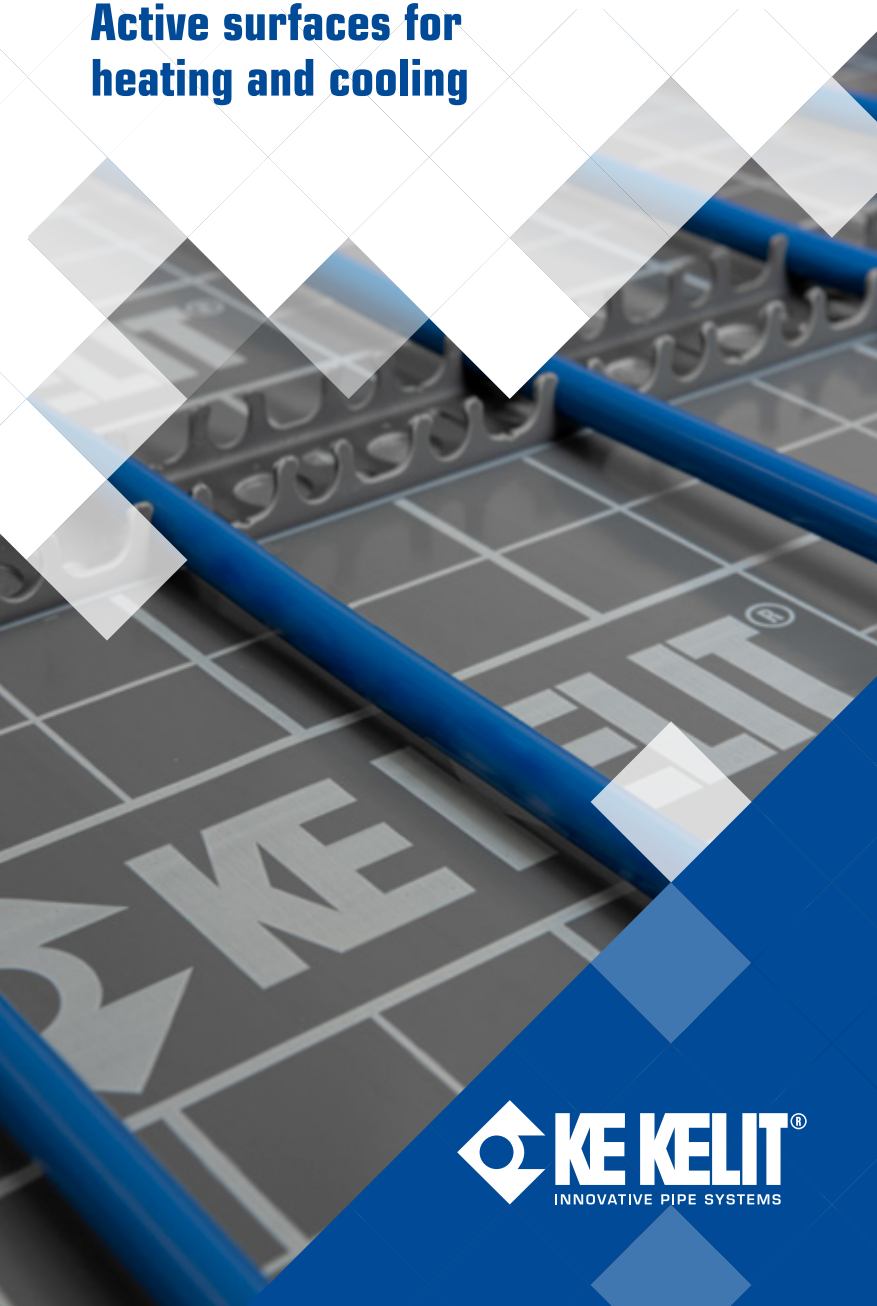
KELOX®

Panel Heating System

Active surfaces for heating and cooling



KE KELIT®
INNOVATIVE PIPE SYSTEMS

® by KE KELIT - KELOX_FB_HB_20220608

KELOX FB®

Active surfaces for heating and cooling

KE KELIT®
INNOVATIVE PIPE SYSTEMS

Contents

Note:

To keep up with ongoing developments, we may update these documents on a regular basis. Visit our web site at www.kekelit.com to view the currently applicable version.

Before use, always find out whether the manual is the most up-to-date version and get information about valid guidelines on areas of application and processing

KE KELIT quality targets

1. Our quality targets extend beyond the quality of the products themselves and include all the areas required by ÖNORM EN ISO 9001.

2. Suppliers and customers are integrated into the order-related quality assurance system to ensure that errors are prevented at this early stage.

3. Every employee is responsible for the quality of their own work and should be highly motivated to perform continuous self-assessment.

4. We consider meeting specific market and customer demands as a precondition for highest customer satisfaction.

5. A responsible attitude towards the environment, both now and in the future, is the driving force that pushes us to manufacture long-lasting products using environmentally friendly processes.

Senator Karl Egger
Honorary
Managing Director

Certifications – Tests – Registration

Both the individual parts and the entire system are subject to basic and regular tests. Multiple forms of monitoring are employed to ensure that we meet the specified quality targets:

Certified quality assurance system
by Quality Austria
ÖNORM EN ISO 9001 – Reg. no. AT 00366/0
ÖNORM EN ISO 14001 – Reg. no. AT 02097/0
ÖNORM EN ISO 10005 – Reg. no. AT 00001/0
ÖNORM EN ISO 50001 – Reg. no. AT 0126/0

Self-monitoring at the KE KELIT quality laboratory:

- Raw material parameters
- Dimensions and tolerances
- Behaviour during warm storage

Third-party monitoring by authorized testing authorities:

- System testing
- Internal pressure creep behaviour
- Peel test of the composite
- Hygienic/toxicological suitability
- Oxygen-tightness

Pipe connector testing:

- under vacuum
- under tensile loads
- in a thermal cycling test
- in a pressure surge
- in an alternating bending test

Products pursuant to:
ÖNORM EN ISO 21003 series
ÖNORM EN ISO 22391
ÖNORM EN 1264 series
ÖNORM B 3732

TÜVRheinland®

KELOX ULTRA PE-RT Type II
Reg. No. 3V408 PE-RT
KELOX PE-RT Type II/Al/PE-RT Type II
Reg. No. 3V409 MVR (M)

Surface heating and cooling

Underfloor heating systems, regardless of whether they heat or cool, distribute heat evenly. This means that they provide a pleasant climate without any dust being swirled up at all times.
Today's clear trend is towards a typical "low-temperature variant" – which is energy-saving, convenient and provides an optimum, healthy room climate!

Heat and cooling from the ground up

In top-end housing, this design has become the standard for especially comfortable living.

Benefits

- Hygienic benefits (no dust turbulence)
- A balanced room climate
- Free floor space and design areas
- Architectural options
- Formation of stone and ceramic coverings as heating zones

Wall heating Embedded in heat

External walls become radiating heating elements with a "tiled stove effect". People feel physiologically that long-wave radiant heat is "cosy warmth".

Benefits

- A healthy room climate due to natural building biology
- Often, it is possible for an effectively lower temperature to suffice. -1° = energy saving of approx. 6%
- option of wall cooling in summer
- KELOX FB pipes can be located electronically in the wall

Well being also means:

Health

- higher radiant heat share
- psychosomatic well being due to low convection
- no dust accumulation in inaccessible locations on radiators
- balanced temperature gradient

Convenience

- No unpleasant hot or cold zones
- can be matched to floor coverings/ wall structures in an optimum way
- optically attractive solutions for visible areas (manifold)

Energy-saving

Floor and wall heating systems function in the low-temperature range (30-45°), which means that they automatically combine the following benefits:

- due to the even ambient temperature, it is possible to lower the room temperature by about 2° compared to radiator heating
- a typical area of application for condensing boiler systems and heat pumps
- effective energy usage

Freedom

- free selection of floor space
- free for any floor coverings: carpet, parquet, ceramic, stone
- in choosing energy. District heating wood heating, waste heat, heat pumps and solar collectors!
- in the areas of application flats, schools, commercial premises, plants, indoor swimming pools, hospitals …

KELOX FB underfloor heating

Due to the clever overall concept of the KELOX-FB system, it is suitable for all laying variations, like meander, spiral, rail- fixing plate, pipe mat, staple, Velcro, drywall construction and industrial surface, for example, as well as for many other application options.

FB surface temperature

ÖNORM EN 1264-3 specifies maximum floor surface temperatures.

Residential premises that are in permanent use	**29°C**
Peripheral zones and baths	**35°C**

Benefits

- Absolutely oxygen-tight
- Roll length: 300 - 600 m
- Suitable for construction site use, easy to lay from the roll even in tight radii and small rooms
- You can choose the installation type with the most favourable heat engineering properties
- embedded in an overall system
- tried and tested KELOX connection technology

KELOX FB floor cooling

The regional dew point and standard internal temperature are based on ÖNORM EN 1264-3.

Requirement No.1: Oxygen-tight

Caution

If pipes in the heating circuit are oxygen-permeable it is always possible for new oxygen to keep diffusing in, and it is constantly bound to corrosive materials (e.g. iron).
This results in the following damage patterns:

- Accumulation of silt in heating pipes and failure of heating circuits due to blockages
- expensive corrosion phenomena
- time-consuming refurbishing measures

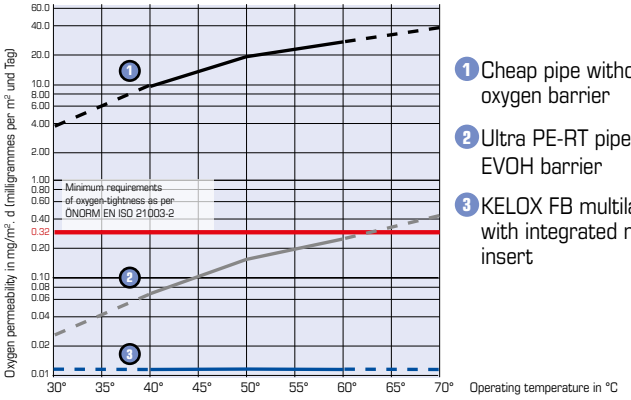
The specification

Floor and wall heating systems have an unusually large number of pipes, which results in large diffusion surfaces.
This means that ÖNORM EN ISO 21003 specifies the minimum requirements with regard to the oxygen-tightness of heating pipes:

≤ 0.32 mg/m² and day

The solution

KELOX FB pipes perform below these standard requirements. The aluminium or EVOH oxygen barrier guarantees a long service life with safe functioning.



1 Cheap pipe without an oxygen barrier

2 Ultra PE-RT pipe with EVOH barrier

3 KELOX FB multilayer pipe with integrated metal insert

Active surfaces for heating and cooling

Structure of KELOX-ULTRAX FB pipe

All five layers are fabricated and joined together in a single process.
The aluminium stabilising pipe is welded with low heat exposure.

Properties

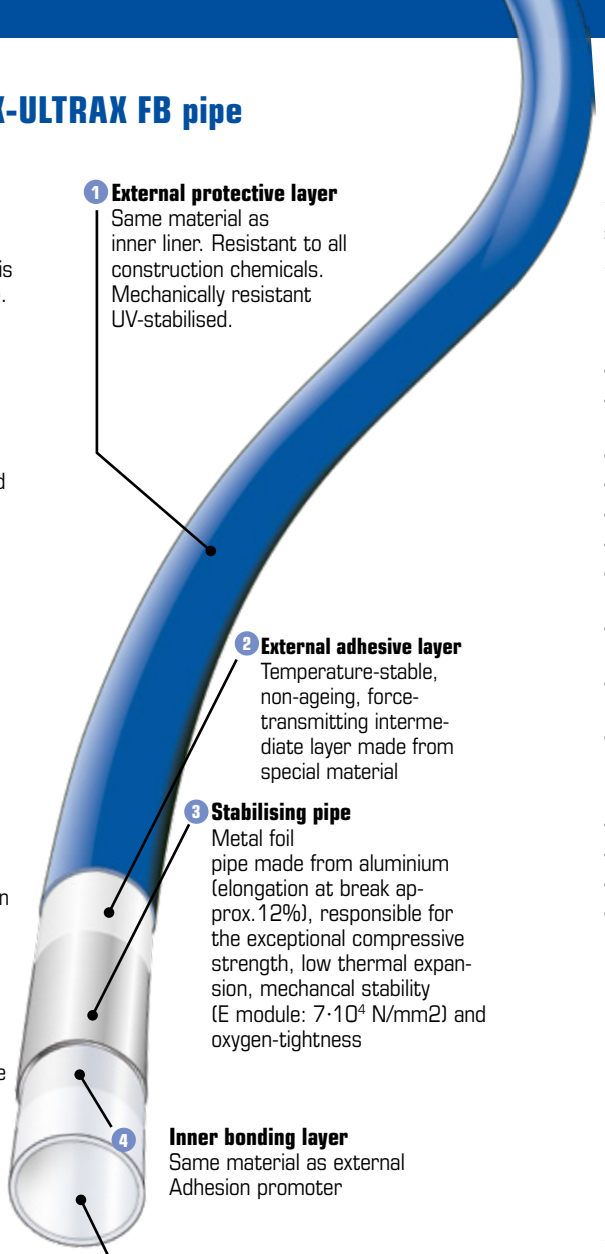
- Minimal residual stress
- Can be modulated
- Absolutely oxygen-tight
- 100% vapour-tight
- Can be located flush-mounted or in the FB area
- Good heat transfer
- Thermal conductivity (λ=0.45 W/mK)
- Low thermal expansion (α =0.025 mm/mK)
- Smooth inner wall (pipe roughness: 0.007 mm)
- Colour: blue

Benefits

- Well-engineered integrated system
- Can be laid without spring-back
- You can choose the installation type with the most favourable heat engineering properties
- Pipes stay just where you laid them
- they have installation characteristics that stay the same regardless of the temperature
- For floors and wall heating
- KELOX FB pipe d16 x 2 mm
- Option of screw-in, press-fit and plug-in connections

Area of application

- Dimension range: d16 mm (up to 500 m/roll)
- Panel heating systems: Class 4 according to ÖNORM EN ISO 21003
- Operating temperature: **60°C - tmax. 70°C/10 bar**



1 **External protective layer**
Same material as inner liner. Resistant to all construction chemicals. Mechanically resistant UV-stabilised.

2 **External adhesive layer**
Temperature-stable, non-ageing, force-transmitting interme-diate layer made from special material

3 **Stabilising pipe**
Metal foil pipe made from aluminium (elongation at break ap-prox.12%), responsible for the exceptional compressive strength, low thermal expan-sion, mechancal stability (E module: 7·10⁴ N/mm2) and oxygen-tightness

4 **Inner bonding layer**
Same material as external Adhesion promoter

5 **Inner liner**
PE-RT highly temperature-resist-ant polyethylene, Type 2, stable against all water constituents, presents no health risk, smooth and seamless.
Colour: Transparent

Structure of ULTRA PE-RT pipe Type 2

All five layers are fabricated and joined together in a single process.
The outstanding mechanical proper-ties of PE-RT are due to its special molecular structure

Properties

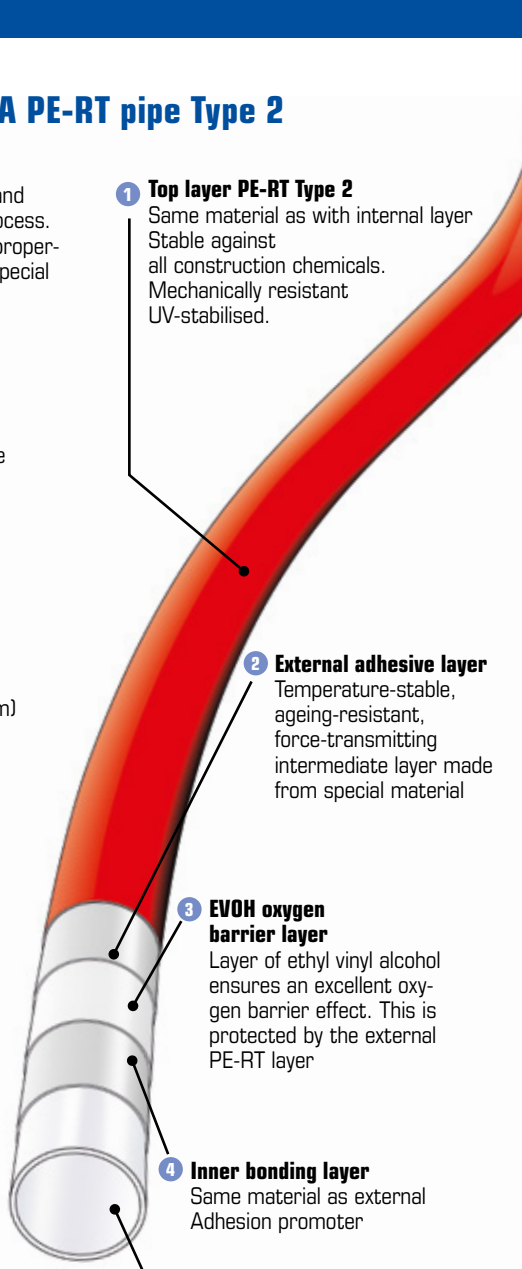
- Increased flexibility
- Oxygen-tight according to DIN 4726
- Very high impact resistance
- Long-term stability
- Good chemical resistance
- Good heat transfer
- Thermal conductivity (λ=0.4 W/mK)
- Thermal expansion (α =0.19 mm/mK)
- Smooth inner wall (pipe roughness: 0.007 mm)
- Colour: red

Benefits

- Exceptional stability
- Universal use
- In stock at wholesalers
- Option of screw-in, press-fit and plug-in connections

Area of application

- Dimension range: d16, d20 and d25 mm (up to 600 m/roll)
- Panel heating systems: Class 4 according to ÖNORM EN ISO 22391
- Operating temperature: **60°C - tmax. 70°C/6 bar**



1 **Top layer PE-RT Type 2**
Same material as with internal layer Stable against all construction chemicals. Mechanically resistant UV-stabilised.

2 **External adhesive layer**
Temperature-stable, ageing-resistant, force-transmitting intermediate layer made from special material

3 **EVOH oxygen barrier layer**
Layer of ethyl vinyl alcohol ensures an excellent oxy-gen barrier effect. This is protected by the external PE-RT layer

4 **Inner bonding layer**
Same material as external Adhesion promoter

5 **Top layer PE-RT Type 2**
PE-RT-resistant against all heating and cooling water, presents no health risk, smooth and seamless
Colour: transparent

KELOX Eurocone fitting

Requirements for the KELOX compression fitting:

- longitudinally friction-locked
- detachable compression fitting, but non-detachable pipe connection
- prevention of electrochemical dipoles
- no contact between medium water and aluminium layer

The solution

The multiple sealing KELOX compression fitting for pipes d16–25mm

Application

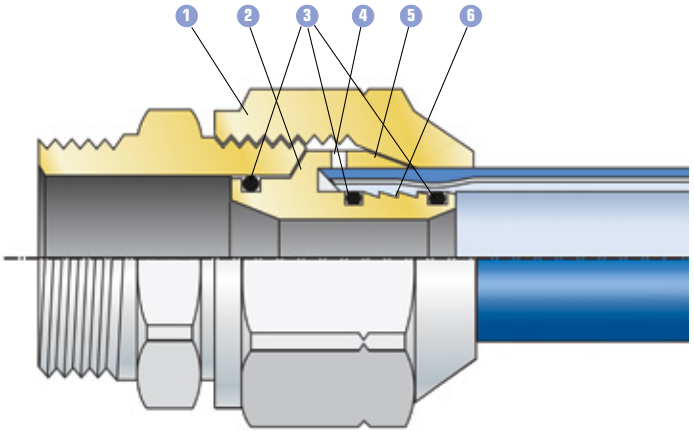
For connections to manifolds, radiators and surface-mounted KELOX screw parts

Tightening torques

d16 - 18mm:	40 Nm	The torques apply at temperatures of approximately 10-30°C (ambient temperature)
d20mm:	45 Nm	
d25mm:	60 Nm	

Material and structure

1. Nut made of high-quality brass, additionally non-porous metallized
2. Metal conical sealing surface
3. Three EPDM O-rings
4. Viewing window as an insertion aid for d16-20mm
5. Compression sleeve made of high-quality brass, additionally non-porous metallized
6. Interlocking hook for longitudinal friction locking



KELOX-PROTEC quick-push coupling

Requirements for the KELOX-PROTEC push connection

- permanently leakproof
- non-detachable push connection
- longitudinally friction-locked
- diffusion-resistant
- insertion block for uncalibrated pipes

The solution

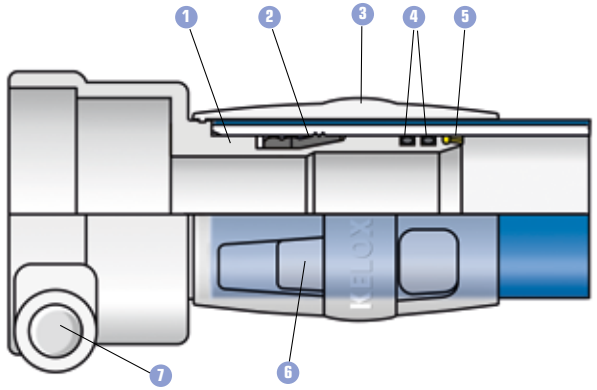
- The tried and tested KELOX-PROTEC push connection for d16-20mm pipes

KMP552 KELOX PROTEC quick-push coupling

- KMP552 KELOX Protec quick-push coupling for safe, stress-free and easy installation on the manifold
- To be used in combination with KMP590M, KMP590E, KMP590Z and KMP590D FB push-fitting manifolds
- Compatible with all d16-d20 KELOX pipes

Material and structure

1. Body of the fittings made of high-quality brass d16-20mm, additionally non-porous metallized
2. 2K GRAB RING holding component made of glass fibre-reinforced polyamide and elastomer
3. Push-on sleeve made of transparent polyamide
4. Two synthetic, ageing-resistant EPDM O-rings
5. Protector ring made of high-strength plastic prevents the insertion of uncalibrated pipes
6. Closed viewing window
7. Locking pin for quick-fit push fitting



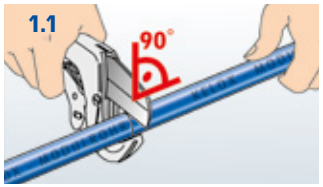
The fittings have protective caps to prevent contamination!

Installation instructions for KELOX Eurocone fitting

Easy steps for a leakproof KELOX compression fitting

Only ever deploy trained installation specialists!

1. Cut to length
Always cut at right angles – this means that you must straighten coils before cutting!



1.1. Cut to length using the WZ932 pipe cutter for d16-20mm or WZ130 pipe shears for d16-25mm.

1.2. Optionally, cut d25 to length using the WZ935 pipe cutter.

2. Calibrate and chamfer.
Always turn in and out clockwise!

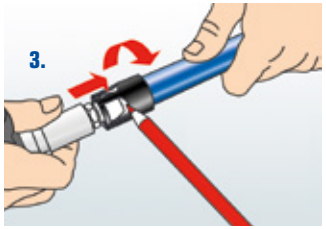
2.1. Click the universal handle onto the WZ915 calibration mandrel and turn it as far as it will go clockwise.

As an option, you can use the WZ916 or WZ916A multi-calibration mandrel.

2.2. Alternatively, you can use an electric drill or a cordless screwdriver running at a slow speed (maximum of 500 rpm). Remove the handle in this case. This achieves the following:

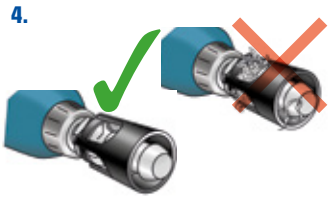
- Cutting angle is corrected to 90°
- Inner pipe wall is calibrated
- Outside is deburred
- Circumferential inside chamfer at the end of the pipe with a depth of approx. 1mm

carry out a visual inspection!



3. Mark the insertion depth for compression fittings
On the protective housing, every calibration mandrel has a corresponding option for marking the correct insertion depth of the screw-on nozzle onto the pipe.
(The marking becomes visible after the compression fitting has been tightened)

4. The plastic/aluminium chips must be removed from the calibration tool after each calibration process.

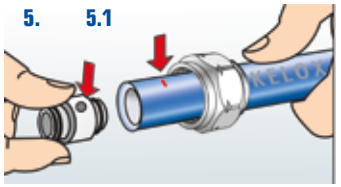


5. Push the nut and the nozzle onto the end of the KELOX pipe.

5.1. Check the correct insertion depth in the viewing windows of the d16-20mm screw connections!

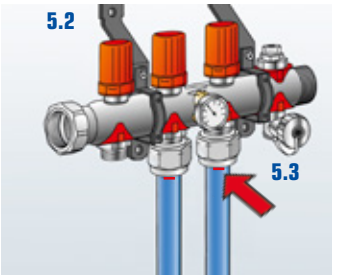
5.2. Tighten

Important: The minimum tightening torques apply at temperatures of approx. 10-30°C
(ambient temperature)



Size	Tightening torques
d 16	40 Nm
d 20	45 Nm
d 25	60 Nm

5.3. Now, tighten the nut onto a mating component (3/4" Eurocone) using a torque wrench; this presses the KELOX pipe, which makes it resistant to longitudinal traction and all the edge seals start to function.



5.4. After tightening, you can see the insertion depth mark at the end of the nut.

Connections that are **NOT** screwed together may be leakproof during a pressure test due to the O-rings, and may in particular pose a risk during an air pressure test when the pipe and fitting may slide apart. The longitudinal friction lock is only achieved when the compression fitting is tightened.

This means that you must carry out a visual inspection on ALL connections!

The connections are rotatable even after processing if installation adjustments are required!

Our KELOX-PROTEC Design Concept Your benefits

Easy
No complex costly assembly tools are required; we offer a homogeneous fitting concept for sizes d16-25mm

Safe
A NON-detachable connection with the sealing function taking priority. The pipe and fitting are fastened on the inside of the pipe with a grab ring. Inserting NON-calibrated pipes is effectively prevented by the protector ring, which protects the O-rings from damage. Correctly processed fittings create a pull-out-resistant, permanently leakproof connection.
The viewing window check ensures your safety!

Installation instructions for the KMP552 KELOX-PROTEC quick-push coupling

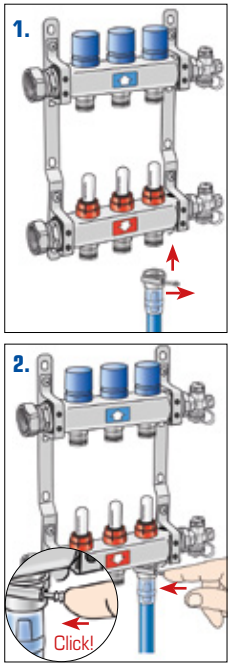
Only for trained installation specialists!

The KMP552 KELOX-PROTEC quick-push coupling allows you to carry out installation on KELOX push fitting manifolds without using any tools whatsoever. The quick-push coupling is a detachable connection that makes it possible to make corrections or changes on the manifold.

1. Pull the safety pin of the KMP552 quick-push coupling all the way out of the fitting and push it completely onto the plug-in nipple on the manifold without stress.
2. Completely engaging the safety pin fixes the KMP552 on the manifold.

The safety pin stays locked even at low system pressure. It is only possible to unlock and dismount the connection if the system is depressurised (0 bar).

Benefits:
- No maintenance
- No mechanical strain on the connection
- No tools
- Can be detached again
- Even more safety



Installation instructions for KELOX-PROTEC push fittings

1. Cut to length

Always cut at right angles – this means that you must straighten coils before cutting!

1.1. Cut to length using the WZ932 pipe cutter for d16-25mm or WZ130 pipe shears for d16-25mm

2. When calibrating and chamfering, always turn the chamfering tool clockwise into and out of the pipe!

2.1. Click the universal handle onto the WZ915 calibration mandrel and turn it as far as it will go clockwise.

2.2. Alternatively, you can use an electric drill or a cordless screwdriver running at a slow speed (maximum of 500 rpm). Remove the handle in this case.

This achieves the following:
- Cutting angle is corrected to 90°
- Inner pipe wall is calibrated
- Outside is deburred
- Circumferential inside chamfer at the end of the pipe with a depth of approx. 1mm

Carry out a visual inspection!
Pipes that have already been inserted into a fitting must **NOT** turn during calibration!
Use WZ939 KELOX pipe-holding pliers, if required!

3. The plastic/aluminium chips must be removed from the calibration tool after each calibration process.

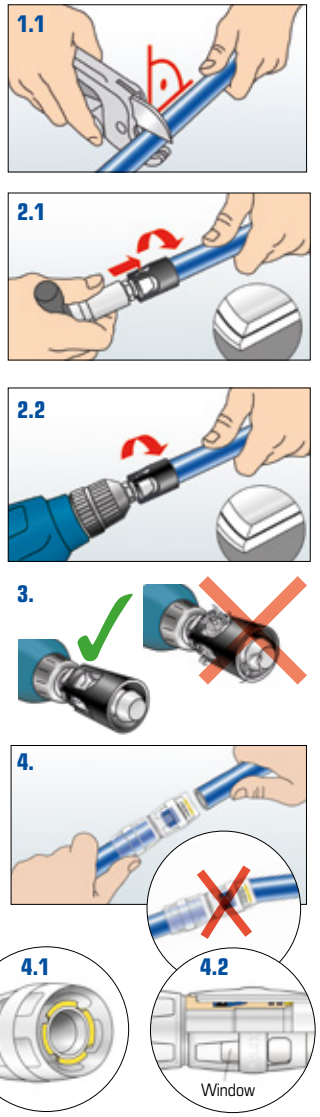
4. Push the push fitting straight WITHOUT tilting all the way onto the calibrated pipe end.

4.1. An intact protector ring prevents NON-calibrated pipes from being inserted into the fitting!

This results in:
- A permanently leakproof connection
- A longitudinal friction lock thanks to the grab ring
- Insertion control at the push fitting!

4.2. The pipe end must **NOT** be visible in the viewing window after the pressure test and during operation!

Only for trained installation specialists!



A maximum of one rotation is allowed for installation corrections after pressing!

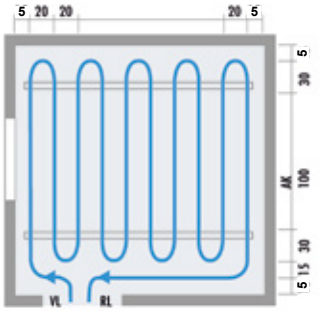
KELOX FB clamping rail system

Meander installation

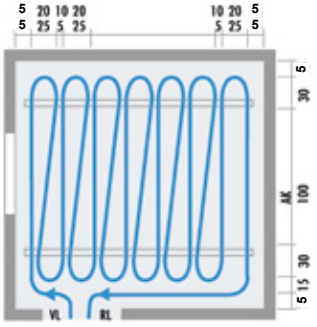
Meander installation using FB clamping rails or an FB fixing plate exploits the module characteristics of the KELOX FB in a particularly effective way.

- It is possible to position the (hotter) feed pipe where the highest heat output is needed:
  - External walls
  - Window areas
  - Balcony entrances
- You can easily choose peripheral areas with increased heat output
- Constant surface temperature characteristic (no waveform).
- Only ever lay clamping rails with composite pipes!

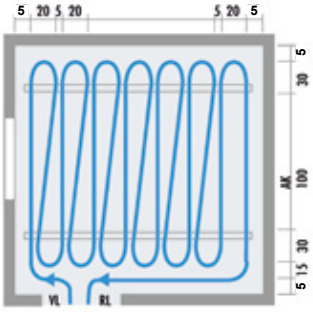
Example of laying with a KM610 KELOX FB clamping rail



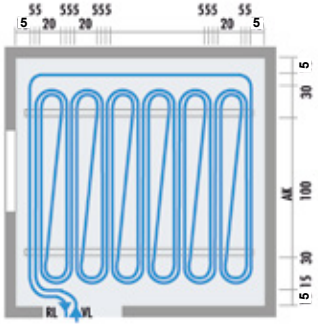
Laying module VA 20



Laying module VA 15



Laying module VA 12



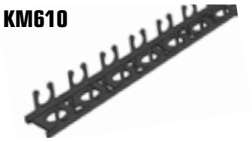
Laying module VA 7

AK = Spacing of the FB clamping rails (max. 100cm).

Clamping rail variants

Our plastic profile rails are designed to allow you to easily clip on the pipes that can be laid in a flexible way. You lay the pipes on the wall side by hand, whereas the underfloor heating pipes are laid in a meandering shape in a standing position with your foot, which saves time and takes the strain off your back.

KM610

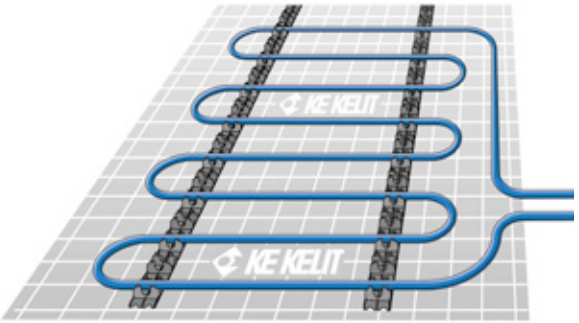


KM610
U-profile clamping rail made of plastic
with self-clamping pipe mount
d16-d25
Pipe spacing: 50mm

KM610PP

KM610PP
Clamping rail made of polypropylene, PVC-free
with self-clamping pipe mount
d16 and d20
Pipe spacing: 50mm

Services

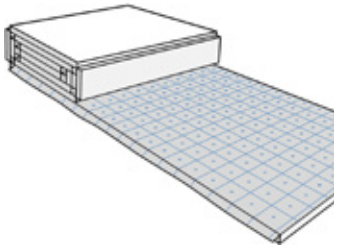


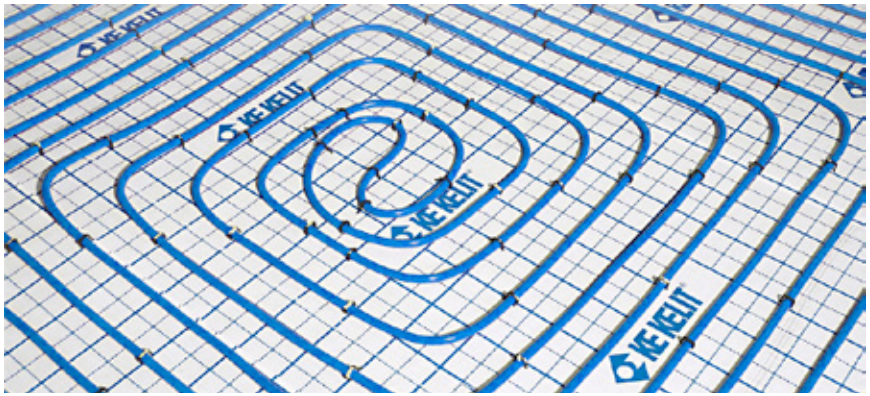
Assumed material required with FB clamping rail for KELOX underfloor heating/m² *

Laying module VA	Multilayer pipe KMU120 running metre/m²	Clamping rail running metre/m²	Fixing hook KM612 Pcs./m²	Joint protection tube KM614 Pcs./circuit	Screentone KM631 m²/m²	Edge insulating strips KM634 running metre/m²	Screed additive KM640 kg/m²
30	3.4	1.0	2	3	1.1	1.1	0.2
25	4.0	1.0	2	3	1.1	1.1	0.2
20	5.2	1.0	2	3	1.1	1.1	0.2
15	6.7	1.0	2	3	1.1	1.1	0.2
12	8.7	1.0	2	3	1.1	1.1	0.2
7	13.5	1.5	3	3	1.1	1.1	0.2

*These values do not include the material required for the connecting pipes.

KELOX FB stable plate system





KMU120 KELOX-ULTRAX FB pipe (blue)
due to the their typical module characteristics, they are more or less ideal for laying and fixing on the KELOX FB stapling panel using KM611 staples combined with a WZ945 stapler.

KU100 ULTRA PE-RT pipe Type 2 (red)
is an alternative plastic pipe made from PE-RT
that is oxygen- and water vapour-diffusion-tight.

KM635S KELOX FB stapling panels
FB stapling panels are available in rollsl In addition to this, the rolls have an overlapping edge on the longitudinal side and one of the lateral sides including an adhesive strip.

You can lay KELOX FB multilayer pipes or ULTRA PE-RT pipes individually in a spiral or meander.

Material
Lambdapor made from expanded polystyrene complying with ÖNORM B 6000, HFC- and CFC-free, including laminated HDPE fabric with PE coating, including overlapping edge with adhesive strip and grid graduation.

Thickness:
as per ÖNORM 13163
30/2 mm,

Compressibility
Tolerance +2 mm

Size
Supplied in coils 10 x1 m

Thermal conductivity
EPS-T 650: Lambda value 0.040 W/mk
EPS-T 1000: Lambda value 0.038 W/mk

Dynamic rigidity
as per gemäß ÖNORM EN 29052-1
EPS-T 650: < 20 MN/m³
EPS-T 1000: < 25 MN/m³

Footfall sound improvement factor
EPS-T 650: approx. < 28 dB
EPS-T 1000: approx. < 27 dB

Load-bearing capacity – as required
EPS-T 650: max. 6.5 kN/m2
EPS-T 1000: max. 10 kN/m2

Flexural strength
as per ÖNORM EN 12089
> 50 kPa (> 0.05 N/mm²)

Water vapour diffusion coefficient of friction
250,000 My –
no FB screentone needed

Temperature resistance
80 to 85°C – for a short time up to 95°C

Fire behaviour
as per ÖNORM EN 13501-1 "E"

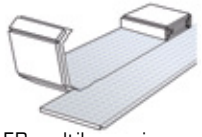
Maximum pipe length
120m/heating circuit (output-dependent)

Services
The heat output of the FB stapler systems are identical with those of the FB clamping rail systems. In dependence on the installation distance, floor covering or room and heating water temperatures, you can refer to these output tables.

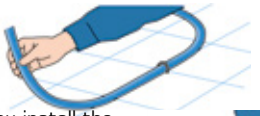
ATTENTION Protect the FB stapling panel from direct sunlight, do not store outdoors!
Max. storage temperature 40°C!

Installing the KM635S stapling panels

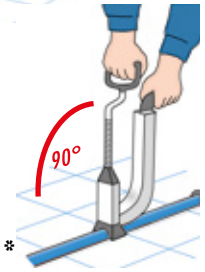
1. To guarantee optimum structure-borne sound insulation, lay the KM634 FB edge insulating strip on the wall without any interruptions.
2. Lay the KM635S FB staple roll over the full surface area in the room and seal the joints tightly using the adhesive overlapping edge on the longitudinal side.



3. Lay the FB multilayer pipes or the ULTRA PE-RT pipes in a spiral or meander in accordance with the installation distance and fix them in position on the FB stapling panel using KM611 FB staples.



4. You install the FB staples on the FB stapling panel using only a WZ945 KELOX stapler at a 90° angle.

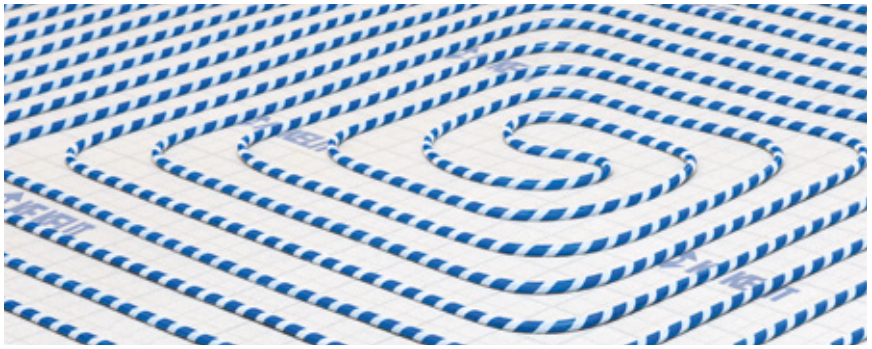


Assumed material required with KM635S FB stapling panel for KELOX underfloor heating/m² *

Laying module VA	FB pipe KMU120 KU100 running metre/m²	Stapling plate KM635S m²/m²	Stapling staples KM611 Pcs./running metre	Joint protection tube KM614 Pcs./circuit	Edge insulating strips KM634 running metre/m²	Screed additive KM640 kg/m²
30	3.4	1.1	2-3	3	1.1	0.2
25	4.0	1.1	2-3	3	1.1	0.2
20	5.2	1.1	2-3	3	1.1	0.2
15	6.7	1.1	2-3	3	1.1	0.2
12	8.7	1.1	2-3	3	1.1	0.2
10	10.2	1.1	2-3	3	1.1	0.2
7	13.5	1.1	2-3	3	1.1	0.2
5	19.4	1.1	2-3	3	1.1	0.2

*These values do not include the material required for the connecting pipes.

KELOX FB Velcro plate system



KMU121K KELOX-ULTRAX FB Velcro tube (blue)
due to the their typical module characteristics and, wraparound Velcro strips, they are more or less ideal for laying and fixing on the KELOX FB Velcro plate without any additional fixing.

KU101K ULTRA PE-RT FB Velcro tube (red)
is an alternative plastic pipe made from PE-RT that is oxygen- and water vapour-diffusion-tight with wraparound Velcro strips.

KM636S KELOX FB Velcro plates
FB Velcro plates are available in rollsl In addition to this, the rolls have an overlapping edge on the longitudinal side and one of the lateral sides including an adhesive strip.

KM636K KELOX FB adhesive Velcro foil
KELOX adhesive Velcro foil is 1m wide and is available in 20m rolls. With its thickness of only 6mm, it is perfect with low installation heights combined with approved thin-bed structures. Pay attention to the manufacturer's instructions!

You can lay KELOX FB Velcro tubes individually in a spiral or meander.

Material
Lambdapor made from expanded polystyrene complying with ÖNORM B 6000, HFC- and CFC-free, including laminated HDPE fabric with PE coating, including overlapping edge with adhesive strip and grid graduation.

Thickness:
as per ÖNORM 13163
30/2 mm,

Compressibility
Tolerance +2 mm

Size
Supplied in coils 10x1 m

Thermal conductivity
EPS-T 650: Lambda value 0.040 W/mk
EPS-T 1000: Lambda value 0.038 W/mk

Dynamic rigidity
as per ÖNORM EN 29052-1
EPS-T 650: < 20 MN/m³
EPS-T 1000: < 25 MN/m³

Footfall sound improvement factor
EPS-T 650: approx. < 28 dB
EPS-T 1000: approx. < 27 dB

Load-bearing capacity – as required
EPS-T 650: max. 6.5 kN/m²
EPS-T 1000: max. 10 kN/m²

Flexural strength
as per ÖNORM EN 12089
> 50 kPa (> 0.05 N/mm²)

Water vapour diffusion coefficient of friction
250,000 My –
no FB screentone needed

Temperature resistance
80 to 85°C – for a short time up to 95°C

Fire behaviour
as per ÖNORM EN 13501-1 "E"

Maximum pipe length
120m/heating circuit (output-dependent)

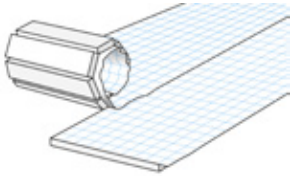
Services
The heat outputs of the FB Velcro systems are identical with those of the FB clamping rail systems. In dependence on the installation distance, floor covering or room and heating water temperatures, you can refer to these output tables.

You install KELOX FB Velcro tubes WITHOUT any additional fastening on the FB Velcro plate, which makes possible faster and more efficient installation.

**ATTENTION Protect the FB Velcro plates from direct sunlight, do not store outdoors!
Max. storage temperature 40°C!**

Installing the KM636S Velcro plates

1. To guarantee optimum structure-borne sound insulation, lay the KM634 FB edge insulating strip on the wall without any interruptions.
2. Lay the KM636S FB Velcro plate over the full surface area in the room and seal the joints tightly using the adhesive overlapping edge on the longitudinal side or KM636V Velcro sealing tape.



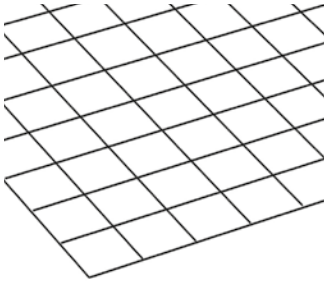
3. Lay KELOX FB Velcro tubes in a spiral or meander in accordance with the installation distance. You fix the pipes using the wraparound adhesive strip on the Velcro tube or the velours lamination on the KELOX Velcro plate.

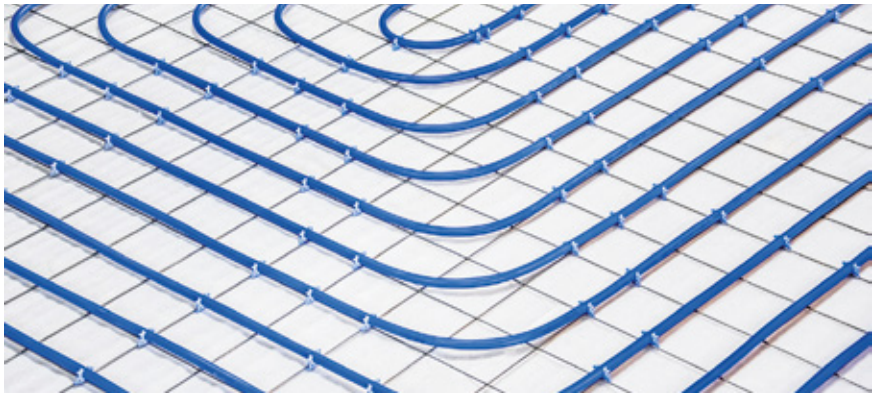
Assumed material required with KM636S FB Velcro plate for KELOX underfloor heating/m² *

Laying module VA	FB pipe KMU121 KU101 running metre/m²	Velcro plate KM636S m²/m²	Joint protection tube KM614 Pcs./circuit	Edge insulating strips KM634 running metre/m²	Screed additive KM640 kg/m²
30	3.4	1.1	3	1.1	0.2
25	4.0	1.1	3	1.1	0.2
20	5.2	1.1	3	1.1	0.2
15	6.7	1.1	3	1.1	0.2
12	8.7	1.1	3	1.1	0.2
10	10.2	1.1	3	1.1	0.2
7	13.5	1.1	3	1.1	0.2
5	19.4	1.1	3	1.1	0.2

*These values do not include the material required for the connecting pipes.

KELOX FB pipe mat system





KMU120 KELOX-ULTRAX FB pipe (blue)
due to the their typical module characteristics, they are more or less ideal for laying and fixing on the KELOX FB pipe mat using KM637C clips.

KU100 ULTRA PE-RT pipe Type 2 (red)
is an alternative plastic pipe made from PE-RT that is oxygen- and water vapour-diffusion-tight.

KM637B KELOX FB pipe mats
bare metal pipe mat with 10x10 cm or 15x15 cm mesh.

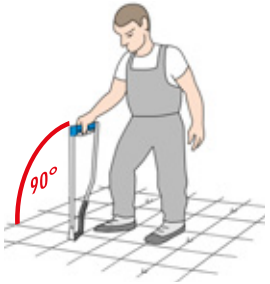
Size: 2.1x1.2 m
Wire thickness 3 mm

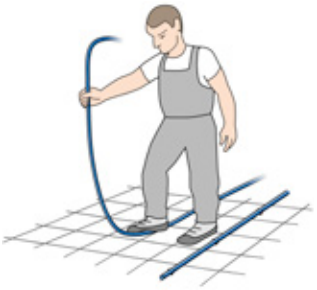
KM637C KELOX FB clips
For fastening KELOX FB pipes on the KM637 or KM637B KELOX FB pipe mat

KM637S KELOX FB wire bag loop
for fastening and connecting KELOX FB pipe mats using a WZ949 KELIT binding device

Services
The heat output of the FB pipe mat systems are identical with those of the FB clamping rail systems. In dependence on the installation distance, floor covering or room and heating water temperatures, you can refer to these output tables.

Maximum pipe length
120m/heating circuit (output-dependent)





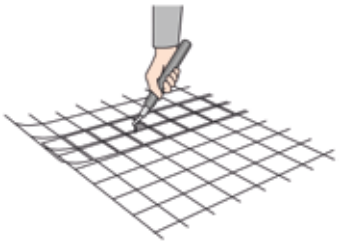
Assumed material required with KM637 FB pipe mat with clips for KELOX underfloor heating/m² *

Laying module VA	FB pipe KMU120 KU100 running metre/m²	Pipe mat KM637B m²/m²	Clips KM637C Pcs./ running metre	Joint protection tube KM614 Pcs./ circuit	Wire bag loop KM637S Pcs./m²	Edge insulating strips KM634 running metre/m²	Screed additive KM640 kg/m²
30	3.4	1.1	2-3	3	1-2	1.1	0.2
20	5.2	1.1	2-3	3	1-2	1.1	0.2
15	6.7	1.1	2-3	3	1-2	1.1	0.2
10	10.2	1.1	2-3	3	1-2	1.1	0.2
5	19.4	1.1	2-3	3	1-2	1.1	0.2

*These values do not include the material required for the connecting pipes.

Mounting the KM637B pipe mats using clips

1. To guarantee optimum structure-borne sound insulation, lay the KM634 FB edge insulating strip on the wall without any interruptions.
2. Lay KM637B FB pipe mats over the full surface area in the room and connect the overlaps with KM637S using wire bag loops. Select a pipe mat mesh in dependence on the installation distance (VA).



3. You mount the KM637C clips on the pipe mat using a WZ946 KELOX clip setter at a 90° angle on the bars of the FB pipe mat.
4. Fix in position on the FB pipe mat the FB multilayer pipes or the ULTRA PE-RT pipes in a spiral or meander in accordance with the installation distance using KM637C FB clips.
5. In the case of floating screed combined with galvanised pipe mats, it is possible that gas forms and you must cover with PE foil. Fasten the heating pipes securely to prevent the pipes from lifting!

Performance table for KELOX FB clamping rails, stapler, Velcro and pipe mat system

e.g.: listed floor covering:
Natural stone, floor tiles
WDW: 0.02 m² K/W
q: Heat flux density [W/m²]
t Fb: Average floor surface temperature (°C)

Max. surface temperature as per ÖNORM EN 1264-3
Residential premises that are in permanent use: **29 °C**
Peripheral zones and baths **35 °C**
Temperature difference (tv–tr): **5 K**

Heating water temperature (tv+tr):2
Standard internal temperature
Pipes required

		VA7 13.50		VA12 8.70		VA15 6.70		VA20 5.20		VA25 4.00		VA30 3.40	
		q	t Fb	q	t Fb	q	t Fb	q	t Fb	q	t Fb	q	t Fb
	15	75.2	22.0	66.2	21.1	60.9	20.6	52.4	19.9	45.5	19.2	40.0	18.7
	18	57.3	23.3	50.4	22.7	46.4	22.3	40.0	21.7	34.7	21.2	30.5	20.8
28	20	45.3	24.2	39.8	23.7	36.7	23.4	31.6	22.9	27.37	22.5	24.1	22.2
	22	33.0	25.1	29.0	24.7	26.7	24.5	23.0	24.1	19.9	23.8	17.5	23.6
	24	20.0	25.8	17.6	25.6	16.2	25.5	13.9	25.3	12.1	25.1	10.6	25.0
	15	87.1	2.1	76.6	22.1	70.4	21.5	60.7	20.6	52.6	19.9	46.3	19.3
	18	69.3	24.4	60.9	23.6	56.0	23.2	48.3	22.5	41.9	21.9	36.8	21.4
30	20	57.3	25.3	50.4	24.7	46.4	24.3	40.0	23.7	34.7	23.2	30.5	22.8
	22	45.3	26.2	39.8	25.7	36.7	25.4	31.6	24.9	27.4	24.5	24.1	24.2
	24	33.0	27.1	29.0	26.7	26.7	26.5	23.0	26.1	19.9	25.8	17.5	25.6
	15	98.9	24.2	87.0	23.1	80.0	22.4	68.9	21.4	59.8	20.5	52.6	19.9
	18	81.1	25.5	71.4	24.6	65.6	24.1	56.6	23.2	49.0	22.5	43.1	22.0
32	20	69.3	26.4	60.9	25.7	56.0	25.2	48.3	24.5	41.9	23.9	36.8	23.4
	22	57.3	27.3	50.4	26.7	46.4	26.3	40.0	25.7	34.7	25.2	30.5	25.7
	24	45.3	28.2	39.8	27.7	36.7	27.4	31.6	26.9	27.4	26.5	24.1	27.1
	15	116.6	25.8	102.5	24.5	94.3	23.7	81.3	22.5	70.4	21.5	62.0	20.7
	18	98.9	27.2	87.0	26.1	80.0	25.4	68.9	24.4	59.8	23.5	52.6	22.9
35	20	87.1	28.1	76.6	27.1	70.4	26.5	60.7	25.6	52.6	24.9	46.3	24.3
	22	75.2	29.0	66.2	28.1	60.9	27.6	52.4	26.9	45.5	26.2	40.0	25.7
	24	63.3	29.9	55.7	29.2	51.2	28.7	44.1	28.1	38.3	27.5	33.7	27.1
	15	134.3	27.4	118.1	25.9	108.6	25.1	93.6	23.7	81.1	22.5	71.3	21.6
	18	116.6	28.8	102.5	27.5	94.3	26.7	81.3	25.5	70.4	24.5	62.0	23.7
38	20	104.8	29.7	92.2	28.5	84.8	27.8	73.0	26.8	63.3	25.9	55.7	25.2
	22	93.0	30.6	81.8	29.6	75.2	29.0	64.8	28.0	56.2	27.2	49.4	26.6
	24	81.1	31.5	71.4	30.6	65.6	30.1	56.6	29.2	49.0	28.5	43.1	28.0
	15	146.0	28.5	128.4	26.9	118.1	25.9	101.8	24.4	88.2	23.2	77.6	22.2
	18	128.4	29.9	112.9	28.5	103.8	27.6	89.5	26.3	77.6	25.2	68.2	24.3
40	20	116.6	30.8	102.5	29.5	94.3	28.7	81.3	27.5	70.4	26.5	62.0	25.7
	22	104.8	31.7	92.2	30.5	84.8	29.8	73.0	28.8	63.3	27.9	55.7	27.2
	24	93.0	32.6	81.8	31.6	75.2	31.0	64.8	30.0	56.2	29.2	49.4	28.6

Performance table for KELOX FB clamping rails, stapler, Velcro and pipe mat system

e.g.: listed floor covering:
Needle felt, plastic coverings, prefabricated parquet max. 8 mm
WDW: 0.06 m² K/W
q: Heat flux density [W/m²]
t Fb: Average floor surface temperature (°C)

Max. surface temperature as per ÖNORM EN 1264-3
Residential premises that are in permanent use: **29 °C**
Peripheral zones and baths **35 °C**
Temperature difference (tv–tr): **5 K**

Heating water temperature (tv+tr):2
Standard internal temperature
Pipes required

		VA7 13.50		VA12 8.70		VA15 6.70		VA20 5.20		VA25 4.00		VA30 3.40	
		q	t Fb	q	t Fb	q	t Fb	q	t Fb	q	t Fb	q	t Fb
	15	60.8	20.6	54.5	20.0	50.7	19.7	44.6	19.1	39.2	18.6	34.9	18.2
	18	46.3	22.3	41.6	21.8	38.7	21.6	34.0	21.1	29.9	20.8	26.6	20.5
28	20	36.6	23.4	32.8	23.0	30.6	22.8	26.9	22.5	23.62	22.2	21.0	21.9
	22	26.7	24.5	23.9	24.2	22.3	24.1	19.6	23.8	17.2	23.6	15.3	23.4
	24	16.1	25.5	14.5	25.3	13.5	25.2	11.9	25.1	10.4	25.0	9.3	24.9
	15	70.3	21.5	63.1	20.8	58.7	20.4	51.6	19.8	45.4	19.2	40.4	18.7
	18	56.0	23.2	50.2	22.6	46.7	22.3	41.1	21.8	36.1	21.3	32.1	21.0
30	20	46.3	24.3	41.6	23.8	38.7	23.6	34.0	23.1	29.9	22.8	26.6	22.5
	22	36.6	25.4	32.8	25.0	30.6	24.8	26.9	24.5	23.6	24.2	21.0	23.9
	24	26.7	26.5	23.9	26.2	22.3	26.1	19.6	25.8	17.2	25.6	15.3	25.4
	15	79.9	22.4	71.6	21.6	66.7	21.2	58.6	20.4	51.5	19.8	45.9	19.2
	18	65.6	24.1	58.8	23.4	54.7	23.1	48.1	22.5	42.3	21.9	37.6	21.5
32	20	56.0	25.2	50.2	24.6	46.7	24.3	41.1	23.8	36.1	23.3	32.1	23.0
	22	46.3	26.3	41.6	25.8	38.7	25.6	34.0	25.1	29.9	24.8	26.6	24.5
	24	36.6	27.4	32.8	27.0	30.6	26.8	26.9	26.5	23.6	26.2	21.0	25.9
	15	94.2	23.7	84.5	22.8	78.6	22.3	69.0	21.4	60.7	20.6	54.1	20.0
	18	79.9	25.4	71.6	24.6	66.7	24.2	58.6	23.4	51.5	22.8	45.9	22.2
35	20	70.3	26.5	63.1	25.8	58.7	25.4	51.6	24.8	45.4	24.2	40.4	23.7
	22	60.8	27.6	54.5	27.0	50.7	26.7	44.6	26.1	39.2	25.6	34.9	25.2
	24	51.2	28.7	45.9	28.2	42.7	28.0	37.5	27.5	33.0	27.1	29.4	26.7
	15	108.4	25.0	97.2	24.0	90.5	23.4	79.5	22.4	69.9	21.5	62.2	20.8
	18	94.2	26.7	84.5	25.8	78.6	25.3	69.0	24.4	60.7	23.6	54.1	23.0
38	20	84.7	27.8	75.9	27.0	70.7	26.5	62.1	25.7	54.6	25.1	48.6	24.5
	22	75.1	29.0	67.4	28.2	62.7	27.8	55.1	27.1	48.5	26.5	43.1	26.0
	24	65.6	30.1	58.8	29.4	54.7	29.1	48.1	28.5	42.3	27.9	37.6	27.5
	15	117.9	25.9	105.8	24.8	98.5	24.1	86.4	23.0	76.1	22.0	67.7	21.3
	18	103.7	27.6	93.0	26.6	86.6	26.0	76.0	25.0	66.9	24.2	59.5	23.5
40	20	94.2	28.7	84.5	27.8	78.6	27.3	69.0	26.4	60.7	25.6	54.1	25.0
	22	84.7	29.8	75.9	29.0	70.7	28.5	62.1	27.7	54.6	27.1	48.6	26.5
	24	75.1	31.0	67.4	30.2	62.7	29.8	55.1	29.1	48.5	28.5	43.1	28.0

Performance table for KELOX FB clamping rails, stapler, Velcro and pipe mat system

e.g.: listed floor covering:
loop pile, thin carpet
WDW: 0.10 m² K/W
q: Heat flux density [W/m²]
t Fb: Average floor surface temperature (°C)

Max. surface temperature as per ÖNORM EN 1264-3
Residential premises that are in permanent use: **29 °C**
Peripheral zones and baths **35 °C**
Temperature difference (tv–tr): **5 K**

Heating water temperature (tv+tr):2
Standard internal temperature
Pipes required

		VA7 13.50		VA12 8.70		VA15 6.70		VA20 5.20		VA25 4.00		VA30 3.40	
		q	t Fb	q	t Fb	q	t Fb	q	t Fb	q	t Fb	q	t Fb
	15	51.0	19.7	46.4	19.3	43.5	19.0	38.7	18.6	34.5	18.2	31.0	17.9
	18	38.9	21.6	35.4	21.3	33.2	21.1	29.5	20.7	26.3	20.4	23.6	20.2
28	20	30.7	22.8	27.9	22.6	26.2	22.4	23.3	22.2	20.75	21.9	18.7	21.7
	22	22.4	24.1	20.4	23.9	19.1	23.8	17.0	23.6	15.1	23.4	13.6	23.3
	24	13.5	25.3	12.3	25.1	11.6	25.1	10.3	25.0	9.1	24.8	8.2	24.8
	15	59.0	20.5	53.7	20.0	50.4	19.7	44.8	19.1	39.9	18.7	35.9	18.3
	18	47.0	22.3	42.7	22.0	40.1	21.7	35.7	21.3	31.7	20.9	28.5	20.6
30	20	38.9	23.6	35.4	23.3	33.2	23.1	29.5	22.7	26.3	22.4	23.6	22.2
	22	30.7	24.8	27.9	24.6	26.2	24.4	23.3	24.2	20.7	23.9	18.7	23.7
	24	22.4	26.1	20.4	25.9	19.1	25.8	17.0	25.6	15.1	25.4	13.6	25.3
	15	67.0	21.2	61.0	20.6	57.2	20.3	50.9	19.7	45.3	19.2	40.7	18.8
	18	55.0	23.1	50.0	22.6	47.0	22.3	41.8	21.9	37.2	21.4	33.4	21.1
32	20	47.0	24.3	42.7	24.0	40.1	23.7	35.7	23.3	31.7	22.9	28.5	22.6
	22	38.9	25.6	35.4	25.3	33.2	25.1	29.5	24.7	26.3	24.4	23.6	24.2
	24	30.7	26.8	27.9	26.6	26.2	26.4	23.3	26.2	20.7	25.9	18.7	25.7
	15	79.0	22.3	71.9	21.7	67.5	21.2	60.0	20.6	53.4	19.9	48.0	19.4
	18	67.0	24.2	61.0	23.6	57.2	23.3	50.9	22.7	45.3	22.2	40.7	21.8
35	20	59.0	25.5	53.7	25.0	50.4	24.7	44.8	24.1	39.9	23.7	35.9	23.3
	22	51.0	26.7	46.4	26.3	43.5	26.0	38.7	25.6	34.5	25.2	31.0	24.9
	24	42.9	28.0	39.0	27.6	36.6	27.4	32.6	27.0	29.0	26.7	26.1	26.4
	15	91.0	23.4	82.7	22.7	77.7	22.2	69.1	21.4	61.5	20.7	55.3	20.1
	18	79.0	25.3	71.9	24.7	67.5	24.2	60.0	23.6	53.4	22.9	48.0	22.4
38	20	71.0	26.6	64.6	26.0	60.6	25.6	53.9	25.0	48.0	24.4	43.2	24.0
	22	63.0	27.8	57.3	27.3	53.8	27.0	47.9	26.4	42.6	25.9	38.3	25.5
	24	55.0	29.1	50.0	28.6	47.0	28.3	41.8	27.9	37.2	27.4	33.4	27.1
	15	99.0	24.2	90.0	23.3	84.5	22.8	75.2	22.0	66.9	21.2	60.1	20.6
	18	87.0	26.1	79.1	25.3	74.3	24.9	66.1	24.1	58.8	23.4	52.9	22.9
40	20	79.0	27.3	71.9	26.7	67.5	26.2	60.0	25.6	53.4	24.9	48.0	24.4
	22	71.0	28.6	64.6	28.0	60.6	27.6	53.9	27.0	48.0	26.4	43.2	26.0
	24	63.0	29.8	57.3	29.3	53.8	29.0	47.9	28.4	42.6	27.9	38.3	27.5

Performance table for KELOX FB clamping rails, stapler, Velcro and pipe mat system

e.g.: listed floor covering:
Velour carpet, solid wood parquet max. 22 mm
WDW: 0.15 m² K/W
q: Heat flux density [W/m²]
t Fb: Average floor surface temperature (°C)

Max. surface temperature as per ÖNORM EN 1264-3
Residential premises that are in permanent use: **29 °C**
Peripheral zones and baths **35 °C**
Temperature difference (tv–tr): **5 K**

Heating water temperature (tv+tr):2
Standard internal temperature
Pipes required

		VA7 13.50		VA12 8.70		VA15 6.70		VA20 5.20		VA25 4.00		VA30 3.40	
		q	t Fb	q	t Fb	q	t Fb	q	t Fb	q	t Fb	q	t Fb
	15	42.4	18.9	39.1	18.6	36.2	18.4	33.3	18.1	29.9	17.8	27.2	17.5
	18	32.4	21.0	29.8	20.8	27.6	20.6	25.4	20.3	22.8	20.1	20.7	19.9
28	20	25.6	22.4	23.5	22.2	21.8	22.0	20.0	21.9	18.03	21.7	16.4	21.5
	22	18.6	23.7	17.1	23.6	15.9	23.5	14.6	23.4	13.1	23.2	11.9	23.1
	24	11.3	25.0	10.4	25.0	9.6	24.9	8.8	24.8	7.9	24.7	7.2	24.7
	15	49.1	19.5	45.2	19.2	41.9	18.9	38.5	18.6	34.7	18.2	31.5	17.9
	18	39.1	21.6	36.0	21.3	33.4	21.1	30.7	20.8	27.6	20.6	25.0	20.3
30	20	32.4	23.0	29.8	22.8	27.6	22.6	25.4	22.3	22.8	22.1	20.7	21.9
	22	25.6	24.4	23.5	24.2	21.8	24.0	20.0	23.9	18.0	23.7	16.4	23.5
	24	18.6	25.7	17.1	25.6	15.9	25.5	14.6	25.4	13.1	25.2	11.9	25.1
	15	55.8	20.2	51.3	19.8	47.6	19.4	43.8	19.1	39.4	18.6	35.7	18.3
	18	45.8	22.2	42.1	21.9	39.1	21.6	35.9	21.3	32.3	21.0	29.3	20.7
32	20	39.1	23.6	36.0	23.3	33.4	23.1	30.7	22.8	27.6	22.6	25.0	22.3
	22	32.4	25.0	29.8	24.8	27.6	24.6	25.4	24.3	22.8	24.1	20.7	23.9
	24	25.6	26.4	23.5	26.2	21.8	26.0	20.0	25.9	18.0	25.7	16.4	25.5
	15	65.8	21.1	60.5	20.6	56.1	20.2	51.6	19.8	46.4	19.3	42.1	18.9
	18	55.8	23.2	51.3	22.8	47.6	22.4	43.8	22.1	39.4	21.6	35.7	21.3
35	20	49.1	24.5	45.2	24.2	41.9	23.9	38.5	23.6	34.7	23.2	31.5	22.9
	22	42.4	25.9	39.1	25.6	36.2	25.4	33.3	25.1	29.9	24.8	27.2	24.5
	24	35.7	27.3	32.9	27.0	30.5	26.8	28.0	26.6	25.2	26.3	22.9	26.1
	15	75.7	22.0	69.7	21.5	64.6	21.0	59.4	20.5	53.4	19.9	48.5	19.5
	18	65.8	24.1	60.5	23.6	56.1	23.2	51.6	22.8	46.4	22.3	42.1	21.9
38	20	59.1	25.5	54.4	25.0	50.5	24.7	46.4	24.3	41.7	23.9	37.9	23.5
	22	52.5	26.9	48.3	26.5	44.8	26.1	41.1	25.8	37.0	25.4	33.6	25.1
	24	45.8	28.2	42.1	27.9	39.1	27.6	35.9	27.3	32.3	27.0	29.3	26.7
	15	82.4	22.6	75.8	22.0	70.3	21.5	64.6	21.0	58.1	20.4	52.8	19.9
	18	72.4	24.7	66.7	24.2	61.8	23.7	56.8	23.3	51.1	22.7	46.4	22.3
40	20	65.8	26.1	60.5	25.6	56.1	25.2	51.6	24.8	46.4	24.3	42.1	23.9
	22	59.1	27.5	54.4	27.0	50.5	26.7	46.4	26.3	41.7	25.9	37.9	25.5
	24	52.5	28.9	48.3	28.5	44.8	28.1	41.1	27.8	37.0	27.4	33.6	27.1

KELOX FB fixing plate system

KMU120 KELOX-ULTRAX FB pipes d16 (blue)
are ideally suited for laying on the module characteristics fixing plate due to the typical module characteristics.

KU100 ULTRA PE-RT pipes Type 2 (red)
are an alternative plastic pipe made from PE-RT that are oxygen and water vapour diffusion-tight.

Laying KELOX FB multilayer pipes on the FB fixing plate can be combined well with the typical module characteristics of the pipes.
Convenient laying and connection of the FB fixing plates due to the cleverly designed father-mother nubs on each of the longitudinal and lateral sides of the FB fixing plates. Can be laid in a spiral or meander.

Material
Polystyrene panel with deep-drawn pipe holding burls for stable fastening of KELOX FB multilayer pipes d16mm, connection of individual panels by overlapping.

Size
Length: 1.45m
Width: 0.85m
Height: 20mm

Water vapour diffusion resistance
132,000My –
no FB screentone needed.

Insulation
Low insulation due to air inclusion in the burls, no footfall sound insulation.

Installation distances
VA 5, 10, 15, 20, 25 and 30cm

Load-bearing capacity
5.0 kN/m²

Material required
Add at least 10% additional requirement due to overlapping!

Maximum pipe length:
120m/heating circuit
(output-dependent)

Assumed material required with KM613 FB fixing plate for KELOX underfloor heating/m² *

Laying module VA	Multilayer pipe KMU120/ KU100 running metre/m²	Fixing plate KM613 m²/m²	Joint protection tube KM614 Pcs./circuit	Edge insulating strips KM634 running metre/m²	Screed additive KM640 kg/m²
30	3.4	1.1	3	1.1	0.2
25	4.0	1.1	3	1.1	0.2
20	5.2	1.1	3	1.1	0.2
15	6.7	1.1	3	1.1	0.2
10	10.2	1.1	3	1.1	0.2
5	19.4	1.1	3	1.1	0.2

* These values do not include the material required for the connecting pipes.

Assembly of the KM613 FB fixing plate

You assemble the KM613 FB fixing plate after laying the KM630 FB edge insulating strips on the substructure of the floor or insulation.

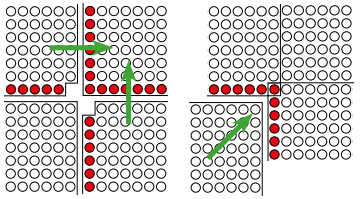
One long edge and one wide one as a reduced-size parent burl, marked with the KELIT logo between the burls.

You must lay the first (1) plate in the space such the father nubs (marked in red) point into the "inside space"; you can press the other plates gently according to the push-button principle (2) onto the plates that have already been laid.
Due to the recesses on the corners, (3) you do not need to lay the plates offset.
In the case of an expansion joint, you must leave a space between the burl plates to set the joint protection pipes.
(Coordinate with the screed installer)

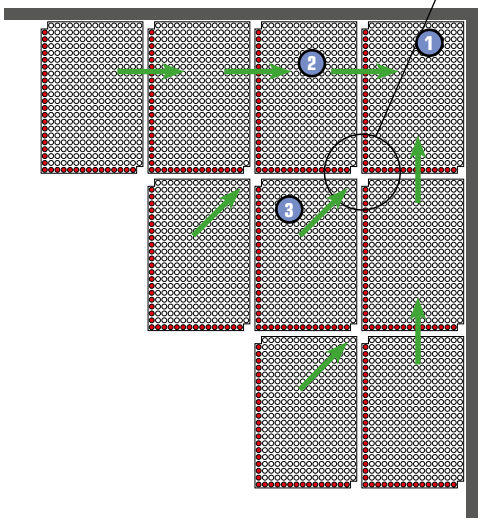
Benefits

- The pipe-holding nubs fix the pipe in position
- Specially suitable on unstable surfaces like loose-fill insulation, Perlite, etc. for example.
- Can be laid in a spiral or meander

Detail of corner overlapping



KM613 KELOX FB fixing plate installation



Performance table for KELOX FB fixing plate system

e.g.: listed floor covering:
Natural stone, floor tiles

WDW: 0.02 m² K/W

q: Heat flux density [W/m²]

t Fb: Average floor surface temperature (°C)

Max. surface temperature as per ÖNORM EN 1264-3

Residential premises that are in permanent use: **29 °C**

Peripheral zones and baths **35 °C**

Temperature difference (tv–tr): **5 K**

Heating water temperature (tv+tr):2

Standard internal temperature

Pipes required

		VA5 19.40		VA10 10.20		VA15 6.70		VA20 5.20		VA25 4.00		VA30 3.40	
		q	t Fb	q	t Fb	q	t Fb	q	t Fb	q	t Fb	q	t Fb
	15	77.2	22.1	67.3	21.2	57.6	20.3	49.2	19.6	42.3	18.9	36.7	18.4
	18	58.8	23.4	51.3	22.7	43.9	22.1	37.5	21.5	32.2	21.0	28.0	20.6
28	20	46.5	24.3	40.5	23.7	34.7	23.2	29.6	22.7	25.33	22.3	22.1	22.0
	22	33.9	25.1	29.5	24.7	25.2	24.3	21.6	24.0	18.4	23.7	16.1	23.5
	24	20.5	25.9	17.8	25.7	15.3	25.4	13.0	25.2	11.1	25.0	9.7	24.9
	15	89.3	23.3	77.9	22.2	66.7	21.2	57.0	20.3	49.1	19.5	42.5	18.9
	18	71.1	24.6	61.9	23.7	53.1	22.9	45.3	22.2	39.0	21.6	33.8	21.1
30	20	58.8	25.4	51.3	24.7	43.9	24.1	37.5	23.5	32.2	23.0	28.0	22.6
	22	46.5	26.3	40.5	25.7	34.7	25.2	29.6	24.7	25.3	24.3	22.1	24.0
	24	33.9	27.1	29.5	26.7	25.2	26.3	21.6	26.0	18.4	25.7	26.1	25.5
	15	101.5	24.4	88.4	23.2	75.8	22.0	64.8	21.0	55.9	20.2	48.3	19.5
	18	83.3	25.7	72.6	24.7	62.2	23.8	53.1	22.9	45.7	22.2	39.6	21.7
32	20	71.1	26.6	61.9	25.7	53.1	24.9	45.3	24.2	39.0	23.6	33.8	23.1
	22	58.8	27.4	51.3	26.7	43.9	26.1	37.5	25.5	32.2	25.0	28.0	24.6
	24	46.5	28.3	40.5	27.7	34.7	27.2	29.6	26.7	25.3	26.3	22.1	26.0
	15	119.6	26.1	104.2	24.7	89.4	23.3	76.4	22.1	66.0	21.1	56.9	20.3
	18	101.5	27.4	88.4	26.2	75.8	25.0	64.8	24.0	55.9	23.2	48.3	22.5
35	20	89.3	28.3	77.9	27.2	66.7	26.2	57.0	25.3	49.1	24.5	42.5	23.9
	22	77.2	29.1	67.3	28.2	57.6	27.3	49.2	26.6	42.3	25.9	36.7	25.4
	24	65.0	30.0	56.6	29.2	48.5	28.5	41.4	27.8	35.6	27.3	30.9	26.9
	15	137.8	27.8	120.0	26.1	103.0	24.5	88.5	23.1	76.1	22.1	65.6	21.1
	18	119.6	29.1	104.2	27.7	89.4	26.3	76.4	25.1	66.0	24.1	56.9	23.3
38	20	107.6	30.0	93.7	28.7	80.3	27.4	68.6	26.4	59.2	25.5	51.1	24.7
	22	95.4	30.8	83.1	29.7	71.3	28.6	60.9	27.6	52.5	26.9	45.4	26.2
	24	83.3	31.7	72.6	30.7	62.2	29.8	53.1	28.9	45.7	28.2	39.6	27.7
	15	149.9	28.9	130.6	27.1	112.0	25.4	95.7	23.9	82.9	22.7	77.3	21.6
	18	131.7	30.2	114.8	28.6	98.4	27.1	84.1	25.8	72.8	24.7	62.7	23.8
40	20	119.6	31.1	104.2	29.7	89.4	28.3	76.4	27.1	66.0	26.1	56.9	25.3
	22	107.5	32.0	93.7	30.7	80.3	29.4	68.6	28.4	59.2	27.5	51.1	26.7
	24	95.4	32.8	83.1	31.7	71.3	30.6	60.9	29.6	52.5	28.9	45.4	28.2

Performance table for KELOX FB fixing plate system

e.g.: listed floor covering:
Needle felt, plastic coverings, prefabricated parquet max. 8 mm

WDW: 0.06 m² K/W

q: Heat flux density [W/m²]

t Fb: Average floor surface temperature (°C)

Max. surface temperature as per ÖNORM EN 1264-3

Residential premises that are in permanent use: **29 °C**

Peripheral zones and baths **35 °C**

Temperature difference (tv–tr): **5 K**

Heating water temperature (tv+tr):2

Standard internal temperature

Pipes required

		VA5 19.40		VA10 10.20		VA15 6.70		VA20 5.20		VA25 4.00		VA30 3.40	
		q	t Fb	q	t Fb	q	t Fb	q	t Fb	q	t Fb	q	t Fb
	15	62.2	20.8	55.4	20.1	48.5	19.5	42.2	18.9	37.0	18.4	32.0	18.0
	18	47.5	22.4	42.2	21.9	36.9	21.4	32.2	21.0	28.1	20.6	24.4	20.3
28	20	37.5	23.5	33.3	23.1	29.2	22.7	25.4	22.4	22.15	22.1	19.2	21.8
	22	27.3	24.5	24.3	24.2	21.2	24.0	18.5	23.7	16.1	23.5	14.0	23.3
	24	16.5	25.5	14.7	25.4	12.8	25.2	11.2	25.0	9.7	24.9	8.5	24.8
	15	72.0	21.7	64.1	20.9	56.1	20.2	48.8	19.5	42.9	19.0	37.0	18.4
	18	57.3	23.3	51.0	22.7	44.6	22.1	38.8	21.6	34.0	21.2	29.4	20.7
30	20	47.5	24.4	42.2	23.9	36.9	23.4	32.2	23.0	28.1	22.6	24.4	22.3
	22	37.5	25.5	33.3	25.1	29.2	24.7	25.4	24.4	22.2	24.1	19.2	23.8
	24	27.3	26.5	24.3	26.2	21.2	26.0	18.5	25.7	16.1	25.5	14.0	25.3
	15	81.8	22.6	72.8	21.7	63.8	20.9	55.4	20.1	48.7	19.5	42.0	18.9
	18	67.2	24.2	59.7	23.5	52.3	22.8	45.5	22.2	39.9	21.7	34.5	21.2
32	20	57.3	25.3	51.0	24.7	44.6	24.1	38.8	23.6	34.0	23.2	29.4	22.7
	22	47.5	26.4	42.2	25.9	36.9	25.4	32.2	25.0	28.1	24.6	24.4	24.3
	24	37.5	27.5	33.3	27.1	29.2	26.7	25.4	26.4	22.2	26.1	19.2	25.8
	15	96.4	23.9	85.9	23.0	75.2	22.0	65.3	21.0	57.6	20.3	49.5	19.6
	18	81.8	25.6	72.8	24.7	63.8	23.9	55.4	23.1	48.7	22.5	42.0	21.9
35	20	72.0	26.7	64.1	25.9	56.1	25.2	48.8	24.5	42.9	24.0	37.0	23.4
	22	62.2	27.8	55.4	27.1	48.5	26.5	42.2	25.9	37.0	25.4	32.0	25.0
	24	52.4	28.9	46.6	28.3	40.8	27.8	35.5	27.3	31.1	26.9	26.9	26.5
	15	111.0	25.3	99.0	24.2	86.6	23.0	75.2	22.0	66.4	21.1	57.0	20.3
	18	96.4	26.9	85.9	26.0	75.2	25.0	65.3	24.0	57.6	23.3	49.5	22.6
38	20	86.7	28.0	77.2	27.1	67.6	26.3	58.7	25.4	51.7	24.8	44.5	24.1
	22	76.9	29.1	68.5	28.3	59.9	27.6	52.1	26.8	45.8	26.2	39.5	25.7
	24	67.2	30.2	59.7	29.5	52.3	28.8	45.5	28.2	39.9	27.7	34.5	27.2
	15	120.8	26.2	107.6	25.0	94.2	23.7	81.7	22.6	72.2	21.7	62.0	20.7
	18	106.2	27.8	94.6	26.8	82.8	25.7	71.9	24.7	63.4	23.9	54.5	23.0
40	20	96.4	28.9	85.9	28.0	75.2	27.0	65.3	26.0	57.6	25.3	49.5	24.6
	22	86.7	30.0	77.2	29.1	67.6	28.3	58.7	27.4	51.7	26.8	44.5	22.1
	24	76.9	31.1	68.5	30.3	59.9	29.6	52.1	28.8	45.8	28.2	39.5	27.7

Performance table for KELOX FB fixing plate system

e.g.: listed floor covering:
loop pile, thin carpet
WDW: 0.10 m² K/W
q: Heat flux density [W/m²]
t Fb: Average floor surface temperature (°C)

Max. surface temperature as per ÖNORM EN 1264-3
Residential premises that are in permanent use: **29 °C**
Peripheral zones and baths **35 °C**
Temperature difference (tv–tr): **5 K**

Heating water temperature (tv+tr):2
Standard internal temperature
Pipes required

		VA5 19.40		VA10 10.20		VA15 6.70		VA20 5.20		VA25 4.00		VA30 3.40	
		q	t Fb	q	t Fb	q	t Fb	q	t Fb	q	t Fb	q	t Fb
	15	52.1	19.8	47.0	19.4	41.8	18.9	36.8	18.4	32.6	18.0	28.9	17.7
	18	39.7	21.7	35.8	21.3	31.9	21.0	28.1	20.6	24.9	20.3	22.0	20.0
28	20	31.4	22.9	28.3	22.6	25.2	22.3	22.2	22.1	19.65	21.8	17.4	21.6
	22	22.9	24.1	20.6	23.9	18.4	23.7	16.1	23.5	14.3	23.3	12.7	23.2
	24	13.9	25.3	12.5	25.2	11.1	25.0	9.7	24.9	8.7	24.8	7.7	24.7
	15	60.2	20.6	54.5	20.0	48.4	19.5	42.7	19.0	37.7	18.5	33.4	18.1
	18	48.0	22.4	43.3	22.0	38.5	21.6	33.9	21.1	30.0	20.8	26.6	20.5
30	20	39.7	23.7	35.8	23.3	31.9	23.0	28.1	22.6	24.9	22.3	22.0	22.0
	22	31.4	24.9	28.3	24.6	25.2	24.3	22.2	24.1	19.6	23.8	17.4	23.6
	24	22.9	26.1	20.6	25.9	18.4	25.7	16.1	25.5	14.3	25.3	12.7	25.2
	15	68.4	21.3	61.9	20.7	55.0	20.1	48.5	19.5	42.8	19.0	38.0	18.5
	18	56.1	23.2	50.7	22.7	45.1	22.2	39.8	21.7	35.2	21.3	31.2	20.9
32	20	48.0	24.4	43.3	24.0	38.5	23.6	33.9	23.1	30.0	22.8	26.6	22.5
	22	39.7	25.7	35.8	25.3	31.9	25.0	28.1	24.6	24.9	24.3	22.0	24.0
	24	31.4	26.9	28.3	26.6	25.2	26.3	22.2	26.1	19.6	25.8	17.4	25.6
	15	80.6	22.5	73.0	21.8	64.8	21.0	57.2	20.3	50.5	19.7	44.8	19.1
	18	68.4	24.3	61.9	23.7	55.0	23.1	48.5	22.5	42.8	22.0	38.0	21.5
35	20	60.2	25.6	54.5	25.0	48.4	24.5	42.7	24.0	37.7	23.5	33.4	23.1
	22	52.1	26.8	47.0	26.4	41.8	25.9	36.8	25.4	32.6	25.0	28.9	24.7
	24	43.8	28.1	39.6	27.7	35.2	27.3	31.0	26.9	27.5	26.5	24.3	26.3
	15	92.7	23.6	84.0	22.8	74.5	21.9	65.9	21.1	58.1	20.4	51.6	19.8
	18	80.6	25.5	73.0	24.8	64.8	24.0	57.2	23.3	50.5	22.7	44.8	22.1
38	20	72.4	26.7	65.6	26.1	58.2	25.4	51.4	24.8	45.4	24.2	40.3	23.7
	22	64.3	28.0	58.2	27.4	51.7	26.8	45.6	26.2	40.3	25.7	35.7	25.3
	24	56.1	29.2	50.7	28.7	45.1	28.2	39.8	27.7	35.2	27.3	31.2	26.9
	15	100.8	24.3	91.4	23.5	81.1	22.5	71.7	21.6	63.2	20.9	56.1	20.2
	18	88.7	26.2	80.3	25.4	71.3	24.6	63.0	23.8	55.6	23.1	49.3	22.6
40	20	80.6	27.5	73.0	26.8	64.8	26.0	57.2	25.3	50.5	24.7	44.8	24.1
	22	72.4	28.7	65.6	28.1	58.2	27.4	51.4	26.8	45.4	26.2	40.3	25.7
	24	64.3	30.0	58.2	29.4	51.7	28.8	45.6	28.2	40.3	27.7	35.7	27.3

Performance table for KELOX FB fixing plate system

e.g.: listed floor covering:
Velour carpet, solid wood parquet max. 22 mm
WDW: 0.15 m² K/W
q: Heat flux density [W/m²]
t Fb: Average floor surface temperature (°C)

Max. surface temperature as per ÖNORM EN 1264-3
Residential premises that are in permanent use: **29 °C**
Peripheral zones and baths **35 °C**
Temperature difference (tv–tr): **5 K**

Heating water temperature (tv+tr):2
Standard internal temperature
Pipes required

		VA5 19.40		VA10 10.20		VA15 6.70		VA20 5.20		VA25 4.00		VA30 3.40	
		q	t Fb	q	t Fb	q	t Fb	q	t Fb	q	t Fb	q	t Fb
	15	43.2	19.0	39.6	18.7	35.7	18.3	31.9	18.0	28.5	17.6	25.5	17.4
	18	33.0	21.1	30.2	20.8	27.2	20.5	24.3	20.3	21.7	20.0	19.4	19.8
28	20	26.1	22.4	23.8	22.2	21.5	22.0	19.2	21.8	17.16	21.6	15.4	21.4
	22	19.0	23.8	17.4	23.6	15.7	23.4	14.0	23.3	12.5	23.2	11.2	23.0
	24	11.5	25.1	10.5	25.0	9.5	24.9	8.5	24.8	7.6	24.7	6.8	24.6
	15	50.0	19.6	45.8	19.2	41.3	18.8	37.0	18.4	33.0	18.1	29.5	17.7
	18	39.8	21.7	36.4	21.4	32.9	21.0	29.4	20.7	26.2	20.4	23.5	20.2
30	20	33.0	23.1	30.2	22.8	27.2	22.5	24.3	22.3	21.7	22.0	19.4	21.8
	22	26.1	24.4	23.8	24.2	21.5	24.0	19.2	23.8	17.2	23.6	15.4	23.4
	24	19.0	25.8	17.4	25.6	15.7	25.4	14.0	25.3	12.5	25.2	11.2	25.0
	15	56.8	20.3	52.0	19.8	47.0	19.3	42.0	18.9	37.5	18.5	33.5	18.1
	18	46.6	22.3	42.7	22.0	38.5	21.6	34.4	21.2	30.7	20.8	27.5	20.5
32	20	39.8	23.7	36.4	23.4	32.9	23.0	29.4	22.7	26.2	22.4	23.5	22.2
	22	33.0	25.1	30.2	24.8	27.2	24.5	24.3	24.3	21.7	24.0	19.4	23.8
	24	26.1	26.4	23.8	26.2	21.5	26.0	19.2	25.8	17.2	25.6	15.4	25.4
	15	66.9	21.2	61.4	20.7	55.4	20.1	49.5	19.6	44.2	19.1	39.5	18.7
	18	56.8	23.3	52.0	22.8	47.0	22.3	42.0	21.9	37.5	21.5	33.5	21.1
35	20	50.0	24.6	45.8	24.2	41.3	23.8	37.0	23.4	33.0	23.1	29.5	22.7
	22	43.2	26.0	39.6	25.7	35.7	25.3	31.9	25.0	28.5	24.6	25.5	24.4
	24	36.4	27.4	33.3	27.1	30.1	26.8	26.9	26.5	24.0	26.2	21.5	26.0
	15	77.0	22.1	70.7	21.5	63.8	20.9	57.0	20.3	50.9	19.7	45.5	19.2
	18	66.9	24.2	61.4	23.7	55.4	23.1	49.5	22.6	44.2	22.1	39.5	21.7
38	20	60.2	25.6	55.2	25.1	49.8	24.6	44.5	24.1	39.7	23.7	35.5	23.3
	22	53.4	26.9	48.9	26.5	44.2	26.1	39.5	25.7	35.2	25.3	31.5	24.9
	24	46.6	28.3	42.7	28.0	38.5	27.6	34.4	27.2	30.7	26.8	27.5	26.5
	15	83.7	22.8	76.9	22.1	69.4	21.4	62.0	20.7	55.3	20.1	49.5	19.6
	18	73.6	24.8	67.6	24.3	61.0	23.6	54.5	23.0	48.6	22.5	43.5	22.0
40	20	66.9	26.2	61.4	25.7	55.4	25.1	49.5	24.6	44.2	24.1	39.5	23.7
	22	60.2	27.6	55.2	27.1	49.8	26.6	44.5	26.1	39.7	25.7	35.5	25.3
	24	53.4	28.9	48.9	28.5	44.2	28.1	39.5	27.7	35.2	27.3	31.5	26.9

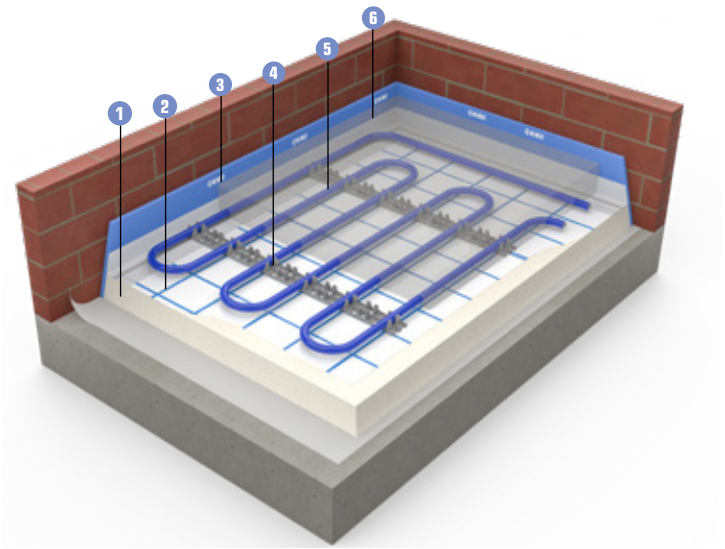
KELOX FB set up with FB clamping rail

Meander installation using FB clamping rails exploits the module characteristics of KELOX FB pipes in a particularly effective way.

1. **Heat insulation**
   prevents heat flow towards the ceiling and dissipation out of the room. This means that you should only ever use resilient insulation materials on-site.
2. **KELOX FB screentone**
   0.15 mm thick HDPE foil. Functions as a protective layer and is an ideal background for bonding the grip rails. The 10 cm grid makes installation easy.
3. **KELOX FB edge insulating strip**
   allows thermal expansion of the screed and prevents noise bridges. You can use the integrated adhesive strips to easily attach the foil that is applied at the factory to the protective layer.
   Minimum thickness: 8 mm
4. **KELOX FB grip rail**
   keeps the KELOX multilayer pipe in position with regard to the pipe spacing and screed bedding.
   d16-d20: Height 24 mm
   d25: Height 35 mm
5. **KELOX FB multilayer pipe**
   installed as a meander according to the requirement specification depending on the output and type of space.
6. **Screed**
   the KELOX FB screed additive gives the heating screed the necessary elasticity and thermal tensile strength.

   You must specify screed thicknesses according to the dependency below:

- Use of space (building owner)
- Screed type and quality (builder, planner)
- Overall thickness of insulation (architect, building physicist)



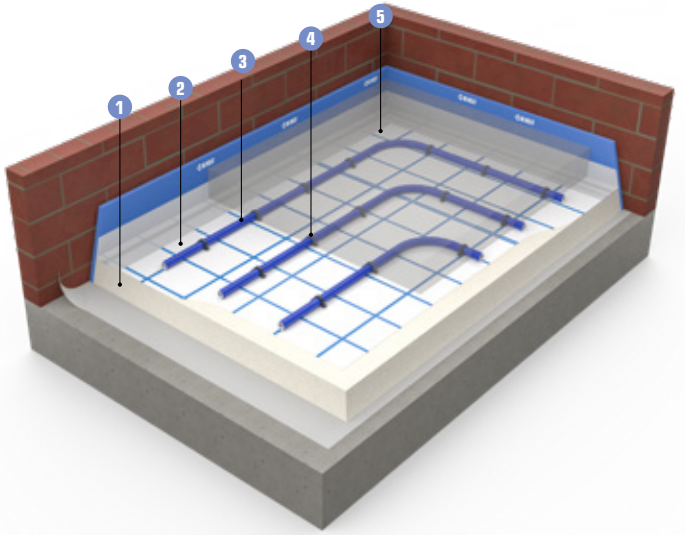
KELOX FB set up with FB stapling panel

On the KELOX FB stapling panel, you can fix in position both FB multilayer pipes and ULTRA PE-RT pipes as meander or spiral installations.

1. **Heat insulation**
   The FB stapling panel is made from 30/2 mm-thick expanded Polystyrene for thermal and footfall sound insulation with an overlapping edge and adhesive strips on the longitudinal and lateral sides and has a PE coating that is applied at the factory.
2. **KELOX FB edge insulating strip**
   Allows thermal expansion of the screed and prevents noise bridges. You can use the integrated adhesive strips to easily attach the foil that is applied at the factory to the PE coating of the stapling panel.
   Minimum thickness: 8 mm
3. **FB multilayer pipe or ULTRA PE-RT pipe**
   installed as a meander or spiral according to the requirement specification depending on the output and type of space.
4. **KELOX FB clip**
   to keep the FB pipes in position on the stapling panel using a WZ945 KELOX stapler.
5. **Screed**
   the KELOX FB screed additive gives the heating screed the necessary elasticity and thermal tensile strength.

   You must specify screed thicknesses according to the dependency below:

- Use of space (building owner)
- Screed type and quality (builder, planner)
- Overall thickness of insulation (architect, building physicist)



KELOX FB set up with FB Velcro panel

On the KELOX FB Velcro panel, you can fix in position both KELOX FB Velcro tubes and ULTRA PE-RT FB Velcro tube as meander or spiral installations without needing any additional fastening materials.

1. **Heat insulation**
   The FB Velcro panel is made from 30/2 mm-thick expanded Polystyrene for thermal and footfall sound insulation with an overlapping edge and adhesive strips on the longitudinal and lateral sides and has side velour fabric and a PE coating that are applied at the factory.

   As an alternative: KM636K FB adhesive Velcro foil made from extruded closed-cell PE foam with applied velours fabric for fixing the KELOX FB Velcro tube without any additional fastening

   Thickness: 6 mm

2. **KELOX FB edge insulating strip**
   allows thermal expansion of the screed and prevents noise bridges.

   Minimum thickness: 8 mm

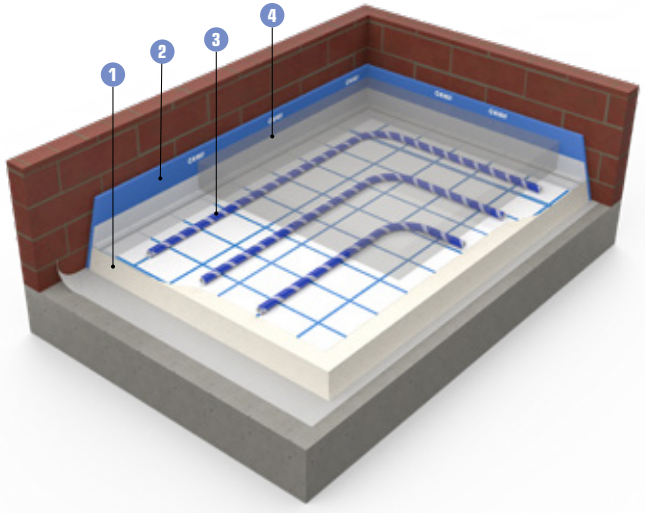
3. **FB multilayer pipe or ULTRA PE-RT pipe**
   including a bonded Velcro strip that is wrapped round at the factory and can be fixed as a meander or spiral installation on the FB Velcro panel according to the requirement specification and in dependence on the output and type of space.

4. **Screed**
   the KELOX FB screed additive gives the heating screed the necessary elasticity and thermal tensile strength.

   You must specify screed thicknesses according to the dependency below:

- Use of space (building owner)
- Screed type and quality (builder, planner)
- Overall thickness of insulation (architect, building physicist)

This structure makes possible an efficient, alternative installation of the underfloor heating WITHOUT needing any additional fastenings!



KELOX FB set up with FB pipe mat

On the KELOX FB pipe mat with clips, you can fix in position both FB multilayer pipes and ULTRA PE-RT pipes as meander or spiral installations.

1. **Heat insulation**
   prevents heat flow towards the ceiling and dissipation out of the room. This means that you should only ever use resilient insulation materials on-site.

2. **KELOX FB screentone**
   0.15 mm thick HDPE foil. Functions as a protective layer and is an ideal background for bonding the grip rails. The 10 cm grid makes installation easy.

3. **KELOX FB edge insulating strip**
   allows thermal expansion of the screed and prevents noise bridges.

   Minimum thickness: 8 mm

4. **KELOX FB multilayer pipe or ULTRA PE-RT pipe**
   installed as a meander or spiral according to the requirement specification, the output and type of space.

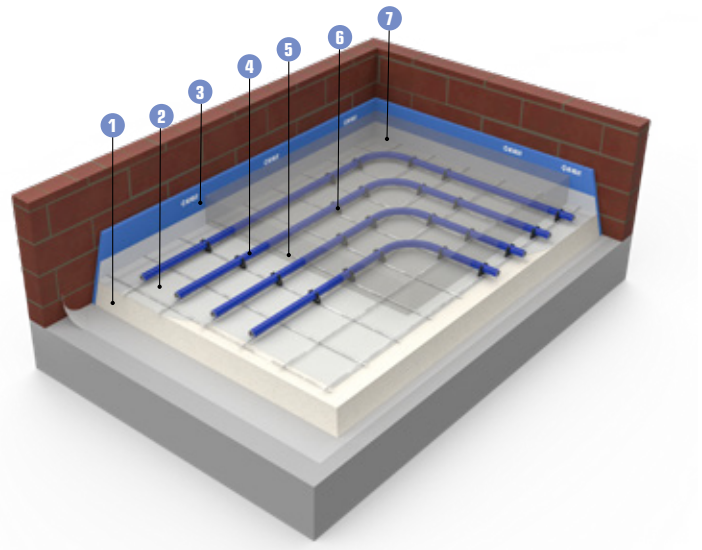
5. **KELOX FB pipe mat**
   used as carrier material for KELOX FB clips Option of 10 or 15 cm grid, depending on the requirement specification. The individual overlapping pipe mats are connected using KM637S FB wire bag loops.

6. **KELOX FB clips**
   to keep the FB pipes in position on the pipe mat using a WZ946 KELOX clip setter.

7. **Screed**
   the KELOX FB screed additive gives the heating screed the necessary elasticity and thermal tensile strength.

   You must specify screed thicknesses according to the dependency below:

- Use of space (building owner)
- Screed type and quality (builder, planner)
- Overall thickness of insulation (architect, building physicist)



KELOX FB set up with FB fixing plate

The stable FB fixing plate provides an elegant solution, in particular on unstable surfaces (loose-fill insulation, cement-bound EPS foam, recyclate, Perlite …). One long edge and one wide one as a reduced-size parent burl, marked with the KELIT logo between the parent burls.

1. **Heat insulation**
   e.g. on-site loose-fill insulation, recyclate, Perlite, etc.

2. **KELOX FB fixing plate**
   Deep-drawn pipe holding burls keep the KELOX FB multilayer pipe in position. Individual panels connected by overlapping (approximately 10% more needed). Installation distances:
   VA 5, 10, 15, 20, 25 and 30 cm
   Burl height: 20 mm

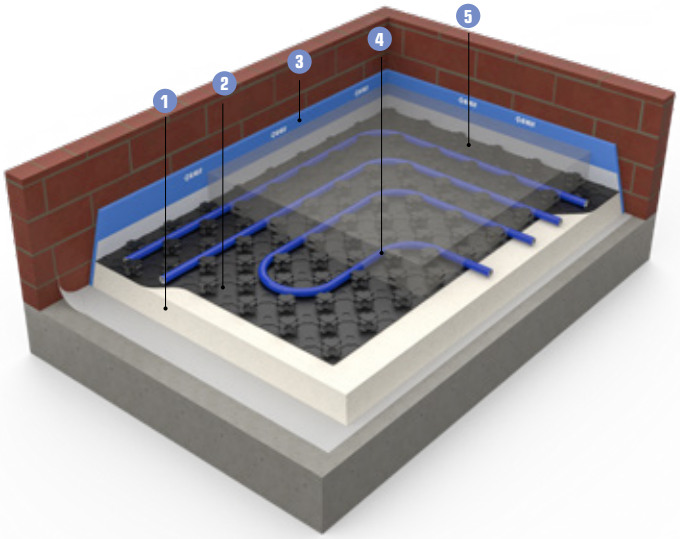
3. **KELOX FB edge insulating strip**
   Allows thermal expansion of the screed and prevents noise bridges. You can use the integrated adhesive strips to easily attach the foil, which is applied at the factory to the fixing plate, that functions as a protective layer.
   Minimum thickness: 8 mm

4. **FB multilayer pipe or ULTRA PE-RT pipe**
   installed as a meander or spiral according to the requirement specification depending on the output and type of space.

5. **Screed**
   the KELOX FB screed additive gives the heating screed the necessary elasticity and thermal tensile strength.

   You must specify screed thicknesses according to the dependency below:

- Use of space (building owner)
- Screed type and quality (builder, planner)
- Overall thickness of insulation (architect, building physicist)

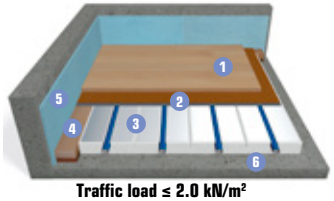


KELOX dry drywall construction system FB set up

A universal, optimised underfloor heating system for all new and old buildings. Particularly suitable for renovation, extensions and applications in drywall and wooden constructions. Aluminium guide plates ensure optimum heat transfer directly to the upper floor, which makes the system extremely responsive. The system elements, which are made from high-pressure-resistant polystyrene, can be laid directly after pipe laying with different upper floors depending on the traffic load. This makes it possible to shorten building times and allows a low construction height.

Benefits

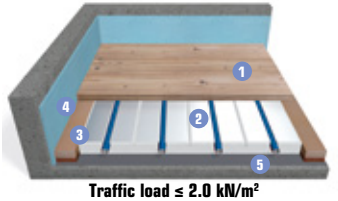
- Shorter building times
- Low construction height
- Free selection of the upper floor
- Responsive due to low coverage
- Optimum heat transfer due to aluminium guide plates



Traffic load ≤ 2.0 kN/m²

Parquet direct application

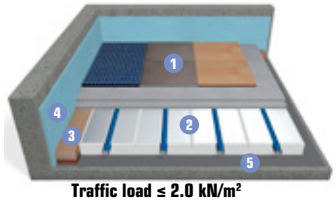
1. Parquet ≥14 mm
2. Structure-borne sound and sound-insulating web 2-3mm
3. KM660 system element 30 mm and KELOX FB pipe
4. KM683 wooden frame 30 mm
5. KM634 edge insulating strip
6. Possibly a moisture barrier



Traffic load ≤ 2.0 kN/m²

Solid wood boards on buffer beams installed directly

1. Wooden boarding ≥22 mm
2. KM660 system element 30 mm and KELOX FB pipe
3. KM683 wooden frame 30 mm and buffer beam
4. KM634 edge insulating strip
5. Possibly moisture barrier and footfall sound foil

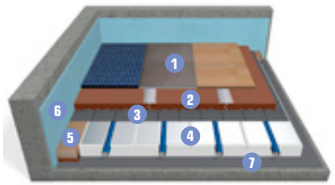


Traffic load ≤ 2.0 kN/m²

Carpet, tiles, parquet, laminate, plastic coating on dry screed/Fermacell

Coordinate with carpet fitter or tiler!

1. Carpet, tiles, parquet, laminate screed element laid with offset joints 2 x10 mm (Fermacell)
2. KM660 system element 30 mm and KELOX FB pipe
3. KM683 wooden frame 30 mm
4. KM634 edge insulating strip
5. Possibly moisture barrier and footfall sound foil



Traffic load ≤ 5.0 kN/m²

Carpet, tiles, parquet, laminate, plastic coating on screed tile® Creapur

1. Carpet, tiles, parquet, laminate
2. Screed tile 20 mm (Cerapur)
3. KM631 FB screentone
4. KM660 system element 30 mm and KELOX FB pipe
5. KM683 wooden frame 30 mm
6. KM634 edge insulating strip
7. Possibly moisture barrier and footfall sound foil

Active surfaces for heating and cooling

KELOX dry drywall construction system installation

KM660 KELOX dry system elements with pipe spacing of 12.5 and 25 cm are polystyrene panels that are pre-fabricated to a thickness of 30 mm and a Lambda value of 0.035 W/mK. They are laminated on virtually the entire surface with aluminium guide plates that have outstanding heat conduction capabilities.

The pipe channels for the **KMU120 KELOX-ULTRAX FB pipes d16x2mm** are omega-shaped and the edges are chamfered.

Rupture joints on the system elements guarantee optimum adaptation to the room geometry, which means that even angular rooms can be laid over the full surface area.

In accordance with the pipe spacing, **KM662 KELOX dry head elements** must be used for changes of direction at the end of meanders.

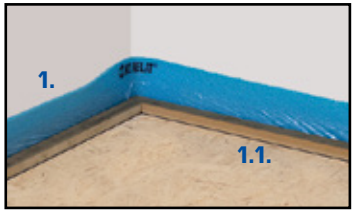
The **KM663 KELOX dry replaceable element** is available as a transition between the two spacings (12.5 or 25 cm).

Residual surfaces and surfaces that may not have been heated are filled up with **KM664 KELOX dry filler insulation.**

To improve the compressive strength of the floor and with doorways, the **KM683 KELOX dry wooden frame** with two-ply structure is available as an MDF panel and a sturdy soft fibreboard panel.

KM681 KELOX dry aluminium cover plate is available as an additional heat conduction plate with head elements or edge plates. The **KM682 KELOX dry steel load distribution plate** is used to cover doorways.

Attention: To avoid subsequent unevenness and cracks, the KELOX dry elements must be flat in contact over the full surface area with a dry, bondable, clean and, tread-resistant substrate. The system elements cannot compensate existing unevenness!



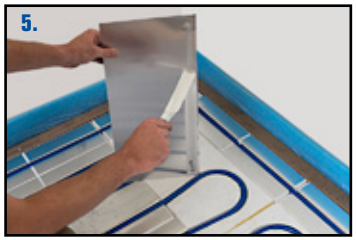
Installing KELOX dry

1. Lay KM634 KELOX FB edge insulating strips on the wall without any interruptions; this ensures optimum structure-borne sound insulation.

1.1. Lay KM683 KELOX dry wooden frame around the wall and the door area.
The wooden frames with pipe cutouts must be additionally bolted to the subsurface.

2. Adjust the KELOX dry system elements and lay them.

2.1. In rooms measuring less than 8 m², ALL THE KELOX dry system elements must be bonded to the KM686 KELOX dry universal dispersion fixative on the substrate.



2.2. In the case of rooms measuring 8 m² and more, you must use KM686 KELOX dry universal dispersion fixative to bond ONLY the head elements, replaceable head elements or bespoke system elements on the substrate.

KM662 KELOX dry head elements are placed at the end of a meander to change direction in accordance with the selected pipe spacings.

The KM663 KELOX dry replaceable head element is needed to change the spacing.

Residual surfaces and surfaces that may not have been heated are filled up with KM664 KELOX dry filler insulation.

3. Using a WZ960 KELOX heat cutter, you can incorporate the pipe channels for the connecting lines.

The connection on the FB manifold is made according to the KELOX processing guidelines.

4. KMU120 KELOXULTRAX FB pipes d16 x 2 mm are fixed in omega-shaped milled pipe channels of the system elements without any other aids or fastening elements.

5. To optimise heat distribution, it is possible to use KM681 KELOX dry aluminium cover plates with adhesive strips to cover the replaceable head elements as well as the connecting lines.

6. In the area of the heating manifold and in the door area, covering is by means of KM682 KELOX dry steel load distribution plates.

Performance table for KELOX dry drywall construction system

e.g.: listed floor covering:
Direct installation: Parquet, laminate
Dry screed: Parquet, laminate, tiles

q: Heat flux density [W/m²]

t Fb: Average floor surface temperature (°C)

Max. surface temperature as per ÖNORM EN 1264-3

Residential premises that are in permanent use:	**29 °C**
Peripheral zones and baths	**35 °C**
Temperature difference (tv–tr):	**5 K**

Heating water temperature (tv+tr):2
Standard internal temperature

Installation distance VA: 12.5cm
Pipes required: 8 running metres/m²

		PARQUET				LAMINATE				TILES			
		Direct installation		Fermacell 20mm		Direct installation		Fermacell 20mm		Fermacell 20mm		Fermacell 25mm	
		q	t Fb	q	t Fb	q	t Fb	q	t Fb	q	t Fb	q	t Fb
28	15	44.2	19.0	34.7	18.1	55.5	20.0	43.9	19.0	65.3	20.9	59.0	20.3
	18	34.0	21.1	26.7	20.4	42.7	21.8	33.8	21.0	50.2	22.5	45.4	22.1
	20	27.2	22.5	21.4	21.9	34.2	23.1	27.0	22.4	40.2	23.6	36.3	23.3
	22	20.4	23.8	16.0	23.4	25.6	24.3	20.3	23.8	30.1	24.7	27.2	24.5
	24	13.6	25.2	10.7	25.0	17.1	25.5	13.5	25.2	20.1	25.8	18.2	25.6
34	15	64.6	20.8	50.7	19.6	81.1	22.3	64.2	20.8	95.4	23.6	86.3	22.8
	18	54.4	22.9	42.7	21.8	68.3	24.2	54.1	22.9	80.3	25.2	72.6	24.5
	20	47.6	24.3	37.4	23.4	59.8	25.4	47.3	24.3	70.3	26.3	63.6	25.7
	22	40.8	25.7	32.0	24.9	51.2	26.6	40.6	25.7	60.2	27.4	54.5	26.9
	24	34.0	27.1	26.7	26.4	42.7	27.8	33.8	27.0	50.2	28.5	45.4	28.1
40	15	85.0	22.7	66.8	21.0	106.8	24.6	84.5	22.6	125.5	26.3	113.5	25.2
	18	74.8	24.7	58.7	23.3	93.9	26.5	74.4	24.7	110.4	27.9	99.9	27.0
	20	68.0	26.1	53.4	24.8	85.4	27.7	67.6	26.1	100.4	29.0	90.8	28.2
	22	61.2	27.5	48.1	26.3	76.9	28.9	60.8	27.5	90.4	30.1	81.7	29.4
	24	54.4	28.9	42.7	27.8	68.3	30.2	54.1	28.9	80.3	31.2	72.6	30.5

Heating water temperature (tv+tr):2
Standard internal temperature

Installation distance VA: 25 cm
Pipes required: 4 running metres/m²

		PARQUET				LAMINATE				TILES			
		Direct installation		Fermacell 20mm		Direct installation		Fermacell 20mm		Fermacell 20mm		Fermacell 25mm	
		q	t Fb	q	t Fb	q	t Fb	q	t Fb	q	t Fb	q	t Fb
28	15	35.2	18.2	29.3	17.6	43.7	18.9	36.5	18.3	50.4	19.5	46.0	19.1
	18	27.1	20.4	22.5	20.0	33.6	21.0	28.1	20.5	38.8	21.5	35.4	21.2
	20	21.7	22.0	18.0	21.6	26.9	22.4	22.5	22.0	31.0	22.8	28.3	22.6
	22	16.3	23.5	13.5	23.2	20.2	23.8	16.9	23.5	23.3	24.1	21.2	23.9
	24	10.8	25.0	9.0	24.8	13.4	25.2	11.2	25.0	15.5	25.4	14.2	25.3
34	15	51.5	19.6	42.8	18.9	63.8	20.8	53.4	19.8	73.7	21.6	67.3	21.1
	18	43.4	21.9	36.0	21.2	53.8	22.8	45.0	22.1	62.1	23.6	56.6	23.1
	20	37.9	23.4	31.5	22.8	47.0	24.2	39.3	23.5	54.3	24.9	49.6	24.5
	22	32.5	24.9	27.0	24.4	40.3	25.6	33.7	25.0	46.6	26.2	42.5	25.8
	24	27.1	26.4	22.5	26.0	33.6	27.0	28.1	26.5	38.8	27.5	35.4	27.2
40	15	67.8	21.1	56.3	20.1	84.0	22.6	70.3	21.3	97.0	23.7	88.5	23.0
	18	59.6	23.4	49.5	22.5	73.9	24.7	61.8	23.6	85.4	25.7	77.9	25.0
	20	54.2	24.9	45.0	24.1	67.2	26.1	56.2	25.1	77.6	27.0	70.8	26.4
	22	48.8	26.4	40.5	25.6	60.5	27.4	50.6	26.6	69.8	28.3	63.7	27.7
	24	43.4	27.9	36.0	27.2	53.8	28.8	45.0	28.1	62.1	29.6	56.6	29.1

KELOX dry swinging underfloor heating or sport flooring

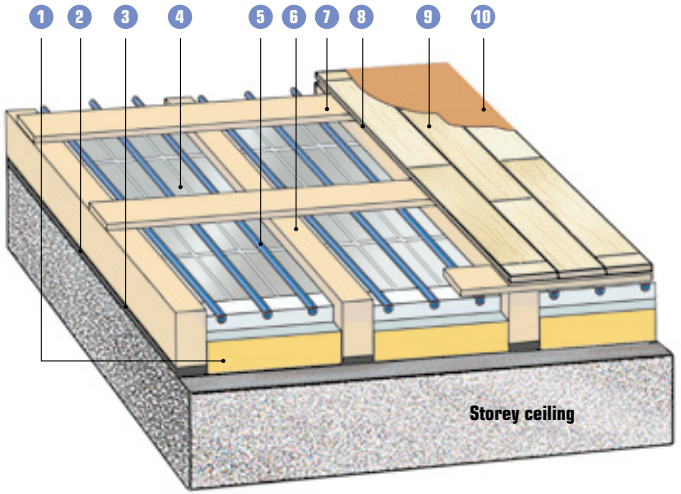
This laying application is a special type of underfloor heating, which is used for sprung floors in gymnasiums, etc.

1. Heat insulation according to the sprung floor manufacturer
2. If necessary, moisture barrier by the customer
3. Permanently elastic, absorbing elastomer inserts; if necessary, on a multi-layer basis
4. **KELOX dry system element** with laminated 0.5 mm aluminium heat conduction plate for installation distances of 12.5 cm or 25 cm
5. **KELOX-ULTRAX FB pipe**
6. Buffer beams
7. Springing boards as a subfloor
8. If necessary, covering foil or vapour barrier, e.g. **KELOX FB screentone**
9. Parquet surface covering, possibly multi-layer
10. Alternative surface covering made of plastic for sport flooring

Benefits

- The module characteristics of the pipes with drywall construction system elements are particularly important
- No additional brackets needed for the FB multilayer pipes
- Good heat output of the KELOX dry system elements
- Alternative surface-mounted versions are possible

Variant:
As an alternative, you can also lay a floor with KELOX FB clamping rails and KMU120 KELOX-ULTRAX FB pipes or KU100 ULTRA PE-RT pipes.



Floor structures construction surface load ≤2 kN/m2

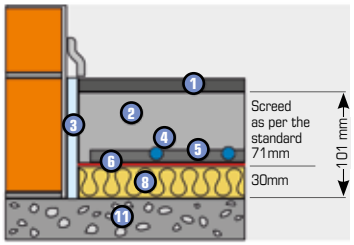
Structures for the listed uses or spaces located below under the following conditions:

- Use category: Cat. A (residential) as per ÖNORM EN 1991-1-1
- Loading capacity: Cat. A (1.5-2,0 kN/m²) as per ÖNORM EN 1991-1-1
- Overall thickness of insulation: > 25 mm as per ÖNORM B 3732
- Screed quality: Cement screed E 300 as per ÖNORM B 3732
- Screed thickness: as per ÖNORM B 3732 and EN 1264-4

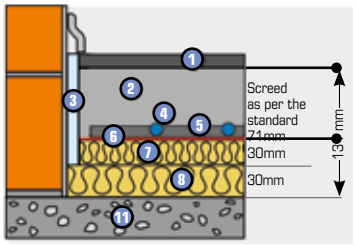
ÖNORM B 3732 specifies that with heated screeds you must add the pipe diameter to the minimum screed thickness.

Building physicists will always specify the screed thickness on the basis of the standards to be applied!

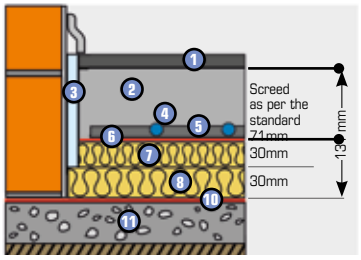
Sample recommendations



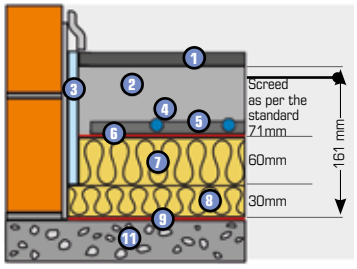
Heated room



Unheated room



Ground



Outside air

In the case of floor structures for wet rooms, you must lay an additional moisture barrier below the insulation.

	Floor structures	Heated Space	Heated Space wet	Unheated Space	Unheated Space wet	Ground	Outside air
1	Floor covering	Variable	Variable	Variable	Variable	Variable	Variable
2	Heated screed as per ÖNORM	x	x	x	x	x	x
3	KELOX FB edge insulating strips	x	x	x	x	x	x
4	KELOX FB pipe d16mm	x	x	x	x	x	x
5	KELOX FB clamping rail	x	x	x	x	x	x
6	KELOX FB screentone	x	x	x	x	x	x
7	Additional heat insulation as per standard	-	-	30mm	30mm	30mm	60mm
8	Footfall sound insulation 33/30mm or 30mm insulation and footfall sound foil	x	x	x	x	x	x
9	Moisture barrier	-	x	-	x	-	x
10	Sealing by the customer	-	-	-	-	x	-
11	Bare ceiling (base plate)	x	x	x	x	x	x

Underfloor heating baking out according to ÖNORM B 3732

Client/building owner: .....

.....

Construction project: .....

.....

Contractor: .....

.....

Architect/planner: .....

.....

Screed company: .....

.....

KELOX underfloor heating ..... m²

Screeding including KM640 KELOX FB screed additive
Finished on ..... Date

Start of heating up period after ☐ 21 days (cement-bound screed)

On: ☐ 7 days (calcium sulphate floating screed)

When determining the minimum curing time, you must invoice days with an average room temperature of at least +15°C at the full daily rate and days with an average room temperature between +5°C and +15°C at 0.7 of the daily rate.

The heating up period was carried out in temperature steps of a maximum of 5K/24h until the maximum feed temperature of the underfloor heating was reached. ..... ° C

The maximum feed temperature must be maintained until the heating up period (heating up, stability and cooling down times) depending on the average room temperature.....days, is at least 11 days.

Cooling down is carried out at a maximum of 10K/24h. During heating up and cooling down, you must ventilate the room; when doing this, there must not be any draughts

Cooling down must be carried out in temperature steps of a maximum of 10 K per day.

System handed over on: ..... Date

Function heating of the screed as per ÖNORM EN 1264-4

Function heating is only for verifying that the underfloor heating is functioning. You must not carry out function heating until after baking out has been completed. Function heating is no substitute for this! Function heating starts at a flow temperature of 25°C that must be maintained for at least three days. After this, you must set the maximum design temperature and maintain this value for at least four days.

Start of function heating: ..... Date

End of function heating: ..... Date

Client	Building owner, Architect	Planner, Heating contractor

KELOX wall heater

The wall heater heats a room by emitting heat from the walls with a relatively high proportion of radiation. By preference, it is used in the low-temperature range.

Benefits

- cosy warmth
- no "radiated cold" to external walls
- targeted heat distributions due to large space supplied by all the walls
- KELOX-ULTRAX FB pipes can be located electronically in the wall
- option of wall cooling in summer

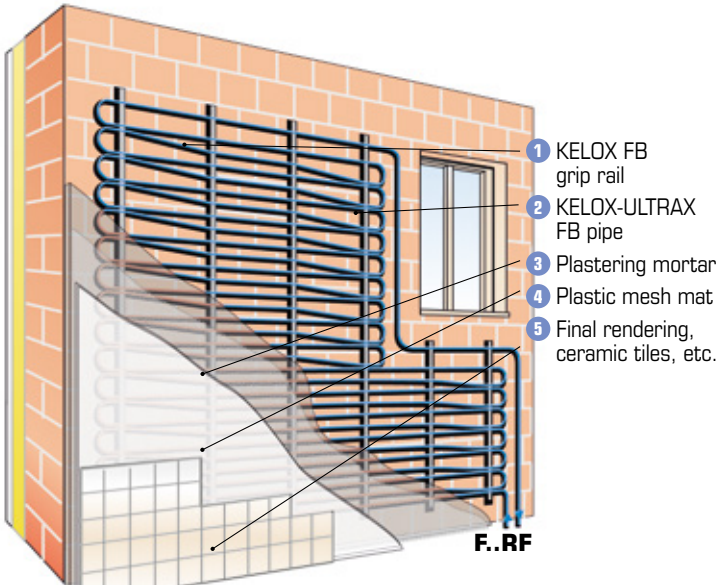
Laying

- Mount clamping rails vertically at intervals of 0.5 m: (screw, nail, staple …) usually, only ever execute pipe register up to a height of 2 m
- Press KELOX FB pipes horizontally into the clamping rail at installation distance VA 12
- Pay attention to installation guidelines!
- **Maximum pipe length:** 80m/heating circuit (output-dependent)
- **Maximum hot water temperature: 40°C as per the Austrian Association for Plastering 2020 Edition**
- Carry out a pressure test, if need be, pay attention to frost protection
- Correct plastering

Assumed material required for KELOX wall heater /m²*

Laying module VA	Multilayer pipe KMU120 running metre/m²	Clamping rail KM610 running metre/m²
12	8.7	2,0
15	6.7	2,0

* These values do not include the material required for the connecting pipes.



Sample wall structure

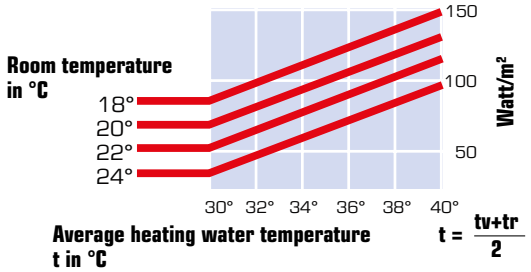
Information on plastering work

The guidelines below are explained in detail in the brochure issued by the Austrian Association for Plastering entitled „Verarbeitungsrichtlinien für das Verputzen von wasserführenden Wandheizungssystemen" (Guidelines for plastering water-bearing wall heating systems):

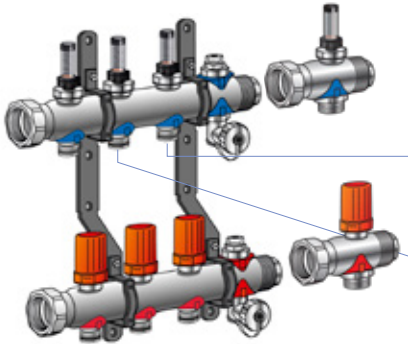
- **Closing any slits** and openings and fastening of installations must have been completed in good time before starting plastering work.
- **Any preparation work that may be necessary,** like spraying or bonding bridges, etc., must be matched to the existing backing or plaster base.
- If the wall heating **is used additionally for cooling,** you must make sure that the wall surface does not fall below the dew point.
- **Plastering mortar that contains gypsum is not recommended** for use in interior spaces with serious moisture issues; pay attention to stress groups as per ÖNORM B 3346.

Reducing the risk of cracking

- With **gypsum-based plasters,** a textile glass mesh measuring at least 6x6 mm is embedded to reinforce the plaster in the outer third of the render layer. **Wet-to-wet** working is essential.
- In the case of **renders containing lime or cement** you can also embed a textile glass mesh measuring at least 6x6 mm in the outer third. You can do this with **single-layer processing** as the first or second step.
- With **two-layer processing,** you can incorporate the plaster reinforcement into the top layers of the first coat or into the second coat in the middle, for example.
- You can be sure **to avoid cracking to the greatest possible extent** with two-layer application by **applying a textile glass mesh** measuring at least 3x3mm to the hardened rendering coat
- In the case of components measuring more than 8 m in length, you must plan joints due to thermal changes in length.
- In the case of subsequent vapour-tight coating (e.g. tiles), make sure that the **render dries adequately.**
- **Render thickness of at least 10 mm across the pipe crown.**
- To allow you to detect immediately any possible damage to the pipe register when carrying out plastering work, it is sensible **to keep the heating pipes under water pressure.**



KM590E KELOX FB manifold
KMP590M KELOX-PROTEC FB push-fitting manifold



Connection option

KM590E
with
KM220

KMP590M
with
KMP552

Application area: max. 80°C - 6bar

KM590E/KMP590M FB flow bar

- Wrench for setting the 6 mm double-spindle valve
- Manual drive for opening and closing the heating circuits
- Thread connection M 30x1.5mm for the KM596 KELOX thermal motor

KM590E/KMP590M FB return flow bar

- Water quantity dial on the measuring pipe of 0.5-2.5 l/min, can be changed over to 0.5-5 l/min, fitted with a protective cap

Benefits

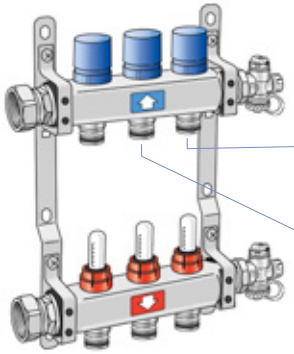
- FB manifold bar with pre-formed 1" union nut
- extendable WITHOUT additional connection fittings
- Flow double-spindle valve per heating circuit (red)
- RF-water meter per heating circuit (blue)
- Can be retrofitted with contact thermometer up to 80°C
- Rotatable draining and separate bleeding
- KM590E heating circuit outlets 3/4" EUROCONE
- KMP590M prepared at the factory for the KMP552 quick-push coupling to make assembly easier.
- KMP553 quick-push cap available to close unused circuits

The required water quantity is configured using the double-spindle valve on the flow and is read off at the fully open return flow water meter.

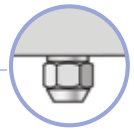
The basis for adjustment of the required water flow in each heating circuit is the specified water quantity from the calculation.

The viewing window of the water meter is only for reading off the water quantity. The fixed setting of the water quantity on the double-spindle valve in accordance with ÖNORM EN 1264-4 ensures that the water quantity is not changed even if individual heating circuits are opened and closed subsequently. It may be necessary to correct the values slightly in a second adjustment procedure, since the flow values of the individual heating circuits influence one another while they are being adjusted.

KMU590E KELOX-ULTRAX FB stainless steel manifold
KMP590E PROTEC FB stainless steel push fitting manifold



Connection option



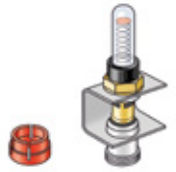
KMU590E
with
KM220

KMP590E
with
KMP552

Application area: max. 70°C – 6bar

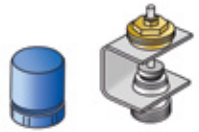
KMU590E/KMP590E FB flow bar

- Water quantity dial at the measuring pipe of 0.5–5 l/min
- Setting can be fixed using a (red) locking cap



KMU590E/KMP590E FB return flow bar

- Setting screw for double-spindle valve 8mm
- Manual drive for opening and closing the individual heating circuits
- Thread connection M 30x1.5mm for the KM596 KELOX thermal motor



Benefits

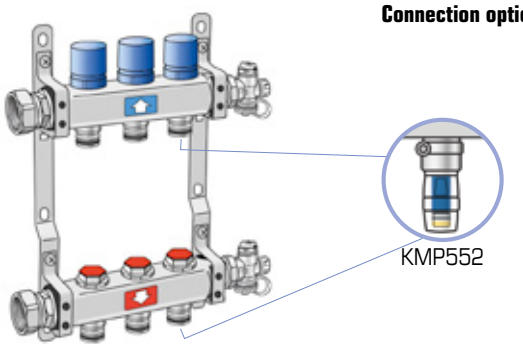
- Return flow double-spindle valve per heating circuit (blue)
- Flow water quantity meter per heating circuit (red)
- Emptying and separate bleeding prepared at the highest point.
- KMU590E heating circuit outlets 3/4" EUROCONE
- KMP590E prepared at the factory for the KMP552 quick-push coupling to make assembly easier.
- KMP553 quick-push cap available to close unused circuits

The required water quantity is set at the return flow using the double spindle valve and is read at the fully opened flow water quantity meter.

The basis for adjustment of the required water flow in each heating circuit is the specified water quantity from the calculation.

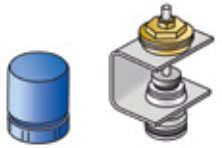
The viewing window of the water meter is only for reading off the water quantity. The fixed setting of the water quantity on the double-spindle valve in accordance with ÖNORM EN 1264-4 ensures that the water quantity is not changed even if individual heating circuits are opened and closed subsequently. It may be necessary to correct the values slightly in a second adjustment procedure, since the flow values of the individual heating circuits influence one another while they are being adjusted.

KMP590Z PROTEC FB stainless steel 10bar push fitting manifold

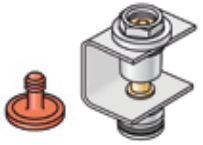


Application area: max. 70°C – 10bar

KMP590Z FB return flow bar
- Setting screw for double-spindle valve 8mm
- Manual drive for opening and closing the individual heating circuits suitable for KM596
- Thread connection M 30x1.5mm for the KM596 KELOX thermal motor



KMP590Z FB flow bar
- Feed shut-off valve by means of 6mm hex key for opening and closing the heating circuit



Benefits

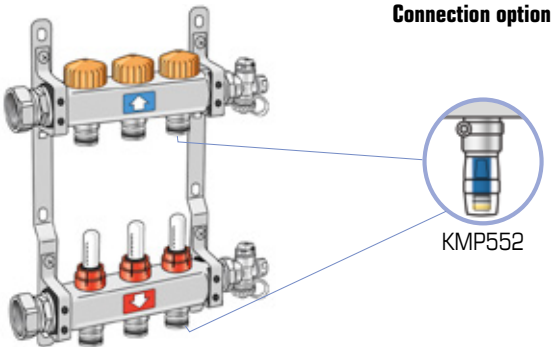
- FB manifold bar with pre-formed 1" union nut
- Return flow double-spindle valve per heating circuit (blue)
- Feed shut-off valve
- Bleeding and venting at the manifold end
- Flow and return flow bar with pluggable heating circuit outlets
- Sound-insulated steel consoles

The required water quantity is set at the return flow using the double spindle valve and is read at the fully opened flow water quantity meter.

The basis for adjustment of the required water flow in each heating circuit is the specified water quantity from the calculation.

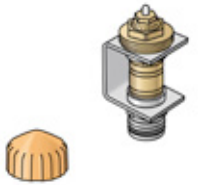
The fixed setting of the water quantity on the double-spindle valve in accordance with ÖNORM EN 1264-4 ensures that the water quantity is not changed even if individual heating circuits are opened and closed subsequently. It may be necessary to correct the values slightly in a second adjustment procedure, since the flow values of the individual heating circuits influence one another while they are being adjusted.

KMP590D KELOX-Protec FB control push-fitting manifold

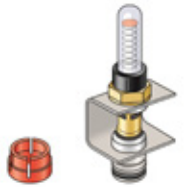


Application area: max. 70°C - 6bar

KM590D FB return flow bar
- Automatic flow control
- Hydraulic balancing of the individual return flow valves; suitable for KM596 KELOX thermal motor



KM590D FB flow bar
- Option of opening and closing the heating circuits
- Setting can be fixed using a locking cap



Benefits

- FB manifold bar with screwed in 1" union nut
- Automatic return flow control
- Feed water meter per heating circuit (blue)
- Sound-insulated steel consoles
- Bleeding and venting at the manifold end
- KMP590M prepared at the factory for the KMP552 quick-push coupling to make assembly easier.

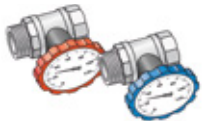
The required water quantity is set using the return valve and is read off at the fully opened flow water quantity meter.

The basis for adjustment of the required water flow in each heating circuit is the specified water quantity from the calculation.

The viewing window of the water meter is only for reading off the water quantity. The fixed setting of the water quantity on the return valve in accordance with ÖNORM EN 1264-4 ensures that the water quantity is not changed even if individual heating circuits are opened and closed subsequently. Due to the special valve in the return flow, the setting values of the individual heating circuits do not affect one another.

KELOX FB manifold connection components

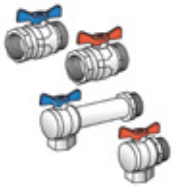
KM593T KELOX connection ball valves with thermometer handle



Straight connecting ball valves for shutting off 6/4“ manifolds, flat-sealing male thread to the manifold bar, including seal, thermometer from 0-120°C, non-porous metallized brass

6/4“ straight, flat-sealing

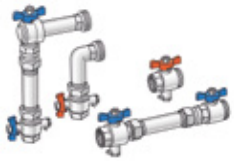
KM593E KELOX connecting ball valves



Straight- or elbow-form connecting ball valves for shutting off manifolds, flat-sealing male thread to the manifold bar, including seal, (return flow elbow form extended) non-porous metallized brass
Straight- or elbow-form connecting ball valves also available individually

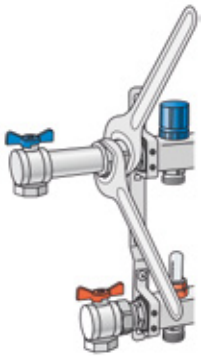
3/4" straight
3/4" elbow 90°
1" straight
1" elbow 90°

KM591E KELOX heat meter fitting piece



Straight- or elbow-form 3/4" connection ball valves, length 110 mm, with flat-sealing male thread for connecting to the manifold bar; seal included; with connection option for temperature measurement (return flow elbow form extended); non-porous metallized brass

3/4" straight
3/4" elbow 90°

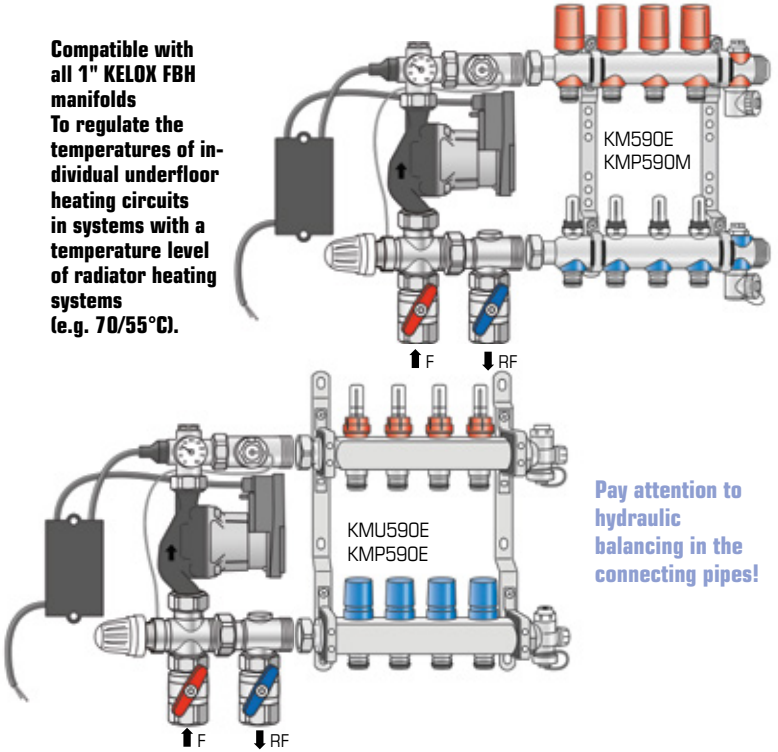


Before screwing in, check the thread for contamination and damage. This avoids damage to the seals that can lead to leakage. Only ever use an engineer's wrench or fitting wrench to tighten the union nut. Hold the fitting tight and tighten the union nut.
To avoid damage to the ball valve, never clamp it in a vice.

Do not use a pipe wrench!

KM651 KELOX FB fixed value regulator set

Compatible with all 1" KELOX FBH manifolds
To regulate the temperatures of individual underfloor heating circuits in systems with a temperature level of radiator heating systems (e.g. 70/55°C).



Pay attention to hydraulic balancing in the connecting pipes!

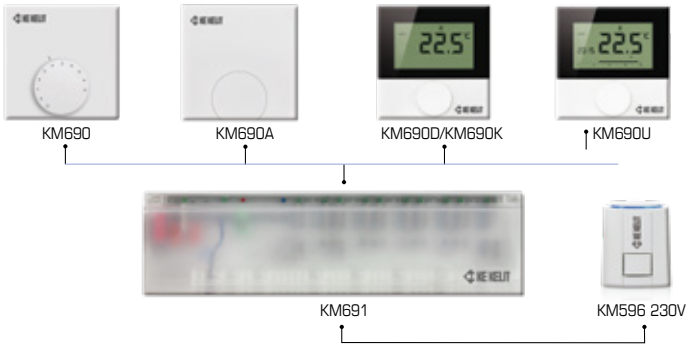
Easy installation and commissioning

- The principle functions according to thermal injection control as a fixed-value regulator system and is installed directly on the manifold
- If all the underfloor heating circuits are to be closed on an automated basis, the pump must be secured by means of a pump logic facility (e.g. a KM691 KELOX connection unit) to deactivate the pump
- A safety temperature limiter is integrated in the set and it deactivates the pump if the maximum feed temperature is exceeded
- The desired feed temperature is set using the thermostat head on the 3-way valve
- Minimum depth of manifold cabinet 110mm (e.g. KM576+ stacking frame). Suitable for all 1“ KELOX FB manifolds, additional width required is at least 220mm!
- Hydraulic balancing is essential for each system and is mandatory for perfect functioning of the KM651 fixed-value regulator set.

Installation on all 1“ KE KELIT manifolds

- You install the feed bar (double-spindle valves) on the pressure side of the pump (at the top)
- The return bar (water flow meter) is installed on the suction side (at the bottom)

KELOX 230 Volt room control unit



KELOX room thermostat variants

KM690/KM690A room thermostat
Analogue
- Flat version 86x86x29 mm
- Standalone controller or can be implemented in a system
- Lowering input for lowering via a timer or KM690U
- Target value calibration
- Setting range limitation of the target temperature
- Covered operation with KM690A

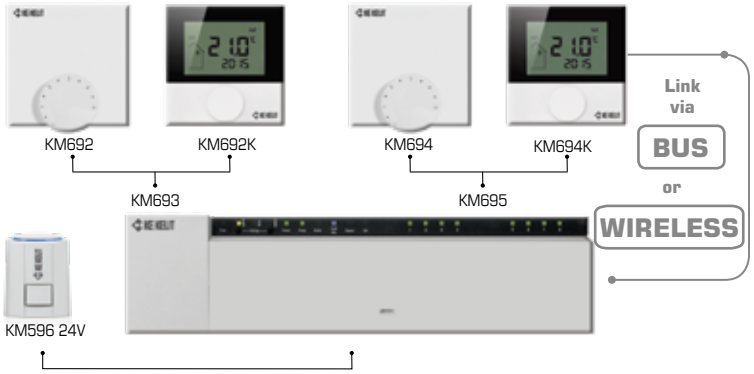
KM690D room thermostat
Digital standard
- Clearly arranged LC display
- Flat version 86x86x31 mm
- User-friendly, intuitive operation
- Standalone controller or can be implemented in a system
- Correction of actual temperature acquisition
- Limitation of setting range of the target temperature
- Valve and frost protection function
- High-quality designer pane made of scratch-resistant plastic
- High functional safety

KM690K room thermostat
Digital convenience
Same as KM690D additionally with:
- Backlit LC display
- Equipment for heating and cooling systems
- Changeover input
- Suitable for NO contact or NC contact operation

KM690U room thermostat
Digital control
Same as KM690K additionally with:
- Smart Start and Stop functions
- Convenient time-switching programs for heating and cooling
- Connection option for KM699 floor sensor

KM691 KELOX connection unit
KELOX 230V connection unit
- 6 zones
- Connection of up to 15 actuators
- Equipment for heating/cooling
- Simple installation
- Screwless terminal connection technology
- Clearly arranged terminal clamps
- Lowering input for lowering via a timer/KM690U
- Pump and boiler control
- Connection option for safety temperature limiter (STL) or dew point sensor
- Maintenance-free

KELOX 24 Volt BUS or wireless room control unit



Ethernet port for integration into a domestic network and global access via the Internet

KM692 BUS room thermostat analogue
KM692K BUS room thermostat digital

KM694 KELOX wireless room thermostat analogue

KM694K KELOX radio room thermostat digital

KM693 BUS connection unit, 24V
KM695 24V wireless receiver

- Flat, high-quality design
- User-friendly, intuitive operation
- Wireless or BUS version
- 8 zones with Ethernet port
- Wireless or BUS version
- All-in-one solution for any application
- Proven, easy installation
- Connection voltage 230V, regulation voltage 24V

Features of the BUS or wireless room control unit

Perfect connection to a system. The new generation convenient room control unit: Easy to use on a universal basis for energy efficiency and user convenience at the highest level; can be controlled using your smartphone or computer.

- System components communicate via bi-directional wireless (868 Mhz wireless technology) or a two-wire BUS
- Intuitive operation, central program, easy installation
- Energy savings of up to 20% due to intelligent regulation
- Various inputs and outputs allow communication with external devices/systems
- Ethernet port for easy operation, programming and setting up of the room control system on a room-by-room basis as well as visualisation of status conditions using a computer or smartphone
- Micro SD card slot for system upgrades and uploading system parameters
- Integrated system clock
- Custom programming and setting for each heating zone
- LC display containing information about operating status conditions and functions
- Perfect interaction of control systems across several storeys by means of a (syBUS) serial bus or 868 Mhz wireless technology
- All the equipment you need for energy management
- Smart Start function
- XML interface for easy integration in third-party building automation systems

KM692K KELOX BUS room thermostat, analogue
KM694K KELOX wireless room thermostat, analogue

Flat version, approx. 26 mm
and small dimensions 86 m86 mm

Convenient operation using rotary button
with fine, dynamic latching

Power supply

KM692K: via 2-wire bus

KM694K: 2x AAA batteries,
battery life approx. 2 years

Features

- Optimum price-performance ratio
- Patented setpoint matching facility
- Setting range 10 … 28 °C
- Fast, instantaneous data communication via bus or wireless connection
- Flat version, and small dimensions 86x86x26 mm
- Rotary button with ¼-degree -soft latching
- In-wall and flush-mounted sockets possible
- With limitation of the room temperature setting range to a maximum and/or minimum value
- Can be parameterised without limitation by means of a Web-based user interface

KM692K KELOX BUS room thermostat, digital
KM694K KELOX wireless room thermostat, digital

Scratch-resistant plastic

Generous 60×40 mm LCD

Flat version, approx. 22 mm
and small dimensions 86 mm×86 mm

Convenient operation using rotary button
(with rotate and press mechanism) with
fine, dynamic latching

Power supply

KM692K: via 2-wire bus

KM694K: 2x AAA batteries,
battery life approx. 2 years

Features

- Intuitive, language-neutral operation
- Clearly arranged, backlit LC display with KM692K
- High-quality designer pane made of scratch-resistant plastic
- Fast, instantaneous data communication
- Limitation of room temperature setting range
- Setting range 5 … 30°C
- Continuous display of room temperature, system time and operating status
- Connection option for KM699 floor sensor

Functions and settings for users

- Day, automatic mode, presence, Eco mode (night status),
- Party function, holiday function with date display
- Four preset lifestyle time-switching programs
- Setting range of target room temperature can be limited
- Date and time with automatic daylight saving time/standard time switching
- Information about low battery charge level (wireless version)
- Operation lock for public buildings

Code-protected settings for specialist personnel

- Selection of heating type (regulation according to two-point or PI behaviour per heating zone can be selected amongst other things)
- Activation active switching between heating/cooling
- Set frost protection temperature
- Block heating/cooling
- Pump/boiler outlets can be parameterised
- Smart Start function can be set.

LC display

The KELOX room thermostat shines with its functional, language-neutral display. The icons that can be understood anywhere in the world guarantee intuitive operation. Three menu levels mean that any of the functions that users or installation engineers need are always available.
This also guarantees that it is not possible to change important functions by mistake.

- Basic functions
- Enhanced functions
- Expert level
- Error signal
- Child-proof lock
- Battery
- OFF function
- Wireless
- Temperature
- Date/time
- AUTO Automatic function
- Daytime operation
- Nighttime operation
- Dewpoint
- Cooling
- Heating
- At home function
- Party function
- Heated floors
- Holiday function

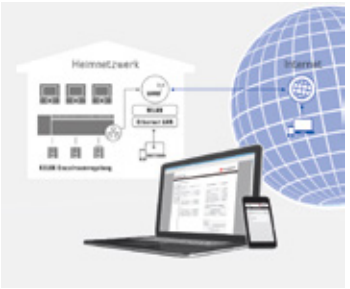
KM693 KELOX 24V BUS connection unit
KM695 KELOX 24V wireless receiver

Features

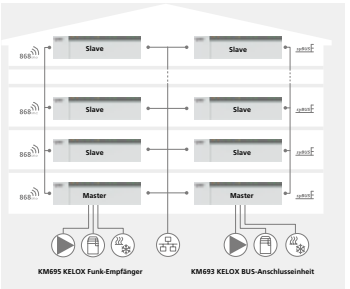
- All-in-one: Complete equipment for heating and/or cooling systems
- System components communicate via bi-directional wireless (868 Mhz wireless technology) or a two-wire BUS
- Wireless and bus models in 8 zones
- Connection of up to 12 KM596 thermal motors; 1 to 2 per zone
- Status displays by LEDs: 9 system LEDs/1 LED per zone
- You can set different regulation algorithms per heating zone
- Ethernet port for network integration
- Multi-storey solution – coupling up to 7 connection units/receivers by means of wireless and/or a bus
- Direction of control of the system (NC/NO) can be configured
- Lowering (Eco mode) can be carried out on a room-by-room basis via the integrated system clock or centrally by means of an external switching signal
- Operating modes (frost protection, heating, cooling, eco, automatic, emergency operation)
- Boiler outlet
- Dew point monitoring
- Parameterisable valve protection function at all the outlets
- Integrated, parameterisable pump module including pump protection function
- Connection option for a safety temperature limiter or dew point monitor on the connection unit/receiver
- Tried and tested cable routing and strain relief
- Transformer housing of appropriate design
- Accessories same as external antenna or repeater
- Smart Start/Smart Stop
- After two to three days, the controller has analysed the behaviour of the rooms. The start and end of the heating phase is optimised such that the desired temperature is reached at the preset times.

Benefits

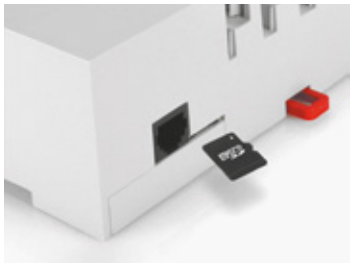
Smart Home-ready
The connection units make it possible to control the KELOX room control unit system locally or via a home network and all over the world via the Internet.
Using the XML interface, you can integrate the KELOX room control unit into higher-level home automation systems without any complications.
In this connection, you can use your existing home network (router, wifi, switch, etc.) It is also possible to implement building services management system integration scenarios and EIB/KNX applications.



KELOX room control unit with Ethernet
monitoring and control using a computer or smartphone via the home network or the Internet for access all over the world.



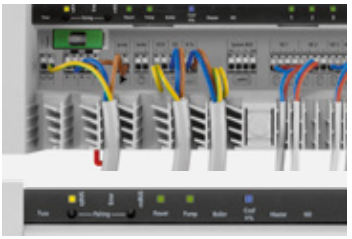
Multi-storey solution
You can couple the KM693 connection units or the KM695 wireless receivers to the multi-storey solution via 868 MHz wireless and/or the syBUS system bus.



MicroSD card slot
The connection units/receivers have a MicroSD card slot to upgrade the firmware or for carrying out offline parameterisation on your computer in a clear and convenient way.

Ethernet port

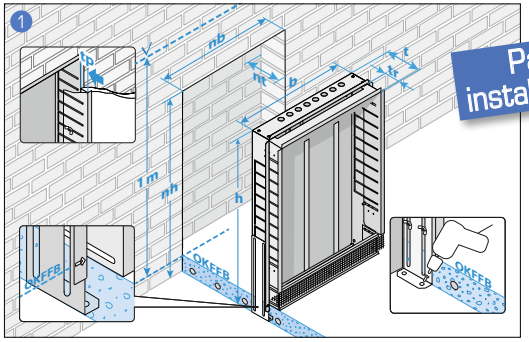
- Easy integration in the home network & access from all over the world
- Web-based application software for convenient control and visualisation of status conditions using your computer or smartphone
- XML data exchange with any third-party systems



Easy installation and commissioning
A clear connection to the system by means of the tried and tested cable routing and strain relief as well as the screwless plug-in/clamping technology all guarantee fast and safe installation.

Everything under control
LEDs show the status of ongoing operation and correct functioning: Operating status, NO/NC, fuse, pairing, cooling, system error, alarm, heating zone, dew point.

Installation of KELOX flush-mount manifold cabinets



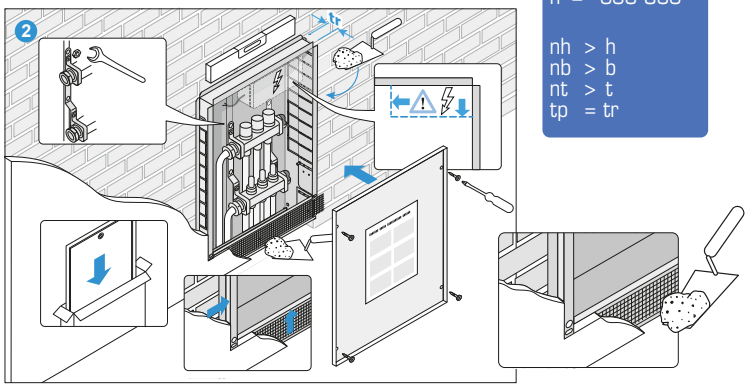
Pay attention to installation dimensions!

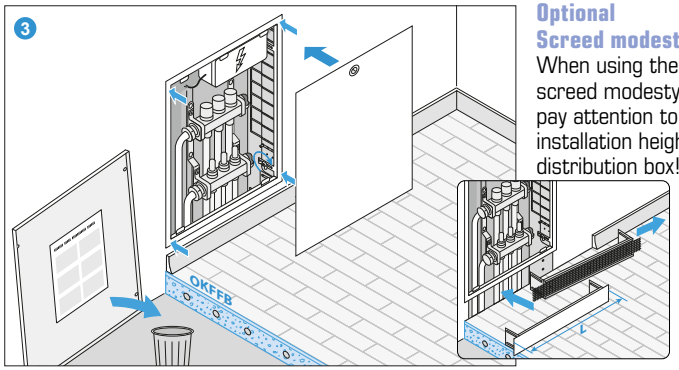
KM570
t = 75
h = 600-830

KM570F
t = 110
h = 600-830

KM577
t = 75-120
h = 600-850

nh > h
nb > b
nt > t
tp = tr





Optional
Screed modesty panel
When using the screed modesty panel, pay attention to the installation height of the distribution box!

Benefits of KM570 and KM570F

- No contamination of the inside of the cabinet due to the splash protection box
- visible parts are not needed until finishing on-site
- Skirting board can be implemented uninterrupted
- Surface-mounted visible parts and screed modesty panels available as an option **Height: 135 mm**

Benefits of KM577

- Inside of the cabinet is protected by a splash guard
- Flexible use due to the extending structure
- Skirting board can be implemented uninterrupted
- Screed modesty panels are available as an option **Height: 90 mm**

KELOX FB

KM570 or KM570F KELOX manifold cabinet bodies and the KM571 UP visible part are supplied to order in separate packaging!

1. Sendzimir-galvanised universal sheet steel cabinet body, also suitable for dry construction. Fastening clip for plaster grid provided on the back. Can be connected from below or at the side; height-adjustable feet, fastening components for the manifold and splash protection box.
   Refer to the program overview for dimensions

1.1 You use the height-adjustable feet to adapt the manifold cabinet body to the finished floor height (100-230mm). The marking notch on the frame corresponds to the finished floor structure (rule mark +/-0)

1.2 When installing in cavity walls, the body is fastened to the supporting structure on the wall.

Attention: Measured from the finished floor, the body height must not exceed 600 mm!

2. Carry out plastering work.
   Do not forget the height-adjustable plaster trim element!
   The splash protection box protects the inside of the cabinet.

2.1 Install the underfloor heating or radiator manifold using the provided fastening elements.
Carry out installation work for the connections.

2.2 Lay the edge insulating strips on the wall or the plaster trim element of the body; carry out screeding and laying of floor coverings.

3. Flush-mounted visible part comprising: Sendzimir-galvanised, powder-coated, lockable front door and frame. 4 depth-adjustable, break-off frame fasteners and door key.

3.1 Push the frame fasteners onto the provided screws and fix them in place using the wing nuts.

Installation depth of KM570: 75-140 mm
Installation depth of KM570F: 110-170cm

3.2 The height of the skirting board depends on the level of the finished floor.
Up to a maximum of 120 mm

KM577 KELOX manifold cabinet body metal cover are supplied to order in the same packaging!

1. Sendzimir-galvanised universal sheet steel cabinet body, also suitable for dry construction. Cabinet and visible part depth-adjustable from 75-120 mm by means of telescope system. Fitted with height-adjustable installation feet, rule mark indicator for floor surface and cutouts in the frame for connection pipes. Frame and doors or optional skirting board trim in RAL 9010 white with protective foil.
   Refer to the program overview for dimensions

1.1 You use the height-adjustable feet to adapt the manifold cabinet body to the finished floor height (100-250mm). The marking notch on the frame corresponds to the finished floor structure (rule mark +/-0)

1.2 When installing in cavity walls, the body is fastened to the supporting structure on the wall.

Attention: Measured from the finished floor, the body height must not exceed 570 mm!

2. Pull out the frame and plaster trim element to the desired depth

2.1 Carry out plastering work.
Do not forget the plaster trim element!
The splash guard protects the inside of the cabinet.

2.2 Install the underfloor heating or radiator manifold using the provided fastening elements.
Carry out installation work for the connections.

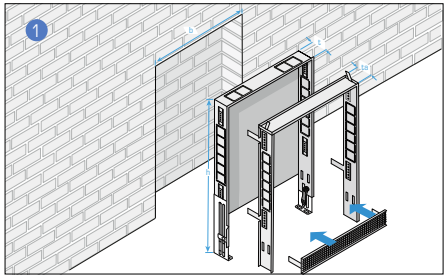
2.3 Lay the edge insulating strips on the wall or the plaster trim element of the body; carry out screeding and laying of floor coverings.

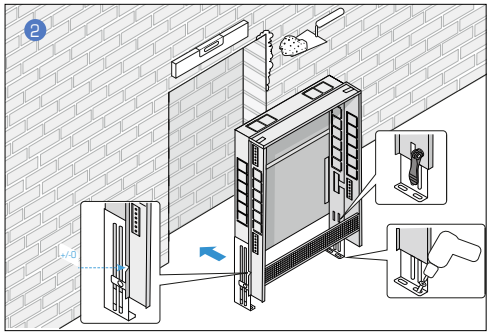
3. Push the frame fasteners onto the provided screws and fix them in place using the wing nuts.
   Installation depth of KM577: 75-140 mm

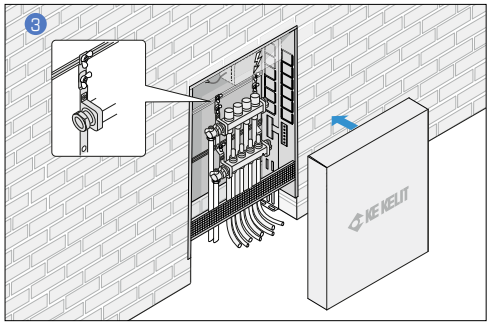
3.1 The height of the skirting board depends on the level of the finished floor. **Up to a maximum of 60 mm**

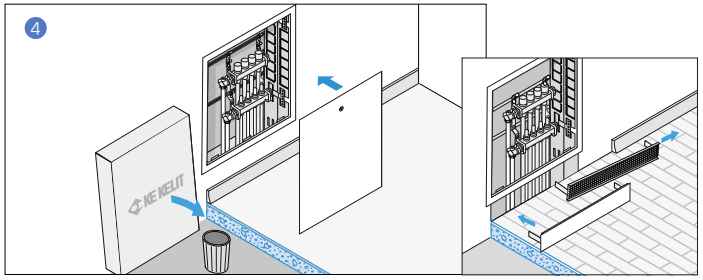
Make sure that the plastering elements are installed stress-free!

Installation of KM576 KELOX flush-mount manifold cabinet and stacking frame





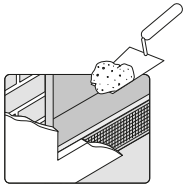




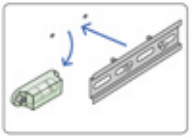
Pay attention to installation dimensions!

KM576
t = 75
ta = 70
h = 630-950
t+ta = 145

Niche dimensions (b)
1-3: 410
1-4: 560
5-8: 760
9-12: 1080
13-15: 1360



Optional
Screed modesty panel
When using the screed modesty panel, pay attention to the installation height of the distribution box!



1. Optional stacking frame that increases the installation depth by 70mm. To do this, plug the three parts together and fasten them on the distribution box; then fix them in position using the enclosed screws. Attach the plaster grid to the stacking frame. This makes it possible to install the KM651 KELOX FB fixed-value regulator set and the KU590E industrial surface manifold.

2. Galvanised universal sheet steel cabinet body, also suitable for dry construction. Can be connected from below, the top or at the side; height-adjustable feet, fastening components for the manifold and splash protection box.
Refer to the program overview for dimensions

2.1 You use the height-adjustable feet to adapt the manifold cabinet body to the finished floor height (100-320mm). The marking notch on the frame corresponds to the finished floor structure (rule mark +/-0)

2.2 When installing in cavity walls, the body is fastened to the supporting structure on the wall.

Attention: Measured from the finished floor, the body height must not exceed 630 mm!

3. Carry out plastering work.
The splash protection box protects the inside of the cabinet.

3.1 As an option, you can install the KELOX room control unit in the cabinet. Remove the integrated spirit level and mount the bracket for the room control unit.

3.2 Install the underfloor heating or radiator manifold using the provided fastening elements.
Carry out installation work for the connections.

3.3 Lay the edge insulating strips on the wall or the plaster trim element of the body; carry out screeding and laying of floor coverings.

4. Flush-mounted visible part comprising: galvanized sheet steel, powder-coated, separately packaged front door and frame with four depth-adjustable break-off frame fasteners.

4.1 Push the viewing frame into the provided clips and fasten them using the enclosed screws.

4.2 The height of the skirting board depends on the level of the finished floor.
Up to a maximum of 85 mm

Make sure that installation is stress-free!

KELOX ULTRA PE-RT industrial surface heating

For the most part, industrial surface heating systems transfer heat as radiant heat. The temperature across the height of the building is virtually constant; this means that no added factor is needed when calculating the heating load. Since the room temperature increases with convective heating systems and radiant ceiling heating systems, which means that more heat is lost through the roof, normal heat losses should be rated about 15-60% higher than with underfloor heating systems.

KU100 ULTRA PE-RT pipe type 2
Industrial surface pipe according to ÖNORM EN ISO 22391, with an oxygen-tight EVOH barrier protected with PE-RT coating in accordance with DIN 4726.

Area of application – underfloor heating
60°C - tmax. 70°C /6 bar
Colour: Red
Roll length: 300 running metres, 500 running metres or 600 running metres.

Joining technology
Connections can be made using screw connections, press fittings and plug-in fittings from the KELOX range.

Installation distances
You select the installation distance (VA) of industrial surface heating systems in dependence on the calculated output. Normally, installation distances are VA15, VA30 or VA45. The pipes can be laid meander- or spiral-shaped. The minimum bending radii of ULTRA PE-RT pipes depend on the respective pipe dimension.

Minimum bending radii for ULTRA PE-RT pipes

ULTRA PE-RT pipe	mm
d16	6 x d
d20	7 x d
d25	8.5 x d

Peripheral zones
In peripheral areas or in front of gateways, you can provide peripheral zones with a tighter installation distance, which gives higher floor surface temperatures. Normally, peripheral zones are executed as VA15.

Surface temperature

Recreation areas:	tmax 29°C
Peripheral zones:	tmax 35°C

Maximum pipe lengths/heating circuit:
(output-dependent)
d16: 120 m
d20: 150 m
d25: 180 m

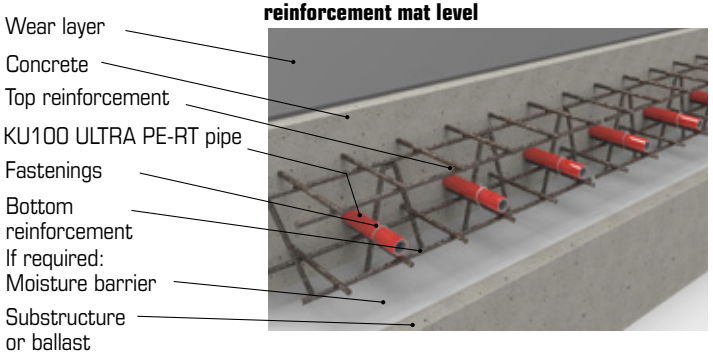
Function heating
Function heating of an industrial surface heating system can be executed based on ÖNORM EN 1264-4.

Installation on the reinforcement
To install ULTRA PE-RT pipes on the reinforcement installed by the customer, two different fastening options are available.

KU615 ULTRA PE-RT pipe connector
Plastic pipe connector for manual fastening spaced at about 0.7 m.

KU617 ULTRA PE-RT binding wire
galvanised binding wire for binding and fastening ULTRA PE-RT FB pipes spaced at about 0.7 m using a WZ948 KELIT wire binding device.

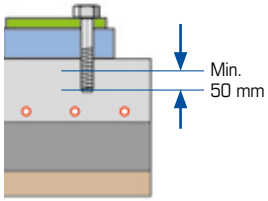
Fastening ULTRA PE-RT pipes on the bottom reinforcement mat level



The issues below must be coordinated between architects planners and the contractors involved as early as the planning stage:

- The type and thickness of the concrete, screed and floor coverings
- Division of surface area of the screed and concrete as well as alignment and arrangement of joints

Hall equipment
When fastening hall equipment or machine foundations, there should be a safety distance of 50 mm to the pipes.
Otherwise, you must cut out a blind area in these areas when laying the pipes.



Concrete thicknesses
are executed in thicknesses between 100 and 300 mm depending on the required load-bearing capacity.

Heat insulation
If the building is to be heated for more than four months a year and room temperatures are above12°C, it is advisable to install a heat insulation layer below the concrete slab in an area of about 5 m room depth along the external wall. If the groundwater depth is less than about 2 m, continuous heat insulation below the industrial surface heating is advisable with regard to energy losses.
Heat insulation with a high level of compressive strength must be used.

In the case of moisture coming from below, the customer must provide a moisture barrier.

Design parameters for the performance tables below
Wear layer (R): 0.0 m^2 K/W
Concrete (λ): 1.9 W/mK
Insulation: None
Ground temperature: 5°C
ULTRA PE-RT pipe
d20x2.25mm and d25 x2.5mm

Performance table for KELOX ULTRA PE-RT d20 industrial surface heating system

Concrete cover: 100 and 200mm

ULTRA PE-RT pipe d20mm

q: Heat flux density [W/m²]

t Fb: Average floor surface temperature (°C)

Max. surface temperature as per ÖNORM EN 1264-3

Recreation area: **29 °C**

Peripheral zones: **35 °C**

Temperature difference (tv–tr): **10 K**

Heating water temperature (tv+tr):2

Standard internal temperature

Pipes required

		VA15 6.70		VA20 5.20		VA30 3.40		VA45 2.30		VA15 6.70		VA20 5.20		VA30 3.40		VA45 2.30	
		Concrete cover: 100 mm								Concrete cover: 200 mm							
		q	t Fb	q	t Fb	q	t Fb	q	t Fb	q	t Fb	q	t Fb	q	t Fb	q	t Fb
	12	78.0	19.2	64.7	18.0	56.1	17.2	39.8	15.7	66.7	18.2	55.8	17.2	47.5	16.4	33.2	15.1
	15	61.3	20.7	50.9	19.7	44.1	19.1	31.3	17.9	52.5	19.9	43.9	19.1	37.3	18.5	26.1	17.4
28	18	44.5	22.1	36.9	21.4	32.0	21.0	22.7	20.1	38.0	21.5	31.8	20.9	27.1	20.5	18.9	19.8
	20	32.7	23.0	27.2	22.5	23.5	22.2	16.7	21.5	28.0	22.6	23.4	22.2	19.9	21.8	13.9	21.3
	22	19.4	23.8	16.1	23.5	14.0	23.3	9.9	22.9	16.6	23.5	13.9	23.3	11.8	23.1	8.3	22.8
	12	89.0	20.2	73.9	18.8	64.0	17.9	45.5	16.2	76.1	19.0	63.7	17.9	54.2	17.0	37.9	15.5
	15	72.4	21.7	60.1	20.6	52.1	19.8	37.0	18.4	61.9	20.7	51.8	19.8	44.1	19.1	30.8	17.9
30	18	55.8	23.2	46.3	22.3	40.1	21.7	28.5	20.6	47.7	22.4	39.9	21.7	33.9	21.1	23.7	20.2
	20	44.5	24.1	36.9	23.4	32.0	23.0	22.7	22.1	38.0	23.5	31.8	22.9	27.1	22.5	18.9	21.8
	22	32.7	25.0	27.2	24.5	23.5	24.2	16.7	23.5	28.0	24.6	23.4	24.2	19.9	23.8	13.9	23.3
	12	100.1	21.3	83.1	19.7	72.0	18.7	51.1	16.7	85.6	19.9	71.7	18.6	60.9	17.6	42.6	15.9
	15	83.5	22.7	69.3	21.4	60.1	20.6	42.6	18.9	71.4	21.6	59.8	20.5	50.8	19.7	35.5	18.3
32	18	66.9	24.2	55.5	23.1	48.1	22.5	34.2	21.2	57.2	23.3	47.9	22.4	40.7	21.8	28.4	20.6
	20	55.8	25.2	46.3	24.3	40.1	23.7	28.5	22.6	47.7	24.4	39.9	23.7	33.9	23.1	23.7	22.2
	22	44.5	26.1	36.9	25.4	32.0	25.0	22.7	24.1	38.0	25.5	31.8	24.9	27.1	24.5	18.9	23.8
	12	111.2	22.3	92.3	20.5	80.0	19.4	56.8	17.3	95.1	20.8	79.6	19.4	67.7	18.3	47.3	16.4
	15	94.6	23.8	78.5	22.3	68.0	21.3	48.3	19.5	80.9	22.5	67.7	21.3	57.6	20.3	40.2	18.7
34	18	78.0	25.2	64.7	24.0	56.1	23.2	39.8	21.7	66.7	24.2	55.8	23.2	47.5	22.4	33.2	21.1
	20	66.9	26.2	55.5	25.1	48.1	24.5	34.2	23.2	57.2	25.3	47.9	24.4	40.7	23.8	28.4	22.6
	22	55.8	27.2	46.3	26.3	40.1	25.7	28.5	24.6	47.7	26.4	39.9	25.7	33.9	25.1	23.7	24.2
	12	133.4	24.4	110.8	22.3	96.0	20.9	68.1	18.3	114.1	22.6	95.5	20.8	81.2	19.5	56.8	17.3
	15	116.7	25.8	96.9	24.0	84.0	22.8	59.6	20.5	99.8	24.2	83.6	22.7	71.1	21.6	49.7	19.6
38	18	100.1	27.3	83.1	25.7	72.0	24.7	51.1	22.7	85.6	25.9	71.7	24.6	60.9	23.6	42.6	21.9
	20	89.0	28.2	73.9	26.8	64.0	25.9	45.5	24.2	76.1	27.0	63.7	25.9	54.2	25.0	37.9	23.5
	22	78.0	29.2	64.7	28.0	56.1	27.2	39.8	25.7	66.7	28.2	55.8	27.2	47.5	26.4	33.2	25.1
	12	144.6	25.4	120.0	23.1	104.0	21.6	73.8	18.8	123.7	23.5	103.5	21.6	88.0	20.2	61.5	17.7
	15	127.9	26.8	106.1	24.8	92.0	23.5	65.3	21.0	109.4	25.1	91.5	23.5	77.8	22.2	54.4	20.0
40	18	111.2	28.3	92.3	26.5	80.0	25.4	56.8	23.3	95.1	26.8	79.6	25.4	67.7	24.3	47.3	22.4
	20	100.1	29.3	83.1	27.7	72.0	26.7	51.1	24.7	85.6	27.9	71.7	26.6	60.9	25.6	42.6	23.9
	22	89.0	30.2	73.9	28.8	64.0	27.9	45.5	26.2	76.1	29.0	63.7	27.9	54.2	27.0	37.9	25.5

Performance table for KELOX ULTRA PE-RT d20 industrial surface heating system

Concrete cover: 250 and 300mm

ULTRA PE-RT pipe d20mm

q: Heat flux density [W/m²]

t Fb: Average floor surface temperature (°C)

Max. surface temperature as per ÖNORM EN 1264-3

Recreation area: **29 °C**

Peripheral zones: **35 °C**

Temperature difference (tv–tr): **10 K**

Heating water temperature (tv+tr):2

Standard internal temperature

Pipes required

		VA15 6.70		VA20 5.20		VA30 3.40		VA45 2.30		VA15 6.70		VA20 5.20		VA30 3.40		VA45 2.30	
		Concrete cover: 250 mm								Concrete cover: 300 mm							
		q	t Fb	q	t Fb	q	t Fb	q	t Fb	q	t Fb	q	t Fb	q	t Fb	q	t Fb
	12	61.0	17.7	51.2	16.7	45.1	16.2	30.9	14.9	56.0	17.2	47.8	16.4	42.6	15.9	29.7	14.7
	15	48.0	19.4	40.2	18.7	35.5	18.3	24.3	17.2	44.0	19.1	37.6	18.5	33.5	18.1	23.3	17.2
28	18	34.8	21.2	29.2	20.7	25.7	20.4	17.6	19.6	31.9	21.0	27.2	20.5	24.3	20.3	16.9	19.6
	20	25.6	22.4	21.5	22.0	18.9	21.8	13.0	21.2	23.5	22.2	20.0	21.9	17.9	21.7	12.5	21.2
	22	15.2	23.4	12.8	23.2	11.2	23.0	7.7	22.7	14.0	23.3	11.9	23.1	10.6	23.0	7.4	22.7
	12	69.7	18.5	58.4	17.4	51.5	16.8	35.2	15.3	63.9	17.9	54.5	17.0	48.7	16.5	33.9	15.1
	15	56.7	30.3	47.5	19.4	41.9	18.9	28.7	17.7	52.0	19.8	44.4	19.1	39.6	18.7	27.6	17.6
30	18	43.7	22.0	36.6	21.4	32.2	21.0	22.1	20.0	40.0	21.7	34.1	21.2	30.5	20.8	21.2	20.0
	20	34.8	23.2	29.2	22.7	25.7	22.4	17.6	21.6	31.9	23.0	27.2	22.5	24.3	22.3	16.9	21.6
	22	25.6	24.4	21.5	24.0	18.9	23.8	13.0	23.2	23.5	24.2	20.0	23.9	17.9	23.7	12.5	23.2
	12	78.4	19.3	65.7	18.1	57.9	17.4	39.6	15.7	71.9	18.7	61.3	17.7	54.7	17.1	38.1	15.5
	15	65.4	21.1	54.8	20.1	48.3	19.5	33.0	18.1	60.0	20.6	51.1	19.7	45.7	19.2	31.8	17.9
32	18	52.4	22.8	43.9	22.1	38.7	21.6	26.5	20.5	48.0	22.4	41.0	21.8	36.6	21.4	25.5	20.4
	20	43.7	24.0	36.6	23.4	32.2	23.0	22.1	22.0	40.0	23.7	34.1	23.2	30.5	22.8	21.2	22.0
	22	34.8	25.2	29.2	24.7	25.7	24.4	17.6	23.6	31.9	25.0	27.2	24.5	24.3	24.3	16.9	23.6
	12	87.1	20.1	73.0	18.8	64.3	18.0	44.0	16.1	79.8	19.4	68.1	18.3	60.8	17.6	42.3	15.9
	15	74.0	21.9	62.1	20.7	54.7	20.1	37.4	18.5	67.9	21.3	57.9	20.4	51.7	19.8	36.0	18.3
34	18	61.0	23.7	51.2	22.7	45.1	22.2	30.9	20.9	56.0	23.2	47.8	22.4	42.6	21.9	29.7	20.7
	20	52.4	24.8	43.9	24.1	38.7	23.6	26.5	22.5	48.0	24.4	41.0	23.8	36.6	23.4	25.5	22.4
	22	43.7	26.0	36.6	25.4	32.2	25.0	22.1	24.0	40.0	25.7	34.1	25.2	30.5	24.8	21.2	24.0
	12	104.5	21.7	87.6	20.1	77.2	19.1	52.8	16.9	95.8	20.9	81.7	19.6	73.0	18.8	50.8	16.7
	15	91.4	23.5	76.6	22.1	67.5	21.3	46.2	19.3	83.8	22.8	71.5	21.6	63.8	20.9	44.4	19.1
38	18	78.4	25.3	65.7	24.1	57.9	23.4	39.6	21.7	71.9	24.7	61.3	23.7	54.7	23.1	38.1	21.5
	20	69.7	26.5	58.4	25.4	51.5	24.8	35.2	23.3	63.9	25.9	54.5	25.0	48.7	24.5	33.9	23.1
	22	61.0	27.7	51.2	26.7	45.1	26.2	30.9	24.9	56.0	27.2	47.8	26.4	42.6	25.9	29.7	24.7
	12	113.2	22.5	94.9	20.8	83.6	19.7	57.2	17.3	103.8	21.6	88.6	20.2	79.1	19.3	55.1	17.1
	15	100.1	24.3	83.9	22.8	73.9	21.8	50.6	19.7	91.8	23.5	78.3	22.3	69.9	21.5	48.7	19.5
40	18	87.1	26.1	73.0	24.8	64.3	24.0	44.0	22.1	79.8	25.4	68.1	24.3	60.8	23.6	42.3	21.9
	20	78.4	27.3	65.7	26.1	57.9	25.4	39.6	23.7	71.9	26.7	61.3	25.7	54.7	25.1	38.1	23.5
	22	69.7	28.5	58.4	27.4	51.5	26.8	35.2	25.3	63.9	27.9	54.5	27.0	48.7	26.5	33.9	25.1

Performance table for KELOX ULTRA PE-RT d25 industrial surface heating system

Concrete cover: 100 and 200mm

ULTRA PE-RT pipe d25mm

q: Heat flux density [W/m²]

t Fb: Average floor surface temperature (°C)

Max. surface temperature as per ÖNORM EN 1264-3

Recreation area: **29 °C**

Peripheral zones: **35 °C**

Temperature difference (tv–tr): **10 K**

Heating water temperature (tv+tr):2

Standard internal temperature

Pipes required

		VA15 6.70		VA20 5.20		VA30 3.40		VA45 2.30		VA15 6.70		VA20 5.20		VA30 3.40		VA45 2.30	
		Concrete cover: 100 mm								Concrete cover: 200 mm							
		q	t Fb	q	t Fb	q	t Fb	q	t Fb	q	t Fb	q	t Fb	q	t Fb	q	t Fb
	12	83.6	19.7	71.4	18.6	64.2	17.9	47.3	16.4	71.7	18.6	61.4	17.7	54.1	17.0	40.0	15.7
	15	65.7	21.1	56.2	20.2	50.5	19.7	37.2	18.4	56.4	20.2	48.3	19.5	42.6	18.9	31.5	17.9
28	18	47.7	22.4	40.7	21.8	36.6	21.4	27.0	20.5	40.9	21.8	35.0	21.2	30.8	20.9	22.8	20.1
	20	35.1	23.2	30.0	22.8	26.9	22.5	19.9	21.8	30.1	22.8	25.8	22.4	22.7	22.1	16.8	21.6
	22	20.8	23.9	17.8	23.6	16.0	23.5	11.8	23.1	17.9	23.7	15.3	23.4	13.5	23.2	10.0	22.9
	12	95.4	20.8	81.6	19.6	73.3	18.8	54.0	17.0	81.9	19.6	70.1	18.5	61.8	17.7	45.7	16.2
	15	77.6	22.2	66.4	21.1	59.6	20.5	44.0	19.1	66.6	21.2	57.0	20.3	50.3	19.7	37.2	18.4
30	18	59.8	23.5	51.1	22.7	45.9	22.2	33.8	21.1	51.3	22.7	43.9	22.1	38.7	21.6	28.6	20.6
	20	47.7	24.4	40.7	23.8	36.6	23.4	27.0	22.5	40.9	23.8	35.0	23.2	30.8	22.9	22.8	22.1
	22	35.1	25.2	30.0	24.8	26.9	24.5	19.9	23.8	30.1	24.8	25.8	24.4	22.7	24.1	16.8	23.6
	12	107.3	21.9	91.7	20.5	82.4	19.6	60.7	17.6	92.1	20.5	78.8	19.3	69.5	18.4	51.3	16.8
	15	89.5	23.3	76.5	22.1	68.7	21.4	50.7	19.7	76.8	22.1	65.7	21.1	57.9	20.4	42.8	19.0
32	18	71.7	24.6	61.3	23.7	55.1	23.1	40.6	21.8	61.5	23.7	52.7	22.9	46.4	22.3	34.3	21.2
	20	59.8	25.5	51.1	24.7	45.9	24.2	33.8	23.1	51.3	24.7	43.9	24.1	38.7	23.6	28.6	22.6
	22	47.7	26.4	40.7	25.8	36.6	25.4	27.0	24.5	40.9	25.8	35.0	25.2	30.8	24.9	22.8	24.1
	12	119.2	23.0	101.9	21.4	91.6	20.5	67.5	18.2	102.3	21.5	87.5	20.1	77.1	19.1	57.0	17.3
	15	101.4	24.4	86.6	23.0	77.9	22.2	57.4	20.3	87.0	23.1	74.5	21.9	65.6	21.1	48.5	19.5
34	18	83.6	25.7	71.4	24.6	64.2	23.9	47.3	22.4	71.7	24.6	61.4	23.7	54.1	23.0	40.0	21.7
	20	71.7	26.6	61.3	25.7	55.1	25.1	40.6	23.8	61.5	25.7	52.7	24.9	46.4	24.3	34.3	23.2
	22	59.8	27.5	51.1	26.7	45.9	26.2	33.8	25.1	51.3	26.7	43.9	26.1	38.7	25.6	28.6	24.6
	12	143.1	25.2	122.3	23.3	109.9	22.2	81.0	19.5	122.8	23.4	105.1	21.7	92.6	20.6	68.4	18.3
	15	125.1	26.6	107.0	24.9	96.1	23.9	70.8	21.6	107.4	24.9	91.9	23.5	81.0	22.5	59.9	20.5
38	18	107.3	27.9	91.7	26.5	82.4	25.6	60.7	23.6	92.1	26.5	78.8	25.3	69.5	24.4	51.3	22.8
	20	95.4	28.8	81.6	27.6	73.3	26.8	54.0	25.0	81.9	27.6	70.1	26.5	61.8	25.7	45.7	24.2
	22	83.6	29.7	71.4	28.6	64.2	27.9	47.3	26.4	71.7	28.6	61.4	27.7	54.1	27.0	40.0	25.7
	12	155.0	26.4	132.5	24.3	119.1	23.0	87.8	20.1	133.1	24.3	113.9	22.5	100.3	21.3	74.2	18.9
	15	137.1	27.7	117.2	25.8	105.3	24.7	77.6	22.2	117.7	25.9	100.7	24.3	88.7	23.2	65.6	21.1
40	18	119.2	29.0	101.9	27.4	91.6	26.5	67.5	24.2	102.3	27.5	87.5	26.1	77.1	25.1	57.0	23.3
	20	107.3	29.9	91.7	28.5	82.4	27.6	60.7	25.6	92.1	28.5	78.8	27.3	69.5	26.4	51.3	24.8
	22	95.4	30.8	81.6	29.6	73.3	28.8	54.0	27.0	81.9	29.6	70.1	28.5	61.8	27.7	45.7	26.2

Performance table for KELOX ULTRA PE-RT d25 industrial surface heating system

Concrete cover: 250 and 300mm

ULTRA PE-RT pipe d25mm

q: Heat flux density [W/m²]

t Fb: Average floor surface temperature (°C)

Max. surface temperature as per ÖNORM EN 1264-3

Recreation area: **29 °C**

Peripheral zones: **35 °C**

Temperature difference (tv–tr): **10 K**

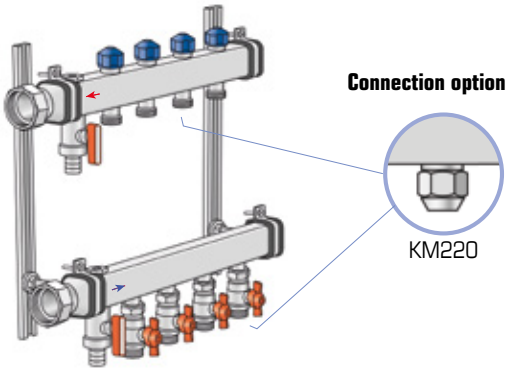
Heating water temperature (tv+tr):2

Standard internal temperature

Pipes required

		VA15 6.70		VA20 5.20		VA30 3.40		VA45 2.30		VA15 6.70		VA20 5.20		VA30 3.40		VA45 2.30	
		Concrete cover: 250 mm								Concrete cover: 300 mm							
		q	t Fb	q	t Fb	q	t Fb	q	t Fb	q	t Fb	q	t Fb	q	t Fb	q	t Fb
	12	65.6	18.1	56.5	17.2	51.1	16.7	36.4	15.4	60.0	17.6	52.0	16.8	48.7	16.5	35.6	15.3
	15	51.6	19.8	44.5	19.1	40.2	18.7	28.7	17.7	47.2	19.4	40.9	18.8	38.3	18.5	28.0	17.6
28	18	37.4	21.5	32.2	21.0	29.1	20.7	20.8	19.9	34.2	21.2	29.6	20.7	27.8	20.6	20.3	19.9
	20	27.5	22.5	23.7	22.2	21.4	22.0	15.3	21.4	25.2	22.3	21.8	22.0	20.4	21.9	14.9	21.4
	22	16.3	23.5	14.1	23.3	12.7	23.2	9.1	22.8	15.0	23.4	13.0	23.2	12.1	23.1	8.9	22.8
	12	74.9	18.9	64.6	18.0	58.3	17.4	41.6	15.9	68.5	18.3	59.3	17.5	55.6	17.1	40.6	15.8
	15	60.9	20.6	52.5	19.9	47.4	19.4	33.8	18.1	55.7	20.2	48.3	19.5	45.2	19.2	33.1	18.1
30	18	46.9	22.3	40.4	21.7	36.5	21.4	26.1	20.4	42.9	22.0	37.2	21.4	34.8	21.2	25.5	20.4
	20	37.4	23.5	32.2	23.0	29.1	22.7	20.8	21.9	34.2	23.2	29.6	22.7	27.8	22.6	20.3	21.9
	22	27.5	24.5	23.7	24.2	21.4	24.0	15.3	23.4	25.2	24.3	21.8	24.0	20.4	23.9	14.9	23.4
	12	84.2	19.8	72.6	18.7	65.5	18.1	46.8	16.3	77.0	19.1	66.7	18.2	62.5	17.8	45.7	16.2
	15	70.2	21.5	60.6	20.6	54.7	20.1	39.0	18.6	64.3	20.9	55.6	20.2	52.1	19.8	38.1	18.5
32	18	56.2	23.2	48.5	22.5	43.8	22.1	31.3	20.9	51.5	22.8	44.6	22.1	41.8	21.9	30.5	20.8
	20	46.9	24.3	40.4	23.7	36.5	23.4	26.1	22.4	42.9	24.0	37.2	23.4	34.8	23.2	25.5	22.4
	22	37.4	25.5	32.2	25.0	29.1	24.7	20.8	23.9	34.2	25.2	29.6	24.7	27.8	24.6	20.3	23.9
	12	93.5	20.7	80.6	19.5	72.8	18.7	52.0	16.8	85.6	19.9	74.1	18.9	69.4	18.4	50.8	16.7
	15	79.5	22.4	68.6	21.3	61.9	20.7	44.2	19.1	72.8	21.7	63.0	20.8	59.0	20.5	43.2	19.0
34	18	65.6	24.1	56.5	23.2	51.1	22.7	36.4	21.4	60.0	23.6	52.0	22.8	48.7	22.5	35.6	21.3
	20	56.2	25.2	48.5	24.5	43.8	24.1	31.3	22.9	51.5	24.8	44.6	24.1	41.8	23.9	30.5	22.8
	22	46.9	26.3	40.4	25.7	36.5	25.4	26.1	24.4	42.9	26.0	37.2	25.4	34.8	25.2	25.5	24.4
	12	112.2	22.4	96.8	21.0	87.4	20.1	62.4	17.8	102.7	21.5	88.9	20.2	83.3	19.7	60.9	17.6
	15	98.2	24.1	84.7	22.8	76.4	22.1	54.6	20.1	89.8	23.3	77.8	22.2	72.9	21.7	53.3	19.9
38	18	84.2	25.8	72.6	24.7	65.5	24.1	46.8	22.3	77.0	25.1	66.7	24.2	62.5	23.8	45.7	22.2
	20	74.9	26.9	64.6	26.0	58.3	25.4	41.6	23.9	68.5	26.3	59.3	25.5	55.6	25.1	40.6	23.8
	22	65.6	28.1	56.5	27.2	51.1	26.7	36.4	25.4	60.0	27.6	52.0	26.8	48.7	26.5	35.6	25.3
	12	121.6	23.3	104.9	21.7	94.7	20.8	67.6	18.3	111.3	22.3	96.4	20.9	90.3	20.4	66.0	18.1
	15	107.5	25.0	92.7	23.6	83.7	22.8	59.8	20.5	98.4	24.1	85.2	22.9	79.8	22.4	58.4	20.4
40	18	93.5	26.7	80.6	25.5	72.8	24.7	52.0	22.8	85.6	25.9	74.1	24.9	69.4	24.4	50.8	22.7
	20	84.2	27.8	72.6	26.7	65.5	26.1	46.8	24.3	77.0	27.1	66.7	26.2	62.5	25.8	45.7	24.2
	22	74.9	28.9	64.6	28.0	58.3	27.4	41.6	25.9	68.5	28.3	59.3	27.5	55.6	27.1	40.6	25.8

KU590E/KU590W ULTRA PE-RT industrial surface manifold 6/4”



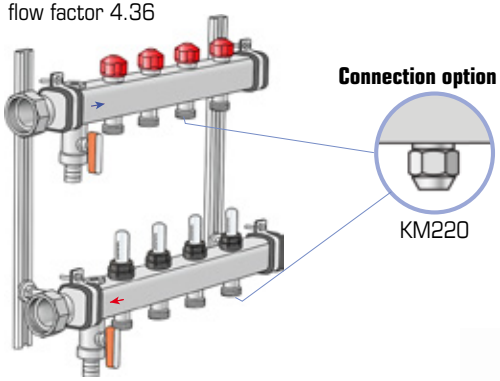
Application area: max. 80°C - 6bar

KU590E/KU590W FB flow bar

- Setting screw for double-spindle valve 8mm
- Manual drive for opening and closing the individual heating circuits
- Thread connection M 30x1.5mm for the KM596 KELOX thermal motor

KU590E FB return flow bar

- Return flow ball valve
- When fully open – 23.0 l/min flow factor 4.36



Application area: max. 80°C - 6bar

KU590W FB flow bar

- Water quantity dial at the measuring pipe of 1–15 l/min
- Setting can be fixed using a locking cap

KU590W FB return flow bar

- Setting screw for double-spindle valve 8mm
- Manual drive for opening and closing the individual heating circuits
- Thread connection M 30x1.5mm for the KM596 KELOX thermal motor

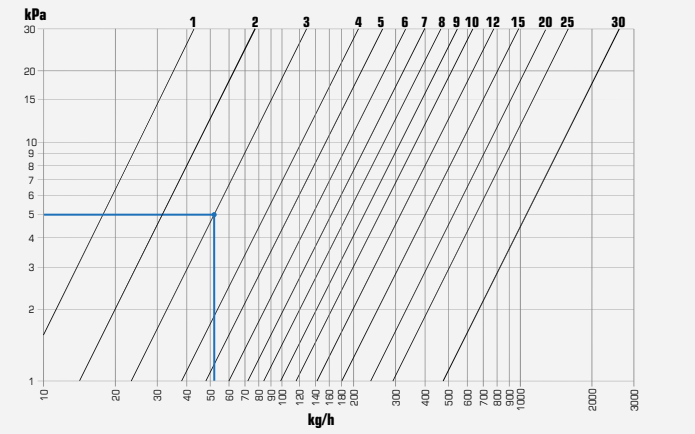
Benefits

- FB manifold bar with pre-formed 6/4" union nut
- KU590E on 3/4“ return flow ball valve with 3/4“ male Eurocone,
- KU590W on feed flow water flow meter
- 3/4“ thermostatic valve, male Eurocone, valve bonnets suitable for KM596 KELOX thermal motor with male thread
- Venting at the highest point
- Heating circuit outlets 3/4" EUROCONE
- K87 angle clips are available for inserting and fixing flexible pipes

Flow media

- Heating water
- Cooling water
- Water mixtures using corrosion and frost protection additives in common use as per ÖNORM H 5195

Diagram of double-spindle valve setting



Example

5kPA pressure loss
52 kg/h (l/h)
Setting value of double-spindle valve position 3

The pressure loss/through-flow diagram shows the relationship between the pressure loss, the through-flow and the presetting. The respective presetting results from the necessary through-flow and an available differential pressure.

The basis for adjustment of the required water flow in each heating circuit is the specified water quantity from the calculation.

The viewing window of the water meter is only for reading off the water quantity. The fixed setting of the water quantity on the double-spindle valve in accordance with ÖNORM EN 1264-4 ensures that the water quantity is not changed even if individual heating circuits are opened and closed subsequently. It may be necessary to correct the values slightly in a second adjustment procedure, since the flow values of the individual heating circuits influence one another while they are being adjusted.

Concrete joints

Building planners specify whether and if so to what extent a specific type of concrete joint is to be implemented.
A differentiation is made between dummy joints, compression joints and movement joints (expansion joints). Aligning joints is intended to avoid uncontrollable cracks; or, in the case of expansion joints, to separate fields from fixed installation parts (supports, edges, shafts).

Joint alignment

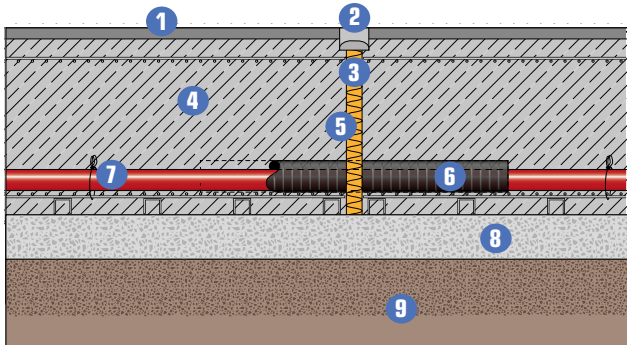
Structural engineers are responsible for joint planning; due to the low heat level temperature, it is independent from industrial surface heating. Heating specialist planners should request a joint plan to coordinate alignment of the heating circuits or the connecting lines with it.

Movement joints

Continuous movement joints spaced at approximately 20 mm separate concrete panels from different components (e.g. shafts, ducts, supports, walls, etc.)
Connecting lines that cross expansion joints or movement joints must be protected by a **KM614 FB joint protection pipe** of approximately 1 m in length due to the loading forces that can be expected in the joint area.

Important!

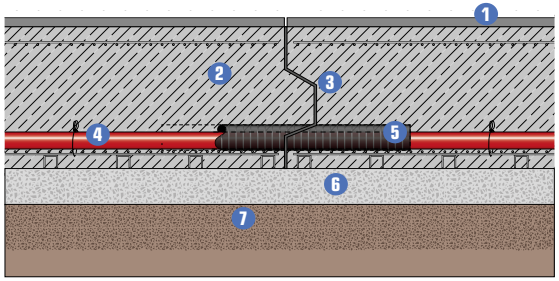
Only ever pass through expansion joints with connecting lines. You must provide a KM614 FB joint protection pipe for connecting lines that pass through expansion joints.



1. Wear layer
2. Joint sealing compound
3. Joint filler
4. Concrete
5. Movement joint
6. KM614 FB joint protection pipe
7. KELOX ULTRA PE-RT pipe
8. Foundation course/insulation
9. Ground/ballast

Compression joints

Compression joints result in the form of working joints when creating neighbouring floor plates that are concreted at time intervals. If transverse shear force transmission in compression joints is necessary, you can make them in panels with a thickness of at least 18 cm by dovetailing. To do this, you position a trapezoidal profile on the side formwork of the strip that was concreted first. When the formwork has been stripped, this profile leaves behind a groove-shaped indentation for dovetailing.

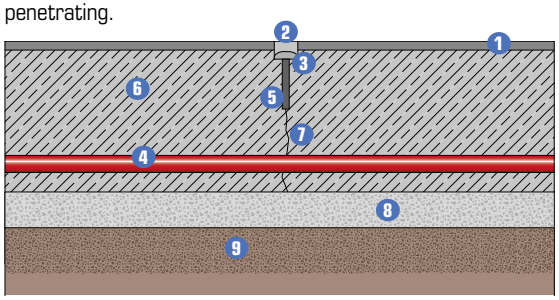


Important!
At installation, provide a KM614 FB joint protection pipe for heating pipes that pass through compression joints in the case of mechanical loading.

1. Wear layer
2. Concrete
3. Compression joint
4. KELOX ULTRA PE-RT pipe
5. KM614 FB joint protection pipe
6. Foundation course/insulation
7. Ground/ballast

Dummy joints

Dummy joints "guide" the crack through a specified weakening of the cross section in the top third of the panel. You must saw in the cut as early as possible (approximate depth 1/3 of the panel thickness). In the case of open spaces, it is sensible to implement a joint seal to prevent water from penetrating.



Important!
Coordinate the maximum cutting depth with the building planner.

1. Wear layer
2. Joint sealing compound
3. Foam rubber
4. KELOX ULTRA PE-RT pipe
5. Dummy joint
6. Concrete
7. Fine crack
8. Foundation course/insulation
9. Ground/ballast

KELOX ULTRA PE-RT space heating system

Below the area that is to be kept free of ice and snow, pipes made from KELOX ULTRA PE-RT (d16 - d25) are laid containing a water/glycol mixture. The antifreeze should be food-safe to ensure that the groundwater is not contaminated in the case of leaks.
The pipe spacing of the heating register should be from 12 cm to a maximum of 20 cm. In this connection, the rule applies in the same way as with normal surface heating systems that states that the closer the pipe spacing, the more even is the temperature on the surface. In the case of additional surface coverings (e.g. asphalt or gravel), the heat dissipation decreases or the system temperature must be increased. To reduce heat losses downwards into the ground, you should integrate moisture-resistant heat insulation under the pipes.
The supporting concrete in which the heating registers are laid, must comply with local static and structural requirements. The KELOX ULTRA pipes cannot take on any static functions.

For safety reasons and convenience, specific surfaces must be kept free of ice, snow and frost

- Parking areas
- Helicopter landing pads
- Driveways (hospitals, underground car parks)
- Bridges
- Car washes
- Pedestrian underpasses
- Ramps

Output requirement

Ice results at a relative humidity of approximately 85% and a ground temperature of approximately -1°C to -5°C

Outside temperature °C	Ice-free in W/m²	Free of ice and snow 1cm of snow/h in W/m²
-5	95	210
-10	160	230
-15	230	250
-20	250	280

Maximum pipe lengths/heating circuit:
(output-dependent)

d16 -80 m
d20 -120 m
d25 -150 m

The information below is based on average empirical values

Performance table for ULTRA PE-RT space heating system d20 mm pipe

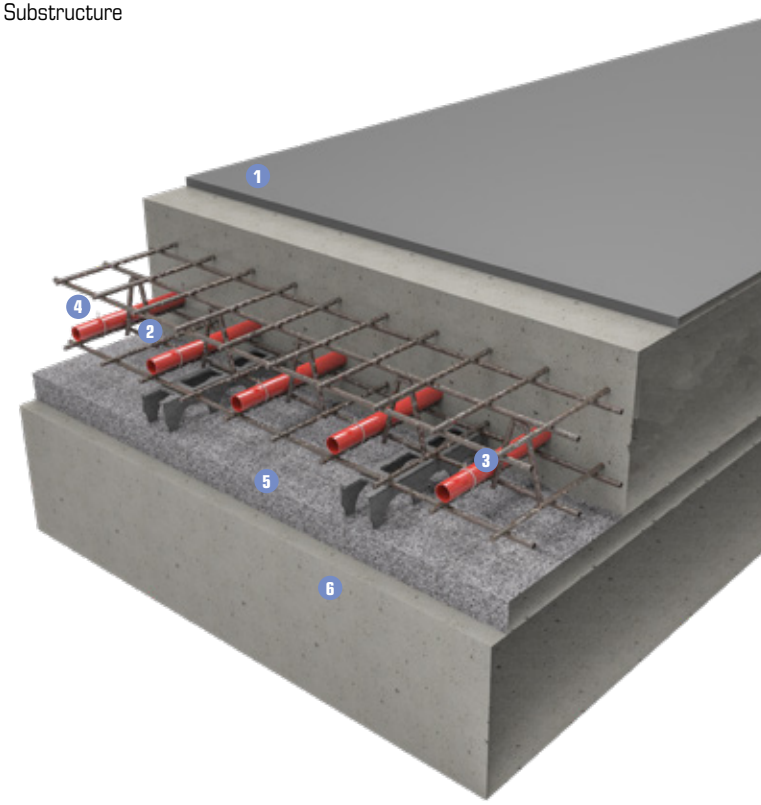
q = heat flux density (W/m2)
Temperature difference (tv–tr): 15 K

Heating water temperature (tv+tr):2	Outside temperature	Pipes required VA12 8.70 q	VA15 6.70 q	VA20 5.20 q
		Concrete cover: 100 mm		
20	-5	139	136	125
	-10	169	164	151
	-15	198	193	177
	-20	227	221	204
30	-5	198	193	177
	-10	227	221	204
	-15	256	250	230
	-20	285	278	256
40	-5	256	250	230
	-10	285	278	256
	-15	314	306	281
	-20	343	334	307
50	-5	314	306	281
	-10	343	334	307
	-15	372	363	333
	-20	401	391	359

Important information on laying

- Always fill the system with antifreeze (-25°C)
- Feed via a heat exchanger
- Provide a drain for thawed water
- In general, the projects in question are specific ones that need to be coordinated with architects, structural engineers and system manufacturers.
- KU590E and KU590W 6/4“ industrial surface manifolds are available

1. Coating, wear layer (asphalt, etc.)
2. Reinforcement according to structural design
3. ULTRA PE-RT pipe, fastened to the lower reinforcement, for example
4. Concrete embedding, at least 100 mm above the pipe crown
5. If insulation is permitted for structural engineering reasons, pay attention to moisture
6. Substructure



Sizing and pressure loss for KELOX heating pipes

For information on calculating individual resistances, refer to the manual too.

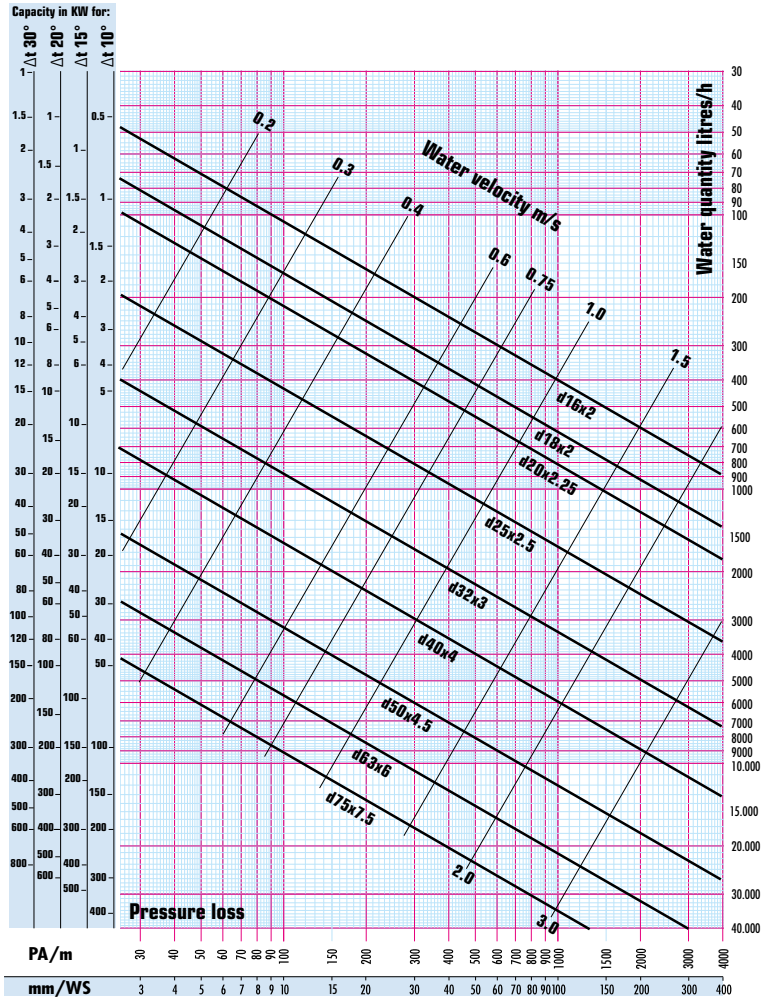
KELOX multilayer pipe d: 16, 18 20, 25, 32, 40, 50, 63, 75

The pressure losses are calculated according to the Nikuradse formula:

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

Pipe roughness: 0.007mm

R = pipe friction pressure gradient (Pa/m)
$\dot{M}$ = Mass flow (l/h)
di = internal pipe diameter (mm)



Pressure test report for water-based surface-embedded heating and cooling systems

KE KELIT recommends carrying out a leak test based on the "Pressure test for surface-embedded heating and cooling systems" in accordance with ÖNORM EN ISO 1264-4. Caution! Before every pressure test, ensure that all the steps in the installation instructions have been carried out conscientiously.

Functional test when using "leak before pressed" fittings

For temperature differences (> 10 K) between ambient temperature and fill water temperature, a waiting time of 30 min. must be adhered to after filling the system with drinking water so the temperature can equalize.

Test pressure: 0.05 MPa (0.5 bar) up to max. 0.2 MPa (2 bar)
Test duration: 15 minutes after temperature equalization between the pipe and test medium.
Test differential pressure: 0.0 bar

A visual check must then be performed on all pipe connections.

If a pressure test is performed using air or inert gases following the pressure test for drinking water systems, you can omit the functional test!

Pressure test

You must check the pipe network at each location in the system at double the operating pressure but at least at a pressure of 4 bar to a maximum of 6 bar.
When checking with air, the test pressure must be 2bar to 3bar.

You must use pressure gauges that allow reliable reading of a pressure change of 0.2 bar/h. If possible, the pressure gauge should be positioned at the lowest point in the system. The temperature equalization between ambient temperature and fill water temperature must be taken into account after applying the test pressure by waiting an adequate amount of time. After the waiting time, the test pressure must be reapplied, if required. For the period of the pressure test, you must disconnect from the system to be tested all the containers, devices and fittings that are not suitable for the test pressure. The system is filled with filtered water and fully bled of air. During testing, you must carry out a visual inspection of the pipe fittings and unions. To detect damage to the pipes, you must apply the test pressure to the pipes while introducing the screed.

KELIT recommends a testing period of 30 minutes.

Calculated test pressure: ..... bar
Testing period ..... hr

☐ NO pressure loss was observed during the testing period.

☐ The system contains ..... as the antifreeze:

☐ The system does NOT contain any antifreeze, which means that it has been emptied completely for safety reasons.

Location: .....

Property: .....

System pressure: .....

Confirmation

Responsible person: .....

Date: ..... Time: from ..... to .....

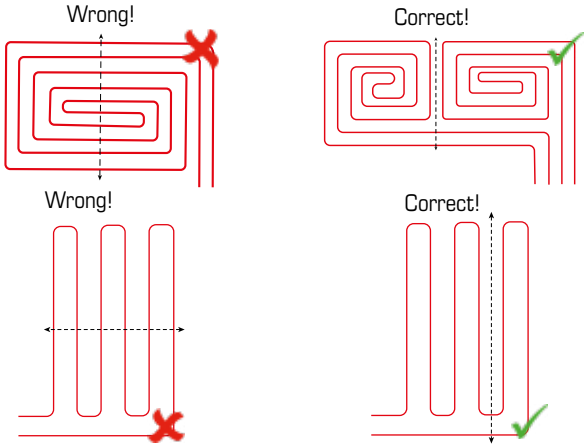
Client: .....

Signature/stamp

KELOX FB laying imperatives

1. At the planning stage, the issues below must be coordinated between architects, the client, planners and contractors like heating engineers, screed installers, etc. for example:
   - Specifying the space usage in all the rooms
   - The type and thickness of the screed and the floor structure (e.g. vapour barrier)
   - Division of surface area of the screed and arrangement of expansion joints
   - Number of measuring points for residual moisture measurement
2. Specify the installation distances in every room according to the output requirement and choose an FB system.
3. Route the flow line where the highest heat requirement can be expected (windows, external doors, peripheral zones).
4. Do not exceed the pipe length per heating circuit, pay attention to the maximum output-dependent pressure loss

   d16 max. 120m
   d20 max. 150m
   d25 max. 180m
5. If necessary, insulate connecting lines in accordance with applicable regulations or route them on the bare ceiling using KMU120P.
6. The type of installation of KELOX FB pipes in a spiral or meander is shown as an example in the FB configurations.
7. Installing KM614 KELOX FB joint protection pipes ensures that the complete functionality of the thermal expansion joints of the screed is guaranteed in future. According to ÖNORM EN 1264, maximum field sizes of 40m² with a side length of 8m at the most are permitted without additional expansion joints! The ratio of length to width must not exceed 2:1.
8. You must coordinate heating circuits and joint as follows:
   - Plan and lay the pipe registers such that they do not run through joints under any circumstances.
   - Only connecting pipes are allowed to cross joints.
   - In these areas, the heating pipes beyond the joint must be protected from shear stress on both sides for about 20cm by means of a protective pipe (KM614 KELOX FB joint protection pipe).



9. You can set connection points in the screeding without any problems. Correct planning and optimum use of roll lengths allows you to avoid unnecessary connection points. As specified in ÖNORM EN 1264, connections in the floor structure must be designated and positioned precisely in a revision drawing. When installing in screed, concrete or plaster, you must take into consideration the anti-corrosion conditions and take appropriate protective measures if necessary.
10. The maximum laying temperature is -10°C
11. Avoid crossing points by means of intelligent pipe routing.
12. Avoid noise bridges in future as early as the pipe laying stage.
    This means installing KM634 KELOX FB edge insulating strips over the entire circumference.
    Screed expansion: ≈ 2 mm/5 m.
13. In external walls and window areas, provide peripheral zones that are a maximum of 1 m wide with compressed spacing.
14. Lay pipes more than 50mm with all vertical structural components and 200mm from chimneys, open fireplaces, masonry shafts and lift shafts.
15. To determine screed moisture, set KM619 FB measuring points in the screed to safely mark drilled holes.
16. Avoid screed faults, use KM640 KELOX FB screed additive against cracks. The building physicist specifies screed thicknesses depending on the use, insulation material thickness and screed quality.
17. By preference, you should ensure that heating circuits are leak-tight during screed installation by means of a water pressure test! (Pay attention to frost protection).
18. Pay attention to baking out! As specified in ÖNORM B 3732, you must subject all underfloor heating systems to a baking out procedure after drying of the screed and before laying the floor coverings. Function heating of the screed as per ÖNORM EN 1264-4 is only to verify functioning of the underfloor heating and is no substitute for baking out.

Important principle!

The only thing that guarantees a functional, economic underfloor heating system with a long service life is optimum cooperation between KE KELIT as the system supplier, specialist wholesalers, specialist installation companies, builders and the client. Consult with these specialists to obtain the best advice.

KELOX FB general laying guidelines

1. The plastic KELOX multilayer pipe system must be handled carefully to avoid shocks, impacts, nicks and kinks.

2. Store and transport all KELOX system components with care. The external protective layer is stabilized against UV influences, but the pipes should not be exposed to long-lasting, direct sunlight. This does not apply to typical storage and working times.

3. Pay attention to the processing guidelines of the KM220 Eurocone fitting.

- Always cut straight at right angles to the pipe axis
- Calibrate the pipe end precisely
- Push on the union completely without damaging the O-rings
- Screw the union tight

4. Be sure to avoid kinks. Never install pipes that have been damaged or handled/worked incorrectly. For tight radii, please use the following from the tools available: Bending spring or pipe bending tool.

Permitted bending radii:

Multilayer pipe	with hand	with bending pliers	with Bending spring
d16	5 x d	3 x d	3 x d
d20	5 x d	3 x d	3 x d
d25	5 x d	3.5 x d	4 x d

ULTRA PE-RT pipe	with hand	with bending pliers	with Bending spring
d16	6 x d	—	—
d20	7 x d	—	—
d25	8.5x d	—	—

Avoid tight bending radii immediately after compression and screw connections due to the risk of breakage (cutting effect of the support sleeve).

5. Every heating installation must be subjected to a pressure test in accordance with the standard. Document the pressure test using the report form provided.

6. With regard to frost protection, KELOX can handle ethylene or propylene glycol up to a maximum concentration of 35% without any problems. If using alternative antifreeze additives, pay attention to the suitability and approval information as well as any application instructions provided by the supplier.

7. ÖNORM H 5195/1 specifies the pH value and water hardness (pH) of heating and refilling water. This can affect the functions of valves and regulating equipment, etc.

8. KELOX installation pipe systems should not be worked on at temperatures below -10°C. At low negative temperatures, we recommend storing the system components on temperature-controlled or heated premises directly prior to fitting work.

9. KELOX PPSU fittings should not come into direct contact with solvents or solvent-containing building materials such as lacquers, sprays, installation foams, glues (e.g. Armaflex 520 adhesive, etc.) Under unfavourable conditions, aggressive solvent components that may be present could damage the plastic material.

- When using PPSU fittings, it is possible to use **solvent-free** Armaflex SF990 adhesive when glueing insulations.
- Since ammonia, chloride and nitrate-containing substances can cause tension cracks, the used materials and auxiliary materials and the ambient conditions must be free from them to avoid impairment of the metal materials.
- Do not use installation foams or two-component grout based on methyl acrylate, isocyanate or acrylate when mounting the system parts.
- Do not use any cold-welding materials, such as those used to weld PVC protective film, that contain acetone or tetrahydrofuran (THF) must not be used.

10. NOTE! Damage to material due to impermissible leak detection agents

Impermissible leak detection agents can lead to material damage and leaks. As a result of this, water damage can occur.

- Only ever use leak detection agents that the manufacturer has released for use on the PPSU material.
- Be sure to comply with the processing information of the respective manufacturer.

Product ranges	KELOX pipes	KMW	KWW/ KWU	KMU	KMP	KWP
Ethylene glycol < 35%	✓	✓	✓	✓	✓	✓
Hemp + Fermit	✓	✓	✓	✓	✓	✓
Loctite 55	✓	✓	✗	✓	✓	✗
Lacquers, sprays, (2-component) adhesives (like Armaflex 520, for example)	✓	✓	✗	✓	✓	✗
Cold welding compounds contain acetone or tetrahydrofuran (THF)	✓	✓	✗	✓	✓	✗
Compressed air system, based on oil-free systems complying with ISO 8573-1, Class 1	✓	✓	✓	✓	✓	✓
Osmosis water	✓	✗	✓	✗	✓	✓

11. To ensure warranty services (warranty agreement with the Federal Guild of Construction), you must only ever use KELOX system components in each installation case.

12. For perfect installation of the KELOX multilayer pipe system, you only need a small number of tools. For your safety, we recommend using our original tools which have been tried and tested multiple times in practical applications, and also that they be regularly serviced.

13. In case of doubt, do not hesitate to contact our application technicians. There may not be an optimum solution for every case, but we can always help.

14. Demonstration videos can be downloaded by scanning the KE KELIT QR code.
www.youtube.com/kekelit

KELOX FB program overview

The KELOX system is continuously adapted to meet changing engineering requirements, and is enhanced on a systematic basis.
The most up-to-date version of our available product range can be found in the current KELOX multilayer pipe price list.

Please use the product code (e.g., KMU120 for KELOX FB multilayer pipe or KM635 for KELOX FB stapling panel, etc.) when ordering, as this will simplify the process.

Area of application of Underfloor Heating Systems:

KELOX-ULTRAX FB pipe

Class 4 according to
ÖNORM EN ISO 21003
60°C - tmax 70°C/10bar

ULTRA PE-RT pipe

Class 4 according to
ÖNORM EN ISO 22391
60°C - tmax 70°C/6bar

KMU120 KELOX-ULTRAX FB pipe

KELOX-ULTRAX FB pipe conforming to ÖNORM EN ISO 21003, oxygen- and water vapour diffusion-tight
5-layer multilayer pipe made of PE-RT/Al/PE-RT
Operating conditions classified acc. to ÖNORM EN ISO 21003
Underfloor heating - Class 4: 60°C - tmax 70°C/10 bar
Colour: blue/transparent
Supplied in coils

Art. No.	Designation	PU1 Runn. m	Weight kg	Capacity l/m
7001603	16x2	300	0.105	0.113
7001605	16x2	500	0.105	0.113

KMU120P KELOX-ULTRAX FB plus pipe, 9mm

KELOX-ULTRAX FB plus pipe conforming to ÖNORM EN ISO 21003, oxygen- and water vapour diffusion-tight 5-layer multilayer pipe made of PE-RT/Al/PE-RT, with factory-applied 9 mm closed-cell soft foam insulation and jacket made of viscoplastic PE film
Classification of operating conditions according to ÖNORM EN ISO 21003
Underfloor heating - Class 4: 60°C - tmax 70°C/10 bar
Insulation material thickness: 9 mm
Colour: red
Rolls

Art. No.	Designation	PU1 Runn. m	Weight kg	Capacity l/m
7001162	16x2	100	0.18	0.113

KMU121K KELOX-ULTRAX FB Velcro tube

KELOX-ULTRAX FB Velcro tube conforming to ÖNORM EN ISO 21003; oxygen- and water vapour-tight
5-layer multilayer pipe made of PE-RT/Al/ PE-RT; incl. coiled Velcro strip for fixing directly on the KM636 and KM636K KELOX FB Velcro panel and foil without any additional fixing
Area of application as per ÖNORM EN ISO 21003
Underfloor heating - Class 4: 60°C - tmax 70°C/10 bar
Colour: blue/transparent
Supplied in coils

Art. No.	Designation	PU1 Runn. m	Weight kg	Capacity l/m
7001613	16x2	300	0.105	0.113

KU100 ULTRA PE-RT pipe Type 2

ULTRA PE-RT pipe type 2 acc. to ÖNORM EN ISO 22391, with an oxygen-tight EVOH barrier protected with PE-RT coating in accordance with DIN 4726. Connections can be made using KM compression fittings, KMP, KWP, KMU and KWU fittings
Classification of operating conditions according to ÖNORM EN ISO 22391
Underfloor heating - class 4: 60°C - tmax 70°C/6 bar
Colour: red
Supplied in coils

Art. No.	Designation	PU1 Runn. m	Weight kg	Capacity l/m
7011630	16x2	300	0.09	0.113
7011650	16x2	500	0.09	0.113
7012030	20x2.25	300	0.125	0.189
7012060	20x2.25	600	0.125	0.189
7012530	25x2.5	300	0.156	0.314

KU101K ULTRA PE-RT Velcro pipe Type 2

ULTRA PE-RT Velcro tube Type 2 as per ÖNORM EN ISO 22391, with an oxygen-tight EVOH barrier protected with PE-RT coating in accordance with DIN 4726, including wrapped Velcro strips for direct attachment on the KM636 and KM636K KELOX FB Velcro panel and film without additional fasteners. Connections can be made using KM compression fittings, KMP, KWP, KMU and KWU fittings
Classification of operating conditions according to ÖNORM EN ISO 22391
Underfloor heating - class 4: 60°C - tmax 70°C/6 bar
Colour: red
Supplied in coils

Art. No.	Designation	PU1 Runn. m	Weight kg	Capacity l/m
7011613	16x2	300	0.082	0.113

KM610 KELOX FB grip rail

U-profile clamping rail made of plastic with self-clamping pipe fastening
d16: L: 3.9m W: 50mm H: 24mm - pipe spacing 50mm
d20: L: 4.0m W: 50mm H: 24mm - pipe spacing 50mm
d25: L: 4.0m W: 50mm H: 35mm - pipe spacing 50mm

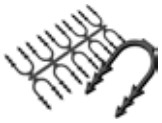
Art. No.	Designation	PU1 Runn. m	Weight kg
6106160	16	62.40	0.28
6106210	20	64	0.22
6106250	25	64	0.44

KM610PP KELOX FB grip rail PP

Grip rail made of PP, PVC-free with self-clamping pipe fastening for pipes d16 and d20mm at 50mm intervals,
WITH adhesive strip
d16/20: L: 2m W: 40mm, H: 26.5mm

Art. No.	Designation	PU1 Runn. m	Weight kg
6106220	16/20	280	0.22

KM612 KELOX FB fixing hook



For fastening KELOX multilayer pipes and underfloor heating clamping rails on the insulation, made of plastic

Art. No.	Designation	PU1 UNIT	Weight kg
1008000	40mm	100	0.002
1008010	60mm	100	0.002

KM613 KELOX FB fixing plate

Deep-drawn pipe holding burls for stable fastening of KELOX multilayer pipes d16, connection of individual panels by overlapping. One long edge and one wide one as a reduced-size parent burl, marked with the KELIT logo between the parent burls; by preference, you should start installing on the right-hand side of the room. As a replacement for a clamping rail, PE screentone and fixing hooks

Spacing: VA 5, 10, 15, 20, 25 and 30cm
Height: 20mm
Content: 160 pcs/pallet

Attention: Add at least 10% additional requirement due to overlapping!

Art. No.	Designation	PU1 M2	Weight kg
6106310	1.45x0.85m	196.80	1.31

KM615 KELOX FB nub clip

To fix FB pipes within the fixing plate when laying pipes at an angle of 45°
Colour: black

Art. No.	Designation	PU1 UNIT	Weight kg
6106510	75x26mm	100	0.003

KM615H KELOX FB pipe anchor

To fix FB pipes within the insulation and fixing plates made of 3mm steel wire

Art. No.	Designation	PU1 UNIT	Weight kg
6106530	3mm	500	0.004

KM635S KELOX FB stapling panel - S

Expanded Polystyrene as per ÖNORM B 6000, HFC- and CFC-free, laminated HDPE fabric with PE coating, incl. adhesive overlap edge for stapling and fastening the KELOX-ULTRAX FB and ULTRA PE-RT pipes using KM611 staples
Load-bearing capacity of roll/folding panel:
max. 6.5 kN/m2 - EPS-T 650 - Dynamic rigidity < 20 MN/m3
Load-bearing capacity of roll/folding panel:
max. 10 kN/m2 - EPS-T 1000 - Dynamic rigidity < 25 MN/m3
Load-bearing capacity of folding roll:
max. 6.5 kN/m2 - EPS-T 040 - Dynamic rigidity < 20 MN/m3
Footfall sound improvement factor as per ÖNORM B 8115-4 with screeding mass of 100 kg/m2:
30/2 - 6.5kN - Footfall sound improvement factor:
28 dB - Lambda value: 0,040 W/mK
30/2 - 10kN - Footfall sound improvement factor:
27 dB - Lambda value: 0.038 W/mK
Water vapour diffusion resistance: 250,000 My
Compressibility: 2mm
supplied in coils: 10x1m
Folding roll: 10x1m

ATTENTION: Protect from direct sunlight, do not store outdoors!
Max. storage temperature 40°C!

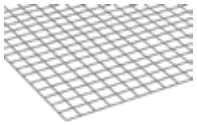
Art. No.	Designation	PU1 M2	Weight kg
6060730	30/2 roll 6.5kN	10	0.37
6060760	30/2 folding roll, 6.5kN	10	0.37
6060740	30/2 roll 10kN	10	0.39

KM611 KELOX FB staple

For stapling KELOX FB and ULTRA PE-RT d16 and 20mm pipes on the KM635 stapling panel using a WZ945 KELIT stapler.25 pcs each magazined, made of plastic
Requirement: approx. 2-3 pcs/running metre of pipe
Colour: black

Art. No.	Designation	PU1 UNIT	Weight kg
1008040	40mm	1000	0.002
1008050	50mm	250	0.002

KM637B KELOX FB pipe mat



Bare metal pipe mat for fastening KELOX ULTRAX FB and ULTRA PE-RT pipes using KM637C FB floor clips
Wire thickness: 3mm
Size: 2.1x1.2m
Pipe mats with mesh width of 50 x 50mm are available on request!

Art. No.	Designation	PU1 M2	Weight kg
6061110	100x100	2.52	1.1
6061210	150x150	2.52	0.76

KM637C KELOX FB clips

KELOX FB clips as a pipe holder on the KM637 or KM637B KELOX FB pipe mats; clips are mounted using the d16 or 20mm WZ946 KELOX clip setter

Art. No.	Designation	PU1 UNIT	Weight kg
6061500	16	2500	0.003
6061550	20	280	0.006

KM637S KELOX FB wire bag loops

KELOX FB bare wire bag loops for fastening and connecting KM637 KELOX FB pipe mats using a WZ949 KELIT binding device
Length: 12mm

Price per 100

Art. No.	Designation	VPE1 100 pcs	Weight kg
6061600	120	1000	0.001

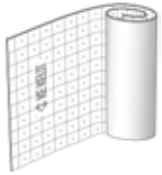
KM636S KELOX FB Velcro roll - S

Expanded polystyrene complying with ÖNORM B 6000, HFC- and CFC-free, laminated velour fabric with PE coating, incl. adhesive overlap edge for fixing KELOX-ULTRAX FB and ULTRA PE-RT Velcro tubes without additional fastening
Thickness: 30mm
Load-bearing capacity:
max. 6.5 kN/m2 - EPS-T 650 - Dynamic rigidity < 20 MN/m3
Load-bearing capacity:
max. 10 kN/m2 - EPS-T 1000 - Dynamic rigidity < 25 MN/m3
Footfall sound attenuation according to ÖNORM B 8115-4 with screeding mass of 100 kg/m2:
30/2 - 6.5kN - Footfall sound improvement factor:
28 dB - Lambda value: 0,040 W/mK
30/2 - 10kN - Footfall sound improvement factor:
27 dB - Lambda value: 0.038 W/mK
Water vapour diffusion resistance: 250,000 My
Compressibility: 2mm
supplied in coils: 10x1m

ATTENTION: Protect from direct sunlight, do not store outdoors!
Max. storage temperature 40°C!

Art. No.	Designation	PU1 M2	Weight kg
6060530	30/2 roll 6.5kN	10	0.38
6060560	30/2 roll 10kN	10	0.40

KM636K KELOX FB adhesive Velcro foil



Extruded PE foam, closed-cell 100% HCFC- and HFC-free self-adhesive over the full surface area with laminated velours fabric for fixing KELOX-ULTRAX FB Velcro tubes and ULTRA PE-RT Velcro tubes without additional fastening.
With thin-layer heated screeds, you must only ever use the KELOX-ULTRAX FB Velcro tube!
Thickness: 6mm
Max. load-bearing capacity: 5 kN/m2
Footfall sound improvement factor approx. 13 dB
Lambda value: 0.045 W/mK
Water vapour diffusion resistance: approx. 15,000 My
Supplied in coils: 20x1m
With thin-layer heated screeds, you must only ever use the KELOX-ULTRAX FB pipe!

ATTENTION: Protect from direct sunlight, do not store outdoors!
Max. storage temperature 40°C!

Art. No.	Designation	PU1 M2	Weight kg
6060510	6mm	20	0.04

KM636V KELOX FB Velcro sealing tape

Double-sided Velcro fastener for connecting the KM636 FB Velcro panel and the KM636K FB adhesive velour layer on the top as the adhesive layer for the KELOX-ULTRAX FB Velcro tube and the ULTRA PE-RT Velcro tube
Width: 50mm
Roll length 100m

Art. No.	Designation	PU1 UNIT	Weight kg
6060590	50mm	1	0.23

KM614 KELOX FB joint protection pipe

LDPE pipe with longitudinal slit for protecting KELOX FB pipes and ULTRA PE-RT pipes in the screed joint areaArt. No. 6108030: Length 400mm for FB pipe d16mm
Art. No. 6108050: Length 50m for FB pipes d16 and d20mm
Art. No. 6108070: Length 25m for FB pipe d25mm

Art. No.	Designation	PU1 UNIT	Weight kg
6108030	d16/400mm	1	0.036
6108050	d16 & 20/50m	50	0.089
6108070	d25/25m	25	0.098

KM619 KELOX FB measuring point

Self-adhesive measuring point for securely labelling drilled holes in the screed to determine the screed moisture

Art. No.	Designation	PU1 UNIT	Weight kg
6108100	100mm	5	0.006

KM630 KELOX FB footfall sound foil

Made from cross-linked polyethylene, coated on one side with tear-resistant mesh fabric and pigmented PE-LLD foil
Insulation thickness: 4mm

** Discontinued item

Art. No.	Designation	PU1 M2	Weight kg
6060900**	1.4x50m	70	0.237

KM631 KELOX FB screentone

Made from PE regranulate with grid graduation of 50mm
Thickness: 0.15-0.2mm

Art. No.	Designation	PU1 M2	Weight kg
6060910	2mx50m, folded	100	0.158

KM632 KELOX FB sealing tape

For bonding individual footfall sound foils and screentones
Width: 75mm
Roll length 66m

Art. No.	Designation	PU1 UNIT	Weight kg
1007120	75mm	1	0.253

KM634 KELOX FB edge insulating strip

Made from foamed PE, self-adhesive reverse including five tear-off strips; front with self-adhesive shrink-wrapped overlapping foil to connect tightly edge insulating strips and footfall sound foil or screentone
Roll length: 25m
Thickness: 8mm
Width: 150mm
Max. storage temperature 40°C!

mm	mm	PU1 Runn. m	Weight kg
150	8	200	0.05

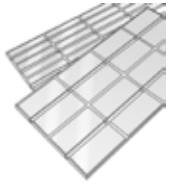
KM640 KELOX FB screed additive

Non-corrosive plastic dispersion as a plasticiser to improve the elasticity of heated screed and to prevent shrinkage cracks, Type ACE 417
Dosing: With screed thickness of 60 - 70mm, approx. 0.2 kg/m²

ATTENTION: DO NOT mix with other screed additives!
Protect from frost!

Art. No.	Designation	PU1 KG	Weight kg
1007200	Screed additive	10	10

KM660 KELOX dry system element



System element made from polystyrene EPS 035 DEO, 240 kPa, with 0.5 mm aluminium heat conduction plate laminated over the full surface area at the factory and omega-shaped flanged pipe channels to effectively enclose the KELOX-ULTRAX FB pipe, incl. rupture joints for exact-fitting over the full surface area of premises
VA: 12.5cm or 25cm
L: 1000mm W: 500mm H: 30mm

ATTENTION: to improve pressure stability, use wooden frame KM683!

Art. No.	Designation	PU1 UNIT	Weight kg
6103010	12.5	10	1.2
6103000	25	10	1.2

KM662 KELOX dry head element

Head element made from polystyrene EPS 035 DEO, 240 kPa, incl. milled pipe ducts for mounting KELOX-ULTRAX FB pipes
VA: 12.5cm or 25cm
L: 250mm W: 500mm H: 30Mm 4-ply

ATTENTION: to improve pressure stability, use wooden frame KM683!

Art. No.	Designation	PU1 UNIT	Weight kg
6103050	12.5/4-way	10	0.1
6103040	25/4-way	10	0.1

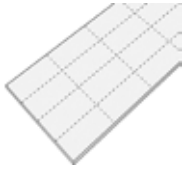
KM663 KELOX dry replaceable head element

Replaceable head element made from polystyrene EPS 035 DEO, 240 kPa, incl. milled pipe ducts for mounting KELOX-ULTRAX FB pipes for changing spacings
VA: 12.5cm-25cm
L: 250mm W: 380mm H: 30Mm 1-ply

ATTENTION: to improve pressure stability, use wooden frame KM683!

Art. No.	Designation	PU1 UNIT	Weight kg
6103060	12.5-25	1	0.1

KM664 KELOX dry filler insulation



Filler insulation made from polystyrene EPS 035 DEO, 240 kPa, incl. rupture joints for exact-fitting laying of rooms over the full surface area, cut the pipe ducts using the WZ960 KELOX heat cutter

ATTENTION: to improve pressure stability, use wooden frame KM683!

Art. No.	Designation	PU1 UNIT	Weight kg
6103070	1000x500x30mm	10	0.1

KM681 KELOX dry aluminium cover plate

Aluminium cover with adhesive strips as an additional heat conduction plate with head elements and edge plates where connection lines are to be routed

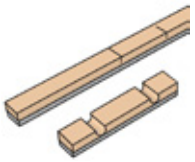
Art. No.	Designation	PU1 UNIT	Weight kg
6103600	495x242x0,5mm	1	0.1

KM682 KELOX dry steel load distribution plate

Galvanised load distribution plate made from steel plate as an additional cover with doorways or in the area of the manifold

Art. No.	Designation	PU1 UNIT	Weight kg
6103610	800x200x1mm	1	0.3

KM683 KELOX dry wooden frame



Wooden frame placed loosely all round to improve the compressive strength of the floor. To allow you to provide the necessary stability when changing floor coverings and to fasten the top profile rail, the wooden frame must be screwed in place at the doorways.
Two-layer structure, MDF 22 GL (22 mm medium-density fibreboard) as the base and pressure-stable low-density fibreboard WF 08 Hopa - 8mm

Wooden frame L: 1000mm W: 44mm H: 30mm
Passage wood L: 250mm W: 44mm H: 30mm - incl. 2 pipe grooves

Art. No.	Designation	PU1 UNIT	Weight kg
6103620	250x44x30mm	1	0.1
6103630	1000x44x30mm	1	0.4

KM686 KELOX dry universal dispersion fixative

For fixing and bonding KELOX dry Strong load distribution plates, KELOX dry head elements and cut KELOX dry system elements

Requirement: approx. 150 - 200 g/m2

Art. No.	Designation	PU1 KG	Weight kg
6103670	Dispersion fixative	5	5

KU615 ULTRA PE-RT pipe connector

For fixing ULTRA PE-RT pipes on the structural steel mesh
Colour: natural

Price: per 100 pcs.

Art. No.	Designation	VPE1 100 pcs	Weight kg
1008090	142/3.2	100	0.001

KU617 ULTRA PE-RT binding wire

Galvanised wire for binding and fixing ULTRA PE-RT pipes to structural steel mesh using the WZ948 KELIT wire-binding machine
Art. No. 1007880 - coil length: 100m for approx. 160 bindings

Art. No.	Designation	PU1 UNIT	Weight kg
1007880	Binding wire	10	0.4

K87 KELIT angle clip 90°

Plastic 90° angle clip for inserting and fixing flexible pipes
Suitable for:
KWS d16: KU100/d16
KWS d20: KU100/d20
KWS d29: KU100/d25

Art. No.	Designation	PU1 UNIT	Weight kg
2679022	KWS d16	5	0.06
2679024	KWS d20	5	0.06
2679033	KWS d29	5	0.14

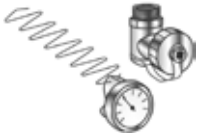
KM590E KELOX FB manifold

Feed and return flow bar with heating circuit outlets 3/4" euro cone with male thread, with bleeding at the highest point and draining, manifold ends closed, connections with pre-formed union nut 1" flat-sealing, manifold ends with 1" male thread, for screwing together individual manifold bars without additional connectors, on the feed line, pre-settable double-spindle valve, top parts to fit KM596 KELOX thermal motor, on the return flow water flow meter (0.5-2.5 l/min), non-porous metallized brass, incl. labelled plates for each heating circuit and sound-insulated metal consoles (1 circuit) without drain outlet, bleeding and metal console
Application area: tmax. 80°C/6 bar

ATTENTION - WITHOUT KM220 Euro screw fitting!

Art. No.	Designation	PU1 UNIT	Weight kg
7901500	1 L: 75mm	1	0.674
7902500	2 L: 175mm	1	1.884
7903500	3 L: 225mm	1	2.312
7904500	4 L: 275mm	1	2.805
7905500	5 L: 325mm	1	3.205
7906500	6 L: 375mm	1	3.688
7907500	7 L: 425mm	1	4.075
7908500	8 L: 475mm	1	4.543
7909500	9 L: 525mm	1	4.973
7910500	10 L: 575mm	1	5.452
7911500	11 L: 625mm	1	5.845
7912500	12 L: 675mm	1	6.354
1001000	Manifold mount	1	0.2
7902119	Key feed	1	0.002

KM592E KELOX accessories for manifold



KFE tap 3/8" Elbow 90° as spare part for KM590E, KMP590M
KFE tap 1/2", Elbow 90° as spare part for KM580E, KU590 and KC590
feed line screw-in double nipple 3/8"
feed line thermostat valve 3/8"
return line screw-in double nipple 3/8"
return line water flow meter 0.5-2.5 l/min 3/8"
contact thermometer d35 mm to 80°C as spare part for KM580E, KM590E and KMP590M

Art. No.	Designation	PU1 UNIT	Weight kg
9004435	3/8"male	1	0.283
9004430	1/2"male	1	0.283
9004440	Contact thermometer	1	0.091

KMU590E KELOX-ULTRAX FB manifold

Stainless steel flow and return flow bar with heating circuit outlets 3/4“ Eurocone male, with bleeding and emptying at the manifold end, connections with screwed-in cap nut 1“ flat-sealing. Return flow valve bonnets suitable for KM596 KELOX thermal motor, flow water meter of 0.5-5.0 l/min adjustable, incl. sound-insulated steel consoles
Application area: tmax. 70°C/6 bar

ATTENTION - WITHOUT KM220 Euro screw fitting!

Art. No.	Designation	PU1 UNIT	Weight kg
7902600	2 L: 225mm	1	2.15
7903600	3 L: 275mm	1	2.47
7904600	4 L: 325mm	1	2.85
7905600	5 L: 375mm	1	3.26
7906600	6 L: 425mm	1	3.678
7907600	7 L: 475mm	1	4.094
7908600	8 L: 525mm	1	4.512
7909600	9 L: 575mm	1	4.936
7910600	10 L: 625mm	1	5.342
7911600	11 L: 675mm	1	5.754
7912600	12 L: 725mm	1	6.136
7913600	13 L: 775mm	1	6.546

KMP590E KELOX-PROTEC FB stainless steel push fitting manifold

Stainless steel flow and return flow bar with pluggable heating circuit outlets, with bleeding and emptying at the manifold end, connections with screwed-in cap nut 1“ flat-sealing. Return flow valve bonnets suitable for KM596 KELOX thermal motor, flow water meter of 0.5-5.0 l/min adjustable, incl. sound-insulated steel consoles
Application area: tmax. 70°C/6 bar

ATTENTION - WITHOUT KMP552 PROTEC quick-push coupling!

Art. No.	Designation	PU1 UNIT	Weight kg
73171020	2 L: 225mm	1	2.15
73171030	3 L: 275mm	1	2.47
73171040	4 L: 325mm	1	2.85
73171050	5 L: 375mm	1	3.26
73171060	6 L: 425mm	1	3.678
73171070	7 L: 475mm	1	4.094
73171080	8 L: 525mm	1	4.512
73171090	9 L: 575mm	1	4.936
73171100	10 L: 625mm	1	5.342
73171110	11 L: 675mm	1	5.754
73171120	12 L: 725mm	1	6.136
73171130	13 L: 775mm	1	6.546

KMP590Z — KELOX-PROTEC FB stainless steel push fitting manifold, 10bar

Stainless steel flow and return flow bar with pluggable heating circuit outlets, with bleeding and emptying at the manifold end, connections with screwed-in cap nut 1" flat-sealing. Return flow valve bonnets suitable for KM596 KELOX thermal motor, flow shut-off valve, incl. sound-insulated steel consoles
Application area: tmax. 70°C/10 bar

ATTENTION - WITHOUT KMP552 PROTEC quick-push coupling!

Art. No.	Designation	PU1 UNIT	Weight kg
73173020	2 L: 225mm	1	2.13
73173030	3 L: 275mm	1	2.45
73173040	4 L: 325mm	1	2.83
73173050	5 L: 375mm	1	3.24
73173060	6 L: 425mm	1	3.66
73173070	7 L: 475mm	1	4.07
73173080	8 L: 525mm	1	4.49
73173090	9 L: 575mm	1	4.92
73173100	10 L: 625mm	1	5.32
73173110	11 L: 675mm	1	5.73
73173120	12 L: 725mm	1	6.12

KMP590D — KELOX-PROTEC regulating floor-heating push fitting manifold

Stainless steel flow and return flow bar with pluggable heating circuit outlets, with bleeding and emptying at the manifold end, connections with screwed-in cap nut 1" flat-sealing. Automatic flow control and hydraulic balancing of the individual return flow valves suitable for KM596 KELOX thermal motor, flow water meter of 0.5-5.0 l/min adjustable, incl. sound-insulated steel consoles
Application area: tmax. 70°C/6 bar

ATTENTION - WITHOUT KMP552 PROTEC quick-push coupling!

Art. No.	Designation	PU1 UNIT	Weight kg
73172020	2 L: 225mm	1	2.15
73172030	3 L: 275mm	1	2.47
73172040	4 L: 325mm	1	2.85
73172050	5 L: 375mm	1	3.26
73172060	6 L: 425mm	1	3.68
73172070	7 L: 475mm	1	4.1
73172080	8 L: 525mm	1	4.51
73172090	9 L: 575mm	1	4.94
73172100	10 L: 625mm	1	5.34
73172110	11 L: 675mm	1	5.76
73172120	12 L: 725mm	1	6.14

KMU592E — KELOX-ULTRAX FB manifold accessories

Manifold accessories for KMU590E, KMP590E, KMP590Z and KMP590D:
Manifold connecting screw fitting 1" male - 1" female
Manifold extension nipple 1" male - observe hydraulics
Bleeding and emptying 1"Manifold bracket
Return flow connecting nipple 1/2"x3/4" - suitable for KMU590E and KMP590Z
Return flow thermostat valve 1/2" - suitable for KMU590E and KMP590E
Flow connecting nipple 1/2"x3/4" - suitable for KMU590E
Flow top meter 1/2" - 0.5 - 5 l/min - suitable for KMU590E and KMP590E
Return flow thermostat valve 1/2" - suitable for KMP590D
Return flow cap (blue) - suitable for KMP590E and KMP590E
Manifold insulation 13-fold - SET for 1 manifold bar

Art. No.	Designation	PU1 UNIT	Weight kg
1221110	1" female thread x 1" male thread	1	0.15
1221115	Extension nipple 1"	1	0.31
1221150	Bleeding/emptying 1"	1	0.04
1221140	Bracket 200x82mm	1	0.4
1221220	RF-1/2"x3/4"E	1	0.015
1221350	RF valve 1/2"	1	0.08
1221210	F-1/2"x3/4"E	1	0.015
1221310	F-Topm. 1/2"-0.5-5	1	0.02
1221120	1"x1/2"	1	0.025
1221130	Drain outlet 1/2"	1	0.03
1221360	Return valve KMP590D	1	0.04
1221380	Return line cap, blue	1	0.01
1221160	Manifold insul.-13x	1	0.01

KM220 — KELOX Eurocone fitting

For connection to installation parts with 3/4" EUROCONE (male thread) as per EN 215, non-porous metallized brass, incl. nut female thread, support sleeve with O-rings and clamping ring
Marking: notch on circumference of the nut
O-ring colour: BLACK

Art. No.	Designation	PU1 UNIT	Weight kg
7701090	16x3/4"	20	0.081
7701120	20x3/4"	20	0.079
7701190	25x3/4"	10	0.158

KM370E — KELOX screw cap

End cap made of non-porous metallized brass with female thread; for closing off manifold outlets with a 3/4" euro cone, coupling system components, and the KM595 Quattrox radiator block

Art. No.	Designation	PU1 UNIT	Weight kg
7706820	3/4"	10	0.03

KMP552 KELOX-PROTEC quick-push coupling

Quick-push coupling, made of non-porous metallized brass, fits FB manifolds KMP590E, KMP590D and KMP590M, incl. support sleeves, O-rings, withdrawal barriers and a protector ring as an insertion locking device

Art. No.	Designation	PU1 UNIT	Weight kg
73175B00	16	10	0.062
73175D00	20	10	0.069

KMP553 KELOX-PROTEC quick-push cap

Quick-push cap, made of non-porous metallized brass, fits FB manifolds KMP590E, KMP590D and KMP590M

Art. No.	Designation	PU1 UNIT	Weight kg
73178B00	F/RF	10	0.07

KMP554 KELOX-PROTEC quick-push adapter with male thread

Quick-push adapter with male thread, made of non-porous metallized brass, fits FB manifolds KMP590E, KMP590D and KMP590M. In combination with KM258 reusable stoppers suitable for pressure testing KELOX multilayer pipes

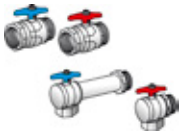
Art. No.	Designation	PU1 UNIT	Weight kg
73179Z02	F/RF 1/2"	10	0.07

KM593A KELOX connecting set

Manifold connection:
Reduction or nipple flat-sealing made of non-porous metallized brass

Art. No.	Designation	PU1 PAIR	Weight kg
9004400	1"x3/4" redu.	1	0.175
9004420	1"x1" nipple	1	0.223

KM593E KELOX connection ball valve



Straight- or elbow-form connection ball valves for shutting off manifolds, flat-sealing male thread to the manifold bar incl. seal, (return flow elbow extended) non-porous metallized brass

Art. No.	Designation	PU1 SET	Weight kg
9004700	3/4" straight	1	0.596
9004750	3/4" elbow 90°	1	0.775
9004800	1" straight	1	0.775
9004850	1" elbow 90°	1	0.775
90048502	1" elbow 90° B	1	0.517
90048501	1" elbow 90° R	1	0.258
90048002	1" straight B.	1	0.388
90048001	1" straight R.	1	0.388
90047502	3/4" elbow 90° B	1	0.517
90047501	3/4" elbow 90° R	1	0.258
90047002	3/4" straight B.	1	0.298
90047001	3/4" straight R.	1	0.298

KM591E KELOX heat meter fitting piece

Straight- or elbow-form connection ball valves, heat meter fitting piece, 3/4" (110 mm) with flat seal male thread for connecting to the manifold bar; seal included; connection option for temperature measurement (return flow elbow form extended); non-porous metallized brass

Art. No.	Designation	PU1 SET	Weight kg
9004200	3/4" straight	1	1.435
9004250	3/4" elbow 90°	1	1.762

KM593T KELOX 6/4" connection ball valve with thermometer

Straight connecting ball valves for shutting off 6/4" manifolds, flat-sealing male thread to the manifold bar, including seal, thermometer from 0-120°C, non-porous metallized brass

Art. No.	Designation	PU1 PAIR	Weight kg
90049050	6/4" straight	1	2.75

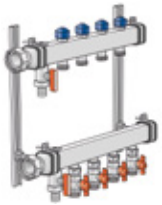
KM651 KELOX FB fixed value regulator set

KELOX FB fixed value regulator set for regulating the temperature of individual underfloor heating circuits to a temperature level of radiator heating systems (e.g. 70/55°C). The principle functions according to thermal injection control as a fixed-value regulator system and is installed directly on the manifold. If all the underfloor heating circuits are to be closed on an automated basis, the pump must be secured by means of a pump logic facility (e.g. a KM691 KELOX connection unit) to deactivate the pump. Pay attention to hydraulic balancing in the connecting pipes! Minimum depth of manifold cabinet 110mm
Consisting of:
Wilo-Yonos-Para 15/6 high-efficiency pump, temperature monitor, three-way valve, 2 connection ball valves with 3/4" male thread, all connection fittings on the manifold installed ready to plug in. Suitable for all KELOX FB 1" manifolds; additional width required is at least 220mm!

Application area: tmax. 80°C/6bar

Art. No.	Designation	PU1 UNIT	Weight kg
7952000	Type 2 all manifolds	1	4
7951020	Res. pump	1	2
7952200	Res. STB	1	0.005
7952100	Res. thermostat head	1	0.009
7952300	Res. return line barbed cross connection 1"	1	0.4
7952310	Res. thermometer	1	0.02
7952320	Res. feed line barbed cross connection 1"	1	0.4
7952330	Res. ball valve, red, 3/4"	1	0.3
7952331	Res. ball valve, blue, 3/4"	1	0.3

KU590E ULTRA PE-RT industrial surface manifold pipe 6/4"



6/4" stainless steel flow and return flow bar with bleeding and emptying at the manifold end, connections with screwed-in 6/4" flat-sealing cap nut. On the feed line ball valve, 3/4" non-porous metallized brass with euro cone male thread; on the return line thermostatic valve for setting the water amount, heating circuit outlets 3/4" euro cone with male thread, return flow valve bonnets to fit KM596 KELOX thermal motor including soundproofed steel consoles
Area of application: tmax. 80°C/6 bar

ATTENTION - WITHOUT KM220 Euro screw fitting!

Art. No.	Designation	PU1 UNIT	Weight kg
7964020	2 L:300mm	1	3.58
7964030	3 L:380mm	1	4.37
7964040	4 L:460mm	1	5.16
7964050	5 L:540mm	1	5.98
7964060	6 L:620mm	1	6.73
7964070	7 L:700mm	1	7.52
7964080	8 L:780mm	1	8.31
7964090	9 L:860mm	1	9.09
7964100	10 L:940mm	1	9.88
7964110	11 L:1020mm	1	10.72
7964120	12 L:1100mm	1	11.44

KU590W ULTRA PE-RT industrial surface manifold pipe 6/4"

6/4" stainless steel flow and return flow bar with bleeding and emptying at the manifold end, connections with screwed-in 6/4" flat-sealing cap nut. On the feed line ball valve, 3/4" non-porous metallized brass with euro cone male thread; on the return line thermostatic valve for setting the water amount, heating circuit outlets 3/4" euro cone with male thread, return flow valve bonnets to fit KM596 KELOX thermal motor including soundproofed steel consoles
Area of application: tmax. 80°C/6 bar

ATTENTION - WITHOUT KM220 Euro screw fitting!

Art. No.	Designation	PU1 UNIT	Weight kg
7966020	2 L:300mm	1	3.47
7966030	3 L:380mm	1	4.24
7966040	4 L:460mm	1	5.01
7966050	5 L:540mm	1	5.8
7966060	6 L:620mm	1	6.53
7966070	7 L:700mm	1	7.29
7966080	8 L:780mm	1	8.06
7966090	9 L:860mm	1	8.82
7966100	10 L:940mm	1	9.58
7966110	11 L:1020mm	1	10.4
7966120	12 L:1100mm	1	11.1
7966130	13 L:1180mm	1	11.88
7966140	14 L:1260mm	1	12.64
7966150	15 L:1340mm	1	13.41
7966160	16 L:1420mm	1	14.18

KM570 KELOX universal manifold cabinet body

Sendzimir-galvanised sheet steel cabinet can be connected from below or at the side; height-adjustable feet; surface-or flush-mounted visible part can be retrofitted. Number of manifold outlets matched to KM590E and KMP590M KELOX FB manifold plaster trim element below cabinet, Width: max. 120mm
Cabinet depth: 75mm
Installation height: 600mm above finished floor

Art. No.	Designation	PU1 UNIT	Weight kg
9000500	1-4 L: 460mm	1	6
9000600	5-8 L: 690mm	1	7.8
9000700	9-12 L: 840mm	1	9.7
9000800	Special size L: 1150mm	1	12.5
1001003	Screed panel 460mm	1	0.2
1001002	Screed panel 690mm	1	0.25
1001006	Screed panel 840mm	1	0.3
1001005	Screed panel 1150mm	1	0.35

KM570F KELOX manifold cabinet body 110

Sendzimir-galvanised sheet steel cabinet can be connected from below or at the side; height-adjustable feet; surface-or flush-mounted visible part can be retrofitted. Suitable for installing the KM651 KELOX FB fixed value regulator set and KU590 industrial surface manifold. Space for straight or 90° connection sets KM593E as well as KM591E 90° elbow taken into account. Number of manifold outlets matched to KM590E KMP590M KELOX FB brass manifolds!
Plaster trim element below cabinet, Width: 120mm
Cabinet depth: 110mm
Installation height: 600mm above finished floor

Art. No.	Designation	PU1 UNIT	Weight kg
9000510	1-4 L: 460mm	1	6.3
9000610	5-8 L: 690mm	1	8.15
9000710	9-12 L: 840mm	1	10.1
9000810	Special size L: 1150mm	1	12.95

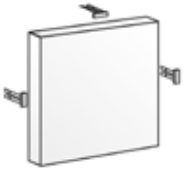
KM571 KELOX UP visible part

Sendzimir-galvanised lockable front door and frame, powder-coated, can be retrofitted with cylinder lock
Colour: White (RAL 9016)
Height: 530mm

Screed modesty panel, powder-coated (RAL 9016)
Length: coordinated with cabinet length
Height: 135mm

Art. No.	Designation	PU1 UNIT	Weight kg
9000550	1-4 L: 530mm	1	3.3
9000650	5-8 L: 760mm	1	4.6
9000750	9-12 L: 910mm	1	7.7
9000850	Special size L: 1220mm	1	10.2
1001004	Cylinder lock	1	0.03
1001010	Modesty panel 1-4/135	1	0.09
1001007	Modesty panel 5-8/135	1	0.1
1001008	Modesty panel 9-12/135	1	0.11
1001009	Modesty panel 1220/135	1	0.12

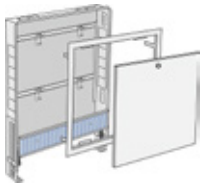
KM572 KELOX AP visible part



Sendzimir-galvanised door with depth-adjustable surface-mounted visible part with magnetic holder; powder-coated
Colour: white (RAL 9016)
Depth: 130mm
Height: 670mm above finished floor

Art. No.	Designation	PU1 UNIT	Weight kg
9000580	1-4 L: 530mm	1	8.5
9000680	5-8 L: 760mm	1	10.8
9000780	9-12 L: 910mm	1	12.6
9000880	Special size L: 1220mm	1	16.1

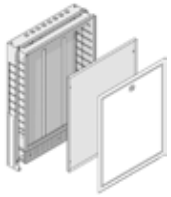
KM576 KELOX manifold cabinet with metal cover



Galvanised universal sheet steel cabinet; can be connected from below or at the side, height-adjustable feet with special length up to 32cm raised floor, plaster trim element below cabinet, including plaster net and plaster protection for inside the cabinet protruding on the plaster trim element, including manifold brackets, galvanised lockable front doors and frame, powder-coated. Space for straight or 90° connection sets KM593E as well as KM591E 90° elbow. Number of manifold outlets matched to KMU590E, KMP590E, KMP590Z and KMP590D FB stainless steel manifolds!
Colour: White (RAL 9016)
Cabinet depth: 75mm
Optional stacking frame to increase installation depth by 70mm for compatibility with KU590E too
Optional modesty panel, white as later replacement for plaster trim element, height, 85mm
Installation height: 630mm above finished floor

Art. No.	Designation	PU1 UNIT	Weight kg
9003100	1-3 L: 400mm SET	1	7.9
9003200	1-4 L: 550mm SET	1	9.7
9003300	5-8 L: 750mm SET	1	12.2
9003400	9-12 L: 1070mm SET	1	16.2
9003500	13-15 L: 1350mm SET	1	19.7
9003110	Stacking frame 1-3	1	4.14
9003210	Stacking frame 1-4	1	4.34
9003310	Stacking frame 5-8	1	4.61
9003410	Stacking frame 9-12	1	5.04
9003510	Stacking frame 13-15	1	5.42
9003120	Modesty panel 1-3/70	1	0.9
9003220	Modesty panel 1-4/70	1	1.1
9003320	Modesty panel 5-8/70	1	1.4
9003420	Modesty panel 9-12/70	1	1.9
9003520	Modesty panel 13-15/70	1	2.3
9003130	Replacement visible part 1-3	1	2.8
9003230	Replacement visible part 1-4	1	3.5
9003330	Replacement visible part 5-8	1	4.5
9003430	Replacement visible part 9-12	1	6.1
9003530	Replacement visible part 13-15	1	7.6

KM577 KELOX UP manifold cabinet with metal cover



Galvanised universal steel housing with telescopic pull-out frame; can be connected from below or at the side; height-adjustable feet; plaster trim element below cabinet, including plaster net and plaster protection for inside the cabinet protruding by 60mm on the plaster trim element; including manifold brackets, galvanised lockable front doors and frame, powder-coated, cylinder lock can be retrofitted.
Space for straight or 90° connection sets KM593E as well as KM591E 90° elbow. Number of manifold outlets matched to KMU590E KMP590E KELOX-ULTRAX FB stainless steel manifolds!
Colour: White (RAL 9016)
Cabinet depth: 75 - 120mm
Installation height: 600mm above finished floor

Screed modesty panel, powder-coated (RAL 9010)
Length: coordinated with cabinet length
Height: 90mm

Art. No.	Designation	PU1 UNIT	Weight kg
9001530	1-3 L: 400mm SET	1	6
9001630	4-6 L: 600mm SET	1	7.1
9001730	7-9 L: 800mm SET	1	10.5
9001830	10-13 L: 1000mm SET	1	12.7
9001930	Special size L: 1200mm SET	1	14.9
1002541	Modesty panel 1-3/90	1	0.4
1002641	Modesty panel 4-6/90	1	0.6
1002741	Modesty panel 7-9/90	1	0.7
1002841	Modesty panel 10-13/90	1	0.9
1002941	Modesty panel 1260/90	1	1
9000541	1-3 metal visible parts	1	2.7
9000641	4-6 metal visible parts	1	3.4
9000741	7-9 metal visible parts	1	3.9
9000841	10-13 metal visible parts	1	5.7
9000941	L:1200 metal visible parts	1	6.7
1001531	1-3 telescopic frame	1	0.75
1001631	4-6 telescopic frame	1	0.86
1001731	7-9 telescopic frame	1	0.97
1001831	10-12 telescopic frame	1	1.08
1001931	L: 1200 telescopic frame	1	1.19
1001170	Cylinder lock, metal	1	0.03

KM690 KELOX wireless room thermostat, analogue

Surface-mount room thermostat for controlling 1 to 10 230V thermal motors (maximum of 3 W per thermal motor) Operating voltage: 230V AC 50 Hz
Hysteresis: +/- 0.5 K
Contact: 1 NCC
Setting range: 10°C - 28°C
Protection class/degree of protection: IP 20
Size: 86x86x29mm
Colour: white (RAL 9003)
Compatible with KM691 connection unit!

ATTENTION: Only in conjunction with KM596 KELOX thermal motor 230V!

Art. No.	Designation	PU1 UNIT	Weight kg
5881100	86x86x29mm	1	0.09

KM690A KELOX room thermostat, analogue, covered

Surface-mount room thermostat with covered controller for controlling 1 to 10 230V thermal motors (maximum of 3 W per thermal motor)
Operating voltage: 230V AC 50 Hz
Hysteresis: +/- 0.5 K
Contact: 1 NCC
Setting range: 10°C - 28°C
Protection class/degree of protection: IP 20
Size: 86x86x2
Colour: white (RAL 9003)
Compatible with KM691 connection unit!

ATTENTION: Only in conjunction with KM596 KELOX thermal motor 230V!

Art. No.	Designation	PU1 UNIT	Weight kg
5881110	86x86x26mm	1	0.09

KM690D KELOX Standard room thermostat, digital

Surface-mount room thermostat with display for controlling 1 to 5 230V thermal motors (maximum of 3 W per thermal motor)
Operating voltage: 230V AC 50 Hz
Hysteresis: +/- 0.5 K at 17-24°C
Contact: 1 NCC
Setting range: 5°C - 30°C
Protection class/degree of protection: IP 20
Size: 86x86x31mm
Colour: white (RAL 9003)
Compatible with KM691 connection unit!

ATTENTION: Only in conjunction with KM596 KELOX thermal motor 230V!

Art. No.	Designation	PU1 UNIT	Weight kg
5881120	86x86x31mm	1	0.105

KM690K KELOX Comfort room thermostat, digital

Surface-mount room thermostat with backlit display for controlling 1 to 5 230V thermal motors (maximum of 3 W per thermal motor), for heating and cooling with changeover input
Operating voltage: 230V AC 50 Hz
Hysteresis: +/- 0.5 K at 17-24°C
Contact: 1 NCC
Setting range: 5°C - 30°C
Protection class/degree of protection: IP 20
Size: 86x86x31mm
Colour: white (RAL 9003)
Compatible with KM691 connection unit!

ATTENTION: Only in conjunction with KM596 KELOX thermal motor 230V!

Art. No.	Designation	PU1 UNIT	Weight kg
5881130	86x86x31mm	1	0.105

KM690U KELOX Control room thermostat, digital

Surface-mount room thermostat with backlit display for controlling 1 to 5 230V thermal motors (maximum of 3 W per thermal motor), for heating and cooling with changeover input, self-learning control system with selectable time-switching programs, KM560 dew point monitor or KM699 floor sensor can be connected
Operating voltage: 230V AC 50 Hz
Hysteresis: +/- 0.5 K at 17-24°C
Contact: 1 NCC
Setting range: 5°C - 30°C
Protection class/degree of protection: IP 20
Size: 86x86x31mm
Colour: white (RAL 9003)
Compatible with KM691 connection unit!

ATTENTION: Only in conjunction with KM596 KELOX thermal motor 230V!

Art. No.	Designation	PU1 UNIT	Weight kg
5881140	86x86x31mm	1	0.105

KM691 KELOX 230V connection unit

For connecting a maximum of 6 room thermostats, possible to connect up to 15 thermal motors, maximum of 5 thermal motors per channel, possible to connect a time switch for time control or for a changeover signal, as well as pump logic for connecting and switching a 230V/200W circulation pump
Size: 327x90x52mm

ATTENTION: Take into account space requirement in distribution cabinet!
Only in conjunction with KM596 KELOX thermal motor 230V!

Art. No.	Designation	PU1 UNIT	Weight kg
5881160	327x90x52mm	1	0.43

KM692K KELOX BUS room thermostat, digital

Surface-mount bus room thermostat as a signal transmitter to the KM693 BUS connection unit and, in addition, to control 24 V thermal motors; with backlit display; can also be used for programming the KM693 connection unit, KM699 floor sensor or KC560 dew point monitor can be connected
Power supply: 24V via the mBUS of the KM693 KELOX 24V bus connection unit
Hysteresis: +/- 0.3 K
Setting range: 5°C - 30°C
Protection class/degree of protection: IP 20
Size: 86x86x26.5 mm
Colour: white (RAL 9003)

ATTENTION: Can only be operated in conjunction with the KM693 24V connection unit!

Art. No.	Designation	PU1 UNIT	Weight kg
5881520	86x86x26,5mm	1	0.11

KM693 KELOX BUS 24V connection unit

For connecting a maximum of 8 room thermostats, possible to connect up to 12 (24V) thermal motors, potential-free contact for a changeover signal, as well as pump logic for switching a 230V/200 W circulation pump, up to 7 KM693 can be connected via syBUS. Integration into a network by means of an RJ45 Ethernet port is possible, operation by means of a Web interface or smartphone app (a network connection is necessary) or via a KM692K room unit. Integration by means of an XML interface into a centralised instrumentation and control system is possible
Connection voltage: 230V AC 50 Hz
Size: 370x52x75mm
Colour: light grey (RAL 7035)

ATTENTION: Take into account space requirement in distribution cabinet!
Only in conjunction with KM692K bus room thermostats!
Only in conjunction with KM596 KELOX thermal motor 24V!

Art. No.	Designation	PU1 UNIT	Weight kg
5881560	370x52x75mm	1	1.69

KM694 KELOX wireless room thermostat, analogue

Surface-mount wireless room thermostat as a signal transmitter to the KM695 wireless receiver bus connection unit and, in addition, to control 24V thermal motors
Power supply: 2xAAA Batteries (included)
Hysteresis: +/- 0.3 K
Setting range: 10°C - 28°C
Protection class/degree of protection: IP 20
Wireless frequency: 868 MHz
Size: 86x86x26mm
Colour: white (RAL 9003)

ATTENTION: Can only be operated in conjunction with the KM695 or KM695S!

Art. No.	Designation	PU1 UNIT	Weight kg
5881300	86x86x26mm	1	0.11

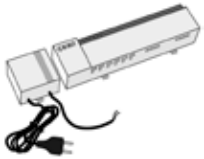
KM694K KELOX wireless room thermostat, digital

Surface-mount digital wireless room thermostat with backlit display as a signal transmitter to the KM695 bus wireless receiver and, in addition, to control 24V thermal motors; can also be used for programming the KM695 receiver; KM699 floor sensor can be connected
Hysteresis: +/- 0.3 K
Contact: 1 NCC
Setting range: 5°C - 30°C
Protection class/degree of protection: IP 20
Wireless frequency: 868 MHz
Power supply: 2xAAA Batteries (included)
Size: 86x86x26.5 mm
Colour: white (RAL 9003)

ATTENTION: Can only be operated in conjunction with the KM695 or KM695S!

Art. No.	Designation	PU1 UNIT	Weight kg
5881330	86x86x26,5mm	1	0.11

KM695 KELOX 24V wireless receiver



For connecting a maximum of 8 room thermostats, possible to connect up to 12 (24V) thermal motors, potential-free contact for a changeover signal, as well as pump logic for switching a 230 V/200 W circulation pump, up to 7 KM695 or KM695S can be connected via wireless and/or syBUS.
Integration into a network by means of an RJ45 Ethernet port is possible, operation by means of a Web interface or smartphone app (a network connection is necessary) or via a KM694K room unit. Integration by means of an XML interface into a centralised instrumentation and control system; maximum distance from wireless room thermostat 3 walls and 1 storey ceiling
Connection voltage: 230V AC 50 Hz
Wireless frequency: 868 MHz
Size: 370x52x75mm
Colour: Light grey (RAL 7035)

ATTENTION Take into account space requirement in distribution cabinet!
In conjunction with KM694 or KM694K wireless room thermostats only!
Only in conjunction with KM596 KELOX thermal motor 24V!

Art. No.	Designation	PU1 UNIT	Weight kg
5881360	370x52x75mm	1	1.69

KM695S KELOX single-channel 230V wireless receiver

For connecting a room thermostat, possible to connect thermal motors up to a maximum of 10 W overall output as well as pump logic for connecting and switching a circulation pump, up to 7 KM695 or KM695S can be connected via wireless and/or syBUS. Maximum distance from wireless room thermostat 3 walls and 1 storey ceiling max.
Connection voltage: 230V AC 50 Hz
Wireless frequency: 868 MHz
Switching capacity: 1 A
Size: 86x86x33mm
Colour: white (RAL 9003)

ATTENTION: Take into account space requirement in distribution cabinet!
In conjunction with KM694 or KM694K wireless room thermostats only!
Only in conjunction with KM596 KELOX thermal motor 230V!

Art. No.	Designation	PU1 UNIT	Weight kg
5881370	86x86x33mm	1	0.13

KM695R KELOX 230V wireless repeater

To improve and amplify the wireless transmission signal between wireless room thermostats and wireless receivers under difficult ambient conditions
Operating voltage: 230V AC 50 Hz
Wireless frequency: 868 MHz
Size: 76x76x35mm
Colour: white (RAL 9003)

ATTENTION: In conjunction with KM694 or KM694K wireless room thermostats only!

Art. No.	Designation	PU1 UNIT	Weight kg
5881390	76x76x35mm	1	0.155

KM699 KELOX FB floor sensor

KELOX FB floor sensor for collecting and monitoring the underfloor heating temperature. If possible, installation on the screed surface; connection and control carried out via KELOX room thermostats
Cable length: 3m

ATTENTION: Only in conjunction with KM690U, KM692K and KM694K!

Art. No.	Designation	PU1 UNIT	Weight kg
5881600	Underfloor heating sensor	1	0.01

KM596 KELOX thermal motor

For mounting on KM590E, KMU590E, KU590, KMP590E, KMP590E, KMP590M and KC590 with adapter for M30x1.5mm thread, incl. first-open function: half-open when new, does not close to 100% until after commissioning (at least 6 minutes)
230V AC: Switch-on current 550 mA / 1W
24V - AC/DC: Switch-on current 300 mA / 1W
Protection type/class: IP 54
Displacement: 4.0mm
Standard: "normally closed" (NC)

Art. No.	Designation	PU1 UNIT	Weight kg
9005050	230V normally closed 1W	1	0.145
9005040	24V normally closed 1W	1	0.145
9005025	230V normally open 1W	1	0.145
9005015	24V normally open 1W	1	0.145

WZ915 KELOX calibration mandrel

Calibration mandrels for deburring and inside chamfering on KELOX multilayer pipes, socket for slow-running drills or KELOX universal click handle to plug in, suitable for all sizes.

Calibration SET 1 consisting of:
Calibration mandrel d16, 20, 25 and 1 universal click handle, packaged in a case

Calibration SET 5 consisting of:
Calibration mandrel d16, 20, 25, 32 and 1 universal click handle, Bending spring d16, 20, 25,
and pipe shears, packaged in a case

Calibration SET 6 consisting of:
Calibration mandrel d16, 20, 25, 32 and 1 universal click handle, WZ916A multi-calibration mandrel,
bending spring d16, 20, 25, pipe shears and pipe-holding pliers, packaged in a case

** Discontinued item

Art. No.	Designation	PU1 UNIT	Weight kg
7609160	16	1	0.07
7609200	20	1	0.08
7609250	25	1	0.13
7609100	Calibration SET 1	1	0.7
7609135	Calibration SET 5	1	2.535
7609050	Calibration SET 6	1	3.15
7609090	Universal click handle	1	0.11
7609080	Case	1	0.32

WZ916 KELOX multi-calibration mandrel

Multi-calibration mandrel for deburring and creation of the inside chamfer at the KELOX multilayer pipe
Art. No. 7608000: d16, 20, 25mm
Art. No. 7608050: d16, 20mm

Art. No.	Designation	PU1 UNIT	Weight kg
7608000	16-20-25	1	0.35
7608050	16-20	1	0.35

WZ916A KELOX multi-calibration mandrel with removable protective sleeves

Multi-calibration mandrel for deburring and inside chamfering on the KELOX multilayer pipe with removable protective sleeves specifically for processing heating and cooling connections
Sizes: d16, 20 and 25mm

Art. No.	Designation	PU1 UNIT	Weight kg
7608100	16-20-25	1	0.35

WZ130 KELIT pipe scissors

For cutting the KELIT pipes d16-40mm
Replacement blade WZ130/2
Repair set WZ130/2
Replacement bolt set for blade WZ130/2

Art. No.	Designation	PU1 UNIT	Weight kg
2690000	16-40	1	0.57
2690070	Replacement blade-2	1	0.09
2690060	Replacement set-2	1	0.035
2690080	Replacement bolt-2	1	0.03

WZ932 KELOX pipe cutter

For cutting to length KELOX multilayer pipes up to d20mm

Art. No.	Designation	PU1 UNIT	Weight kg
7601000	10-20	1	0.348
7601100	Replacement blade	1	0.016

WZ920 KELOX bending spring

To create tight radii
(smaller than 5d) on KELOX multilayer pipes without cross-section constriction, the dimensions d16, 18, 20 and 25mm are equipped with an extension spring 1.2m
Spring length: 610mm
1.2 m extension spring available separately on request!

Art. No.	Designation	PU1 UNIT	Weight kg
7600160	16	1	0.219
7600200	20	1	0.327
7600250	25	1	0.471
7600160V	Verl.1,2 m	1	0.025

WZ940 KELOX decoiler

For torsion-free unwinding of KELOX d16-25mm pipes, steel pipe, galvanised, foldable; option of widening using an extension set for large rolls, packaged in a cardboard box

Art. No.	Designation	PU1 UNIT	Weight kg
1007940	UNI. d16-25	1	21
1007941	Extension set	1	1

WZ941 KELOX door spreader for Velcro tubes

Door spreader with wire spiral for spreading in 70-100 cm-wide doors, as an installation aid for hanging and laying KELOX Velcro tubes KMU121K and KU101K ULTRA PE-RT pipes

Art. No.	Designation	PU1 UNIT	Weight kg
1007300	Door spreader for Velcro tubes	1	0.5

WZ945 KELOX stapler

For stapling KELOX multilayer pipes using KM611 staples on the KM635 stapling panel

Art. No.	Designation	PU1 UNIT	Weight kg
1007950	Stapler	1	2.5
1007951	Stand	1	0.3

WZ946 KELOX clip setter

For installing the KM637C KELOX FB heating clips on the KM637 and KM637B KELOX FB pipe mat

Art. No.	Designation	PU1 UNIT	Weight kg
1007965	16	1	1.5
1007970	20	1	1.6

WZ950 KELOX hand dispenser

For rapid, reliable unwinding of the 75mm sealing tape

Art. No.	Designation	PU1 UNIT	Weight kg
1007110	Hand dispenser	1	0.818

WZ948 KELIT wire binding device

For binding and fastening ULTRA PE-RT pipes using KU617 binding wire on structural steel mesh; incl. 2 batteries and charger; supplied in plastic case
Handle extension: 82cm

Art. No.	Designation	PU1 UNIT	Weight kg
1007810	up to 40mm Type 2	1	5.7
1007835	Handle extension Type 2	1	0.9
1007841	Rechargeable battery 4.0 Ah li-ion	1	0.5
1007855	Charger, 18V Type 2	1	0.55
1007838	Wire guide extension	1	0.042

WZ949 KELIT binding device

Binding device with rubber handle for twisting KELOX KM637S FB wire bag loops
Length: 310mm

Art. No.	Designation	PU1 UNIT	Weight kg
1007860	310	1	0.5

WZ960 KELOX heat cutter

For later cutting of pipe channels in KELOX dry polystyrene panels

Art. No.	Designation	PU1 UNIT	Weight kg
9911000	Heat cutter	1	1.5

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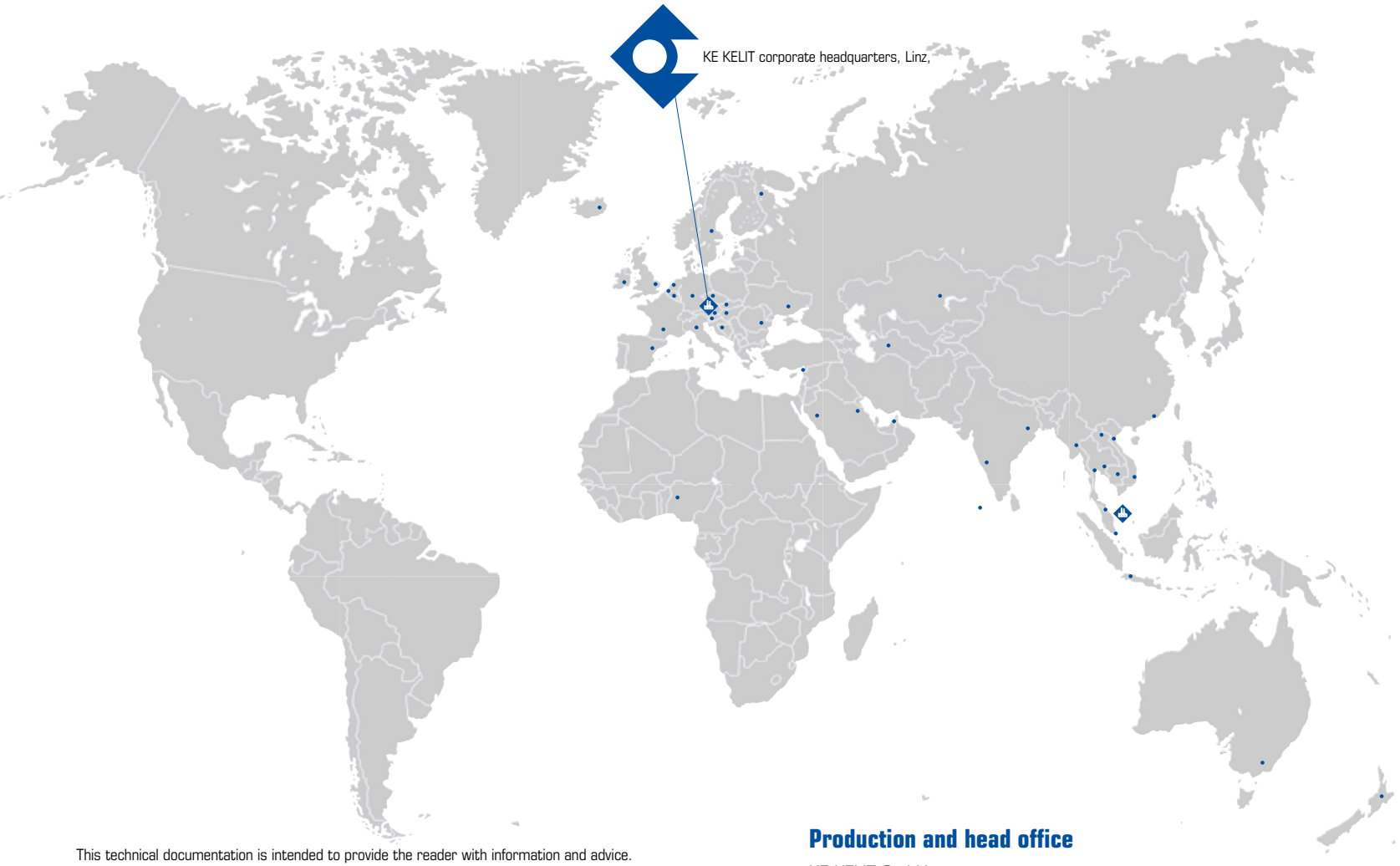

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The publication of this technical information invalidates all previous versions of this document!
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