KELOX® Surface heating system

The installed heat
Table of Contents

Quality targets, approval, registration 3
Surface heating systems, KELOX FB underfloor heating 4–5
Structure of the module pipes and oxygen-tightness 6–7
KM220 euro screw connection and assembly 8–9
Performance tables – clamping rails, staple and Velcro system 12–15
FB fixing plate system – assembly and required materials 16–17
Fixing plate tables – fixing plate system 18–21
FB staple plate system – assembly and required materials 22–23
FB Velcro plate system – assembly and required materials 24–25
KELOX FB clamping rail and fixing plate structure 26–27
KELOX FB staple plate and Velcro plate structure 28–29
KELOX dry drywall construction system and assembly 30–31
Performance tables – KELOX dry drywall construction system 32
KELOX dry swinging underfloor heating and sport flooring 33
Floor structure – recommendations 34
KELOX FB bake-out process and functional heating 35
KELOX wall heating and plaster instructions 36–37
KM590E KELOX and KMUS90E KELOX-ULTRAX FB manifold 38–39
KELOX FB manifold components and radio components 40–41
KELOX flush-mounted and surface-mounted manifold cabinet 42–43
KELOX ULTRA PE-RT industrial surface heating 44–45
Performance tables – industrial surface heating 46–47
KU590 ULTRA PE-RT industrial surface manifold 48
KELOX ULTRA PE-RT open-space heating system 49
KELOX dimensioning and pressure loss - pressure test 50–51
 KELOX FB installation requirements and general installation guidelines 52–53
KELOX programme overview 54–70
Programme overview 71–73
Representative, production and headquarters 74–75

KE KELIT's quality targets

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

Note
Prior to the first KELOX FB application, please inform yourself in this assembly handbook about the assembly rules and particularly about the joining technology.

Approval Registration

Products in accordance with:
ÖNORM EN ISO 21003
ÖNORM EN 1264 - Series
ÖNORM B 2242 - Series
ÖNORM H 5160

Certified quality assurance system by ÖQS
ÖNORM EN ISO 9001
Reg.No. 366/0
ÖNORM EN ISO 14001
Reg.No. 02097/0

System testing
Not only individual parts, but also the entire system, are subject to basic and periodic testing. To ensure the quality targets defined in ISO 9001, two types of monitoring take place:

Self-monitoring in the KELIT quality laboratory:
- Raw material parameters
- Measurements
- Behaviour during warm storage

Third-party monitoring by authorised testing institutes
- System testing
- Internal pressure creep behaviour
- Peeling test of the composite
- Hygienic/toxicological suitability
- Oxygen-tightness
- Testing of the pipe connectors: compared to vacuum under tensile stress in an alternating temperature test in a pressure surge in an alternating bending test

The basis is the respective ÖNORM EN ISO 21003 series
Surface heating

Underfloor heating: ... heat from the ground up
In top-end housing construction, this embodiment is becoming the standard for particular living comfort.

Advantages
- hygienic benefits (no dust dispersal)
- balanced indoor climate
- free floor space and design space, architectural possibilities
- Formation of stone and ceramic coverings as heat zones

Wall heating: ... embedded in heat
Outside walls become “radiant heating elements” with a tiled stove effect. Long-wave radiant heat is perceived physiologically as being “pleasantly warm”.

Advantages
- healthy indoor climate through environmentally compatible, natural generation
- this can often be found sufficiently with an effective lower indoor air temperature, $-1^\circ = \text{approx. } 6\%$ energy saving
- Possibility of wall cooling in the summer
- KELOX FB module pipes can be detected electronically in the wall

Wellbeing also means ...

... health
- higher share of radiant heat
- psychosomatic wellbeing through low convection
- no smouldering dust at inaccessible radiator locations
- balanced temperature gradient

... comfort
- no uncomfortable heat zones
- optimally tunable to the floor covering/wall structure
- visibly appealing solutions for the visible area (manifolds)

... saving energy
Underfloor heating and wall heating systems operate in the low-temperature range (30 – 55°) and therefore automatically combine the following advantages:
- through the even ambient temperature, the indoor temperature can be reduced by approx. 2° in comparison to radiator heating
- typical area of application for condensing boiler systems and heating pumps
- effective use of energy

... freedom
- free choice of installation sites
- being free for all floor coverings: carpet, parquet, ceramic, stone
- in the choice of energy: district heating, wood heating, waste heat, heat pump and solar collectors!
- in the area of application: flats, schools, business premises, office buildings, indoor swimming pools, hospitals ...

KELOX FB underfloor heating

Through the high degree of flexibility of the module pipes and the well thought-out overall concept of the KELOX system parts, the KELOX FB system is suitable for all installation options, such as meandering, spiral, drywall, staple, Velcro or industrial surface installation and for many other implementation possibilities.

Floor surface temperature
ÖNORM EN 1264-3 defines the maximum floor surface temperatures.

| Living spaces, constantly used | 29°C |
| Bathrooms | 33°C |
| Peripheral zones | 35°C |

Advantages of the KELOX FB pipes
- can be modulated; the pipe remains stress-free in any position, no spring-back.
- absolutely oxygen-tight
- coil length: 300 and 500m
- for building site use, also easy to install from the coil, even in narrow radii and small spaces
- the most thermally favourable type of installation can be selected
- integrated into an overall system
- for underfloor and wall heating KELOX FB pipe systems

Therefore, the following damage patterns no longer apply:
- expensive signs of corrosion
- reduced service life of radiators and boilers
- accumulation of silt in heating pipes and malfunction of heating circuits due to blockage

Temperature profile with a typical KELOX underfloor heating system

... comfort
- no uncomfortable heat zones
- optimally tunable to the floor covering/wall structure
- visibly appealing solutions for the visible area (manifolds)
The structure of the KELOX FB module pipe

All five layers are produced “online” within one work stage and integrated into one another. The aluminium stabilisation pipe is welded in a thermally protected manner.

Characteristics
- minimum residual stress
- can be modulated
- virtually endless (up to 500m/roll)
- absolutely oxygen-tight
- 100% water-vapour-tight
- electrically detectable under plaster or in the underfloor area
- low thermal expansion
- \( (\alpha = 0.025\text{mm/mK}) \)
- thermal conductivity
- \( (\lambda = 0.45 \text{W/mK}) \)
- smooth internal wall (pipe roughness: 0.007mm),

Advantages
- fully developed overall system
- universally implementable
- in stock with wholesaler
- optional screw, press and push connections

Operating conditions
- Surface heating systems: Class 4 according to ÖNORM EN ISO 21003
- good heat transfer.
- Operating temperature: tmax. 70°C /10 bar

Underfloor heating pipes must be oxygen-tight.
Oxygen \((O_2)\) is dissolved in the water. This is vital for fish. For metal surfaces in a heating circuit, it can become deadly: Dissolved oxygen bonds with the iron in a steel surface (e.g. boiler, radiator, ...) into iron oxide.

Caution
If pipes in a heating circuit are \(O_2\)-permeable, new oxygen can repeatedly diffuse from the outside in and is constantly bonded again to iron. This leads to the following damage pattern:
- accumulation of silt in heating pipes and malfunction of heating circuits due to blockage
- expensive signs of corrosion
- complex renovation measures

The regulation
Because underfloor and wall heating systems have an unusually high proportion of pipes, this results in large diffusion surfaces. Modern standards (ÖNORM EN ISO 21003) therefore specify the minimum requirements regarding oxygen-tightness of heating pipes:

\[ \leq 0.32 \text{mg/m² and day} \]

The solution
KELOX FB module pipes underbid such standard requirements by 100 times! The aluminium intermediate layer is not only a supporting backbone in relation to strength, expansion and stability, but also an effective oxygen barrier and therefore is a guarantor for a long lifetime with assured functionality.

1. Cheap pipe without \(O_2\) barrier layer
2. Pipe with outside barrier layer
3. KELOX FB pipe with integrated metal insert
KM220 KELOX
euro screw connection

Requirements
- longitudinal traction
- detachable screw fitting, however, non-detachable pipe connection
- prevention of electrochemical dipoles
- no contact between medium water and aluminium layer

The solution
The multiple sealing KELOX screw fitting for pipes of d16 – 25mm

Implementation
For connections to the KM590E, KMU590E and KU590 etc. manifolds and radiators in the surface-mounted area and all KELOX screw system parts with a euro cone

The material
- stress-free annealed brass
- non-porous metal plating
- synthetic, ageing-resistant EPDM O-rings

Assembly instructions for KELOX euro screw connection

Only use trained assembly specialists!

1. Cut to length:
   Always at right angles – therefore straighten materials supplied in coils beforehand!  
   1.1 d14 – 20mm cut to length with WZ130 pipe cutter
   1.2 Pipes ≥ d25 cut to length with the WZ935 pipe cutter

2. Calibrate and chamfer:
   Always turn clockwise, both into and out of the pipe!  
   2.1 Click the universal handle onto the WZ915 calibration mandrel and rotate clockwise as far as it will go.

2.2 Alternatively, a slow running drill or power screwdriver can be used (max. 500 rpm). Remove the handle for this.

   This achieves the following:
   - Cutting angle corrected to 90°
   - Inner pipe wall is calibrated
   - Deburred on the outside
   - Surrounding inner bevel at the end of the pipe with a depth of approx. 1 mm. Visual check!

3. Marking the insertion depth with screw connectors
   On the protective housing, every calibration mandrel contains a relevant marking possibility for drawing on the correct insertion depth of the screw-on nozzle onto the pipe. (Marking becomes visible after tightening the screw fitting)

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

5. Slide the nut and nozzle of the screw fitting onto the end of the KELOX pipe.

6. Screwing together
   Important! Pay attention to the tightening torques.

   The nut is now tightened sufficiently on a counterpart (3/4” euro cone). This way, the KELOX pipe is pressed tightly with longitudinal tension and all sealing levels become functional.

6.1 After screwing, the marking of the insertion depth on the end of the nut is visible.

   Connections that are NOT screwed together can be sealed with the O-rings during the pressure test.

   The longitudinal traction is only created by tightening the screw fitting.

   Therefore, perform a visual check of ALL joints!

   For assembly corrections, the joints may be turned also after processing!

   Tightening torques
   d16   40 – 50 Nm
   d20   60 – 70 Nm
   d25   100 –110 Nm
**KELOX FB clamping rail system**

**Laying modules with KM610 KELOX FB clamping rail**

![Diagram]

**Meander installation**

The meander installation using FB clamping rails or FB fixing plate uses the module characteristics of the KELOX FB particularly effectively:

- The (warmer) flow can be positioned where the greatest heat emission is required:
  - outside walls
  - window areas
  - terrace entrances
- Peripheral zones with increased heat output can be selected without any problem
- Constant development of the surface temperature (no waviness).

**Advantages**

KELOX FB pipes have modular characteristics:

- Can be laid without spring-back
- The most thermally favourable type of installation can be selected
- Pipes remain laid – in the way that they are bedded
- They have a consistent installation characteristic, regardless of the temperature
- For underfloor and wall heating KELOX FB pipe d16 x 2mm

**Maximum pipe length**

120m/heating circuit (output-dependent)

**Assumed material requirement with KM610 FB clamping rail for KELOX underfloor heating/m²**

<table>
<thead>
<tr>
<th>Laying module</th>
<th>Module pipe KMU120 m/m²</th>
<th>Clamping rail KM610 m/m²</th>
<th>Fixing hook KM612 unit/m²</th>
<th>Protective joint tube KM614 unit/circle</th>
<th>Grid foil KM631 m/m²</th>
<th>Edge insulating strips KM634 m/m²</th>
<th>Screed additive KM640 kg/m²</th>
</tr>
</thead>
<tbody>
<tr>
<td>30</td>
<td>3.4</td>
<td>1.0</td>
<td>2</td>
<td>3</td>
<td>1.1</td>
<td>1.1</td>
<td>0.2</td>
</tr>
<tr>
<td>25</td>
<td>4.0</td>
<td>1.0</td>
<td>2</td>
<td>3</td>
<td>1.1</td>
<td>1.1</td>
<td>0.2</td>
</tr>
<tr>
<td>20</td>
<td>5.2</td>
<td>1.0</td>
<td>2</td>
<td>3</td>
<td>1.1</td>
<td>1.1</td>
<td>0.2</td>
</tr>
<tr>
<td>15</td>
<td>6.7</td>
<td>1.0</td>
<td>2</td>
<td>3</td>
<td>1.1</td>
<td>1.1</td>
<td>0.2</td>
</tr>
<tr>
<td>12</td>
<td>8.7</td>
<td>1.0</td>
<td>2</td>
<td>3</td>
<td>1.1</td>
<td>1.1</td>
<td>0.2</td>
</tr>
<tr>
<td>7</td>
<td>13.5</td>
<td>1.5</td>
<td>3</td>
<td>3</td>
<td>1.1</td>
<td>1.1</td>
<td>0.2</td>
</tr>
</tbody>
</table>

*These values do not include the required materials for the connection lines.

AK = Distance of the FB clamping rails (max. 100cm).
### Performance table for KELOX FB - clamping rail, staple and velcro system

**Floor covering:**
Natural stone, floor tiles

**WDW:** 0.02m² K/W

**t Fb:** mean floor surface temperature (°C)

**q:** Heat flow density q (W/m²)

<table>
<thead>
<tr>
<th>ID7</th>
<th>ID12</th>
<th>ID15</th>
<th>ID20</th>
<th>ID25</th>
<th>ID30</th>
</tr>
</thead>
<tbody>
<tr>
<td>13.50</td>
<td>8.70</td>
<td>6.70</td>
<td>5.20</td>
<td>4.00</td>
<td>3.40</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Max. surface temperature in accordance with ÖNORM EN 1264-3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bathrooms: 29 °C</td>
</tr>
<tr>
<td>Peripheral zones: 35 °C</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Spread (tf–trf):</th>
</tr>
</thead>
<tbody>
<tr>
<td>5 K</td>
</tr>
</tbody>
</table>

### Performance table for KELOX FB - clamping rail, staple and velcro system

**Floor covering:** Needle felt, plastic coating, readymade parquet

**WDW:** 0.06m² K/W

**t Fb:** mean floor surface temperature (°C)

**q:** Heat flow density q (W/m²)

<table>
<thead>
<tr>
<th>ID7</th>
<th>ID12</th>
<th>ID15</th>
<th>ID20</th>
<th>ID25</th>
<th>ID30</th>
</tr>
</thead>
<tbody>
<tr>
<td>13.50</td>
<td>8.70</td>
<td>6.70</td>
<td>5.20</td>
<td>4.00</td>
<td>3.40</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Max. surface temperature in accordance with ÖNORM EN 1264-3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bathrooms: 29 °C</td>
</tr>
<tr>
<td>Peripheral zones: 35 °C</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Spread (tf–trf):</th>
</tr>
</thead>
<tbody>
<tr>
<td>5 K</td>
</tr>
</tbody>
</table>
### Performance table for KELOX FB - clamping rail, staple and velcro system

**Floor covering:**
- Loop fabric, thin carpet
  - WDW: 0.10 m² K/W
  - q: Heat flow density q (W/m²)
  - t Fb: mean floor surface temperature (°C)

**Max. surface temperature in accordance with ÖNORM EN 1264-3**
- Living spaces, constantly used: 29 °C
- Bathrooms: 33 °C
- Peripheral zones: 35 °C
- Spread (tf–trf): 5 K

<table>
<thead>
<tr>
<th>Standard room temperature</th>
<th>Pipe requirement</th>
<th>ID7</th>
<th>ID12</th>
<th>ID15</th>
<th>ID20</th>
<th>ID25</th>
<th>ID30</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>q t Fb</td>
<td>q t Fb</td>
<td>q t Fb</td>
<td>q t Fb</td>
<td>q t Fb</td>
<td>q t Fb</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>59.0 20.5</td>
<td>30.0 19.0</td>
<td>2.5 17.0</td>
<td>2.0 15.0</td>
<td>1.5 13.0</td>
<td>1.0 11.0</td>
<td></td>
</tr>
<tr>
<td>18</td>
<td>47.0 22.1</td>
<td>28.0 20.4</td>
<td>2.1 18.1</td>
<td>1.8 16.2</td>
<td>1.5 14.3</td>
<td>1.2 12.4</td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>39.0 23.9</td>
<td>24.0 21.7</td>
<td>1.9 19.7</td>
<td>1.6 17.7</td>
<td>1.4 15.8</td>
<td>1.2 13.8</td>
<td></td>
</tr>
<tr>
<td>22</td>
<td>35.0 25.1</td>
<td>22.0 23.5</td>
<td>1.7 16.9</td>
<td>1.6 16.4</td>
<td>1.4 15.8</td>
<td>1.3 14.9</td>
<td></td>
</tr>
<tr>
<td>24</td>
<td>32.0 26.9</td>
<td>20.0 25.9</td>
<td>1.5 16.2</td>
<td>1.4 15.7</td>
<td>1.3 15.2</td>
<td>1.2 14.7</td>
<td></td>
</tr>
</tbody>
</table>

### Performance table for KELOX FB - clamping rail, staple and velcro system

**Floor covering:**
- Velour carpet, solid wood parquet
  - WDW: 0.15 m² K/W
  - q: Heat flow density q (W/m²)
  - t Fb: mean floor surface temperature (°C)

**Max. surface temperature in accordance with ÖNORM EN 1264-3**
- Living spaces, constantly used: 29 °C
- Bathrooms: 33 °C
- Peripheral zones: 35 °C
- Spread (tf–trf): 5 K
KELOX FB fixing plate system

The installation of the KELOX FB module pipe on the FB fixing plate can be combined well with the typical module characteristics of the pipe. Convenient installation and connecting of the FB fixing plates through the well thought-out design of the father-mother nubs on each of one longitudinal and lateral side of the FB fixing plates. Laying is possible in a spiral and meandering shape.

Material
Polystyrene plate with deep-drawn pipe holding nubs for sturdy fastening of the KELOX FB module pipe d16mm, connection of the individual plates by overlapping.

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

Vapour diffusion resistance
Sd 13.2m – used as a vapour brake – no FB grid foil necessary.

Installation
The first plate must be placed in the space, such that the father nubs (marked red) point towards the “inside of the space”; the other plates can be lightly laid on the plates that are already laid according to the “push-button principle”.

Advantages
● The pipe-holding nubs keep the pipe in its position
● Specifically appropriate on an unstable subsurface, such as granular insulation, Perlite etc.
● Meandering of spiral installation possible
● Low insulation downwards, due to air inlet in the nubs

Assembled material requirement with KM610 FB fixing plate for KELOX underfloor heating/m² *

<table>
<thead>
<tr>
<th>Laying module ID</th>
<th>Module pipe</th>
<th>Fixing plate</th>
<th>Protective joint tube</th>
<th>Edge insulating strips</th>
<th>Screed additive</th>
</tr>
</thead>
<tbody>
<tr>
<td>30</td>
<td>3.4</td>
<td>1.1</td>
<td>3</td>
<td>1.1</td>
<td>0.2</td>
</tr>
<tr>
<td>25</td>
<td>4.0</td>
<td>1.1</td>
<td>3</td>
<td>1.1</td>
<td>0.2</td>
</tr>
<tr>
<td>20</td>
<td>5.2</td>
<td>1.1</td>
<td>3</td>
<td>1.1</td>
<td>0.2</td>
</tr>
<tr>
<td>15</td>
<td>6.7</td>
<td>1.1</td>
<td>3</td>
<td>1.1</td>
<td>0.2</td>
</tr>
<tr>
<td>10</td>
<td>10.2</td>
<td>1.1</td>
<td>3</td>
<td>1.1</td>
<td>0.2</td>
</tr>
<tr>
<td>5</td>
<td>19.4</td>
<td>1.1</td>
<td>3</td>
<td>1.1</td>
<td>0.2</td>
</tr>
</tbody>
</table>

*These values do not include the required materials for the connection lines.
### Performance table for KELOX FB - fixing plate system

#### Floor covering
Natural stone, floor tiles

**Heat flow density (W/m²)**
- **q**: Heat flow density (W/m²)
- **t Fb**: mean floor surface temperature (°C)

#### Max. surface temperature in accordance with ÖNORM EN 1264-3

**Living spaces, constantly used**: 29 °C

**Bathrooms**: 33 °C

**Peripheral zones**: 35 °C

**Spread (tf–trf)**: 5 K

---

### Performance table for KELOX FB - fixing plate system

#### Floor covering
Needle felt, plastic coating, radymade parquet

**Heat flow density (W/m²)**
- **q**: Heat flow density (W/m²)
- **t Fb**: mean floor surface temperature (°C)

#### Max. surface temperature in accordance with ÖNORM EN 1264-3

**Living spaces, constantly used**: 29 °C

**Bathrooms**: 33 °C

**Peripheral zones**: 35 °C

**Spread (tf–trf)**: 5 K

---

### Heating water temperature °C (tf–trf): 2

#### Standard room temperature

<table>
<thead>
<tr>
<th>Pipe requirement</th>
<th>ID5</th>
<th>ID10</th>
<th>ID15</th>
<th>ID20</th>
<th>ID25</th>
<th>ID30</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>19.40</td>
<td>10.20</td>
<td>6.70</td>
<td>5.20</td>
<td>4.00</td>
<td>3.40</td>
</tr>
<tr>
<td>15</td>
<td>89.3</td>
<td>23.3</td>
<td>77.9</td>
<td>22.2</td>
<td>66.7</td>
<td>21.2</td>
</tr>
<tr>
<td>18</td>
<td>71.1</td>
<td>24.6</td>
<td>61.9</td>
<td>23.7</td>
<td>53.1</td>
<td>22.9</td>
</tr>
<tr>
<td>20</td>
<td>58.8</td>
<td>25.4</td>
<td>53.1</td>
<td>24.7</td>
<td>43.9</td>
<td>24.1</td>
</tr>
<tr>
<td>22</td>
<td>46.5</td>
<td>26.3</td>
<td>40.5</td>
<td>25.7</td>
<td>34.7</td>
<td>25.2</td>
</tr>
<tr>
<td>24</td>
<td>33.9</td>
<td>27.1</td>
<td>29.5</td>
<td>26.7</td>
<td>25.2</td>
<td>23.6</td>
</tr>
</tbody>
</table>

---

### Heating water temperature °C (tf–trf): 2

#### Standard room temperature

<table>
<thead>
<tr>
<th>Pipe requirement</th>
<th>ID5</th>
<th>ID10</th>
<th>ID15</th>
<th>ID20</th>
<th>ID25</th>
<th>ID30</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>19.40</td>
<td>10.20</td>
<td>6.70</td>
<td>5.20</td>
<td>4.00</td>
<td>3.40</td>
</tr>
<tr>
<td>15</td>
<td>72.0</td>
<td>21.7</td>
<td>64.1</td>
<td>20.3</td>
<td>61.6</td>
<td>19.5</td>
</tr>
<tr>
<td>18</td>
<td>57.3</td>
<td>23.3</td>
<td>51.0</td>
<td>22.7</td>
<td>46.6</td>
<td>22.1</td>
</tr>
<tr>
<td>20</td>
<td>47.5</td>
<td>24.4</td>
<td>42.2</td>
<td>23.9</td>
<td>36.9</td>
<td>23.4</td>
</tr>
<tr>
<td>22</td>
<td>37.5</td>
<td>25.5</td>
<td>33.3</td>
<td>25.1</td>
<td>29.2</td>
<td>24.7</td>
</tr>
<tr>
<td>24</td>
<td>27.3</td>
<td>26.5</td>
<td>24.3</td>
<td>25.6</td>
<td>21.2</td>
<td>25.6</td>
</tr>
</tbody>
</table>

---

### Heating water temperature °C (tf–trf): 2

#### Standard room temperature

<table>
<thead>
<tr>
<th>Pipe requirement</th>
<th>ID5</th>
<th>ID10</th>
<th>ID15</th>
<th>ID20</th>
<th>ID25</th>
<th>ID30</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>19.40</td>
<td>10.20</td>
<td>6.70</td>
<td>5.20</td>
<td>4.00</td>
<td>3.40</td>
</tr>
<tr>
<td>15</td>
<td>72.0</td>
<td>21.7</td>
<td>64.1</td>
<td>20.3</td>
<td>61.6</td>
<td>19.5</td>
</tr>
<tr>
<td>18</td>
<td>57.3</td>
<td>23.3</td>
<td>51.0</td>
<td>22.7</td>
<td>46.6</td>
<td>22.1</td>
</tr>
<tr>
<td>20</td>
<td>47.5</td>
<td>24.4</td>
<td>42.2</td>
<td>23.9</td>
<td>36.9</td>
<td>23.4</td>
</tr>
<tr>
<td>22</td>
<td>37.5</td>
<td>25.5</td>
<td>33.3</td>
<td>25.1</td>
<td>29.2</td>
<td>24.7</td>
</tr>
<tr>
<td>24</td>
<td>27.3</td>
<td>26.5</td>
<td>24.3</td>
<td>25.6</td>
<td>21.2</td>
<td>25.6</td>
</tr>
</tbody>
</table>

---

### Heating water temperature °C (tf–trf): 2

#### Standard room temperature

<table>
<thead>
<tr>
<th>Pipe requirement</th>
<th>ID5</th>
<th>ID10</th>
<th>ID15</th>
<th>ID20</th>
<th>ID25</th>
<th>ID30</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>19.40</td>
<td>10.20</td>
<td>6.70</td>
<td>5.20</td>
<td>4.00</td>
<td>3.40</td>
</tr>
<tr>
<td>15</td>
<td>72.0</td>
<td>21.7</td>
<td>64.1</td>
<td>20.3</td>
<td>61.6</td>
<td>19.5</td>
</tr>
<tr>
<td>18</td>
<td>57.3</td>
<td>23.3</td>
<td>51.0</td>
<td>22.7</td>
<td>46.6</td>
<td>22.1</td>
</tr>
<tr>
<td>20</td>
<td>47.5</td>
<td>24.4</td>
<td>42.2</td>
<td>23.9</td>
<td>36.9</td>
<td>23.4</td>
</tr>
<tr>
<td>22</td>
<td>37.5</td>
<td>25.5</td>
<td>33.3</td>
<td>25.1</td>
<td>29.2</td>
<td>24.7</td>
</tr>
<tr>
<td>24</td>
<td>27.3</td>
<td>26.5</td>
<td>24.3</td>
<td>25.6</td>
<td>21.2</td>
<td>25.6</td>
</tr>
</tbody>
</table>

---

### Heating water temperature °C (tf–trf): 2

#### Standard room temperature

<table>
<thead>
<tr>
<th>Pipe requirement</th>
<th>ID5</th>
<th>ID10</th>
<th>ID15</th>
<th>ID20</th>
<th>ID25</th>
<th>ID30</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>19.40</td>
<td>10.20</td>
<td>6.70</td>
<td>5.20</td>
<td>4.00</td>
<td>3.40</td>
</tr>
<tr>
<td>15</td>
<td>72.0</td>
<td>21.7</td>
<td>64.1</td>
<td>20.3</td>
<td>61.6</td>
<td>19.5</td>
</tr>
<tr>
<td>18</td>
<td>57.3</td>
<td>23.3</td>
<td>51.0</td>
<td>22.7</td>
<td>46.6</td>
<td>22.1</td>
</tr>
<tr>
<td>20</td>
<td>47.5</td>
<td>24.4</td>
<td>42.2</td>
<td>23.9</td>
<td>36.9</td>
<td>23.4</td>
</tr>
<tr>
<td>22</td>
<td>37.5</td>
<td>25.5</td>
<td>33.3</td>
<td>25.1</td>
<td>29.2</td>
<td>24.7</td>
</tr>
<tr>
<td>24</td>
<td>27.3</td>
<td>26.5</td>
<td>24.3</td>
<td>25.6</td>
<td>21.2</td>
<td>25.6</td>
</tr>
</tbody>
</table>

---

### Heating water temperature °C (tf–trf): 2

#### Standard room temperature

<table>
<thead>
<tr>
<th>Pipe requirement</th>
<th>ID5</th>
<th>ID10</th>
<th>ID15</th>
<th>ID20</th>
<th>ID25</th>
<th>ID30</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>19.40</td>
<td>10.20</td>
<td>6.70</td>
<td>5.20</td>
<td>4.00</td>
<td>3.40</td>
</tr>
<tr>
<td>15</td>
<td>72.0</td>
<td>21.7</td>
<td>64.1</td>
<td>20.3</td>
<td>61.6</td>
<td>19.5</td>
</tr>
<tr>
<td>18</td>
<td>57.3</td>
<td>23.3</td>
<td>51.0</td>
<td>22.7</td>
<td>46.6</td>
<td>22.1</td>
</tr>
<tr>
<td>20</td>
<td>47.5</td>
<td>24.4</td>
<td>42.2</td>
<td>23.9</td>
<td>36.9</td>
<td>23.4</td>
</tr>
<tr>
<td>22</td>
<td>37.5</td>
<td>25.5</td>
<td>33.3</td>
<td>25.1</td>
<td>29.2</td>
<td>24.7</td>
</tr>
<tr>
<td>24</td>
<td>27.3</td>
<td>26.5</td>
<td>24.3</td>
<td>25.6</td>
<td>21.2</td>
<td>25.6</td>
</tr>
</tbody>
</table>
### Performance table for KELOX FB - fixing plate system

#### Floor covering
Loop fabric, thin carpet  
**WDW:** 0.10 m² K/W  
**q:** Heat flow density (W/m²)  
**t Fb:** mean floor surface temperature (°C)

<table>
<thead>
<tr>
<th>Max. surface temperature in accordance with ÖNORM EN 1264-3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Living spaces, constantly used: 29 °C</td>
</tr>
<tr>
<td>Bathrooms: 33 °C</td>
</tr>
<tr>
<td>Peripheral zones: 35 °C</td>
</tr>
</tbody>
</table>

#### Spread (tf–trf): 5 K

### Performance table for KELOX FB - fixing plate system

#### Floor covering
Velour carpet, solid wood parquet  
**WDW:** 0.15 m² K/W  
**q:** Heat flow density (W/m²)  
**t Fb:** mean floor surface temperature (°C)

<table>
<thead>
<tr>
<th>Max. surface temperature in accordance with ÖNORM EN 1264-3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Living spaces, constantly used: 29 °C</td>
</tr>
<tr>
<td>Bathrooms: 33 °C</td>
</tr>
<tr>
<td>Peripheral zones: 35 °C</td>
</tr>
</tbody>
</table>

#### Spread (tf–trf): 5 K

### Heating Water Temperature °C (tf+trf) 2

#### Standard Room Temperature

<table>
<thead>
<tr>
<th>Pipe requirement</th>
<th>ID5</th>
<th>ID10</th>
<th>ID15</th>
<th>ID20</th>
<th>ID25</th>
<th>ID30</th>
</tr>
</thead>
<tbody>
<tr>
<td>19.40</td>
<td>15</td>
<td>18</td>
<td>20</td>
<td>22</td>
<td>24</td>
<td>15</td>
</tr>
<tr>
<td>10.20</td>
<td>20</td>
<td>22</td>
<td>24</td>
<td>26</td>
<td>28</td>
<td>20</td>
</tr>
<tr>
<td>6.70</td>
<td>22</td>
<td>24</td>
<td>26</td>
<td>28</td>
<td>30</td>
<td>22</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Pipe requirement</th>
<th>ID5</th>
<th>ID10</th>
<th>ID15</th>
<th>ID20</th>
<th>ID25</th>
<th>ID30</th>
</tr>
</thead>
<tbody>
<tr>
<td>5.20</td>
<td>15</td>
<td>18</td>
<td>20</td>
<td>22</td>
<td>24</td>
<td>15</td>
</tr>
<tr>
<td>4.00</td>
<td>20</td>
<td>22</td>
<td>24</td>
<td>26</td>
<td>28</td>
<td>20</td>
</tr>
<tr>
<td>3.40</td>
<td>22</td>
<td>24</td>
<td>26</td>
<td>28</td>
<td>30</td>
<td>22</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Pipe requirement</th>
<th>ID5</th>
<th>ID10</th>
<th>ID15</th>
<th>ID20</th>
<th>ID25</th>
<th>ID30</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.80</td>
<td>15</td>
<td>18</td>
<td>20</td>
<td>22</td>
<td>24</td>
<td>15</td>
</tr>
<tr>
<td>2.40</td>
<td>20</td>
<td>22</td>
<td>24</td>
<td>26</td>
<td>28</td>
<td>20</td>
</tr>
<tr>
<td>2.00</td>
<td>22</td>
<td>24</td>
<td>26</td>
<td>28</td>
<td>30</td>
<td>22</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Pipe requirement</th>
<th>ID5</th>
<th>ID10</th>
<th>ID15</th>
<th>ID20</th>
<th>ID25</th>
<th>ID30</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.60</td>
<td>15</td>
<td>18</td>
<td>20</td>
<td>22</td>
<td>24</td>
<td>15</td>
</tr>
<tr>
<td>1.30</td>
<td>20</td>
<td>22</td>
<td>24</td>
<td>26</td>
<td>28</td>
<td>20</td>
</tr>
<tr>
<td>1.00</td>
<td>22</td>
<td>24</td>
<td>26</td>
<td>28</td>
<td>30</td>
<td>22</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Pipe requirement</th>
<th>ID5</th>
<th>ID10</th>
<th>ID15</th>
<th>ID20</th>
<th>ID25</th>
<th>ID30</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.80</td>
<td>15</td>
<td>18</td>
<td>20</td>
<td>22</td>
<td>24</td>
<td>15</td>
</tr>
<tr>
<td>0.60</td>
<td>20</td>
<td>22</td>
<td>24</td>
<td>26</td>
<td>28</td>
<td>20</td>
</tr>
<tr>
<td>0.40</td>
<td>22</td>
<td>24</td>
<td>26</td>
<td>28</td>
<td>30</td>
<td>22</td>
</tr>
</tbody>
</table>

---

**KEKELIT**

---

**KELOX**
Due to the typical module characteristics, the KELOX FB module pipes are virtually ideally suited for installation and fastening using KELOX FB staples on the KELOX FB staple plates.

**KM635 KELOX FB staple plates**
The FB staple plates are available in rolls. Furthermore, the rolls have an overlapping edge, including an adhesive strip, applied on the longitudinal side and one lateral side.

Through the improved lambda value, the KM635 staple plate with a 28/25mm thickness has the same insulation value as a conventional PS plate with a 33/30mm thickness.

The installation of the KELOX FB module pipe or ULTRA PE-RT pipe is individually possible in a spiral or meandering shape.

**Material**
Lambdapor made of expanded Poly-styrene EPS-T plus 033 in accordance with ÖNORM B 6000, free from HFC and CFC, including lamination with HD-PE fabric and PE coating, including overlapping edge with adhesive strip and graduation

**Thickness**
28/25mm – tolerance in accordance with ÖNORM EN 13163 + 3mm

**Size**
Reel material: 10 x 1m

**Thermal conductivity**
Lambda value: 0.033 W/mK

**Dynamic rigidity**
In accordance with ÖNORM EN 29052 -1 < 20MN/m³

**Footfall sound improvement factor:**
approx. 30 dB

**Load-bearing capacity - as required**
Total load max. 6.5 kN/m²
Total load max. 10 kN/m²

**Flexural strength**
In accordance with ÖNORM EN 12089 > 50 kPa (> 0.05 N/m²)

**Water vapour diffusion coefficient of friction**
Sd: approx. 75m - used as vapour brake. No FB grid foil necessary

**Temperature resistance**
80 to 85°C - short-term up to 95°C

**Fire behaviour**
In accordance with ÖNORM EN 13501-1 "E"

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

**Outputs**
The outputs of the FB staple system are identical to the outputs of the FB clamping rail systems and are shown in these performance tables, based on installation distance, floor covering, room and heating water temperatures. (Page 12–15)

**Assembly of the KM635 staple plates**
1. In order to ensure optimum structure-borne noise insulation, lay the KM634 GB edge insulating strips without interruption on the wall.
2. Lay KM635 FB staple roll or folding plate over the entire surface in the room and connect the joints tightly with the adhesive overlapping edge applied on the longitudinal side.
3. Lay KELOX FB module pipe or ULTRA PE-RT pipe in a spiral or meandering shape in accordance with the installation distance and affix to the FB staple plate using the KM611 FB staples.
4. The assembly of the FB staples takes place with the WZ945 KELOX stapler at a 90° angle onto the FB staple plate.

**ATTENTION** Protect FB staple plate from direct sunlight, do not store outdoors!

---

### Assumed required materials with KM635 FB staple plate for KELOX underfloor heating/m²*

<table>
<thead>
<tr>
<th>Laying module</th>
<th>FB pipe KM635 m/m²</th>
<th>Stable plate KM635 m²</th>
<th>Stables KM611 unit/m</th>
<th>Protective joint tube KM614 unit/circle</th>
<th>Edging insulating strips KM634 m²</th>
<th>Screed additive KM640 kg/m²</th>
</tr>
</thead>
<tbody>
<tr>
<td>30</td>
<td>3.4</td>
<td>1.0</td>
<td>2–3</td>
<td>3</td>
<td>0.01</td>
<td>0.02</td>
</tr>
<tr>
<td>25</td>
<td>4.0</td>
<td>1.1</td>
<td>2–3</td>
<td>3</td>
<td>0.01</td>
<td>0.02</td>
</tr>
<tr>
<td>20</td>
<td>5.2</td>
<td>1.1</td>
<td>2–3</td>
<td>3</td>
<td>0.01</td>
<td>0.02</td>
</tr>
<tr>
<td>15</td>
<td>6.7</td>
<td>1.1</td>
<td>2–3</td>
<td>3</td>
<td>0.01</td>
<td>0.02</td>
</tr>
<tr>
<td>12</td>
<td>8.7</td>
<td>1.1</td>
<td>2–3</td>
<td>3</td>
<td>0.01</td>
<td>0.02</td>
</tr>
<tr>
<td>10</td>
<td>10.2</td>
<td>1.1</td>
<td>2–3</td>
<td>3</td>
<td>0.01</td>
<td>0.02</td>
</tr>
<tr>
<td>7</td>
<td>13.5</td>
<td>1.1</td>
<td>2–3</td>
<td>3</td>
<td>0.01</td>
<td>0.02</td>
</tr>
<tr>
<td>5</td>
<td>19.4</td>
<td>1.1</td>
<td>2–3</td>
<td>3</td>
<td>0.01</td>
<td>0.02</td>
</tr>
</tbody>
</table>

*These values do not include the required materials for the connection lines.
KELOX FB velcro plate system

KMU121K KELOX-ULTRAX FB Velcro pipe (blue)
are virtually ideally suited for installation and fixing on the KELOX FB Velcro plate without additional fastening, due to the typical module characteristics and wrapped Velcro strips.

KU101K ULTRA PE-RT FB Velcro pipe (red)
is a plastic pipe alternative made of PE-RT. Oxygen-tight and water-vapour-diffusion-tight, with wrapped Velcro strip.

KM636 KELOX FB Velcro plates
The FB Velcro plates are available in rolls. Furthermore, the rolls have an overlapping edge, including an adhesive strip, applied on the longitudinal side and one lateral side.

Through the improved lambda value, the FB Velcro plate with a 28/25mm thickness has the same insulation value as a conventional PS plate with a 33/30mm thickness.

The installation of the KELOX FB Velcro pipe is individually possible in a spiral or meandering shape.

Material
made of Lambdapor made (expanded Polystyrene) EPS-T 650 plus in accordance with ÖNORM B 6000, free from HFC and CFC, lamination with velour fabric and PE coating, including overlapping edge with adhesive strip and graduation.

Assembly of the KM636 velcro plates
1. In order to ensure optimum structure-borne noise insulation, lay the KM634 GB edge insulating strips without interruption on the wall.
2. Lay KM636 FB Velcro over the entire surface in the room and connect the joints tightly with the adhesive overlapping edge applied on the longitudinal side.
3. Lay KELOX FB Velcro pipe in a spiral or meandering shape in accordance with the installation distance. The affixing of the pipe takes place using the wrapped Velcro strip on the Velcro pipe/velour lamination on the KM636 KELOX Velcro plate.

Outputs
The heat outputs of the FB Velcro systems are identical to the outputs of the FB clamping rail systems and are shown in these performance tables, based on installation distance, floor covering, room and heating water temperatures.

The assembly of the KELOX FB Velcro pipe takes place WITHOUT additional fastening on the FB Velcro plate, which makes faster and more efficient assembly possible.

ATTENTION Protect FB Velcro plates from direct sunlight, do not store outdoors!

Assumed material requirement with KM636 FB Velcro plate for KELOX underfloor heating/m² *

<table>
<thead>
<tr>
<th>Laying module</th>
<th>FB pipe KMU121 ID</th>
<th>Velcro plate KM636 ID</th>
<th>Protective joint tube KM614 ID</th>
<th>Edge insulating strips KM634 ID</th>
<th>Screed additive KM640 ID</th>
</tr>
</thead>
<tbody>
<tr>
<td>30</td>
<td>3.4</td>
<td>1.1</td>
<td>3</td>
<td>1.1</td>
<td>0.2</td>
</tr>
<tr>
<td>25</td>
<td>4.0</td>
<td>1.1</td>
<td>3</td>
<td>1.1</td>
<td>0.2</td>
</tr>
<tr>
<td>20</td>
<td>5.2</td>
<td>1.1</td>
<td>3</td>
<td>1.1</td>
<td>0.2</td>
</tr>
<tr>
<td>15</td>
<td>6.7</td>
<td>1.1</td>
<td>3</td>
<td>1.1</td>
<td>0.2</td>
</tr>
<tr>
<td>12</td>
<td>8.7</td>
<td>1.1</td>
<td>3</td>
<td>1.1</td>
<td>0.2</td>
</tr>
<tr>
<td>10</td>
<td>10.2</td>
<td>1.1</td>
<td>3</td>
<td>1.1</td>
<td>0.2</td>
</tr>
<tr>
<td>7</td>
<td>13.5</td>
<td>1.1</td>
<td>3</td>
<td>1.1</td>
<td>0.2</td>
</tr>
<tr>
<td>5</td>
<td>19.4</td>
<td>1.1</td>
<td>3</td>
<td>1.1</td>
<td>0.2</td>
</tr>
</tbody>
</table>

*These values do not include the required materials for the connection lines.
**KELOX FB mounting with FB clamping rail**

The meander installation using FB clamping rails uses the module characteristics of the KELOX FB particularly effectively. (Page 10–11)

1. **Thermal insulation** prevents the heat flow in the direction of the storey ceiling and therefore escape from the space. Therefore, only use resilient insulating materials on site.

2. **KELOX FB grid foil** HDPE foil in 0.15mm thickness. Functions as a vapour brake and forms an ideal base for bonding the clamping rails. The 10cm grid simplifies installation. Option: Instead of the grid foil, the KM630 KELOX FB footfall sound film can reduce the transfer of sound.

3. **KELOX FB edge insulating strips** allows heat expansion of the screed and prevents sound bridges. Minimum thickness: 8mm

4. **KELOX FB clamping rail** affixes the KELOX module pipe in its position regarding pipe distance and screed bedding. Height: 24mm

5. **KELOX FB module pipe** Meander installation in accordance with the requirement profile based on output and room type.

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

**The screed thicknesses must be defined based on:**
- Space use (developer)
- Screed type and quality (builder, planner)
- Total thickness of the insulation (architect, building physicist)

---

**KELOX FB mounting with FB fixing plate**

Particularly on an unstable surface (granular insulation, cement-bonded EPS foam materials, recyclate, Perlite ...), the sturdy FB fixing plate is an elegant solution. One longitudinal and one lateral edge is designed as a scaled-down father nub, which is marked with the KELIT logo in between the nubs. (Page 16–17)

1. **Conditionally loadable thermal insulation** such as granular insulation, recyclate, Perlite on site ...

2. **KELOX FB fixing plate** deep-drawn pipe holding nubs affix the KELOX FB module pipe in its position. Joining of the individual plates by overlapping (approx. 10% additional requirement) Installation distances ID 5, 10, 15, 20, 25 and 30cm.

   **Nub height: 20mm**

3. **KELOX FB edge insulating strips** allows heat expansion of the screed and prevents sound bridges.

   **Minimum thickness: 8mm**

4. **KELOX FB module pipe** Meandering or spiral installation in accordance with requirement profile, space type and output

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

**The screed thicknesses must be defined based on:**
- Space use (developer)
- Screed type and quality (builder, planner)
- Total thickness of the insulation (architect, building physicist)
KELOX FB mounting with FB staple plate

FB module pipes, as well as ULTRA PE-RT FB pipes, can be affixed to the KELOX FB staple plate in meandering or spiral installation.

1. **Thermal insulation.** The FB staple plate is made of expanded Polystyrene with a thickness of 28/25mm, as thermal and footfall sound insulation, with an overlapping edge and adhesive strips on the longitudinal and lateral side, as well as a PE coating that is laminated in the factory.

2. **KELOX FB edge insulating strips** allows heat expansion of the screed and prevents sound bridges.
   - **Minimum thickness:** 8mm

3. **FB module pipe or ULTRA PE-RT FB pipe** in meandering or spiral installation based on output and space type.

4. **KELOX FB staple** to affix the FB pipe to the staple plate with the WZ945 KELOX stapler.

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

   **The screed thicknesses must be defined based on:**
   - Space use (developer)
   - Screed type and quality (builder, planner)
   - Total thickness of the insulation (architect, building physicist)

KELOX FB mounting with FB velcro plate

FB Velcro pipes, as well as ULTRA PE-RT FB Velcro pipes, can be affixed to the KELOX FB Velcro plate in meandering or spiral installation without additional fastening materials.

1. **Thermal insulation.** The FB Velcro plate is made of expanded Polystyrene with a thickness of 28/25mm, as thermal and footfall sound insulation, with an overlapping edge and adhesive strips on the longitudinal and lateral side, as well as a Velcro fabric that is laminated in the factory and a PE coating.

2. **KELOX FB edge insulating strips** allows heat expansion of the screed and prevents sound bridges.
   - **Minimum thickness:** 8mm

3. **FB Velcro pipe or ULTRA PE-RT FB Velcro pipe** including a wrapped adhesive Velcro strip that is wound in the factory, can be affixed to the FB Velcro plate in meandering or spiral installation, in accordance with the requirement profile, based on output and space type.

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

   **The screed thicknesses must be defined based on:**
   - Space use (developer)
   - Screed type and quality (builder, planner)
   - Total thickness of the insulation (architect, building physicist)

   **With this mounting, an efficient, alternative type of installation of the underfloor heating is enabled, WITHOUT additional fasteners!**
KELOX dry drywall construction system

Universal, optimised underfloor heating system for all new and old buildings. Particularly suitable for renovations, additions and use in drywall and wood constructions. Through the optimum transfer of heat directly to the surface floor by means of aluminium baffle plates, the system is extremely responsive. The system elements, made of high-pressure resistant Polystyrene ($\lambda = 0.035 \text{ W/m K}$), can have various surface floors applied to them directly after pipe installation, depending on the traffic load. This enables a short building time and low mounting height.

In order to avoid unevenness and cracks later, the KELOX dry elements must be applied evenly and fully to the dry, adhesive, clean and crush-resistant subsurface. The system elements cannot compensate existing unevenness!

Traffic load ≤ 2.0 kN/m²

Traffic load ≤ 2.0 kN/m²

Traffic load ≤ 2.0 kN/m²

Traffic load ≤ 5.0 kN/m²

Parquet

Direct application

1. Parquet ≥14mm
2. Structure-borne noise and sound insulation strip 2–3mm
3. KM660 system element 30mm and KELOX FB pipe
4. KM683 frame wood 30mm
5. KM634 edge insulating strips
6. If applicable, moisture barrier

Traffic load ≤ 2,0 kN/m²

Traffic load ≤ 2,0 kN/m²

Traffic load ≤ 2,0 kN/m²

Traffic load ≤ 2,0 kN/m²

Carpet, floor tiles, parquet, laminate, plastic covering on dry-screed/Fermacell

1. Carpet, floor tiles, parquet, laminate screed element installed with offset joints 2 x 10mm (Fermacell)
2. KM660 system element 30mm and KELOX FB pipe
3. KM683 frame wood 30mm
4. KM634 edge insulating strips
5. If applicable, moisture barrier and footfall sound insulation film

Traffic load ≤ 2,0 kN/m²

Traffic load ≤ 2,0 kN/m²

Traffic load ≤ 2,0 kN/m²

Traffic load ≤ 2,0 kN/m²

Solid wood planks on flooring joints

Direct application

1. Wood planks ≥22mm
2. KM660 system element 30mm and KELOX FB pipe
3. KM683 frame wood 30mm and flooring joint
4. KM634 edge insulating strips
5. If applicable, moisture barrier and footfall sound insulation film

Traffic load ≤ 2,0 kN/m²

Traffic load ≤ 2,0 kN/m²

Traffic load ≤ 2,0 kN/m²

Traffic load ≤ 2,0 kN/m²

Advantages

- reduced building times
- low mounting height
- free choice of surface floor
- responsive due to low covering
- optimum heat transfer due to aluminium baffle plates
- Installation distances: 12.5 and 25cm

KM660 KELOX dry system elements, are prefabricated Polystyrene plates (thickness 30mm), which are fully laminated over virtually the entire surface on the top surface with excellent heat-conductive aluminium baffle plates. The pipe ducts for holding the KMU120 KELOX module pipe d16 x 2mm are omega-shaped and the edges are rounded off.

Predetermined breaking points on the system elements ensure optimum adaptation to the space geometry, so that installation can also take place over the entire surface in rooms that are full of nooks and crannies.

For changes in direction, in accordance with the pipe distances, the matching KM662 KELOX dry head elements should be used. As a transition between both installation distances, the KM663 KELOX dry head change element is available.

For spaces < 8m², all KELOX dry system elements must be bonded using the KM666 KELOX dry-universal dispersion adhesive on the subsurface. For spaces ≥ 8m², only the head element, head change elements/system elements that have been cut to size need to be bonded.

Remaining surfaces and any unheated surfaces have KM664 KELOX dry filler insulation applied to them.

Due to the installation of the KM663 KELOX dry frame wood all around on the wall and door area, the compressive strength of the structure is ensured in the edge area. The frame wood with pipe recesses in the door area must be additionally screwed to the subsurface.

Using the WZ960 KELOX hot cutting device, the pipe ducts can be integrated for the connection lines.

For optimised heat distribution, the head/change element and the connections lines can additionally be covered with loose KM681 KELOX dry alu cover plates. In the area of the heating circuit manifold, the covering takes place using a KM682 KELOX dry steel load distribution plate.
### KELOX dry swinging underfloor heating or sport flooring

This installation application is a special form of an underfloor heating system, particularly for elastically mounted floors of gymnasiums etc.

1. Thermal insulation according to information from the swinging floor manufacturer
2. If applicable, moisture barrier on site
3. Permanently elastic, vaporising elastomer inserts, in multiple layers, if applicable
4. KELOX dry system element with laminated aluminium heat-conducting baffle 0.5 mm, for installation distances of 12.5cm or 25cm
5. KELOX FB module pipe
6. Flooring joints
7. Swing boards as sub-floor
8. If required, covering foil or vapour barrier, e.g. KELOX FB grid foil
9. Parquet top covering, possibly structured in multiple layers
10. Alternative top covering made of plastic for sport floors

#### Advantages
- The module characteristics of the pipe with drywall construction system elements are particularly important, on additional holders for the FB module pipes necessary
- Good heat emission of the KELOX dry system elements
- Alternative mounting options possible

#### Variant:
If a floor structure is alternatively selected, which is realised with KM610 KELOX FB clamping rails and KMU120 KELOX FB module pipes instead of KELOX dry system elements, if required, the heat emission of the pipe can be enlarged using heat-conducting baffles that can additionally be clipped onto the KELOX FB module pipes.

#### Performance table for KELOX dry drywall construction system

**Floor covering:**
Direct application: Parquet, laminate dry screed; Parquett, laminate, floor tile

- **q:** Heat flow density (W/m²)
- **t Fb:** mean floor surface temperature (°C)

**Maximum surface temperature in accordance with ÖNORM EN 1264-3**
- Living Spaces, constantly used: 29 °C
- Bathrooms: 33 °C
- Peripheral zones: 35 °C
- Spread (tf–trf): 5 K

**Installation disdance ID:**
- 12,5 cm: Pipe requirement: 8 running metres/m²
- 25 cm: Pipe requirement: 4 running metres/m²

#### Table 1: Standard room temperature

<table>
<thead>
<tr>
<th>PARQUET</th>
<th>FLOOR TILE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Direct application</td>
<td>Direct application</td>
</tr>
<tr>
<td>Fermacell 20mm</td>
<td>Fermacell 20mm</td>
</tr>
<tr>
<td>q</td>
<td>t Fb</td>
</tr>
<tr>
<td>15</td>
<td>51.0</td>
</tr>
<tr>
<td>18</td>
<td>46.1</td>
</tr>
<tr>
<td>20</td>
<td>40.7</td>
</tr>
<tr>
<td>22</td>
<td>36.2</td>
</tr>
<tr>
<td>24</td>
<td>32.8</td>
</tr>
<tr>
<td>15</td>
<td>68.0</td>
</tr>
<tr>
<td>18</td>
<td>65.1</td>
</tr>
<tr>
<td>20</td>
<td>64.5</td>
</tr>
<tr>
<td>22</td>
<td>64.0</td>
</tr>
<tr>
<td>24</td>
<td>63.5</td>
</tr>
</tbody>
</table>

#### Table 2: Heating water temperature °C (tf+trf): 2

<table>
<thead>
<tr>
<th>PARQUET</th>
<th>FLOOR TILE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Direct application</td>
<td>Direct application</td>
</tr>
<tr>
<td>Fermacell 20mm</td>
<td>Fermacell 20mm</td>
</tr>
<tr>
<td>q</td>
<td>t Fb</td>
</tr>
<tr>
<td>15</td>
<td>51.0</td>
</tr>
<tr>
<td>18</td>
<td>46.1</td>
</tr>
<tr>
<td>20</td>
<td>40.7</td>
</tr>
<tr>
<td>22</td>
<td>36.2</td>
</tr>
<tr>
<td>24</td>
<td>32.8</td>
</tr>
</tbody>
</table>
Floor structures for housing construction
Surface load ≤ 2 kN/m²

Mountings for introduced use, or spaces lying underneath with the following conditions:
- Utilisation category: Cat. A (residential space) in accordance with ÖNORM EN 1991-1-1
- Load capacity: Cat. A (1.5–2.0 kN/m²) in accordance with ÖNORM EN 1991-1-1
- Total thickness of the insulation: > 25 mm in accordance with ÖNORM B 3732
- Screed quality: Cement screed E 300 in accordance with ÖNORM B 3732
- Screed thickness: in accordance with ÖNORM B 3732, or B 2242

In accordance with ÖNORM B 2242, with heating screeds, the pipe diameter must be added to the minimum screed thickness!
The building physicist basically defines the screed thickness on the basis of the applicable standards!

Example recommendations

<table>
<thead>
<tr>
<th>Floor structures</th>
<th>heated space</th>
<th>heated damp space</th>
<th>unheated space</th>
<th>unheated damp space</th>
<th>soil</th>
<th>outside damp</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Floor covering</td>
<td>variabel</td>
<td>variabel</td>
<td>variabel</td>
<td>variabel</td>
<td>variabel</td>
<td>variabel</td>
</tr>
<tr>
<td>2 Heating screen in accordance with ÖNORM</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>3 KELOX FB-edge insulating strips</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>4 KELOX FB pipe d16mm</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>5 KELOX FB clamping rail</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>6 KELOX FB grid foil</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>7 Additional heat insulation in accordance with standard</td>
<td>-</td>
<td>-</td>
<td>30mm</td>
<td>30mm</td>
<td>30mm</td>
<td>30mm</td>
</tr>
<tr>
<td>8 Footfall sound insulation 33/30mm or 30mm</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>9 Moisture barrier</td>
<td>-</td>
<td>x</td>
<td>-</td>
<td>x</td>
<td>-</td>
<td>x</td>
</tr>
<tr>
<td>10 Sealing on site</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>x</td>
<td>-</td>
<td>x</td>
</tr>
<tr>
<td>11 Ceiling slab (floor slab)</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
</tbody>
</table>

With floor structures to damp spaces, a moisture barrier must additionally be installed underneath the insulation.

Underfloor heating bake-out process in accordance with ÖNORM B 2242-2

Client/developer: _______________________________
Building project: _______________________________
Site management: _______________________________
Architect/planner: _______________________________
Heating contractor: _______________________________
Screed contractor: _______________________________
KELOX FB heating _______ m²
Screed work incl. KM640 KELOX screed additive completed on _______ Date
Start of heating-up time after 21 days, or definition by the screed manufacturer _______ Date
The heating-up time begins with a screed temperature of min. 15°C - in steps of max. 5K /24h until the max. flow temperature is reached _______ ° C
The bake-out time including heating-up time, standing time and cool-down time must be a minimum of 11 days _______ days
The cooling down takes place with max. 10K/24h
During heating up and cooling down, the space must be ventilated and aerated, with drafts being avoided.
Handover of the system on: _______ Date
KELOX FB heating in operation _______ yes/no
Cross out where not applicable!
If yes, max. flow temperature _______ ° C

Functional heating of the screed in accordance with ÖNORM EN 1264-4

The functional heating only services as proof of the functionality of the underfloor heating. The functional heating is performed after the bake-out process and does not replace it! The functional heating begins with a temperature of 20–25°C, which must be maintained for a minimum of 3 days, then the max. design temperature must be set and held at this value for a minimum of 4 days.

Start of functional heating: _______ Date

Client: _______________________________
Developer: Architect: _______________________________
Planner: Heating contractor: _______________________________
KELOX wall heating

While the share of radiant heating and convection are about the same with under-floor heating, the wall heating becomes a preferred “radiant heating element”. The “feeling of warmth” in spaces that are heated in this way corresponds to this.

Advantages

- Cosy warmth
- No “radiant cold” on outside walls
- Targeted heat distribution through large surface available of all walls
- KELOX FB module pipes can be detected electronically in the wall
- Possibility of wall cooling in the summer

Installation

- Install clamping rails vertically at a distance of 0.5 m: (screw, nail, shoot …)
- Usually only realised pipe register up to a height of 2m
- Press in KELOX FB pipe horizontally in an installation distance ID 12 into the clamping rail.
- No kinks in bending radii! Start flow at bottom.
- Maximum pipe length: 80m/heating circuit (output-dependent)
- Connect flow and return flow to manifold
- Perform pressure test (Page 51), observe frost protection, where
- Professional plastering

Assumed required materials for KELOX wall heating /m² *

<table>
<thead>
<tr>
<th>Laying module</th>
<th>Module pipe KMU120 m/m²</th>
<th>Clamping rail KM610 m/m²</th>
</tr>
</thead>
<tbody>
<tr>
<td>ID 12</td>
<td>8.7</td>
<td>2.0</td>
</tr>
<tr>
<td>ID 15</td>
<td>6.7</td>
<td>2.0</td>
</tr>
</tbody>
</table>

*These values do not include the required materials for the connection lines.

Plastering instructions

The following guidelines are explained in detail by “Austrian ARGE PUTZ” in the brochure “Processing Guidelines for Plastering Water-Conducting Wall Heating Systems”:

- The closure of slits and breaking through and fastening of installations must be completed in good time prior to starting the plastering work.
- Possibly necessary plastering pre-treatment e.g. pre-treatment, bonding bridges etc. must be adapted to the existing plaster surface/plaster base.
- With additional use of the wall heating system for cooling purposes, please note that the wall surface should not fall below the dew point.
- Render mortar with gypsum content are not recommended for interior spaces with increased moisture exposure. Stress groups in accordance with ÖNORM B 3346 must be noted.

Reduction of cracking risk

- For plasters with gypsum content, a textile glass mesh with a minimum mesh width of 7 x 7mm is embedded in the outer third of the plaster layer as plaster reinforcement. Working “fresh on fresh” is urgently necessary.
- For plasters with lime or lime/cement content, a textile glass mesh with a minimum mesh width of 7 x 7mm should also be embedded in the outer third, whereas this can take place in the first or second work step with single-layer processing.
- For double-layer processing, the plaster reinforcement can be embedded in the top layer of the first application or around the middle of the second application.
- The utmost security of crack reduction for the two-layer application is achieved by applying a textile glass mesh, with a minimum mesh width of 4 x 4mm on the hardened rendering layer.
- For structural parts with a length of more than 8 m, joints must be planned in due to thermal changes in length.
- With a subsequent vapour-tight coating (e.g. tiles) it must be ensured that the plaster dries sufficiently.
- Plaster thickness min. 10mm over pipe crown.

To avoid any damage to the pipe register during the plastering work, it is purposeful to keep the heating pipes under water pressure.

Room temperature °C

Average hot water temperature t in °C

\[ t = \frac{t_f + tr_f}{2} \]

maximum hot water temperature 50°C
**KM590E KELOX FB manifold**

Manifold bar – metal-plated brass

Return flow water meter. Flow double spindle valve

Operating conditions: max. 80°C – 6bar

The viewing window of the return flow meter is only for the purpose of reading off the water quantity. Through the fixed setting of the water quantity on the double spindle valve of the flow, in accordance with ÖNORM EN 1264-4, the water quantity is not changed, even after opening and closing of the individual heating circuits. As the flow values of the individual heating circuits influence one another during setting, it can be necessary to slightly correct the values in a second step.

**Advantages**
- FB manifold bars extendible with mounted union nut 1” WITHOUT additional connection fittings
- F-double spindle valve per heating circuit (red)
- RF-water meter per heating circuit (blue)
- Upgradable with contact thermometer Ø 35mm to 80°C
- Rotatable drainage and separate bleeding at the highest point
- Heating circuit outlets 3/4” EURO CONE

The specified water quantity from the calculation serves as a basis for setting the required water flow in each heating circuit.

**KM590E FB return flow bar**
- one water meter installed in each heating circuit.
- water quantity scale on the measuring tube of 0.5–2.5 l/min, convertible to 0.5–5 l/min, provided with a protective cap

**KM590E FB flow bar**
- Double spindle valve for setting the water quantity installed in each heating circuit
- Key for setting the double spindle valve 6mm
- Manual handle for opening and closing the individual heating circuits
- Threaded connector for KM596 KELOX-thermal motor M 30 x 1.5mm

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

---

**KMU590E KELOX-ULTRAX FB manifold**

Manifold bar – stainless steel

Return flow double spindle valve. Flow water meter

Operating conditions: max. 70°C – 6bar

The viewing window of the flow meter is for the purpose of reading off the flow water quantity. Through the fixed setting of the water quantity on the return valve, in accordance with ÖNORM EN 1264-4, the water quantity is not changed after opening and closing of the heating circuits. As the flow values of the individual heating circuits influence one another during setting, it can be necessary to slightly correct the values in a second step.

**Advantages**
- RF-double spindle valve per heating circuit (blue)
- F-water meter per heating circuit (red)
- Drainage and separate bleeding at the highest point
- Heating circuit outlets 3/4” EURO CONE

The specified water quantity from the calculation serves as a basis for setting the required water flow in each heating circuit.

**KMU590E FB return flow bar**
- Double spindle valve for setting the water quantity installed in each heating circuit
- Manual handle for opening and closing the individual heating circuits
- Threaded connector for KM596 KELOX-thermal motor M 30 x 1.5mm

**KMU590E FB flow bar**
- water meter installed in each heating circuit.
- water quantity scale on measuring tube of 0.5–5 l/min
- Setting fixable with locking cap

The required water quantity is set using the double spindle valve on the return flow and read off of the fully opened flow meter.
KM590E KELOX FB manifold system components

Manifold connection:
Brass with non-porous metal plating
1" x 3/4" reduction flat-sealing
1" x 1" nipple flat-sealing

Connection ball valves in straight or elbow shape for shutting off the manifolds, flat-sealing male thread to the manifold bar including seal (RF-elbow extended) brass non-porous metal plating
3/4" straight, 1" straight
3/4" elbow 90°, 1" elbow 90°

Connection ball valves in straight or elbow shape for shutting off the manifolds, flat-sealing male thread to the manifold bar including seal, flat-sealing male thread to the manifold bar including seal (RF-elbow extended) brass non-porous metal plating
3/4" straight°, 3/4" elbow 90°

Room thermostat (RTR-E) for control from 1 to 10 Thermal motors 230V
Operating voltage: 230 V AC 50/60 Hz
Hysteresis: 0.5 K, Contact:
1 Opener setting range: 5°C –30°C
IP Code/class: IP 30
Size: 75 x 75 x 25.5 mm, Colour: white

KM596 KELOX thermal motor
KM596 incl. adaptor M 30 x 1.5 mm (grey), for mounting on KM590E, KMU590E, KU590 and KC590 incl. “first open function”, half opened in new condition
230 V – AC: Start-up current 550 mA/1 W
24 V – AC/DC: Start-up current 300mA/1 W
IP Code/class: IP 54, Travel: 4.0 / 5.0 mm
Standard: “currentless closed” currentless open on request!

For a maximum of 6 room thermostats, and up to 12 thermal motors, 2 thermal motors per channel, connection option for one time switch for time control, and a pumping logic for connecting and switching a circulating pump 230 V, 50 watts
Size: 335 x 75 x 45 mm

Attention: Take account of space requirement in manifold cabinet!

KELOX FB radio system components

KM565 KELOX radio-controlled room thermostat
For controlling from 1 to 10 thermal motors
Distance to the radio control manifold max. 3 walls and 1 storey ceiling
Supply: 2x alkaline batteries 1.5 V
Temperature reduction/increase: 2 K
Radio frequency: 868 MHz
Setting range: 5°C–30°C
IP Code/class: IP 30
Size: 75 x 75 x 25.5 mm, Colour: white

KM565E KELOX radio-clock thermostat
For controlling from 1 to 10 thermal motors
Distance to the radio control manifold max. 3 walls and 1 storey ceiling, with 3 pre-set programmes.
Supply: 2x alkaline batteries 1.5 V
Temperature reduction/increase: 2 K
Radio frequency: 868 MHz
Setting range: 5°C–32°C
IP Code/class: IP 30
Size: 137 x 96.5 x 31.3 mm, Colour: white

KM565R KELOX repeater
For connecting a maximum of 6 channels for use as a radio-controlled room thermostat, pump and/or heating control unit. Connection option for a maximum of 12 thermal motors (230V), maximum of 10 thermal motors per channel, including output channels for pump and heating control, with mains cable 0.85 m. Distance to radio-controlled room thermostat max. 3 walls and 1 storey ceiling
Supply voltage: 230 V AC
Radio frequency: 868 MHz
IP Code/class: IP 40
Size: 450 x 57 x 52 mm, Colour: white

Radio antenna installed in housing!
Attention: Take account of space requirement in manifold cabinet!

KM567 KELOX radio-control manifold
To improve the transmission security with difficult ambient conditions between radio thermostats KM565, KM565E and radio control manifold KM567.
Integrates automatically into existing connections, operates fully automatically without intervention by the user, only one repeater required for several connections, distance up to 90 m, display of the received signal quality via 3 LEDs, 2 repeaters can be used in series
Radio frequency: 868 MHz
IP Code/class: IP 20
Size: 127 x 75 x 27.5 mm, Colour: white

Attention: Take account of space requirement in manifold cabinet!
Assembly flush-mounted manifold cabinet

KM570 or KM570F KELOX manifold cabinet carcass and KM571 flush-mounted visible part are packaged separately, delivered on order!

1. Sendzimir zinc-coated universal sheet steel cabinet carcass, also suitable for drywall construction assembly. Mounting bracket for plaster mesh provided on the back. Connection option from the bottom or on the side, height-adjustable feet, fastening elements for manifold and spray protection box. For longitudinal dimensions, see programme overview and price list.

2. The manifold cabinet carcass is set up on the finished floor height (100-230mm) with height-adjustable feet. The marking notch in the frame corresponds to the finished floor structure (horizontal level +/-0)

2.1 With cavity wall installations, the carcass is attached to the support structure of the wall.

3. Perform plastering work. **Do not forget the height-adjustable plaster trim element.** The spray protection box protects the inside of the cabinet.

4. Install underfloor heating or radiator manifolds using the fastening elements provided. Perform the installation work for the connections.

4.1 Install edge insulating strips on the wall or on the plaster trim element of the carcass, perform screed and floor covering work.

5. Flush-mounted visible part comprised of: Sendzimir zinc-coated, powder-coated, lockable front door and frame.

5.1 Slide frame fasteners onto the screws provided and attach using the wingnuts.

**Installation depth: 75mm –140mm**

6. The skirting board height is dependent on the level of the finished floor. Up to max. 120mm

**Advantages**

- no contamination of the inside of the cabinet due to the spray protection box.
- Visible parts are only required for completion on the building site.
- The skirting board can be fully installed without interruption.

---

Assembly surface-mounted manifold cabinet

KM570 or KM570F KELOX manifold cabinet carcass and KM572 surface-mounted viewing window, are packaged separately, delivered on order!

1. Sendzimir zinc-coated universal sheet steel cabinet carcass, also suitable for drywall construction assembly. Mounting bracket for plaster mesh provided on the back. Connection option from the bottom or on the side, height-adjustable feet, fastening elements for manifold and spray protection box. For longitudinal dimensions, see programme overview and price list.

2. The manifold cabinet carcass is set up on the finished floor height (100-230mm) with height-adjustable feet. The marking notch in the frame corresponds to the finished floor structure (horizontal level +/-0)

**Attention:** The carcass height must not exceed 660mm, measured from the finished floor.

2.1 The plaster trim element can be readjusted by 30mm in terms of height.

2.2 Attach the rear wall of the cabinet to the ready-plastered wall.

3. Install underfloor heating or radiator manifolds using the fastening elements provided. Perform the installation work for the connections. After the assembly work, the spray protection box protects the installation from contamination.

4. If the plaster trim element has been unscrewed during the installation work, this must be reattached (protection from distortion).

4.1 Install edge insulating strips on the wall or on the plaster trim element of the carcass, perform screed and floor covering work.

5. Surface-mounted visible part comprised of: Sendzimir zinc-coated, powder-coated hood and three depth-adjustable magnetic brackets.

5.1 Attach the magnetic brackets to the fasteners provided. Slide the hood onto the manifold cabinet carcass and push onto the magnetic brackets.

**Surface-mounted visible part:**

130mm deep

**Advantages**

- no contamination of the inside of the cabinet due to the spray protection box.
- Visible parts are only required for completion on the building site.
**KELOX ULTRA PE-RT industrial surface heating system**

Industrial surface heating systems mainly transfer heat as radiant heat. The temperature flow over the hall height is virtually constant, so that no supplement is usually necessary for the heating load calculation.

As the room temperature increases with the room height with convection heating systems and ceiling radiant heating systems and therefore more heat is lost through the hall roof, the standard heat losses are set higher by approx. 15 – 60% than with surface heating systems.

**KU100 ULTRA PE-RT pipe**

Industrial surface pipe in accordance with ÖNORM EN ISO 22391, oxygen-tight and water-vapour-tight with EVOH barrier in accordance with DIN 4724.

**Operating conditions:** Surface heating system – tmax. 70°C /6 bar

**Colour:** Red, Roll length 300 running metres or 500 running metres

**Joining technology:** The joints are created with screw fittings, press fittings and push fittings from the KELOX module pipe programme.

**Bending radii for ULTRA PE-RT pipes:** d16: 6 x d; d20: 7 x d; d20: 8.5 x d

**Joints:** Continuous movement joints with a distance of approx. 20mm separate concrete slabs from various components (e.g. shafts, ducts, supports, walls etc.). Connection lines that cross over room joints or movement joints must be protected due to the anticipated stresses in the joint area with a KM614 FB joint protection pipe of approx. 1.0m in length.

**Installation distances:** The pipes for the industrial surface heating system can be installed in a meandering shape or spiral shape. The installation distances are usually selected in ID15, ID30 or ID45. In the peripheral areas or in front of hall gates, peripheral zones can be provided with a closer installation distance and thus higher floor surface temperatures. Peripheral zones are usually realised in ID15.

**Surface temperature:**

- Occupied areas: tmax 29°C
- Peripheral zones: tmax 35°C

**Maximum pipe lengths/heating circuit:** (output-dependent)
d16: 100 – 120m; d20: 120 – 150m; d20: 140 – 180m

**Design parameters for the following performance tables**

- **Wear layer (R):** 0.0m² K/W
- **Concrete (λ):** 1.9 W/mK
- **Insulation:** without
- **Soil temperature:** 5 °C
- **ULTRA PE-RT pipe:** d20 x 2.25mm

---

**Assembly on the reinforcement** for the assembly of the ULTRA PE-RT pipe to the reinforcement that is installed on site, two different fastening options are available.

**KU615 ULTRA PE-RT pipe ties:** plastic pipe ties for manual fastening at a distance of approx. 0.7m.

**KU617 ULTRA PE-RT binding wire:** galvanised binding wire for binding and fastening the ULTRA PE-RT pipes with WZ948 KELIT wire fastening device at a distance of approx. 0.7m.

**Hall installations:** When fastening hall installations or machine foundations, a safety distance of 50m should be maintained to the pipes. Otherwise, a blind area should be left open in these areas for pipe installation.

**The concrete thicknesses** are realised from 100mm to 300mm, depending on the required load-bearing capacity

**Thermal insulation:** If the building is heated for longer than 4 months per year and the room temperatures are above 12°C, the installation of a thermal insulation layer is recommended under the concrete slab in an area of approx. 5m room depth along the outside wall. If the groundwater depth is less than approx. 2m, thermal insulation under the industrial surface heating is advisable with regard to the energy losses downwards. Thermal insulation with high compressive strength should be used.

In the case of moisture from below, a moisture barrier should be provided on site.
Performance table for KELOX ULTRA PE-RT industrial surface heating system

Concrete cover: 100 and 200mm

### ULTRA PE-RT pipe d20mm
- **q**: Heat flow density (W/m²)
- **t Fb**: mean floor surface temperature (°C)

#### Maximum Surface temperature in accordance with ÖNORM EN 1264-3
- Occupied area: 29 °C
- Peripheral zones: 35 °C
- Spread (tf–trf): 10 K

#### Performance table

<table>
<thead>
<tr>
<th>Concrete cover: 100mm</th>
<th>Concrete cover: 200mm</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>ID15</strong></td>
<td><strong>ID30</strong></td>
</tr>
<tr>
<td>6.70</td>
<td>3.40</td>
</tr>
<tr>
<td>q</td>
<td>t Fb</td>
</tr>
<tr>
<td>12</td>
<td>89.0</td>
</tr>
<tr>
<td>15</td>
<td>72.4</td>
</tr>
<tr>
<td>18</td>
<td>55.7</td>
</tr>
<tr>
<td>20</td>
<td>44.4</td>
</tr>
<tr>
<td>22</td>
<td>32.7</td>
</tr>
</tbody>
</table>

**Heating water temperature °C (tf+trf):** 2

#### Standard room temperature
- Pipe requirement
- **DI15**: 6.70
- **DI30**: 3.40
- **DI45**: 2.30

#### Concrete cover: 250 and 300mm

### ULTRA PE-RT pipe d20mm
- **q**: Heat flow density (W/m²)
- **t Fb**: mean floor surface temperature (°C)

#### Maximum Surface temperature in accordance with ÖNORM EN 1264-3
- Occupied area: 29 °C
- Peripheral zones: 35 °C
- Spread (tf–trf): 10 K

#### Performance table

<table>
<thead>
<tr>
<th>Concrete cover: 250mm</th>
<th>Concrete cover: 300mm</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>ID15</strong></td>
<td><strong>ID30</strong></td>
</tr>
<tr>
<td>6.70</td>
<td>3.40</td>
</tr>
<tr>
<td>q</td>
<td>t Fb</td>
</tr>
<tr>
<td>12</td>
<td>78.4</td>
</tr>
<tr>
<td>15</td>
<td>65.4</td>
</tr>
<tr>
<td>18</td>
<td>52.2</td>
</tr>
<tr>
<td>20</td>
<td>43.7</td>
</tr>
<tr>
<td>22</td>
<td>34.8</td>
</tr>
</tbody>
</table>

**Heating water temperature °C (tf+trf):** 2

#### Standard room temperature
- Pipe requirement
- **DI15**: 6.70
- **DI30**: 3.40
- **DI45**: 2.30

---

**KE KELIT**

---

**KELOX**

---
KU590 ULTRA PE-RT industrial surface manifold 5/4"

Flow and return flow bar 5/4", with bleeding/rinsing connection at the highest point, ends of manifold closed. Thermostatic valves that are rotatable on the flow with 3/4” euro cone male thread, top parts fit KM596 KELOX thermal motor, on return flow, rotatable ball valves with 3/4” euro cone male thread, non-porous metal plating, including sound insulated steel consoles for fastening the manifold bars.

Operating conditions: max. 80°C – 6bar

Advantages
- FB manifold bar with moulded union nut 6/4” and flat-sealing reduction nipple 5/4” male thread, brass non-porous metal plating
- Flow valve rotatable, top part matches KM596 KELOX thermal motor with 3/4” euro cone male thread, per heating circuit
- Return flow ball valve rotatable with 3/4” euro cone male thread, per heating circuit
- Rotatable drainage and bleeding at the highest point
- Heating circuit outlets 3/4” EURO CONE

Flow media
- Heating water
- Cooling water
- Water mixtures with conventional corrosion and frost protection additives in accordance with ÖNORM H 5195

Technical data for flow valve 3/4”
- Thermostatic valve: upgradable with KM596 KELOX thermal motor
- Max. operating pressure 6 bar
- Euro cone 3/4” male thread

Setting values for flow valve
- With 1/4 rotation 2.1 l/min KVS value 0.40
- With 1/2 rotation 4.7 l/min KVS value 0.88
- With 1 rotation 6.6 l/min KVS value 1.23
- With 1 1/2 rotations 7.2 l/min KVS value 1.37
- With 2 rotations 7.8 l/min KVS value 1.48
- With 2 1/2 rotations 8.2 l/min KVS value 1.56
- With 3 rotations 8.4 l/min KVS value 1.59
- With full opening 8.9 l/min KVS value 1.69

Technical data for return flow ball valve 3/4”
- Seals: made of PTFE/ Teflon
- Max. operating pressure 6 bar
- Euro cone 3/4” male thread

Setting values for return flow ball valve
- With full opening 16.4 l/min KVS value 3.11

KELOX ULTRA PE-RT open-space heating system

For safety and comfort reasons, specific surface must be kept free from ice, snow and frost
- Parking surfaces
- Helicopter landing pads
- Entry roads (hospitals, underground garages)
- Bridges
- Car washes
- Pedestrian passageways
- Ramps

Important installation instructions
- Basically fill system with anti-freeze (–25°C)
- feed via heat exchanger
- provide drain for melted water
- it usually involves specific projects, which require consultation with architects, structural engineers and system manufacturers.
- KU590 industrial surface manifolds 5/4” are available
- Maximum pipe lengths/heating circuit: (output-dependent)
  d16  60 – 80m
  d20  100 – 120m
  d25 120 – 150m

The following details are based on average empirical values.

Performance table for open-space heating system
KELOX ULTRA PE-RT pipe d20mm
q = heat flow density (W/m²) pread (tf–trf): 15 K

<table>
<thead>
<tr>
<th>Outside temperature °C</th>
<th>pipe requirement (output-dependent)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>ID12</td>
</tr>
<tr>
<td>-5</td>
<td>139</td>
</tr>
<tr>
<td>-10</td>
<td>169</td>
</tr>
<tr>
<td>-15</td>
<td>198</td>
</tr>
<tr>
<td>-20</td>
<td>227</td>
</tr>
<tr>
<td>-5</td>
<td>198</td>
</tr>
<tr>
<td>-10</td>
<td>227</td>
</tr>
<tr>
<td>-15</td>
<td>256</td>
</tr>
<tr>
<td>-20</td>
<td>285</td>
</tr>
<tr>
<td>-5</td>
<td>256</td>
</tr>
<tr>
<td>-10</td>
<td>285</td>
</tr>
<tr>
<td>-15</td>
<td>314</td>
</tr>
<tr>
<td>-20</td>
<td>343</td>
</tr>
<tr>
<td>-5</td>
<td>314</td>
</tr>
<tr>
<td>-10</td>
<td>343</td>
</tr>
<tr>
<td>-15</td>
<td>372</td>
</tr>
<tr>
<td>-20</td>
<td>401</td>
</tr>
</tbody>
</table>

Structure

1. Cover, wear layer (asphalt etc.)
2. Reinforcement according to statics
3. KELOX ULTRA PE-RT pipe, attached e.g. to bottom reinforcement
4. Concrete embedding, min. 100mm above the pipe crown
5. Insulation, if permitted for statics reasons, pay attention to moisture
6. Sub-structure

Output requirement
Black ice is produced with relative humidity of approx. 85% and a ground temperature of approx. –1°C to –5°C

<table>
<thead>
<tr>
<th>Outside temperature °C</th>
<th>ice-free 1cm snow/h W/m²</th>
<th>ice-free and snowfree W/m²</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>W/m²</td>
<td>W/m²</td>
</tr>
<tr>
<td>-5</td>
<td>95</td>
<td>210</td>
</tr>
<tr>
<td>-10</td>
<td>160</td>
<td>230</td>
</tr>
<tr>
<td>-15</td>
<td>230</td>
<td>250</td>
</tr>
<tr>
<td>-20</td>
<td>250</td>
<td>280</td>
</tr>
</tbody>
</table>
**KELOX sizing and loss of pressure**

The calculation of the individual resistances can be found in the KELOX Handbook

**KELOX module pipe:**
\(d16, 20, 25, 32, 40, 50, 63, 75\)mm

---

**Pressure test for FB heating systems**

KE KELIT recommends performing the leak-tightness test on the basis of ÖNORM EN 1264-4. Every pressure test is a snapshot of the actual state and cannot be a guarantee against installation errors.

**Attention!** Prior to every pressure test, ensure that all points of the assembly instructions have been conscientiously carried out.

**Pressure test**

Test the pipeline network with double operating pressure, however at least with 4 bar and up to a maximum of 6 bar, at every point in the system. Use pressure measurement devices that allow a pressure change of 0.1 bar to be easily read off. The pressure measurement device should preferably be at the lowest position in the system.

The temperature equalisation between ambient and filling water temperature must be taken into account after the testing pressure is generated. The testing pressure should be restored after the waiting time, if necessary.

All containers, devices and fittings that are not suitable for the testing pressure should be disconnected from the system during the pressure test.

The system is filled with filtered water and is completely bled. During the test, a visual check of the pipe connectors and screw fittings must be performed.

To identify damage to the pipe, testing pressure must be applied to the pipes while the screed is being brought in.

**KELOX recommends a testing time of 1 hour.**

| Calculated testing pressure | bar |
| Test time                  | Hr  |

- During the testing time, NO loss of pressure was determined.
- The system contains ……………………… as anti-freeze
- The system contains NO anti-freeze and has therefore be emptied completely for safety reasons.

**Location** …………………………………………………………………………………………………………………

**Object** …………………………………………………………………………………………………………………

**System pressure** ……………………………………………………………………………………………………………

**Confirmation**

**Clerk**

**Date** …………………. **Time from** ………………… to …………………

**Client** …………………………………………………………………………………………………………………

**Signature/stamp**
KELOX FB installation requirements

You should ...

1. ... define the installation distance in every room according to the output requirement and select the FB system.
2. ... in external wall and window areas, provide peripheral zones with a maximum width of 1 m with a compacted installation distance.
3. ... lead the flow line to where the greatest heat requirement is expected (window, outside door areas, 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. ... the installation type of the KELOX FB pipes in a spiral or meandering shape is shown as an example in the FB structure types (Page 10–25).
6. ... improve the sound insulation by using the KM630 KELOX footfall sound insulation.
7. ... Avoid joining points in the screed area and remember at the same time to utilise the roll length optimally. Connections in the floor structure must be precisely positioned and labelled in a revision drawing in accordance with ÖNORM EN 1264.
8. ... avoid crossing points through intelligent pipe layout.
9. ... already avoid future noise bridges during pipe installation. Therefore, fully install the KM634 KELOX FB edge insulating strips.
10. ... through the assembly of the KM614 KELOX FB joint protection tubes, guarantee the full functionality of the future thermal expansion joints of the screed. According to ÖNORM EN 1264, maximum field sizes of 40m² are permitted with a maximum side length of 8m without an additional expansion joint! The ratio of length to width must not exceed 2 : 1.
11. ... to determine the screed moisture, apply the KM619 FB measuring points for safe marking of the drill holes in the screed.
12. ... Avoid screed faults, use KM640 KELOX FB screed additive to prevent cracks. The screed thicknesses are defined by the building physicist on the basis of use, insulation thickness and screed quality.
13. ... ensure the density of the heating circuits during the screed laying by means of a water pressure test! (Pay attention to anti-freeze).
14. ... pay attention to the bake-out process! In accordance with ÖNORM B 2242-2, every underfloor heating system must be subjected to a bake-out process after the screed dries out and prior to installing the floor coverings. The functional heating of the screed in accordance with ÖNORM EN 1264-4 only serves the purpose of verifying the functionality of the underfloor heating and does not replace the bake-out process. (Page 35)

Important principle!

Only an optimum cooperation between KE KELIT as the system supplier, the trade wholesaler, specialist installation company, master builder and developer guarantees a functional, long-lasting and efficient underfloor heating system. Use the technical advice of these partners!

General installation instructions

1. The KELOX module pipe system is made of plastic and requires careful handling in relation to shock, impact, nicks and kinks.
2. Store and transport all KELOX system components with care. The external protective layer is stabilised against UV influences; however do not expose the pipes to long-lasting, direct sunlight. The conventional storage and processing times are not affected by this.

Vitally important!

- always cut pipes straight, at right angles to the pipe axis
- precisely calibrate ends of pipes
- slide the screw fitting on completely, without damaging the O-rings
- tighten screw fitting firmly

4. Avoid kinks! Do not install pipes that are damaged or incorrect! With tight radii, please use the following from the tools available: Bending sprint or pipe bending pliers

5. Each installation must be subjected to a pressure test in accordance with the standard. Keep a log of the pressure test (Page 51).

6. Water containing glycol for the frost protection is not a problem for KELOX. Observe the application instructions of the suppliers.

7. ÖNORM H 5195/1 defines the pH value and the water hardness (pH) of heating and refilling water. The functionality of valves, control devices etc. can be influenced by this.

8. To ensure the guarantee services (warranty agreement with the Federal Guild of Construction), KELOX system components must be exclusively used in each installation case.

9. Fault-free installation of the KELOX module pipe system requires a minimum of tools. For your safety, we recommend using the original tools that have been tried and tested many times in practice and their regular servicing.

10. Don’t hesitate to consult our application engineers if you are in any doubt. There is no optimal solution for every case, but we can always help.

Permitted bending radii

<table>
<thead>
<tr>
<th>Modul-pipe</th>
<th>by hand</th>
<th>with bending pliers</th>
<th>with bending spring</th>
</tr>
</thead>
<tbody>
<tr>
<td>d16</td>
<td>5 x d</td>
<td>3.5 x d</td>
<td>3 x d</td>
</tr>
<tr>
<td>d20</td>
<td>5 x d</td>
<td>3.5 x d</td>
<td>3 x d</td>
</tr>
<tr>
<td>ULTRA-PE-RT-pipe</td>
<td>by hand</td>
<td>with bending pliers</td>
<td>with bending spring</td>
</tr>
<tr>
<td>d16</td>
<td>5 x d</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>d25</td>
<td>5 x d</td>
<td>–</td>
<td>–</td>
</tr>
</tbody>
</table>

Avoid tight bending radii directly after pressing and screw connections due to risk of breakage (cutting effect of the support sleeve).
KELOX FB programme overview

The KELOX module pipe system is constantly adapted to practical requirements and is systematically enhanced. Please see the respective valid KELOX FB price list for the current status of the supply range.

The short symbols (e.g. KMU120 for KELOX FB module pipe or KM635 for KELOX FB staple plate ...) simplify the ordering process significantly and are therefore requested in your order.

Operating conditions

Surface heating systems:
Class 4 according to ÖNORM EN ISO 21003

KELOX-ULTRAX FB pipe
tmax 70°C/10bar
ULTRA PE-RT FB pipe
tmax 70°C/6bar

<table>
<thead>
<tr>
<th>KMU120</th>
<th>KELOX-ULTRAX FB pipe</th>
</tr>
</thead>
<tbody>
<tr>
<td>ULTRA X FB pipe conforming to EN ISO 21003, oxygen and water vapour barrier; 5-layered composite pipe made of PE-RT/Al/PE-RT</td>
<td></td>
</tr>
<tr>
<td>Operating conditions: tmax 70°C/10 bar</td>
<td></td>
</tr>
<tr>
<td>Colour: blue/transparent</td>
<td></td>
</tr>
<tr>
<td>Reel material</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>KMU120P</th>
<th>KELOX-ULTRAX FB Plus pipe – 9mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>KELOX-ULTRAX FB Plus pipe conforming to EN ISO 21003; oxygen and water vapour barrier; 5-layer multilayer pipe made of PE-RT/Al/PE-RT; 9mm closed cell soft foam insulation and protective sleeve made of viscoplastic PE foil</td>
<td></td>
</tr>
<tr>
<td>Operating conditions: tmax 70°C/10 bar</td>
<td></td>
</tr>
<tr>
<td>Insulation thickness: 9mm</td>
<td></td>
</tr>
<tr>
<td>Colour: red</td>
<td></td>
</tr>
<tr>
<td>Reel material</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>KM610</th>
<th>KELOX FB clamping rail</th>
</tr>
</thead>
<tbody>
<tr>
<td>U-profile clamping rail made of plastic with self-clamping pipe fastener in 50mm distances</td>
<td></td>
</tr>
<tr>
<td>d16: L: 3.9m W: 50mm H: 24mm</td>
<td></td>
</tr>
<tr>
<td>d20: L: 4.0m W: 50mm H: 24mm</td>
<td></td>
</tr>
<tr>
<td>d25: L: 4.0m W: 50mm H: 35mm</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>KM612</th>
<th>KELOX FB fixing hook</th>
</tr>
</thead>
<tbody>
<tr>
<td>For fastening KELOX module pipes and FB clamping rails to the insulation, plastic</td>
<td></td>
</tr>
<tr>
<td>Dimension</td>
<td>PU/Unit</td>
</tr>
<tr>
<td>40</td>
<td>100</td>
</tr>
<tr>
<td>60</td>
<td>100</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>KM613</th>
<th>KELOX FB fixing plate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Deep-drawn pipe holding nubs for sturdy fastening of the KELOX module pipe d16mm, connection of the individual plates by overlapping. One longitudinal and one lateral edge is designed as a scaled-down father nub, which is marked with the KELIT logo in between the nubs, the installation should preferably start on the right-hand side of a room. As a replacement for clamping rail, PE grid foil and fixing hook. Installation distance: ID 5, 10, 15, 20, 25 and 30cm Height: 20mm</td>
<td></td>
</tr>
<tr>
<td>Content: 6106310: 160 units/pallet 6106320: 10 units/box or 14 boxes/pallet</td>
<td></td>
</tr>
<tr>
<td>Attention: due to overlapping, add 10% additional requirement!</td>
<td></td>
</tr>
</tbody>
</table>
KM635  KELOX FB stable plate

Lambdapor made of expanded polystyrene EPS-T 650 plus 033 in accordance with ÖNORM B 6000, free from HFC and CFC, lamination HDPE fabric with PE coating, incl. adhesive overlapping edge, for stapling and fastening the KELOX FB pipe with KM611 staples.

Thickness: 28/25 mm
Load-bearing capacity: max. 6.5 kN/m²
Load-bearing capacity: max. 10 kN/m²
Lambda value: 0.033 W/mK
Dynamic rigidity: in accordance with ÖNORM EN 29052 -1 < 20 MN/m³
Coefficient of water vapour diffusion: 250.000 My
Reel material: 10 x 1 m
Graduation: 50 mm
Article No. 6060750 - expanded Polystyrene EPS-plus T 1000, with a compressive strength of max. 10 KN.

ATTENTION Protect from direct sunlight, do not store outdoors!

KM611  KELOX FB stable

For stapling the KELOX FB pipe onto the KM635 FB staple plate with WZ945 KELIT staples.

Magazined with 25 units each, made of plastic
Requirement: approx. 2–3 units/running metre of pipe
Colour: blue

KMU121K  KELOX-ULTRAX FB Velcro pipe

ULTRA X FB Velcro pipe in accordance with EN ISO 21003, oxygen-tight and water-vapour-tight 5-layer composite pipe made of PE-RT/Al/PE-RT, incl. wrapped Velcro strip for direct attachment to the KM636 KELOX FB Velcro plate without additional fastening.

Operating conditions:
tmax 70°C/10 bar
Colour: blue/transparent
Reel material

KM614  KELOX FB joint protection

Longitudinally slitted LDPE tube for the protection of the KELOX FB pipe in the screed joint area
Art. No. 6108030: Length 400 mm for FB pipe d16 mm
Art. No. 6108050: Length 50 mm for FB pipe d16 and d20 mm
Art. No. 6108070: Length 25 m for FB pipe d25 mm

KU101K  ULTRA PE-RT FB Velcro pipe

ULTRA PE-RT FB Velcro pipe in accordance with EN ISO 22391, oxygen-tight and water-vapour-tight PE-RT pipe with EVOH barrier in accordance with DIN 4724, incl. wrapped Velcro strip for direct attachment to the KM636 KELOX FB Velcro plate without additional fastening.

The joints can be created with KM screw fittings, KMP, KWP, KMU and KWU fittings.

Operating conditions:
tmax. 70°C/6 bar
Colour: red
Reel material

KM636  KELOX FB Velcro plate

Lambdapor made of expanded polystyrene EPS-T 650 plus 033 in accordance with ÖNORM B 6000, free from HFC and CFC, lamination Velour fabric with PE coating, including adhesive overlapping edge, for stapling and fastening the KELOX FB pipe with KM611 staples.

Thickness: 28/25 mm
Load-bearing capacity: max. 6.5 kN/m²
Load-bearing capacity: max. 10 kN/m²
Lambda value: 0.033 W/mK
Dynamic rigidity: in accordance with ÖNORM EN 29052 -1 < 20 MN/m³
Coefficient of water vapour diffusion: 250.000 My
Reel material: 10 x 1 m
Graduation: 50 mm
Article No. 6060750 - expanded Polystyrene EPS-plus T 1000, with a compressive strength of max. 10 KN.

ATTENTION Protect from direct sunlight, do not store outdoors!
<table>
<thead>
<tr>
<th>KM619 KELOX FB Measuring point</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Self-adhesive measuring point for secure marking of a drill hole in the screed, to determine the screed moisture</td>
<td>Dimension</td>
</tr>
<tr>
<td>100</td>
<td>5</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>KM630 KELOX FB footfall sound insulation</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Made of cross-linked PE foam, coated on one side with tear-resistant mesh fabric and pigmented PE-LLD foil. Insulation thickness: 4mm</td>
<td>Dimension</td>
</tr>
<tr>
<td>1,4x50m</td>
<td>70</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>KM631 KELOX FB grid foil</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Made of PE regranulate with 50mm graduation Thickness: 0.15–0.2mm</td>
<td>Dimension</td>
</tr>
<tr>
<td>2mx50m gefaltet</td>
<td>100</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>KM632 KELOX FB fastening strap</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>For bonding individual footfall sound insulation and grid foils. Width: 75mm Reel length: 66 m</td>
<td>Dimension</td>
</tr>
<tr>
<td>75mm</td>
<td>1</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>KM634 KELOX FB edge insulation</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Made of foamed PE, reverse side self-adhesive incl. 5 tear-off strips, front with self-adhesive, welded-on overlapping foil for tight connection of edge insulating strips and footfall sound insulation Reel length: 25m</td>
<td>Dimension</td>
</tr>
<tr>
<td>8 x 150</td>
<td>200</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>KM640 KELOX FB screed</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Non-corrosive plastic dispersion as plasticiser, to improve the elasticity of the heating strip and to prevent shrinkage cracks, type ACE 417 Dosage: with 60 - 70 mm screed thickness approx. 0.2kg/m²</td>
<td>Dimension</td>
</tr>
<tr>
<td>1</td>
<td>10</td>
</tr>
</tbody>
</table>

**ATTENTION DO NOT mix with other screed additives!**

<table>
<thead>
<tr>
<th>KM660 KELOX dry system element</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>System element made of Polystyrene EPS 035 DEO, 240 kPa, with factory-laminated aluminium heat-conducting baffle 0.5 mm over entire surface and omega-shaped, safety-flanged pipe ducts for effective enclosure of the KELOS module pipes, incl. predetermined breaking points, for perfectly fitted installation over the entire surface in the rooms ID: 12.5cm 25cm L: 1000mm W: 500mm H: 30mm</td>
<td>Dimension</td>
</tr>
<tr>
<td>1</td>
<td>10</td>
</tr>
</tbody>
</table>

**ATTENTION to improve the pressure stability, frame wood KM683 should be used!**

<table>
<thead>
<tr>
<th>KM662 KELOX dry head element</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Head element made of Polystyrene EPS 035 DEO, 240 kPa, incl. milled-in pipe ducts for holding the KELOX module pipes ID: 12.5cm or 25cm L: 250mm W: 500mm H: 30mm</td>
<td>Dimension</td>
</tr>
<tr>
<td>12.5 / 4-times</td>
<td>10</td>
</tr>
<tr>
<td>25 / 4-times</td>
<td>10</td>
</tr>
</tbody>
</table>

**ATTENTION to improve the pressure stability, frame wood KM683 should be used!**

<table>
<thead>
<tr>
<th>KM663 KELOX dry head change element</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Head change element made of Polystyrene EPS 035 DEO, 240 kPa, incl. milled-in pipe ducts for holding the KELOX module pipes, for changing the installation distances ID: 12.5cm – 25cm L: 250mm W: 380mm H: 30mm</td>
<td>Dimension</td>
</tr>
<tr>
<td>12.5 – 25</td>
<td>1</td>
</tr>
</tbody>
</table>

**ATTENTION to improve the pressure stability, frame wood KM683 should be used!**
KM664  KELOX dry filler insulation
Filler insulation made of Polystyrene EPS 035 DEO, 240 kPa, including predetermined breaking points for perfectly fitted installation over the entire rooms, for subsequent cutting-in of the pipe ducts with the KELOX hot cutting device WZ960

ATTENTION to improve the pressure stability, frame wood KM683 should be used!

KM681  KELOX dry alu cover plate
Aluminium cover as an additional heat-conducting baffle for head elements and edge plates where connection lines are routed

KM682  KELOX dry steel load distribution plate
Galvanised load distribution plate made of sheet steel, as an additional cover for doorways or in the manifold area

KM683  KELOX dry frame wood
Frame wood installed loosely all around to improve the compressive strength of the floor. In order to provide the necessary stability for a change of covering and to attach the top profile rail, the frame wood must be screwed down tightly in doorways. Two-layer structure, the support plate MDF 22 GL (medium-density fibre board - 22mm), and pressure-stable soft-fibre board WF 08 Hopa - 8mm.
Frame wood
L: 1000mm  W: 44mm  H: 30mm

KM686  KELOX dry dispersion adhesive
For adhering and bonding KELOX dry strong load distribution plates, KELOX dry head elements and cut KELOX dry system elements
Consumption: ca. 150 – 200 g/m²

KU100  ULTRA PE-RT pipe
ULTRA PE-RT pipe Industrial surface pipe in accordance with ÖNORM EN ISO 22391, oxygen-tight and water-vapour-tight with EVOH barrier in accordance with DIN 4724. The joints can be created with KM screw fittings, with KMP, KWP, KMU and KWU fittings.
Operating conditions:
\[ t_{\text{max}} = 70^\circ\text{C} / 6 \text{ bar} \]
Colour: red
Reel material

KU615  ULTRA PE-RT pipe ties
To attach the ULTRA PE-RT pipe to the structural steel mesh
Colour: natural

KU617  ULTRA PE-RT binding wire
Galvanised wire for attaching and fastening the ULTRA PE-RT pipe with a WZ948 KELIT wire fastening device on structural steel mesh.
Reel length:
95m for approx. 120 attachments

K87  KELIT elbow bracket 90°
Plastic elbow bracket 90° for insertion and attachment of flexible pipes. Fits:
KWS16: KU100/d16
KWS20: KU100/d20
KWS29: KU100/d25
**KM590E**  
**KELOX FB manifold**  
Flow and return flow bars with 3/4" heating circuit outlets euro cone male thread, with bleeding and draining at the highest point, manifold ends closed, connections with moulded 1" union nut, flat-sealing, manifold ends with 1" male thread, for screwing together individual manifold bars without additional shaped connectors, double spindle valve on flow - pre-settable, top sections fit KM596 KELOX thermal motor, on return flow, water volume meter (0.5-2.5 l/min), brass with non-porous metal plating, including signs that can be labelled for each heating circuit and noise-insulated metal consoles.  
**Operating conditions:**  
tmax 80°C/6bar  
**ATTENTION WITHOUT KM220**  
Euro screw connection!  

**Dimension** | **PU/Unit**  
--- | ---  
1 L: 75mm | 1  
2 L: 175mm | 1  
3 L: 225mm | 1  
4 L: 275mm | 1  
5 L: 325mm | 1  
6 L: 375mm | 1  
7 L: 425mm | 1  
8 L: 475mm | 1  
9 L: 525mm | 1  
10 L: 575mm | 1  
11 L: 625mm | 1  
12 L: 675mm | 1

**KM592E**  
**KELOX manifold accessories**  
Fill and drain valve 3/8" elbow 90° - as replacement part for KM590E, KU590 and KC590  
Fill and drain valve 1/2" elbow 90° - as replacement part for KM590E contact thermometer d35mm to 80°C - as replacement part for KM580E and KM590E  

**Dimension** | **PU/Unit**  
--- | ---  
3/8 AG | 1  
1/2 AG | 1  
Contact thermometer | 1

**KM593A**  
**KELOX connection set**  
For manifold connection: reduction or nub flat-sealing brass pore-free metal-plated  

**Dimension** | **PU/Unit**  
--- | ---  
1" x 3/4" redu. | 1  
1" x 1" nub | 1

**KM593B**  
**KELOX ULTRAX manifold accessories**  
Manifold accessories for KM590E:  
Manifold screw fitting:  
1" fem. t. x 1" male t.  
Bleeding and emptying  
1/2" x 3/4" euro c.  
RF-connection nub  
1" x 3/4" euro c.  
RF-thermostatic valve  
1/2" 0.5–5 l/min

**Dimension** | **PU/Unit**  
--- | ---  
1" fem. t. x 1" male t. | 1  
1" | 1  
1/2" x 3/4" euro c. | 1  
1" x 3/4" euro c. | 1  
1/2" 0.5–5 l/min | 1

**KM593E**  
**KELOX Connection ball valve**  
Connection ball valves in straight or elbow shape for shutting off the manifolds, flat-sealing male thread to the manifold bar including seal (RF-elbow extended) brass non-porous metal plating

**Dimension** | **PU/Unit**  
--- | ---  
3/4" straight | 1  
3/4" elbow 90° | 1  
1" straight | 1  
1" elbow 90° | 1

**KM593E**  
**KELOX WMZ-adaptor**  
Connection ball valves in straight or elbow shape, heat meter adaptor 3/4" (110mm) with flat-sealing male thread to the manifold bar including seal, with connection option for temperature measurement (return flow elbow shape extended), brass non-porous metal plating

**Dimension** | **PU/Unit**  
--- | ---  
3/4" straight | 1  
3/4" elbow 90° | 1

**KM593E**  
**KELOX-ULTRAX FB manifold**  
Stainless steel flow and return flow bar with heating circuit outlets 3/4" euro cone male thread, with bleeding and drainage at the end of the manifold, connections with screwed-in union nut 1" flat-sealing. Return flow valve top parts fit KM596 KELOX thermal motor, flow water meter adjustable of 0.5–5.0 l/min, including sound-insulated steel consoles  
**Operating conditions:**  
tmax 70°C/6bar  
**ATTENTION WITHOUT KM220**  
Euro screw connection!  

**Dimension** | **PU/Unit**  
--- | ---  
2 L: 200mm | 1  
3 L: 250mm | 1  
4 L: 300mm | 1  
5 L: 350mm | 1  
6 L: 400mm | 1  
7 L: 450mm | 1  
8 L: 500mm | 1  
9 L: 550mm | 1  
10 L: 600mm | 1  
11 L: 650mm | 1  
12 L: 700mm | 1
**KU590**

**ULTRA PE-RT industrial surface manifold**

Flow and return flow bars (5/4") with heating circuit outlets euro cone 3/4" connection option with rotatable valves in screw-fitting area, with bleeding/rinsing connection at the highest point, connections with 6/4" moulded union nut, flat-sealing and 5/4" reducing nipple with male thread, manifold ends closed. KELOX thermal motor, on return flow thermostatic valve 3/4" euro cone male thread, top parts fit KM596 KELOX thermal motor, on return flow ball valve 3/4" euro cone male connection, brass and non-porous metal plating, including noise-insulated steel consoles for mounting the manifold bars.

**Operating conditions:**

* tmax 80°C/6bar

**ATTENTION WITHOUT KM220**

Euro screw connection!

**KM220**

**KELOX euro screw connection**

For connection to installation components with 3/4" EUROCONE (male thread) according to EN215, brass with non-porous metal plating, including nut with female thread, support sleeve with O-rings and clamping ring.

Code: surrounding nicks on the nut O-ring colour: BLACK

<table>
<thead>
<tr>
<th>Dimension</th>
<th>PU/Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>16 x 3/4&quot;</td>
<td>20</td>
</tr>
<tr>
<td>20 x 3/4&quot;</td>
<td>20</td>
</tr>
<tr>
<td>25 x 3/4&quot;</td>
<td>20</td>
</tr>
</tbody>
</table>

**KM650**

**KELOX FB fixed-value control set**

KELOX FB fixed-value control set for temperature control of individual FB heating circuits in systems with a temperature level of radiator heating systems (e.g. 70/55°C).

The principle works according to a thermal injection control unit as a fixed-value controller and is mounted directly onto the manifold.

If all FB circuits are to be automatically closed, the pump must be secured to switch off the pump with a pump logic (e.g. KM568 KELOX connection unit). The primary flow is connected to the return flow bar, the primary return flow is connected to the flow bar. Pay attention to hydraulic balancing in the connection lines!

Minimum depth from the manifold cabinet 110mm.

Comprised of: highly efficient pump Wilo-Yonos-Para 15/6, temperature monitor, throttle valve, thermostatic valve, thermostatic head, including all connection parts to the manifold, assembled ready to plug in.

**Operating conditions:**

* tmax 80°C/6bar

**ATTENTION only in conjunction with KM590E FB manifold!**

Screw-fitting connection with 3/4" female thread (euro cone) and 1/2" male thread self-sealing

<table>
<thead>
<tr>
<th>Dimension</th>
<th>PU/Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>3/4&quot; fem.1 x 1/2&quot; male t.</td>
<td>1</td>
</tr>
</tbody>
</table>

**KM570**

**KELOX universal manifold cabinet carcass**

Sendzimir zinc-coated universal sheet steel cabinet, connection option from below or on the side, height-adjustable feet, plaster trim element below the cabinet, (width 120mm), upgradable with a surface-mounted or flush-mounted visible part. Number of manifold outputs on KM590E KELOX FB manifold coordinated!

Cabinet depth: 75mm

<table>
<thead>
<tr>
<th>Dimension</th>
<th>PU/Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>1–4 L: 460mm</td>
<td>1</td>
</tr>
<tr>
<td>5–8 L: 690mm</td>
<td>1</td>
</tr>
<tr>
<td>9–12 L: 840mm</td>
<td>1</td>
</tr>
<tr>
<td>Special size L: 1150mm</td>
<td>1</td>
</tr>
</tbody>
</table>
**KM571**  
**KELOX in wall visible part**  
Sendzimir zinc-coated, lockable front doors and frame, powder-coated, plaster trim from manifold cabinet carcass max. 120mm under the front door, upgradable with a cylinder lock.  
Colour: white (RAL 9010)  
Height: 530mm

**KM572**  
**KELOX surface-mounted visible part**  
Sendzimir zinc-coated, depth-adjustable surface-mounted visible part with magnetic bracket, powder-coated  
Colour: white (RAL 9010)  
Installation depth: 130mm  
Installation height: 670mm above the finished floor

**KM565**  
**KELOX radio room thermostat**  
Radio-controlled room thermostat (R10) for controlling from 1 to 10 thermal motors Distance to the radio control manifold max. 3 walls and 1 storey ceiling  
Supply: 2x alkaline batteries 1.5 V  
Temperature reduction/increase: 2 K  
Radio frequency 868 MHz  
Setting range: 5°C – 30°C  
IP Code/class: IP 30  
Size: 75x75x25.5mm  
Colour: white  
ATTENTION only in conjunction with KM596 KELOX thermal motor 230V!  
85x85mm frame also usable for KM594

**KM570F**  
**KELOX manifold cabinet carcass 110**  
Sendzimir zinc-coated universal sheet steel cabinet, connection option from below or on the side, height-adjustable feet, plaster trim element below the cabinet, (width 120mm), upgradable with a surface-mounted or flush-mounted visible part. Suitable for the installation of KM650 KELOX FB fixed-value control set. Number of manifold outputs on KM590E KELOX FB manifold coordinated!  
Cabinet depth: 110mm  
Installation height: 600mm above the finished floor

**KMU577K**  
**KELOX-ULTRAX manifold cabinet with plastic panel**  
Galvanised universal sheet steel cabinet with telescopic pull-out frame, connection option from below or on the side, height-adjustable feet, plaster trim element below the cabinet, incl. on the back and the plaster trim element 60mm protruding plastering mesh and plastering protection for the inside of the cabinet. Including 12 drill screws 4.2 x 16mm for attachment of the manifold. With anti-static, paintable, UV-resistant ABS covering, attachable with ABS screws. Number of manifold outputs in KMU590E KELOX-ULTRA X FB manifold coordinated!  
Colour: RAL 9010  
Cabinet depth: 75–120mm  
Installation height: 600mm above the finished floor  
Telescopic frame, plaster covering, ABS covering, ABS screws and drill screw set available separately.

---

**Dimension PU/Unit**  
1–4 L: 530mm 1  
5–8 L: 760mm 1  
9–12 L: 910mm 1  
Spez. size L: 1220mm 1  
Cylinder lock 1

---

**Dimension PU/Unit**  
1–4 L: 530mm 1  
5–8 L: 690mm 1  
9–12 L: 840mm 1  
Spez. size L: 1150mm 1
**KM565E**  **KELOX radio clock thermos**

Radio-controlled clock thermostat (R10) for controlling from 1 to 10 thermal motors. Distance to radio control manifold max. 3 walls and 1 storey ceiling, with 3 pre-set programmes.

Supply: 2x alkaline batteries 1.5 V

Temperature reduction/increase: 2 K

Radio frequency: 868 MHz

Setting range: 5°C–32°C

IP Code/class: IP 30

Size: 137 x 96.5 x 31.3 mm

Colour: white

**ATTENTION only in conjunction with KM596 KELOX thermal motor 230V!**

**KM565R**  **KELOX radio repeater**

To improve the transmission security with difficult ambient conditions between radio thermostats KM565, KM565E and radio control manifold KM567. Integrates automatically into existing connections, operates fully automatically without intervention by the user, only one repeater required for several connections, distance up to 90 m, display of the received signal quality via 3 LEDs. 2 repeaters can be used in series.

Radio frequency: 868 MHz

IP Code/class: IP 20

Size: 127 x 75 x 27.5 mm

Colour: white

**ATTENTION only in conjunction with KM565 and KM565E!**

**KM567**  **KELOX radio control distributor**

Radio control distributor for the connection of a maximum of 6 channels, for use as radio-controlled room thermostats, pump and/or heating control unit. Connection option for a maximum of 12 thermal motors (230 V), max. 10 thermal motors (230 V) per channel, including output channels for pump and heading control, with mains cable 0.85 m.

Radio antenna installed in housing! Distance to radio-controlled room thermostat max. 3 walls and 1 storey ceiling

Supply voltage: 230 V AC

Radio frequency: 868 MHz

IP Code/class: IP 40

Size: 450 x 57 x 52 mm

Colour: white

**ATTENTION only in conjunction with KM596 KELOX thermal motor 230V!**

**ATTENTION** Take account of space requirement in manifold cabinet!

**KM594**  **KELOX room thermostat**

Room thermostat (RTR-E) for control of 1 to 10 thermal motors

Operating voltage: 230 V AC 50/60 Hz

Hysteresis: 0.5 K

Contact: 1 opener

Setting range: 5°C–30°C

IP Code/class: IP 30

Size: 75 x 75 x 25.5 mm

Colour: white

**ATTENTION only in conjunction with KM596 KELOX thermal motor 230V!**

Compatible with KM565 frame 85 x 85 mm!
**KELOX processing tools**

**WZ915 KELOX calibration mandrel**

Calibration mandrels for deburring and applying the inner bevel to the KELOX module pipe, mount for slow-running drill or KELOX universal click handle for insertion, suitable for all dimensions.

**Calibration SET 1** comprised of:
- Calibration mandrel d16, 20, 25 and 1 universal click handle, packaged in case

**Calibration SET 2** comprised of:
- Calibration mandrel d16, 20, 25, 1 universal click handle, bending spring d16, 20, 25 and pipe cutter, packaged in case

**Calibration SET 3** comprised of:
- Calibration mandrel d16, 20, 25, 1 universal click handle, bending spring d16, 20, 25, pipe cutter and pipe-holding pliers, packaged in case.

**Calibration SET 4** comprised of:
- Calibration mandrel d16, 20, 25, 32 and 1 universal click handle, packaged in case

**Calibration SET 5** comprised of:
- Calibration mandrel d16, 20, 25, 32 and 1 universal click handle, bending spring d16, 20, 25, pipe cutter, packaged in case

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

**WZ916 KELOX multi calibration mandrel**

Multi calibration mandrel for deburring and applying the inner bevel on the KELOX module pipe. Dimensions: d16, 20 and 25mm

**KM596 KELOX thermal motor**

For attachment to KM590E, KMU590E, KU590 and KC 590 with adaptor for thread M30x1.5mm incl. “first option function”, half opened in new condition 230V-AC:
- Start-up current 550mA/1W
- 24V–AC/DC:
- Start-up current 300 mA/1W
- IP Code/class IP 54
- Travel: 4.0/5.0mm
- Standard: “currentless closed”
- Currentless open on request!

**KM568 KELOX connection unit**

For connecting a maximum of 6 room thermostats, connection option for up to 12 thermal motors, 2 thermal motors per channel, connection option for a time switch for time control, as well as a pump logic for connecting and switching a circulating pump 230 V, 50 watt size: 335x75x45mm

**ATTENTION** Take account of space requirement in manifold cabinet!
<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
<th>Dimensions/PU/Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>WZ916A</td>
<td><strong>KELOX multi calibration mandrel with removable protective cover</strong>&lt;br&gt;Multi-calibration mandrel for deburring and applying the inner bevel on the KELOX module pipe with removable protective covers, specifically for processing HK connections. Dimensions: d16, 20 and 25mm.</td>
<td>16-20-25 1</td>
</tr>
<tr>
<td>WZ920</td>
<td><strong>KELOX bending spring</strong>&lt;br&gt;For the formation of tight radii (less than 5d) to KELOX module pipes without cross-section narrowing. The dimensions d16, 20 and 25 mm are equipped with a 1.2m extension spring. Spring length: 610mm.</td>
<td>16 1&lt;br&gt;20 1</td>
</tr>
<tr>
<td>WZ130</td>
<td><strong>KELOX pipe scissors</strong>&lt;br&gt;For cutting off KELIT pipes d16–40. Replacement blade for WZ130/2. Repair set for WZ130/2. Replacement bolt set for blade WZ130/2.</td>
<td>16–40 1&lt;br&gt;Spare blade 1&lt;br&gt;Repair set 1</td>
</tr>
<tr>
<td>WZ932</td>
<td><strong>KELOX pipe cutter</strong>&lt;br&gt;For cutting KELOX module pipes to length up to d20.</td>
<td>14–20 1&lt;br&gt;Spare blade 1&lt;br&gt;Repair set 1</td>
</tr>
<tr>
<td>WZ936</td>
<td><strong>KELOX fixing plate cutter</strong>&lt;br&gt;Cordless cutter for cutting the KM613 fixing plates, including integrated rechargeable battery and charging device, the cutting process takes place on the bask of the fixing plate.</td>
<td>1</td>
</tr>
<tr>
<td>WZ940</td>
<td><strong>KELOX installation reel</strong>&lt;br&gt;For torsion-free unrolling of KELOX pipes d16mm roll length: max. 500m. d20–25mm roll length: max. 300m. Galvanised steel pipe, foldable, packed in a box.</td>
<td>300/500 1</td>
</tr>
<tr>
<td>WZ945</td>
<td><strong>KELOX stapler</strong>&lt;br&gt;For stapling down KELOX-FB pipes with KM611 staples onto the KM635 staple plate.</td>
<td></td>
</tr>
<tr>
<td>WZ948</td>
<td><strong>KELIT wire fastening device</strong>&lt;br&gt;For attaching and fastening the UL-TRA PE-RT pipe with KU617 binding wire to structural steel mesh, incl. two rechargeable batteries and charger, packed in plastic case.</td>
<td></td>
</tr>
<tr>
<td>WZ960</td>
<td><strong>KELOX hot cutting device</strong>&lt;br&gt;For subsequent cutting-in of pipe ducts in KELOX dry Polystyrene panels.</td>
<td></td>
</tr>
<tr>
<td>WZ950</td>
<td><strong>KELOX hand dispenser</strong>&lt;br&gt;For quick and reliable dispensing of fastening strap 75mm.</td>
<td></td>
</tr>
</tbody>
</table>
The technical contents in this brochure are for your information and consultation. We are not liable for the contents. The application and installation of the products should be adapted to the individual requirements of each project. KE KELIT is constantly improving its products and retains the right to make technical changes in the course of these improvements. We are not liable for printing and spelling errors.

© by KE KELIT KELOX FB Handbook 03/2016 engl.