOW LOSSES EXPRESSED IN EQUIVALENT PIPE METRES

Reference		14x2.0	16x2.25	16x2.0	18x2.0	20x2.5	20x2.0	26x3.0	32x3.0	40x3.5	50x4
Curved pipe		0.75	0.65	0.63	0.60	0.55	0.54	0.50	0.55	0.45	0.48
90° angle support		1.8	1.45	1.4	1.3	1.2	1.1	1.05	0.95	1.15	1.15
90° T-piece		1.5	1.25	1.0	0.9	0.75	0.73	0.62	0.59	0.55	0.65
90° T-piece		1.75	1.55	1.53	1.50	1.45	1.44	1.4	1.3	1.2	1.2
90° T-piece		1.9	1.65	1.50	1.35	1.25	1.24	1.2	1.1	1.25	1.3
Straight connection		1.15	0.85	0.80	0.75	0.75	0.70	0.65	0.20	0.35	0.45

### FOR EXAMPLE: CALCULATING THE TOTAL FLOW LOSS

Calculate the total flow losses in a line system with 80 m of LS pipes 32 x 3.0, 3 angle supports and 2 straight connections for a flowthrough of 0.8 l/s.

First of all add the pipe length and pipe length equivalents from various connections.

Pipe	angle support	Straight connections	total
80	3x0.95	2x0.2	83.25

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## GUARANTEE LETTER

Dear Our Partner:

Thank you for your choose “LS” Brand Products, We wish you can open the market with “LS” Brand Products and get win in your market. Our factory give you 25 years for guarantee for "LS" Brand Products.