KELEN® piping system

PP-R

hot- and cold water system

KE KELIT®
INNOVATIVE PIPE SYSTEMS

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Note:
Before using KELEN for the first time, please consult this handbook for the installation rules and, in particular, the jointing technology.

Index of Symbols

In the KELEN-specific documentation, we use the following, mostly customary symbols.

Symbol	Quantity name	Units
A	cross-sectional area	mm^2
d	outer diameter of pipe	mm
di	Inner diameter of pipe	mm
Da	Outer diameter of jacket pipe	mm
E	elastic (Young's) modulus	N/mm^2
t_F	Freezing time	h
Ft	Thermal expansion force	N
h	hour(s)	
l	pipe length	m
Ln	natural logarithm	
LU	loading unit	
$\dot{m}$	hourly volumetric flow	l/h
MDP	system working pressure	bar
MS	Minimum leg length	mm
SU	sanitary unit (DIN)	
p	internal pressure	bar
Q_A	water demand	l/sec
Q_{min}	minimum withdrawal flow	l/sec
Q_R	heat loss	W
R	frictional pressure gradient	Pa/m
s	pipe wall thickness	mm
SDR	standard dimension ratio	d/s
sec	second(s)	
t	temperature	°C
t_m	medium temperature	°C

Symbol	Quantity name	Units
t_v	laying temperature	°C
V	volume per unit length	l/m
$\dot{V}$	volumetric flow	l/sec
$\dot{V}_R$	rated flow (DIN)	l/sec
$\dot{V}_S$	peak flow (DIN)	l/sec
v	flow velocity	m/sec
Z	individual "resistance" (pressure drop)	Pa
z	z-dimension, design dimension	mm
α	coefficient of thermal expansion	mm/mK
Δ_l	specific longitudinal expansion	mm
Δ_p	total pressure drop	Pa
Δ_t	temperature difference	K
ζ	loss coefficient	
λ	thermal conductivity	W/mK
ρ	density	kg/m^3
Σ	sum	
ς_v	equivalent stress	MPa

Quality Objectives of KE KELIT

1. Our quality objectives go beyond the quality of the products and extend to all areas covered by the ISO 9001 standard.
2. A quality assurance system covering the product through the whole business cycle and involving both suppliers and customers is intended to prevent errors and failures.
3. Every employee is responsible for the quality of his/her work. High motivation should be the approach for continual self-testing.
4. We regard the fulfilment of specific market and customer requirements as the prerequisite for the highest possible level of customer satisfaction.
5. Responsibility for the environment, both now and in the future, is our motivation for the production of durable products using environmentally friendly processes.

Senator Karl Egger eh.

Managing Director

Approvals – Audits – Registration

Not only the individual parts but also the system as a whole are subject to thorough-going, periodical testing. To ensure that the defined quality objectives are met, various monitoring techniques are used.

Quality assurance system certified by Quality Austria
EN ISO 9001 – Reg. No. AT 00366/0
EN ISO 14001 – Reg. No. AT 02097/0
EN ISO 10005 – Reg. No. AT 00001/0
EN ISO 50001 – Reg. No. AT 0126/0

Registration and system auditing in accordance with
EN ISO 15874 - series
for polypropylene (PP) plastic piping systems
for hot and cold water systems

Plastic piping systems for industrial applications
EN ISO 15494

Installation and Sizing

EN 806 - series
ÖNORM B 2531
DIN 1988-300

Malaysia Standard MS 2286

ÖVGW (Austrian Association for Gas and Water) approval

ÖVGW test mark
Award No. W 1.213

Suitability for drinking water

Investigations of the chemical composition of the raw material, physiological harmlessness, odour and taste neutrality in accordance with ÖNORM B 5014-1, 3
EN ISO 8795
EN ISO 12873-1

Threaded fittings

- Conical outer thread and cylindrical Inner thread in accordance with EN 10226
- cylindrical connections, not sealing in thread in accordance with EN ISO 228-1
- Corrosion of metals and alloys
  EN ISO 6509

Warranty commitments in coordination with the Federal Guild of Sanitary and Heating Installers.

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

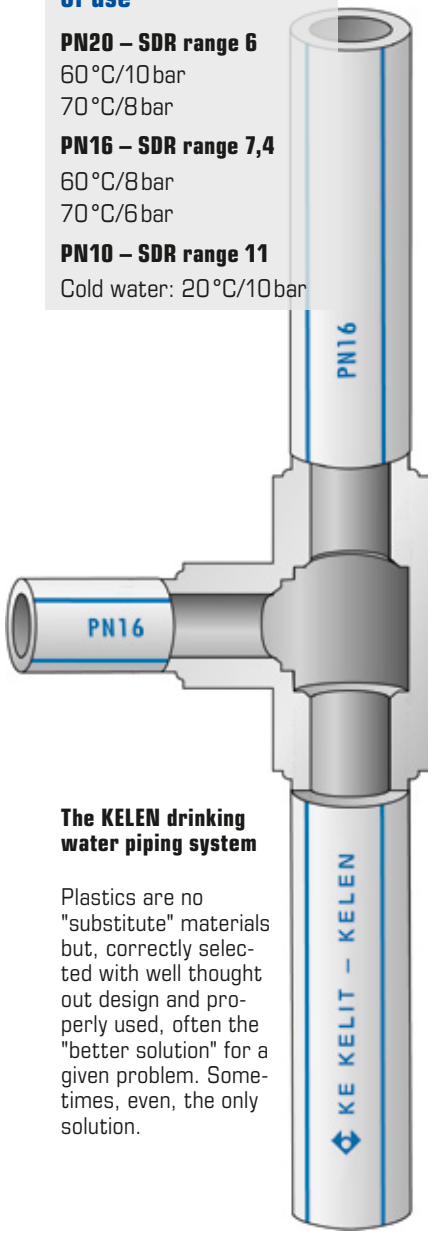
The Solution

Standard-conditions of use

PN20 – SDR range 6
60 °C/10 bar
70 °C/8 bar

PN16 – SDR range 7,4
60 °C/8 bar
70 °C/6 bar

PN10 – SDR range 11
Cold water: 20 °C/10 bar



The KELEN drinking water piping system

Plastics are no "substitute" materials but, correctly selected with well thought out design and properly used, often the "better solution" for a given problem. Sometimes, even, the only solution.

The result

The KELEN piping system with many advantages: Ideal for hot and cold water in existing and new buildings

- **KELEN PP-R /PN20**
  Diameter range d 20 – 110 mm for hot and cold water
- **KELEN PP-R /PN16**
  Diameter range d 20 – 160 mm for hot and cold water
- **KELEN PP-R /PN10**
  Diameter range d 20 – 160 mm for cold water
- internally and externally corrosion resistant to all ions in water and in building materials
- no crystallisation points for lime scale
- secure jointing technique without additional materials
- harmless in contact with food, hygienically irreproachable
- low pressure losses due to smooth surfaces
- low noise
- temperature and pressure resistant
- low thermal conductivity
- λ values compared:
  KELEN 0.24 W/mK
  Copper 320.00 W/mK
  Cast iron /steel 42.00 W/mK
- Easy to install impact-resistant at subzero temperatures
- Low laying costs
- Standardised, audited and monitored quality
- Assured long service life
- Factory insulated concealed piping parts

"Safe and corrosion-free into the 3rd millennium"

The Raw Materials Used

The plastic – PP-R

The base material is a polypropylene (PP-R) with its typical quality characteristics (EN ISO 15874). All materials are subject to natural ageing. Even PP-R is subject to this law of nature. Temperature and stress dependent "creep curves" indicate the long service life to be expected (conditions of use see pages 14–15).

Density:	0,91 g/cm³
Melting point:	~ 140 °C
Tensile strength:	40 N/mm²
Elongation at break:	800 %
E modulus (20°C):	900 N/mm²
Spec. heat:	2 kJ/kg K
Thermal conductivity:	0.24 W/mK
Spec. thermal expansion:	0.14 mm/mK

Thanks to special technical know-how, KELEN is particularly impact-resistant at temperatures down to – 5°C.
Pipes and fittings are made from identical types of raw material.

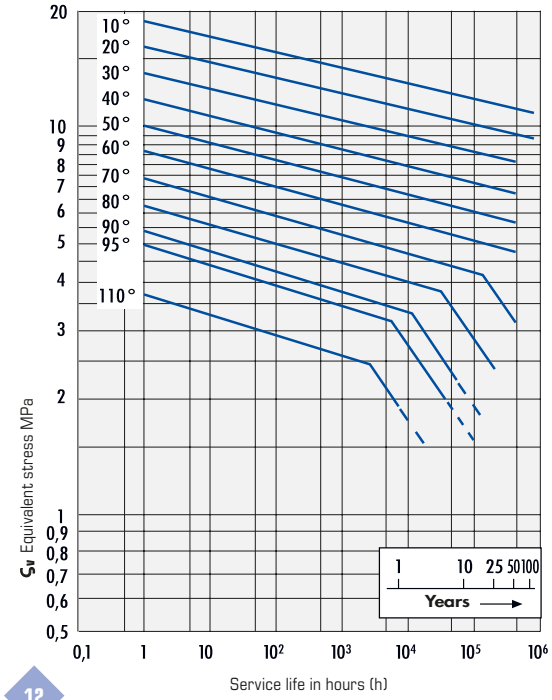
Equivalent stress (σ_v):

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

p = in N/mm² (1bar = 0.1 N/mm²)

The formula can be used to calculate the equivalent stress actually occurring so that the temperature dependent service life to be expected can be read off the creep diagram.

Creep curves in accordance with EN ISO 15874-2



Metal adaptor fittings

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

Special quality criteria

- Brass (MS 58, CW 617N) 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 EN 10226-1 for normal faucets

KELEN

KELEN PP-R pipe system

MK02 KELEN pipe PN10/SDR 11

d x s	Pipe weight kg	Water volume l/m
20 x 1.9 mm	0.11	0.21
25 x 2.3 mm	0.17	0.33
32 x 2.9 mm	0.26	0.54
40 x 3.7 mm	0.42	0.83
50 x 4.6 mm	0.64	1.31
63 x 5.8 mm	1.01	2.07
75 x 6.8 mm	1.41	2.96
90 x 8.2 mm	2.03	4.25
110 x 10.0 mm	3.01	6.36
160 x 14.6 mm	6.38	13.44

Dimensions: as specified by EN ISO 15874

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:
Cold water
PN10/SDR 11: 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)	Duration (Years)
20	10	50
30	9	50

MK08 KELEN pipe PN16/SDR 7,4

d x s	Pipe weight kg	Water volume l/m
20 x 2.8 mm	0.15	0.16
25 x 3.5 mm	0.23	0.25
32 x 4.4 mm	0.37	0.42
40 x 5.5 mm	0.58	0.66
50 x 6.9 mm	0.90	1.03
63 x 8.6 mm	1.41	1.65
75 x 10.3 mm	2.01	2.32
90 x 12.3 mm	2.87	3.36
110 x 15.1 mm	4.30	5.00
160 x 21.9 mm	9.04	10.60

Dimensions: as specified by EN ISO 15874

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:
Hot and cold water
PN16/SDR 7.4: 20°C/16 bar
60°C/8 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)	Duration (Years)
20	16	50
40	12	50
60	8	50

MK00 KELEN pipe PN20/SDR 6

d x s	Pipe weight kg	Water volume l/m
20 x 3.4 mm	0.17	0.14
25 x 4.2 mm	0.27	0.22
32 x 5.4 mm	0.43	0.35
40 x 6.7 mm	0.67	0.56
50 x 8.3 mm	1.04	0.88
63 x 10.5 mm	1.65	1.39
75 x 12.5 mm	2.34	1.96
90 x 15.0 mm	3.36	2.83
110 x 18.3 mm	5.01	4.23

Dimensions: as specified by EN ISO 15874

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:
Hot and cold water
PN20/SDR 6: 20°C/20 bar
70°C/8 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)	Duration (Years)
20	20	50
40	15	50
60	10	50
70	8	50

The four ways of joining the pipes

The key features of a piping system are the range of variation and safety of the connection methods. KE KELIT exhausts all the technical possibilities for its well proven piping system!

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

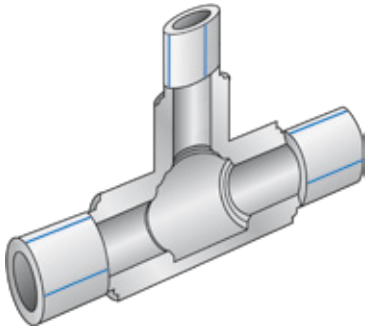
All KELEN PPR polyfusion fittings from d20 to d110 are rated PN10/16/20
Fittings d160 are rated PN10/16

Polyfusion heated coil welding is carried out in accordance with DVS guideline 2207-11

Please check the price list to see which sizes and pressure ratings are currently available.

1. Polyfusion welding PP-R

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



A wide range of welding fittings is available

Sizes:

Fittings d20 – 110 mm
PN10/16/20

Fittings d160 mm
PN10/16

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)
- No change in cross-section in the area of the fitting

2. Threaded transitions PP-R

Range: d20 x 1/2" – 90 x 3"
Thread in accordance with EN 10226 in dezincification-resistant, lead-free brass (MS 58 CW 617N), with pore-free metallisation for protection against stress corrosion. Inside and outside thread, straight or elbow.

Advantages

- Adequate range to suit installation
- Inside thread straight (cylindrical)
- Outside thread conical, roughened
- Twist-proof anchoring of the insert in the plastic

3. Releasable unions PP-R

Range: d20 x 1/2" – 90 x 3"

KE55: PP-R/male

KE56: PP-R/PP-R

KE57: PP-R/female

Advantages

- "Dutch" union can be released at any time
- Permanently elastic EPDM seal
- MK57 as appliance connection fitting

4. Flange connection PP-R / PN10

Range: d40 – 160 mm
The solution for flanged valves. Flange sleeve with sleeve for fusion welding d40 – 160 mm

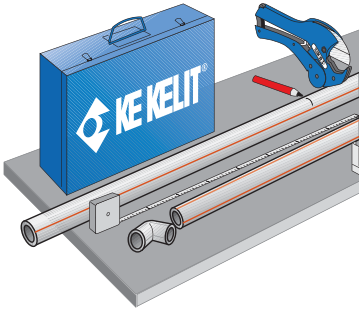
Advantages

- Can be released at any time
- Permanently elastic EPDM seal with steel insert
- Dimensions in accordance with DIN 2501-PN16 (see page 57)

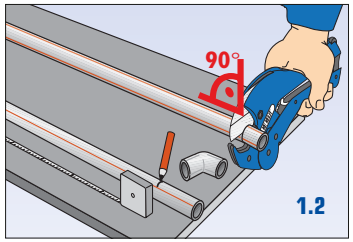
Polyfusion Welding of KELEN with the Hand Welding Unit

in accordance with DVS Guideline 2207-11

These instructions apply for KELEN pipe types



1. Joints between pipe and fitting are made by polyfusion welding at 260 °C. Self regulating (factory adjusted) welding equipment and tools are available for this purpose. Just plug in (230 V) and wait: The red pilot light indicates an intact power supply and starts to flash when welding temperature is reached. At the same time, the green pilot light turns on. In addition, there is a single acoustic signal. Now you can start work.



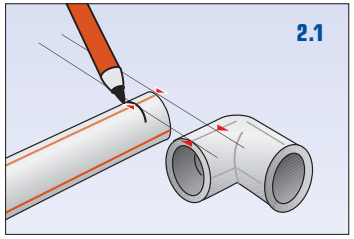
1.1 Certainty is all that counts!

Before any further work, potentially damaged extremities should be removed by cutting off about 1 cm from each end of each length of pipe. The pipes are manufactured with this amount of additional length without additional charge.

1.2 Everything starts with getting the size right! Determine the actual measurements, taking the Z-dimension into account. Convert the dimensions into lengths of pipe! Using pipe shears (up to 40 mm) and pipe cutters (up to 160 mm), this is simple enough.

d mm pipe	Heating time sec	Adjustment time sec	Cooling time min
20	5	4	2
25	7		
32	8	6	4
40	12		
50	18		
63	24	8	6
75	30		
90	40		
110	50	10	8
160	70	10	8

Welding parameters at ambient temperatures around 20 °C

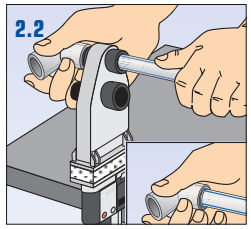


The welding procedure

2. Ensure that the surfaces of the pipe and fitting are free from grease, clean and dry.

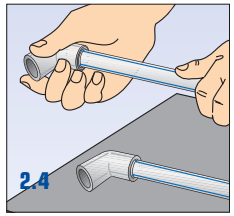
2.1 Insert the pipe in the fitting to the correct depth (sleeve length of the fitting).

2.2 Push the pipe and fitting fully into the welding tool, only then does the heating time begin (see table).



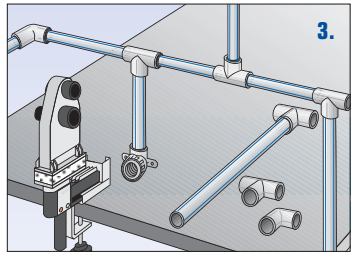
2.3 The heating time depends on the pipe dimension (see table). At the end of the heating time, the pipe and fitting should be quickly and evenly pushed together. A uniform and high-strength joint will be formed.

2.4 Three stripes on the pipe, offset from one another by 90°, simplify the orientation of the fittings.



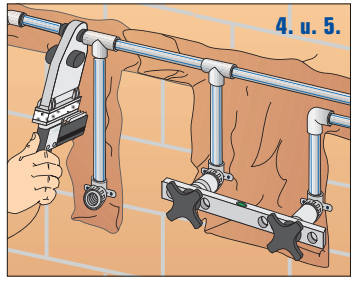
2.5 For a short time, the orientation of the fittings can be adjusted (see table), a short time later, the section of pipe can be fully loaded (see table).

3. The low weight and high flexibility lend themselves to the preparation of whole pipe sections on the workbench. Make what use you can of this possibility. It saves a lot of time.



4. However, there will remain joints to be finished within the constraint of the groove in the wall. Make sure that these points are as accessible as possible.

5. The installation gauge with spirit level enables the wall outlets to be adjusted and then fixed at all the usual spacings.



6. Don't forget to insulate the pipes as required. Elastic insulation tubes (UP tube, LEXEL etc.) are available.

Polyfusion Welding of KELEN with the Table Welding Machine

1. Screw the heating elements for the desired dimension onto the welding block. These are of different lengths, depending on the dimension, to heat to the required depth.
2. The fitting clamping jaws are interchangeable according to dimension:

   Type 1:

   d 20 – 50: small mounting
   d 63 – 90: large mounting

   Type 2:

   d 25 – 63: small mounting
   d 75 – 125: large mounting

   Type 3:

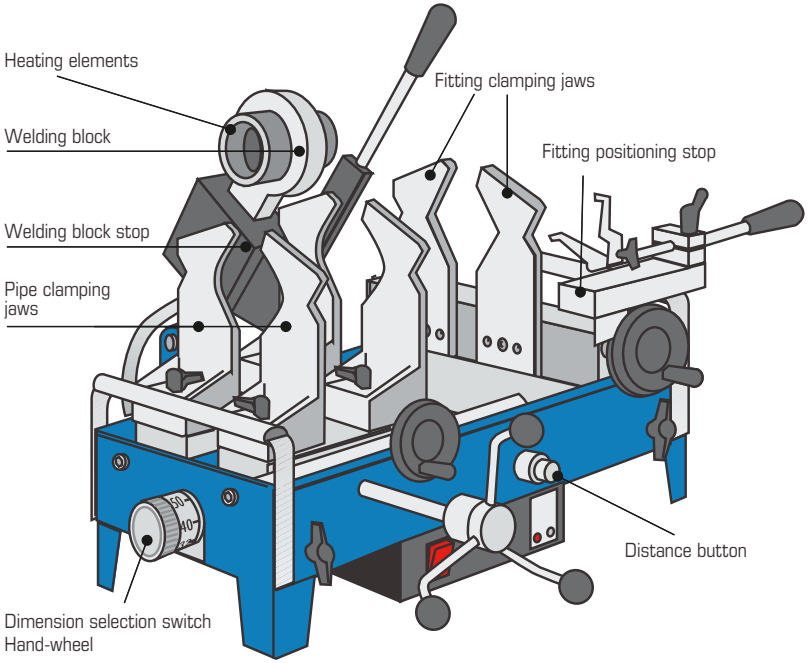
   d 63 – 160 mm

3. The pipe clamping jaws, like the fitting clamping jaws, are interchangeable.
4. Dimension selection switch select the desired dimension to set the depth to which the pipe is pushed into the fitting.
5. By pressing the distance button the slides can be held at a defined spacing to fix the insertion length of the pipe and fitting in the heating elements.

There are three welding machines available:

Type 1: d 20 – 90 mm
Type 2: d 20 – 125 mm
Type 3: d 63 – 160 mm

The welding temperature, processing instructions and welding parameters are to be found on page 21



The welding procedure:

1. Clamp the fitting square in the clamping jaws and fix with the positioning stop.

1.1 Lay the pipe to be welded in the pipe clamping jaws without tightening.

1.2 Hold the distance button pressed and move the slides together with the hand-wheel until the pipe end touches the edge of the fitting or the slides are against the distance button.

1.3 Release the distance button and now clamp the pipe tight.

2. Move the slides apart and bring down the welding block.

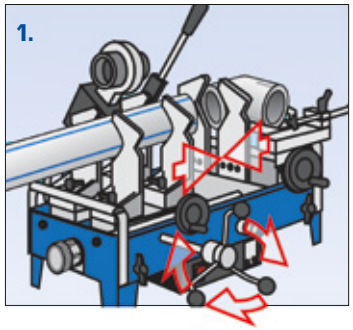
2.1 As for the melting procedure for the plastic, bring the slides together until they are stopped by the welding block stop.

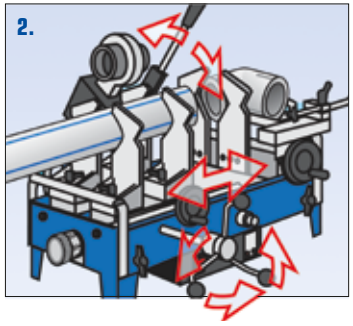
2.2 At the end of the heating time, quickly move the slides apart and raise the welding block out of the way.

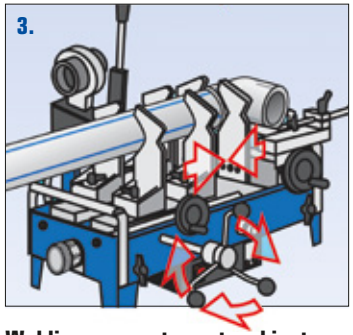
3. Quickly move the slides together to the end stop set with the dimension selection switch.

3.1 Never cool the weld seam abruptly. A short while later, release the clamping jaws. The welded parts can now be removed.

Can be fully loaded only after the specified cooling time.





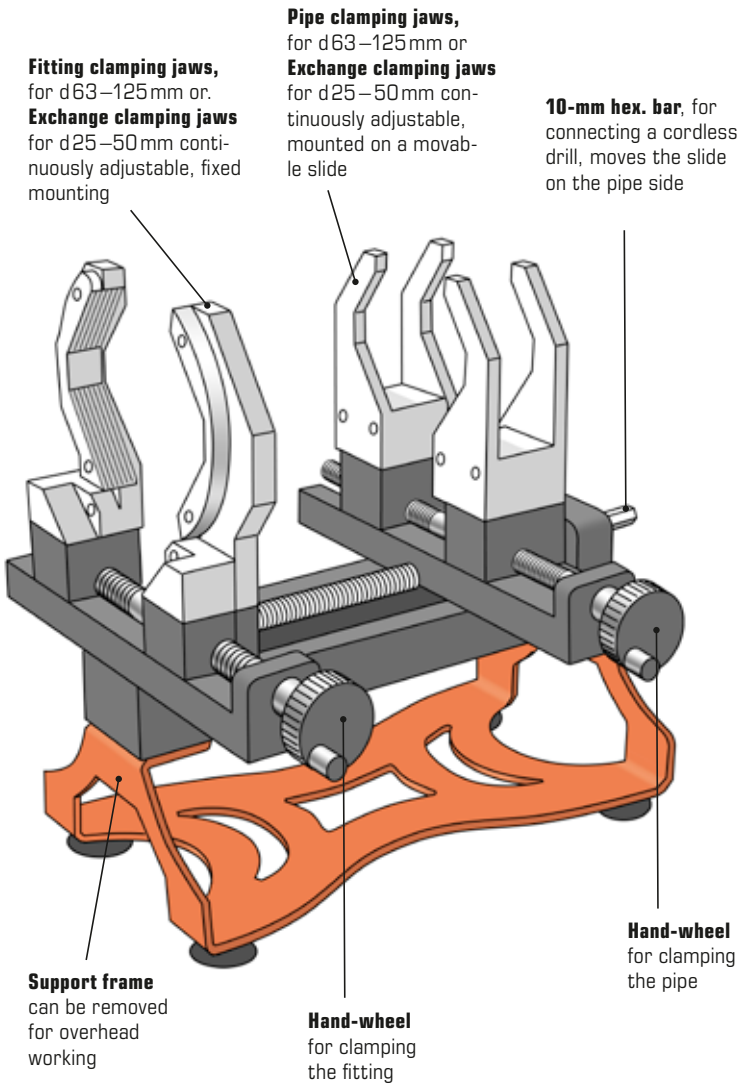


Welding parameters at ambient temperatures around 20 °C

d mm pipe	Heating time sec	Adjustment 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	50	10	8
160	70	10	8

Polyfusion Welding with the WZ120R KELIT Overhead Welding Machine

Use of the overhead welding machine is recommended for welds on exposed pipes in confined spaces, dimensions d25–125mm



1. Clamp the machine onto a pipe already installed in a confined space by means of the pipe clamping jaws. The machine thus hangs free from the end of the pipe.

1.1 It should be ensured that there is a pipe support in the immediate vicinity of the pipe clamping jaws.

1.2 Clamp the fitting in the fitting clamping jaws. The fitting must be free to move in the axial direction by at least the thickness of the welding block plus the weld insertion length.

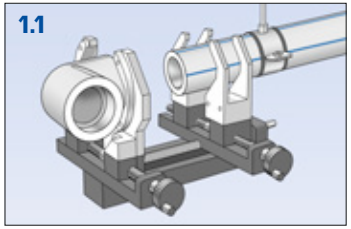
2. The protrusion of the pipe from the pipe clamping jaws must permit the insertion of the hand-held welding block supplied with the machine while being sufficient to fully insert the pipe in the fitting after heating.

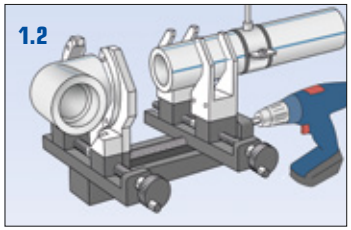
With the slides at full separation, the space between pipe and fitting should be 100 to 150mm.

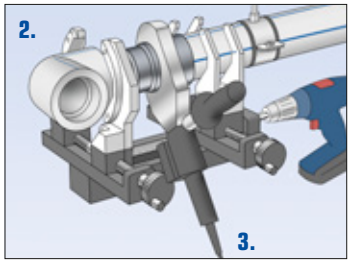
3. Insert the hand-held welding block with the correct welding tool (260°C) for the pipe dimension and, using a cordless screwdriver/drill (not supplied), move the axially guided slides together until the pipe and fitting are inserted in the tool to the marked depth (sleeve length of the fitting and heat them.

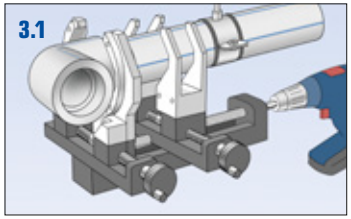
3.1 After the heating time shown in the table, move the slides apart, withdraw the welding block and quickly bring the pipe and fitting together and weld within the specified adjustment time.

Can be fully loaded only after the specified cooling time.









Welding parameters at ambient temperatures around 20°C

d mm pipe	Heating time sec	Adjustment 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

Dimensioning, Pressure Drop of KELEN Systems

The total pressure drop (Δ_p) of a KELEN system can be calculated from the pipe length (**l**) multiplied by the frictional pressure gradient (**R**), plus the sum (**Σ**) of the individual resistances (**Z**)

Total pressure drop Δ_p: $\Delta_p = l \cdot R + \Sigma Z$ **in (Pa)**

The selection of the pipe dimension for the water pipe depends on:

- the available water pressure, geodetic head difference
- pressure drop in equipment and minimum flow pressure (valves)
- pipe frictional pressure gradient, flow velocity
- individual resistances of fittings
- type number and diversity factor of drawing off points

Permissible flow velocities according to DIN 1988-300

The flow velocity in m/sec for a duration of	< 15 min	≥ 15 min
Service pipes: runs with resistance coefficients ζ < 2.5 for the individual resistances [a]	5	2
Service pipes: runs with resistance coefficients ζ < 2.5 for the individual resistances [b]	2,5	2

[a] e.g. piston valves, ball valves, valves with inclined seat [b] e.g. valves with straight seat

Guidelines for circulation pipes according to DIN 1988-300

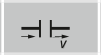
The circulation system is to be sized so dimensioned that the temperature difference between inlet and outlet of the water tank is not more than 5 K. At no point in the system may the hot water fall below 55 °C.
For reasons of economy, the flow velocity in circulation pipes should be about 0.2–0.5 m /sec, in exceptional cases no more than 1.0 m /sec.

Determining the individual resistances (Z) for typical fittings:

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

ζ = loss coefficient
ρ = density (kg/m³)
v = calculated flow velocity (m/sec)

Individual resistances (Z) of KELEN fittings

Individual resistance	Graphical symbol	Loss coefficient ζ
Elbow 90°		1.3
Elbow 45°		0.4
T-piece straight path		0.3
T-piece branch with dividing flow		1.3
T-piece reversed with dividing flow		1.5
Reducer		0.4
Valve with straight seat d20 d25 d32		10.0 8.5 7.0
Valve with inclined seat d20 d25 d32–63		3.5 2.5 2.0
Ball valve d20 d25–32 d40–63		1.0 0.5 0.3

Dimensioning in accordance with EN ISO 806-3

With this dimensioning method, the pipe dimension is determined for normal installations up to a maximum of 12 residential units.
This method is used for both cold and hot water pipes. The definition for normal installations is to be found in EN 806-3 point 4.2. For special installations such as hospitals, spa establishments, hotels, schools etc, according to the Austrian standard, ÖNORM B 2531, reference must be made to DIN 1988-300 (see pages 26–28).

Drawing off point	Q_A	Q_{min}	LU
Washbasin, bidet, WC cistern	0.1	0.1	1
Dishwasher, Shower, sink, household kitchen sink, washing machine ae [a]	0.2	0.15	2
Urinal flush	0.3	0.15	3
Bath tap	0.4	0.3	4
Outdoor tap for garden/garage	0.5	0.4	5
Commercial kitchen sink DN 20, bath tap	0.8	0.8	8
Push flush DN 20	1.5	1.0	15
a) For commercial washing machines according to manufacturer's information			

One load unit (LU) corresponds to a draw-off valve flow (QA) of 0.1 l/sec

With regard to flow noise, a flow velocity of 2 m/sec should not be exceeded in collective feed pipes, risers and multi-storey pipes.
For individual feed pipes, flow velocities of up to 4 m/sec are permissible.

Example:
Connected to a riser are, in total:

3 baths	3	x LU 4	=12
3 showers	3	x LU 2	= 6
3 washbasins	3	x LU 1	= 3
3 WC cisterns	3	x LU 1	= 3
3 kitchen sinks	3	x LU 2	= 6
2 washing machines	2	x LU 2	= 4
Total load value (LU)			34

After addition of the weighted load units (LU) the pipe diameter (d) can be selected from the following table.t

Result:
according to EN 806-3, from the tables below we find
KELEN MK00: d40 x 6.7 mm
KELEN MK08: d32 x 4.4 mm

MK00 KELEN pipe PN20

Dim. d x s mm	Water volum l/m	Load value LU at 2m/sec	highest individual value LU	maxim. pipe lenght m
20x3.4	0.14	3		15
20x3.4	0.14	4		9
20x3.4	0.14	6	4	7
25x4.2	0.22	13	5	
32x5.4	0.35	30	8	
40x6.7	0.56	70		
50x8.3	0.88	200		

MK08 KELEN pipe PN16

Dim. d x s mm	Water volum l/m	Load value LU at 2m/sec	highest individual value LU	maxim. pipe lenght m
20x2,8	0,16	8	5	
25x3,5	0,25	16	8	
32x4,4	0,42	35		
40x5,5	0,66	100		
50x6,9	1,03	350		

Dimensioning Guidelines

Extract from DIN 1988-300:

1. Determining calculation flows and minimum flow pressures of the draw-off valves

The calculation flow $(\dot{V}_R)$ is a value assumed for the draw-off valve flow for calculation purposes. The table gives guide values for the calculation flows of commonly used valves and taps. The calculation flow $(\dot{V}_R)$ is given as an average by the following equation:

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

2. Determining the sum flows and assigning them to the pipe runs

Against the direction of flow – in each case at the most remote draw-off point and ending at the supply pipe – the calculation flows are to be added and the sum flows thus obtained assigned to the respective pipe runs. The respective pipe run begins with the fitting at which the sum flow or the diameter changes. At the branch-off point of the cold water pipe to the water heater, the sum flows of the cold and hot water sides are added.

3. Use of the curves for conversion of sum flow to peak flow

When calculating pipe installations, the basic rule is to take into account all draw-off points with their calculation flows.
An exception is the case where, in an sanitary unit (SU), a second wash-basin, a shower in addition to the bath, a bidet, a urinal or draw-off tap is present in the vestibules of toilet facilities. These are not considered in the sum flow.

4. Diversity according to building type

The peak flow is calculated depending on the sum flow, the draw-off diversity factor is dependent on the type of use of the building (e.g. in flats, hotels etc.).
In general, it is not to be expected that all connected draw-off points are fully opened at the same time. The conversion curves for the various types of building are to be found on page 28.

5. Selecting the pipe diameter

Determine the pipe diameter and pipe friction pressure gradient and the corresponding calculation flow velocity (pressure drop diagrams, see pages 29–31).

6. Comparing pressure drop with available pressure

The overall pressure drop for the pipe diameter thus determined should largely reach but not exceed the available pressure difference.

7. Minimum flow pressures and calculation flows ($\dot{V}_R$ l/sec) of commonly used drinking water draw-off points

Minimum flow pressure bar	Type of drinking water draw-off point	Dimension	$\dot{V}_R$
	Outlet valve		
0.5	without flow regulator [a]	DN 15	0.30
0.5		DN 20	0.50
0.5		DN 25	1.00
1.0	with flow regulator	DN 10	0.15
1.0		DN 15	0.15
	Mixer taps [b.c]		
1.0	showers	DN 15	0.15
1.0	baths	DN 15	0.15
1.0	kitchen sinks	DN 15	0.07
1.0	washbasins	DN 15	0.07
1.0	bidets	DN 15	0.07
	Domestic appliances		
0.5	Dishwasher	DN 15	0.07
0.5	Washing machine	DN 15	0.15
	WC basins and urinals		
1.0	Push flush for urinal. manual or electronic. push flush for	DN 15	0.30
1.2	WC to EN 14124	DN 20	1.00
0.5		DN 15	0.13

a) without equipment connected (e.g. lawn sprinkler)

b) The calculation flow shown is to be used in the calculation for the cold and the hot side connection

c) Angle valves (e.g. for washbasin taps and hose connections in showers) are to be accounted for as individual resistances or in the minimum flow pressure of the draw-off valve/tap

Important note:

The manufacturers of valves and taps must state the minimum flow pressure and the calculation flows $(\dot{V}_R)$ for valves/taps. Basically, the data supplied by the manufacturer is to be taken into account for dimensioning. If these lie above the values stated in the table, the drinking water installation must be dimensioned using the manufacturer's data.

Note:
Draw-off points and appliances not listed in the table of the same kind with larger valve flows or minimum flow pressures than given are also to be taken into account in accordance with the manufacturer's data.

Extract from DIN 1988-300

For the building types listed in the table, the peak flow ($\dot{V}_S$) is calculated in the following range of applicability:

$$\Sigma\ \dot{V}_R : 0.2 \text{ bis} \leq 500 \text{ l/sec}$$

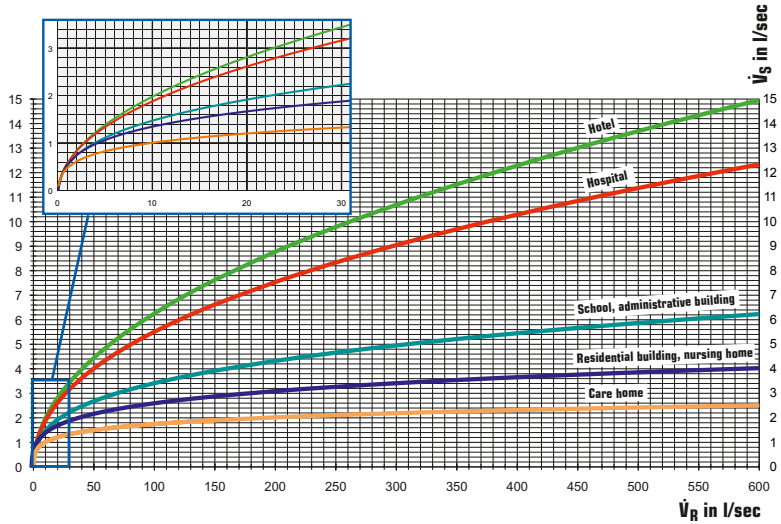
The peak flow ($\dot{V}_S$) is calculated, according to the building type, with the constants **a, b** and **c** from the table as follows:

$$\dot{V}_S : a\,(\Sigma \dot{V}_R)^b - c$$

Constants (a, b, c) for the peak flow according to building type

Building type	Constants a	b	c
Residential building	1.48	0.19	0.94
Establishment for sheltered living, nursing home	1.48	0.19	0.94
Hospital inpatient wards	0.75	0.44	0.18
Hotel	0.70	0.48	0.13
School and administrative building	0.91	0.31	0.38
Care home	1.40	0.14	0.92

Graphical solution for the calculation of peak flow $\dot{V}_S$ depending on sum flow $\dot{V}_S$ for the range from 0–500 l/sec



Exceptions for calculation of the peak flow $\dot{V}_S$

Continuous users with flow times of more than 15 min. are added to the peak flow of the other draw-off points.

Group installations for which the diversity factors and water draw-off are to be determined with the operator and the peak flows to be added if they could occur simultaneously.

For special builds such as commercial and industrial buildings, large kitchens, public baths etc, the peak flows shall be determined together with the operator of the system and added together if they occur at the same time.

KELEN

Dimensioning and Pressure Drop for

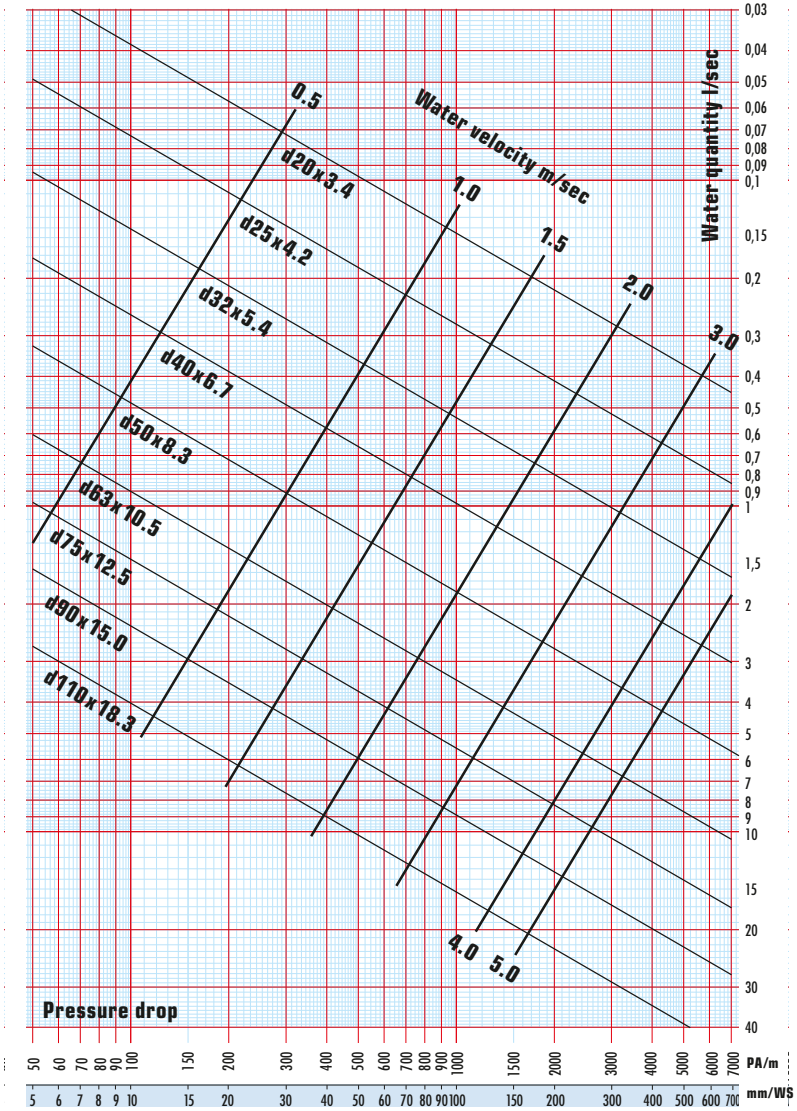
MK00 KELEN PP-R / PN20

For calculation of the individual resistances, see the **KELEN** manual, page 24

The pressure drops are calculated according to the Nikuradse formula:

$$R = 3.62315 \cdot 10^3 \cdot \dot{m}^{1.70651} \cdot di^{-4.64237}$$

Pipe roughness: 0.007 mm
R = frictional pressure gradient (Pa/m)
$\dot{m}$ = flow (l/h)
di = Inner diameter of pipe (mm)



Dimensioning and Pressure Drop for

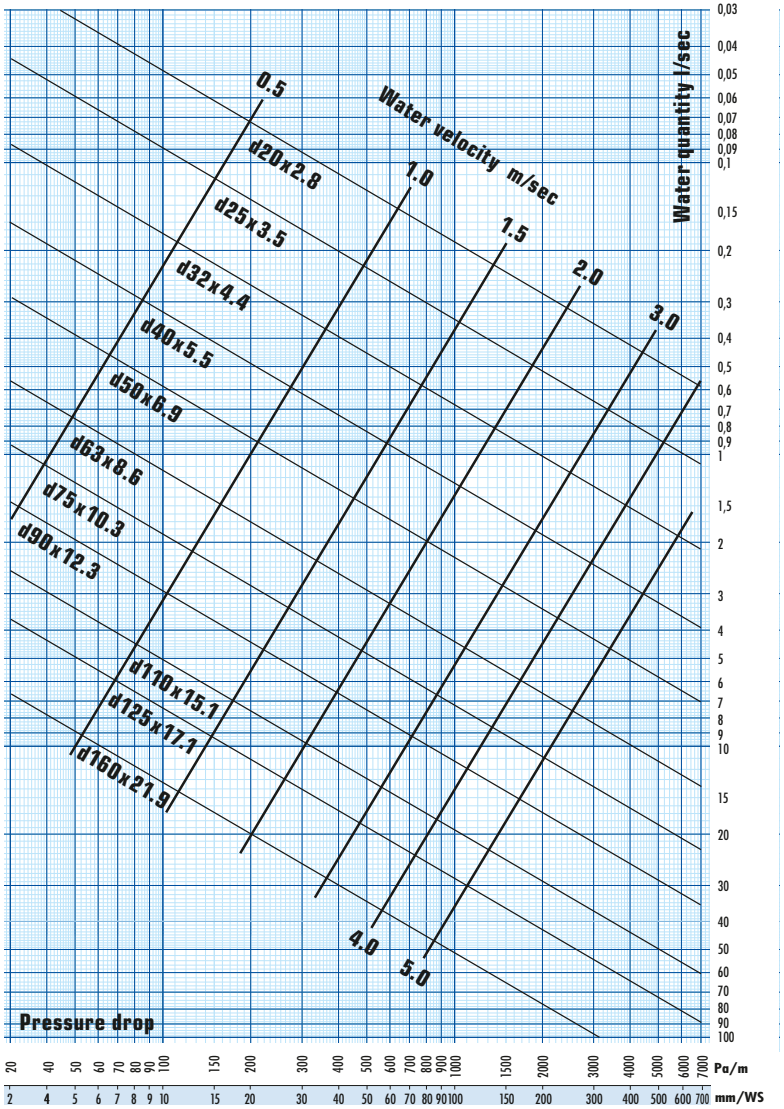
MK08 KELEN PP-R / PN16

For calculation of the individual resistances, see the **KELEN** manual, page 24

The pressure drops are calculated according to the Nikuradse formula:

$$R = 3.62315 \cdot 10^3 \cdot \dot{m}^{1.70651} \cdot di^{-4.64237}$$

Pipe roughness: 0.007 mm
R = frictional pressure gradient (Pa/m)
$\dot{m}$ = flow (l/h)
di = Inner diameter of pipe (mm)



Dimensioning and Pressure Drop for

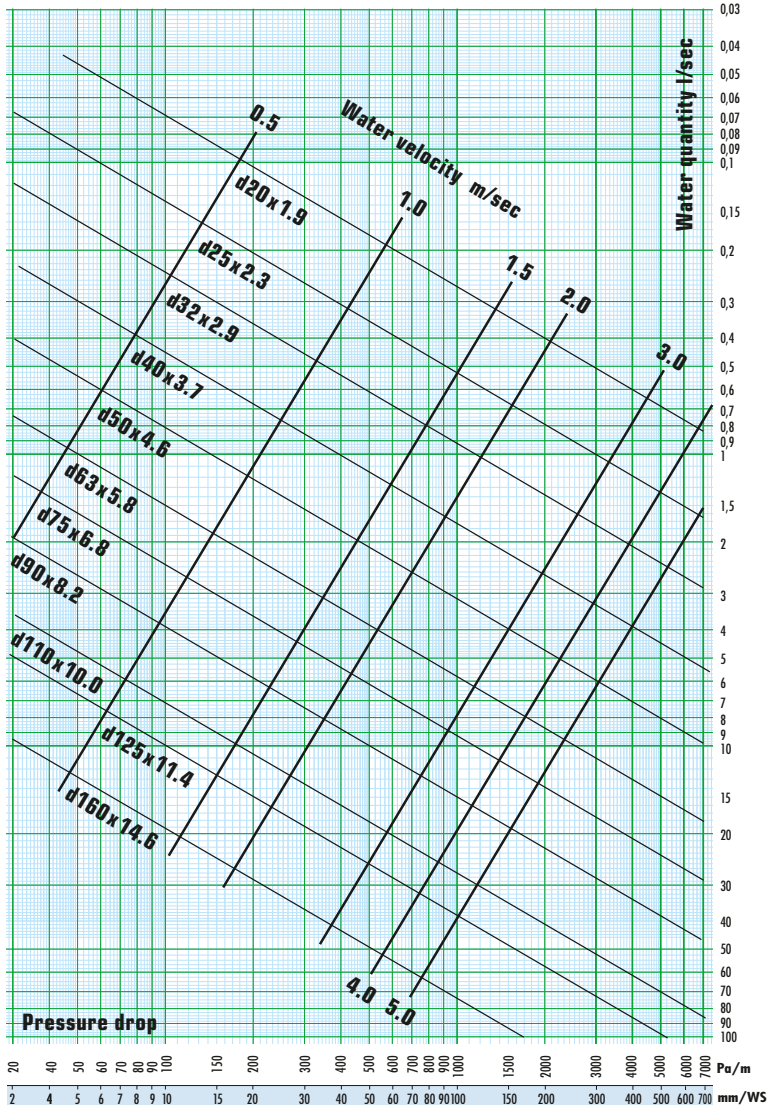
MK02 KELEN PP-R / PN10

For calculation of the individual resistances, see the **KELEN** manual, page 24

The pressure drops are calculated according to the Nikuradse formula:

$$R = 3.62315 \cdot 10^3 \cdot \dot{m}^{1.70651} \cdot di^{-4.64237}$$

Pipe roughness: 0.007 mm
R = frictional pressure gradient (Pa/m)
$\dot{m}$ = flow (l/h)
di = Inner diameter of pipe (mm)



Expansion Behaviour of KELEN Pipes

Longitudinal thermal expansion

All materials, when heated, are subject to an increase in volume leading to a change in length. In every piping system, the longitudinal expansion must be considered in relation to the installation situation.

The longitudinal expansion depends on the pipe length, the temperature rise and coefficients of thermal expansion but is independent of the dimension.

Calculation of the longitudinal expansion (Δ_l):

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

Δ_l = specific longitudinal expansion (mm)
l = pipe length, installed length (m)
Δ_t = temperature difference (K)
α = coefficient of thermal expansion (mm/mK)

Material characteristics

Material	Coefficient of thermal expansion α mm/mK	E-modulus 60° N/mm²
Galvanised steel	0,012	220.000
Stainless steel	0,015	200.000
Copper	0,016	130.000
KELOX	0,025	4.240
KELEN	**0,14**	**300**
PEX	0,175	540

Under the influence of temperature, KELEN, when laid free from constraint, expands more than metallic materials but with lower expansion force.

Expansion leg of open-laid pipes

For open-laid KELEN pipes subject to thermal expansion, appropriate expansion compensation must be provided. This can be by a suitable arrangement of bending legs in combination with fixed points (**FP**) and sliding bearings (**GL**).
Even if the temperature rise is only short-term, the expansion compensation must always be provided between two fixed points or between a fixed point and a change of direction (bending leg)

Bending leg calculation (MS):

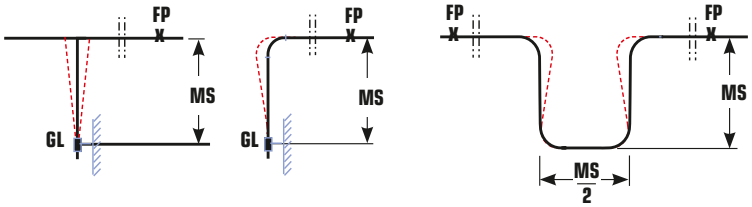
$$MS = 20 \cdot \sqrt{d \times \Delta_l}$$

d = outer pipe diameter (mm)
20 = material constant for KELEN
MS = Minimum leg length (mm) e.g: from 90° bend to next fixed point

Example:

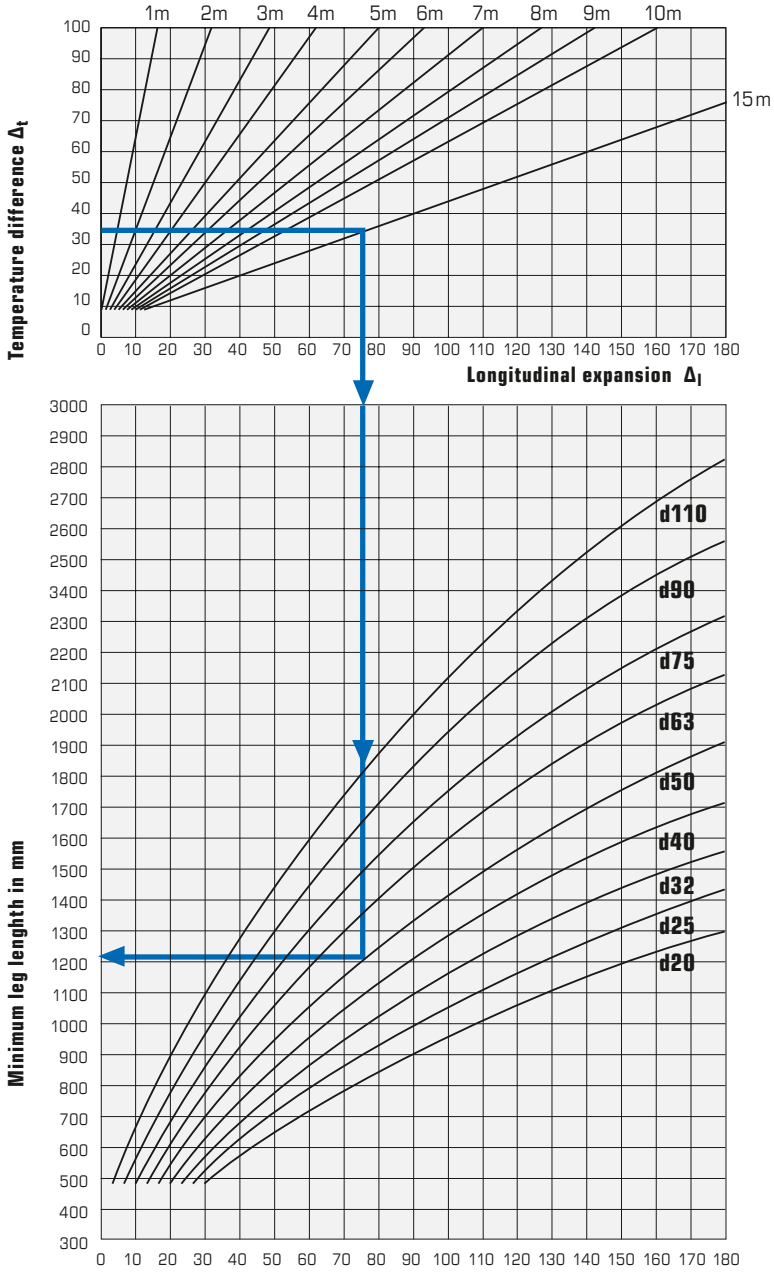
A d50 mm pipe is laid over a length of 15 m. Δ_t = 35 K Question: what bending leg should be provided to compensate the expansion?

Δ_l = $15 \cdot 35 \cdot 0{,}14$
Δ_l = 74 mm expansion
MS = $20 \cdot \sqrt{50 \cdot 74}$
MS = 1217 mm leg length



Graphical solution: unimpeded longitudinal expansion

Thermal expansion diagram



Thermal Expansion Forces of KELEN Pipes

Thermal expansion leads to material-specific forces. Technical practice is to calculate the specific expansion force using the following formula:t

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

F_t = expansion force (N)
E = E modulus (N/mm²)
A = pipe cross-sectional area (mm²)
α = coefficient of thermal expansion (mm/mK)
Δ_t = temperature difference (K)

- **Thermal expansion forces depend on the dimension (pipe cross-sectional area) and temperature change but are independent of the pipe length.**

- **Comparison of materials: Under the influence of temperature, KELEN, when laid free from constraint, expands more than metallic materials. The resulting thermal expansion forces, however, are many times smaller!**

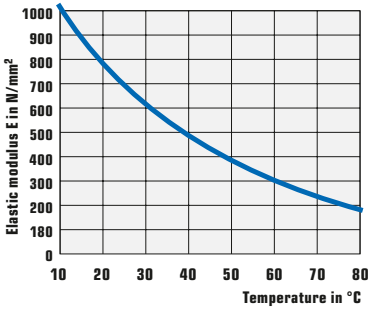
Like any plastic, polypropylene exhibits a marked dependence of the E modulus on temperature (graph).

> Temperature: < E modulus

< Temperature: > E modulus

The thermal expansion force thus becomes an important criterion for pipe laying!
A significant factor is the stiffness (E modulus) of the material:

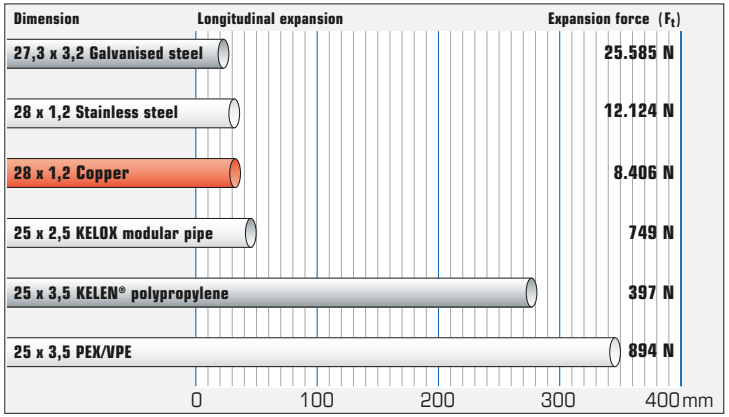
E modulus of polypropylene as a function of temperature t_m



Examples according to table:

Installed length:	l	= 50 m
temperature:	t_v	= 20 °C
temperature:	t_m	= 60 °C
temperature difference:	Δ_t	= 40 K

Comparison of materials



Compensation possibilities in practice

Laying rules in respect of longitudinal expansion

The basic installation rule is to ensure that pipes are routed sensibly while making appropriate allowance for expansion. The expansion forces can be calculated for any concrete case of use. As a rule, however, they are a fraction of the forces for metallic materials. The suppliers of shell clamps can offer solutions where required (fixed points, sliding points etc.)

Pipes laid under plaster or in the floor structure

- Pipes in masonry are prevented from expanding by the frictional forces arising. (no expansion provision)
- Insulated pipes offer an additional expansion possibility.
- Direct contact of pipes and fittings laid under plaster with the masonry, tiles, mortar etc. is fundamentally to be avoided by suitable insulation.
- Pipes in the floor structure can move in the axial direction within the insulation. The changes in length to be expected must therefore be taken into account. Right-angled changes of direction in the insulation layer are to be so executed that any longitudinal expansion is compensated by the insulation in the area of the fitting.
- The elastic deformation of pipes directly embedded in screed or concrete makes additional compensation unnecessary in such cases. The thermal and footfall noise insulation requirements must, however, be taken into account

Open laid hot water pipes require compensation

Even if the temperature rise is brief, appropriate expansion compensation must be provided (see pages 32–33 and 36–37).

Any change in temperature gives rise to forces:

- > medium temperature = expansion force
- < medium temperature = contraction force
- **For open pipework, care must be taken to calculate the fixed point forces arising from the compensation!**
- For greater stability of the pipes, the use of shell clamp pipe supports is recommended! The expansion will be reduced to the value for steel.
- For free-standing pipes (cellar pipes, risers etc.), fastening depends on the structural conditions and the recognised practical rules. Fixed points should not be directly applied to fittings that effect a change in direction.
- The fastening of vertical pipes (risers etc.) can, as a rule, be solely with fixed points, in which case the fixation should be immediately above or below any branch off from the riser.

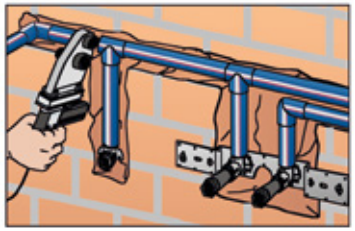
Installation Examples

1. Installation in shafts

In practice, risers between 2 floors can hang free in the shaft space, provided that a pipe clamp is placed immediately next to the branch pipe to provide a fixed point in the riser. The spacing between fixed points: > 3 m
There are other recognised methods for taking up the longitudinal expansion, such as the insertion of spring legs in the branch pipe.

2. Laying under plaster

Pipes embedded in masonry, concrete, screed etc. are prevented from expanding longitudinally. The resulting compressive and tensile stresses are absorbed by the material without damage. In the case of insulated pipes, the insulation material provides an additional expansion possibility.



Guideline values for support spacings

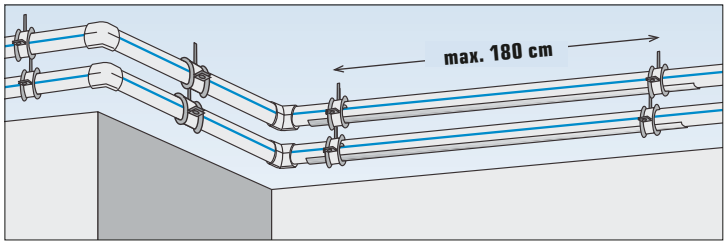
With the pipe clamp spacings (cm) shown, the kinking of water-filled, horizontally laid KELEN pipes WITHOUT pipe supports will be prevented.

d	PN 10	PN 16		PN 20	
mm	20°C	20°C	60°C	20°C	60°C
20	70	75	60	80	65
25	75	80	70	85	75
32	90	95	80	100	85
40	100	105	90	110	95
50	115	120	100	125	105
63	130	135	110	140	120
75	150	160	130	170	150
90	185	195	150	205	170
110	195	205	160	215	180
125	205	225	175	–	–
160	220	240	185	–	–

3. Free-standing installation

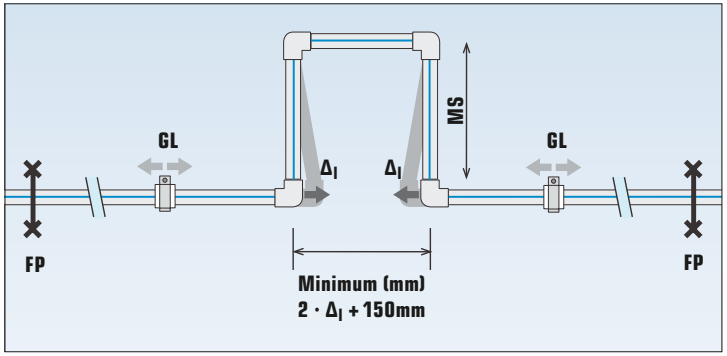
3.1 Mechanical expansion restraint d 20 – 50 mm

For pipes < d 63 mm installed free-standing, KELEN ALU composite pipes are to be preferred for the sake of appearance. On the other hand, higher stability of form can be achieved by using steel support clamps. Here, all pipes are supported by the clamps (K88), all support points are executed as fixed points and the pipes are additionally fixed within the clamp shells (e.g. with cable ties); (shells d 20, 25 and 32 mm are self-clamping to the pipe). Using this technique, the longitudinal expansion of the plastic pipes is effectively reduced to that of steel.



3.2 Expansion loops and expansion compensation d 63 – 160 mm

To increase the support spacing on free-standing pipes ≥ d63 mm, the pipe supports (K88) is recommended. To absorb the longitudinal expansion, use can be made of all changes of direction that arise in the course of the installation.
If need be, expansion compensation must be provided by an expansion U loop. The arrangement of the fixed points divides the pipe into individual pipe runs and thus directs the expansion in the desired direction. Calculation of the minimum leg length (see pages 32 – 33).



Pressure Testing – Drinking Water Systems with Air or Inert Gases according to ÖNORM B 2531

Pressure testing with air or inert gases is performed in a two-step procedure consisting of leakage testing and load testing. The leakage testing for pipes ≤ DN 50/ OD 63 can be performed in two ways.

The pressure testing with air or inert gases can be performed in sections and does not take the place of the final pressure test with drinking water!

The pressure test must be performed with largely oil and dust-free air or inert gas and is suitable for all pipe materials. In buildings subject to increased hygiene requirements (e.g. medical establishments) an inert gas must be used for pressure testing.

Because of the compressibility of the medium, for pressure testing with air or inert gases, the test pressure may not exceed 300 kPa (3 bar) for safety reasons.

Higher test pressures represent a safety risk and do not enhance the precision of the test. During testing, the safety of persons and goods must be considered. The division into short pipe runs for pressure testing leads to higher test precision and thus to greater certainty. Increasing the pressure in steps is a sensible additional safety measure.
All pipe openings must be closed and sealed off with plugs or blind flanges that will withstand the test pressure. For pressure testing with air or inert gases, the the connection points of the piping parts must be accessible and visible, discharge valves must be provided for safe release of the test pressure. If leaks are detected or a drop in pressure is observed, all connections are to be checked for leakage with a suitable bubble-forming test medium and the test repeated after correction of the leaks.

Two-step pressure testing for all pipes ≤ DN 50/OD 63 Consists of leakage testing method 1 or 2 and load testing

Leakage testing – method 1

Test pressure 15 kPa (150 mbar) – test time 60 min.
Indicator precision of the pressure gauge or manometer 0.1 kPa (1 mbar)

Leakage testing – method 2

Test pressure 100 kPa (1 bar) – test time 60 min.
Indicator precision of the pressure gauge 5 kPa (50 mbar); in addition, all connection points in the system are to be checked for leakage with a suitable bubble-forming test medium.

Load testing

Test pressure 300 kPa (3 bar) – test time 10 min.
Indicator precision of the pressure gauge 10 kPa (100 mbar)

Two-step pressure testing for all pipes > DN 50/OD 63 Consists of leakage testing and load testing

Leakage testing

Test pressure 15 kPa (150 mbar) – test time 90 min.
Indicator precision of the pressure gauge or manometer 0.1 kPa (1 mbar); in addition, all connection points in the system can be checked for leakage with a suitable bubble-forming test medium.

Load testing

Test pressure 100 kPa (1 bar) – test time 10 min.
Indicator precision of the pressure gauge 10 kPa (100 mbar)

KELEN

Pressure test report in accordance with ÖNORM B 2531 for KELEN drinking water systems

Test medium: air or inert gas

Customer: .....

Contractor: .....

Property: ..... Test section: .....

Pipe materials and dimensions: .....

Ambient temperature: ..... Temperature compensation: ☐

Highest system working pressure MDP: ..... Visual inspection: ..... ☐

Two-step pressure testing for all pipes ≤ DN 50/OD 63 Consists of leakage testing method 1 or 2 and load testing

Leakage testing – method 1 ☐

Test pressure 15 kPa (150 mbar) – test time 60 min

Leakage testing – method 2 ☐

Test pressure 100 kPa (1 mbar) – test time 60 min
In addition, all connection points in the system are to be checked for leakage with a suitable bubble-forming test medium.

Load testing ☐

Test pressure 300 kPa (3 mbar) – test time 10 min.

Two-step pressure testing for all pipes > DN 50/OD 63 consists of leakage testing and load testing

Leakage testing ☐

Test pressure 15 kPa (150 mbar) – test time 90 min
In addition, all connection points in the system can be checked for leakage with a suitable bubble-forming test medium.

Load testing ☐

Test pressure 100 kPa (1 mbar) – test time 10 min

Note:

- After successful pressure testing, we recommend the preparation of a confirmed test report.
- Pressure testing with air or inert gas is no substitute for the pressure test with drinking water in accordance with Austrian standard EN 806-4. This must be performed immediately before commissioning the system.

Confirmation

Tester: .....

Date: ..... time: from ..... to .....

Customer: .....

.....

Pressure Testing – Drinking Water Systems with Drinking Water in accordance with EN 806-4

The pressure test with drinking water is a combined leakage and load test and must be carried out on all piping according to EN 806-4. Pipes and other piping parts are to be tested for the maximum system working pressure (MDP) in accordance with EN 805 or EN 806 series. They must, however, at least be designed for a system working pressure (MDP) or nominal pressure (PN) of 1000 kPa (10 bar).

- **Since the test pressure according to EN 806-4 must be 1.1 times the highest system working pressure, the pressure test must be performed with at least 1.1 MPa (11 bar).**
- **If a pressure test with air or inert gas in accordance with ÖNORM B 2531 has been carried out, the water pressure test can be performed with 0.9 MPa (9 bar).**

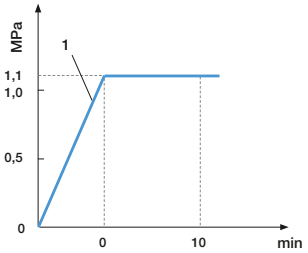
Indication precision of the pressure gauge (positioned at the deepest possible point) 0.02 MPa (0.2 bar). Depending on the pipe materials and dimensions, 3 different methods can come into question for leakage and load testing

Test method A – test time 10 min.

For all plastics (PP, PE, PEX, PB and the like) and for all combined systems (metal systems-multilayer composite systems with plastics)

≤ DN 50/OD 63

The test pressure (1) is to be applied with pumps and maintained for 10 min. During this time, the test pressure must remain constant, no fall in pressure is permitted.



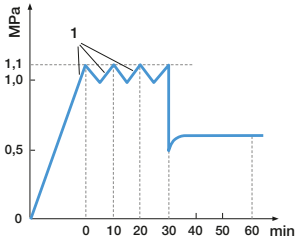
Choice of test method B or C

For all plastics (PP, PE, PEX, PB and the like) and for all combined systems (metal systems-multilayer composite systems with plastics)

> DN 50/OD 63

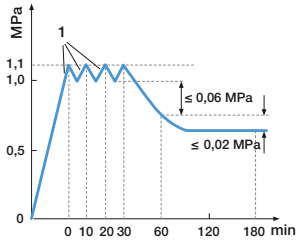
Test method B – test time 60 min.

The test pressure (1) is to be applied with pumps and maintained for 30 min. The system is then to be drained down to 0.5 times the test pressure. This reduced pressure must remain constant for 30 min, no fall in pressure is permitted. A visual inspection of the connections is to be performed.



Test method C – test time 180 min.

The test pressure (1) is to be applied with pumps, maintained for 30 min. and recorded. After a further 30 minutes, the pressure is again recorded. If, after this time, the pressure has fallen by less than 0.06 MPa (0.6 bar), the pressure test is to be continued without further pumping. The test continues for a further 120 min. during which the pressure may not fall to less than 0.02 MPa (0.2 bar) below the last recorded pressure. A visual inspection of the connections is to be performed.



KELEN

Pressure test report in accordance with EN 806-4 for KELEN drinking water systems

Test medium: Drinking water

Test pressure according to EN 806-4 with 1.1 MPa (11 bar)
Test pressure according to ÖNORM B 2531 with 0.9 MPa (9 bar)

Customer: .....

Contractor: ....

Property: ..... Test section: .....

Pipe materials and dimensions: .....

Ambient temperature: ..... System air-bled: ☐

Temperature compensation: ..... ☐ Visual inspection: ☐

Pressure testing for drinking water systems with at least 1.1 MPa (11 bar)
Combined air and drinking water test with at least 0.9 MPa (9 bar)

Test pressure EN 806-4 / 11 bar ☐ **Test pressure B 2531 / 9 bar** ☐

Pipes: d 20 ..... m	Pipes: d 50 ..... m	Pipes: d 110 ..... m
Pipes: d 25 ..... m	Pipes: d 63 ..... m	Pipes: d 125 ..... m
Pipes: d 32 ..... m	Pipes: d 75 ..... m	Pipes: d 160 ..... m
Pipes: d 40 ..... m	Pipes: d 90 ..... m	

Test method A – test time 10 minutes ☐

Metal and composite piping systems – all dimensions
Plastic systems and combined systems with plastics ≤ DN 50/OD 63

Choice of test method B or C

Test method B – test time 60 minutes ☐

Plastic systems and combined systems with plastics > DN 50/OD 63

Test method C – test time 180 minutes ☐

Plastic systems and combined systems with plastics > DN 50/OD 63

- **Temperature changes can influence the test pressure!**
- **Every pressure check applies at the time of checking and cannot be regarded as a guarantee against installation error.**
- **After successful pressure testing, we recommend the preparation of a confirmed test report.**

Confirmation

Tester: .....

Date: ..... time: from ..... to .....

Customer: .....

.....

Thermal Insulation for Hot Water Pipes in accordance with ÖNORM H 5155

The purpose of the Austrian standard, ÖNORM H 5155, is to harmonise and simplify the planning, execution and maintenance of the insulation of building installations.

- The objective of ÖNORM H 5155 is to prescribe insulation thicknesses to minimise the heat flow from the transport medium to the ambient or vice versa.
- ÖNORM H 5155 is to be used for the thermal insulation of all components of heating and drinking water installations.
- A further differentiating criterion is the type of the installation and position of the pipes (e.g. exposed, in false ceiling, heated room)
- Please follow the recommendations of KE KELIT, which also include comfort aspects, such as noise reduction.

For the application case of KELEN hot water pipes ÖNORM H 5155 gives a lambda value (λ) of 0.047 W/mK for a middle temperature of 50 °C and an outer heat transfer coefficient of 9 W/m²K.

On the basis of the lambda value (λ) of 0,036 W/mK at 20 °C of pre-insulated KELEN LX pipes, the amount of insulation required by the ÖNORM can be provided with the following KELEN LX pipes:

Insulation thickness 5 mm ≙ KELEN LX4 with 4-mm insulation thickness
Insulation thickness 10 mm ≙ KELEN LX9 with 9-mm insulation thickness
Insulation thickness 15 mm ≙ KELEN LX13 with 13-mm insulation thickness

ÖNORM H 5155 is the guideline for insulating hot and cold water pipes. On request KE KELIT can supply KELEN-LX pipes which are pre-insulated at the factory.

Extract from ÖNORM H 5155, table 6, the DN/OD values, however, are adjusted to the specific KE KELIT pipe dimensions

Pipe outer diameter	20	25	32	40	50	63	75	90
Position of the pipe	**Minimum insulation thickness (mm)**							
Technical area	20	25	30	40	55	70	70	100
Unheated area	20	25	30	40	55	70	70	100
Heated area	10	15	15	20	30	35	35	50
Installation shaft, installation walkway, predominantly adjacent to unheated areas	20	25	30	40	55	70	70	100
False ceiling, false floor, installation shaft predominantly adjacent to heated areas	10	15	15	20	30	35	35	50
Under plaster, floor in unheated areas	10	10	10	10	10	10	10	10
Under plaster, floor in heated areas	5	5	5	10	10	10	10	10

Locally applicable laws and standards relating to thermal insulation are to be taken into account and/or complied with.

KELEN

Thermal Insulation for Cold Water Pipes in accordance with ÖNORM H 5155

The purpose of the Austrian standard, ÖNORM H 5155, is to harmonise and simplify the planning, execution and maintenance of the insulation of building installations.

- The objective of ÖNORM H 5155 is to prescribe insulation thicknesses to minimise the heat flow from the transport medium to the ambient or vice versa.
- ÖNORM H 5155 is to be used for the thermal insulation of all components of heating and drinking water installations.
- A further differentiating criterion is the type of the installation and position of the pipes (e.g. exposed, in false ceiling, heated room)
- Please follow the recommendations of KE KELIT, which also include comfort aspects, such as noise reduction.

For the application case of KELEN cold water pipes ÖNORM H 5155 gives a lambda value (λ) of 0.036 W/mK for a middle temperature of 0°C and an outer heat transfer coefficient of 9 W/m²K.

On the basis of the lambda value (λ) of 0,036 W/mK at 20 °C of pre-insulated KELEN LX pipes, the amount of insulation required by the ÖNORM can be provided with the following KELEN LX pipes:

Insulation thickness 4 mm ≙ KELEN LX4 with 4-mm insulation thickness
Insulation thickness 9 mm ≙ KELEN LX9 with 9-mm insulation thickness
Insulation thickness 13 mm ≙ KELEN LX13 with 13-mm insulation thickness

ÖNORM H 5155 is the guideline for insulating hot and cold water pipes. On request KE KELIT can supply KELEN-LX pipes which are pre-insulated at the factory.

Extract from ÖNORM H 5155, table 6, the DN/OD values, however, are adjusted to the specific KE KELIT pipe dimensions

Pipe outer diameter	20	25	32	40	50	63	75	90
Position of the pipe	**Minimum insulation thickness (mm)**							
Technical area	13	13	13	19	25	25	25	32
Unheated area, free-standing pipe	9	9	9	13	19	19	19	25
Heated area, free-standing pipe	13	13	13	19	25	25	25	32
Installation shaft, Installation walkway, together WITH hot-running pipes	13	13	13	19	25	25	25	32
Installation shaft, Installation walkway, WITHOUT hot-running pipes	9	9	9	13	19	19	19	25
False ceiling, false floor, lightweight wall, under plaster, floor (distribution pipes only)	13	13	13	19	25	25	25	32
Free-sanding installation, floor (floor and individual pipes)	4	4	4	9	13	13	13	19
Free-sanding installation, floor, near hot-running circulation pipes (floor and individual pipes)	13	13	13	19	25	25	25	32

Locally applicable laws and standards relating to thermal insulation are to be taken into account and/or complied with.

Flushing Report in accordance with ÖNORM B 2531

Drinking water system – Flushing medium – drinking water

Customer: .....

Contractor: .....

Property: ..... Test section: .....

Pipe material: ..... Date: .....

To meet the requirements of EN 806-4, proceed as follows

Table 2: Guidelines for the minimum number of draw-off points to be opened

Largest nominal diameter of the pipe in the section currently being flushed (DN/ID)	20	25	32	40	50	65	80	100
Minimum number of draw-off points to be opened	2	2	4	6	8	12	18	28
Opened for flushing:								

Note: Independently of the flushing procedure, in the course of commissioning, every draw-off point should be fully opened once..

According to EN 806-4, the flushed pipes are to be fully operational within 7 days. The procedure for flushing with mixed air and water is described in EN 806-4.

- ☐ The drinking water used for flushing was filtered (no particles greater than or equal to 150 µm)
- ☐ Hot and cold water pipes were flushed separately. Circulation pipes were flushed per run, immediately before entry to the water heater.
- ☐ The minimum number of draw-off points was determined in accordance with table 2.
- ☐ During flushing, all shut-off and control valves were fully opened.
- ☐ Sensitive valves (e.g. solenoid valves, push flushes, thermostatic valves, regulator valves) and equipment (e.g. drinking water heaters) were replaced with adapters or bridged as specified by the manufacturers.
- ☐ The Installation was flushed in sections, starting with the first riser after main stopcock.

Correct flushing of the system is confirmed

Installation contractor / installer .....

Customer .....

Noise Protection

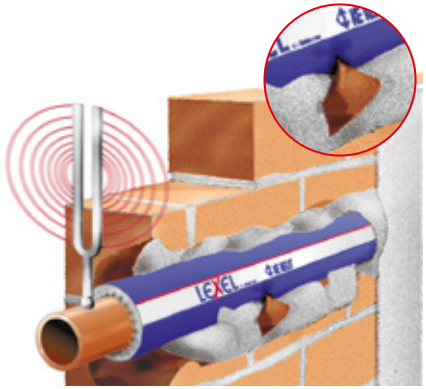
The purpose of all noise protection measures is to protect people in living rooms from disturbance by noise transmission. According to DIN 4109, include living, bed, teaching, office and work rooms. DIN 4109 recommends the following measures:

- the use of low-noise valves,
- acoustic decoupling in pipe fastenings and wall plates, e.g. KE85, KE85SB,
- the use of factory pre-insulated KELEN LX pipes:
- KELEN LX4-, LX9- and LX13 pipes or jacketing with sound-damping insulation together with structural noise decoupling (e.g. LEXEL),
- avoidance of high pressures and flow velocities
- not exceeding a permissible quiescent pressure of 5 bar before draw-off points,
- using transmitted noise damping pipe fastenings (e.g. rubber inserts),
- giving particular attention to rooms in need of protection.

The noise level for rooms in need of protection is defined in accordance with the Austrian standard ÖNORM B 8115.

- constant noises such as heating pumps, flow noises of drinking water or heating pipes etc. ≤ 25 dB (A),
- intermittent noises such as WC flushes, wastewater noises, lifts etc. ≤ 30 dB (A)

Increased noise protection, in 5 dB (A) steps below the values required in ÖNORM B 8115, must always be agreed separately!



Attention:
Damaged insulation or mortar residues between pipes, wall or screeds can form noise bridges that transmit the noise without attenuation. The objective must therefore be the most unbroken possible decoupling by pipe insulation in the interests of good noise protection.

Just one noise bridge can practically negate all other noise protection measures!

Summary of the Installation Guidelines

1. The KELEN piping system is made of plastic and requires careful handling with regard to impact and stress. To avoid hairline cracks in the pipe and any consequent damage, we recommend that about 1 cm is cut off each end before use.
The KELEN are manufactured about 2 cm longer than nominal.

2. Store and transport all KELEN parts with care. Protect pipes, fittings and parts from prolonged, direct exposure to UV (sunlight). This does not affect normal storage and working times, the material is UV-stabilised but not long-term UV-resistant.

3. Observe the guidelines for executing the various welded connections (see pages 18–23). The welding parameters are based on an ambient temperature of about 20 °C. If the ambient temperature changes, the interval from insertion in the tool to the start of heating time can change slightly.

4. Corrections in the range of a 5° twist must be made at once during welding, before the weld sets. Later corrections will lead to failures. (note the adjustment time on page 18).

5. KE KELIT recommends that, with KELEN inside thread fittings, only valves and connections with cylindrical thread should be used!
Do NOT screw in threaded pipes or malleable cast iron fittings!
We recommend the use of hemp in combination with an approved plumbing sealant (e.g. Fermit, Boss White). Using too much hemp risks damaging the inside thread.
As an alternative to hemp, Teflon sealing tape or thread sealing fibres can be used. **The basic rule: do not overtighten the thread!**

6. KELEN drinking water pipes have precisely defined expansion properties. These must be taken into account in the planning and installation. In masonry, no provision is needed for expansion.
Remember to compensate free-standing pipes (see pages 32–37). With careful choice of the fixed points, long pipe runs can be divided into expansion zones.

7. Avoid hot bending of the pipes (cold bends with r = 8 x d are possible). If unavoidable, use hot air; never use an open flame! Maximum bending temperature: 140 °C

8. Try to prepare recurrent piping sections in the workshop (z-dimension). This will save time and work in favour of system safety.

9. KELEN pipes are corrosion-resistant, in relation to acoustic and thermal insulation, this must be in accordance with standards.
By applying continuous insulation, even in the area of fittings, the connection points are protected from damage and noise bridges. For use under plaster, factory insulated LX fittings are available.

10. To be standards-compliant, a complete water installation must undergo a cold water pressure test (see pages 40–41). Keep a record of the pressure test. With regard to hygiene requirements, a pressure test can be performed with air or inert gases (see pages 38–39).

11. Disinfection of the drinking water pipe system must be performed in accordance with the KE KELIT disinfection guideline – **www.kekelit.com**

For the disinfectants listed in ÖNORM B 5019 (e.g. chlorine, chlorine dioxide, ozone), the concentrations and soak times are to be observed and may in no case be exceeded.

Should the disinfection not be in accordance with the KE KELIT disinfection guideline or with the concentrations and times listed in the standard, material damage cannot be excluded.

- According to ÖNORM B 5019, thermal disinfection is always to be preferred to chemical disinfection!
- Copper and copper ions have a destabilising effect and are to be avoided in the installations

12. To ensure the maximum permissible working temperature is not exceeded, solar heaters must be monitored and/or regulated, the electrical connections to hot water tanks must be checked and we recommend that, after the boiler, a service water mixer is inserted in the hot water pipe.

13. The KELEN piping system is not electrically conducting and can therefore not be used for equipotential bonding and should also not be earthed.

14. Classification of the working conditions for KELEN PP-R piping systems in accordance with EN ISO 15874-1

Usage class	Calculation temp.	Service life at calculation temp.	t max	Service life at t max.	t mal	Service life at t mal	Max. permissible working pressure SDR 6	Max. permissible working pressure SDR 7.4
Class 1 a) Hot water 60 °C	60 °C	49 years	80 °C	1 year	95 °C	100 h	10 bar	8 bar
Class 2 a) hot water 70 °C	70 °C	49 years	80 °C	1 year	95 °C	100 h	10 bar	6 bar

For cold water, a temperature of 20 °C at 10 bar must be ensured

a) In line with the national regulations, either usage class 1 or 2 may be selected.

15. To validate the guarantee (guarantee agreement with the Federal Guild), in any one installation, only KELEN system components must be used.

16. A perfect installation of the KELEN system requires a minimum of tools. For your own safety and confidence, we recommend the use of the original tools that have proven their worth many times in practice and their regular maintenance.

17. In the event of doubt, do not hesitate to consult our application technicians. There may not be a perfect solution for every case but we can always help. Using the KE KELIT QR code you can view installation videos.
www.youtube.com/kekelit

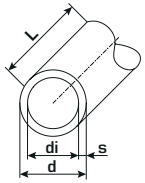
Product Range Overview

The KELEN piping system is continually adapted to practical requirements and systematically extended.

- For the latest product range, please see the current KELEN price list.
- The short symbols (e.g. MK00 = pipe - PN20 or MK30 = tee) greatly simplify ordering and are therefore requested in your order to the wholesaler.
- On request, we can produce not only prefabrications (e.g. manifolds and recurring, identical piping sections) but also special fittings such as bends of up to 90° made up from the appropriate medium pipe or special fitting designs.

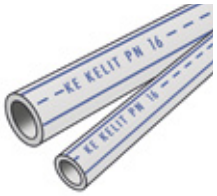
MK00 KELEN pipe - PN20

KELEN drinking water piping system to EN ISO 15874 in polypropylene (PP-R).
Usable over the range: 20°C/20bar – 70°C/8bar
Colour: grey with 3 coextruded, red, longitudinal stripes
Length: 4 m

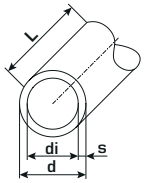


d mm	s mm	di mm	Weight kg/m	Water volume l/m	L m
20	3.4	13.2	0.17	0.14	4
25	4.2	16.6	0.27	0.22	4
32	5.4	21.2	0.43	0.35	4
40	6.7	26.6	0.67	0.56	4
50	8.3	33.4	1.04	0.88	4
63	10.5	42.0	1.65	1.39	4
75	12.5	50.0	2.34	1.96	4
90	15.0	60.0	3.36	2.83	4
110	18.3	73.4	5.01	4.23	4

MK08 KELEN pipe - PN16



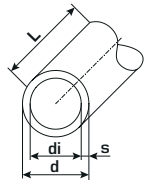
KELEN drinking water piping system to EN ISO 15874 in polypropylene (PP-R).
Usable over the range: 20°C/16bar – 60°C/8bar
Colour: grey with 3 coextruded, blue, longitudinal stripes
Length: 4m



d mm	s mm	di mm	Weight kg/m	Water volume l/m	L m
20	2.8	14.4	0.15	0.16	4
25	3.5	18.0	0.23	0.25	4
32	4.4	23.2	0.37	0.42	4
40	5.5	29.0	0.58	0.66	4
50	6.9	36.2	0.90	1.03	4
63	8.6	45.8	1.41	1.65	4
75	10.3	54.4	2.01	2.32	4
90	12.3	65.4	2.87	3.36	4
110	15.1	79.8	4.30	5.00	4
160	21.9	116.2	9.04	10.60	4

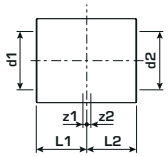
MK02 KELEN pipe - PN10

KELEN drinking water piping system to EN ISO 15874 in polypropylene (PP-R).
Usable over the range: 20°C/10 bar
Colour: grey with 3 coextruded, green, longitudinal stripes-
Length: 4m



d mm	s mm	di mm	Weight kg/m	Water volume l/m	L m
20	1.9	16.2	0.11	0.21	4
25	2.3	20.4	0.17	0.33	4
32	2.9	26.2	0.26	0.54	4
40	3.7	32.6	0.42	0.83	4
50	4.6	40.8	0.64	1.31	4
63	5.8	51.4	1.01	2.07	4
75	6.8	61.4	1.41	2.96	4
90	8.2	73.6	2.03	4.25	4
110	10.0	90.0	3.01	6.36	4
160	14.6	130.8	6.38	13.44	4

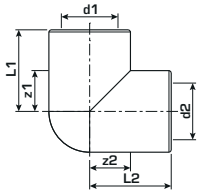
MK10 KELEN coupling



KELEN polyfusion welding fitting, jointing of PP-R pipes and fittings of the same material without change in cross-section

d1 mm	d2 mm	L1 mm	z1 mm	L2 mm	z2 mm
20	20	16.5	1.5	16.5	1.5
25	25	21.5	1.5	21.5	1.5
32	32	25.5	1.5	25.5	1.5
40	40	28.5	2.5	28.5	2.5
50	50	30	2.5	30	2.5
63	63	31	2.5	31	2.5
75	75	32.5	2.5	32.5	2.5
90	90	37	3	37	3
110	110	42.5	5.5	42.5	5.5
160	160	57	9	57	9

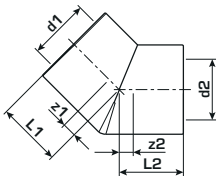
MK20 KELEN elbow 90°



KELEN polyfusion welding fitting, jointing of PP-R pipes and fittings of the same material without change in cross-section

d1 mm	d2 mm	L1 mm	z1 mm	L2 mm	z2 mm
20	20	26	11	26	11
25	25	36	16	36	16
32	32	42	20	42	20
40	40	52	27	52	27
50	50	58	32	58	32
63	63	65	36	65	36
75	75	71	41	71	41
90	90	84	50	84	50
110	110	95	58	95	58
160	160	133	85	133	85

MK70 KELEN elbow 45°

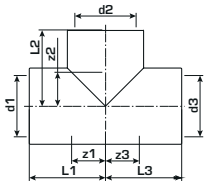


KELEN polyfusion welding fitting, jointing of PP-R pipes and fittings of the same material without change in cross-section

d1 mm	d2 mm	L1 mm	z1 mm	L2 mm	z2 mm
20	20	22	4	22	4
25	25	27	7	27	7
32	32	32	7	32	7
40	40	38	19	38	19
50	50	40	12	40	12
63	63	45	15	45	15
75	75	49	18	49	18
90	90	60	25	60	25
110	110	90	53	90	53
160	160	125	74	125	74

KELEN

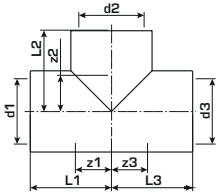
MK30 KELEN tee equal



KELEN polyfusion welding fitting, jointing of PP-R pipes and fittings of the same material without change in cross-section

d1 mm	d2 mm	d3 mm	L1 mm	z1 mm	L2 mm	z2 mm	L3 mm	z3 mm
20	20	20	26	11	26	11	26	11
25	25	25	36	16	36	16	36	16
32	32	32	42	20	42	20	42	20
40	40	40	52	27	52	27	52	27
50	50	50	58	32	58	32	58	32
63	63	63	65	36	65	36	65	36
75	75	75	71	41	71	41	71	41
90	90	90	84	50	84	50	84	50
110	110	110	95	58	95	58	95	58
160	160	160	133	85	133	85	133	85

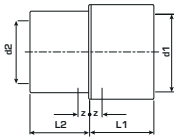
MK35 KELEN reducer tee



KELEN polyfusion welding fitting, jointing of PP-R pipes and fittings of the same material without change in cross-section

d1 mm	d2 mm	d3 mm	L1 mm	z1 mm	L2 mm	z2 mm	L3 mm	z3 mm
25	20	25	34	16	31	16	34	16
32	20	32	42	20	41	26	42	20
32	25	32	42	20	42	22	42	20
40	20	40	47	27	42	27	47	27
40	25	40	47	27	44	24	47	27
40	32	40	47	27	48	26	47	27
50	20	50	56	32	47	32	56	32
50	25	50	56	32	48	28	56	32
50	32	50	56	32	52	30	56	32
50	40	50	56	32	56	29	56	32
63	20	63	64	36	60	44	64	36
63	25	63	64	36	62	40	64	36
63	32	63	64	36	62	36	64	36
63	40	63	64	36	64	37	64	36
63	50	63	64	36	64	36	64	36
75	25	75	71	41	62	26	71	41
75	32	75	71	41	64	22	71	41
75	40	75	71	41	68	27	71	41
75	50	75	71	41	68	28	71	41
75	63	75	71	41	68	29	71	41
90	32	90	83	50	78	26	83	50
90	40	90	83	50	83	27	83	50
90	50	90	83	50	83	28	83	50
90	63	90	83	50	83	29	83	50
90	75	90	83	50	80	30	83	50
110	50	110	99	58	101	27	99	58
110	63	110	99	58	99	29	99	58
110	75	110	99	58	98	30	99	58
110	90	110	99	58	93	34	99	58
160	90	160	122	74	152	34	122	74
160	110	160	122	74	158	37	122	74

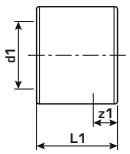
MK40 KELEN reducer i/i



KELEN polyfusion welding fitting, jointing of PP-R pipes and fittings of the same material without change in cross-section

d1 mm	d2 mm	z mm	L1 mm	L2 mm
25	20	2	20	18
32	20	3	23	19
32	25	2	22	20
40	20	5	27	21
40	25	4	26	22
40	32	3	25	23
50	20	6	31	22
50	25	5	30	23
50	32	4	29	24
50	40	3	28	25
63	25	7	36	25
63	32	6	35	26
63	40	5	34	27
63	50	3.5	32.5	28.5
75	32	8	41	28
75	40	7	40	29
75	50	6	39	31
75	63	3	36	32
90	32	12	57	32
90	40	11	59	33
90	50	9.5	62	34.5
90	63	7.5	66	36.5
90	75	5.5	70	38.5
110	50	14	68	39
110	63	12	72	41
110	75	10	76	43
110	90	8	80	45
160	110	16	86	45

MK60 KELEN end cap



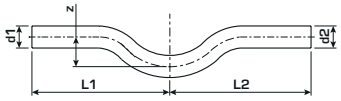
KELEN polyfusion welding fitting, jointing of PP-R pipes and fittings of the same material without change in cross-section

d1 mm	L1 mm	z1 mm
20	24	8
25	30	9
32	36	11
40	38	13
50	43	17
63	49	19
75	52	21
90	62	26
110	78	41
160	94	46

MK90 KELEN cross-over bend

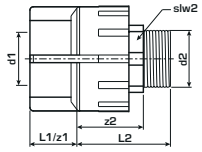
KELEN polyfusion welding fitting, jointing of PP-R pipes and fittings of the same material without change in cross-section

d1 mm	d2 mm	L1 mm	L2 mm	z mm
20	20	215	215	25
25	25	215	215	23
32	32	215	215	23



MK11 KELEN transition with o/s thread

KELEN polyfusion welding fitting, jointing of PP-R pipes and fittings of the same material without change in cross-section, with moulded in outside thread of dezincification-resistant brass and pore-free metallisation, thread to EN 10226, system parts marked with "S" are manufactured with spanner flats

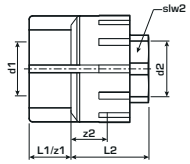


d1 mm	d2 Inch	L1 mm	z1 mm	L2 mm	z2 mm	slw2
20	1/2"	15	15	44	29	-
20	3/4"	15	15	44	30	-
25	1/2"	20	20	40	40	-
25	3/4"	20	20	40	35	-
32	3/4"	22	22	48	31	-
32	1" S	22	22	60	42	39
40	5/4" S	25	25	65	42	46
50	6/4" S	26	26	68	44	52
63	2" S	29	29	80	51	64
75	2 1/2" S	30	30	90	58	80
90	3" S	34	34	102	66	96

MK13 KELEN transition with i/s thread

KELEN polyfusion welding fitting, jointing of PP-R pipes and fittings of the same material without change in cross-section, with moulded in outside thread of dezincification-resistant brass and pore-free metallisation, thread to EN 10226, system parts marked with "S" are manufactured with spanner flats

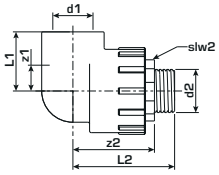
Do NOT screw in threaded pipes or malleable cast iron fittings!



d1 mm	d2 Inch	L1 mm	z1 mm	L2 mm	z2 mm	slw2
20	1/2"	15	15	27	18	-
20	3/4"	15	15	27	18	-
25	1/2"	20	20	29	16	-
25	3/4"	20	20	29	16	-
32	3/4"	22	22	43	25	-
32	1" S	22	22	46	22	39
40	5/4" S	25	25	43	28	48
50	6/4" S	26	26	41	30	56
63	2" S	29	29	48	38	70
75	2 1/2" S	30	30	52	44	88
90	3" S	34	34	60	52	102

MK21 KELEN transition elbow 90° with o/s thread

KELEN polyfusion welding fitting, jointing of PP-R pipes and fittings of the same material without change in cross-section, with moulded in outside thread of dezincification-resistant brass and pore-free metallisation, thread to EN 10226, system parts marked with "S" are manufactured with spanner flats

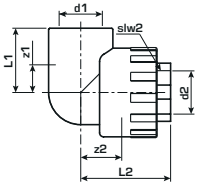


d1 mm	d2 Inch	L1 mm	z1 mm	L2 mm	z2 mm	slw2
20	1/2"	28	13	49	35	-
25	3/4"	37	17	52	37	-
32	1" S	42	20	71	54	39

MK23 KELEN transition elbow 90° with i/s thread

KELEN polyfusion welding fitting, jointing of PP-R pipes and fittings of the same material without change in cross-section, with moulded in outside thread of dezincification-resistant brass and pore-free metallisation, thread to EN 10226, system parts marked with "S" are manufactured with spanner flats

Do NOT screw in threaded pipes or malleable cast iron fittings

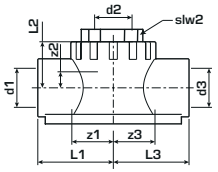


d1 mm	d2 Inch	L1 mm	z1 mm	L2 mm	z2 mm	slw2
20	1/2"	28	15	35	21	-
25	1/2"	37	20	37	21	-
25	3/4"	37	20	37	21	-
32	1" S	44	24	54	38	39

MK33 KELEN tee with i/s thread branch

KELEN polyfusion welding fitting, jointing of PP-R pipes and fittings of the same material without change in cross-section, with moulded in inside thread of dezincification-resistant brass and pore-free metallisation, thread to EN 10226
System parts are manufactured with spanner flats

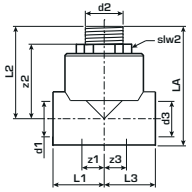
Do NOT screw in threaded pipes or malleable cast iron fittings!



d1/d3 mm	d2 Inch	L1 mm	z1 mm	L2 mm	z2 mm	L3 mm	z3 mm	slw2
20	1/2"	28	12	34	19	28	12	-
20	3/4"	28	12	34	29	28	12	-
25	1/2"	33	13	45	20	33	13	-
25	3/4"	33	13	45	31	33	13	-
32	1/2"	42	17	50	24	42	17	-
32	3/4"	42	17	50	35	42	17	-
32	1" S	42	17	61	42	42	17	39

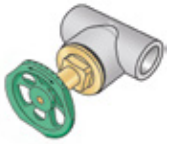
MK31 KELEN tee with o/s thread branch

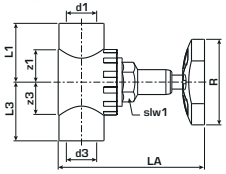
KELEN polyfusion welding fitting, jointing of PP-R pipes and fittings of the same material without change in cross-section, with moulded in outside thread of dezincification-resistant brass and pore-free metallisation, thread to EN 10226, system parts marked with "S" are manufactured with spanner flats



d1/d3 mm	d2 Inch	L1 mm	z1 mm	L2 mm	z2 mm	L3 mm	z3 mm	slw2	LA mm
20	1/2"	28	12	49	35	28	12	-	64
20	3/4"	28	13	49	49	28	13	-	64
25	1/2"	33	13	60	45	33	13	-	78
25	3/4"	33	13	60	45	33	13	-	78
32	1/2"	42	25	69	50	42	25	-	90
32	3/4"	42	25	69	50	42	25	-	90
32	1" S	42	25	78	59	42	25	39	99

MK50PF — KELEN shut-off valve with hand-wheel upper part

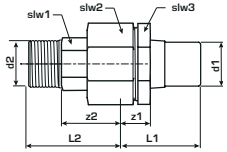




KELEN polyfusion welding fitting, jointing of PP-R pipes and fittings of the same material without change in cross-section, shut-off valve including hand-wheel upper part

d1/d3 mm	L1/L3 mm	z1/z3 mm	LA mm
20	38	23	93
25	38	23	93
32	46	24	104
40	57	32	118
50	66	40	140
63	82	52	166

KE55 — KELEN union fitting plastic-metal o/s thread

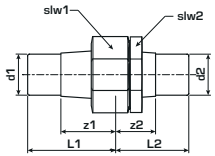


KELEN polyfusion welding fitting, flat sealed, thread to EN 10226 plastic bushing or EPDM seal supplied separately!

d1 mm	d2 Inch	L1 mm	z1 mm	L2 mm	z2 mm	slw1	slw2 slw3
20	1/2"	42	25	31	21	21	36
25	3/4"	49	29	39	25	27	46
32	1"	56	30	43	27	34	52
40	5/4"	86	35	50	28	42	66
50	6/4"	86	35	55	34	51	70
63	2"	86	36	63	40	62	86
75	2 1/2"	92	42	65	43	76	108
90	3"	93	42	71	46	89	122

KE57D union replacement seal (3 mm) supplied separately

KE56 — KELEN union fitting plastic-plastic

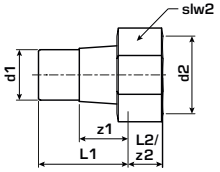


KELEN polyfusion welding fitting, flat sealed, including EPDM seal. Plastic bushing or EPDM seal supplied separately!

d1 mm	d2 mm	L1 mm	z1 mm	L2 mm	z2 mm	slw1	slw2
20	20	42	25	42	25	36	36
25	25	49	29	49	29	46	46
32	32	56	30	56	30	52	52
40	40	86	35	86	35	66	66
50	50	86	35	86	35	70	70
63	63	86	36	86	36	86	86
75	75	92	42	92	42	108	108
90	90	93	42	93	42	122	122

KE57D union replacement seal (3 mm) supplied separately

KE57 — KELEN valve connection union fitting with i/s thread

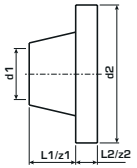


KELEN polyfusion welding fitting, flat sealed, including EPDM seal. Plastic bushing or EPDM seal supplied separately!

d1 mm	d2 Inch	L1 mm	z1 mm	L2 mm	z2 mm	slw2
20	1"	42	25	9	9	36
25	5/4"	49	29	10	10	46
32	6/4"	56	30	11	11	52
40	2"	86	35	16	16	66
50	5/4"	86	35	16	16	70
63	2 3/4"	86	36	16	16	86
75	3 1/4"	92	42	21	21	108
90	3 3/4"	93	42	22	22	122

KE57D union replacement seal (3 mm) supplied separately

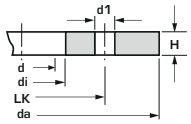
MK18 — KELEN Flange sleeve - PN10



KELIT polyfusion welding fitting (PP-R), jointing of PP-R and PP-R pipes flat sealing.
Use only original EPDM seals with steel insert!
Colour: grey

d1 mm	DN	d2 mm	L1 mm	z1 mm	L2 mm	z2 mm
40	DN 32	78	22	22	4	4
50	DN 40	88	24	24	6	6
63	DN 50	102	28	28	5	5
75	DN 65	122	32	32	6	6
90	DN 80	138	37	37	5	5
110	DN 100	158	42	42	5	5
160	DN 150	212	48	48	8	8

K19 — KELIT loose flange for sleeve welding



KELIT PP loose flange with steel insert
Hole circle dimension (HC) to DIN 2501-PN16

d mm	DN	di mm	da mm	H mm	LK mm	Holes Stk	d1 mm
40	DN 32	51	140	16	100	4	18
50	DN 40	62	150	18	110	4	18
63	DN 50	78	165	18	125	4	18
75	DN 65	92	185	18	145	4	18
90	DN 80	108	200	18	160	8	18
110	DN 100	135	220	18	180	8	18
160	DN 150	178	285	24	240	8	22

K19A — KELIT sealing set for loose flange MK18 - steel flange

Includes bolts, nuts, spring washers, plain washers and EPDM seal with steel insert, bolt length to suit KE18 flange sleeve with K19 loose flange-steel flange
EPDM seal with steel insert available separately

d mm	
20	4-hole
25	4-hole
32	4-hole
40	4-hole
50	4-hole
63	4-hole
75	4-hole
90	8-hole
110	8-hole
160	8-hole

K19K — KELIT sealing set for loose flange MK18 - MK18

Includes bolts, nuts, spring washers, plain washers and EPDM seal with steel insert, bolt length to suit KE18 flange sleeve with K19 loose flange-steel flange
EPDM seal with steel insert available separately!

d mm	
20	4-hole
25	4-hole
32	4-hole
40	4-hole
50	4-hole
63	4-hole
75	4-hole
90	8-hole
110	8-hole
160	8-hole

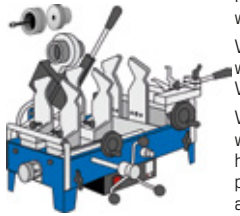
Work tools

WZ100 — KELIT welding tool set

Consisting of the pre-adjusted, self-regulating pipe welder 20–63 mm (230 Volt, 800 Watt) for the welding of pipes and fittings up to d 63, including pipe shear d 16–40 mm, bench top, floor stand and timer, heating elements d 20, 25 and 32, for the dimension d 20 – 40 mm also with heating element d 40, packed in metal case

Set
20 – 32 mm
20 – 40 mm

WZ110 — KELIT pipe welding machine



Pre-adjusted, self-regulating pipe welder:

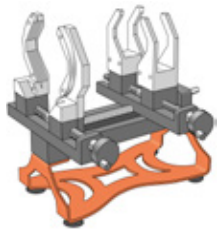
WZ110 d 20–90:
with welding block (230 Volt, 1000 Watt), heating elements d 20–90 mm

WZ110 d 25–125:
with welding block (230 Volt, 1400 Watt), heating elements d 25 – 125 mm including pipe clamping jaws, pipe cutters d 20–75 and d 50–140, timer, special gloves, pipe support and feet, packed in wooden transport crate

WZ110 d 63–160:
with welding block (230 Volt, 3600 Watt), heating elements d 63–160 mm including pipe clamping jaws, packed in wooden transport crate

Set
SET 20 – 90 mm
SET 25 – 125 mm
SET 63 – 160 mm

WZ120R — KELIT overhead welding machine



Consisting of overhead welding machine with removable frame for polyfusion welding in the installation area, including pre-adjusted, self-regulating welding block (230 Volt, 1400 Watt), with centred clamping jaws d 25 – 125, heating elements d 50 – 125 for the welding of pipes and fittings d 50 – 125, pipe cutter d 50 – 140, timer and special gloves, packed in wooden transport crate. Machine weight approx. 10 kg

Set
SET 25 – 125 mm

WZ122 KELIT welding spigot and socket

Teflon-coated heating element for polyfusion welding of pipes and fittings and screwing onto the welding tool

d mm
20
25
32
40
50
63
75
90
110
160

WZ130 KELIT pipe shear

For cutting KELIT pipes d 16 – 40

Replacement blade for WZ130/2

Repair set for WZ130/2
Replacement bolt set for blade WZ130/2

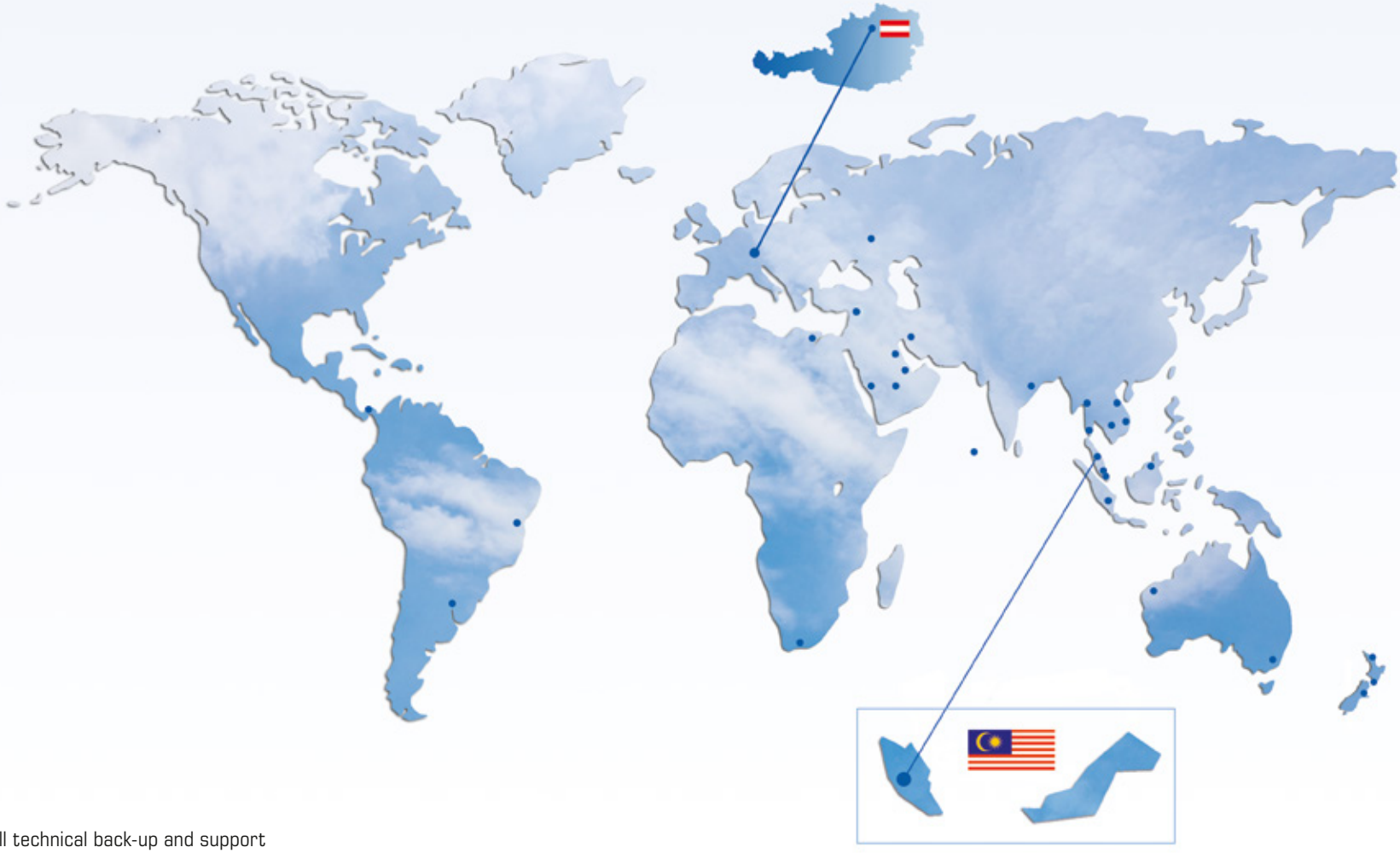
d mm
16 – 40
Replacement bolt-2
Repair set-2
Replacement blade-2

WZ135 KELIT pipe cutter

For cutting KELIT pipes
d 20–75,
d 50–140 or d110–160

d mm
20 – 75
50 – 40
110 – 160
Cutting wheel d20 – 75
Cutting wheel d50 – 140
Cutting wheel d110 – 160

Representative offices, production and headquarters



Full technical back-up and support for the KELEN PP-R pipe system is provided by KE KELIT.

The network of sales partners, subsidiariesand agents is constantly being expanded. Please ask at the Austrian headquarters for the current status, or check on our website **www.kekelit.com**

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