KELEN®-LX

DRINKING WATER SYSTEM + INSULATION

CERTIFIED IQNet QUALITY SYSTEM

Quality assurance system
certified by ÖQS
ÖNORM EN ISO 9001:2000
Reg.Nr.366/0

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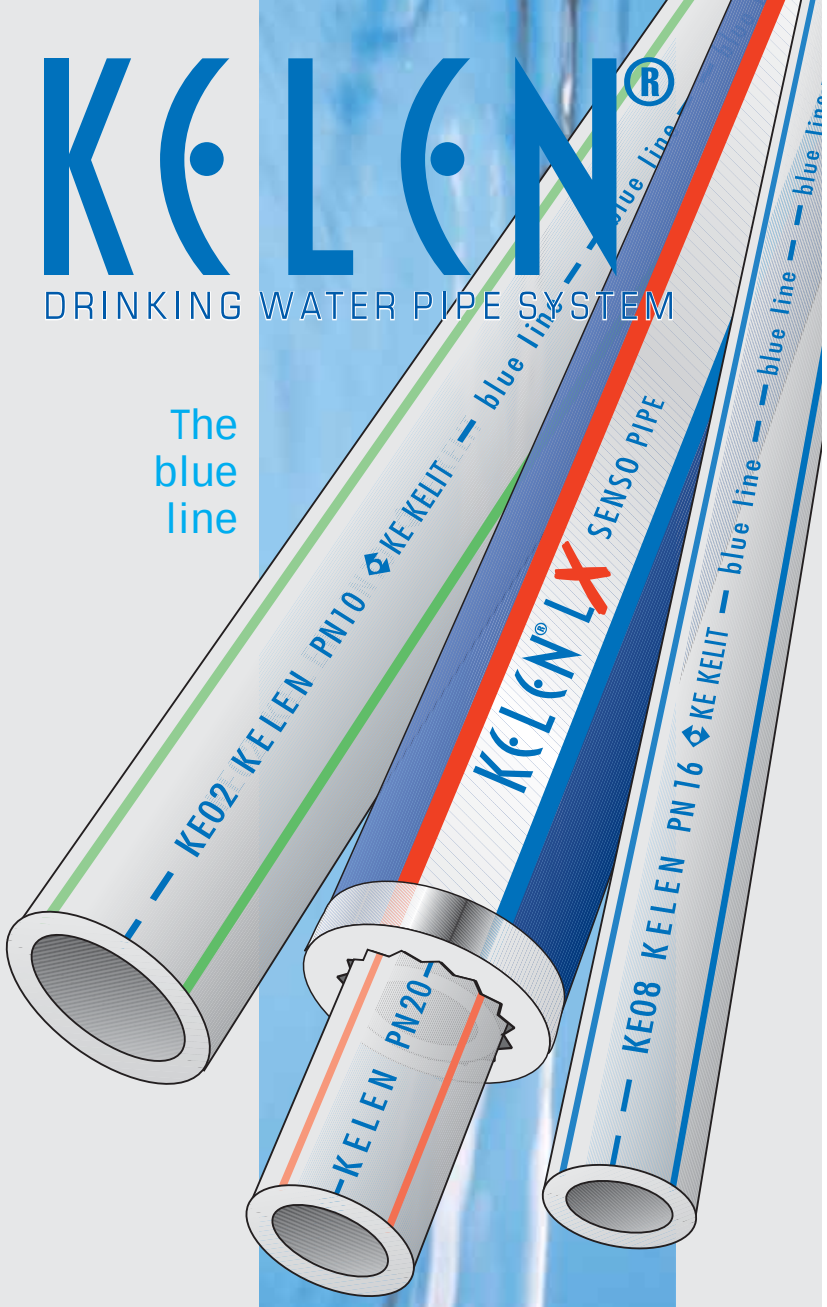
KE KELIT®
INNOVATIVE PIPE SYSTEMS

KELEN®

DRINKING WATER PIPE SYSTEM

The
blue
line



KE KELIT®

Handbook/07

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The following commonly used abbreviations are found in this catalogue.

Abbreviation	Description	Unit
A		^{2}
d		
di	Inside diameter of pipe	mm
E	Module of elasticity	N/mm^2
FP	Fixing point	
F_t	Force of heat expansion	N
IS	Insulation thickness	mm
l	Length of piping	m
MS	Minimum length of expansion pipe	mm
N	Force	Newton
P	Pressure	bar
PN	Pressure rating	bar
R	Pressure loss caused by friction	Pa/m
s	Wall thickness	mm
sec	Time	second
SF	Safety factor	
SP	Supporting point	
t	Temperature	℃
t_m	Temperature of medium	℃
t_v	Temperature at time of installation	℃
V	Volume	l/m
$\dot{V}$	Flow volume	l/sec
v	Flow velocity	m/sec
VP	Packing unit	pc
V_R	Total flow rate (DIN)	l/sec
V_S	Peak flow rate	l/sec
W	Power	Watt
Z	Flow resistance for type of fitting	Pa
z	z dimension	mm
α	Coefficient of expansion	mm/m ℃
Δ_l	Specific linear expansion	mm
Δ_p	Total pressure loss	Pa
Δ_t	Temperature difference	℃
ζ	Pressure loss coefficient	
λ	Coefficient of heat conductivity	W/m ℃
ϱ	Density	kg/m^3
Σ	Sum	
δv	Tensile stress	Mpa

KELEN-LX
DRINKING WATER SYSTEM + INSULATION

Contents

The blue line

Blue is KE KELIT´s company colour and conjures up the following associations:

The preciousness of blue water:
Clean water is becoming ever more precious. The surface of metal pipes are being destroyed by ever more aggressive ions.

The durability of blue sapphire:
Symbolic of value, durability and eternity.

The reliability of blue chip:
On the fast moving share markets a synonym for "safe bet", or "market leader" or "recommended purchase" or "no risk"

Lines are associated with continuity, direction and connections.

The colours, design and marking of the products are regulated by various national standards. KE KELIT products are easily identified by the **"blue line"** marking on the product.

The advantages of the "blue line" range:

- A complete system from one supplier.
- All three pipe materials use the same joint technology, the same machines and the same tools.
- However, each system has been designed for its particular application.
- Every new innovation is integrated into the complete product range.

The Blue line is the new direction taken by the leading pipe system supplier KE KELIT.

KE KELIT`s Quality targets

1. Our quality targets are not confined to the product. They include all areas covered by ÖNORM EN ISO 9001:2000.
2. Suppliers and customers are integrated into the quality assurance system to ensure that mistakes are prevented.
3. Every employee is responsible for the quality of his own work and should be highly motivated to continually assess his work.
4. Customer satisfaction can only be achieved by responding to the requirements of the customer and the market.
5. A responsible attitude to the environment can only be achieved by manufacturing long-life products by environment-friendly processes.

Karl Egger eh.
Managing Director

Technical standards

National and international test institutes test the conformity of our products to a range of different standards.*

KELEN-LX DRINKING WATER SYSTEM + INSULATION

ÖNORM B 5174	
DIN 8077/8078	Dimensions, pressure ratings
EN ISO 15874 1-5	Material requirements
EN ISO 15494	

KEtrix® INDUSTRIAL PIPE SYSTEM

ÖNORM B 5174	Dimensions, pressure ratings
EN ISO 15494	Material requirements, resistance to impact
DIN 8078-1	Resistance to chemicals
ASTM F1249-90	Diffusion of water vapour
ÖNORM B 5157	O_2 diffusion

General:	
EN ISO 8795:2001 BS 6920 ÖNORM B 5014-1 ÖNORM B 5018-1 + 2	Suitability for drinking water
EN 12873-1	Migration
DIN 2999 DIN 16962	Metal threads
DIN 50911	Stress corrosion cracking
ISO 6509	Dezincification resistance
DIN 17660	Brass materials

*For information about specific national approvals please contact the headquarters in Linz or the regional offices.

KEtrix® PIPE SYSTEM

Chilled water / air conditioning (PN10)

Pipe systems for **chilled water cooling systems** (down to +2 °C)
Pipe systems for **brine refrigeration** systems (down to –30 °C)

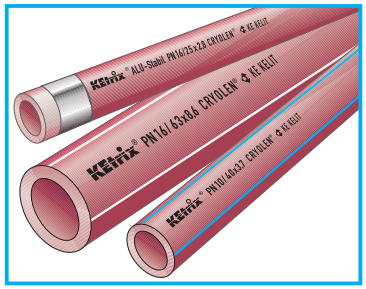
Advantages

- Range of sizes: d20 - 160
- Resistant to impact at –30 °C
- Resistant to any concentration of glycol brines
- **Oxygen barrier (NONOX® process)**
- Resistant to corrosion even when the temperature unintentionally drops below the dew point and at the aggressive temperature of 0 °C.

Drinking water max. temp: 30 °C PN10 max. temp: 40 °C PN16

Advantages

- Highly secure welded joint (safety factor > 3)
- Tools, machines, and welding times similar to **KELEN®** pipe system
- Resistant to chemicals, water particles and pressure hammer, even at low temperatures
- Resistant to corrosion even in places where unwanted condensation has formed



The alternative pipe system

The polymer

KEtrix® is made of CRYOLEN®, a PP-based polyolefine blend.

Properties:

Density	0,9 g/cm³
Tensile strength:	40 N/mm²
Elongation at tear:	800 %
E-module (20°C):	1500 N/mm²
Heat conductivity:	0,23 W/m °C
Spec. thermal expansion:	0,14 mm/m °C
Resistance to impact:	–30° C

Compressed air technology (PN16)

Compressed air has become indispensable for the manufacturing sector and is used for the following tasks:

- Driving medium for tools
- Pneumatic control systems
- Driving medium for regulator fittings
- Air purification at the workplace

Advantages

- Range of sizes: d 20 – 110
- High chemical resistance to compressor oils
- No corrosion and therefore no variation in the quality of the compressed air

A separate catalogue is available for the KEtrix® pipe system!

KEtrix® PIPE SYSTEM

Impermeability to oxygen

The molecular structure of the polymers means that small amounts gases diffuse through the material at different rates.

The problem is well-known:

- Carbonated drinks should not lose any CO_2
- Many foods need to be protected from the effects of O_2 (fats, oils, milk cheese, meat…)
- On the other hand aromas should not escape (coffee, jam, vegetables….)
- Sheets act as water vapour barriers in buildings Pipes in water circulation systems must not allow oxygen to diffuse through the pipe as this will attack the metal components and cause the following problems:
  - Corrosion (Iron, steel)
  - Incrustation
  - Blockages
  - Malfunctioning
  - Expensive repairs

In general these problems are solved by using composite materials:

A combination of plastic material with other materials which provide strength or a barrier to oxygen diffusion E.g.

- EVOH to prevent O_2 diffusion
- Fluorine polymers to prevent H_2O vapour
- PA to prevent diffusion of oils and fuels
- Metal to prevent the loss of aroma

The NONOX® process

KE KELIT has developed a new patented process:

The structure of the polymer alloy makes it possible to close the "molecular pores" by means of a "redox" treatment. O_2 molecules can no longer diffuse through the material.

The result

KEtrix® pipes, which are made completely of plastic are impermeable to oxygen when the wall thickness is a minimum of 3,7 mm.

The material was tested to ÖNORM B5157 according to the zinc absorption method.

Test reports by the TGM institute in Vienna showed the following results:

Max. diffusion
defined by standard: 0,1 mg O_2 / d . m³
Result for Ketrix: < 0,005 mg O_2 / d . m³

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Drinking water problems

Corrosion

- The concentration of ions in drinking water is increasing and consequently the risk of using metal pipes:
  Chlorides: attack stainless steel
  Sulphates: attack galvanised steel
  Nitrates: attack copper
- Ever more problematic sources of water reserves have to be tapped for the supply of drinking water
- Acid rain reduces the pH value of surface and spring water to critical levels below 7 (=neutral).
  External corrosion occurs as a result of new building and insulation materials and new installation methods.
- Disinfectants (chlorine, ozone) attack copper in particular.
  Poisonous Cu ions are released into the water!

Incrustation

- Hard water causes incrustation on the inside walls of metal materials.

The consequences:

- Higher pressure losses
- Reduced flow
- Blockages
- Expensive repair work
- Time-consuming renovation
- Disruptions in the water supply

A secure supply of drinking water is an essential factor for a high quality of life

Internal corrosion - Cu

External corrosion - Steel

Calcite deposits

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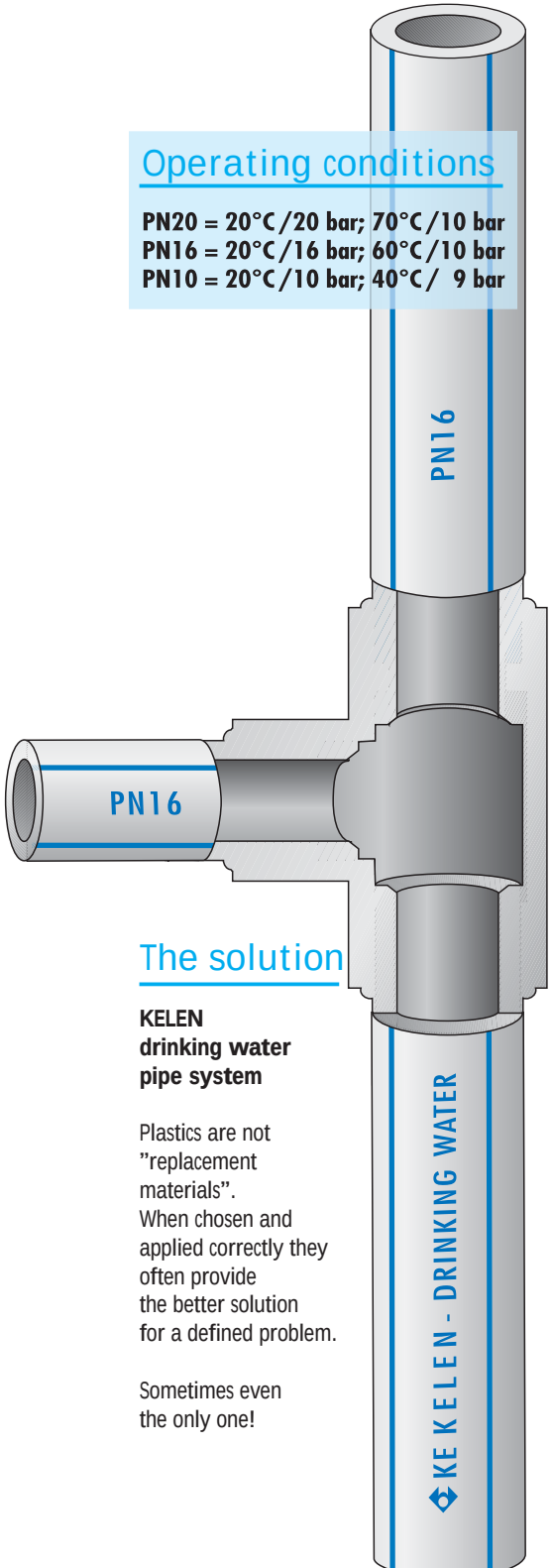
DRINKING WATER SYSTEM + INSULATION

Operating conditions

PN20 = 20°C/20 bar; 70°C/10 bar
PN16 = 20°C/16 bar; 60°C/10 bar
PN10 = 20°C/10 bar; 40°C/ 9 bar



The solution

KELEN drinking water pipe system

Plastics are not "replacement materials".
When chosen and applied correctly they often provide the better solution for a defined problem.

Sometimes even the only one!

The Result

The KELEN pipe system has many advantages. Ideal for hot and cold water installations for both new projects and renovation.

- Pressure ratings:
  PN10, PN16 and PN20
- Cold water: d20 – d160 mm
  Hot water: d20 – d110 mm
- Resistant to internal and external corrosion caused by ions in the water or chemicals on the site
- No crystallisation points for lime deposits
- Secure joint technology which requires no additional materials.
- Conforms to hygiene regulations and approved for transporting foodstuff
- Low pressure losses as a result of smooth bore
- Low noise level
- Resistant to high temperatures and pressure
- Low thermal conductivity
  comparison of λ-values:

KELEN	0,24 W/m°C
Copper	320,00 W/m°C
Cast iron/steel	42,00 W/m°C

- Stringent testing and monitoring of quality to international standards
- Secure long-term performance
- Pipes are insulated at the factory and can be located behind the wall
- Can be combined with Waterflex flexible pipe system

"No more corrosion in the 3rd millennium"

The raw materials

The long-life plastic

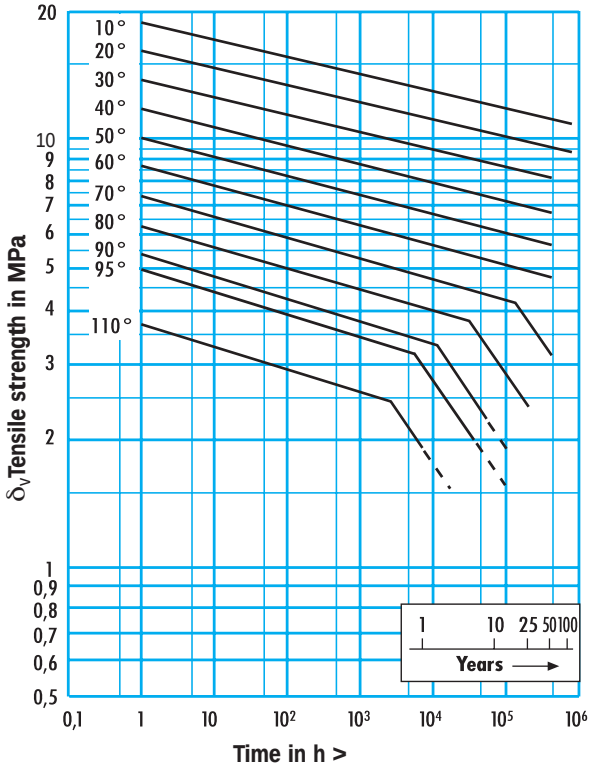
The raw material is a polypropylene copolymer (PP-R) with its typical quality characteristics (DIN 8077, DIN 8078).

Every material is subject to ageing. PP-R is no exception to this rule of nature. The "long-term creep curves", which are determined by temperature and stress, are proof of the long service life (see page 13 for operating conditions).

Density:	0,91 g/cm³
Melting point:	~ 140°C
Tensile strength:	40 N/mm²
Elongation at tear:	800 %
E-module (20°C):	900 N/mm²
Spec. heat:	2 kJ/kg °C
Heat conductivity:	0,24 W/m °C
Spec. thermal expansion:	0,15 mm/m °C

- **KELIT technology has made KELEN pipes particularly resistant to impact at –5°C.**
- **Pipes and fittings are made of the same raw material.**

Long-term creep curve DIN 8078



The following formula is used to calculate the tensile stress:

$$\delta_v = p \cdot \frac{(d - s)}{2s}$$

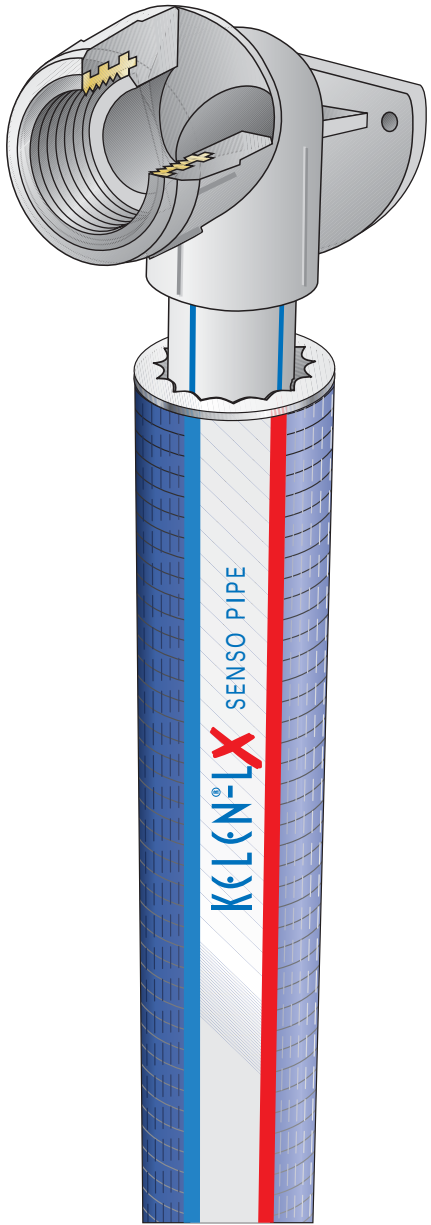
p = in N/mm²
(1bar = 0,1 N/mm²)

The expected service life can be read off the graph.

KELEN®-LX
DRINKING WATER SYSTEM + INSULATION

Metal adaptor fittings

Special care has been taken over the **choice and quality control** of the metal threads.



- Dezincification resistant brass (MS 63, CZ 132) for all parts transporting water ensures high resistance against aggressive water.
- A pore-free, chemically applied metal plating prevents stress corrosion cracking.
- Metal parts which are not in contact with the media are generally made of metal-plated MS 58 brass.
- Exceptional resistance to torsion force and suitable for on-site conditions
- Depth of the thread conforms to DIN 1692 for normal faucets

The insulation (LX)

Foam:

- Cross-linked PE
- 100% closed pore
- Density: ~ 30 kg/m³
- Heat conductivity (λ) at:
  40°: 0.038 W/m°C
  60°: 0.039 W/m°C
- Water vapour permeability
  μ = 10,000
  (an effective vapour barrier)
- Environment-friendly (CFC- free foam)
- Bubble structure to insulate against noise transmission
- Strong enough to withstand site conditions
- **Concealed pipe can be located electronically**
- Insulation can be pushed back to allow room for the welding

Protective coating:

High quality 5-layer composite made of polyolefines and aluminium

KELEN®
DRINKING WATER PIPESYSTEM

PP-R pipe system

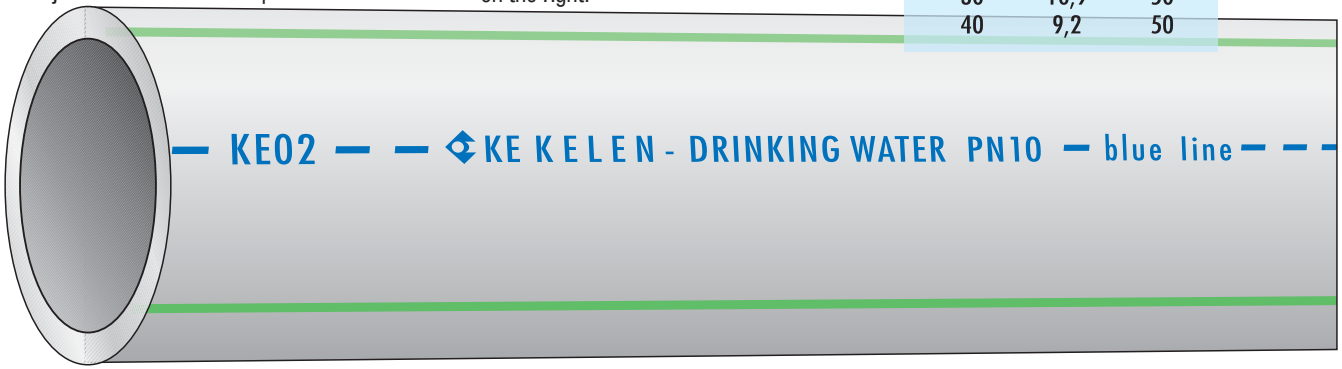
KE02 KELEN pipe	PN10
d x s	Flow rate L/m
20 x 1,9 mm	0,21
25 x 2,3 mm	0,33
32 x 2,9 mm	0,54
40 x 3,7 mm	0,83
50 x 4,6 mm	1,31
63 x 5,8 mm	2,07
75 x 6,8 mm	2,96
90 x 8,2 mm	4,25
110 x 10,0 mm	6,36
125 x 11,4 mm	8,20
160 x 14,6 mm	13,52

Dimensions:
Colour: Grey. 3 co-extruded green lines (90° apart) help the plumber to align pipe and fitting.
Standard length: 4 m,
Other lengths can be produced on request subject to minimum order quantities!

Application as specified by DIN:
Cold water
PN10: **20°C / 10 bar**
Safety factor: The DIN standard takes account of raw material properties and calculates a safety factor of 50% (SF=1.5) when deriving the operating conditions given on the right:

Operating pressure in relation to service life and operating temperature

Temperature (°C)	Pressure (bar)	Service life (years)
20	12,9	50
30	10,9	50
40	9,2	50



KE08 KELEN pipe	PN16
d x s	Flow rate L/m
20 x 2,8 mm	0,16
25 x 3,5 mm	0,25
32 x 4,4 mm	0,42
40 x 5,5 mm	0,66
50 x 6,9 mm	1,03
63 x 8,6 mm	1,65
75 x 10,3 mm	2,32
90 x 12,3 mm	3,36
110 x 15,1 mm	5,00

Dimensions: as specified by DIN 8077
Colour: Grey. 3 co-extruded blue lines (90° apart) help the plumber to align pipe and fitting.
Standard length: 4 m,
Other lengths can be produced on request subject to minimum order quantities!

Application as specified by DIN:
Hot and cold water
PN16: **20°C / 16 bar**
60°C / 10 bar
Safety factor: The DIN standard takes account of raw material properties and calculates a safety factor of 50% (SF=1.5) when deriving the operating conditions given on the right:

Temperature (°C)	Pressure (bar)	Service life (years)
20	20,4	50
30	17,3	50
40	14,5	50
50	12,2	50
60	10,1	50
70	6,7	50
80	5,1	25

KE00 KELEN pipe	PN20
d x s	Flow rate L/m
20 x 3,4 mm	0,14
25 x 4,2 mm	0,22
32 x 5,4 mm	0,35
40 x 6,7 mm	0,56
50 x 8,3 mm	0,88
63 x 10,5 mm	1,39
75 x 12,5 mm	1,96
90 x 15,0 mm	2,83
110 x 18,3 mm	4,23

Dimensions: as specified by DIN 8077
Colour: Grey. 3 co-extruded red lines (90° apart) help the plumber to align pipe and fitting.
Standard length: 4 m,
Other lengths can be produced on request subject to minimum order quantities!

Application as specified by DIN:
Hot and cold water
PN20: **20°C / 20 bar**
70°C / 10 bar
Safety factor: The DIN standard takes account of raw material properties and calculates a safety factor of 25% (SF=1.5) when deriving the operating conditions given on the right:

Temperature (°C)	Pressure (bar)	Service life (years)
20	30,9	50
30	26,1	50
40	22,0	50
50	18,5	50
60	15,3	50
70	10,2	50
80	7,6	25
95	6,1	5

KELIT
ALU Composite pipe

KE06 KELIT ALU Composite pipe PN20	
d x s	Flow rate L/m
20 x 2,8 mm	0,16
25 x 3,5 mm	0,25
32 x 4,4 mm	0,42
40 x 5,5 mm	0,66
50 x 6,9 mm	1,03
63 x 8,6 mm	1,65
75 x 10,3 mm	2,32
90 x 12,3 mm	3,36

Colour: The PP-R medium pipe is colourless. The outside layer is azure blue.
Standard length: 4 m.

A perforated ALU layer is bonded to the medium pipe by a coupling agent. This bonding reduces the expansion considerably.

Operating pressure in relation to service life and temperature

Operating conditions as specified by ÖNORM:

Cold water **20°C – 20 bar**
Hot water **70°C – 10 bar**

Safety factor: As a result of its higher resistance to temperature and pressure a PN16 ALU composite pipe can withstand the same operating conditions as a standard KELEN PN20 pipe.

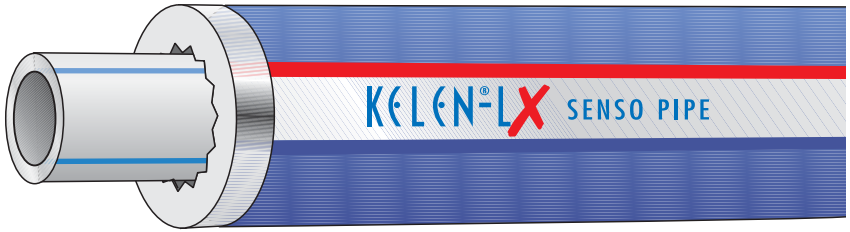
Temperature (°C)	Pressure (bar)	Service life (years)
20	30,9	50
30	26,1	50
40	22,0	50
50	18,5	50
60	15,3	50
70	10,2	50
80	7,5	25
95	6,1	5

KELEN-LX DRINKING WATER SYSTEM + INSULATION

KELEN –LX SENSO
insulated pipe system

Pressure rating	PN10	
Type	KE02-LX4	
Insulation thickness	4 mm	
Size	d 20 x 1,9 mm	
	d 25 x 2,3 mm	
	d 32 x 2,8 mm	

Pressure rating	PN16	PN20
Type	KE08-LX4/LX9	KE00-LX4/LX9
Insulation thickness	4 mm und 9 mm	4 mm und 9 mm
Size	d 20 x 2,8 mm	d 20 x 3,4 mm
	d 25 x 3,5 mm	d 25 x 4,2 mm
	d 32 x 4,4 mm	d 32 x 5,4 mm



Length of pipe: 4 m

Insulation: Pipe is covered in PE foam on the extruder line

Insulation thickness: standard 4mm and 9mm

Protective covering: HDPE linen bound fabric and viscoplastic polymer alloy

Tracing the pipe: **SENSO layer makes it possible to trace concealed pipe**

Advantages

- Enormous time savings
- Cost savings
- As a result of its elasticity the insulation can be pulled back from the welding area
- The ends of the pipes are protected from damage and dirt
- Prevents noise transmission of concealed pipes

The effect

Drinking water pipes made of PP-R are winning an ever bigger share of the world market as the best possible alternative to metal pipes which are subject to corrosion. The appropriate institutions (DIN,CEN, ISO) lay down the minimum standards.

KE KELIT does more than merely meet the minimum standards. KE KELIT provides solutions to specific economic and technical problems such as the heat loss in piping systems.

There is a much lower heat loss through KELEN hot water pipes than through metal pipes as a result of the vastly different heat conductivity of the materials (PP-R $\lambda = 0.24$ W/m°C; Copper $\lambda = 320$ W/m°C; Steel $\lambda = 42$ W/m°C).
This fact alone is not sufficient for KE KELIT who have gone a step further.

The d 20, d 25 and d 32 pipes are pre-insulated at the factory with either 4 mm or 9 mm of a special insulation (LEXEL=LX) against heat loss.
The results are remarkable:

Heat loss Q_R (W/m)

Type of installation — Riser pipes and exposed piping

	KELEN without LX...				KELEN LX4				KELEN LX9			
Medium temp. °C	60°		70°		60°		70°		60°		70°	
Ambient temp.°C	20°	25°	20°	25°	20°	25°	20°	25°	20°	25°	20°	25°
d 20	17,5	15,3	21,8	19,7	12,4	10,9	15,5	14,0	9,4	8,3	11,8	10,6
d 25	21,3	18,6	26,6	23,9	14,6	12,8	18,3	16,5	10,9	9,6	13,7	12,3
d 32	26,1	**22,9**	32,7	29,4	17,6	**15,4**	22,0	19,8	12,9	11,3	16,2	14,5

Type of installation — Embedded piping in concrete and mortar

	KELEN without LX...				KELEN LX 4				Kelen LX 9			
Medium temp. °C	60°		70°		60°		70°		60°		70°	
Ambient temp.°C	20°	25°	20°	25°	20°	25°	20°	25°	20°	25°	20°	25°
d 20	49,3	**43,1**	61,6	55,4	17,6	**15,4**	22,1	19,9	11,0	9,7	13,8	12,4
d 25	51,7	**45,3**	64,7	58,2	20,3	**17,7**	25,3	22,8	12,7	11,1	15,9	14,3
d 32	54,3	47,5	67,8	61,0	23,5	20,6	29,4	26,5	14,9	13,0	18,6	16,7

The following formula is used to calculate the heat loss:

$$Q_R = \frac{\pi\,(t_1 - t_2)}{\left(\frac{1}{\alpha_i \cdot di_{Med}}\right) + \left(\frac{\ln\left(\frac{da_{Med}}{di_{Med}}\right)}{2\lambda_{Med}}\right) + \left(\frac{\ln\left(\frac{di_{Man}}{da_{Med}}\right)}{2\lambda_{Pur}}\right) + \left(\frac{\ln\left(\frac{da_{Man}}{di_{Man}}\right)}{2\lambda_{Man}}\right) + \left(\frac{\ln\left(\frac{da_{Erd}}{da_{Man}}\right)}{2\lambda_{Erd}}\right) + \left(\frac{1}{\alpha_a \cdot da_{Erd}}\right)}$$

The potential savings

The difference between the heat loss through non-insulated and insulated KELEN pipes over the period of a year shows that there is a remarkable potential for savings.

Example

Comparison of a hotel room installation with and without LX 4 insulation:
2.7 m Riser d32 (installed in shaft)
6.0 m Distributor pipe (embedded in concrete)
8.0 m Circulation pipe (embedded in mortar)
Operating conditions:
Hot water temperature: 60°C
Average room temperature: 25°C
System in constant operation 365 days per year: t_2
Hot water requirement: 2 hours /day: t_1
Source of energy: Electricity

Annual heat loss (W)

Pipes d/lfm	Calculation lfm · Q_R · t_2 · t_1	KELEN Q_R	KELEN	KELEN LX 4 Q_R	KELEN LX 4		
20 8,0	8,0 · Q_R · 365 · 2	**43,1**	251 704	**15,4**	30 353	Potential	
25 6,0	6,0 · Q_R · 365 · 2	**45,3**	198 414	**17,7**	77 526	energy	
32 2,7	2,7 · Q_R · 365 · 2	**22,9**	45 136	**15,4**	30 353	savings	
	Sum		495 254		197 815	297 439 W = 297 KWh/a	

Amortisation calculation

The heat loss calculated above must be compensated by the permanent supply of extra energy. Depending on the source of energy (electricity, oil, gas or geothermic energy) the costs will increase considerably.

Example

1KWh of electricity: € 0.06 – 0.15
1KWh of oil/gas: € 0.04 – 0.08

If we assume that the average energy cost is € 0.075/KWh then the reduction in heat loss of 297 KWh by installing the insulated LX4 pipe will provide savings amounting to: **€ 22.28 /year.**

By comparing the costs you can make the following conclusions:

- The extra costs of the insulation is re-paid within WEEKS.
- The total cost of the piping and the insulation is re-paid within a few MONTHS
- This represents a rate of return which cannot be matched by any other form of investment or shares.

Blue line = blue chip = secure tip

The six ways of joining the pipes

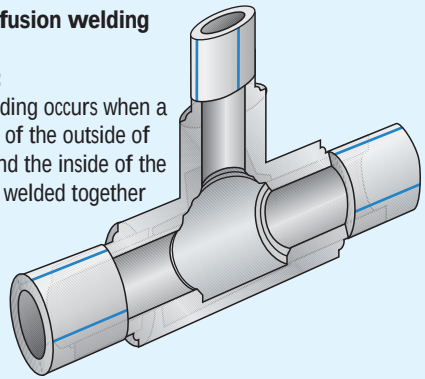
A wide range of safe and secure methods for joining the pipes is essential for a pipe system.

KE KELIT has a comprehensive range of fittings for each method of joining.

All KELEN polyfusion fittings from d 20 to d 110 are rated PN 20. They can be used for welding to pipes of all pressure ratings.

1. Polyfusion welding

Principle:
Fusion welding occurs when a large area of the outside of the pipe and the inside of the socket are welded together

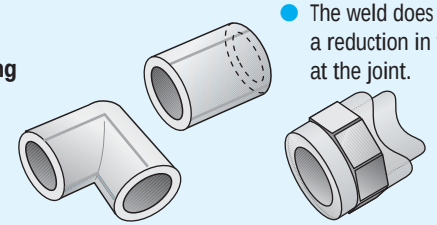


Advantages

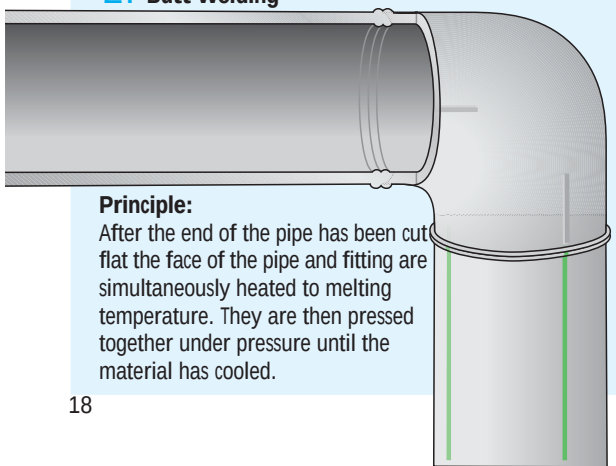
- Pipe and fitting are made of the same material. No additional materials are required.
- Welded joints are not a weak point in the system
- Pipe can only enter the fitting after they have been heated on the welding machine (important safety feature)
- The weld does not cause a reduction in the flow at the joint.

A wide range of welding fittings is available

Sizes: d 20 – d 125



2. Butt welding



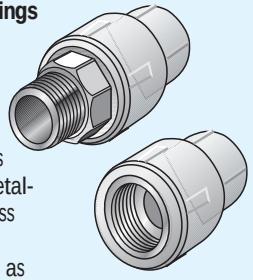
Principle:
After the end of the pipe has been cut flat the face of the pipe and fitting are simultaneously heated to melting temperature. They are then pressed together under pressure until the material has cooled.

Advantages

- Pipe and fitting are made of the same material. No additional materials are required.
- Welded joints are not a weak point in the system.
- The weld does not cause a reduction in the flow at the joint

Sizes:
d160/PN10

3. Threaded adaptor fittings

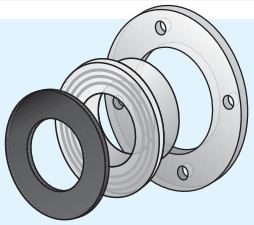


d 20 x 1/2" – d 75 x 2 1/2"
The threads conform to DIN 2999 and are made of dezincification resistant brass (MS63-CZ 132). They are metal-plated to protect against stress corrosion cracking. Male and female threads are available as both straight and elbow fittings.

Advantages

- Wide range of fittings
  Female thread is a straight thread
- Male thread is tapered and roughened
- Thread is firmly anchored in the fitting
  High resistance to twisting strain

4. Flange connection



Sizes: d20 – d160
The solution for flanged fittings
Backing ring conforms to pipe sizes
d20 – d125: Fusion welding
d160: Butt welding

Advantages

- Can be detached at any time
- Elastic EPDM seal
- Dimensions conform to DIN 2501-PN16

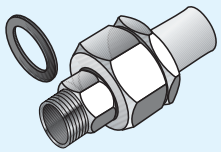
5. Detachable union fittings

Sizes:
d 20 x 1/2" – d90 x 3"

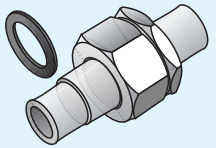
3 types:

Advantages

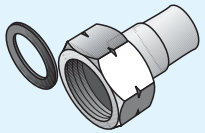
- Detachable fittings
- Elastic EPDM fittings
- **KE57** fitting for connecting to appliances



KE55-PPR-male thread



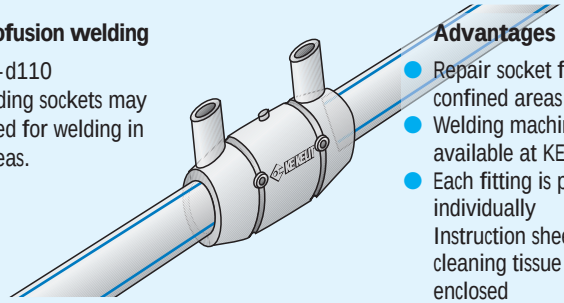
KE56-PPR-PPR



KE57-PPR-female thread

6. Electrofusion welding

Sizes: d20 – d110
KELIT E-welding sockets may be considered for welding in confined areas.

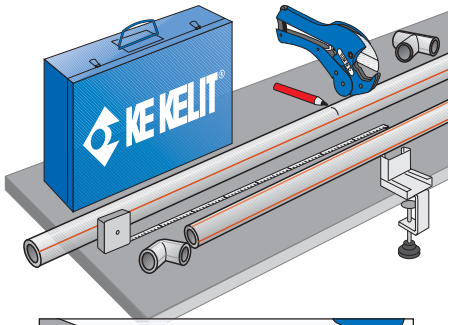


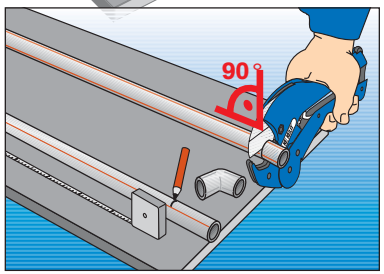
Advantages

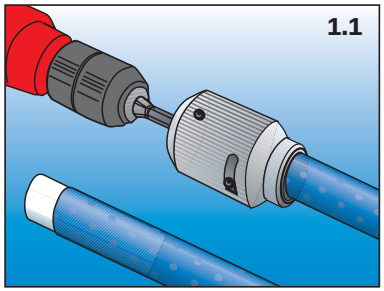
- Repair socket for confined areas
- Welding machine available at KE KELIT
- Each fitting is packaged individually
  Instruction sheet and cleaning tissue are enclosed

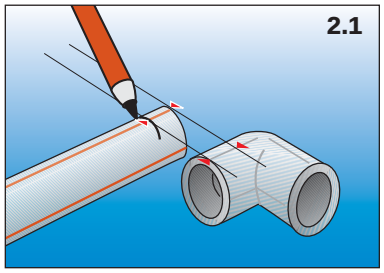
KELEN-LX
DRINKING WATER SYSTEM + INSULATION

KELEN® polyfusion welding with the hand welding machine









1. The pipes and fittings are joined by polyfusion welding at 260°C. The welding machines and tools are self-regulating. Just connect to the electricity supply (230V) and wait:
The **red** light indicates that the machine is connected to the electricity supply.
When the **green** light goes out the welding temperature has been reached.
Work can begin.

Measure the length of pipe required and cut the pipe with the appropriate pipe cutter (up to d40 with the pipe shears;
up to d110 with the wheel pipe cutter).

1.1 Before welding the **KELIT ALU composite pipe** sufficient aluminium must be removed by the peeler to allow the pipe to be welded to the full depth of the socket. The colourless medium pipe is clearly distinctive from the protective covering.

Important: There should be no aluminium in the welding area. Make a visual check before welding!

The pipe can then be welded to the fittings in the same way as the standard **KELEN** pipe.

The welding procedure

2. Ensure that the surface of the pipes are clean and free of grease

2.1 Measure the depth of the socket and mark the insertion depth on the pipe accordingly.

2.2 The heating time (see table) begins when the full insertion depth of the pipe and the whole of the socket in the fitting have been pushed on to the welding tools.

2.3 The heating time varies according to the pipe size (see table).
Once the heating time has elapsed push the pipe and fitting together smoothly and evenly without delay. The result is a homogeneous and strong joint.

2.4 Three lines on the pipe (90° apart) act as a guide for making a straight joint.

2.5 The position of the fitting can be adjusted for a few seconds immediately after the pipe and fitting have been joined. A short time later (see table) the joint is capable of withstanding operating conditions.

3. The low weight and high flexibility of the material makes it possible to weld whole sections of the piping at the work bench. Take advantage of this and save a lot of time.

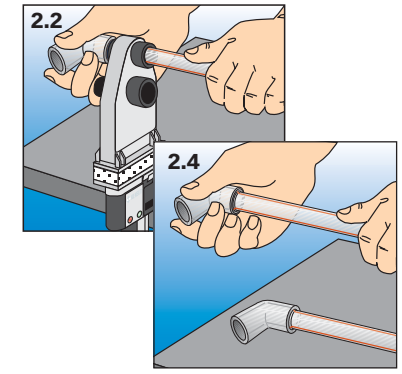
4. Make sure that any joints which still need to made in the wall are positioned so that they are accessible with the welding machine.

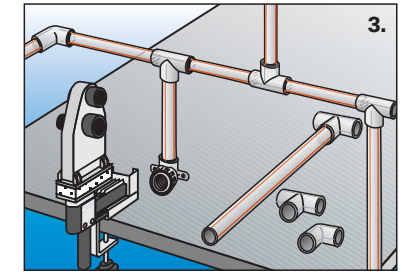
5. The distance between the draw-off points at the wall can be set (for all common installations) both horizontally and vertically using a template equipped with a spirit level.

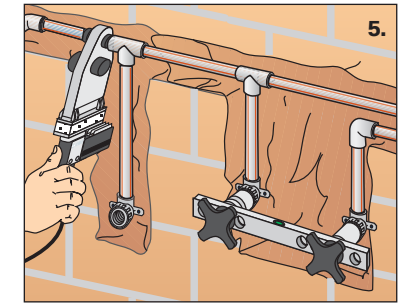
6. The pipes should be insulated according to the relevant national standards.

Welding times

d mm Pipe OD	Heating time sec	Adjusting time sec	Cooling time min
20 25	5 7	4	2
32 40 50	8 12 18	6	4
63 75 90	24 30 40	8	6
110 125	50 60	10	8





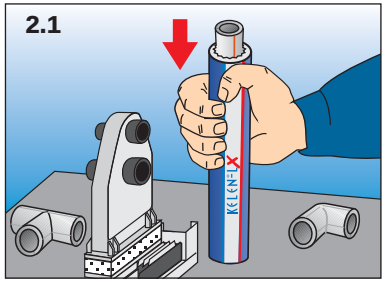


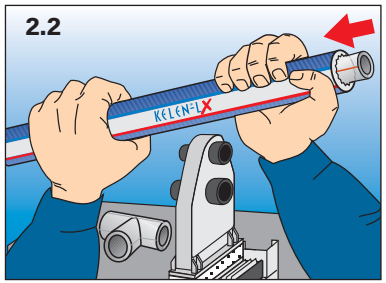
Polyfusion welding of KELEN®-LX pipes with the hand welding machine

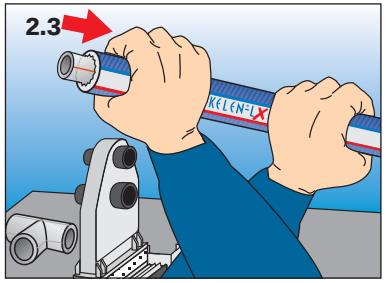
Important!

The bubble structure and the good grip make it easy to pull back the insulation.

Pressing the insulation to the pipe can prevent the insulation from slipping back







The following guidelines apply for all pre-insulated KELEN-LX pipes.

Point 1. is identical to the instructions for non-insulated pipes on pages 20 and 21

2. Exposing the ends of the pipes

2.1 For short lengths of pipes the welding area can be exposed by simultaneously supporting the pipe on a bench and pushing back the insulation.

2.2 For longer lengths of pipes one hand holds the pipe while the other hand pushes back the insulation

2.3 For especially long lengths of pipe it may be easier if the hands are crossed over.

2.4 It is NOT necessary to cut the insulation.

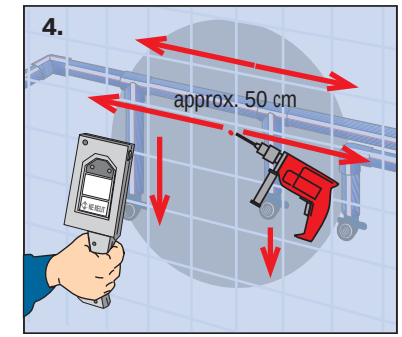
3. The welding procedure and welding times are identical to **point 2.** of the instructions for the standard KELEN pipe.

4. SENSO pipe detection

SENSO properties LX insulation allows the system to be located up to a maximum depth of 80 mm in the wall.

4.1 Follow the instructions for the detector.

4.2 Locate where the pipe is running both horizontally and vertically within a radius of 50 cm from the place where the hole is going to be drilled.



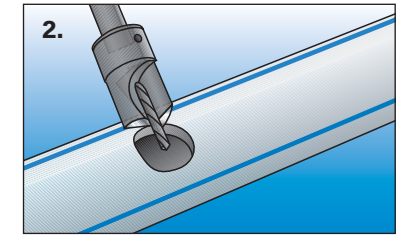
Welding KELEN® saddle fittings

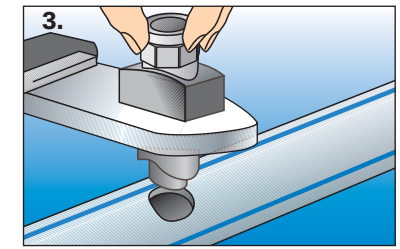
1. The surface of the pipes and saddle fittings should be free of grease, clean and dry.

2. A hole is drilled in the pipe using a 24 mm saddle drill.

3. The pipe wall and the saddle fitting are heated simultaneously with the specially designed welding tools for approx. 30 sec.

4. Once the heating time is over the saddle fitting is pushed into the pipe wall immediately (**do not twist!**) and pressed for approx. 30 sec. The melting of both the pipe wall and the pipe surface ensures a strong homogenous joint. After approx. 10 minutes the joint can be subjected to operating conditions.





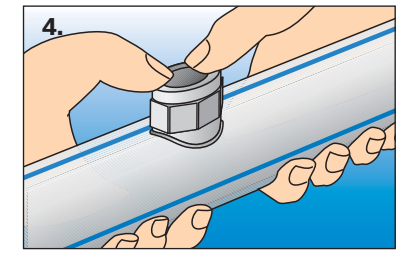


Table welding machine

1. Screw the required **heating elements** to the **welding plate**. The length of the heating element varies according to the size of the pipe and the section of pipe to be welded.

2. One side of the **pipe clamps** can be used for small pipe sizes (**d20 – d40**). For larger sizes (**d50 – d90**) the clamps should be turned around.

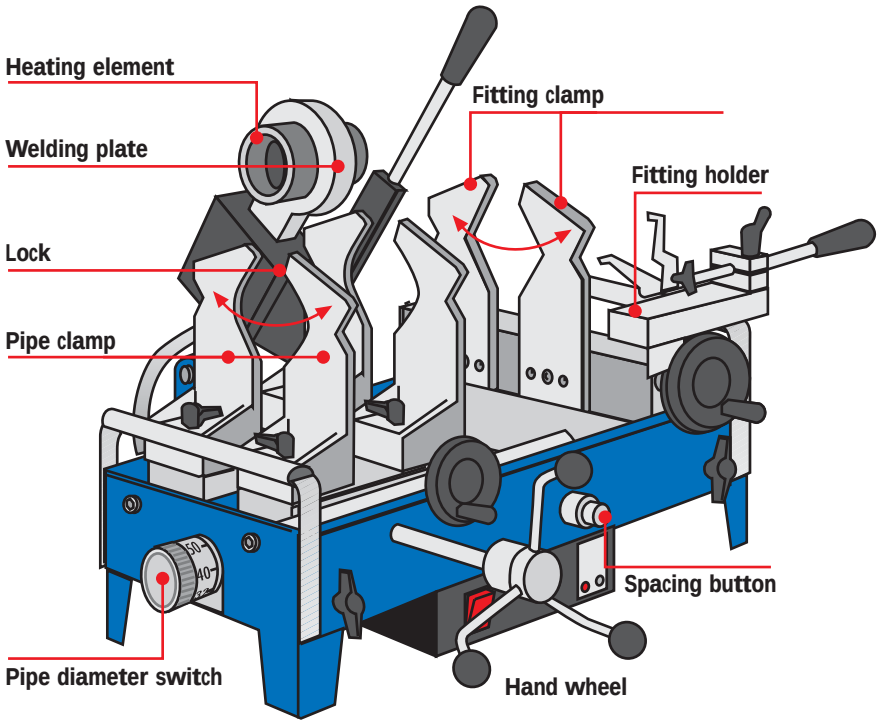
3. The same principle applies for the **fittings clamps**.

See pages 20 and 21 for instructions on preparing pipes and fittings for welding.

4. Set the pipe **diameter switch** to the required size. This switch regulates the length of the pipe that will be welded into the socket

5. Spacing button.
Press the button to fix the distance between the two sliding blocks which will enable the appropriate section of pipe and the complete socket of the fitting to be heated on the welding elements.

Note: The machine is available in two sizes:
Type 1: d20 – 90 mm
Type 2: d25 – 125 mm



The welding procedure:

1. Fix the fitting in the clamp and the fitting holder. Ensure that the face of the fitting is **flat against** the clamp.

1.1 Put the pipe in the pipe clamp. **Do not tighten the clamp**.

1.2 Hold down the spacing button and move the sliding blocks together using the hand wheel until the pipe is touching the fitting or the sliding blocks can no longer move

1.3 Release the spacing button. **Only now fix the pipe in the clamp.**

2. Move the sliding blocks apart and pull down the welding plate.

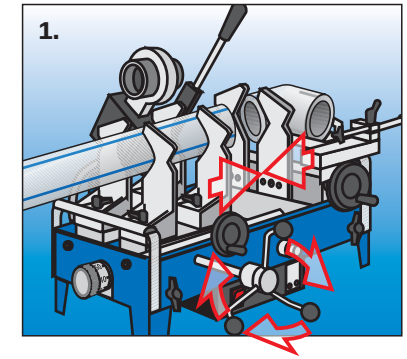
2.1 Move the sliding blocks together until they are stopped by the lock

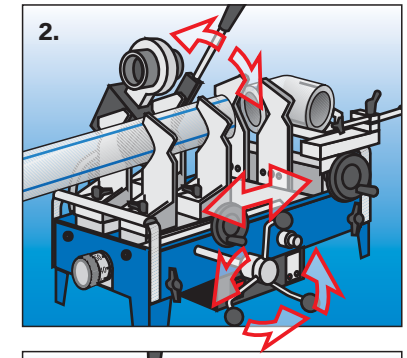
2.2 When the heating time has elapsed move the sliding blocks apart briskly and **quickly remove the welding plate**.

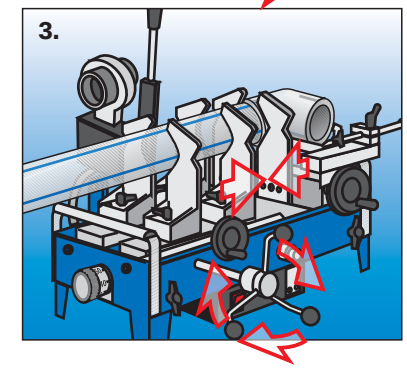
3. Push the **sliding blocks together briskly** until the pipe diameter switch catches.

3.1 Never cool the welded joint abruptly. After a while loosen the clamp and the finished joint can be removed from the machine.

3.2 Once the cooling time has elapsed the joint can be subjected to operating conditions.







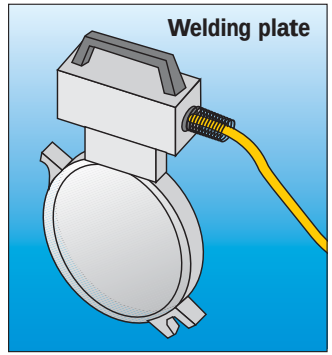
d mm Pipe OD	Heating time sec	Adjusting time sec	Cooling time min
32 40 50	8 12 18	6	4
63 75 90	24 30 40	8	6
110 125	50 60	10	8

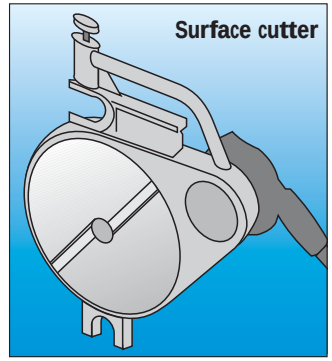
Butt welding machine for KELEN® PN10 pipes

The table below is valid for the KELIT butt welding machine WZ115.

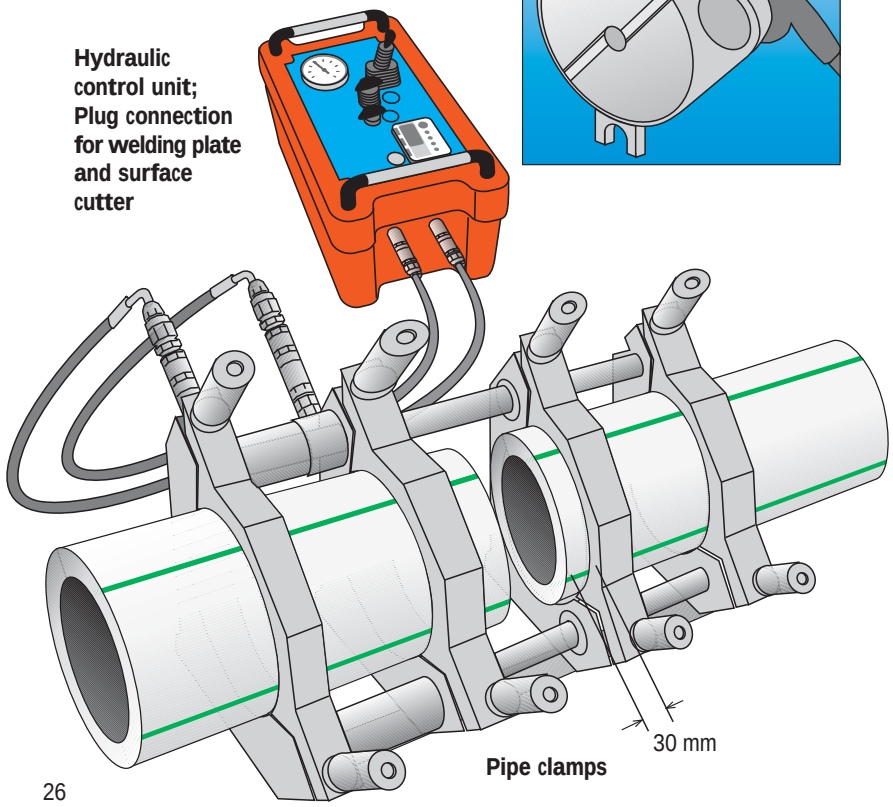
If you use other welding machines then follow the operating instructions for that machine.

Pipe	SDR series	Joining pressure	Height of bead	Heating pressure	Heating time	Max. change-over time	Time to build up pressure	Welding pressure	Cooling time
dxs		bar	mm	bar	sec	sec	sec	bar	min
160x14,6	11	**27**	1,0	3	**277**	8	13	**27**	24





Hydraulic control unit; Plug connection for welding plate and surface cutter



Pipe clamps

1. Loosen the screws and fit the required reducers in the clamps

1.1 The end of the pipes should protrude from the clamps by no more than 30 mm.

2. Put the surface cutter between the pipe ends. Move the pipes together and remove the oxide layer on the welding surface by cutting away 0.2mm of the surface. Ensure that the ends of the pipes are vertically parallel to each other (maximum deviation: 0.3 mm). The maximum deviation horizontally is 0.5 mm.

3. The welding procedure
(see table on the left for welding criteria)

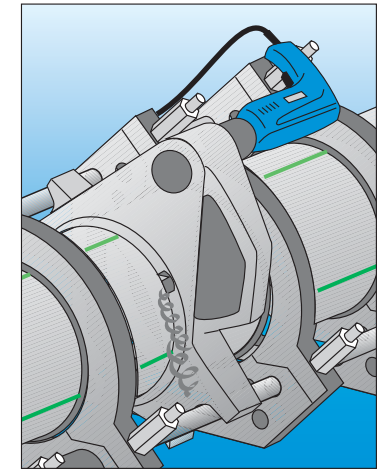
3.1 Before welding begins read off the manometer the pressure required to bring the pipes together. This pressure must be **added** to the joining pressure given in the table.

3.2 Insert the heating element (temp: approx. 210° C). Press the pipe ends on the heating element and apply the pressure as defined in 3.1 until a bead forms around the complete circumference of the pipe. During the **heating time** the pressure must be reduced to the **heating pressure**. Once the heating time is over move the sliding blocks apart rapidly and remove the heating element.

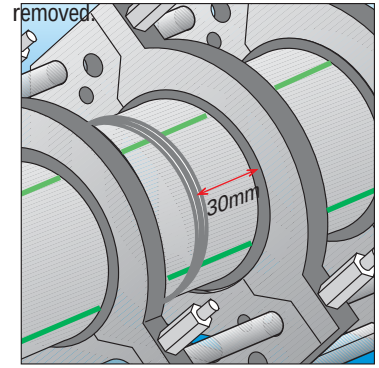
3.3 The **change-over time** (time between removing the heating element and welding the pipes) should be as short as possible.

3.4 The welding pressure should be built up as smoothly as possible during the time given in the table (minimum: 0.15 N/mm^2)

3.5 The welding pressure must be maintained during the **cooling time**.



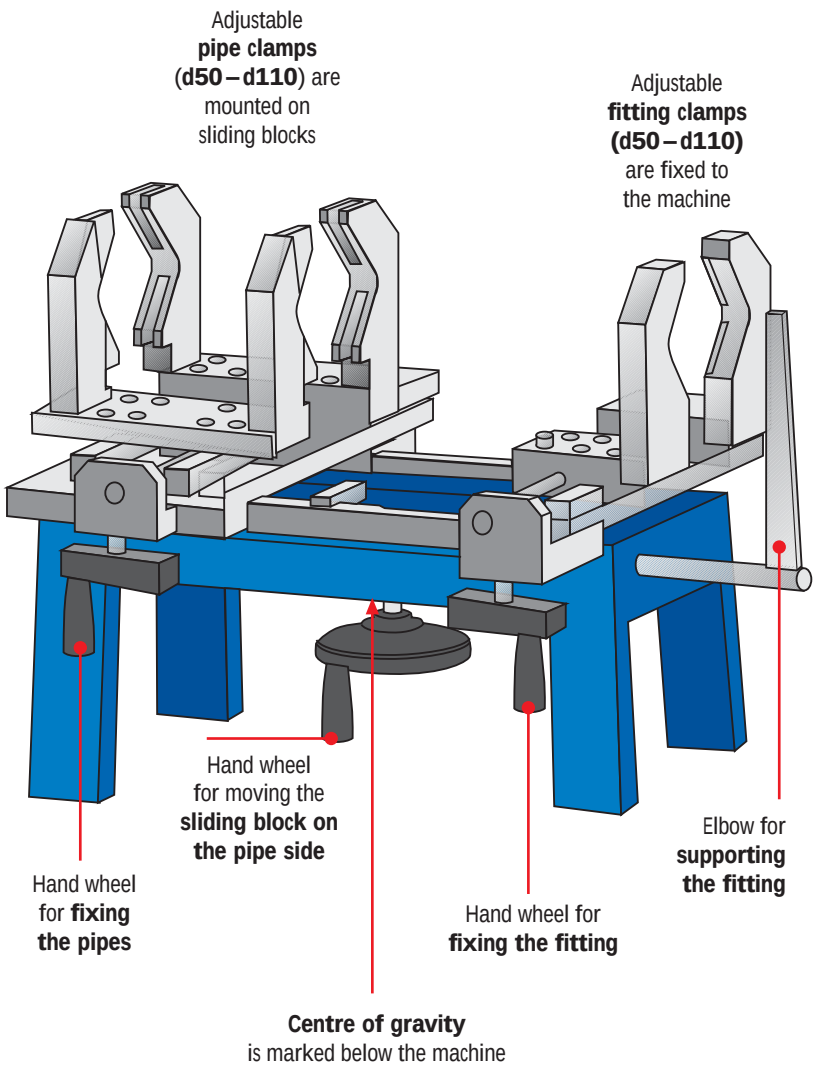
IMPORTANT:
The pipes ends **cannot** be touched and must be welded immediately.
If this is impossible and the welding has to be done later then the welding surface has to be cleaned and any grease removed.



Never cool the joint abruptly.
If the weld has been done correctly a double bead should be visible around the whole circumference of the pipe.

Overhead welding machine

It is recommended to use the overhead welding machine for exposed piping in confined areas (d50 – d110).



1. Fix the pipe clamps to a pipe that has already been installed. The machine will hang at the end of the pipe.

1.1 To provide extra support the pipe should be clamped close to a pipe bracket

1.2 A pole can be placed under the centre of gravity to support the machine if necessary.

1.3 The pipe should protrude far enough out of the pipe clamp to ensure that the pipe can be fully welded into the socket of the fitting but also allow enough space for the welding plate.

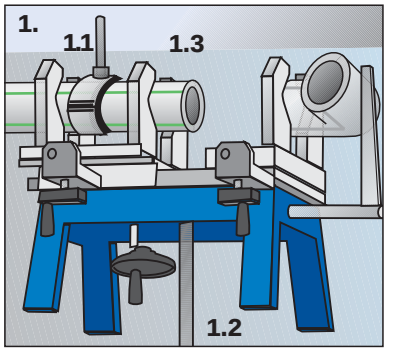
The space between the pipe and the fitting when the sliding block has been completely rolled back should be approx. 100 to 150 mm.

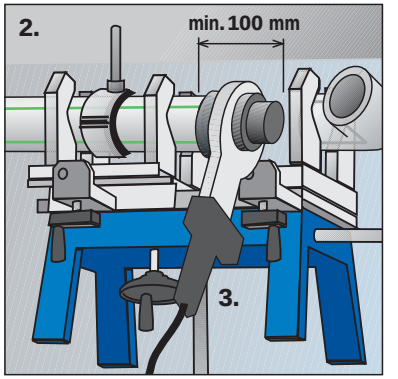
2. Put the fitting in the clamp and support the fitting with the fixing elbow. The fitting must have sufficient room to move sideways so that the whole of the socket can be welded.

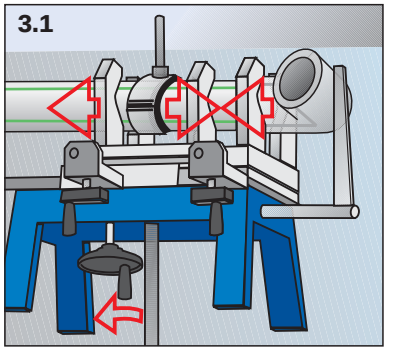
3. Put the welding plate between the pipe and fitting. Turn the hand wheel to move the pipe and fitting on to the welding tools. Heat the pipe and fitting.

3.1 When the heating time is over remove the welding plate and push the pipe and fitting together briskly to weld the joint.

3.2 When the cooling time is over the joint can be subjected to operating conditions.







d mm Pipe OD	Heating time sec	Adjusting time sec	Cooling time min
50	18	6	4
63	24	8	6
75	30		
90	40		
110	50	10	8

Special plumbing solutions

Polyfusion welding of the **KELEN®** pipe system is both secure and quick. A lot more time is spent fixing the pipes and joining to the faucets. The are some practical solutions which can make the job easier for the plumber.

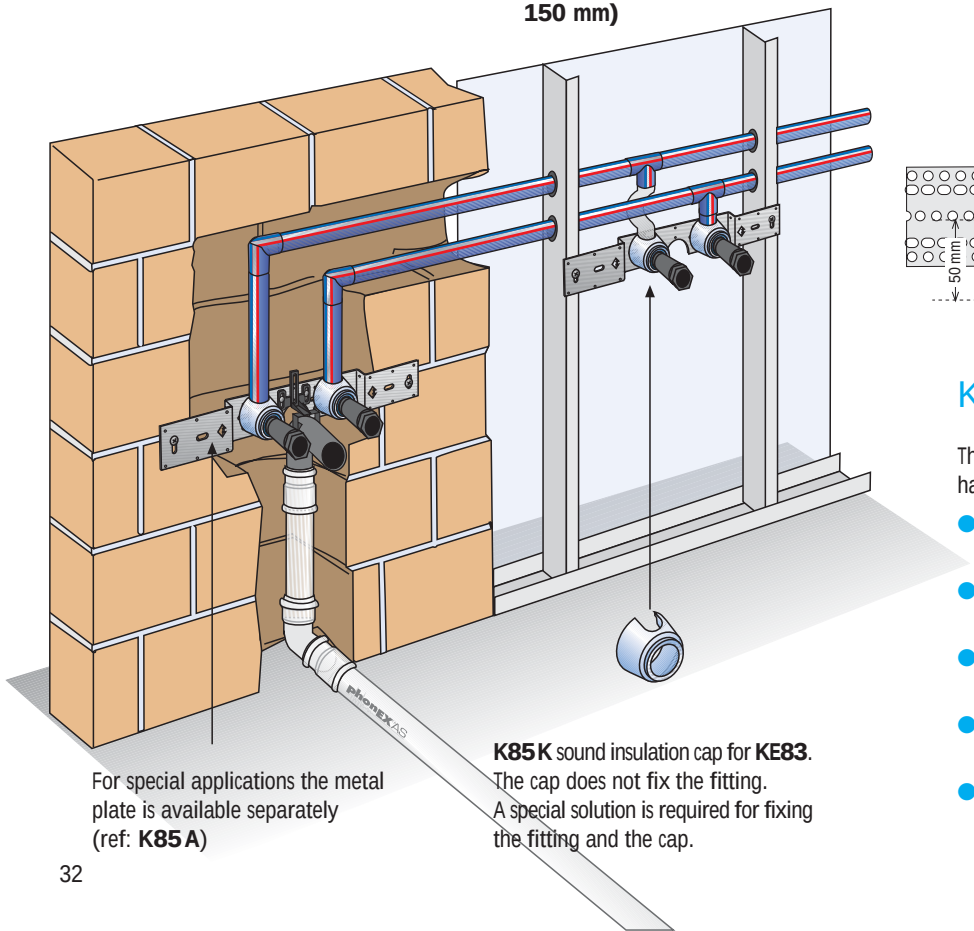
Method of installation:

- Partition wall installation
- Brick wall installation
- Installation in front of the wall

K85 KELEN® Joining set

The set is used for fixing the outlets at the wall and consists of the following items:

- Metal plate (2.5 mm thick)
- Wall brackets: **KE83** d 20 or d 25 x 1/2" and double peg fitting
- Sound insulation caps
- Elastomer sound insulation pads
- Plastic stoppers
- Pegs and screws
- Connection to d 50 siphon trap and d 30 rubber nipple is optional
- **Set available for single outlet or for double outlet (80-100mm or 150 mm)**



For special applications the metal plate is available separately (ref: **K85A**)

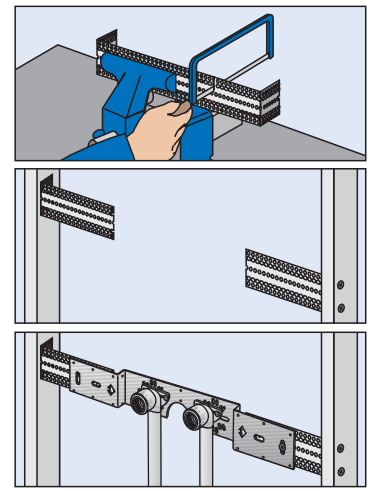
K85K sound insulation cap for **KE83**. The cap does not fix the fitting. A special solution is required for fixing the fitting and the cap.

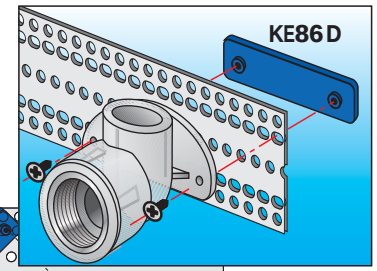
K85H KELEN® Fixing plate for partition walls

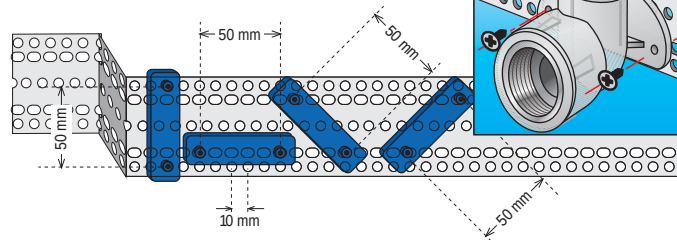
A special system is required for installations in front of the wall and in partition walls.

By cutting the **K85H** plate to the required length it is possible to arrange the plate so that the fittings are fixed in the required positions.

The fitting is fixed to the double peg fitting **K86D** behind the plate.



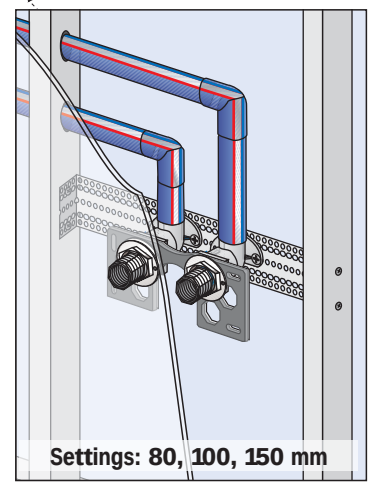




K86 HA Faucet plate

The faucet connection fitting **KE83HA** has the following properties:

- **No transmission of energy** to the plaster board
- The holes are octagonal to prevent twisting of the fitting
- The torque force on both fittings is balanced by the fixing plate
- The octagonal holes mean that the fitting can be fixed in every position
- **Sound insulating** pad is completely covered with PE soft foam



Pipe sizing Pressure losses in KELEN® pipes

The total pressure loss (Δp) in the **KELEN®** pipe system is calculated by multiplying the friction loss (R) by the length of the piping (l) plus the sum (∑) of the friction losses for the individual fittings (Z).

Total pressure loss Δp

$$\Delta p = (l \cdot R + \sum Z) \text{ in Pa}$$

The choice of pipe size for the water supply is dependent on the following factors:

- The available water pressure
- Geodetic difference in height
- Pressure losses through system components
- Minimum flow pressure through faucets
- Pressure losses in the pipes
- The individual pressure losses of the fittings
- Type, number and simultaneous use of the draw-off points
- Flow velocity

Note:
For the purpose of pipe sizing it is assumed that that there will be no reduction in the internal diameter caused by incrustation since the surface structure of the pipe is amorphous and the surface roughness of the pipe is minimal (0,007).

Maximum flow velocity according to DIN 1988

Maximum design flow velocity for a given pipe run	≤ 15 min m/s	>15 min m/s
Service pipes	2	2
Supply mains: pipe runs with low head loss in-line valves (ζ < 2.5)	5	2
In-line valves with greater loss factor	2,5	2

Calculation of the pressure loss (Z) for the standard fittings

$$Z = \zeta \cdot \frac{v^2 \varrho}{2}$$

Fitting	Symbol	Coefficient ζ
Elbow 90°		1,3
Elbow 45°		0,4
Tee - straight flow	v	0,3
Tee - flow separation	v	1,3
Tee - reverse flow	v v	1,5
Reducer		0,4
Stop valve		
d20	G	10,0
d25	G	8,5
Slanted seat valve		
d20		3,5
d25	S	2,5
d32–63	S	2,0

Nominal sizes of main circulating pipes (guideline values)

Nominal size of hot water pipe		Nominal size of circulating pipe
d 20 – 40	=	d 20
d 50	=	d 25
d 63 – 75	=	d 32
d 90 – 110	=	d 40

KELEN® DRINKING WATER SYSTEM + INSTALLATION

Guidelines for pipe sizing (DIN 1988 / 3)

1. Determine the design flow rate and minimum flow pressure for all the draw-off fittings

The design flow rate V_R is derived from the draw-off fitting flow rate. The table below gives guideline values for the design flow rate of common types of fittings and appliances. The design flow rate V_R may be determined as a mean value using the following equation.

$$\dot{V}_R = \frac{\dot{V}_{min} + \dot{V}_{max}}{2}$$

2. Determine total flow rates and assign to pipe runs

The design flow rates for all draw-off points shall be added, starting at the draw-off point furthest from the water main and ending at the water main, and the total flow rates so obtained assigned to the pipe runs considered, each run extending from the fitting where the total flow rate or pipe diameter changes until the next fitting.

At the junction of the cold water pipe feeding the water heater with the pipe that branches off, the total flow rate comprises that of the cold and hot water side.

3. Use of total flow rate / peak flow rate

The design flow rate of all draw-off points shall be included in the design of water supply system, adding the flow rate of the draw-off points for which continuous use is to be assumed to the peak flow rate of the other draw-off points (continuous use being defined as use lasting more than 15 minutes).
Assumptions regarding simultaneous demand are to be based on the type of building or its occupation (e.g. residential building or communal facility).
Normally it may be assumed that not all draw-off fittings are fully open at the same time.
The conversion curves for the different applications are shown on pages 40 and 41.

4. Determination of pipe diameter

Determine the pipe size, pressure loss and flow velocity (see tables on pages 37 to 39).

5. Evaluation of head loss in terms of available pressure

The head loss shall be almost equal to but not greater than the available total head loss.

Guidelines for pipe sizing (DIN 1988 / 3)

6. Minimum flow pressure and design flow rate for typical draw-off points and appliances.

Minimum flow pressure bar	Type of draw-off fitting or appliance		Design flow rate		
			Mixed water*)		Cold water only
			$\dot{V}_R$ cold l/s	$\dot{V}_R$ hot l/s	$\dot{V}_R$ l/s
	Taps				
0,5	without jet regulator	DN 15	–	–	0,30
0,5		DN 20	–	–	0,50
0,5		DN 25	–	–	1,00
1,0	with jet regulator	DN 10	–	–	0,15
1,0		DN 15	–	–	0,15
1,0	Shower heads				
		DN 15	0,10	0,10	0,20
1,0	Flushing valves				
	for urinals	DN 15	–	–	0,30
1,0	Domestic				
	dishwasher	DN 15	–	–	0,15
1,0	Domestic				
	washing machine	DN 15	–	–	0,25
	Mixing valves for				
1,0	showers	DN 15	0,15	0,15	–
1,0	baths	DN 15	0,15	0,15	–
1,0	kitchen sinks	DN 15	0,07	0,07	–
1,0	wash basins	DN 15	0,07	0,07	–
1,0	sitz baths	DN 15	0,07	0,07	–
1,0	Mixing valves	DN 20	0,30	0,30	–
0,5	DIN 19542				
	flushing cistern	DN 15	–	–	0,13

*) The values specified are based on a temperature of 15°C for cold water and 60°C for hot water.

Note:
For any outlets or apparatus not included above or similar to the above with a different flow rate please follow the manufacturers instructions regarding the sizing of the pipes.

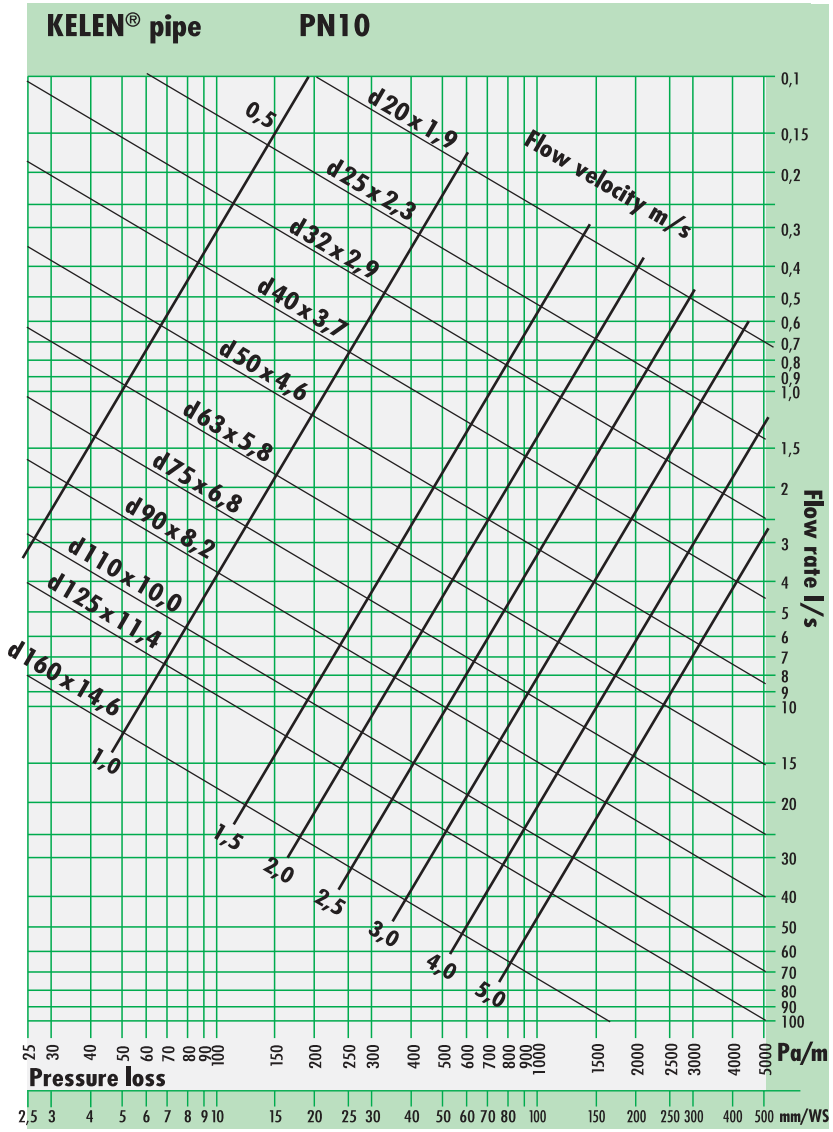
Pressure losses PN10

The method for calculating the pressure loss of the individual fittings is described on page 34.

The pressure losses are calculated according to the Nikuradse formula:

$$R = 3{,}62315 \cdot 10^3 \cdot \dot{m}^{1{,}70651} \cdot d^{-4{,}64237}$$

Surface roughness: 0,007 mm



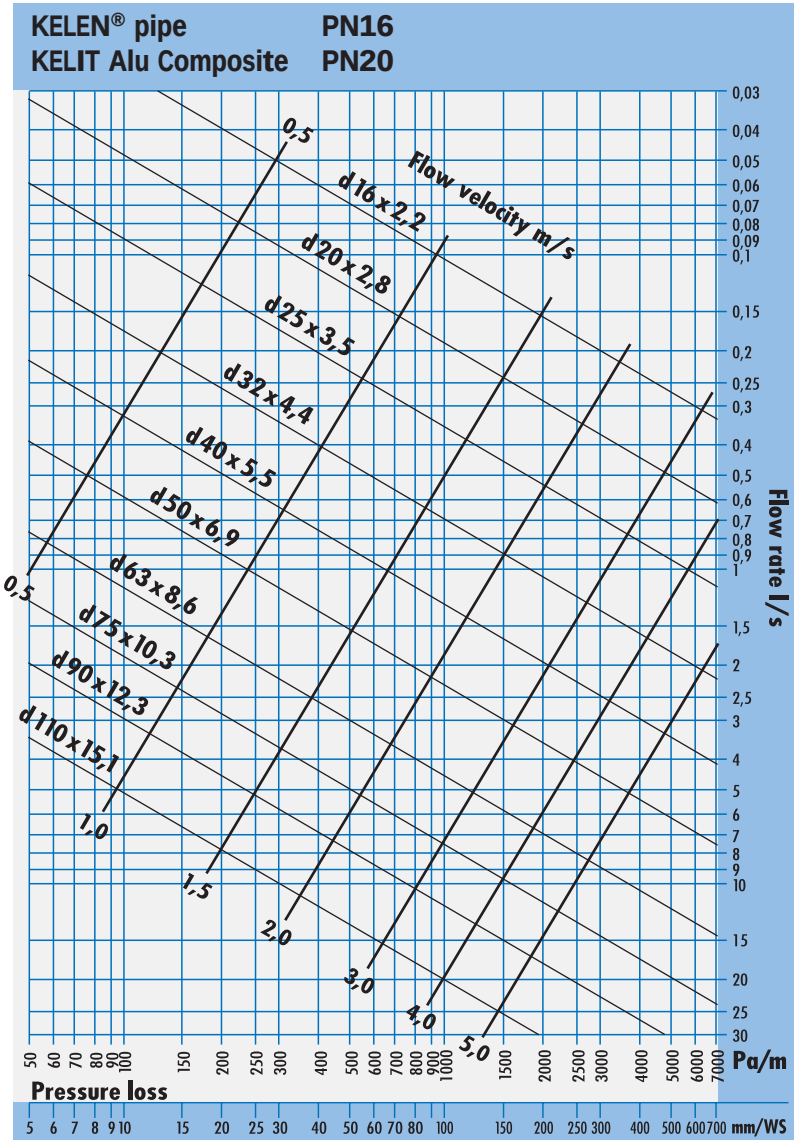
Pressure losses PN16

The method for calculating the pressure loss of the individual fittings is described on page 34.

The pressure losses are calculated according to the Nikuradse formula:

$$R = 3{,}62315 \cdot 10^{3} \cdot \dot{m}^{1{,}70651} \cdot d^{-4{,}64237}$$

Surface roughness: 0,007 mm



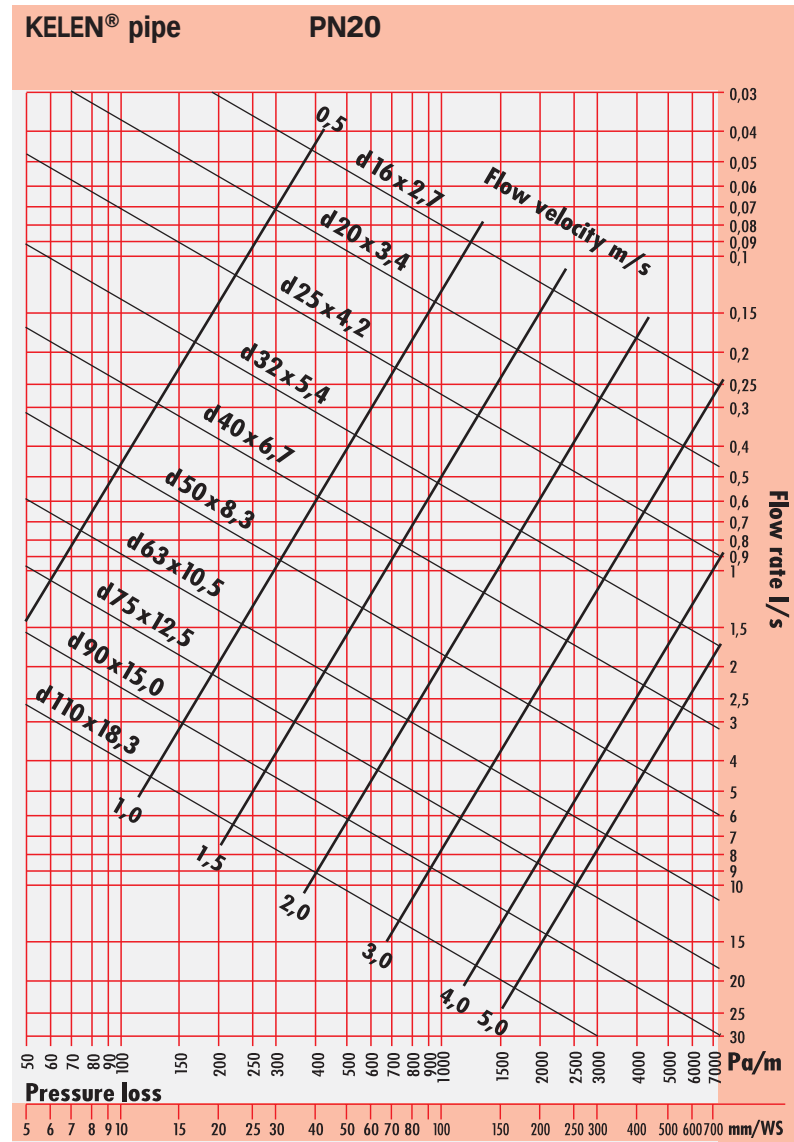
Pressure losses PN20

The method for calculating the pressure loss of the individual fittings is described on page 34.

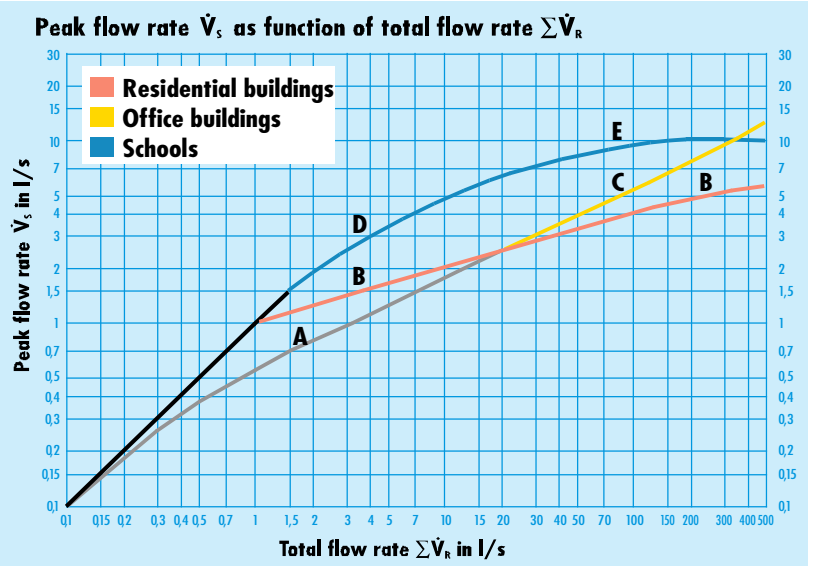
The pressure losses are calculated according to the Nikuradse formula:

$$R = 3{,}62315 \cdot 10^{3} \cdot \dot{m}^{1{,}70651} \cdot d^{-4{,}64237}$$

Surface roughness: 0,007 mm



Excerpt from DIN 1988/3



Calculating the peak flow rate $\dot{V}_S$

Type of building	Curve	Application: $\sum\dot{V}_R \leq 20$ l/s	Curve	Application: $\sum\dot{V}_R > 20$ l/s
Residential buildings	A	$\dot{V}_S = 0{,}682 \cdot (\sum\dot{V}_R)^{0{,}45} - 0{,}14$ in l/s	B	$\dot{V}_S = 1{,}7 \cdot (\sum\dot{V}_R)^{0{,}27} - 0{,}7$ in l/s
Office buildings	A		C	$\dot{V}_S = 0{,}4 \cdot (\sum\dot{V}_R)^{0{,}54} + 0{,}48$ in l/s
Schools	D	$\dot{V}_S = 4{,}4 \cdot (\sum\dot{V}_R)^{0{,}27} - 3{,}41$ in l/s	E	$\dot{V}_S = -22{,}5 \cdot (\sum\dot{V}_R)^{-0{,}5} + 11{,}5$ in l/s

Residential buildings

An additional wash basin, sitz bath, WC, urinal and bath tub (in addition to the bath tub) need not be allowed for in determining the total flow rate if it may be assumed that the level of simultaneous use will not be increased by the use of these appliances.

Schools

The peak flow rate is deemed to be equal to the design flow rate where $\sum \dot{V}_R$ does not exceed **1,5 l/s**.

Special case

If the system is equipped with draw-off fittings with a design flow rate of more than $\dot{V}_R \geq$ **0,5 l/s** then, where the total flow rate is between **0,5 l/s** and **1,0 l/s** the peak flow rate shall be deemed to be equal to the total flow rate. If the total flow rate is ≥ **1,0 l/s** or more curve B shall be used.

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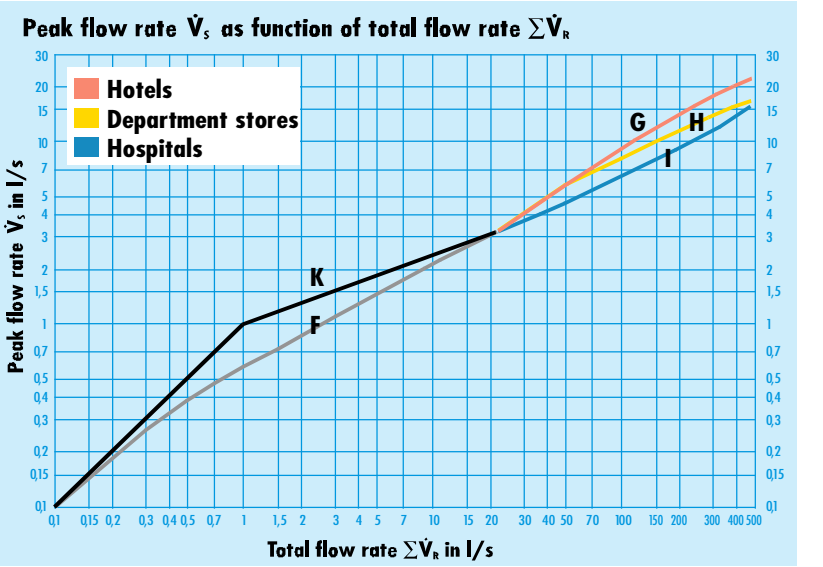
Excerpt from DIN 1988/3



Calculating the peak flow rate $\dot{V}_S$

Type of building	Curve	Application: $\sum\dot{V}_R \leq 20$ l/s	Curve	Application: $\sum\dot{V}_R > 20$ l/s
Hotels	F	$\dot{V}_S = 0{,}698 \cdot (\sum\dot{V}_R)^{0{,}5} - 0{,}12$ in l/s	G	$\dot{V}_S = 1{,}08 \cdot (\sum\dot{V}_R)^{0{,}5} - 1{,}83$ in l/s
Department stores	F		H	$\dot{V}_S = 4{,}3 \cdot (\sum\dot{V}_R)^{0{,}27} - 6{,}65$ in l/s
Hospitals	F		I	$\dot{V}_S = 0{,}25 \cdot (\sum\dot{V}_R)^{0{,}65} + 1{,}25$ in l/s

Hotels, department stores and hospitals

If the system is equipped with draw-off fittings with a design flow rate of more than $\dot{V}_R \geq$ **0,5 l/s** then, where the total flow rate is ≤ **1,0 l/s** the peak flow rate shall be deemed to be equal to the total flow rate. If the total flow rate is **>1,0 l/s** and ≤ **20 l/s curve K** (equation: $\dot{V}_S = (\sum\dot{V}_R)^{0{,}366}$ **in l/s**) is used for calculating the peak flow rate.

Other special buildings, commercial and industrial premises

Particular considerations must be given to the extent to which simultaneous demand is to be assumed for water supply systems on commercial and trade premises. The total flow rate is determined in consultation with the operator of the system.

Expansion behaviour of KELEN® pipes

Linear heat expansion

Under heat conditions all materials increase in volume and/or length according to the following formula:

Calculation of the linear expansion:

$$\Delta_l = l \cdot \Delta_t \cdot \alpha$$

The linear expansion is determined by the length of the pipe, the increase in temperature and the coefficient of expansion.
It is not determined by the diameter of the pipe.

Comparison of materials

	Coefficient of expansion α = mm/m°C	E-module 60° N/mm²
Galv. steel	0,012	220 000
Stainless steel	0,015	200 000
Copper	0,016	130 000
KELIT Alu comp.*	0,035*	3 500
PVC	0,080	1 100
KELEN	0,150	300
PEX	0,175	540

* α d 63 and above = 0,050

This means that when heated KELEN® will expand more than metal materials if the expansion is unhindered.

Expansion arm for exposed piping

Compensation must be made for the expansion of **KELEN®** pipes under heat conditions.

Even if the rise in temperature is only for a short time sufficient compensation must be made for this temperature difference.

Compensation is always made between two fixed points or between a fixed point and a change in direction of the piping (expansion arm).

Calculation of the expansion arm:

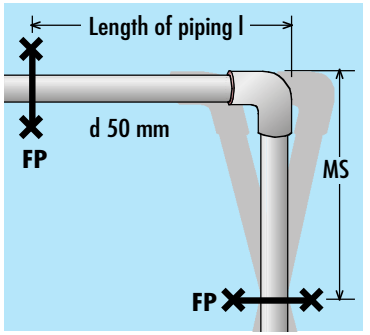
$$MS = 20 \cdot \sqrt{d \cdot \Delta_l}$$

20 = Coefficient for KELEN®
MS = Minimum length of the expansion arm (mm)
Length of pipe which branches off at 90° from the main pipe to the next fixed point

Example:
A d 50 mm pipe runs over a length of 15 m. Δ_t = 35°C
Question: How long does the expansion arm have to be to compensate for the expansion?

$\Delta_l = 15 \cdot 35 \cdot 0.15$
Δ_l = 79 mm expansion

$MS = 20 \cdot \sqrt{50 \cdot 79}$
MS = 1256 mm expansion arm



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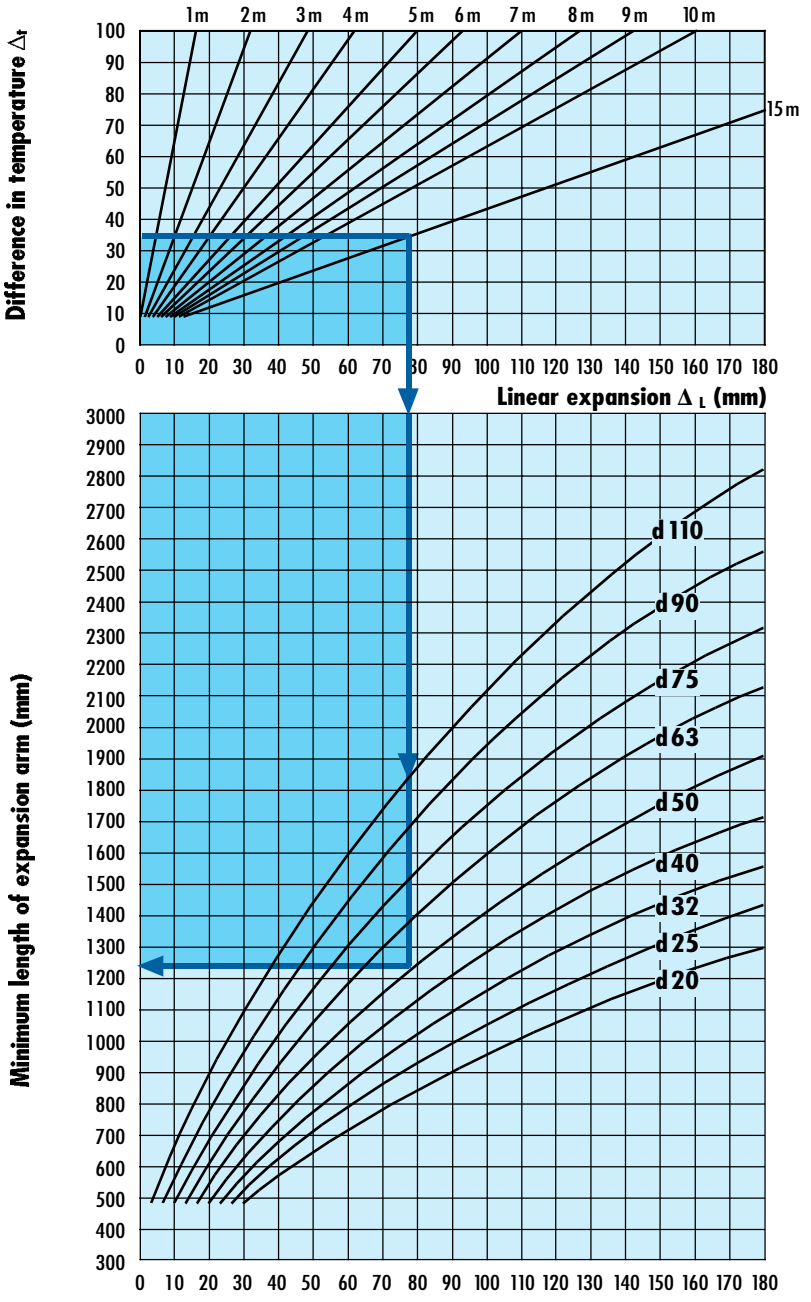
Heat expansion chart (unhindered linear expansion)



Force of heat expansion

The force of linear expansion is different for each material. The specific force of heat expansion is calculated according to the following formula:

$$F_t = E \cdot A \frac{\cdot \alpha \cdot \Delta_t}{1000}$$

The force of heat expansion is dependant on the dimension of the pipe and the change in temperature but not on the length of piping.

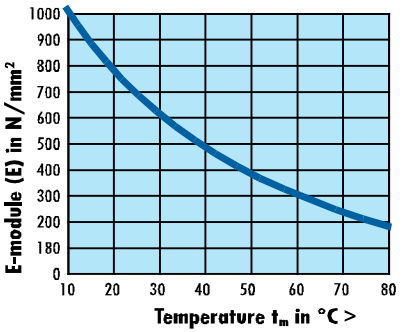
An important factor is the rigidity of the material (E-module)

The E-module of PP-R (like any other plastic) is dependant on the temperature (see graph below)

> Temperature: < E-module
< Temperature: > E-module

As the temperature increases the E-module decreases.

E-module of PP-R in relation to the operating temperature t_m

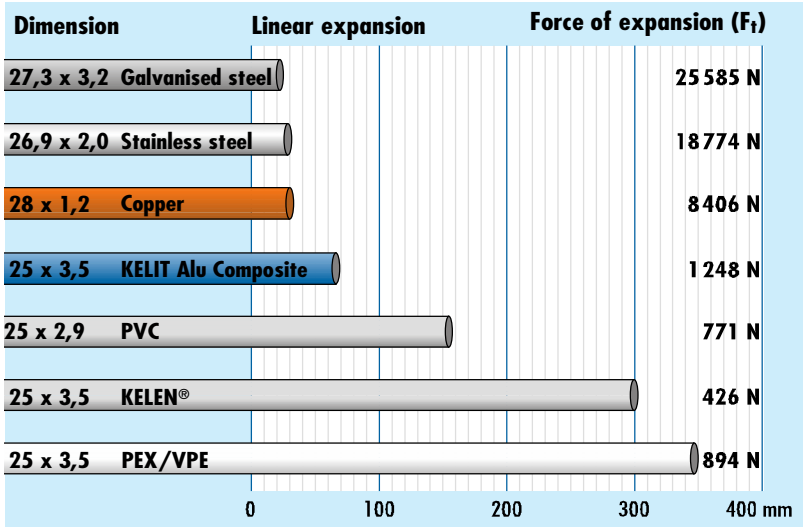


Comparison of the materials:

If unhindered KELEN® pipes will expand more than metal materials under the influence of heat. The force of heat expansion, however, is much smaller!

Example:

Length of piping:	l	= 50 m
Temperature during installation:	t_v	= 20°C
Medium temperature:	t_m	= 60°C
Difference in temperature:	Δ_t	= 40°C



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Practical solutions for compensating expansion

The following methods can be used to control the linear expansion and the force of expansion:

- **Piping that is embedded in the wall or the floor is prevented from expansion by frictional force. No extra measures are required.**
- **Compensation must be made for expansion of exposed piping**
- Even if the rise in temperature is only for a short time sufficient compensation must be made for this temperature difference
(see pages 42, 43, 46 and 47)
- Every change in temperature will exert a force.
> An expansion force will occur when the temperature rises.
< A shrinking force will occur when the temperature falls.

The force of expansion can be calculated for every installation. However, in general the force is just a fraction of the force which occurs with metal materials.

Suppliers of pipe clamps and brackets know the properties of the materials and offer a range of solutions.

- Pipe channels may be used to increase the stability of the pipe.
The expansion is reduced to the same value as steel pipes.
- The strength of the fixed points should be sufficient to compensate the expansion force.
- The specific expansion can be minimised by installing the **KELIT ALU composite pipe** (d 20 – d 90), especially on long pipelines.
This pipe reduces the expansion by approx. 75%.

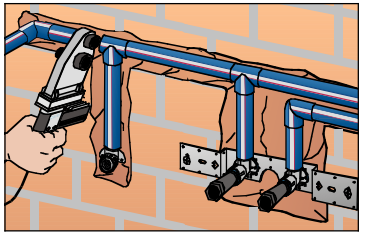
Installing KELEN®

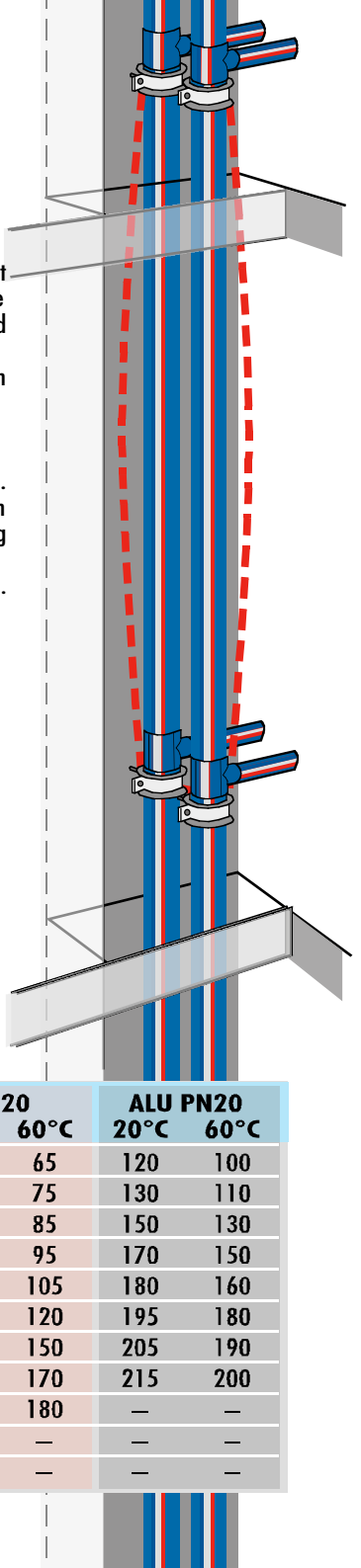
1. Installing the pipes in the shaft

In practise the main risers can expand and contract laterally in the shaft between two floors if a fixed point is located next to the pipe that branches off from the main pipe. The distance between two fixed points should not exceed 3 m. Other methods can be used to accommodate expansion such as an expansion arm in the pipe branching off from the riser.

2. Embedding the pipe

Piping that is embedded in the wall, floor screed etc.... is prevented from linear expansion. The material can absorb the pressure and tensile stress without causing any damage. If the pipes are insulated then the insulation material provides further room for expansion.





Guidelines for distance between pipe support points

The distances between the support points given below (in cm) prevent KELEN® pipes from sagging when they are filled with water and there are NO pipe channels.

d mm	PN10 20°C	PN16 20°C	PN16 60°C	PN20 20°C	PN20 60°C	ALU PN20 20°C	ALU PN20 60°C
20	70	75	60	80	65	120	100
25	75	80	70	85	75	130	110
32	90	95	80	100	85	150	130
40	100	105	90	110	95	170	150
50	115	120	100	125	105	180	160
63	130	135	110	140	120	195	180
75	150	160	130	170	150	205	190
90	185	195	150	205	170	215	200
110	195	205	160	215	180	—	—
125	205	—	—	—	—	—	—
160	220	—	—	—	—	—	—

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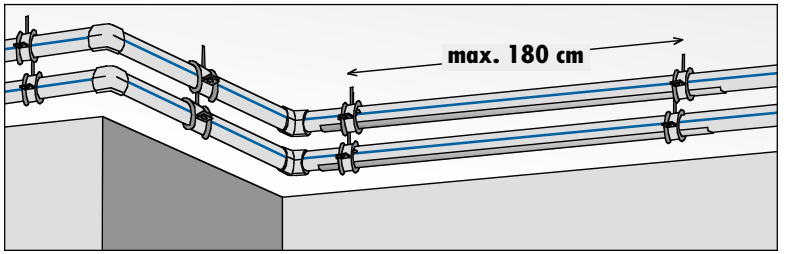
3. Exposed piping

3.1 Preventing expansion by mechanical restraint d 20–d50

For aesthetic reasons **KELEN ALU pipes** are often preferred for exposed pipes below d 63. Greater stability can be obtained by installing the pipes in steel channels.

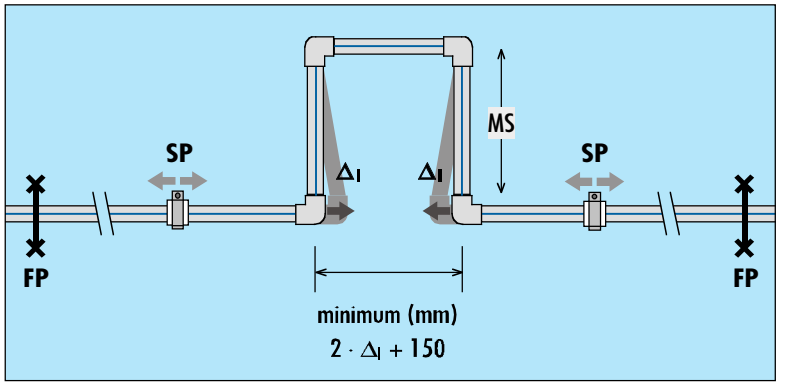
In order to achieve this stability all of the pipes must be supported by pipe channels and all of the brackets must be fastened tightly to the pipe to make them fixed points. In addition the channels are fixed to the pipe (e.g. using cable ties) except for the sizes d 20, d 25 and d 32 as the channels for these sizes are self-locking. This method reduces the linear expansion to the same amount as steel.



3.2 Expansion loops d 63 – 110

All changes in the direction of the pipe can be used to accommodate the linear expansion. In some cases an expansion loop will be necessary.

The fixed points are arranged so that the piping is divided into sections and the expansion force can be guided in the desired direction. See pages 42 –45 for the calculations of the length of the expansion arm.



Pressure testing for drinking water systems

KE KELIT recommends pressure testing to **DIN 1988/2** for plastic pipes as stated below.

As a result of the material properties of plastic pipes the pipe will expand during the pressure testing. The pressure testing is split into a preliminary test and a main test. The preliminary test is sufficient for small sections of the piping such as connecting pipes and distributing pipes in the wet rooms.

a) Preparation

1. After the pipes have been installed and before they are concealed the piping is filled with water and any air removed.
2. If possible the pump should be placed at the lowest point in the system
3. The manometer should be capable of reading changes in pressure of 0,1 bar and should be placed at the lowest point of the section of piping being tested.

b) Preliminary testing

The test pressure is equal to the maximum operating pressure of the system plus 5 bar (minimum: 15 bar). The test pressure must be built up over a period of 30 minutes. Within the 30 minutes the pressure should be re-adjusted 2 times (each time 10 minutes apart). After a further period of 30 minutes under pressure testing there should be no leaks and the drop in pressure should not exceed 0,6 bar.

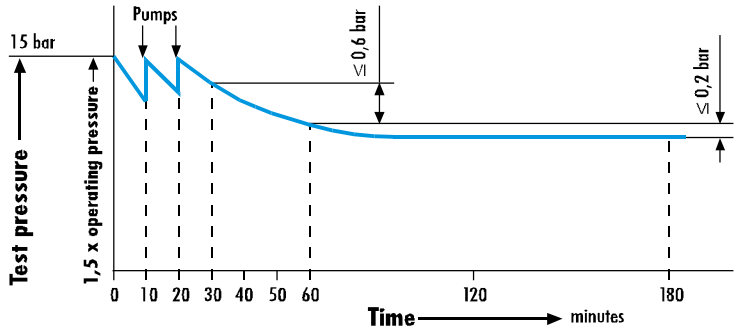
c) Main testing

The main testing should be carried out immediately after the preliminary testing. The duration of the test is 2 hours. The drop in pressure between the end of the preliminary testing and the end of the 2 hour main test must not exceed 0,2 bar.

After the pressure testing has been completed we recommend issuing a confirmed report.

Please note:

- **Fluctuations in the temperature may alter the test pressure**
- **Every pressure test is an assessment of the current state of the system and is no guarantee against any mistakes made during installation.**



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Drinking water – Pressure test report

Location: _____

Project: _____

Length of piping:	d 16 _____	m	Length of piping:	d 63 _____	m
Length of piping:	d 20 _____	m	Length of piping:	d 75 _____	m
Length of piping:	d 25 _____	m	Length of piping:	d 90 _____	m
Length of piping:	d 32 _____	m	Length of piping:	d 110 _____	m
Length of piping:	d 40 _____	m	Length of piping:	d 125 _____	m
Length of piping:	d 50 _____	m	Length of piping:	d 160 _____	m

Test: Yes ☐ No ☐

Visual check:

Test pressure: ____ bar (minimum: 15 bar)

Preliminary test:
Testing time = 60 min.
Pressure after 1 hour: ____ bar (max. pressure drop: ≤ 0,6 bar)

Main test:
Testing time = 120 min.
Pressure after 2 hours ____ bar (max. pressure drop: ≤ 0,2 bar)

Location of highest outlet: ____ m above the manometer

Ambient temperature: ____ ° C

The piping is free of leaks: ☐

Complaints: _____

_____

Confirmation

Person in charge: _____

Date: _____ Time: from _____ to _____

Client: _____

signature/stamp

Technical rules for drinking water

Assuming that the design and installation has been done professionally we recommend that the following guidelines are followed.

Rinsing

After pressure testing the drinking water pipes must be rinsed.
Depending on the size of the installation and how the piping is run the system should be rinsed in sections from the bottom to the top.
Each riser is rinsed in turn and the length of piping should not exceed 100 m.
DIN 1988/2, table 10, specifies the minimum number of draw-off points that have to be opened. Under normal circumstances all draw-off points should be opened. The rinsing time depends on the length of piping and should not be less than 15 seconds for each metre of pipe. The rinsing time at each draw-off point should be at least 2 minutes. After the pipe has been rinsed for approx. 2 minutes at the last draw-off point all the draw-off points are closed in the reverse order to which they were opened.

Sound control

DIN 4109 recommends the following measures:

- Use low-sound faucets
- Avoid direct contact between pipes and other sound transmitting bodies when fixing the pipe.
- Avoid high pressures and high flow velocities
- Special measures should be taken for sound sensitive areas
- Cover with sound reducing insulation
- **KELEN LX pipes**
  (4 mm or 9 mm insulation)
  The bubble structure of the insulation provides excellent protection against sound transmission.
  The high strength of the insulation cover provides a long term barrier between the pipe and other sound transmitters.

DIN 1988/2

Largest nominal diameter of the distributing pipe	**DN**	25	32	40	50	65	80	100
Minimum flow through the completely full distributing pipe	**l/min**	15	25	38	59	100	151	236
Minimum number of draw-off points to be opened	**DN 15**	1	2	3	4	6	9	14

Minimum flow and minimum number of draw-off points to be opened for rinsing at a minimum velocity of 0,5 m/s.

KELEN® LX
DRINKING WATER SYSTEM + INSULATION

Heat insulation for potable water pipes

Drinking water pipes (cold)
Cold water pipes need to be insulated against warming and condensation.
It must be ensured that the water quality is not reduced as a result of the water warming.

DIN 1988/2 specifies the minimum insulation thickness for potable water pipes when the medium temperature is assumed to be 10 °C.

Type of installation	Thickness of insulation mm	
Exposed pipework in an unheated room (e.g. cellar)	**4**	**KELEN LX-4**
Exposed pipework in a heated room	**9**	**KELEN LX-9**
Pipework underground with no adjacent hot water pipes	**4**	**KELEN LX-4**
Pipework underground next to hot water pipes	**13**	**KELEN + insulation**
Pipework in wall, riser	**4**	**KELEN LX-4**
Pipework on concrete ceiling	**4**	**KELEN LX-4**

Drinking water pipes (hot)
We recommend that hot water pipes are insulated in accordance with DIN 1988/2.
If there is no requirement for hot water in circulation it is usually possible to do without insulation for pipes up to 25 mm.

Even thin insulation reduces the heat loss considerably!
See pages 16 and 17.

Summary of the instruction guidelines

1.

The **KELEN®** pipe system is made of plastic and needs to be treated carefully to prevent shocks and impact on the pipe during transportation, storage and installation.

2.

Protect the pipes, fittings and components from lengthy exposure to direct UV radiation from the sun.

The usual time required for storage and installation will have no effect on the material as it is stabilised against UV rays but the material is not resistant to long-term UV exposure.

3.

The welding machines are regulated to operate at 260°C. Welding times are based on an ambient temperature of 20°C.

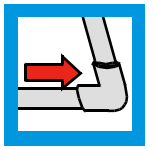
If the ambient temperature changes the time required to push the pipe and fitting on to the heating elements (before the heating time begins) may alter slightly.

4.

Any corrections to the alignment of pipe and fitting up to a maximum of 5° must be made during the welding procedure (see pages 18 – 25 for the permissible time for adjustments). Any later corrections will damage the joint.

5.

Do NOT screw any threaded pipes or any cast iron fittings into the female threads of the metal moulded fittings.
Only join to faucets and components with straight threads. The threaded joint can be sealed by the usual methods (hemp, paste, tape . . .).
Do not over twist the threads.



6.

The expansion of **KELEN®** pipes is clearly defined and must be accounted for in the design and installation of the system.

Please refer to pages 42-47 regarding the methods of accommodating the expansion of exposed piping

- KELIT Alu composite pipe (page 14)
- Pipe channels (page 47)
- Expansion loops (pages 42 and 43)

For longer sections of piping the fixed points can be located in such a way that the system is split into expansion zones.

Suppliers of pipe clamps and brackets offer a wide range of solutions.

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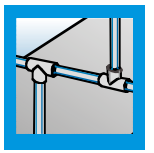
DRINKING WATER SYSTEM + INSULATION

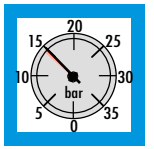
7.

Avoid using heat to bend the pipes (it is possible to bend the cold pipe to a radius of 8 x d). If the pipe has to be heated then only use hot air. Never heat the pipe with a naked flame!
Maximum temperature for bending the pipe: 140°C



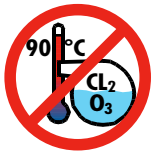
8.

Try to make the joints for standard sections of piping at the work bench before they are installed. This saves time and increases the security of the system.



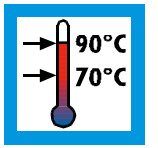
9.

Once the system has been installed it should be subjected to pressure testing.
You can copy pages 48 and 49 of the catalogue to make a test report.



10.

- A temperature of 90°C for short periods of time is NO problem for KELEN. Higher temperatures over longer periods of time should be avoided. The pipe system is suited for thermal disinfection.
- The gradual or continual (max. 6 months) disinfection of the pipe system with chlorine dioxide, chlorine or ozone is only permitted for the cold water system and after consultation with KE KELIT.
- Excessive concentrations are not only threatening to health they can also cause premature ageing of pipe systems.
- Copper und copper ions have a destabilising effect and their presence in the system should be avoided.



11.

The following precautions can be made to ensure that the maximum operating temperature is not exceeded:

- Monitor and regulate solar energy storage.
- Check the electric connections to the hot water storage before the system is operated.
- We recommend installing in the hot water piping a mixer valve which is regulated by the boiler.

12.

In order to qualify for guarantee cover each installation must use **KELEN®** system parts only.

13.

In order to install the **KELEN®** system correctly a minimal amount of expenditure is required for tools For your own security we recommend that you use and maintain the tried and trusted tools.

14.

If you are in doubt do not hesitate to consult our technicians.
There is not always a perfect solution but we can always help.

KE02-LX4 — KELEN® LX-SENSO pipe — PN10

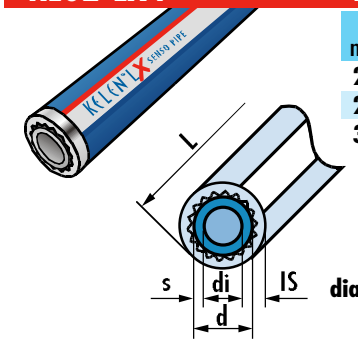


diagram for all KELEN® LX-SENSO pipes

d mm	s mm	di mm	IS mm	L m	Weight kg/m	V l/m
20	1,9	16,2	4	4	0,14	0,21
25	2,3	20,4	4	4	0,20	0,33
32	2,9	26,2	4	4	0,30	0,54

KE08-LX4 — KELEN® LX-SENSO pipe — PN16

d mm	s mm	di mm	IS mm	L m	Weight kg/m	V l/m
20	2,8	14,4	4	4	0,18	0,16
25	3,5	18,0	4	4	0,26	0,25
32	4,4	23,2	4	4	0,40	0,42

KE08-LX9 — KELEN® LX-SENSO pipe — PN16

d mm	s mm	di mm	IS mm	L m	Weight kg/m	V l/m
20	2,8	14,4	9	4	0,22	0,16
25	3,5	18,0	9	4	0,30	0,25
32	4,4	23,2	9	4	0,44	0,42

KE00-LX4 — KELEN® LX-SENSO pipe — PN20

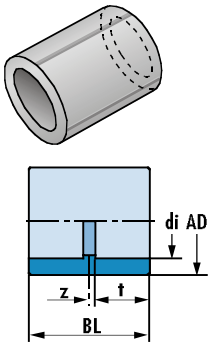
d mm	s mm	di mm	IS mm	L m	Weight kg/m	V l/m
20	3,4	13,2	4	4	0,21	0,14
25	4,2	16,6	4	4	0,30	0,22
32	5,4	21,2	4	4	0,46	0,35

KE00-LX9 — KELEN® LX-SENSO pipe — PN20

d mm	s mm	di mm	IS mm	L m	Weight kg/m	V l/m
20	3,4	13,2	9	4	0,25	0,14
25	4,2	16,6	9	4	0,34	0,22
32	5,4	21,2	9	4	0,50	0,35

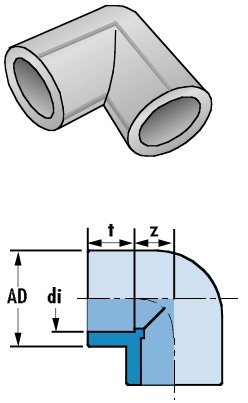
KELEN® LX
DRINKING WATER SYSTEM + INSULATION

KE 10 — Socket



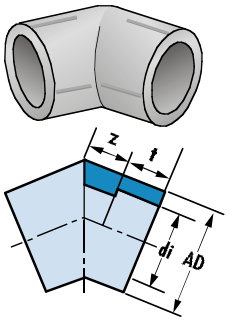
di mm	z mm	t mm	AD mm	BL mm	VP Pcs
20	1,5	15	29	33	10
25	1,5	20	36	43	10
32	1,5	24	46	51	10
40	1,5	27	54	57	5
50	2	28	68	60	2
63	2	29	85	62	1
75	2,5	30	101	65	1
90	3	34	121	74	1
110	5,5	37	145	85	1
125	10	40	165	90	1

KE 20 — Elbow 90°



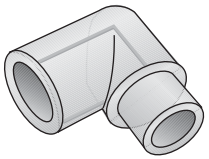
di mm	z mm	t mm	AD mm	VP Pcs
20	11	15	29	10
25	16	20	36	10
32	20	24	46	10
40	25	27	54	5
50	30	28	68	2
63	36	29	85	1
75	41	30	102	1
90	50	34	122	1
110	58	37	145	1
125	84	40	165	1

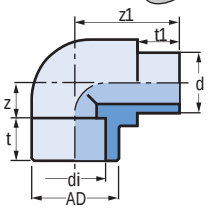
KE 70 — Elbow 45°



di mm	z mm	t mm	AD mm	VP Pcs
20	12	15	29	10
25	13	20	36	10
32	15	24	46	10
40	19	27	53	5
50	23	28	68	2
63	32	29	85	1
75	37	30	101	1
90	48	34	122	1
110	53	37	145	1
125	62	40	165	1

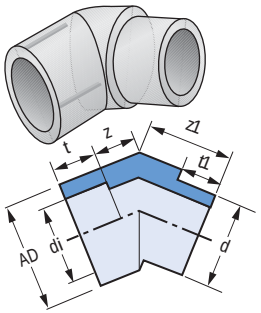
KE 26 Elbow 90° (male / female)





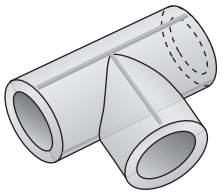
d / di	z	t	z1	t1	AD	VP
20	11	15	33	15	29	10
25	16	20	42	20	36	10
32	20	24	42	22	43	5

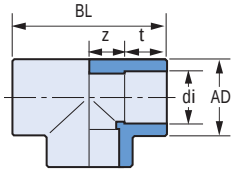
KE 27 Elbow 45° (male / female)



d / di mm	z mm	t mm	z1 mm	t1 mm	AD mm	VP Pcs
20	11	16	31	16	29	10
25	18	20	33	20	36	10

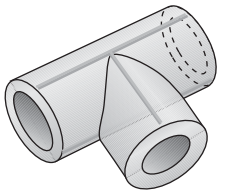
KE 30 Equal tee

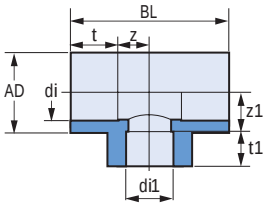




di mm	z mm	t mm	AD mm	BL mm	VP Pcs
20	11	15	29	52	10
25	16	20	36	68	10
32	20	24	46	84	5
40	25	27	54	94	5
50	30	28	68	112	2
63	36	29	85	128	1
75	41	30	102	142	1
90	50	34	122	166	1
110	58	37	145	195	1
125	84	40	165	248	1

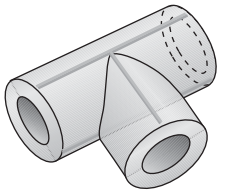
KE 35 Reducer tee

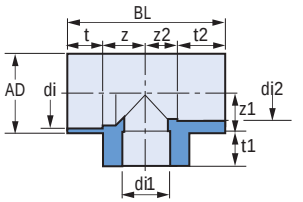




di	di1	z	t	z1	t1	AD	BL	VP
25	**20**	16	20	16	15	36	68	10
32	**20**	20	24	26	15	46	84	5
32	**25**	20	24	22	20	46	84	5
40	**20**	25	27	27	15	54	94	5
40	**25**	25	27	24	20	54	94	5
40	**32**	25	27	26	24	54	94	5
50	**20**	30	28	32	15	68	112	2
50	**25**	30	28	28	20	68	112	2
50	**32**	30	28	30	24	68	112	2
50	**40**	30	28	29	27	68	112	2
63	**25**	36	29	40	20	85	128	1
63	**32**	36	29	36	24	85	128	1
63	**40**	36	29	37	27	85	128	1
63	**50**	36	29	36	28	85	128	1
75	**32**	41	30	42	24	102	142	1
75	**40**	41	30	41	27	102	142	1
75	**50**	41	30	40	28	102	142	1
75	**63**	41	30	39	29	102	142	1
90	**63**	50	34	54	29	122	166	1
90	**75**	50	34	50	30	122	166	1
110	**63**	58	37	70	29	145	195	1
110	**75**	58	37	68	30	145	195	1
110	**90**	58	37	65	34	145	195	1
125	**75**	84	40	74	30	165	248	1
125	**90**	84	40	72	34	165	248	1
125	**110**	84	40	73	37	165	248	1

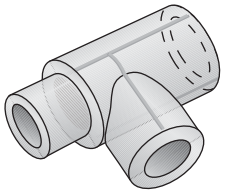
KE 36 Reducer tee

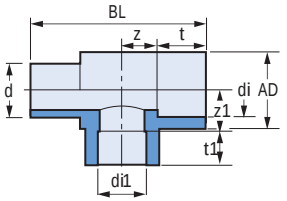




di mm	di1 mm	di2 mm	z mm	t mm	z1 mm	t1 mm	z2 mm	t2 mm	AD mm	BL mm	VP Pcs
20	**25**	**20**	16	15	16	20	16	15	36	68	10
25	**20**	**20**	16	20	18	15	18	15	36	68	10
25	**25**	**20**	16	20	16	20	18	15	46	84	10
32	**20**	**25**	20	24	26	15	22	20	46	84	5
32	**25**	**20**	20	24	22	20	26	15	46	84	5
32	**25**	**25**	20	24	22	20	22	20	46	84	5
32	**32**	**20**	20	24	20	24	26	15	46	84	5
32	**32**	**25**	20	24	20	24	22	20	46	84	5

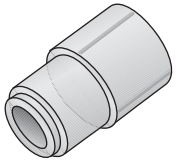
KE 38 Manifold tee (male / female)

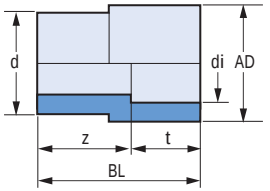




di/d	di1	z	t	z1	t1	AD	BL	VP
25	**20**	13	20	16	15	36	71	10

KE 41 Reducer (male / female)

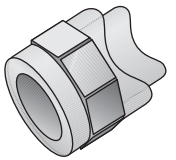


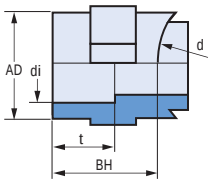


d mm	di mm	z mm	t mm	BL mm	AD mm	VP Pcs
25	**20**	23	15	38	29	10
32	**20**	27	15	42	29	10
32	**25**	27	20	47	36	10
40	**20**	29	15	44	29	5
40	**25**	28	20	48	36	5
40	**32**	36	24	60	45	5
50	**32**	65	20	85	45	2
50	**40**	56	24	80	53	2
63	**40**	61	24	85	53	1
63	**50**	61	24	85	68	1
75	**50**	66	28	94	68	1
75	**63**	65	29	94	84	1
90	**63**	66	29	95	84	1
90	**75**	66	29	95	101	1
110	**63**	61	24	85	68	1
110	**75**	61	29	90	101	1
110	**90**	61	32	93	119	1
125	**110**	75	37	112	145	1

KLEN-LX DRINKING WATER SYSTEM + INSTALLATION

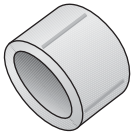
KE 47 Saddle fitting

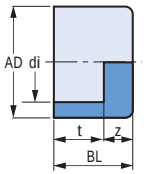




d	di	t	AD	BH	VP
40	**20**	15	36	29	5
40	**25**	20	36	29	5
50	**20**	15	36	29	5
50	**25**	20	36	29	5
63	**20**	15	36	29	5
63	**25**	20	36	29	5
75	**20**	15	36	29	5
75	**25**	20	36	29	5
90	**20**	15	36	29	5
90	**25**	20	36	29	5
110	**20**	15	36	29	5
110	**25**	20	36	29	5

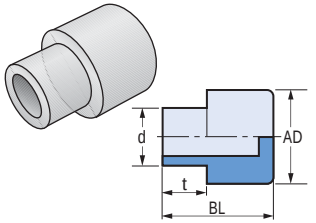
KE 60 End cap





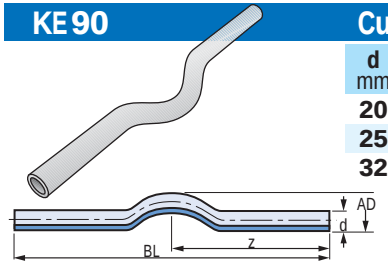
di mm	z mm	t mm	AD mm	BL mm	VP Pcs
20	8	16	29	24	10
25	9	21	36	30	10
32	11	25	46	36	10
40	13	25	53	38	5
50	15	28	67	43	5
63	19	30	84	49	5
75	21	31	100	52	1
90	26	36	120	62	1
110	41	37	145	78	1

KE 61 Manifold cap



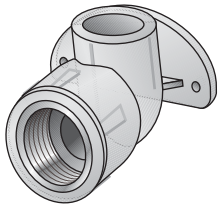
d mm	t mm	AD mm	BL mm	VP Pcs
25	18	36	48	10

KE 90 Curved pipe

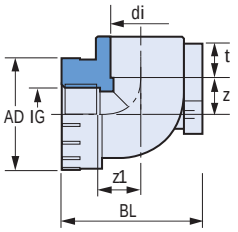


d mm	z mm	AD mm	BL mm	VP Pcs
20	215	45	430	10
25	215	48	430	10
32	215	55	430	5

KE 83 — Wall bracket 90° (female)

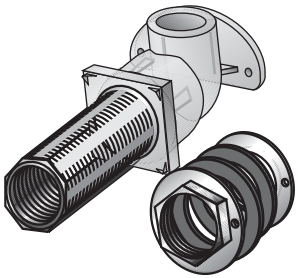


di	IG	z	z1	t	AD	BL	VP
20	½"	13	21	15	41,5	48,5	10
20	¾"	17	26	15	46	57	10
25	½"	17	26	20	46	57	10
25	¾"	17	26	20	46	57	10

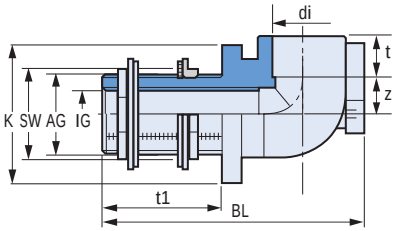


DO NOT join to any threaded pipes or cast iron fittings!

KE 83 HA — Partition wall fitting 90° (female) 50 mm

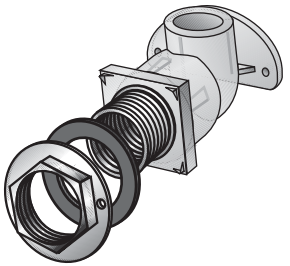


di mm	IG Inch	AG mm	z mm	t mm	t1 mm	K mm	BL mm	SW mm	VP Pcs
20	½"	M28x1,5	13	15	50	43	98	30	5

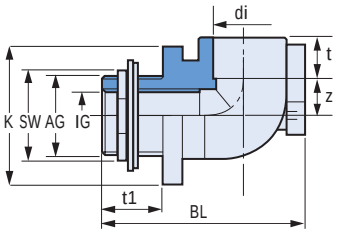


DO NOT join to any threaded pipes or cast iron fittings!

KE 83 SP — Flush box fitting 90° (female) 15 mm



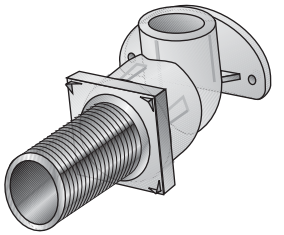
di mm	IG Inch	AG mm	z mm	t mm	t1 mm	K mm	BL mm	SW mm	VP Pcs
20	½"	M28x1,5	13	15	15	43	63	30	5



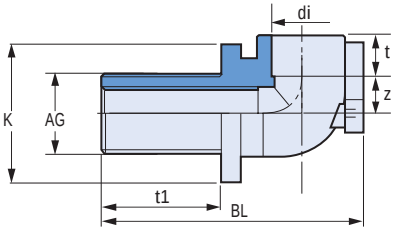
DO NOT join to any threaded pipes or cast iron fittings!

KLEN-LX DRINKING WATER SYSTEM + INSULATION

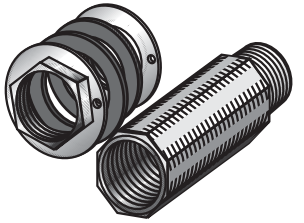
KE 81 LA — LA Wall bracket 90° (male) 50 mm



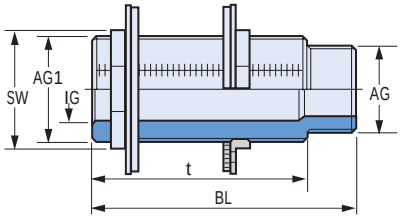
di mm	AG Inch	z mm	t mm	t1 mm	K mm	BL mm	VP Pcs
20	½"	13	15	50	43	98	10



K 84 — Fitting for partition wall connection

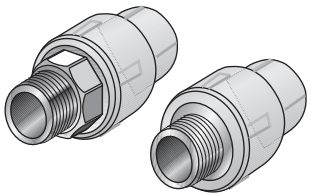


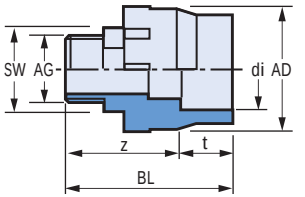
IG Inch	AG Inch	AG mm	t mm	BL mm	SW mm	VP Pcs
½"	½"	M28x1,5	50	64	30	5



DO NOT join to any threaded pipes or cast iron fittings!

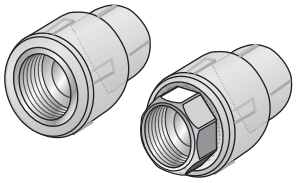
KE 11 — Male adaptor

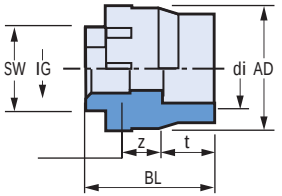




di mm	AG Inch	z mm	t mm	AD mm	BL mm	SW mm	VP Pcs
20	½"	44	15	45	60	-	10
20	¾"	44	15	45	60	-	10
25	½"	40	20	45	60	-	10
25	¾"	40	20	45	60	-	10
32	¾"	48	24	60	72	-	5
32	1"	59	24	60	83	39	5
40	1"	60	27	76	87	39	2
40	5/4"	63	27	76	90	46	2
50	6/4"	66	28	82	92	52	1
63	2"	80	29	97	107	64	1
75	2½"	90	30	123	120	80	1

KE 13 Female adaptor

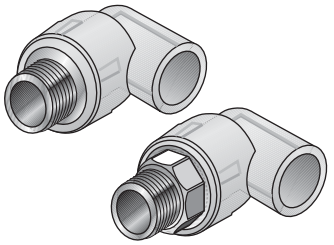




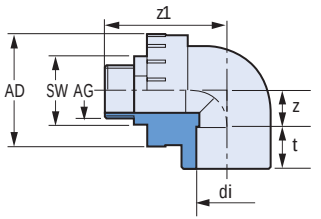
di	IG	z	t	AD	BL	SW	VP
20	**½"**	18	15	45	45	-	10
20	**¾"**	18	15	45	45	-	10
25	**½"**	16	20	45	45	-	10
25	**¾"**	16	20	45	45	-	10
32	**¾"**	25	24	60	68	-	5
32	**1"**	22	24	60	68	39	5
40	**1"**	25	27	76	70	39	2
40	**1¼"**	26	27	76	71	48	2
50	**1½"**	28	28	82	71	56	1
63	**2"**	38	29	97	86	70	1
75	**2½"**	44	30	123	96	88	1

DO NOT join to any threaded pipes or cast iron fittings!

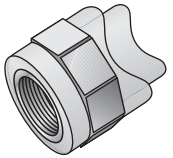
KE 21 Elbow adaptor 90° (male)

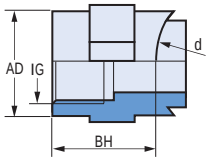


di mm	AG Inch	z mm	t mm	z1 mm	AD mm	SW mm	VP Pcs
20	**½"**	13	15	49	42	-	10
25	**¾"**	17	20	52	46	-	10
32	**1"**	20	24	61	61	39	5



KE 43 Saddle fitting (female)

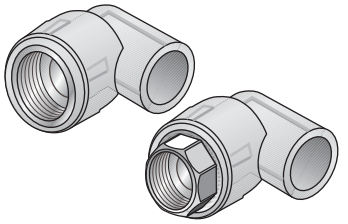




d mm	IG Inch	AD mm	BH mm	VP Pcs
40	**½"**	36	29	5
50	**½"**	36	29	5
63	**½"**	36	29	5
75	**½"**	36	29	5
90	**½"**	36	29	5
110	**½"**	36	29	5

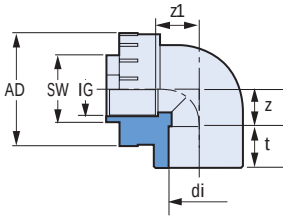
DO NOT join to any threaded pipes or cast iron fittings!

KE 23 Elbow adaptor 90° (female)

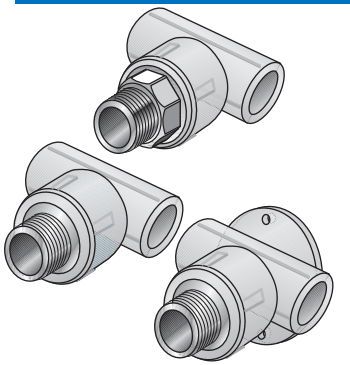


DO NOT join to any threaded pipes or cast iron fittings!

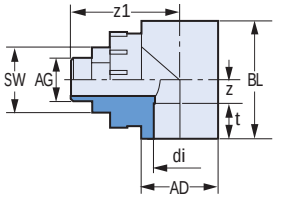
di	IG	z	t	z1	AD	SW	VP
20	**½"**	13	15	21	42	-	10
20	**¾"**	13	15	21	42	-	10
25	**½"**	17	20	21	46	-	10
25	**¾"**	17	20	21	46	-	10
32	**¾"**	20	24	21	46	-	5
32	**1"**	20	24	38	61	39	5



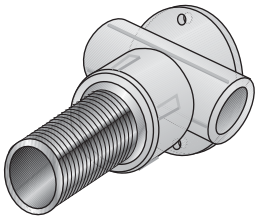
KE 31 Tee with male thread



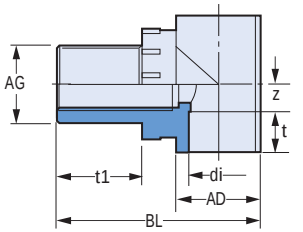
di mm	AG Inch	z mm	t mm	z1 mm	AD mm	BL mm	SW mm	VP Pcs
20	**½"**	13	15	49	29	54	-	10
20	**½"BF**	13	15	49	29	54	-	10
25	**¾"**	17	20	60	36	66	-	10
32	**1"**	20	24	78	46	86	39	5



KE 31 LA LA Tee with male thread 50 mm

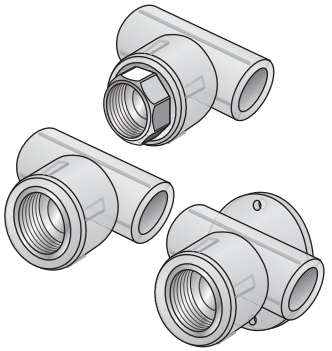


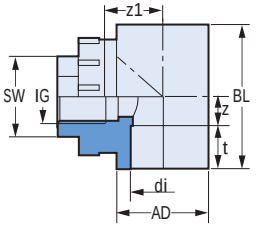
di mm	AG Inch	z mm	t mm	z1 mm	t1 mm	AD mm	BL mm	VP Pcs
20	**½"BF**	13	15	85	50	29	54	10



KE 33 — Tee with female thread

di	IG	z	t	z1	AD	BL	SW	VP
20	½"	13	15	23	30	56	-	10
20	½"BF	13	15	23	30	56	-	10
25	½"	17	20	32	37	66	-	10
25	¾"	17	20	32	37	66	-	10
32	1"	20	24	42	46	84	39	5

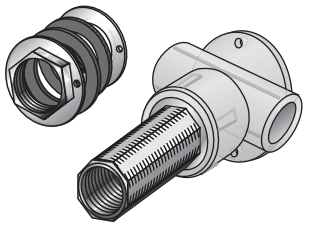


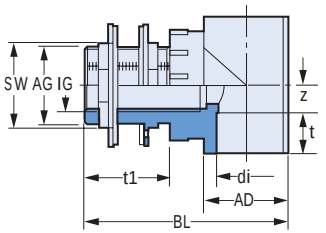


DO NOT join to any threaded pipes or cast iron fittings!

KE 33 HA — Tee with female thread for partition walls

di mm	IG Inch	AG mm	z mm	t mm	t1 mm	AD mm	BL mm	SW mm	VP Pcs
20	½"BF	M28x1,5	13	15	50	29	99	30	10

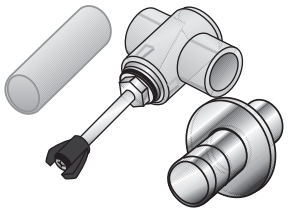


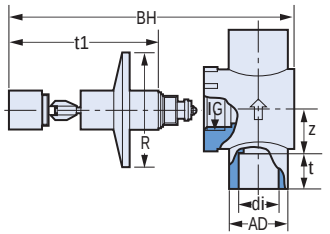


DO NOT join to any threaded pipes or cast iron fittings!

KE 50 — Valve with stem

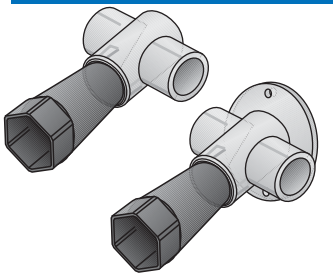
di mm	IG Inch	z mm	t mm	t1 mm	AD mm	BH mm	R mm	VP Pcs
20	½"	21	15	80	30	127	70	1
25	¾"	23	20	80	37	137	70	1



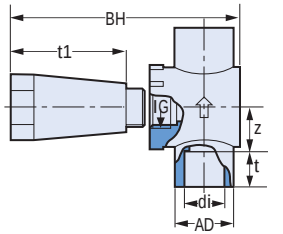


KE 50 A — Valve with stopper

di	IG	z	t	t1	AD	BH	VP
20	½"	21	15	58	30	105	5
20	½" BF	21	15	58	30	105	5
25	¾"	23	20	58	37	110	5

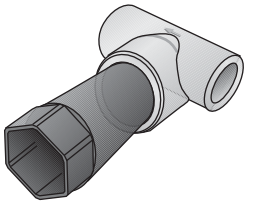


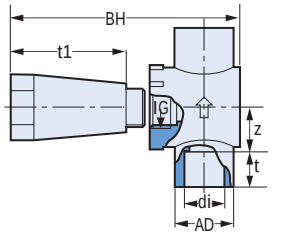
All common stems are compatible with the valve.



KE 50 P — Stop valve with stopper

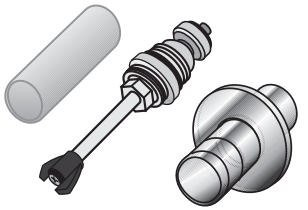
di mm	IG Inch	z mm	t mm	t1 mm	AD mm	BH mm	VP Pcs
20	¾"	23	15	58	37	78	1
25	¾"	23	15	58	37	78	1
32	¾"	21	18	58	43	78	1

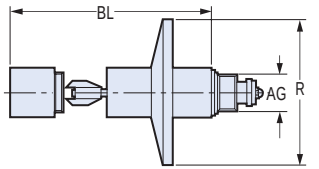




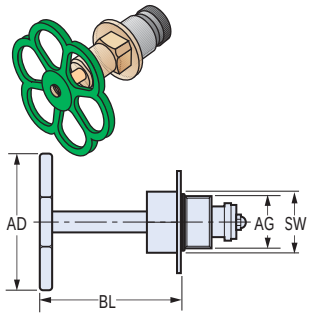
K 50 C — Stem for KE 50 A

AG Inch	BL mm	R mm	VP Pcs
½"	80	70	1
¾"	80	70	1



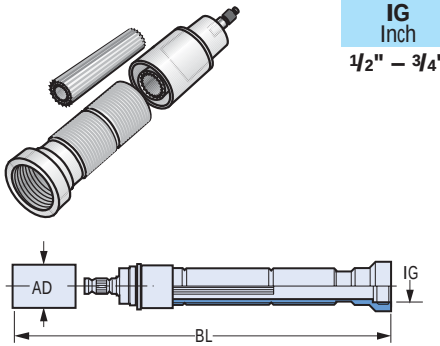


K50 F — Stem for KE50 A and KE50 P



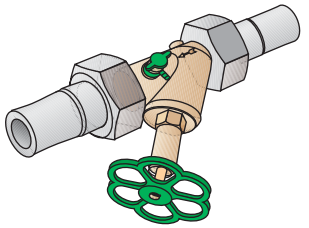
AG	BL	AD	SW	VP
3/4"	45,5	50	17	1

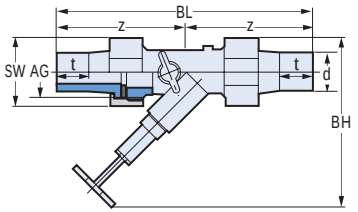
K50 S — Extension to K50 C



IG Inch	AD mm	BL mm	VP Pcs
1/2" – 3/4"	26	150	1

KE52 — Slanted seat valve with KE57 union

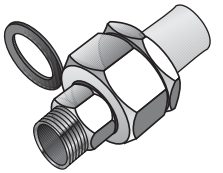


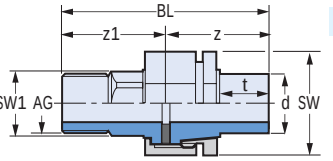


d mm	DN	AG Inch	z mm	t mm	BL mm	BH mm	SW mm	VP Pcs
20	15	1"	84	17	168	110	36	1
25	20	5/4"	95	20	190	130	46	1
32	25	6/4"	107	26	214	155	52	1
40	32	2"	147	50	294	180	66	1
50	40	2 1/4"	155	50	310	190	70	1
63	50	2 3/4"	165	50	330	225	86	1

includes drainage and replaceable EPDM seals!

KE55 — Union (plastic - metal)

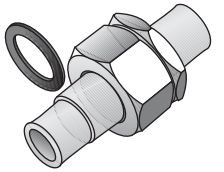


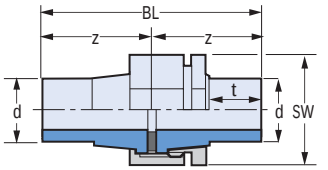


d mm	AG Inch	z mm	t mm	z1 mm	BL mm	SW mm	SW1 mm	VP Pcs
20	1/2"	42	17	33	75	36	23	5
25	3/4"	49	20	40	89	46	30	5
32	1"	55	26	44	99	52	37	3
40	5/4"	85	50	52	137	66	45	2
50	6/4"	85	50	58	143	70	55	1
63	2"	85	50	65	150	86	66	1
75	2 1/2"	90	50	68	158	108	80	1
90	3"	90	50	73	163	122	94	1

includes drainage and replaceable EPDM seals!

KE56 — Union (plastic - plastic)

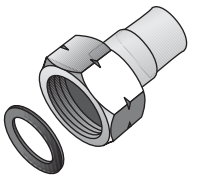


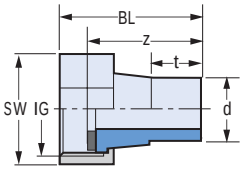


d mm	z mm	t mm	BL mm	SW mm	VP Pcs
20	42	17	84	36	5
25	49	20	98	46	5
32	55	26	110	52	3
40	85	50	170	66	2
50	85	50	170	70	1
63	85	50	170	86	1
75	90	50	180	108	1
90	90	50	180	122	1

includes drainage and replaceable EPDM seals!

KE57 — Union with female thread

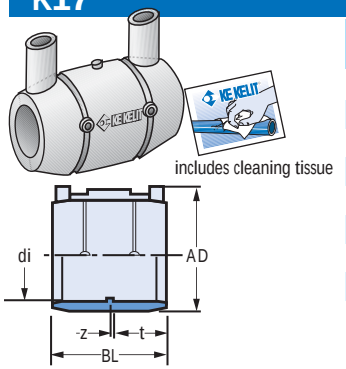




d mm	IG Inch	z mm	t mm	BL mm	SW mm	VP Pcs
20	1"	44	17	53	36	5
25	5/4"	50	20	60	46	5
32	6/4"	56	26	67	52	3
40	2"	87	50	103	66	2
50	2 1/4"	87	50	103	70	1
63	2 3/4"	87	50	103	86	1
75	3 1/4"	93	50	114	108	1
90	3 3/4"	93	50	115	122	1

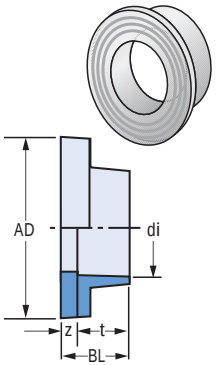
includes drainage and replaceable EPDM seals!

K17 E-Uni Welding socket



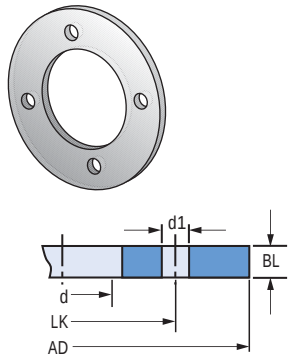
di	z	t	AD	BL	VP
20	1,5	26	48	55	1
25	1,5	26	54	55	1
32	1,5	25	62	53	1
40	1,5	25	70	53	1
50	1,5	25	80	53	1
63	1,5	30	94	63	1
75	2	33	107	70	1
90	2	36	121	76	1
110	2,5	41	143	87	1

KE18 Backing ring PP-R



di mm	DN	z mm	t mm	BL mm	AD mm	VP Pcs
20	**15**	5	15	20	45	1
25	**20**	5	20	25	58	1
32	**25**	5	24	29	68	1
40	**32**	5	27	32	78	1
50	**40**	5	28	33	88	1
63	**50**	5	29	34	102	1
75	**65**	5	30	35	122	1
90	**80**	5	32	37	138	1
110	**100**	5	34	39	158	1
125	**100**	15	40	55	162	1

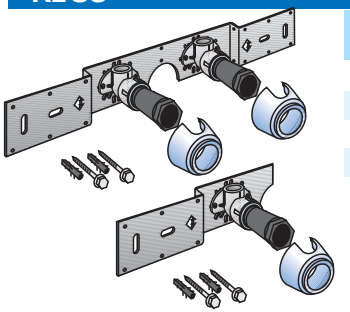
K19 PP flange with steel insert



d mm	DN	LK mm	d1 mm	Holes mm	BL mm	AD mm	VP Pcs
20	**15**	65	14	4	12	95	1
25	**20**	75	14	4	12	105	1
32	**25**	85	14	4	16	115	1
40	**32**	100	18	4	16	140	1
50	**40**	110	18	4	18	150	1
63	**50**	125	18	4	18	165	1
75	**65**	145	18	4	18	185	1
90	**80**	160	18	8	18	200	1
110	**100**	180	18	8	18	220	1
125	**100**	180	18	8	18	220	1

Sizing according to DIN 2501 PN16

KE 85 Joining set

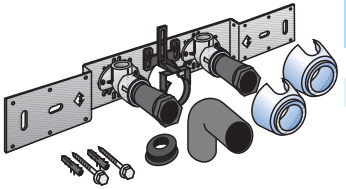


Setting mm	Dimension	VP Pcs
Single outlet	d20 x 1/2"	1
80 – 100	d20 x 1/2"	1
80 – 100	d25 x 1/2"	1
150	d20 x 1/2"	1
150	d25 x 1/2"	1

Includes **KE83** with sound insulation, stoppers, metal plate, pegs and screws.

DO NOT join to any threaded pipes or cast iron fittings!

KE 85 SB Joining set with siphon trap

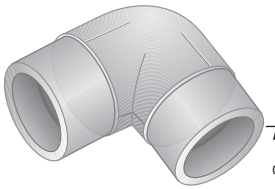


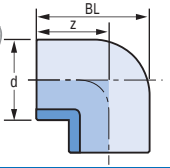
Setting mm	Dimension	VP Pcs
80 – 100	d20 x 1/2"	1
150	d20 x 1/2"	1

Includes **KE83** with sound insulation, stoppers, metal plate, pegs and screws, siphon trap and d30 rubber nipple.

DO NOT join to any threaded pipes or cast iron fittings!

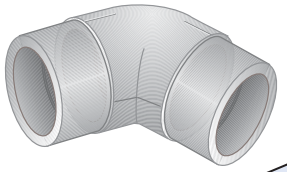
KE20 ST — Elbow 90° — PN10

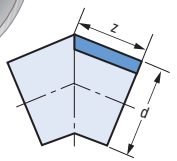




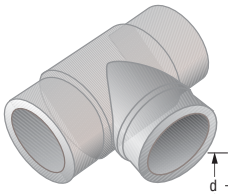
d mm	z mm	BL mm	VP Pcs
160	220	300	1

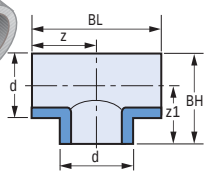
KE70 ST — Elbow 45° — PN10





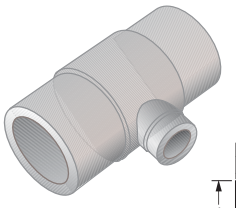
d mm	z mm	VP Pcs
160	172	1

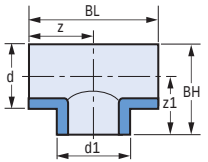




d mm	z mm	z1 mm	BL mm	BH mm	VP Pcs
160	220	220	440	300	1

KE35 ST — Reducer tee — PN10

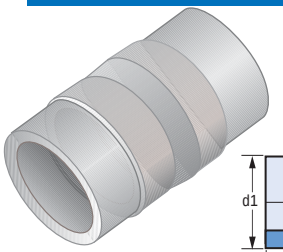


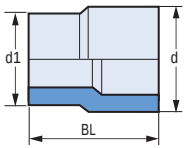


d mm	d1 mm	z mm	z1 mm	BL mm	BH mm	VP Pcs
160	**90**	220	180	424	260	1
160	**110**	220	200	424	280	1

KE LEN-LX
DRINKING WATER SYSTEM + INSTALLATION

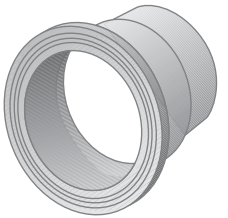
KE41 ST — Reducer — PN10

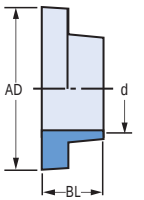




d	d1	BL	VP
160	**125**	225	1

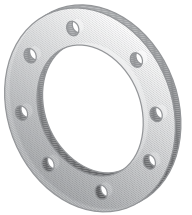
KE18 ST — Welding neck — PN10

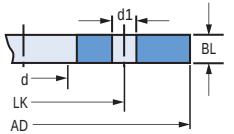




d mm	AD mm	BL mm	VP Pcs
160	**212**	202	1

K19 ST — Flange — PN10



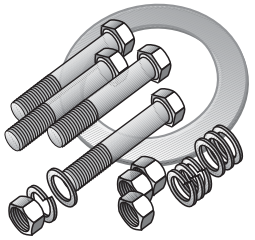


Sizing according to DIN 2501 PN16

d mm	DN mm	LK mm	d1 mm	Holes	BL mm	AD mm	VP Pcs
160	**150**	240	22	8	24	285	1

Accessories

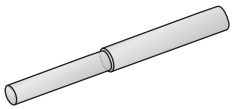
K19 A — Flange seal set



1 set consisting of screws, bolts, washers and EPDM seal.

d mm	Holes Pcs	VP Pcs
20	4	1
25	4	1
32	4	1
40	4	1
50	4	1
63	4	1
75	4	1
90	8	1
110	8	1
125	8	1
160	8	1

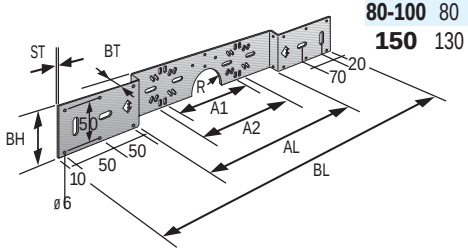
KE99 — Repair plug



d mm	BL mm	VP Pcs
7 – 11	120	10

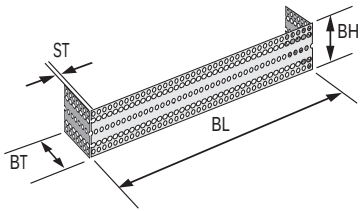
K85 A — Rail

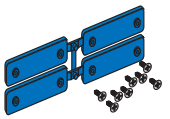
Setting mm	A1 mm	A2 mm	AL mm	BL mm	BH mm	BT mm	ST mm	R mm	VP Pcs
Einzel.	-	-	-	228	60	45	3	-	1
80-100	80	100	210	456	60	45	3	-	1
150	130	150	260	506	60	45	3	30	1



K85 H — Rail for partition walls

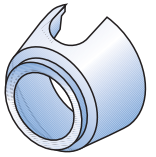
BL mm	BH mm	BT mm	ST mm	VP Pcs
350	60	45	3	1





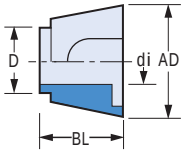
KLEN-LX DRINKING WATER SYSTEM + INSTALLATION

K85 K — Sound insulation cap

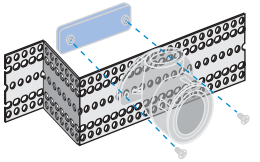


Sound insulation for **KE83**.
Does **NOT** fix or secure the fitting.

d mm	di mm	D mm	AD mm	BL mm	VP Pcs
20	41,5	53	75	52	10
25	46	53	75	60	10

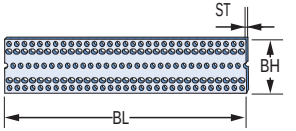


K86 L — Perforated plate

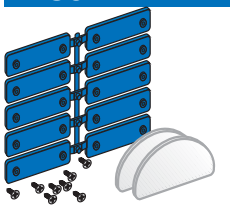


Steel plate for securing fittings in all positions.

BL mm	BH mm	ST mm	VP Pcs
2000	60	3	1



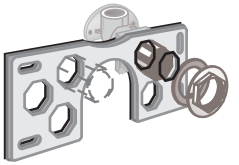
K86 D — pegs for K86L



Includes sound insulating discs and screws.

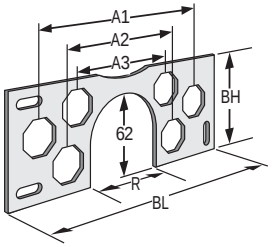
VP Pcs
10

K86 HA — Fixing plate

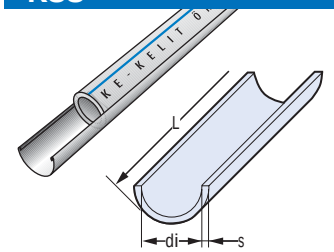


Octagonal holes to prevent twisting of **KE83HA** and **K84** and elastomer covering for dry wall installations.

A1 mm	A2 mm	A3 mm	BL mm	BH mm	R mm	VP Pcs
150	100	80	200	80	65	1



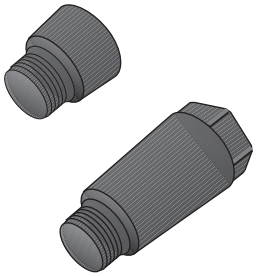
K88 Pipe channel



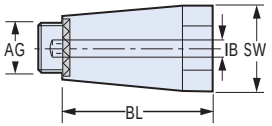
di	s	L	VP
20	0,6	2000	20
25	0,6	2000	20
32	0,6	2000	20
40	0,6	2000	10
50	0,8	2000	10
63	0,8	2000	10
75	0,8	2000	10
90	0,8	2000	10
110	0,9	2000	10

Galvanised steel - d20, d25 and d32 have clips to lock the pipe into the channel.

K95 Stopper



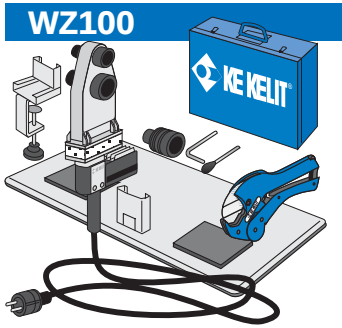
AG Inch	BL mm	AD mm	IB mm	VP Pcs
1/2" sh	22	32	12	10
1/2" lg	32	58	12	5
3/4" lg	42	58	12	5



KELEN-LX
DRINKING WATER SYSTEM + INSTALLATION

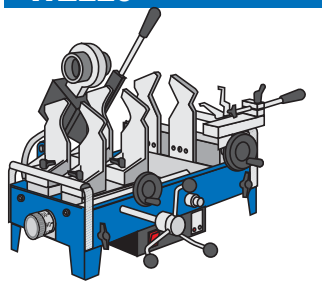
KELIT tools

WZ100 Welding set



Pipe welding machine 230 Volt, 800 Watt
Includes case, table clamp and floor rest
Heating elements: **d20 – 32** mm
Pipe cutters **d16 – 40** mm.

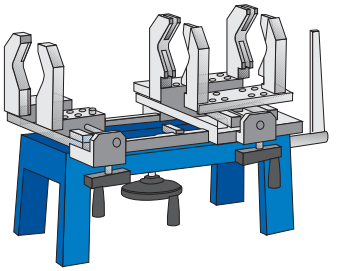
WZ110 Pipe welding machine



Pipe welding machine 230 Volt, 1000 Watt
Includes case,
heating elements **d20 – 90** or **d25 – 125**,
Pipe cutters **d20 – 75**, **d50 – 140**,
special gloves and pipe rests.
Packaged in transport crate.

Type 1	**d20 – 90**
Type 2	**d25 – 125**

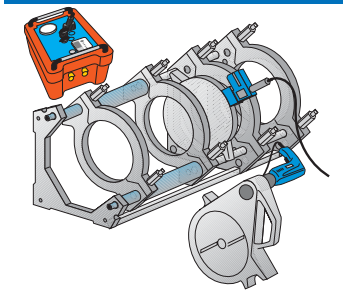
WZ120 Overhead welding machine



For making polyfusion joints in areas that cannot be accessed with the table welding machine. Can be used for the pipe types **KE00, KE02, KE06** and **KE08**. Includes hand welding machine (1200 Watt), **d50 – 110** welding tools, **d16-75** and **d50-140** pipe cutters, timer and special gloves. Packaged in transport crate.

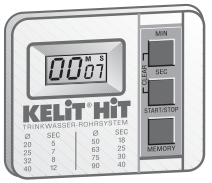
Weight of machine: approx. 12 kilos

WZ115 Butt welding machine



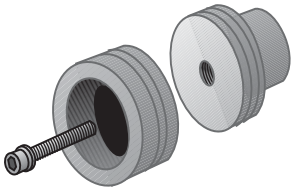
hydraulic butt welding machine 230 Volt, 1000 Watt
Includes plane cutter, welding plate,
d40 – 160 welding tools.
Packaged in transport crate.

WZ129 Timer



For setting and checking the welding times of **d20 – 110**

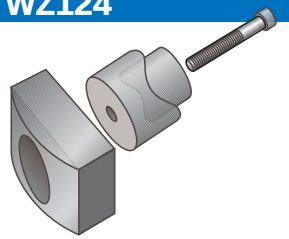
WZ122 Polyfusion welding tool



Heating elements

d mm	VP Pcs
20	1
32	1
40	1
50	1
63	1
75	1
90	1
110	1

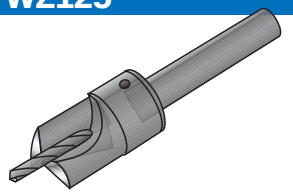
WZ124 Saddle welding tool



For welding the saddle fittings

d mm	VP Pcs
40x20 / 25	1
50x20 / 25	1
63x20 / 25	1
75x20 / 25	1
90x20 / 25	1
110x20 / 25	1

WZ125 Saddle drill

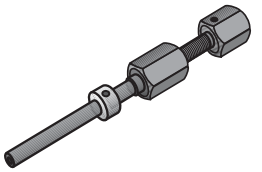


d mm	VP Pcs
24	1

For drilling the pipes before welding the saddle fitting.

KELEN-LX
DRINKING WATER SYSTEM + INSTALLATION

WZ128 Repair welding tool

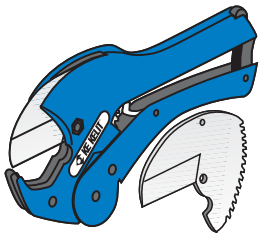


Heating elements for welding the repair plugs

d	VP
7	1
11	1

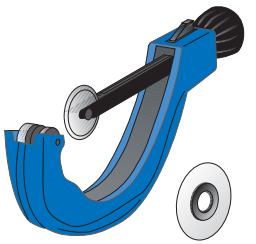
Size of drilled holes
For d7 = 6 mm hole
For d11 = 10 mm hole

WZ130 Pipe cutter



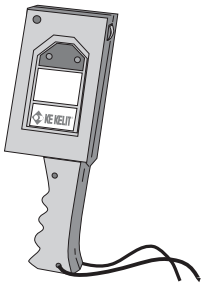
d mm	VP Pcs
16 – 40	1
Replacement blade	1

WZ135 Wheel pipe cutter



d mm	VP Pcs
16 – 75	1
50 – 140	1
Replacement wheel: small	1
Replacement wheel: large	1

WZ158 SENSO pipe detector



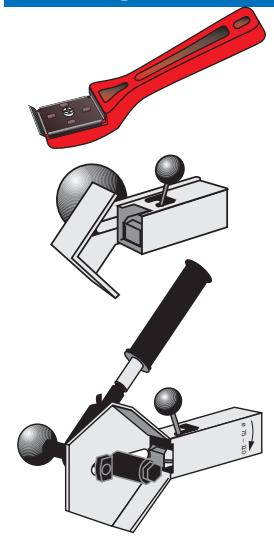
For locating concealed **LX-SENSO pipes** and fittings (max. depth: 80 mm)

WZ140 E-socket welding machine

For welding the **E-UNI welding socket K17**. Hand scraper included.

d mm	VP Pcs
20 – 110	1

WZ145 Pipe scraper



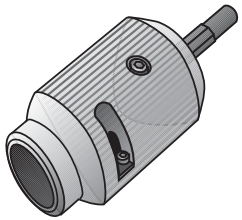
Hand scraper

Pipe shaver for small sizes:
d 20 – d 63

Pipe shaver for large sizes:
d 75 – d 110

For shaving the surface of the pipes before electrofusion welding.

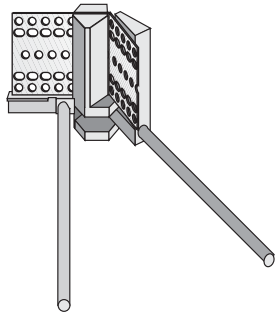
WZ150 Alu peeler



d mm
20
25
32
40
50
63
75
90

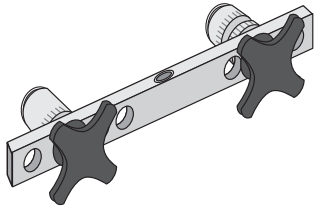
For peeling **KELIT ALU composite pipes K06** before welding. Remove the screw to extend the peeling area if the pipe is going to be welded to an **E-UNI socket K17**.
Peeler can be connected to a drill.

WZ138 Bending tool for K86 L



for bending the perforated plate **K86L**

WZ155 Setting gauge



settings mm
75
100
120
150
200
240

KE KELIT®
INNOVATIVE PIPE SYSTEMS

Partners worldwide

"There is hardly anything in this world that somebody cannot do a little bit worse and sell at a lower price. People who are only dictated by price are easy prey for such machinations.

It is imprudent to pay too much but it is worse to pay too little. When you pay too little, sometimes you lose everything since the object you have bought cannot fulfil the task it has been set. According to the law of the economy it is not possible to acquire high value with little money.

Accept the lowest offer and you take the risk that you may need to incur extra costs. If this is the case then you also have enough money to pay for something better."

(K. Ruskin English social reformer 1819-1900)

Project references and satisfied customers are the primary benchmark for real quality.

Please note that for technical printing reasons the numbers are written according to the common practice in the German-speaking countries (i.e. the number and the decimals are separated by a comma).

Full technical back-up and support for the **KELEN® pipe system** is provided by **KE KELIT®-Austria/ Europe**.

The network of sales partners, subsidiaries and agents is constantly being expanded. Please ask at the Austrian headquarters for the current status.

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