TECHNICAL INFORMATION
SYSTEM GUIDELINES, PIPING AND CONNECTION
PLANNING AND ASSEMBLY
This Technical Information
System guidelines, piping and connection
is valid from January 2013.

Its publication means that the previous Technical Information 850624 (as of September 2012) is no longer valid.

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TECHNICAL INFORMATION

System guidelines, piping and connection

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Validity
This Technical Information is valid for Denmark & Norway.

Further applicable Technical Informations
- RAUTITAN – THE NEW GENERATION
- Underfloor Heating and Cooling

Navigation
A detailed table of contents is included at the beginning of this Technical Information with the hierarchical titles and the corresponding page numbers.

Definitions
- Supply lines or piping consist of pipes and their joints (e.g. compression sleeves, fittings, threads, or similar). This applies to gas piping, drinking water and heating piping and all other pipes in this Technical Information.
- Piping systems, installations, systems, etc. consist of the pipes and the necessary components.
- Connection components consist of fittings with the corresponding compression sleeves and pipes as well as seals and screw connections.

Illustration
Illustrations for individual subsystems are listed in the corresponding pipe, fitting and compression sleeve colours. Illustrations, which apply system-wide for drinking water, heating installation or underfloor heating/cooling, are illustrated with grey piping and white fittings/compression sleeves.

Explanation of symbols

Safety information
Legal information
Important information, which needs to be taken into account
Information on the Internet
Your benefits/advantages

Updated Technical Information
For your own safety and the correct use of our products, check regularly whether the Technical Information which you have is available in a latest version. The date of issue of your Technical Information is always printed on the bottom left of the cover.
- The latest Technical Information can be found at your REHAU sales office, specialist wholesaler or online for download at www.rehau.no or www.rehau.dk.

Safety advice and operating instructions
- For your own safety and other’s, read the safety instructions and the operating instructions carefully and completely before beginning installation.
- Store the operating instructions in a safe place and make sure it is available when needed.
- In case you did not understand the safety advice or the individual assembly situations, or if they are not clear to you, please contact your REHAU sales office.
- Failure to observe the safety information/instructions can result in damage to property and persons.

Intended use
The system components and compression sleeve jointing technique must only be planned, installed and operated as described in this Technical Information. Any other use that does not fall within the intended use of the system is prohibited.
Observe the applicable national and international regulation on installation, accident prevention and safety when installing piping systems, as well as the instructions in this Technical Information.

Also observe the applicable laws, standards, guidelines and regulations (e.g. DIN, EN, ISO, DVGW, TRGI, VDE and VDI) as well as regulations on environmental protection, provisions of professional associations and regulations of the local public utility companies.

Areas of application not contained in this Technical Information (special applications) require consultation with our Applications Department. For detailed advice, please contact your REHAU sales office.

The design and installation instructions related solely to the specific REHAU product. Occasionally, references are made to parts of applicable standards and directives. Always observe the current version of any guidelines, standards or directives. Further directives, regulations and guidelines related to the design, installation and operation of drinking water, heating and buildings services systems must also be referred but these do not form part of this Technical Information.

Staff requirements
- Only allow authorised and trained persons to install our systems.
- Only allow work on electrical systems or conductors to be carried out by suitably trained and authorised people.

General safety precautions
- Keep your workplace clean and free of obstructions.
- Ensure adequate lighting at your workplace.
- Keep children, household pets and unauthorised people away from tools and the installation places. This applies particularly to refurbishment in occupied places.
- Only use those components in the corresponding piping system, which have been generally approved by REHAU. Using components which are not part of the system or tools which do not originate from the respective REHAU installation system can lead to accidents or other hazards.

Work clothing
- Wear eye protection, adequate work clothing, protective shoes, a helmet and a hairnet if you have long hair.
- Do not wear loose clothing or jewellery which can be caught by moving parts.
- A safety helmet has to worn during installations work at face level or overhead.

Follow the assembly instructions
- Always read and observe the available operating instructions of the REHAU installation tool.
- Incorrect handling of tools can cause cuts and crushing or sever limbs.
- Incorrect handling of tools can damage connection components and bring about leaks.
- The REHAU pipe cutters have sharp blades. Store and handle them in such a way that they will not create any risk of injury.
- When cutting the pipes, keep a safety distance between the holding hand and the cutting tool.
- When cutting do not reach into the cutting zone of the tool or near its moving parts.
- After the expansion process, the expanded end of the pipe returns to its original shape (memory effect). During this time, do not put any other objects into the expanded end of the pipe.
- Keep your hands away from movable parts or the tools pressing area during jointing.
- Before the joint is completed, the fitting may fall out of the pipe. Danger of injury!
- Always disconnect the power from a tool prior to carrying out maintenance work, changing over any moveable parts (e.g. compression jaws) or when moving the tool to a new location on site.

Operating parameter
- If the operating parameters are exceeded, the pipes and joints may become overstretched. Not adhering to the operating parameters is thus not allowable. Keeping within the operating parameters must be ensured by safety/control equipment (e.g. pressure reducers, safety valves, etc.).
## COMPONENT OVERVIEW

### RAUTITAN – THE NEW GENERATION

#### RAUTITAN universal system for drinking water and heating

<table>
<thead>
<tr>
<th>Pipe</th>
<th>Tool</th>
</tr>
</thead>
<tbody>
<tr>
<td>Universal pipe RAUTITAN stabil</td>
<td></td>
</tr>
<tr>
<td>Universal pipe RAUTITAN flex</td>
<td></td>
</tr>
</tbody>
</table>

#### Compression sleeve

<table>
<thead>
<tr>
<th>Compression sleeve</th>
<th>RAUTITAN PX</th>
<th>RAUTITAN MX</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>PVDF</td>
<td>Brass</td>
</tr>
</tbody>
</table>

#### Fitting

<table>
<thead>
<tr>
<th>Fitting</th>
<th>RAUTITAN PX</th>
<th>RAUTITAN RX</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>PPSU</td>
<td>Gunmetal</td>
</tr>
<tr>
<td></td>
<td>RAUTITAN SX</td>
<td>Stainless steel</td>
</tr>
</tbody>
</table>

### REHAU system for underfloor heating/cooling

#### Underfloor heating/cooling

<table>
<thead>
<tr>
<th>Pipe</th>
<th>Tool</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heating pipe RAUTHERM S</td>
<td></td>
</tr>
</tbody>
</table>

#### Compression sleeve

<table>
<thead>
<tr>
<th>Compression sleeve</th>
<th>Compression sleeve for heating pipe RAUTHERM S</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Brass with silver surface finish</td>
</tr>
</tbody>
</table>

#### Fitting

<table>
<thead>
<tr>
<th>Fitting</th>
<th>Fitting for heating pipe RAUTHERM S</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Brass with silver surface finish</td>
</tr>
</tbody>
</table>
At REHAU, all types of pipes are subjected to constant quality assurance and pass through numerous short and long-term tests to ensure the quality of the REHAU pipes. Several standard tests conducted in the REHAU test laboratory are described below. For polymer pipe materials subjected to thermal and mechanical loads, it must be observed that deformation and the strength depend on the temperature and the exposure time. To determine the permissible conditions for long-term loads, it is necessary to investigate the mechanical behaviour over a long period and at different temperatures. This also applies to pipes subjected to internal pressure.

**Burst pressure test**
In the burst pressure test, the pipes are subjected to a rising pressure in a test apparatus until the pipe ruptures. The burst pressure at room temperature is approximately seven times the maximum operating pressure.

**Notch impact test**
The resistance of the pipes to the effects of impact is tested in a notch impact testing device. A hammer-shaped pendulum strikes the tested pipe under controlled conditions. Pipes made of crosslinked polyethylene have a very high resistance to these severe mechanical effects. The depicted test example (see Fig. 3-2) shows a notch impact strength of the pipe without breaking at a temperature of –30°C.

**Tension test**
In a tension testing machine, the pipes are pulled longitudinally at high force under controlled conditions until they break. Pipes made of crosslinked polyethylene show an extremely high extensibility in comparison with metal pipes. The length of the extended pipe can be several times the original pipe length. The compression sleeve jointing technique cannot pull out under operating conditions: The pipe is not pulled out of the joint.

**Long-term test**
The use of pipes in domestic installations requires a service life of 50 years or more. To determine the long-term effects, e.g. by temperature fluctuations, pressure and mechanical loads, the pipes are subjected to extreme conditions of temperature and pressure in long-term tests and are tested periodically by the test methods described above. The pipes are then photo- optically examined.

The necessary parameters were developed on the basis of over 25 years of experience in the laboratory and in practice with numerous trials and extensive tests on pipes made of high-pressure crosslinked polyethylene. The pipes in the background with brown surfaces (see Fig. 3-4) have been tested since production began at REHAU in a test bath at 95°C and 10 bar. Other tests are conducted according to the applicable standards and regulations. E.g., these are the measurement of the degree of crosslinking, shrinkage tests, ageing tests, temperature cycling tests, pulsing tests and many more.
4.1 Handling the pipes and system components

Avoid damaging the pipes and system components:
- Load and unload with due care.
- Convey suitably for the materials.
- Do not drag over floors or concrete surfaces.
- Store on a flat surface with no sharp edges.
- Protect against mechanical damage.
- Protect against dirt, drilling dust, mortar, grease, oil, paint, solvents, chemicals, humidity, etc.
- Protect against sunlight, e.g. with an opaque film or similar material.
- Protect against long sunlight during the building phase.
- Only unpack shortly before laying.
- Note the hygienic requirements (e.g. sealing of pipe ends, protection of the fittings, compliance with VDI 6023 - Hygiene-conscious planning, execution, operation and installation of drinking water systems).

Store and transport pipes and components protected against UV radiation.

Fig. 4-1  Protect pipes against sunlight

Fig. 4-2  Do not store pipes on sharp-edged surfaces
5.1 PE-X materials

Peroxide-crosslinked polyethylene

Peroxide-crosslinked polyethylene is designated PE-Xa. This method of crosslinking is conducted at high temperatures and pressure with the aid of peroxides. Here, the individual molecules of the polyethylene combine to form a three-dimensional network. This high-pressure crosslinking is characterised by crosslinking in the melt away from the crystallite melting point. Crosslinking occurs during the moulding of the pipe in the tool. This method of crosslinking ensures an even and very high degree of crosslinking over the entire cross-section of even thick-walled pipes.

Radiation crosslinked polyethylene

Radiation crosslinked polyethylene is designated PE-Xc. Crosslinking is conducted after the production of the pipes under the effects of high-energy radiation.

Inliner universal pipe RAUTITAN stabil

The interior pipe in the universal pipe RAUTITAN stabil, which comes into contact with the flowing medium, is known as inliner. This inliner is made of cross-linked polyethylene (PE-X).

5.2 Material – Pipe (overview)

<table>
<thead>
<tr>
<th>Composition / Material</th>
<th>Pipe</th>
</tr>
</thead>
<tbody>
<tr>
<td>Self-supporting PE-X inliner, pressure-resistant and crosslinked</td>
<td>Universal pipe RAUTITAN stabil</td>
</tr>
<tr>
<td>Aluminium layer</td>
<td></td>
</tr>
<tr>
<td>Polyethylene outer layer</td>
<td></td>
</tr>
<tr>
<td>RAU-PE-Xa</td>
<td>Universal pipe RAUTITAN flex</td>
</tr>
<tr>
<td>Adhesive agent</td>
<td>Flex</td>
</tr>
<tr>
<td>Oxygen diffusion barrier</td>
<td></td>
</tr>
<tr>
<td>Heating pipe RAUTHERM S</td>
<td></td>
</tr>
</tbody>
</table>

Tab. 5-1 Pipe composition/material (composition from interior to exterior)
5.3 Areas of application: Pipes

The RAUTITAN universal system for drinking water and heating can be used extensively in the following:
- Drinking water installation
- Heating installation
- Radiator connection from the wall
- Radiator connection from the floor
- Radiator connection from the skirting (only with RAUTITAN stabil)
- Underfloor heating/cooling

For underfloor heating and cooling, we recommend the REHAU systems with the red heating pipe RAUTHERM S.
- Larger inside pipe diameter
- Various laying systems
- Optimum wall thicknesses for flexible installation

<table>
<thead>
<tr>
<th>Pipe</th>
<th>Size</th>
<th>Pipe material</th>
<th>Drinking water installation</th>
<th>Heating installation</th>
<th>Radiator connection from the skirting</th>
<th>Underfloor heating/cooling</th>
</tr>
</thead>
<tbody>
<tr>
<td>Universal pipe RAUTITAN stabil</td>
<td>16–40</td>
<td>Metal plastic composite pipe</td>
<td>++</td>
<td>++</td>
<td>++</td>
<td>+</td>
</tr>
<tr>
<td>Universal pipe RAUTITAN flex</td>
<td>16–63</td>
<td>PE-Xa with oxygen diffusion barrier</td>
<td>++</td>
<td>++</td>
<td>–</td>
<td>+</td>
</tr>
<tr>
<td>Heating pipe RAUTHERM S</td>
<td>10–32</td>
<td>PE-Xa with oxygen diffusion barrier</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>++</td>
</tr>
</tbody>
</table>

++ Use permitted       + Use permitted with limitation      – Use not permitted

5.4 Areas of application: Pipes in underfloor heating/cooling

<table>
<thead>
<tr>
<th>Installation system</th>
<th>Pipe</th>
</tr>
</thead>
<tbody>
<tr>
<td>Studded panel Varionova</td>
<td>Universal pipe RAUTITAN stab</td>
</tr>
<tr>
<td>- impact noise insulation 30–2</td>
<td>16.2 x 2.6 mm</td>
</tr>
<tr>
<td>- thermal insulation 11 mm</td>
<td>16 x 2.2 mm</td>
</tr>
<tr>
<td></td>
<td>14 x 1.5 mm / 17 x 2.0 mm</td>
</tr>
<tr>
<td>Studded panel Varionova without impact sound insulation</td>
<td>16.2 x 2.6 mm</td>
</tr>
<tr>
<td></td>
<td>14 x 1.5 mm</td>
</tr>
<tr>
<td>Stapler system</td>
<td>16.2 x 2.6 mm</td>
</tr>
<tr>
<td></td>
<td>16 x 2.2 mm / 20 x 2.8 mm</td>
</tr>
<tr>
<td></td>
<td>14 x 1.5 mm / 17 x 2.0 mm</td>
</tr>
<tr>
<td>RALFIX rail for 12/14</td>
<td>16.2 x 2.6 mm</td>
</tr>
<tr>
<td></td>
<td>16 x 2.2 mm</td>
</tr>
<tr>
<td></td>
<td>17 x 2.0 mm / 20 x 2.0 mm</td>
</tr>
<tr>
<td>RALFIX rail for 16/17/20</td>
<td>16.2 x 2.6 mm</td>
</tr>
<tr>
<td></td>
<td>16 x 2.2 mm</td>
</tr>
<tr>
<td>Pipe grid</td>
<td>16.2 x 2.6 mm / 20 x 2.8 mm</td>
</tr>
<tr>
<td></td>
<td>14 x 1.5 mm / 16 x 2.0 mm</td>
</tr>
<tr>
<td></td>
<td>17 x 2.0 mm / 20 x 2.0 mm</td>
</tr>
<tr>
<td>Dry fit system</td>
<td>16.2 x 2.6 mm</td>
</tr>
<tr>
<td></td>
<td>16 x 2.2 mm</td>
</tr>
<tr>
<td>Base plate TS–14</td>
<td>–</td>
</tr>
<tr>
<td></td>
<td>14 x 1.5 mm</td>
</tr>
<tr>
<td>Cooling ceiling</td>
<td>–</td>
</tr>
<tr>
<td></td>
<td>10.1 x 1.1 mm</td>
</tr>
<tr>
<td>Acoustic chilled ceiling</td>
<td>–</td>
</tr>
<tr>
<td></td>
<td>10.1 x 1.1 mm</td>
</tr>
<tr>
<td>Wall heating/cooling in drywall construction</td>
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</tr>
<tr>
<td></td>
<td>10.1 x 1.1 mm</td>
</tr>
<tr>
<td>Wall heating/cooling in wetwall construction</td>
<td>–</td>
</tr>
<tr>
<td></td>
<td>10.1 x 1.1 mm</td>
</tr>
<tr>
<td>Modernisation system for the floor</td>
<td>–</td>
</tr>
<tr>
<td></td>
<td>10.1 x 1.1 mm</td>
</tr>
</tbody>
</table>
5.5 Universal pipe RAUTITAN stabil

- Metal/plastic composite pipe with the following structure from the inside outwards:
  - Self-supporting inliner (pressure-resistant inner tube) made of crosslinked polyethylene (PE-X) according to DIN EN ISO 15875 and DIN 16892
  - Oxygen-diffusion tight aluminium layer
  - Polyethylene outer layer
- Areas of application
  - Drinking water installation, see:
    - Technical Information "RAUTITAN — THE NEW GENERATION"
  - Heating installation, see:
    - Technical Information "RAUTITAN — THE NEW GENERATION"
    - Technical Information "Underfloor heating/cooling"

### Delivery make-up

<table>
<thead>
<tr>
<th>d [mm]</th>
<th>s [mm]</th>
<th>Content [l/m]</th>
<th>Make-up</th>
</tr>
</thead>
<tbody>
<tr>
<td>16.2</td>
<td>2.6</td>
<td>0.095</td>
<td>Cut length / Coil</td>
</tr>
<tr>
<td>20</td>
<td>2.9</td>
<td>0.158</td>
<td>Cut length / Coil</td>
</tr>
<tr>
<td>25</td>
<td>3.7</td>
<td>0.243</td>
<td>Cut length / Coil</td>
</tr>
<tr>
<td>32</td>
<td>4.7</td>
<td>0.401</td>
<td>Cut length</td>
</tr>
<tr>
<td>40</td>
<td>6.0</td>
<td>0.616</td>
<td>Cut length</td>
</tr>
</tbody>
</table>

*Tab. 5-2  Delivery make-up, universal pipe RAUTITAN stabil*

**Approvals for Germany and quality certificates**
- DVGW registration for universal pipe RAUTITAN stabil and compression sleeve jointing technique from REHAU with RAUTITAN connection components
- System approvals for sizes 16–40: DVGW DW-8501AU2346
- Self-supporting inliner (pressure-resistant inner tube) made of crosslinked polyethylene complies with DIN EN ISO 15875 and DIN 16892

**Approvals outside of Germany**
National approvals outside Germany may differ from the German approvals in the respective countries. If the RAUTITAN system is used in other countries, consult your REHAU sales office.
Universal pipe RAUTITAN flex

- Pipe made from RAU-PE-Xa
  - Peroxide-crosslinked polyethylene (PE-Xa)
  - With oxygen diffusion barrier
  - Oxygen-tight according to DIN 4726
  - Complies with DIN EN ISO 15875
- Areas of application
  - Drinking water installation, see:
    - Technical Information “RAUTITAN – THE NEW GENERATION”
  - Heating installation, see:
    - Technical Information “RAUTITAN – THE NEW GENERATION”
    - Technical Information “Underfloor heating/cooling”

Delivery make-up

<table>
<thead>
<tr>
<th>d</th>
<th>s</th>
<th>DN</th>
<th>Content/l</th>
<th>m</th>
<th>Make-up</th>
</tr>
</thead>
<tbody>
<tr>
<td>16</td>
<td>2.2</td>
<td>12</td>
<td>0.106</td>
<td>Cut length / Coil</td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>2.8</td>
<td>15</td>
<td>0.163</td>
<td>Cut length / Coil</td>
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</tr>
<tr>
<td>25</td>
<td>3.5</td>
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<td>0.254</td>
<td>Cut length / Coil</td>
<td></td>
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<tr>
<td>32</td>
<td>4.4</td>
<td>25</td>
<td>0.423</td>
<td>Cut length / Coil</td>
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<td>6.9</td>
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<td>1.029</td>
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<tr>
<td>63</td>
<td>8.6</td>
<td>50</td>
<td>1.633</td>
<td>Cut length</td>
<td></td>
</tr>
</tbody>
</table>

Tab. 5-3 Delivery make-up, universal pipe RAUTITAN flex

Approvals for Germany and quality certificates
- DVGW registration for universal pipe RAUTITAN flex and compression sleeve jointing technique from REHAU with RAUTITAN connection components
- System approval for the sizes 16–63: DVGW DW-8501AU2200
- The universal pipe RAUTITAN flex complies with DIN EN ISO 15875
- DIN CERTCO registration confirms the suitability of the pipes for use in the heating installation to DIN 4726/DIN EN ISO 15875 - application class 5 and the necessary tightness against oxygen diffusion

Approvals outside of Germany
National approvals outside Germany may differ from the German approvals in the respective countries. If the RAUTITAN system is used in other countries, please consult your REHAU sales office.
5.7 Heating pipe RAUTHERM S

- Pipe made from RAU-PE-Xa
- Peroxide-crosslinked polyethylene (PE-Xa) according to DIN EN ISO 15875 and DIN 16892
- With oxygen diffusion barrier
- Oxygen-tight according to DIN 4726
- Area of application
  - Underfloor heating/cooling, see:
    - Technical Information “Underfloor heating/cooling”
    - Technical Information “RAUTITAN – THE NEW GENERATION”
  - Heating installation in buildings. The safety equipment of the heaters must comply with DIN EN 12828

Approvals for Germany and quality certificates
- The heating pipe RAUTHERM S complies with DIN 16892 and DIN 4726
- DIN CERTCO registration for the sizes 10.1 / 14 / 17 / 20 and 25 confirms the suitability of the pipes and the corresponding compression sleeve jointing technique in the heating installation according to DIN 4726/DIN EN ISO 15875 - application class 5 and the necessary tightness against oxygen diffusion

Approval outside of Germany
National approvals outside Germany may differ from the German approvals in the respective countries. If the heating pipe RAUTHERM S is used in other countries, consult your REHAU sales office.

Delivery make-up

<table>
<thead>
<tr>
<th>d [mm]</th>
<th>s [mm]</th>
<th>Content [l/m]</th>
<th>Make-up</th>
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<td>0.049</td>
<td>Coiled</td>
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<tr>
<td>12</td>
<td>2.0</td>
<td>0.050</td>
<td>Coiled</td>
</tr>
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<td>14</td>
<td>1.5</td>
<td>0.095</td>
<td>Coiled</td>
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<td>2.0</td>
<td>0.133</td>
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<td>0.201</td>
<td>Cut length / Coiled</td>
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<td>25</td>
<td>2.3</td>
<td>0.327</td>
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<tr>
<td>25</td>
<td>2.9</td>
<td>0.539</td>
<td>Cut length</td>
</tr>
</tbody>
</table>

Tab. 5-4 Delivery make-up, heating pipe RAUTHERM S

The heating pipe RAUTHERM S may not be used in the drinking water installation!
A simultaneous load at the pressure and temperature limits during operation of drinking water and heating systems is not allowed (e.g. 95 °C at 10 bar in continuous working).

<table>
<thead>
<tr>
<th>Technical data</th>
<th>Unit</th>
<th>Universal pipe</th>
<th>Universal pipe</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>RAUTITAN stabil</td>
<td>RAUTITAN flex</td>
</tr>
<tr>
<td>Material (surface)</td>
<td>–</td>
<td>PE-X/Al/PE</td>
<td>PE-Xa</td>
</tr>
<tr>
<td>Colour (surface)</td>
<td>–</td>
<td>Silver</td>
<td>Silver</td>
</tr>
<tr>
<td>Notch impact strength at 20 °C</td>
<td>–</td>
<td>No fracture</td>
<td>No fracture</td>
</tr>
<tr>
<td>Notch impact strength at –20 °C</td>
<td>–</td>
<td>No fracture</td>
<td>No fracture</td>
</tr>
<tr>
<td>Average coefficient of expansion</td>
<td>[mm/(m·K)]</td>
<td>0.026</td>
<td>0.15</td>
</tr>
<tr>
<td>when laying with pipe support channel</td>
<td></td>
<td>–</td>
<td>0.04</td>
</tr>
<tr>
<td>Size 16–40</td>
<td></td>
<td>–</td>
<td>0.1</td>
</tr>
<tr>
<td>Size 50 and 63</td>
<td></td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>Thermal conductivity</td>
<td>[W/(m·K)]</td>
<td>0.43</td>
<td>0.35</td>
</tr>
<tr>
<td>Pipe roughness</td>
<td>[mm]</td>
<td>0.007</td>
<td>0.007</td>
</tr>
<tr>
<td>Operating pressure (maximum)</td>
<td>[bar]</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>Operating temperature</td>
<td></td>
<td>Maximum</td>
<td>Minimum</td>
</tr>
<tr>
<td>Maximum</td>
<td>[°C]</td>
<td>95</td>
<td>90</td>
</tr>
<tr>
<td>Minimum</td>
<td>[°C]</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>Short-term maximum temperature (malfunction)</td>
<td>[°C]</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>Oxygen diffusion (to DIN 4726)</td>
<td>–</td>
<td>Oxygen-tight</td>
<td>Oxygen-tight</td>
</tr>
<tr>
<td>Material constant C</td>
<td>–</td>
<td>33</td>
<td>12</td>
</tr>
<tr>
<td>Building material class acc. DIN 4102-1</td>
<td>–</td>
<td>B2</td>
<td>B2</td>
</tr>
<tr>
<td>Construction product class acc. DIN EN 13501-1</td>
<td>–</td>
<td>E</td>
<td>E</td>
</tr>
<tr>
<td>Maximum/Minimum laying temperature</td>
<td>[°C]</td>
<td>+50–10</td>
<td>+50–10</td>
</tr>
<tr>
<td>Minimum bending radius without tools</td>
<td>d = Pipe diameter</td>
<td>–</td>
<td>5 x d</td>
</tr>
<tr>
<td>Minimum bending radius with spiral spring/tool</td>
<td>d = Pipe diameter</td>
<td>–</td>
<td>3 x d</td>
</tr>
<tr>
<td>Minimum bending radius with pipe bend brackets</td>
<td>d = Pipe diameter</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td></td>
<td></td>
<td>5 x d Plumbing/Heating</td>
<td></td>
</tr>
<tr>
<td>Available sizes</td>
<td>[mm]</td>
<td>16 – 40</td>
<td>16 – 63</td>
</tr>
</tbody>
</table>

Tab. 5-5  Technical data of pipes/approximate values
It can happen that singular cases of blistering may occur during operation on the pipe surface of the universal pipe RAUTITAN stabil. Also when using concrete core tempering, blistering can occur as an exception on the pipe surface of RAUTHERM S pipes during pressure testing with pressurised air and longer test durations. This blistering does not represent any reduction in quality or in usability and is not critical.
6.1 Differentiating the fittings and compression sleeves

It needs to be differentiated between the fittings/compression sleeves RAUTITAN and the fittings/compression sleeves of the REHAU systems for underfloor heating/cooling.

<table>
<thead>
<tr>
<th>Areas of application of the fittings and compression sleeves</th>
</tr>
</thead>
<tbody>
<tr>
<td>Drinking water installation</td>
</tr>
<tr>
<td>Fitting</td>
</tr>
<tr>
<td>stabil</td>
</tr>
</tbody>
</table>

| Tab. 6-1 Areas of application of the fittings and compression sleeves |

Only push polymer RAUTITAN PX compression sleeves onto polymer RAUTITAN PX fittings.

| Fig. 6-1 Unapproved combination RAUTITAN PX with brass compression sleeves |
- Application in plumbing and heating installation
- Permanently sealing compression sleeve jointing technique according to DIN EN 806, DIN 1988, DVGW-worksheet W 534
- Approved for flush-mounted installation in accordance with DIN 18380 (VOB)
- Robust jointing technique, highly suitable for the building site
- Without o-ring (pipe material seals itself)
- Easy optical monitoring
- Can be immediately pressurised
- By expanding the pipe, the internal diameters of the pipes and fittings are hydraulically adjusted to each other
- RAUTITAN RX fittings, through which drinking water flows, are made of gunmetal according to DIN EN 12164 and DIN EN 1982
- No risk of confusion with uniform compression sleeves for all pipe types in the RAUTITAN universal system for drinking water and heating
- DVGW registration (all sizes)
- For the RAUTITAN pipes in the drinking water installation
- For the REHAU compression sleeve jointing technique
- Manufacture of the compression sleeve joint with RAUTOOL
- Especially coordinated with the RAUTITAN and RAUTHERM S systems
- Development and supervision directly from REHAU

6.2 Fittings and compression sleeves of the RAUTITAN system

Only use the fittings and compression sleeves RAUTITAN PX, RAUTITAN RX or RAUTITAN SX in the drinking water and heating installation.
- Only push RAUTITAN PX compression sleeves onto RAUTITAN PX fittings.
- Do not confound the RAUTITAN connection components with the connection components of the heating pipe RAUTHERM S (underfloor heating/cooling) (e.g. stainless steel RAUTITAN SX system adapters or radiator elbow connection sets RAUTITAN).

Do not combine fittings and compression sleeves from different ranges with each other.
- Do not insert any fittings from the heating installation (with pink marking or marked correspondingly on the packaging) in the drinking water installation.
- Please note the measurements of the fittings and compression sleeves.
- You can find the precise allocation of the connection components in the current price list.

Information on the current drinking water ordinance and on DIN 50930, part 6 can be found in the Technical Information “RAUTITAN – THE NEW GENERATION”.

The fittings and the compression sleeves RAUTITAN are downward compatible with all RAUTITAN pipes SDR 7.4. This especially applies to existing plumbing installations in which pearl white drinking water pipes RAUTITAN his/RAUHIS or pink heating pipes RAUTITAN pink/RAUPINK have been already laid.

For detailed information about the compatibility of the fittings and compression sleeves with existing pipes, please contact your REHAU sales office.

Size designation of the fittings and compression sleeves for the RAUTITAN system
- 16 x 2.2
- 20 x 2.8
- 25 x 3.5
- 32 x 4.4
- 40 x 5.5
- 50 x 6.9
- 63 x 8.6

Fig. 6-2 Fittings RAUTITAN PX made from PPSU

Fig. 6-3 Fitting RAUTITAN RX (gunmetal)  
Fig. 6-4 Fitting RAUTITAN SX (stainless steel)

Fig. 6-5 RAUTITAN compression sleeves
### 6.2.1 Fittings

#### Fittings for drinking water and heating

<table>
<thead>
<tr>
<th>Fittings for plumbing and heating installations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Threadless fittings</td>
</tr>
<tr>
<td>RAUTITAN PX</td>
</tr>
<tr>
<td>RAUTITAN RX</td>
</tr>
<tr>
<td>Size 16–63</td>
</tr>
<tr>
<td>RAUTITAN RX</td>
</tr>
<tr>
<td>Size 16–40</td>
</tr>
<tr>
<td>RAUTITAN SX</td>
</tr>
</tbody>
</table>

#### Advices about RAUTITAN fittings contours, which were available until 1997

Advises about RAUTITAN fittings contours, which were available until 1997 can be found in chapter „18 Advices about system components until 2005“ page 80.

#### Differences of the fittings for the heating installation

- Only use fittings of the RAUTITAN system in the heating installation with RAUTITAN (e.g. radiator elbow connection sets, radiator tee connection sets, cross fittings) if they are marked in pink or are identified as heating fittings on the packaging.
- You can find the precise allocation of the connection components in the current price list.

#### Material

- **RAUTITAN PX**: Polyphenyl sulphone  
  Material marking: PPSU
- **RAUTITAN RX**: Gunmetal according to DIN EN 1982  
  Material marking: Rg
- **RAUTITAN SX**: Stainless steel (material designations 1.4404/1.4408)  
  The fittings are manufactured according to DIN EN 10088, part 3
6.2.2 Compression sleeves

Compression sleeves for the RAUTITAN universal system for drinking water and heating

<table>
<thead>
<tr>
<th>RAUTITAN PX</th>
<th>RAUTITAN MX</th>
</tr>
</thead>
<tbody>
<tr>
<td>![RAUTITAN PX compression sleeve](Fig. 6-7)</td>
<td>![RAUTITAN MX compression sleeve](Fig. 6-8)</td>
</tr>
</tbody>
</table>

**Size**

<table>
<thead>
<tr>
<th>RAUTITAN PX</th>
<th>RAUTITAN MX</th>
</tr>
</thead>
<tbody>
<tr>
<td>16 x 2.2 mm</td>
<td>50 x 6.9 mm</td>
</tr>
<tr>
<td>20 x 2.8 mm</td>
<td>63 x 8.6 mm</td>
</tr>
<tr>
<td>25 x 3.5 mm</td>
<td></td>
</tr>
<tr>
<td>32 x 4.4 mm</td>
<td></td>
</tr>
<tr>
<td>40 x 5.5 mm</td>
<td></td>
</tr>
</tbody>
</table>

**Material**

<table>
<thead>
<tr>
<th>RAUTITAN PX</th>
<th>RAUTITAN MX</th>
</tr>
</thead>
<tbody>
<tr>
<td>PVDF (Polyvinylidene fluoride)</td>
<td>Thermally annealed brass to DIN EN 1254-3</td>
</tr>
</tbody>
</table>

**Characteristic features**

<table>
<thead>
<tr>
<th>RAUTITAN PX</th>
<th>RAUTITAN MX</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Can be pushed onto the fitting from both sides</td>
<td>- Can only be pushed onto the fitting from one side</td>
</tr>
<tr>
<td>- Black</td>
<td>- Brass finish</td>
</tr>
<tr>
<td></td>
<td>- An encircling groove</td>
</tr>
</tbody>
</table>

Tab. 6-3 RAUTITAN compression sleeves

- Can be used for all pipe types of the RAUTITAN universal system for drinking water and heating
- Permanently sealing compression sleeve jointing technique
  - According to DIN EN 806, DIN 1988 and DVGW worksheet W 534
  - Approved for flush-mounted installation according to DIN 18380 (VOB)
- No risk of confusion with uniform compression sleeves for all pipe types of the RAUTITAN universal system for drinking water and heating
- Existing RAUTITAN brass compression sleeves can still be laid with RAUTITAN fittings made from brass, gunmetal or stainless steel.
6.3 Fittings and compression sleeves for the heating pipe RAUTHERM S

- Do not confound the fittings and compression sleeves for the heating pipe RAUTHERM S (underfloor heating/cooling) with the RAUTITAN fittings and compression sleeves (e.g. RAUTITAN SX system adapters or radiator elbow connection sets RAUTITAN).
- Please note the measurements of the fittings and compression sleeves.
- You can find the precise allocation of the connection components in the current price list.

6.3.1 Fittings for the heating pipe RAUTHERM S

![Compression sleeve fitting for the heating pipe RAUTHERM S](image1)

**Fig. 6-9** Compression sleeve fitting for the heating pipe RAUTHERM S

<table>
<thead>
<tr>
<th>Size</th>
<th>Characteristic features</th>
</tr>
</thead>
<tbody>
<tr>
<td>10.1 x 1.1</td>
<td>One encircling groove, brass with silver surface finish</td>
</tr>
<tr>
<td>12 x 2.0</td>
<td>One encircling groove, brass without silver surface finish</td>
</tr>
<tr>
<td>14 x 1.5</td>
<td>Two encircling grooves, brass with silver surface finish</td>
</tr>
<tr>
<td>16 x 2.0</td>
<td>One encircling groove, brass with silver surface finish</td>
</tr>
<tr>
<td>17 x 2.0</td>
<td>Two encircling grooves, brass with silver surface finish</td>
</tr>
<tr>
<td>20 x 2.0</td>
<td>Two encircling grooves, brass with silver surface finish</td>
</tr>
<tr>
<td>25 x 2.3</td>
<td>Two encircling grooves, brass with silver surface finish</td>
</tr>
<tr>
<td>32 x 2.9</td>
<td>Two encircling grooves, brass with silver surface finish</td>
</tr>
</tbody>
</table>

**Tab. 6-4** Fittings for heating pipe RAUTHERM S

![Characteristic features](image2)

**Characteristic features**

**Fig. 6-10** Compression sleeve for the heating pipe RAUTHERM S

Permanent sealing compression sleeve jointing technique approved according to DIN 18380 (VOB) for flush-mounted installation without inspection opening as soon as for pipelines within the floating screed and concrete.
6.4 Transition to other pipe materials

Water piping

- Only make joints after the soldering process.
- Let the solder cool down fully.
- A direct screwed connection of threaded fittings RAUTITAN MX made of special dezincification-resistant brass to threaded fittings RAUTITAN SX made of stainless steel is not allowed. We recommend the use of a transition piece made of gunmetal between both fittings.
- A direct connection thread between the fitting RAUTITAN SX made of stainless steel and fittings made of galvanised steel is according to DIN EN 806-4 not allowed. We recommend for that the use of a non ferrous metal transition fitting (e.g. gunmetal).
- To extend the thread fittings RAUTITAN we recommend the use of thread pieces made of gunmetal.

E.g. if repairs or piping network extensions make a system change to the RAUTITAN system or to the REHAU systems for underfloor heating/cooling necessary, a threaded joint must always be used to preserve the guarantee and as a clear division between the different systems. An exception to this rule is the use of the soldering/pressing adapter RAUTITAN RX and the RAUTITAN SX stainless steel system pressing adapter.

For transitions from the RAUTITAN system to soldering or metal compression systems (radial compression joints to DVGW worksheet W 534), use the soldering/pressing adapter RAUTITAN RX, e.g. with the materials copper or mild steel (heating installation). When using with metal compression systems, ensure that the surfaces of the soldering/compression end are free of grooves and deformations. Observe the instructions of the metal compression system manufacturers.
Transition to stainless steel systems

System adapter made of stainless steel
- To connect installation systems made of stainless steel, only use the system pressing adapters RAUTITAN SX and system adapters with male threads RAUTITAN SX, both in stainless steel.
- Do not confuse the RAUTITAN SX fittings with the fittings with silver surfaces, which are used to connect the heating pipe RAUTHERM S (underfloor heating/cooling).
- Please note the measurements of the fittings.

Threaded fittings made of stainless steel
- Do not use sealing tape or sealants (e.g. Teflon) which release chloride ions soluble in water.
- Use sealants which do not release chloride ions soluble in water (e.g. hemp).
- To avoid a crevice corrosion of the fittings RAUTITAN SX we recommend the use of hemp as thread sealant.

If the RAUTITAN system is connected to other systems made of stainless steel by interconnecting fittings (e.g. flush-mounted valves or water meters), it is unnecessary to use the RAUTITAN SX adapters.

The material combination of brass with stainless steel has been acknowledged in technical rules for a long time. However, the direct transition point to other systems is not explicitly regulated by the manufacturer’s warranty guidelines of stainless steel system suppliers.

To avoid a loss of warranty for the user of the REHAU system, uniform materials must be used at the system transition to stainless steel systems.

REHAU specifies only the system pressing adapters RAUTITAN SX and RAUTITAN SX system adapters with male threads (both in stainless steel) for direct system connections to stainless steel installation systems.

The same fitting directions apply for the RAUTITAN SX system pressing adapters as for the RAUTITAN RX soldering/pressing adapters.
1. Stainless steel system with flush-mounted valve
2. RAUTITAN system with RAUTITAN RX thread adapters

Direct transition from stainless steel systems to the RAUTITAN system up to size 32 or with threads up to R1/Rp1:
1. Stainless steel system
2. RAUTITAN system with RAUTITAN SX adapters (stainless steel) and RAUTITAN RX (gunmetal)

No direct transition from stainless steel systems to RAUTITAN MX:
1. Stainless steel system
2. RAUTITAN system with RAUTITAN MX (brass) adapters
6.5 Connection to fittings

Equipment and fittings can be easily connected by using adapters with union nuts.

![Adapter with RAUTITAN union nut](image)

Tab. 6-5 Allocation of adapter with RAUTITAN union nut to fittings with male threads

<table>
<thead>
<tr>
<th>RAUTITAN pipe size</th>
<th>RAUTITAN MX with flat-sealed Article description</th>
<th>Fittings with male threads for connection to metal pipe with thread to DIN 3546, Part 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>16</td>
<td>16 - G½</td>
<td>--</td>
</tr>
<tr>
<td>16</td>
<td>16 - G¾</td>
<td>G¾</td>
</tr>
<tr>
<td>20</td>
<td>20 - G½</td>
<td>--</td>
</tr>
<tr>
<td>20</td>
<td>20 - G¾</td>
<td>G¾</td>
</tr>
<tr>
<td>25</td>
<td>25 - G½</td>
<td>--</td>
</tr>
<tr>
<td>25</td>
<td>25 - G¾</td>
<td>G1</td>
</tr>
<tr>
<td>32</td>
<td>32 - G½</td>
<td>--</td>
</tr>
<tr>
<td>32</td>
<td>32 - G¾</td>
<td>G½</td>
</tr>
<tr>
<td>32</td>
<td>32 - G1½</td>
<td>--</td>
</tr>
<tr>
<td>40</td>
<td>40 - G½</td>
<td>G1½</td>
</tr>
<tr>
<td>40</td>
<td>40 - G2</td>
<td>--</td>
</tr>
<tr>
<td>50</td>
<td>50 - G1¼</td>
<td>G1¼</td>
</tr>
<tr>
<td>63</td>
<td>63 - G2½</td>
<td>G2½</td>
</tr>
</tbody>
</table>

6.6 Installation notes for connection components

- Avoid overtightening threaded joints.
- Use open-end wrenches in the right size. Do not clamp fitting too tightly into the vice.
- Using pipe wrenches can cause damage to the fittings and compression sleeves.
- Do not apply excessive hemp to threaded joints. The thread tips must be visible.
- Do not subject fittings and compression sleeves to plastic deformation, e.g. by hammer blows.
- Only use threads according to ISO 7-1, DIN EN 10226-1 and ISO 228 standards.

Other thread types are not permitted.

- Make sure that the connection components are free of inadmissible stress during assembly and when in operation. Make sure that the piping has sufficient scope of movement (e.g. from deflection legs).
- Do not use dirty or damaged system components, pipes, fittings, compression sleeves or seals.
- When flat-sealed joints (or similar) are opened, check that the sealing surface is undamaged before reconnecting and insert a new seal if necessary.

Observe the following instructions when installing threaded fittings:
- Only use sealants approved for gas and water installation (e.g. DVGW-certified sealants).
- Do not extend the leverage of installation tools, e.g. with pipes.
- Screw the threaded joints together so that the thread end remains visible.
- Check if thread types ISO 7-1 and DIN EN 10226-1 are capable of being combined with the thread typ ISO 228 before screwing them together, e.g. tolerances, free movement.
- Other thread types are not permitted.
- If using long threads, ensure the maximum possible screwing depth and sufficient thread depth in opposing parts with inside threads.
- Only use an appropriate G male connector with flat sealing thread fittings with G female thread.

The threads of fittings with thread adapters are executed as follows:
- Thread according to ISO 7-1 and DIN EN 10226-1:
  - Rp = cylindrical female thread
  - R = conical male thread
- Thread according to ISO 228:
  - G = cylindrical thread, non-sealing in the thread

Laying temperature
- Do not go below the minimum laying temperature of –10 °C.
- Do not exceed the maximum laying temperature of +50 °C.
Aligning the fittings

- Use suitable sheathing to protect fittings and compression sleeves against contact with brickwork or with screed, cement, plaster, bonding agents, aggressive media and other materials and substances which can cause corrosion.
- Protect fittings, pipes and compression sleeves against humidity.
- Ensure that the employed sealants, cleaning agents, building foams, insulation, protective tape, adhesive tape or thread sealant etc. do not contain any components which cause stress cracking or corrosion, e.g. ammonia, ammonia-bearing, aromatic and oxygenated solvents (e.g. ketone and ether), chlorinated hydrocarbons or chloride ions which can leach.
- Protect fittings, pipes and compression sleeves against dirt, drilling dust, mortar, grease, oil, paint, lacquers, adhesive/protective primers, solvents, etc.
- In aggressive environments (e.g. farming, encased in concrete, sea water atmosphere, cleaning agents), protect piping and fittings against corrosion adequately and in such a way that they are sealed against diffusion (e.g. to aggressive gases, fermentation gases, chloride mediums).
- Protect fittings, pipes and compression sleeves against humidity.
- Protect systems against damage (e.g. during the construction phase, when in the area of vehicles, machines or farming, and from damage caused by game animals).

RAUTITAN PX
- Only use leak detection agents (e.g. foaming agents) with current DVGW certification, which were also approved by the respective manufacturer for the PPSU and PVDF materials
- Only use sealants, thread sealants, cleaning agents, building foams, insulation, protective tape, adhesive tape and flux, which were approved by the respective manufacturer for the materials PPSU and PVDF.
- When using the connection components, check the compatibility of materials for the corresponding area of application.
- Contact with aromatic and oxygenated solvents (e.g. ketone and ether) as well as halogenated hydrocarbons (e.g. chlorinated hydrocarbons) is not permitted.
- Contact with water-based acrylic paints and adhesive/protective primers is not permitted.

RAUTITAN SX
- Do not use sealing tape or sealants (e.g. Teflon) which release chloride ions soluble in water.
- Use sealants which do not release chloride ions soluble in water (e.g. hemp).
- To avoid a crevice corrosion of the fittings RAUTITAN SX we recommend the use of hemp as thread sealant.

Water additives
The piping can be damaged when using inhibitors, antifreeze agents or other heater water additives.
Approval must be obtained from the respective manufacturers and from our Applications Department.
In this case, please consult your REHAU sales office.
- Before using tools, fully read and observe the information in the operating instructions.
- If these operating instructions are no longer present with the tool or are no longer available, order a copy or download them in internet.
- Do not use damaged tools or tools limited in their function; send these for repair to your REHAU sales office.

Operating instructions can be downloaded online from www.rehau.no or www.rehau.dk

The scope of delivery of the RAUTOOL installation tools can be seen from the Building Technology price list.

- RAUTOOL installation tools are specially coordinated for functioning with REHAU programs.
- Development and supervision directly from REHAU.
- RAUTOOL installation tools are subject to constant improvements and further development.
- Different drive methods of the RAUTOOL installation tools can be selected.
- For joint sizes 16/20, 25/32 and 40:
  - Hydraulic or manual expansion possible.
- For joint sizes 16–32:
  - Double compression jaws, 2 pipe sizes can be worked on without refitting the tool.
  - Simple fitting, even in confined spaces (unfavourable fitting situations).
- Separation of drive unit and clamping tools for hydraulic tools, RAUTOOL H1/H2, E2, E3 and G1/G2.
- No calibration of the pipes necessary with the compression sleeve jointing technique from REHAU.
- Cutting of the pipes is conducted for all sizes and requires little space and time with the REHAU pipe shears. The use of roller pipe cutters is unnecessary.
Notes on the compression jaws in size 40

### Compression jaws for RAUTITAN PX compression sleeves, size 40

<table>
<thead>
<tr>
<th>Compression jaws, new Ø 40</th>
<th>Compression sleeves Ø 40</th>
<th>Compression jaws, old Ø 40</th>
<th>Compression sleeve RAUTITAN PX Ø 40</th>
</tr>
</thead>
<tbody>
<tr>
<td>Compression jaws set 40</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(Black)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>201801-001</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>201803-001</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Compression jaws set M1 40</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(Black)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>201798-001</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>201804-001</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Compression jaws set G1/G2 40</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(Black)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>201802-001</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Tab. 7-1  Compression jaws for RAUTITAN PX compression sleeves, size 40

RAUTITAN PX compression sleeves in size 40 need to be compressed with the new black compression jaws of size 40.

Previous compression jaws (gold-yellow) of other sizes
- 16 x 2,2
- 20 x 2,8
- 25/32
- 50
- 63
can still be used.

- Only compress RAUTITAN PX compression sleeves, size 40, with the new RAUTOOL compression jaws (black) size 40.
- You can find more information on exchanging your old compression jaws 40 (gold-yellow) for the new ones at your REHAU sales office.
- Only make compression sleeve joints with RAUTOOL tools.
  If foreign tools are to be used when making the joint, these must be approved by the corresponding manufacturer for use with the RAUTITAN system and especially for use with the new RAUTITAN PX fittings and compression sleeves.
Compression sleeve tools: RAUTOOL

- For the RAUTITAN system
- For the REHAU systems for underfloor heating/cooling
- For special ranges, e.g. industrial piping systems from REHAU, RAUTHER-MEX range for local and remote heating supplies
- Various attachment sets and accessories (see price list for installation tools RAUTOOL)

7.1 RAUTOOL M1

- Manual tool
- Area of application: Sizes 16–40

Only use the compression jaws M1 with the RAUTOOL M1.

7.2 RAUTOOL H2

- Mechanical-hydraulic tool
- Area of application: Sizes 16–40
- Drive with foot/hand pump
- Ergonomic swivel joints on pressing cylinder

The hydraulic tools RAUTOOL H2, RAUTOOL E2/E3 and RAUTOOL A2/A3/ A-light/A-light2 are compatible with each other and can be equipped with the same supplementary sets. Expanders and expander heads of the expanding system RO are compatible with each other for all tools up to size 32.

7.3 RAUTOOL A3

- Battery hydraulic tool
- Area of application: Sizes 16–40
- Drive with a battery-operated hydraulic unit located directly at the tool cylinder
- The tool cylinder can be used optionally for hydraulic expansion.

7.4 RAUTOOL A-light2

- Battery hydraulic tool
- Area of application: Sizes 16–40
- Drive with a battery-operated hydraulic unit located directly at the tool cylinder
- The tool cylinder can be used optionally for hydraulic expansion.
7.5 RAUTOOL E3

- Electro-hydraulic tool
- Area of application: Sizes 16–40
- Drive with electro-hydraulic power unit connected by an electro-hydraulic hose to the tool cylinder
- The tool cylinder can be used optionally for hydraulic expansion.

7.6 RAUTOOL G2

- Tool for the pipe sizes 50–63 (optionally available for size 40 x 5.5)
- Drive with an electro-hydraulic power unit (optionally with a foot pump)
- The tool cylinder can be used optionally for expansion and clamping.

7.7 RAUTOOL M-light

- Manual clamping tool for compression sleeves RAUTITAN PX
- Sizes 16 and 20
- Not suitable for the connection of compression sleeves made of brass

7.8 RAUTOOL K10 x 1.1

- Manual combination tool for expanding and clamping the heating pipe RAUTHERM S 10.1 x 1.1 mm
- Area of application: Size 10.1 x 1.1

7.9 RAUTOOL K12 x 2.0

- Manual combination tool for expanding and clamping the heating pipe RAUTHERM S 12 x 2.0 mm
- Area of application: Size 12 x 2.0

7.10 RAUTOOL K14 x 1.5

- Manual combination tool for expanding and clamping the heating pipe RAUTHERM S 14 x 1.5 mm
- Area of application: Size 14 x 1.5
When cutting the pipes, observe the following:
- Use the correct pipe cutters for the corresponding pipe type only.
- Cut the pipe square and without burrs.
- Pipe cutters must be in perfect condition.

Spare blades for the pipe cutters can be re-ordered (except the pipe cutters 25).

<table>
<thead>
<tr>
<th>Pipe size</th>
<th>16/20</th>
<th>25 to 40</th>
</tr>
</thead>
<tbody>
<tr>
<td>Universal pipe RAUTITAN stabil</td>
<td><img src="pipe1.png" alt="Image" /></td>
<td><img src="pipe2.png" alt="Image" /></td>
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<tr>
<td>Pipe cutters 16/20 RAUTITAN</td>
<td><img src="pipe3.png" alt="Image" /></td>
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<tr>
<td>Pipe cutters 40 stabil</td>
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<table>
<thead>
<tr>
<th>Pipe size</th>
<th>to 20</th>
<th>to 25</th>
<th>to 40</th>
<th>40 to 63</th>
</tr>
</thead>
<tbody>
<tr>
<td>Universal pipe RAUTITAN flex</td>
<td><img src="pipe5.png" alt="Image" /></td>
<td><img src="pipe6.png" alt="Image" /></td>
<td><img src="pipe7.png" alt="Image" /></td>
<td><img src="pipe8.png" alt="Image" /></td>
</tr>
<tr>
<td>Heating pipe RAUTHERM S</td>
<td><img src="pipe9.png" alt="Image" /></td>
<td><img src="pipe10.png" alt="Image" /></td>
<td><img src="pipe11.png" alt="Image" /></td>
<td><img src="pipe12.png" alt="Image" /></td>
</tr>
<tr>
<td>Pipe cutters 16/20 RAUTITAN</td>
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<tr>
<td>Pipe cutters 25</td>
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<tr>
<td>Pipe cutters 40 stabil</td>
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<tr>
<td>Pipe cutters 63</td>
<td><img src="pipe16.png" alt="Image" /></td>
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<td></td>
<td></td>
</tr>
</tbody>
</table>

**Tab. 8-1 Selection of pipe cutters**
8.1 Pipe cutters 16/20 RAUTITAN

![Image](Fig. 8-1)

Cutting a universal pipe RAUTITAN stab with the pipe cutters 16/20 RAUTITAN

For right-angled cutting of the universal pipe RAUTITAN stab without burrs in sizes 16 and 20.

Only use pipe cutters 16/20 RAUTITAN when cutting universal pipe RAUTITAN stab in sizes 16 and 20.

![Image](Fig. 8-2)

Calibrating mandrel

When using the compression nut set, calibrate the universal pipe RAUTITAN stab (pipe sizes 16 and 20) with the calibrating mandrel moulded onto the side of the pipe cutters 16/20 RAUTITAN.

---

8.2 Pipe cutters 25

To be used exclusively for burr-free cutting of PE-X pipes up to size 25 (see Tab. 8-1 Selection of pipe cutters).

8.3 Pipe cutters 40 stabil

To be used exclusively for burr-free cutting of PE-X-pipes up to size 40 and for RAUTITAN stabil in size 25 to size 40 (see Tab. 8-1 Selection of pipe cutters).

8.4 Pipe cutters 63

To be used exclusively for burr-free cutting of RAUTITAN pipes or PE-X-pipes in sizes 40–63 (see Tab. 8-1 Selection of pipe cutters).

---

PE-X pipes can also be cut with the pipe cutters 16/20 RAUTITAN.
9 EXPANDING TOOLS

9.1 Expander heads and expander bits for pipes

<table>
<thead>
<tr>
<th>Expander heads</th>
<th>Expander bits</th>
<th>Expander head for RAUTOOL G2</th>
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</thead>
<tbody>
<tr>
<td>Pipe sizes</td>
<td>16/20/25/32</td>
<td>40</td>
</tr>
<tr>
<td>Universal pipe RAUTITAN stabil</td>
<td>stabil</td>
<td></td>
</tr>
<tr>
<td>Pipe sizes</td>
<td>16/20/25/32</td>
<td>40</td>
</tr>
<tr>
<td>Universal pipe RAUTITAN flex</td>
<td>flex</td>
<td></td>
</tr>
<tr>
<td>Pipe sizes</td>
<td>17/20/25/32</td>
<td></td>
</tr>
<tr>
<td>Heating pipe RAUTHERM S</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The RAUTHERM S pipe 16 x 2.0 is expanded with the expander head 16 x 2.0 (blue colour code).

Tab. 9-1 Selection of expanding tools

Expander head for radiator connection sets RAUTITAN

Expander set 16/20

Stainless steel or copper pipes 15 x 1.0 of the radiator connection sets RAUTITAN.

Using the expander head 15 x 1.0 RO is described in the Technical Information “RAUTITAN – THE NEW GENERATION” in the chapter on installation directions for radiator sets.

Fig. 9-1 Expander head 15 x 1.0 RO

The expander set 16/20 can be used in combination with the tools RAUTOOL H2/A2/A3/A-light/A-light2 and RAUTOOL E2/E3 to expand the pipes RAUTITAN flex and RAUTHERM S 16 x 2.0.

Fig. 9-2 Expander set 16/20
9.2 Expander bits

When combined with the RAUTOOL tools H2, E2/E3, A2, A3, A-light and A-light2, the following expander bits can be used:
- Universal expander bit 25/32 system RO
- Expander bit 40 x 6.0 stabil
- Expander bit 40 x 5.5

Only expand universal pipe RAUTITAN stabil in size 40 with the expander bit 40 x 6.0.
- Expansion not possible with RAUTOOL G1/G2 and M1.

9.3 Safety advice on the expander heads

- Do not use any defective segments or expander heads (e.g., bent, broken off, fractured).
- Ensure that expansion is even over the entire circumference of the pipe.
- Discard unevenly expanded pipe ends.
- Check the expander head for damage, if necessary carry out test expansion to test even expansion (e.g., no grooves, no local overstretching of the pipe material).
- Replace defective expander head.
- Do not apply grease or similar materials to the expansion segments.
- Apply grease to the cone of the expander.
- Do not use dirty or damaged expander heads, pipes or connection components.
- If cracks occur at the expanded zone or if the pipe ends were not expanded properly, cut off the damaged pipe end and repeat the expanding procedure.
- Observe the allocation of the expander heads to the respective pipe types and sizes.
The REHAU compression sleeve jointing technique is described in the pages below by an example for sizes 16 – 32. Directions for tool handling and making the joint in other pipe sizes are described in the respective operating instructions.

**10.1 Cutting the pipe**

The universal pipe RAUTITAN stabil 40 x 6.0 has shorter expansion lengths than the other RAUTITAN pipes in size 40.

When correctly expanded and pushed fully on, the expanded pipe section ends approx. 6 mm before the collar of the fitting.

Here, each Z-measurement extends by 4 mm. The entire pipe length, which is to be cut off, thus reduces by approx. 8 mm.

1. Before beginning work, ensure that the pipe cutters are in good condition.
2. Take note of the pipe type and use the appropriate pipe cutters.
3. Cut the pipe square and without burrs.
4. Maintain a safe distance between the holding hand and the pipe cutters.

- Uniform REHAU compression sleeve jointing technique
- Permanently sealed joint
- Without o-ring (piping material seals itself)
- Simple optical monitoring
- Can be immediately pressurised
- Pipe need not be calibrated or deburred
- Robust jointing technique, highly suitable for the building site

**10 MAKING THE COMPRESSION SLEEVE JOINT**
10.2 Pushing the compression sleeve over the pipe

Push the compression sleeve onto the pipe:
- The RAUTITAN PX compression sleeve can be pushed onto the fitting from both ends, the push-on direction does not matter.
- Brass compression sleeves should be pushed onto the pipe in such a way that the inner bevel faces the joint.

![Fig. 10-2 Push the RAUTITAN PX compression sleeve over the pipe.](image)

![Fig. 10-3 Push the brass compression sleeve over the pipe, inner bevel (arrow) facing the joint.](image)

![Fig. 10-4 Unapproved combination: RAUTITAN PX with RAUTITAN MX compression sleeves](image)

Always push brass compression sleeves onto the pipe in such a way that the inner bevel faces the joint. Here, the groove is to face away from the joint.

10.3 Expanding the pipe with the expander

- Follow the safety advice for the expander heads (see page 57).
- Check the expander heads for freedom of movement and dirt and clean, if necessary.
- Screw the expander heads fully onto the expansion tool (must not become detached when twisted in pipe).
- Maintain a minimum distance between the end of the pipe and the compression sleeve (at least twice the length of the compression sleeve).
- Expand the pipe when cold.

The pipe to be expanded must have an even temperature. Avoid local heating (e.g. by inspection lamps, etc.). Expand the pipe when cold and stress-free and push it onto the fitting.

1. Push the compression sleeve onto the pipe so that a distance of twice the length of the compression sleeve is free between the pipe end and the compression sleeve.

![Fig. 10-5 Minimum distance: Pipe end – compression sleeve](image)

2. Always push the segments of the expander head fully into the pipe. Avoid skewing the expander head.

3. Expand the pipe once.

![Fig. 10-6 Expand the pipe once](image)

4. Turn the expanding tool approx. 30°. The pipe remains in position.

5. Expand the pipe end once again.

![Fig. 10-7 Turn the expanding tool 30° at the same pipe position and expand the pipe once again.](image)
Inserting the fitting into the expanded pipe

When the pipe has been correctly expanded, the fitting can be pushed into the expanded pipe without difficulty. After a short time, the fitting is held firmly in the pipe, as the pipe contracts (memory effect).

Handle joints which are not clamped when inserting them into the tool and during clamping so that they cannot fall apart.

Push the fitting completely (as far as the end collar) into the expanded pipe after expanding.

![Fig. 10-8 Push the fitting into the expanded pipe](image)

All sealing ribs must be covered by the pipe, as shown in table 10-1.

An exception is when pushing the universal pipe RAUTITAN stabil onto the RAUTITAN PX fittings, size 40. Here, the last sealing rib may not be fully covered.

<table>
<thead>
<tr>
<th>Correct position of the pipe on the RAUTITAN PX fitting</th>
</tr>
</thead>
<tbody>
<tr>
<td>Size</td>
</tr>
<tr>
<td>Universal pipe RAUTITAN stabil</td>
</tr>
<tr>
<td>Universal pipe RAUTITAN flex</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Correct position of the pipe on metal fittings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Universal pipe RAUTITAN stabil</td>
</tr>
<tr>
<td>Universal pipe RAUTITAN flex</td>
</tr>
<tr>
<td>Heating pipe RAUTHERM S</td>
</tr>
</tbody>
</table>

Tab. 10-1 Correct position of the pipe on the fitting

A Fitting body
B Fitting collar
C End collar
D Sealing rib
10.5 Inserting the joint into the clamping tool

Insert compression sleeve joint into the clamping tool.

Avoid jamming. Place the tool over the entire surface and at a right angle.

Bulging of the metal compression sleeve does not impair the quality of the joint and usually occurs when older expander heads are used. When older expander heads are used with pipes made of RAU-PE-Xa (not for universal pipes RAUTITAN stabil), the pipe material may pull together during clamping. In this case, stop pushing on the brass compression sleeve shortly before the bulge (approx. 2 mm distance to the fitting collar).

10.6 Pushing the compression sleeve up to the fitting collar

- Only perform jointing on straight pipe sections (not on pipe elbows).
- The straight pipe section must be at least three-times the compression sleeve length.
- Do not jam joints which are not clamped when inserting them into the tool and always maintain full contact of the tool.
- Push the compression sleeve fully to the fitting collar.
- Do not use lubricants, water, etc. when making the compression sleeve joint.

1. Operate the pressure switch or pedal of the tool.
2. Push the compression sleeve fully to the fitting collar.
3. Carry out an optical check of the joint for damages and incomplete insertion of the compression sleeve.

- Clean and oil the tool after use.
- Store the tool in a dry place.
11 DETACHING THE COMPRESSION SLEEVE JOINT

REHAU will not accept liability if these instructions are not followed (e.g. when heating up the compression sleeve joint when attached).

11.1 Cutting out the joint

Cut the joint to be detached completely out of the existing piping using the pipe shears. Maintain a safe distance between the holding hand and the pipe shears.

![Fig. 11-1 Cutting out the joint](image)

11.2 Usability of cut-out joints

<table>
<thead>
<tr>
<th>Reusable</th>
<th>Not reusable</th>
</tr>
</thead>
<tbody>
<tr>
<td>RAUTITAN system</td>
<td>Dispose of together with all cut-out pipe parts</td>
</tr>
<tr>
<td>Fittings underfloor heating/cooling</td>
<td>Compression sleeves</td>
</tr>
<tr>
<td></td>
<td>Fittings RAUTITAN PX</td>
</tr>
</tbody>
</table>

![Tab. 11-1 Usability of detached compression sleeve joints](chart)

Removed metal fittings from water installations:
- Dispose of used RAUTITAN PX fittings and RAUTITAN PX compression sleeves.
- Only reuse removed metal fittings in perfect condition within the same installation type from which they were removed.
- Dispose of the detached compression sleeves with the detached pipe sections.
11.3 Detaching the cut-out joint from drinking water and heating installations

11.3.1 Heating the joint to be detached

Heating up the RAUTITAN PX compression sleeves to over 200 °C or direct flame exposure can lead to a build-up of toxic gases.

- Do not heat RAUTITAN PX compression sleeves to over 200 °C.
- It is not permitted to burn or apply a flame to the RAUTITAN PX compression sleeves.

1. Heat up the cut-out metal fitting with a hot air blower. 
   Observe the safety advice in the operating instructions of the hot air blower.
2. On reaching a temperature of approx. 135 °C remove the compression sleeve from the fitting body (e.g. with pliers).

11.3.2 Pulling off the compression sleeves

1. Remove pipe from fitting body.
2. Clean dirt from fitting.
   - When in perfect condition and cooled, the fitting can be reused.
   - Do not reuse detached compression sleeves and pipe sections.
3. Dispose of the compression sleeves with the detached pipe sections.

When the joint to be detached is heated, all joints of the heated fitting are no longer sealed.

Always separate the fitting to be heated completely from the piping!
12.1 Bending the universal pipe RAUTITAN stabil

The universal pipe RAUTITAN stabil can be bent either by hand or by using a bending tool.

**Minimum bending radius**
- When bending without tools, the minimum bending radius is five times the outside pipe diameter.
- When bending with a spiral spring, the minimum bending radius is three times the outside pipe diameter.
- The minimum bending radius is in relation to the centre of the pipe.
- Make sure to comply with the specified minimum bending radii.
- After bending, ensure that there are no impressions, wrinkles or bulges and that the outer PE sheath and aluminium layer are undamaged.

At laying temperatures under 0 °C, pipe elbows must be over-bent more strongly.
Only cold bending of pipes RAUTITAN stabil is allowed.

---

### Pipe sizes

<table>
<thead>
<tr>
<th>Pipe sizes</th>
<th>Bending radius R [mm]</th>
<th>Arc B [mm]</th>
<th>Bending radius R [mm]</th>
<th>Arc B [mm]</th>
</tr>
</thead>
<tbody>
<tr>
<td>16</td>
<td>48.6</td>
<td>76</td>
<td>81</td>
<td>127</td>
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<td>20</td>
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<tr>
<td>40</td>
<td>120</td>
<td>188</td>
<td>200</td>
<td>314</td>
</tr>
</tbody>
</table>

Tab. 12-1 Minimum bending radii of universal pipe RAUTITAN stabil

---

Fig. 12-1 Bent universal pipes RAUTITAN stabil

Fig. 12-2

R  Bending radius

B  Arc
Approved bending tools for universal pipe RAUTITAN stabil

<table>
<thead>
<tr>
<th>Pipe size [mm]</th>
<th>Source</th>
<th>Manufacturer</th>
<th>Model description</th>
<th>Material number</th>
<th>Article number</th>
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<tr>
<td>16/20</td>
<td>See price list REHAU</td>
<td>sales office</td>
<td>Internal spiral spring 16 stabil</td>
<td>247484-001</td>
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<td></td>
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<td>Internal spiral spring 20 stabil</td>
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<td>Hummel, D-79178 Waldkirch</td>
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<td>External spiral spring 17</td>
<td>2901170203</td>
<td>2901202503</td>
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<td></td>
<td>External spiral spring 20</td>
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<td>16/20/25</td>
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<td>One-hand pipe bending tool</td>
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</table>

Tab. 12-2 Approved bending tools for the universal pipe RAUTITAN stabil (as of: 2008)

12.2 Bending the universal pipe RAUTITAN flex

Fig. 12-3 Pipe bend bracket, plumbing (3–4 x d) - 90° or 45° for size 16–32

Fig. 12-4 Pipe bend bracket, plumbing/heating (5 x d) - 90° or 45° for size 16–25

Fig. 12-5 Pipe bend bracket, plumbing (4 x d) - 90° and pipe bend bracket, plumbing/heating (5 x d) - 90° each in size 32

Hot bending of universal pipes RAUTITAN flex can damage the oxygen diffusion barrier.

Only bend universal pipes RAUTITAN flex when cold.

Using elbows is not always required for sizes between 16 and 32. With pipe bend brackets, 90° and 45° elbows can be cold-bent quickly and easily.

For pipe sizes 40 to 63, we recommend using fittings.
Minimum bending radius

When bending by hand, the minimum bending radius is eight times the outside pipe diameter.

When laying with pipe bend brackets, the minimum bending radius in plumbing installations is three times and for heating installations five times the outside pipe diameter.

The minimum bending radius is in relation to the centre of the pipe.

<table>
<thead>
<tr>
<th>Pipe sizes</th>
<th>Bending radius R (mm)</th>
<th>Arc B (mm)</th>
<th>Bending radius R (mm)</th>
<th>Arc B (mm)</th>
<th>Bending radius R (mm)</th>
<th>Arc B (mm)</th>
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Tab. 12-3 Minimum bending radii for RAU-PE-Xa pipes

Fig. 12-6 Pipe bend bracket, plumbing 90 degrees, for size 16–32 and pipe bend bracket plumbing/heating 5 x d 90 degree for size 32

R Bending radius

Fig. 12-7

R Bending radius

B Arc
12.3 Bending the heating pipe RAUTHERM S

More information about bending heating pipes RAUTHERM S and using the pipe bend brackets in conjunction with the underfloor heating/cooling systems can be found in the current calculation price list as well as in the Technical Information “Underfloor heating/cooling”.

Hot bending heating pipes RAUTHERM S can damage the oxygen diffusion barrier.
- Only bend heating pipe RAUTHERM S when cold.
- Use the unwinding unit for cold and hot laying.

| Bending by hand (90°) | 5 x d  
| (at > 0° C laying temperature) |
| Pipe bend bracket plumbing/Heating 90° | 5 x d |

Tab. 12-4 Minimum bending radii RAUTHERM S
13 PIPE SUPPORT CHANNEL

13.1 Benefits of using the pipe support channel

- Reduces thermal changes in length
- Clip effect increases the axial retaining force
- Stabilises pipes against sagging and sideways bending
- Increases rigidity
- Increases the pipe clamp interval to 2 m regardless of the pipe size
- Visually attractive installations in exposed areas with RAU-PE-Xa pipes
- Simple assembly
- Self-supporting
- Is clipped onto the pipe
- No additional fastenings (e.g. cable ties, insulating tape) required
- Offcuts of pipe support channels can be used.

13.2 Functionality

The pipe support channel encloses the pipe by about 60 % and is shaped to closely encase the pipe without additional fastenings. This strong clamping effect prevents the pipe from bending and reduces thermal changes in length.

13.3 Assembly of the pipe support channel

Do not fit pipe support channels or pipe fasteners close to deflection legs to avoid preventing the piping from bending.

Pipe cover

![Pipe cover diagram](image)

Fig. 13-2 Let the pipe support channel end approx. 2 mm before the compression sleeve

The pipe support channel must be fitted over the entire length of the piping up to 2 mm before the compression sleeve, as only this ensures reduction of the thermal change in length.

Pipe clamp intervals

![Pipe clamp intervals diagram](image)

Fig. 13-3 Maximum pipe clamp intervals

The maximum pipe clamp interval when using the pipe support channel is 2 m for all sizes. The distance from the pipe end, or when changing the direction, to the first pipe fastener may not exceed 0.5 m. This way, pipe fastenings for pipe routing or in cellars can be attached in a uniform and rational manner.
Fitting cover

Fig. 13-4  Minimum overlapping of 0.5 m

Fittings with brass compression sleeves in sizes 50 and 63 can be clipped in the pipe support channel if the pipe support channel projects at least 0.5 m beyond the fitting. With this installation variant, cutting of the pipe support channel at the fitting is unnecessary.

When using RAUTITAN PX compression sleeves, clipping over the fittings is not possible.

Assembly of the pipe support channels

Reduced retaining force of the pipe support channel can cause greater thermal linear expansion of the pipe.

Do not lessen the retaining force of the pipe support channels by storing or assembling them improperly.

1. Cut off the pipe support channel with a metal saw (see Fig. 13-6). Maintain a safe distance between the holding hand and the cutting tool. Saw pipe support channels from the rounded rear side so that they are not bent open at their bordered ends.

Fig. 13-6  Cutting off

2. If the pipe support channel has been bent inwards or outwards when it was cut to length, bend the pipe support channel back to its original shape.

3. Deburr the ends of the pipe support channel.

Fig. 13-7  Deburring

4. Clip the pipe support channel onto the pipe (by hand or using a pump or pipe wrench with plastic jaws). Do not overlap the pipe support channels when laying.

Fig. 13-8  Clipping in

5. Clip offcuts over the joints of the pipe support channels.

Fig. 13-9  Clipping over

Even short offcuts of the pipe support channel are suitable for clipping over joints and installation almost without cutting losses is possible.
14 PIPE FASTENING

14.1 Pipe clamps

Use only pipe clamps with the following properties:
- Suitable for plastic pipes
- Acoustically insulating pipe clamp inserts
- Matching size (for even sliding when installed and to prevent the pipe clamp inserts from pulling out)
- Free of burrs

14.2 Fixed point installation

Fig. 14-1 Fixed point made with pipe clamps

- Observe the information from the manufacturer of the fastenings.
- The approximate values for the design and execution of the pipe fastenings (see Tab. 14-1) must be adapted to the circumstances in the building and the specifications of the manufacturers of the fastenings as necessary.
- Fixed points can be used to direct thermal changes in length in a desired direction.
- Longer lengths of piping can be subdivided into individual sections with fixed points.
- Fixed points can be made at tees, elbows or connectors. A pipe clamp is placed directly before each compression sleeve of the fitting for this purpose.

14.3 Pipe clamp intervals

Choose pipe clamp intervals according to the approximate values (see Tab. 14-1) for installation with or without pipe support channels.

14.4 Laying in visible areas

When laying piping in visible areas or long piping without changes in direction are laid, the use of the pipe support channel is recommended for the RAU-PE-Xa pipes.
- For installation without the pipe support channel, place the fixed points at intervals of 6 m.
- Ensure sufficient space for the piping to expand.

For installation of pipes made of RAU-PE-Xa without pipe support channel, sagging of the piping must be anticipated.

⚠️ Do not install pipe clamps on the compression sleeves.
<table>
<thead>
<tr>
<th>Pipe type</th>
<th>Pipe size [mm]</th>
<th>( l ) = Maximum pipe clamp distance [m]</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>without pipe support channel</td>
<td>with pipe support channel</td>
</tr>
<tr>
<td>Universal pipe RAUTITAN stabil</td>
<td></td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>1</td>
<td>-</td>
</tr>
<tr>
<td>20</td>
<td>1.25</td>
<td>-</td>
</tr>
<tr>
<td>25</td>
<td>1.5</td>
<td>-</td>
</tr>
<tr>
<td>32</td>
<td>1.75</td>
<td>-</td>
</tr>
<tr>
<td>40</td>
<td>2</td>
<td>-</td>
</tr>
<tr>
<td>Universal pipe RAUTITAN flex</td>
<td>16/17</td>
<td>1</td>
</tr>
<tr>
<td>20</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>25</td>
<td>1.2</td>
<td>2</td>
</tr>
<tr>
<td>32</td>
<td>1.4</td>
<td>2</td>
</tr>
<tr>
<td>40</td>
<td>1.5</td>
<td>2</td>
</tr>
<tr>
<td>50</td>
<td>1.5</td>
<td>2</td>
</tr>
<tr>
<td>63</td>
<td>1.5</td>
<td>2</td>
</tr>
<tr>
<td>Heating pipe RAUTHERM S</td>
<td></td>
<td></td>
</tr>
<tr>
<td>16/17</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>25</td>
<td>1.2</td>
<td>2</td>
</tr>
<tr>
<td>32</td>
<td>1.4</td>
<td>2</td>
</tr>
<tr>
<td>40</td>
<td>1.5</td>
<td>2</td>
</tr>
<tr>
<td>50</td>
<td>1.5</td>
<td>2</td>
</tr>
<tr>
<td>63</td>
<td>1.5</td>
<td>2</td>
</tr>
</tbody>
</table>

Tab. 14-1 Approximate values for pipe clamp intervals
15 THERMAL LENGTH CHANGES

15.1 Guidelines

Due to physical laws, all piping materials expand when heated and contract when cooled. This effect, which occurs regardless of the piping material, must be taken into account in the installation of drinking water, heating and gas pipes. This also applies to the piping of the RAUTITAN system.

The thermal change in length occurs mainly due to the different installation, ambient and operating temperatures. During installation, appropriate pipe routing with provisions for movement (e.g. at changes in direction) and corresponding space for expansion of the piping must always be taken into account. Additional deflection legs, e.g. U expansion bends or lyre loops, are usually only necessary for larger changes in length.

15.2 Benefits

- Low thermal length changes when laying with
  - Universal pipe RAUTITAN stabil
  - Drinking water pipe RAUTITAN his with pipe support channel
- Short deflection legs possible when the flexible RAU-PE-Xa pipes are used
- Simple installation of the pipe support channel

15.3 Calculation of length changes

The thermal change in length is calculated with the following equation:

\[ \Delta L = \alpha \cdot L \cdot \Delta T \]

- \( \Delta L \) = Length change in mm
- \( \alpha \) = Coefficient of linear expansion in \( \frac{mm}{m\cdot K} \)
- \( L \) = Length of the piping in m
- \( \Delta T \) = Temperature difference in K

The coefficient of linear expansion must be chosen according to the employed pipe type and any additionally installed pipe support channel.

Determining the pipe length

The pipe length \( L \) used in the calculation results from the length of the piping installed by the customers. This can be subdivided by installing fixed points or additional deflection legs.

Determining the temperature difference \( \Delta T \)

In the determination of the temperature difference \( \Delta T \), the laying temperature as well as the minimum and maximum temperatures of the pipe wall during operation (e.g. thermal disinfection) and when the system is out of service must be taken into account in the calculation.

<table>
<thead>
<tr>
<th>Pipe type</th>
<th>Pipe size</th>
<th>Coefficient of linear expansion ( \alpha ) ( \frac{mm}{m\cdot K} )</th>
<th>Material constant ( C )</th>
</tr>
</thead>
<tbody>
<tr>
<td>RAUTHERM S</td>
<td>10–32 without pipe support channel</td>
<td>0.15</td>
<td>12</td>
</tr>
<tr>
<td>Universal pipe RAUTITAN stabil</td>
<td>16–40</td>
<td>0.026</td>
<td>33</td>
</tr>
<tr>
<td>Universal pipe RAUTITAN flex</td>
<td>16–63 without pipe support channel</td>
<td>0.15</td>
<td>12</td>
</tr>
<tr>
<td></td>
<td>16–40 with pipe support channel</td>
<td>0.04</td>
<td>–</td>
</tr>
<tr>
<td></td>
<td>50–63 with pipe support channel</td>
<td>0.1</td>
<td>–</td>
</tr>
</tbody>
</table>

Tab. 15-1 Coefficients of linear expansion (approximate values) and material constants for deflection leg calculation (approximate values)
Thermal changes in length can be accommodated by deflection legs. RAU-PE-Xa pipes are particularly suitable for this due to their flexible material. A deflection leg is the freely moveable pipe length, which can take up the required length change. The length of the deflection leg is influenced mainly by the material (material constant C). Deflection legs result mostly from changes in direction of the piping. For long lengths of piping, additional deflection legs must be installed in the piping to compensate the thermal change in length.

**Fig. 16-1 Deflection legs**

- $L_{BS}$: Length of the deflection leg
- $\Delta L$: Thermal changes in length
- $L$: Pipe length
- $x$: Minimum distance of the pipe from the wall
- $FP$: Fixed point clamp
- $GS$: Slide clamp

Do not fit pipe support channels or pipe fastenings close to deflection legs to avoid preventing the piping from bending.
16.1 Calculation of deflection leg length

The minimum length of deflection legs (BS) is calculated by the following formula:

\[ L_{BS} = C \cdot \sqrt{d_a \cdot \Delta L} \]

- \( L_{BS} \) = Length of the deflection leg in mm
- \( d_a \) = Outside pipe diameter in mm
- \( \Delta L \) = Length change in mm
- \( C \) = Material constant of the piping material

Approximate values for the material constant \( C \) see Tab. 15-1, page 74.

Do not fit pipe support channels or pipe fastenings close to deflection legs to avoid preventing the piping from bending.

16.2 Calculation examples

The piping length \( L \), for which the thermal change in length is to be accommodated at a deflection leg, is 7 m.

The temperature difference between the minimum and maximum value (installation temperature and subsequent operating temperature) is 50 K. The employed pipe has an outside diameter of 25 mm.

What length of deflection leg is required in dependency on the laid pipe type?

Calculation of the deflection leg length with the universal pipe RAUTITAN stabil

\[ \Delta L = a \cdot L \cdot \Delta T \]

\[ \Delta L = 0.026 \frac{\text{mm}}{\text{m} \cdot \text{K}} \cdot 7 \text{ m} \cdot 50 \text{ K} \]

\[ \Delta L = 9.1 \text{ mm} \]

\[ L_{BS} = C \cdot \sqrt{d_a \cdot \Delta L} \]

\[ L_{BS} = 33 \cdot \sqrt{25 \text{ mm} \cdot 9.1 \text{ mm}} \]

\[ L_{BS} = 498 \text{ mm} \]

Calculation of the deflection leg length with RAU-PE-Xa pipes mounted with pipe support channel

\[ \Delta L = a \cdot L \cdot \Delta T \]

\[ \Delta L = 0.04 \frac{\text{mm}}{\text{m} \cdot \text{K}} \cdot 7 \text{ m} \cdot 50 \text{ K} \]

\[ \Delta L = 14 \text{ mm} \]

\[ L_{BS} = C \cdot \sqrt{d_a \cdot \Delta L} \]

\[ L_{BS} = 33 \cdot \sqrt{25 \text{ mm} \cdot 14 \text{ mm}} \]

\[ L_{BS} = 224 \text{ mm} \]

Assessment of the results

The universal pipe RAUTITAN stabil has a lower thermal change in length than a RAU-PE-Xa pipe due to its aluminium sheath. However, the required deflection leg length for the RAU-PE-Xa is smaller due to the flexible pipe material. For metallic pipe materials, a substantially larger deflection leg is required with the same operating parameters during installation, due to the significantly higher material constant \( C \), than for the pipes of the RAUTITAN system.

You can conduct deflection leg calculations and find calculation diagrams online at www.rehau.no or www.rehau.dk
17.1 Laying on the raw floor

- Adhere to the advice and assembly instructions in this Technical Information.
- Details on protecting and insulating the piping can be found in the respective application sections.
- Always lay RAUTITAN piping in insulation in the drinking water and heating installation.
- Take note of the necessary height produced by the insulated piping in the planning phase.
- Fasten the pipes on the floor (take note of the specifications in DIN 18 560, Floor screeds in building construction).
- Lay piping in a suitable compensating layer to attain a flat surface to receive the insulating layer and impact sound insulation.

17.2 Inadmissible heating of pipes

Make sure during the construction phase that piping, etc. is not exposed by other contractors to inadmissible temperatures (e.g. when sealing bitumen sheeting, or welding or soldering in the direct vicinity of unprotected piping).

Piping close to devices with high thermal emissions must be insulated sufficiently and permanently protected against inadmissible heating. Adhere to the maximum allowable operating pressure (e.g. operating temperature and duration).
17.3 External installation

- Piping:
  - Do not use for laying in ground
  - Protect against UV radiation
  - Protect against frost
  - Protect against high temperatures
  - Protect against damage

When laying in ground, use the REHAU systems for groundworks. Additional information on this can be found online at www.rehau.com or www.rehau.com/tiefbau.

17.4 Laying exposed to UV radiation

- Store and transport pipes protected against UV radiation.
- Protect piping from UV rays in areas where UV radiation can occur (e.g. sunlight, neon light).

17.5 Light transmission

The universal pipe RAUTITAN flex is permeable to light. Light exposure can be detrimental to the hygiene of the drinking water. Protect pipes against exposure to light (e.g. close to windows and lamps).
17.6 Laying on bitumen sheeting and bitumen coatings

![Fig. 17-9 Laying is permissible only on top of bitumen sheeting](image)

Do not lay pipes under bitumen sheeting.
Laying under a bitumen sheeting can lead to damage to the piping or to the bitumen sheeting.

- Before laying on solvent-bearing bitumen sheeting or bitumen coatings, they must have dried thoroughly.
- Observe the setting time specified by the manufacturer.
- Before beginning laying, ensure that impairment of the piping and the drinking water is prevented.
- When laying pipes in the vicinity of bitumen sheeting to be heated with a torch, protect the piping sufficiently against heating.

Details on insulating and laying RAUTITAN piping in the drinking water and heating can be found in the Technical Information “RAUTITAN – THE NEW GENERATION”

17.7 Auxiliary heating

![Fig. 17-10 Example of laying with auxiliary heating](image)

- If pipes are laid with the pipe support channel, the heating strip must be attached to the outside of the pipe support channel.
- Take the appropriate measures to ensure that the piping and connection components do not at any point exceed 70 °C.
- When installing heating strips on pipes, observe the laying instructions of the auxiliary heating manufacturer.

17.8 Laying under hot asphalt screed

![Fig. 17-11 Laying under hot asphalt screed](image)

Hot asphalt screeds are laid at a temperature of approx. 250 °C in the building. To protect the piping from overheating, the proper steps need to be taken. Since these are dependent on the structural conditions and cannot be influenced by REHAU, these must be coordinated with and approved by the planner.

Agree with the contractor laying the hot asphalt screed on suitable insulating and protective measures for the installation and laying of the hot asphalt screed in order to prevent overheating of the piping.

17.9 Potential compensation

![Fig. 17-12 Potential compensation when exchanging pipes](image)

RAUTITAN piping must not be used as an earth conductor for electrical systems as per DIN VDE 0100.

After replacement of existing metal pipe installations with the RAUTITAN system, the function of potential compensation and the effectiveness of the electrical safety devices must be verified by an electrician.
Some system components, which has been produced and sold before 2005, are yet restrictively applicable or not applicable at all anymore.

Please following advices about the compatibility of the system components to each other have to be considered.

### 18.1 Advices about fitting contours when using the universal pipe RAUTITAN stabil, size: 16–32

With universal pipes RAUTITAN stabil and brass fittings, always use brass parts with fully shaped end collars.

Since 1997, production at REHAU has been changed completely to incorporate fitting contours with end collars in sizes 16–32.
Standards

Observe the applicable national and international laying, installation, accident prevention and safety regulations when installing piping systems, as well as the instructions in this Technical Information.

Also observe the applicable laws, standards, guidelines and regulations (e.g. DIN, EN, ISO, DVGW, TRGi, VDE and VDI) as well as regulations on environmental protection, provisions of professional associations and regulations of the local public utility companies.

Areas of application not contained in this Technical Information (special applications) require consultation with our Applications Department. For detailed advice, consult your REHAU sales office.

The planning and installation instructions are directly connected with the respective REHAU product. References are made to excerpts from generally applicable standards and regulations. Observe the respectively valid issues of the guidelines, standards and regulations. Further standards, regulations and guidelines with regard to the planning, installation and operation of drinking water, heating and building technology systems must also be taken into account, but are not a part of this Technical Information.

The following standards, regulations and guidelines are referred to in the Technical Information (the current version is always valid):

- DIN 1045
  Concrete, reinforced and prestressed concrete structures
- DIN 1055
  Action on structures
- DIN 1186
  Building plasters
- DIN 15018
  Cranes
- DIN 16892
  Crosslinked polyethylene (PE-X) pipes - General requirements, testing
- DIN 16893
  Crosslinked polyethylene (PE-X) pipes - Dimensions
- DIN 18180
  Gypsum plasterboards
- DIN 18181
  Gypsum plasterboards for building construction
- DIN 18182
  Accessories for use with gypsum plasterboards
- DIN 18195
  Water-proofing of buildings
- DIN 18202
  Tolerances in building construction
- DIN 18350
  German Construction Contract Procedures (VOB) - Part C: General Technical Specifications for Building Works - Plaster and stucco works
- DIN 18380
  German Construction Contract Procedures (VOB) - Part C: General Technical Specifications for Building Works - Systems for heating and central water heating
- DIN 18557
  Works mortar
- DIN 18560
  Floor screeds in building construction
- DIN 1988
  Codes of practice for drinking water installations (TRWI)
- DIN 2000
  Central drinking water supply - Guidelines regarding requirements for drinking water, planning, construction, operation and maintenance of plants
DIN 3546
Stop-valves for domestic water supply

DIN 4102
Fire behaviour of building materials and components

DIN 4108
Thermal protection and energy economy in buildings

DIN 4109
Sound insulation in buildings

DIN 4725
Warm water surface heating systems - Systems and components

DIN 4726
Warm water surface heating systems and radiator connecting systems - Plastic piping systems

DIN 49019
Conduits for electrical installation

DIN 49073
Metal boxes and boxes of insulating material for recessed mounting for accommodation of accessories and socket outlets

DIN 50916-2
Testing of copper alloys; stress corrosion and cracking test using ammonia; testing of components

DIN 50930-6

DIN 68 800
Protection of timber used in buildings

DIN EN 1254-3
Copper and copper alloys - Plumbing fittings - Part 3: Fittings with compression ends for use with plastics pipes

DIN EN 1264
Water based surface embedded heating and cooling systems

DIN EN 12831
Heating systems in buildings

DIN EN 12831 Supplementary sheet 1
Heating systems in buildings – Method for calculation of the design heat load

DIN EN 13163
Thermal insulation products for buildings

DIN EN 13163 to DIN EN 13171
Thermal insulation products for buildings

DIN EN 13501
Fire classification of construction products and building elements

DIN EN 14037
Ceiling mounted radiant panels supplied with water at temperature below 120°C

DIN EN 14240
Ventilation for buildings - Chilled ceilings

DIN EN 14291
Foam producing solutions for leak detection on gas installations

DIN EN 14336
Heating systems in buildings

DIN EN 15377
Protection against pollution of potable water installations and general requirements of devices to prevent pollution by backflow

DIN EN 1990
Eurocode: Basis of structural design

DIN EN 1991-1
Eurocode 1: Actions and structures

DIN EN 1992-1
Eurocode 2: Design of concrete structures

DIN EN 1717
Protection against pollution of potable water installations and general requirements of devices to prevent pollution by backflow

DIN EN 442
Radiators and convectors

DIN EN 520
Gypsum plasterboards

DIN EN 60529
Degrees of protection provided by enclosures

DIN EN 806
Codes of practice for drinking water installations

DIN EN ISO 15875
Plastic piping systems for hot and cold water installations - Crosslinked polyethylene (PE-X)

DIN EN ISO 6509
Corrosion of metals and alloys – Determination of dezincification resistance of brass
DIN EN ISO 7730  
Ergonomics of the thermal environment

DIN VDE 0100  
(Summary)  
Electrical systems in building  
Setting up high-voltage current systems  
Setting up low-voltage current systems  
Guidelines for electrical systems

DIN VDE 0100-701  
Low-voltage electrical installations - Requirements for special installations or locations - Part 701: Locations containing a bath or shower

DIN VDE 0298-4  
Application of cables and cords in power installations

DIN VDE 0604-3  
Trunking mounted on walls and ceilings for electrical installations; skirting board ducts

DVGW W 270  
Reproduction of micro-organisms on materials for the drinking water area

DVGW W 291  
Cleaning and disinfection of water distribution systems

DVGW W 534  
Pipe connectors and connections in the drinking water installation

DVGW W 551  
Drinking water heating and drinking water pipe systems

EnEV  
German Energy Saving Ordinance


Council directive relating to machinery (89/392/EEC) including amendments

ISO 228  
Pipe threads where pressure-tight joints are not made on the threads

ISO 7  
Pipe threads where pressure-tight joints are not made on the threads

LBO  
Regional building laws of the states of the Federal Republic of Germany

MBO  
German Building Code for the states of the Federal Republic of Germany

MLAR  
Sample Line Systems Guidelines

Muster-Feu-VO  
Sample firing equipment regulation

TrinkwV  
Drinking Water Ordinance

VDI 2078  
Cooling load calculation of air-conditioned rooms

VDI 4100  
Noise control in dwellings

VDI 6023  
Hygiene for drinking water supply systems

VOB  
German Construction Contract Procedures

ZVSHK data sheets  
German Central Association for Plumbing, Heating, Air-conditioning/Building and Energy Technology (ZVSHK/GED)

VDI 2035  
Prevention of damage in water heating installations