REHAU®

Unlimited Polymer Solutions

PIPING, CONNECTION AND SYSTEM GUIDELINES

TECHNICAL INFORMATION

www.rehau.com
Valid from January 2012
Subject to technical modifications

Construction
Automotive
Industry

This Technical Information
SYSTEM GUIDELINES, PIPING AND CONNECTION
is valid from January 2012.

This publication means that the previous Technical Information ANZ 893 0276 (as of October 2009) is no longer valid.

The latest version of this Technical Information can be found at www.rehau.com.au for download.

All measurements and weights are of approximate values. Errors and changes are to be expected.

TECHNICAL INFORMATION

System guidelines, piping and connection

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1 INFORMATION AND SAFETY ADVICE

NOTES ON THIS TECHNICAL INFORMATION

Validity
This Technical Information is valid for Australia and New Zealand.

Further applicable Technical Information
- RAUTITAN – THE NEW GENERATION
- RAUTITAN – Gas installation systems
- Underfloor Heating and Cooling

Navigation
At the beginning of this document you can find a detailed content page which lists the individual chapters and their respective 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 are applicable for system-wide applications, such as drinking water, heating, and gas installation or underfloor heating/cooling are illustrated with grey piping and white fittings/compression sleeves.

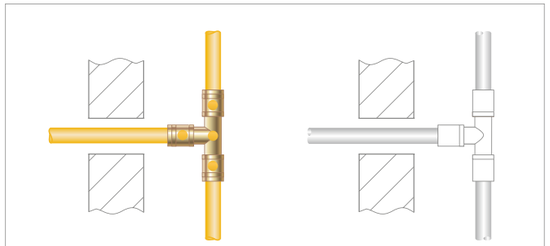

Fig. 1-1 Example: Illustration for gas installation sub-system (left) and example: System-wide illustration for multiple sub-systems (right)

Explanation of symbols
Safety information

Legal information

Important information, which needs to be taken into account

Information on the Internet

Your benefits/advantages

Latest Technical Information
For safe usage of REHAU products, please check regularly if a newer version of the technical information is availble to you. The date of issue of your technical information can be found on the back cover in the bottom right hand corner. The latest technical information manuals are available from the REHAU sales office, appointed wholesalers as well as from our website: www.rehau.com.au.

Safety advice and operating instructions
- Please read these safety instructions and technical information carefully and completely for your own safety and other's before beginning the installations.
- Please keep this copy for your future reference.
- If you have any questions or need further clarifications on the safety instructions and/or the individual installation instructions, please contact your nearest REHAU sales office.
- **Failure to observe the safety information/instructions can result in damage to property and persons.**

Intended use
The REHAU system components and compression sleeve jointing technique is considered as propriety systems and should be designed, installed, and operated in accordance to REHAU's Technical Information. Any other use that does not fall within the intended use of the system is prohibited.

When installing this pipe system, please observe all applicable national and international regulations on installation, accident prevention and safety together with the information contained in this Manual.

Also observe the applicable laws, standards, guidelines and regulations (e.g. DIN, EN, ISO, NCC, BCA, PCS, NZBC, AS/NZS) as well as regulations on environmental protection, provisions of professional associations and regulations of the local public utility companies.

Any applications not described in this Manual - i.e. non-standard applications - must be discussed with our Technical Applications Department. For more detailed advice, please contact your REHAU Sales Office.

This design and installation information is 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 standards, directives and guidelines related to the design, installation and operation of drinking water, heating or buildings services systems should also be referred to, but these do not form part of this Technical Information.

General safety measures

- Keep your workplace tidy and free of obstructions.
- Ensure there is always sufficient light.
- Keep children, pets and unauthorised persons away from tools and installation areas. This is especially important when carrying out refurbishment/repair work in occupied areas.
- Only use the corresponding components in the piping system that 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.

Trades qualifications

- Only authorised and trained persons are allowed to install REHAU systems.
- Work on electrical systems and cables shall only be carried out by qualified, competent and authorised specialists.

Work clothing

- Wear eye protection, adequate work clothing, protective shoes, safety helmets, and a hairnet if you have long hair.
- Do not wear lose clothing or jewelry as these can be caught by moving parts.
- A safety helmet must be worn especially when carrying out installation work at face level or overhead.

Follow the installation instructions

- Read carefully and observe at all times the Operating Manual for the REHAU installation tool which is being used.
- Incorrect handling of tools can cause cuts, crush or sever limbs.
- Incorrect handling of tools can damage jointing components and cause leaks.
- The REHAU pipe cutters have a sharp blade. Store and handle them in such a way that the REHAU pipe cutters will not create any risk of injury.
- When cutting the pipe to the desired length, keep a safe distance between the holding hand and the tool (pipe cutter).
- When cutting, do not reach into the cutting zone of the tool or near its moving parts.
- After the pipe expansion process, the expanded end of the pipe will return to its original shape (due to memory effect). During this time, do not put any other objects into the end of the expanded pipe, except for the intended REHAU fitting.
- 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. This is an injury hazard.
- Always disconnect the power from a tool prior to carrying out maintenance work. This may include changing over any moveable parts (eg. compression jaws) or when moving the tool to a new location on site.

Operating parameters

- If the operating parameters are exceeded, the pipes and joints may become overstrained. 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.)

Gas piping: General safety measures

- Failure to observe the safety information/instructions may cause explosions and fire and can result in fatal damage to persons.
- Always observe the requirements of the national gas standards, e.g. AS/NZS 5601.1.
- Take extra care when designing and installing gas installations.
- Ensure through appropriate safety measures that there is no possibility of uncontrolled gas leaks.
- Installation, modification and maintenance work on gas consumer piping may only be carried out by the following persons:
  - gas utility person
  - gas fitters with a valid gas fitters license for the installation location area.
- Always coordinate any work on gas installations with the responsible gas provider prior to commencing the work.
- When working on gas consumer piping, escape routes must be kept free at all times to ensure a quick and safe escape. Emergency exits are to be kept clear.

Gas piping: What to do if there is a smell of gas in buildings

- Open all doors and windows to create a breeze path, avoid rooms which smell of gas.
- Avoid any sparks or open flames / fires – if one is present extinguish it, do not smoke and do not use any lighters.
- Do not operate any electrical switches, plugs, door bells, phones and other communication devices in the building.
- Close the main lead and the isolating valve at the gas meter that lead into the building.
- Warn other occupants of the building, but do not use the door bells and leave the building.
- Contact the service centre of the gas provider/utility from a phone outside the building.
- If you can hear leaking gas, leave the building immediately. Prevent anyone else from entering the building. Call the police and fire brigade from outside of the building!
- If the gas smell originates from a non-accessible room, contact the police and fire brigade immediately from outside of the building!

Gas piping: What to do in case of fire

- Call the fire brigade.
- Do not extinguish burning gas, as unburnt gas can pose an explosion risk.
- Close isolating valve at gas meter and/or main that leads into the building if it can be done without any danger.

Gas piping: Additional information

We recommend observing the following points, in addition to the safety requirements and accident prevention measures which are in force in your area:

- Do not smoke during work on gas installations and remove any other potential ignition sources.
- Prior to starting the work, close the respective isolating valves and secure them against unauthorised opening, e.g. by removing the handle or key.
- Ensure all inlets and outlets of gas pipes are closed and gas-tight, e.g. using end stops or plugs, if there is a possibility the isolating valve could be opened unauthorised, intentionally or accidentally or if you have to leave the workplace only for a short time.
- Ensure that all isolating valves are actually closed in a gas-tight manner.
- Once the pipe section you work on has been isolated correctly, the gas inside the pipe has to be vented out. The venting out of the gas has to be done in a safe manner using hoses.
- Pipe sections that are out-of-order or no longer in use or disconnected must be sealed permanently at their inlets and outlets in a gas-tight manner, e.g. by using plugs stoppers, end caps or blank flanges.
- Immediately seal all openings resulting from the dismantling of gas meters.
- Prior to cleaning the gas consumer piping, remove all gas appliances, pressure regulators, gas meters and fixtures. Clean the pipes by blowing out the pipes strictly to the outside of the building!
- If possible use gas detection devices for locating gas leaks. Never, under any circumstances, use a naked flame to search for a gas leak.
- In case of using foaming chemicals to locate leaks, be aware that hemp used for sealing joints can temporarily swell and prevent leakage detection.
- Upon completing the pipework installation, always carry out a test for gas leaks. For this test, the gas pipes must not be covered by anything. All joints must be free from any coats and the gas pipes must not be connected to any pipes carrying gas.
- Prior to putting the pipework back into operation, fill the pipes with the intended operating gas and purge out the air inside the pipes until all the air inside the pipes has been fully replaced by the gas. The exiting air/gas mix has to be safely discharged to the outside of the building.
- Prior to putting the complete gas installation into operation, make sure a pressure test is carried out successfully in accordance with rules and regulations currently in force and a pressure test protocol is completed.
- When putting a gas system into operation and the system is charged with gas, ensure all pipe openings are gas-tight.

2 COMPONENT OVERVIEW

RAUTITAN – THE NEW GENERATION

	Size 16 – 25	Size 32 - 40	Size 50 – 63		Tool
Pipe	Hot and cold water pipe RAUTITAN platinum Heating pipe RAUTITAN pink Rainwater pipe RAUTITAN green Recycled water pipe RAUTITAN lilac Hot water pipe RAUTITAN red			RAUTOOL	
	Universal pipe RAUTITAN stabil				
Compression sleeve	**RAUTITAN PX** PVDF		**RAUTITAN MX** Brass		
Fitting	**RAUTITAN PX** PPSU **RAUTITAN MX** Dezincification-resistant special brass **RAUTITAN RX** Gunmetal **RAUTITAN SX** Stainless steel		**RAUTITAN MX** Dezincification-resistant special brass		

	Size 16 – 40			Tool
Pipe	Gas pipe RAUTITAN gas stabil		RAUTOOL	
Compression sleeve and fitting	**RAUTITAN gas** Brass with yellow marking **RAUTITAN gas** Brass with yellow marking			

REHAU system for underfloor heating/cooling

	Size 10–32		Tool
Underfloor heating/cooling			
Pipe	Heating pipe RAUTHERM S	RAUTOOL	
Compression sleeve	Compression sleeve for heating pipe RAUTHERM S Brass with silver surface finish		
Fitting	Fitting for heating pipe RAUTHERM S Brass with silver surface finish		

3 MATERIAL TESTING AT REHAU

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 noted 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.

Fig. 3 - 1 Result of a burst pressure test with the universal pipe RAUTITAN flex

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.

Fig. 3 - 2 Universal pipe RAUTITAN flex in the notch impact testing device

Tension test
In a tensometer, the pipes are pulled longitudinally at high force under controlled conditions until they break. Pipes made of crosslinked polyethylene show an extremely high elongation in comparison to metal pipes. The length of the extended pipe can be several times the original pipe length. The compression sleeve jointing technique cannot be pulled out under operating conditions. The pipe is not pulled out of the joint in Fig 3 - 3.

Fig. 3 - 3 Procedure of a tension test

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.

Fig. 3 - 4 Pipes in a long-term test (under pressure in a water bath)

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 TRANSPORT AND STORAGE

4.1 Handling the pipes and system components

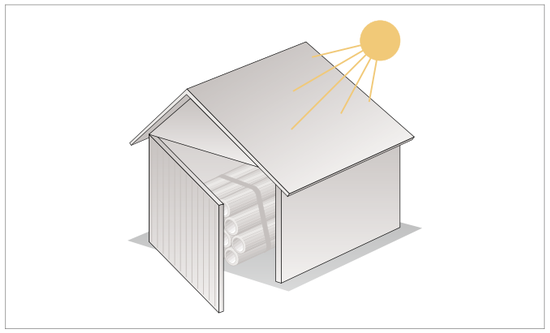

Fig. 4 - 1 Protect pipes against sunlight

Protect pipes and fittings against UV radiation during storage and transportation. When laying in areas where UV-radiation (e.g. sunlight, neon light) can occur, cover the piping fully with UV-proof material.

Avoid damaging the pipes and system components:
- Load and unload with due care.
- Only transport in a fashion suitable for the material.
- 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 exposure during the construction 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).

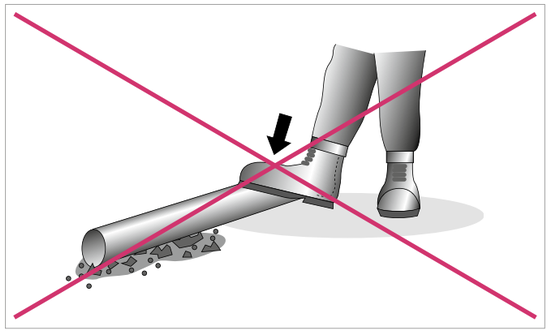

Fig. 4 - 2 Do not store pipes on sharp-edged surfaces

5 PIPES

5.1 PE-X materials

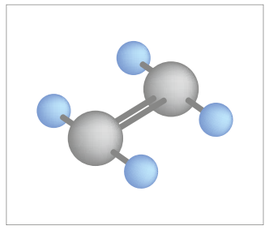

Fig. 5 - 1 Ethylene

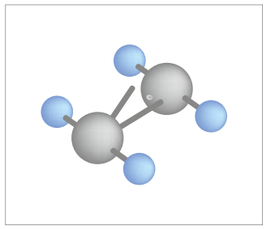

Fig. 5 - 2 Ethylene, detaching double bond

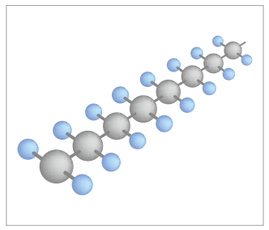

Fig. 5 - 3 Polyethylene (PE)

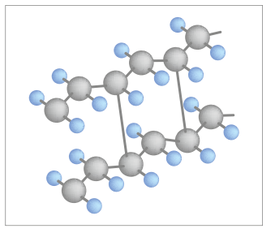

Fig. 5 - 4 Crosslinked polyethylene (PE-X)

- Corrosion resistance of the pipes: No pitting
- No tendency to deposits
- Polymer pipe material reduces sound transmission along the pipe
- Good resistance to abrasion
- Toxicologically and physiologically harmless
- All RAUTITAN pipes with DVGW registration comply with the KTW recommendations
- All RAUTITAN pipes with WaterMark registration comply with AS/NZS 4020 (hygienic requirements)

Peroxide-crosslinked polyethylene
Peroxide-crosslinked polyethylene is designated PE-Xa. This method of crosslinking is conducted at high temperature 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 and gas pipe RAUTITAN gas stabil
The interior pipe in the universal pipe RAUTITAN stabil and in the gas pipe: RAUTITAN gas 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)

Composition / Material	Pipe
- Self-supporting PE-X inliner, pressure resistant - Aluminum layer - Polyethylene outer layer	Universal pipe RAUTITAN stabil Gas pipe RAUTITAN gas stabil
- RAU-PE-Xa - Polyethylene outer layer	Hot and cold water pipe RAUTITAN platinum Rainwater pipe RAUTITAN green Recycled water pipe RAUTITAN lilac Hot water pipe RAUTITAN red
- RAU-PE-Xa - Adhesive agent - Oxygen barrier layer	Heating pipe RAUTITAN pink Heating pipe RAUTHERM S

Tab. 5-1 Pipe composition/material, from interior to exterior

5.3 Areas of application: pipes

The RAUTITAN system for water services and heating installation can be used extensively in the following:
- Hot and cold water services
- Rainwater application
- Recycled water application
- Radiator panels
- Heating/cooling installation

Pipe	Size	Pipe Material	Area of Application					
			Drinking water installation	Heating / cooling installation	Radiator panels	Rain water application	Recycled water application	Gas installation
Universal pipe stabil	16-40	Metal plastic composite pipe	++	++	++	+	+	-
Hot & cold water pipe platinum	16-63	PE-Xa with PE outer layer	++	-	-	+	+	-
Hot water pipe red	16-25	PE-Xa with PE outer layer	++	-	-	+	+	-
Heating pipe pink	16-63	PE-Xa with oxygen barrier layer	-	++	++	-	-	-
Rainwater pipe green	16-63	PE-Xa with PE outer layer	-	-	-	++	-	-
Recycled water pipe lilac	16-63	PE-Xa with PE outer layer	-	-	-	-	++	-
Gas pipe gas	16-40	Metal plastic composite pipe	-	-	-	-	-	++
Heating pipe RAUTHERM S	10-32*	PE-Xa with oxygen barrier layer	-	++	-	-	-	-

Legend: ++ Usage permitted
+ Usage permitted with limitation
- Usage not permitted

** Check for availability in Australia/New Zealand*

5.4 Areas of application: Pipes in underfloor heating/cooling

Installation system	Pipe		
	RAUTITAN stabil	RAUTITAN pink	RAUTHERM S
Tacker system	16.2 x 2.6 mm / 20 x 2.9 mm	16 x 2.2 mm / 20 x 2.8 mm	16 x 2.0 mm / 17 x 2.0 mm / 20 x 2.0 mm
In-slab system	16.2 x 2.6 mm / 20 x 2.9 mm	16 x 2.2 mm / 20 x 2.8 mm / 25 x 3.5 mm	16 x 2.0 mm / 17 x 2.0 mm / 20 x 2.0 mm / 25 x 2.3 mm
Floating floor system	16.2 x 2.6 mm	16 x 2.2 mm	16 x 2.0 mm
Diffusion plate system	-	16 x 2.2 mm	16 x 2.0 mm

5.5 Hot and cold water pipe RAUTITAN platinum

Fig. 5 - 5 Hot and cold water pipe RAUTITAN platinum

- Pipe made of RAU-PE-Xa, with the following structure from the inside out:
  - Peroxide-crosslinked polyethylene (PE-Xa)
  - Outer PE layer
  - Complies with AS/NZS 2492 standard

Field of application
- Hot and cold water services, see:
  - Technical Information RAUTITAN – THE NEW GENERATION: Water services

Delivery make-up

d [mm]	s [mm]	DN	Volume [l/m]	Format
16	2.2	15	0.106	Straight length / coil
20	2.8	18	0.163	Straight length / coil
25	3.5	20	0.254	Straight length / coil
32	4.4	25	0.423	Straight length / coil
40	5.5	32	0.661	Straight length
50	6.9	40	1.029	Straight length
63	8.6	50	1.633	Straight length

Tab. 5 - 2 Delivery make-up, hot and cold water pipe RAUTITAN platinum

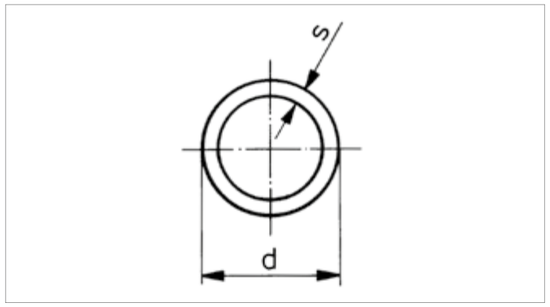

Fig. 5 - 6 Diameter/Wall thickness

Australian and New Zealand approvals and quality certifications
- Product Certification for sizes 16 - 63mm (WateMark LN1413).
- AS/NZS 2492-2007 for crosslinked polyethylene (PE-Xa) pipe for hot and cold water applications and AS/NZS 2537-2011 for mechanical jointing fittings for use with crosslinked polyethylene (PE-Xa) pipes for hot and cold water applications.
- BRANZ appraisal no. 434 REHAU RAUTITAN piping systems.

Approval outside Australia and New Zealand

RAUTITAN platinum complies with ISO 15875. National approvals outside Australia and New Zealand may vary in the respective countries from Australia and New Zealand approvals. When using RAUTITAN plumbing installation system in other countries, please consult your REHAU Sales Office.

5.6 Hot water pipe RAUTITAN red

Fig. 5 - 7 Hot and cold water pipe RAUTITAN red

- Pipe made of RAU-PE-Xa, with the following structure from the inside out:
  - Peroxide-crosslinked polyethylene (PE-Xa)
  - Outer dark red PE layer
  - Complies with AS/NZS 2492 standard

Field of application
- Hot water services, see:
  - Technical Information RAUTITAN – THE NEW GENERATION: Water services

Delivery make-up

d [mm]	s [mm]	DN	Volume [l/m]	Format
16	2.2	15	0.106	Coil
20	2.8	18	0.163	Coil
25	3.5	20	0.254	Coil

Tab. 5 - 3 Delivery make-up, hot and cold water pipe RAUTITAN red

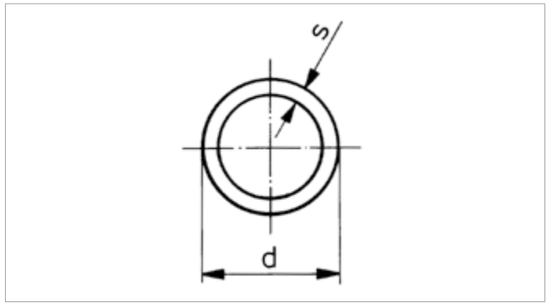

Fig. 5 - 8 Diameter/Wall thickness

Australian and New Zealand approvals and quality certifications
- Product Certification for sizes 16 - 25mm (WateMark LN1413).
- AS/NZS 2492-2007 for crosslinked polyethylene (PE-Xa) pipe for hot and cold water applications and AS/NZS 2537-2011 for mechanical jointing fittings for use with crosslinked polyethylene (PE-Xa) pipes for hot and cold water applications.
- BRANZ appraisal no. 434 REHAU RAUTITAN piping systems.

Approval outside Australia and New Zealand

Rautitan red complies with ISO 15875. National approvals outside Australia and New Zealand may vary in the respective countries from the Australian and New Zealand approvals. When using the REHAU plumbing installation system in other countries, please consult your REHAU Sales Office.

5.7 Heating pipe RAUTITAN pink

Fig. 5 - 9 Heating pipe RAUTITAN pink

- Pipe made of RAU-PE-Xa
  - Peroxide-crosslinked polyethylene (PE-Xa)
  - With oxygen-barrier layer
  - Oxygen-tight according to DIN 4726 standard
  - Complies with AS/NZS 2492 standard

Field of application
- Heating installation, see:
  - Technical Information RAUTITAN – THE NEW GENERATION
  - Technical Information Underfloor heating/cooling

Australian and New Zealand approvals and quality certifications
- REHAU heating pipe RAUTITAN pink complies with AS/NZS 2492 and DIN 4726.
- Confirms that the pipes are suitable for use in heating installations in accordance with DIN 16892 and ISO 15875 - application class 5 and have the necessary impermiability to oxygen.
- BRANZ appraisal no. 434 REHAU RAUTITAN piping systems.

Approval outside Australia and New Zealand
RAUTITAN pink complies with ISO 15875. National approvals outside Australia and New Zealand may vary in the respective countries from the Australian and New Zealand approvals. When using RAUTITAN pink heating installation system in other countries, consult your REHAU Sales Office.

Delivery make-up

d [mm]	s [mm]	DN	Content [l/m]	Make-up
16	2.2	15	0.106	Straight length / coil
20	2.8	18	0.163	Straight length / coil
25	3.5	20	0.254	Straight length / coil
32	4.4	25	0.423	Straight length / coil
40	5.5	32	0.661	Straight length
50	6.9	40	1.029	Straight length
63	8.6	50	1.633	Straight length

Tab. 5 - 4 Delivery make-up, heating pipe RAUTITAN pink

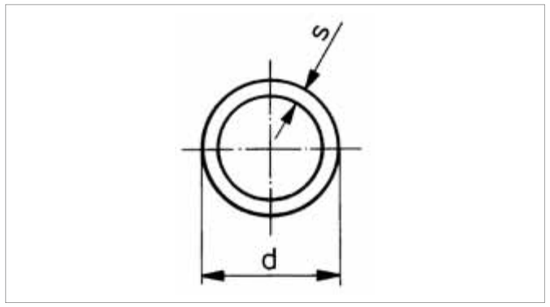

Fig. 5 - 10 Diameter/Wall thickness

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The heating pipe RAUTITAN pink may only be used in heating and cooling installation!

5.8 Rainwater pipe RAUTITAN green

Fig. 5 - 11 Rainwater pipe RAUTITAN green

- Pipe made of RAU-PE-Xa
  - Peroxide-crosslinked polyethylene (PE-Xa)
  - Green PE layer for identification of rainwater system
  - Complies with AS/NZS 2492 standard

Field of application
- Rain water installation, see:
  - Technical Information RAUTITAN – THE NEW GENERATION: Water service

Australian and New Zealand approvals and quality certifications
- Product Certification for sizes 16 - 63mm (WaterMark LN1413).
- AS/NZS 2492-2007 for cross-linked polyethylene (PE-Xa) pipe for hot and cold water application and AS/NZS 2537-2011 for mechanical jointing fittings for use with cross-linked polyethylene (PE-Xa) pipes for hot and cold water applications.
- BRANZ appraisal no. 434 REHAU RAUTITAN piping systems.

Approval outside Australia and New Zealand
RAUTITAN green complies with ISO 15875. National approvals outside Australia and New Zealand may vary in the respective countries from Australia and New Zealand approvals. When using RAUTITAN plumbing installation system in other countries, please consult your REHAU Sales Office.

Delivery make-up

d [mm]	s [mm]	DN	Volume [l/m]	Format
16	2.2	15	0.106	Coil
20	2.8	18	0.163	Coil
25	3.5	20	0.254	Coil
32	4.4	25	0.423	Straight length
40	5.5	32	0.661	Straight length
50	6.9	40	1.029	Straight length
63	8.6	50	1.633	Straight length

Tab. 5 - 5 Delivery make-up, rainwater pipe RAUTITAN green

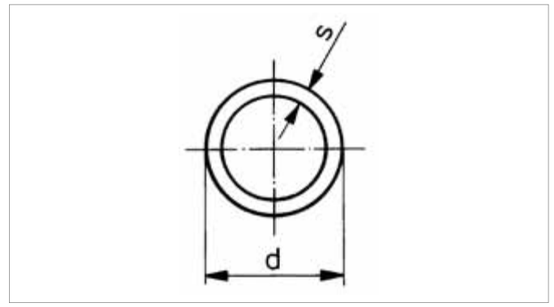

Fig. 5 - 12 Diameter/Wall thickness

5.9 Recycled water pipe RAUTITAN lilac

Fig. 5 - 13 Recycled water pipe RAUTITAN lilac

- Pipe made of RAU-PE-Xa
  - Peroxide-crosslinked polyethylene (PE-Xa)
  - Lilac PE layer for identification of recycled water system
  - Complies with AS/NZS 2492 standard

Field of application
- Recycled water installation, see:
  - Technical Information RAUTITAN – THE NEW GENERATION: Water service

Australian and New Zealand approvals and quality certifications
- Product Certification for sizes 16 - 63mm (WaterMark LN1413).
- AS/NZS 2492-2007 for cross-linked polyethylene (PE-Xa) pipe for hot and cold water application and AS/NZS 2537-2011 for mechanical jointing fittings for use with cross-linked polyethylene (PE-Xa) pipes for hot and cold water applications.
- BRANZ appraisal no. 434 REHAU RAUTITAN piping systems.

Approval outside Australia and New Zealand

RAUTITAN lilac complies with ISO 15875. National approvals outside Australia and New Zealand may vary in the respective countries from Australia and New Zealand approvals. When using RAUTITAN plumbing installation system in other countries, please consult your REHAU Sales Office.

Delivery make-up

d [mm]	s [mm]	DN	Volume [l/m]	Format
16	2.2	15	0.106	Coil
20	2.8	18	0.163	Coil
25	3.5	20	0.254	Coil
32	4.4	25	0.423	Straight length
40	5.5	32	0.661	Straight length
50	6.9	40	1.029	Straight length
63	8.6	50	1.633	Straight length

Tab. 5 - 6 Delivery make-up, recycled water pipe RAUTITAN lilac

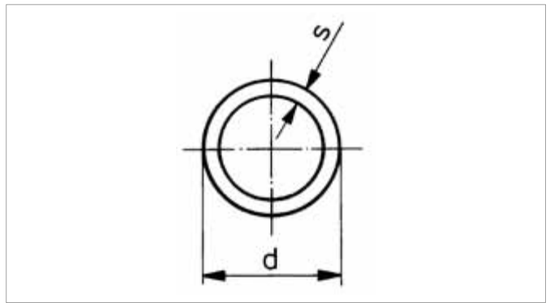

Fig. 5 - 14 Diameter/Wall thickness

5.10 Universal pipe RAUTITAN stabil

Fig. 5 - 15 Universal pipe RAUTITAN stabil

- Multilayer pipe with the following make-up from inside out:
  - Self-supporting inliner (pressure-resistant inner pipe) of crosslinked polyethylene (PE-X)
  - Oxygen-diffusion tight aluminium layer
  - Polyethylene outer layer
  - Complies with AS 4176 standard

Field of application
- Drinking water and radiator panel installation, see:
  - Technical Information RAUTITAN – THE NEW GENERATION: Water services

Australian and New Zealand approvals and quality certifications
- Product Certification for sizes 16-40mm (WaterMark LN21210).
- AS 4176-2010 Multilayer pipes for pressure applications.
- BRANZ appraisal no. 434 REHAU RAUTITAN piping systems.

Approval outside Australia and New Zealand
- DVGW registration for universal pipe RAUTITAN stabil and compression sleeve jointing technique from REHAU with RAUTITAN connection components.
- System approvals for dimension 16 to 40: DVGW DW-8501AU2346.
- Self-supporting inliner (pressure-resistant inliner pipe) of crosslinked polyethylene conforms to DIN 16892.

National approvals outside Australia and New Zealand may vary in the respective countries from the Australian and New Zealand approvals. When using REHAU plumbing installation system in other countries, consult your REHAU Sales Office.

Delivery make-up

d [mm]	s [mm]	Volume [l/m]	Format
16.2	2.6	0.095	Straight length / Coil
20	2.9	0.158	Straight length / Coil
25	3.7	0.243	Straight length / Coil
32	4.7	0.401	Straight length
40	6.0	0.616	Straight length

Tab. 5 - 7 Delivery make-up, universal pipe RAUTITAN stabil

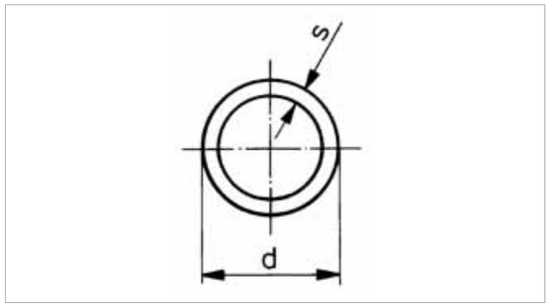

Fig. 5 - 16 Diameter/Wall thickness

5.11 Gas pipe RAUTITAN gas stabil

Fig. 5 - 17 Gas pipe RAUTITAN gas stabil

- Multilayer pipe with the following make-up from inside out:
  - Self-supporting inliner (pressure-resistant inner pipe) of crosslinked polyethylene (PE-X)
  - Oxygen-diffusion tight aluminium layer
  - Yellow polyethylene outer layer

Field of application
- Gas installation, see:
  Technical Information RAUTITAN gas installation system

Australian and New Zealand approvals and quality certifications
- Product Certification for sizes 16 - 40mm (StandardsMark SMKP20633).
- AS 4176.8 - 2010 Multilayer pipe systems for consumer gas installations.

Approval outside Australia and New Zealand
- DVGW registration for RAUTITAN gas stabil pipe and compression sleeve jointing technique from REHAU with RAUTITAN gas connection components.
- System approvals: DVGW DG-8505B00415.
- Self-supporting inliner (pressure-resistant inner pipe) of cross-linked polyethylene conforms to DIN 16892.

National approvals outside Australia may vary in the respective countries from the Australian approvals. When using the REHAU gas installation system in other countries, consult your REHAU Sales Office.

Delivery make-up

d [mm]	s [mm]	Volume [l/m]	Format
16.2	2.6	0.095	Straight length / Coil
20	2.9	0.158	Straight length / Coil
25	3.7	0.243	Straight length / Coil
32	4.7	0.401	Straight length
40	6.0	0.616	Straight length

Tab. 5 - 8 Delivery make-up, universal pipe RAUTITAN gas stabil

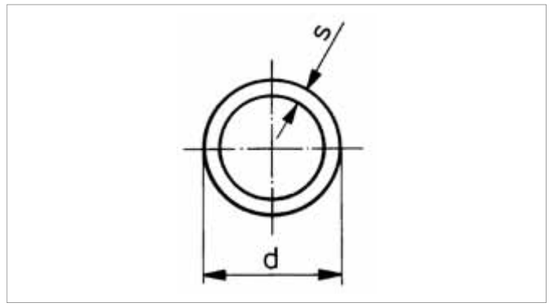

Fig. 5 - 18 Diameter/Wall thickness

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RAUTITAN gas stabil pipe may only be used in consumer gas installation!

5.12 Heating pipe RAUTHERM S

Fig. 5 - 19 Heating pipe RAUTHERM S

- Pipe made of RAU-PE-Xa
  - Peroxide-crosslinked polyethylene (PE-Xa)
  - With oxygen diffusion barrier
  - Oxygen-tight according to DIN 4726
  - Complies with DIN 16892 and ISO 15875

Field of application
- Underfloor heating/cooling, see:
  Technical Information: Underfloor heating/cooling
- For heating installation in buildings, the safety equipment of the heaters must comply with DIN EN 12828

German Approvals and quality certifications
- 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 Germany

National approvals outside Germany may vary from the German approvals in the respective countries. When using heating pipe RAUTHERM S in other countries, consult your REHAU sales office.

Delivery make-up

d [mm]	s [mm]	Volume [l/m]	Format
10.1	1.1	0.049	Coil
14	1.5	0.095	Coil
16	2.0	0.113	Coil
17	2.0	0.133	Straight length / coil
20	2.0	0.201	Straight length / coil
25	2.3	0.327	Straight length / coil
32	2.9	0.539	Straight length

Tab. 5 - 9 Delivery make-up, heating pipe RAUTHERM S

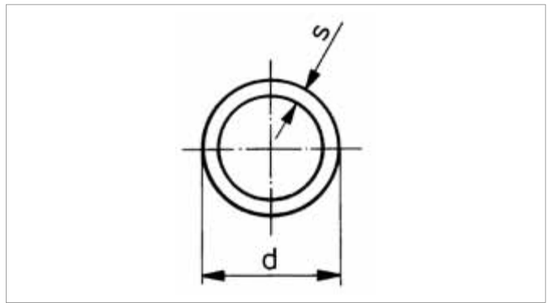

Fig. 5 - 20 Diameter/Wall thickness

Operating parameters
- Recommended operating parameters
  - Continuous operating pressure: 3 bar
  - Continuous operating temperature: 70 °C
  - Service life: 50 years
- Maximum operating parameters
  - Maximum operating pressure: 6 bar
  - Maximum operating temperature: 90 °C
- Properties of the heating water according to VDI 2035

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Heating pipe RAUTHERM S may not be used in drinking water installation!

A simultaneous load at the pressure and temperature limits during operation of water services and heating installation is impermissible.

Technical data	Unit	Pipes		
		Hot and cold water pipe RAUTITAN platinum	Hot water pipe RAUTITAN red	Heating pipe RAUTITAN pink
Material	-	PE-Xa	PE-Xa	PE-Xa EVAL - sheathed
Colour (surface)	-	Platinum	Dark red	Pink
Notch impact strength at 20°C	-	No fracture	No fracture	No fracture
Notch impact strength at -20°C	-	No fracture	No fracture	No fracture
Average coefficient of expansion	[mm/(mK)]	0.15	0.15	0.15
When laying with pipe support channel:				
- Size 16-40		0.04	0.04	0.04
- Size 50-63		0.1	0.1	0.1
Thermal conductivity	[W/(mK)]	0.35	0.35	0.35
Pipe roughness	[mm]	0.007	0.007	0.007
Operating pressure (maximum)	[bar]	10	10	10
	[kPa]	1000	1000	1000
Operating temperature	[°C]			
- Maximum		90	90	90
- Minimum		-	-	-
Short-term maximum temperature (malfunction)	[°C]	100	100	100
Oxygen diffusion (to DIN 4726)	-	-	-	oxygen-tight
Material constant C	-	12	12	12
Building material class acc. DIN 4102-1	-	B2	B2	B2
Construction product class acc. EN 13501-1		E	E	E
Maximum/minimum laying temperature	[°C]	+50 / -10	+50 / -10	+50 / -10
Minimum bending radius without tools d = pipe diameter	-	8 x d	8 x d	8 x d
Minimum bending radius with spiral spring/tool d = pipe diameter	-	-	-	-
Minimum bending radius with pipe bend brackets d = pipe diameter	-	3 - 4 x d	3 - 4 x d	5 x d
Available sizes	[mm]	16 - 63	16 - 25	16 - 63

Pipes				
Rainwater pipe RAUTITAN green	Recycled water pipe RAUTITAN lilac	Universal pipe RAUTITAN stabil	Gas pipe RAUTITAN gas stabil	Heating pipe RAUTHERM S
PE-Xa	PE-Xa	PE-X/AL/PE	PE-X/AL/PE	PE-Xa EVAL-sheathed
Green	Lilac	Silver	Yellow	Red
No fracture	No fracture	No fracture	No fracture	No fracture
No fracture	No fracture	No fracture	No fracture	No fracture
0.15	0.15	0.026	0.026	0.15
0.04	0.04	-	-	-
0.1	0.1	-	-	-
0.35	0.35	0.43	0.43	0.35
0.007	0.007	0.007	0.007	0.007
10	10	10	0.7	6
1000	1000	1000	70	600
90	90	95	60	90
-	-	-	-	-
100	100	100	90	100
-	-	Oxygen-tight	Oxygen-tight	Oxygen-tight
12	12	33	33	12
B2	B2	B2	B2	B2
E	E	E	E	E
+50 / -10	+50 / -10	+50 / -10	+50 / -10	+50 / -10
8 x d	8 x d	5 x d	5 x d	5 x d (At > 0°C laying temperature)
-	-	3 x d	3 x d	-
3-4 x d	3-4 x d	-	-	5 x d
16 - 63	16 - 63	16 - 40	16 - 40	10 - 32

Tab. 5-10 Technical data of pipes (approximate values)

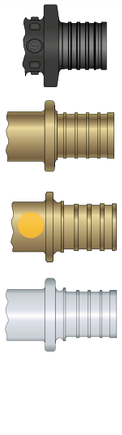
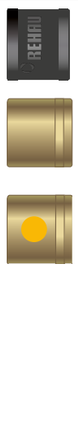
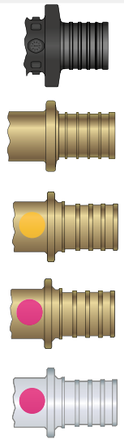
When conducting a pressure test at longer duration with pressurised air, the surface of RAUTHERM S may show blisters in rare cases, especially when used in concrete core tempering installations.
Single cases of blistering on the pipe surface of universal pipe RAUTITAN stabil may also occur during operation. This blistering does not represent any reduction in quality or in usability and is not critical.

6 FITTINGS AND COMPRESSION SLEEVES

6.1 Differentiating the fittings and compression sleeves

It is important to be able to differentiate the fittings and compression sleeves for:
- RAUTITAN water services
- RAUTITAN gas
- REHAU heating/cooling system

Areas of application of the fittings and compression sleeves

Water services		Gas installation		Heating/cooling system			
Hot and cold water pipe RAUTITAN platinum **Hot water pipe** RAUTITAN red **Rainwater pipe** RAUTITAN green **Recycled water pipe** RAUTITAN lilac **Universal pipe** RAUTITAN stabil		**Gas pipe** RAUTITAN gas stabil		**Heating pipe** RAUTITAN pink **Universal pipe** RAUTITAN stabil		**Heating pipe** RAUTHERM S	
Fitting	Compression Sleeve	Fitting	Compression Sleeve	Fitting	Compression Sleeve	Fitting	Compression Sleeve
							

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

Use RAUTITAN PX fittings only in combination with RAUTITAN PX compression sleeves.

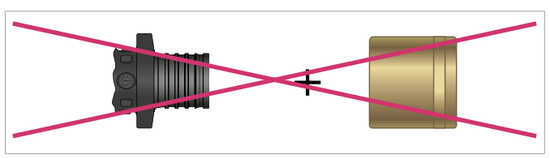


Fig. 6-1 Unapproved combination RAUTITAN PX with brass compression sleeves

6.2 Fittings and compression sleeves of the RAUTITAN system

Fig. 6 - 2 Fittings RAUTITAN PX made of PPSU

Fig. 6 - 3 RAUTITAN MX (brass), RAUTITAN RX (gunmetal) and RAUTITAN SX (stainless steel) fittings

Fig. 6 - 4 RAUTITAN compression sleeves

- Only use fittings and compression sleeves RAUTITAN PX, RAUTITAN MX, RAUTITAN RX or RAUTITAN SX for water services and heating installation.
- Use RAUTITAN PX fittings only in combination with RAUTITAN PX compression sleeves.
- Do not screw threaded fittings RAUTITAN SX made of stainless steel together with threaded fittings RAUTITAN MX made of brass.
- Do not mix RAUTITAN connection components with RAUTHERM S connection components (e.g. stainless steel RAUTITAN SX system adapters or RAUTITAN radiator elbow connection sets).
- Do not combine fittings and compression sleeves from different ranges with each other.
- Do not insert any fittings from heating installation (with pink marking or marked correspondingly on the packaging) into drinking water installation.
- Please note the dimensions of the fittings and compression sleeves.
- You can find the range of connection components in the latest product book.

- Application in plumbing and heating installation
- Compression sleeve jointing technique with permanent sealing in accordance with DIN EN 806, DIN 1988 and DVGW-worksheet W 534
- Approved for flush-mounted installation in accordance to DIN 18380 (VOB)
- Robust jointing technique, highly suitable for construction site
- Without o-ring (self-sealing pipe material)
- Easy visual inspection
- Can be pressurised immediately
- By expanding the pipe, the internal diameters of the pipes and fittings are hydraulically adjusted to each other
- RAUTITAN MX fittings, for drinking water, are made of special dezincification-resistant brass according to AS 2345, DIN EN 12164, DIN EN 12165 and DIN EN 12168
- No risk of confusion with RAUTITAN PX compression sleeves for water services and heating installation
- DVGW registration (all sizes)
  - For RAUTITAN pipes in drinking water services
  - For the REHAU compression sleeve jointing technique
- Assemble the compression sleeve joint with RAUTOOL
  - Especially designed for the RAUTITAN system
  - Development and supervision directly from REHAU

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

Fittings and the compression sleeves RAUTITAN are backward compatible with all RAUTITAN pipes SDR 7,4. This especially applies to existing installations where drinking water pipes RAUTITAN his 311 or heating pipes RAUTITAN pink have been already installed.

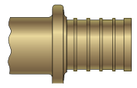
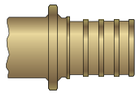
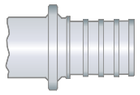
For detailed information about the compatibility of the fittings and compression sleeves with existing pipes, please contact your REHAU sales office.

Size of fittings and compression sleeves for RAUTITAN system for water services and heating installation

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

6.2.1 Fittings

The materials used to date (e.g. dezincification-resistant special brass according to AS 2345, DIN EN 12164, DIN EN 12165 and DIN EN 12168 standards, stainless steel, gunmetal) of the RAUTITAN system for water services and heating installation are supplemented with the polymer materials PPSU and PVDF.

Fittings for water services and heating installation		
Threadless fittings	Size 16–40	Size 50–63
		
	RAUTITAN PX	RAUTITAN MX
Material	PPSU	Brass
Fittings for screwing, soldering, clamping	Size 16–63	
		
	RAUTITAN MX / RAUTITAN RX	
Material	Brass	Gunmetal
	Size 16–40	
		
	RAUTITAN SX	
Material	Stainless steel	

Tab 6 - 2 Fittings for water services and heating installations

Material

- RAUTITAN PX: PPSU (Polyphenyl sulphone)
  - Polyphenyl sulphone (PPSU) is a high-performance polymer, which has proven itself over the years in the area of supply technology.
  - High impact strength
  - Good chemical resistance
  - High temperature resistance
  - Corrosion resistance
  - Hygienically harmless
  - No tendency to encrustations
  - Light weight

- RAUTITAN MX: Special dezincification-resistant brass according to DIN EN 12164, DIN EN 12165 and DIN EN 12168 standards
  - Dezincification resistance
  - Under the effects of certain types of drinking water, a particular form of corrosion known as dezincification can occur in standard brass alloys, e.g. free-cutting brass.
  - RAUTITAN MX fittings used in water services and heating installation are made of special dezincification-resistant brass and are tested for drinking water installation according to DIN ISO 6509. Fittings made of this special dezincification-resistant brass have been proven in practice and have been in use for decades.
  - Stress cracking resistance
  - RAUTITAN MX fittings and RAUTITAN MX compression sleeves for water services and heating installation satisfy the requirements of stress cracking corrosion resistance in compliance with the DVGW worksheet GW 393/DIN 50916, Part 2.
  - Erosion/Erosion corrosion
  - Erosion is the destruction of materials beginning at the surface, caused by excessively high flow velocities.
  - Erosion corrosion is a process involving erosion and corrosion. RAUTITAN pipes for water services and heating installation are expanded before jointing. The flow cross-section of the pipe is therefore adjusted to that of the fitting. This hydraulic and corrosion resistance advantage is optimised in RAUTITAN systems for water services and heating installation, in contrast to systems in which the pipes are not expanded at the joint.

- RAUTITAN RX: Gunmetal

- RAUTITAN SX: Stainless steel (material designations 1.4404/1.4571)
  - The fittings are manufactured according to DIN EN 10088, part 3

Contours of the fittings of the RAUTITAN system for water services and heating installation

Fig. 6-5 Size 16-40, RAUTITAN PX made of PPSU

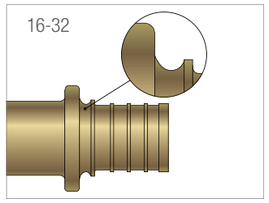


Fig. 6-6 Size 16-32, RAUTITAN MX and RAUTITAN RX

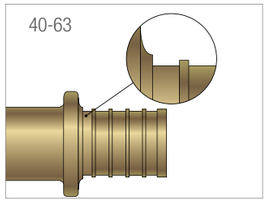


Fig. 6-7 Size 40-63, RAUTITAN MX

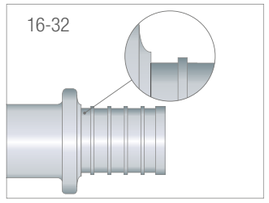


Fig. 6-8 Size 16-32, RAUTITAN SX

Fitting contours when using the universal pipe RAUTITAN stabil, size: 16–32 stabil

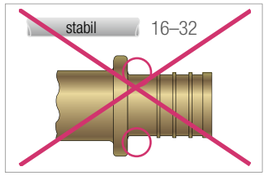


Fig. 6-9 Brass fitting without pre-stop, size 16–32

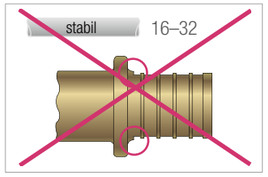


Fig. 6-10 Brass fitting with partially shaped pre-stop, size 16–32

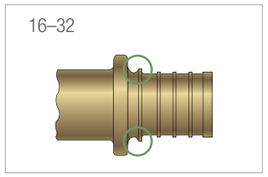


Fig. 6-11 Fitting with fully shaped pre-stop, size 16–32

With universal pipes RAUTITAN stabil and brass fittings, always use brass parts with fully shaped pre-stop.
Since 1997, production at REHAU has been changed completely to incorporate fitting contours with pre-stop in sizes 16–32.

Differences of the fittings for heating installation

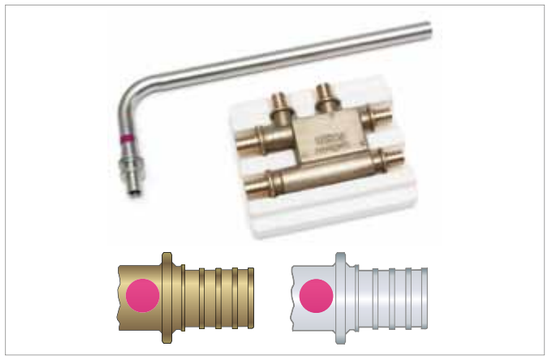


Fig. 1-2 Fittings for heating installation only

- If the fittings are marked in pink or are identified as heating fittings on the packaging (e.g. radiator elbow connection sets, radiator tee connection sets, cross fittings), please use them only for RAUTITAN heating installation systems.
- You can find the range of the connection components in the latest product book.

Fittings RAUTITAN gas

Compression sleeves and fittings		
Threadless fittings	Size 16–40	Size 16–40
	RAUTITAN PX	RAUTITAN gas
Material	PPSU	Brass
Fittings for screwing, soldering, compressing	Size 16–40	
	RAUTITAN gas	
Material	Brass	

Tab. 6-3 Allocation of RAUTITAN gas compression sleeves and fittings

RAUTITAN gas fittings are available only as a packaged set.
A set consists of a fitting and the corresponding compression sleeves, each in brass.

Contours of the RAUTITAN gas fittings

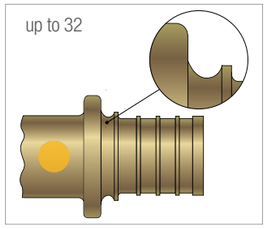


Fig. 6-13 Fitting contour in size 16-32, RAUTITAN gas

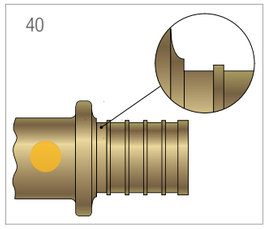


Fig. 6-14 Fitting contour in size 40, RAUTITAN gas

Differences of the fittings for gas installation

- Only use RAUTITAN gas fittings and RAUTITAN gas compression sleeves in gas installation.
  These are made of brass and identified with a yellow marking.
- Do not use any RAUTITAN PX, RAUTITAN MX, RAUTITAN RX or RAUTITAN SX fittings and compression sleeves.
- You can find the range of the connection components in the latest product book.

6.2.2 Compression sleeves

Compression sleeves for RAUTITAN water services and heating installation

Fig. 6-15 RAUTITAN PX compression sleeve made of PVDF, size 16–40

Fig. 6-16 RAUTITAN MX compression sleeve made of brass, sizes 16–25 and 50–63

Fig. 6-17 RAUTITAN MX compression sleeve made of brass, size 32–40, with encircling knurling

Fig. 6-18 RAUTITAN MX compression sleeve made of brass, size 25, with collar

	RAUTITAN PX	RAUTITAN MX
		
Size	16 x 2.2 mm 20 x 2.8 mm 25 x 3.5 mm 32 x 4.4 mm 40 x 5.5 mm	50 x 6.9 mm 63 x 8.6 mm
Material	PVDF (Polyvinylidene fluoride)	Thermally annealed brass according to DIN EN 12164 DIN EN 12165 DIN EN 12168
Characteristic features	- Can be slid onto the fitting from both sides - Black	- Can only be slid onto the fitting from one side - Brass finish - Encircling groove

Tab. 6-4 RAUTITAN compression sleeves

- Can be used for all pipe types in RAUTITAN water services and heating installation
- Compression sleeve jointing technique with permanent sealing
  - 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 universal compression sleeves for all pipes in RAUTITAN water services and heating installation.
- Existing RAUTITAN brass compression sleeves can still be used with RAUTITAN fittings made of brass, gunmetal or stainless steel.

RAUTITAN gas compression sleeves

Fig. 6-19 RAUTITAN gas compression sleeve size up to 25

Fig. 6-20 RAUTITAN gas compression sleeve size 32–40, with encircling knurling

Fig. 6-21 RAUTITAN gas compression sleeve size 25 with collar

	RAUTITAN gas compression sleeves
Size	16 x 2.2 mm 20 x 2.8 mm 25 x 3.5 mm 32 x 4.4 mm 40 x 5.5 mm
Material	Thermally annealed brass according to DIN EN 12164, DIN EN 12165, DIN EN 12168
Characteristic features	- Can only be slid onto the fitting from one side - Brass finish - Yellow marking - Encircling groove - Sizes 32 and 40 also with an encircling knurling

Tab. 6-5 RAUTITAN gas compression sleeve

- Only use RAUTITAN gas compression sleeves in gas installation. They are made of brass and identified with a **yellow marking**.
- Do not use any RAUTITAN PX (polymer materials) or RAUTITAN MX (brass) fittings or compression sleeves in gas installations.
- You can find the range of the connection components in the latest product book.

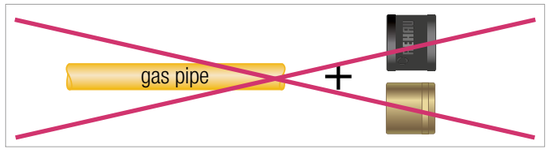


Fig. 6-22 Unapproved combination: RAUTITAN gas stabil pipe with RAUTITAN PX or RAUTITAN MX compression sleeves

6.3 Fittings and compression sleeves for the heating pipe RAUTHERM S

- Do not mix up fittings and compression sleeves for heating pipe RAUTHERM S (underfloor heating/cooling) with RAUTITAN fittings and compression sleeves (e.g. RAUTITAN SX system adapters or RAUTITAN radiator elbow connection sets).
- Please note the dimension of the fittings and compression sleeves.
- You can find the range of the connection components in the latest product book.

6.3.1 Fittings for the heating pipe RAUTHERM S

Fig. 6-23 Compression sleeve fitting for heating pipe RAUTHERM S

	Fittings for the heating pipe RAUTHERM S
Size	10.1 x 1.1 mm 14 x 1.5 mm 16 x 2.0 mm 17 x 2.0 mm 20 x 2.0 mm 25 x 2.3 mm 32 x 2.9 mm
Material	Brass with silver surface finish

Tab. 6-6 Fittings for heating pipe RAUTHERM S

6.3.2 Compression sleeves for heating pipe RAUTHERM S

Fig. 6-24 Compression sleeve for heating pipe RAUTHERM S

Characteristic features

Size	Characteristic features
10.1 x 1.1	One encircling groove, brass with silver surface finish
14 x 1.5	Two encircling grooves, brass with silver surface finish
16 x 2.0	One encircling groove, brass with silver surface finish
17 x 2.0 20 x 2.0 25 x 2.3 32 x 2.9	Two encircling grooves, brass with silver surface finish

Compression sleeves for underfloor heating/cooling can only be slid onto the fitting from one side.

6.4 Transition to other pipe materials

Fig. 6-25 RAUTITAN MX (brass), RAUTITAN RX (gunmetal) and RAUTITAN SX (stainless steel) fittings

If repair works or piping network extensions cause necessary system changes to RAUTITAN system or to REHAU heating/cooling system, threaded joints must be used as clear division between the different systems and to preserve the guarantee.
An exception to this rule is to use RAUTITAN RX soldering/pressing adapter and RAUTITAN SX system pressing adapter.

For transitions from RAUTITAN system to soldering or metal compression systems (radial compression joints to DVGW worksheet W 534), use soldering/pressing adapter RAUTITAN RX, e.g. transition from copper or mild steel (heating installation).
When using 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.

The material combination of brass with stainless steel has been acknowledged in technical rules for a long time. However, there is a great difference in strength between the stainless steel material and the dezincification-resistant special brass. This is the reason why a threaded joint, in particularly made in small fitting sizes (up to size 32 or with threads up to R1/Rp1) with thin walls can lead to excessive stresses in the brass fitting. This can go unnoticed. Therefore a direct fixed connection of threaded fittings RAUTITAN SX made of stainless steel to threaded fittings RAUTITAN MX or to extension pieces for wall mounted elbows, both made of special dezincification-resistant brass, is not allowed. Thick-walled fittings, e.g. flush mounted valves, fittings or threaded adapters in large sizes are less sensitive to these stress loads and can be fixed with RAUTITAN SX fittings without restrictions.

Gas piping
- Only use RAUTITAN gas threaded adapters for the transition to other pipe materials.
- A direct transition to stainless steel installation system is not permitted. Use a non-stainless steel interim piece for the connection of both systems, e.g. a combination of: RAUTITAN gas threaded adapter with male thread – threaded socket – threaded adapter with male thread made of stainless steel.
- Only use mating threads according to AS 1722.1, ISO 7-1 and DIN EN 10226-1 (Rp/R).
- A soldered joint with RAUTITAN gas fittings is not permitted. Only insert solderless joints.

Water piping
- Only make joints after the soldering process.
- Let the solder cool down completely.
- A direct screwed connection of threaded fittings RAUTITAN SX made of stainless steel to threaded fittings RAUTITAN MX made of special dezincification-resistant brass is not allowed.
  We recommend to use a transition piece made of gunmetal between both fittings.
- A direct connection thread between RAUTITAN SX fittings made of stainless steel and fittings made of galvanised steel is not allowed according to DIN EN 806-4. We recommend to use 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.

Fig. 6-26 Adapter with RAUTITAN MX male thread and RAUTITAN RX soldering/pressing adapter

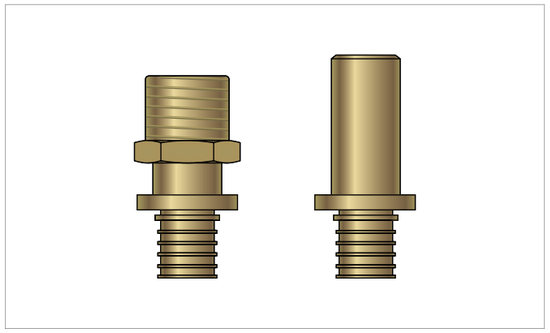


Fig. 6-27 RAUTITAN MX fittings for transitions to other materials

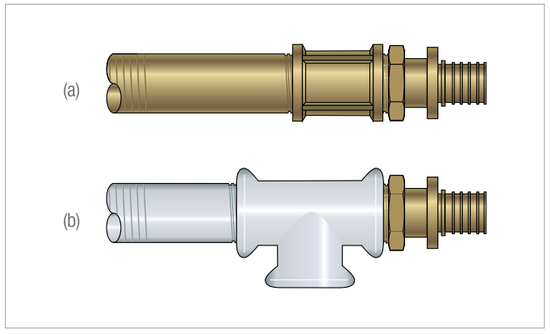


Fig. 6-28 Adapter with RAUTITAN MX male thread fixed into:
(a) Brass fittings
(b) Systems with galvanized steel pipes and fittings

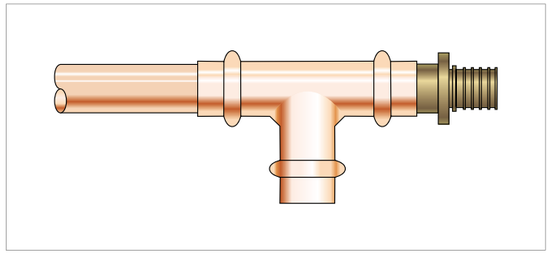


Fig. 6-29 Soldering/Pressing adapter RAUTITAN RX with copper pressing system

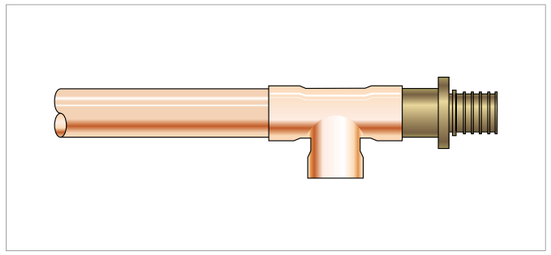


Fig. 6-30 Soldering/Pressing adapter RAUTITAN RX with copper piping system

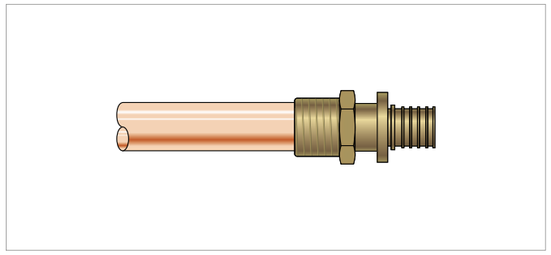


Fig. 6-31 Adapter with RAUTITAN MX male thread, soldered into copper pipe system

Fig. 6-32 System adapter with RAUTITAN SX male thread and RAUTITAN SX system pressing adapter

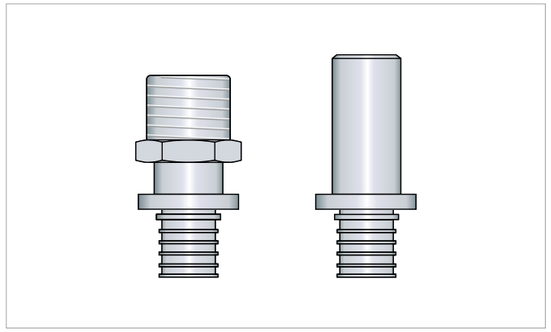


Fig. 6-33 System adapter with RAUTITAN SX male thread and RAUTITAN SX

System adapter made of stainless steel

- The direct transition from RAUTITAN system to stainless steel installation systems with brass adapters can lead to leaks or damage to fittings.
- To connect installation systems made of stainless steel, use only
- RAUTITAN SX system pressing adapters and male threaded RAUTITAN
- SX system adapters, both made of stainless steel.
- Do not mix up RAUTITAN SX fittings with RAUTHERM S fittings with silver surface finish for heating/cooling installation.
- Please note the dimension of the fittings.

Threaded fittings made of stainless steel

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

If RAUTITAN system is connected to other systems made of stainless steel by interconnecting fittings (e.g. flush-mounted valves or water meters), it is not necessary to use 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 loss of warranty for REHAU system user, uniform material 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 made of stainless steel) for direct system connection to stainless steel installation systems.

The same advice is applicable to RAUTITAN RX soldering/pressing adapters.

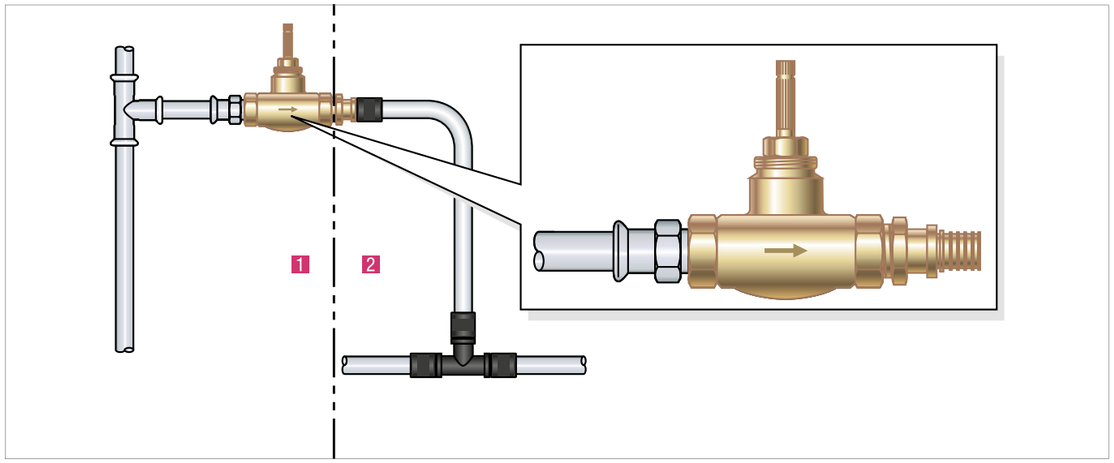


Fig. 6-34 Installation situation of a system adapter to a flush mounted valve (example)

1 Stainless steel system with flush-mounted valve 2 RAUTITAN system with RAUTITAN MX adapters (brass)

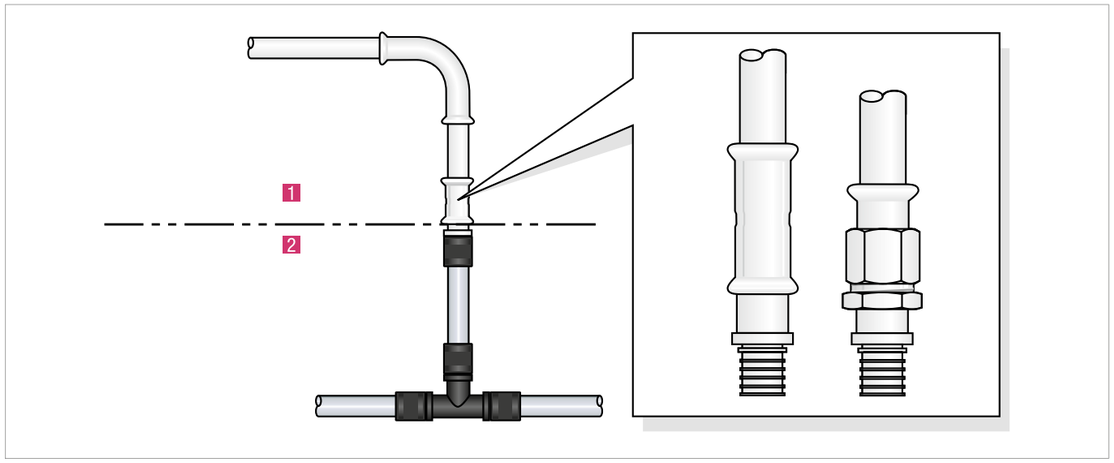


Fig. 6-35 Direct transition from stainless steel system to RAUTITAN system up to size 32 or with threads up to R1/Rp1 in stainless steel (example)

1 Stainless steel system 2 RAUTITAN system with RAUTITAN SX adapters (stainless steel)

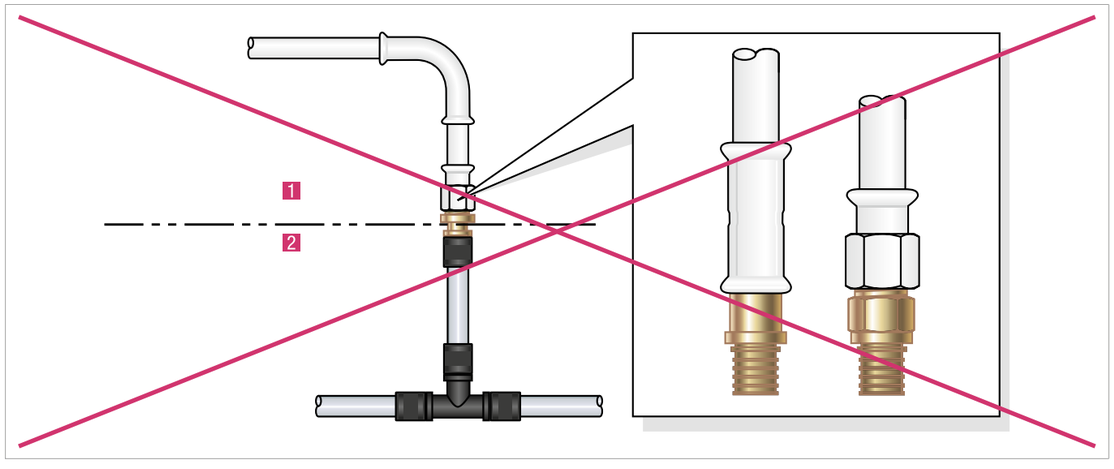


Fig. 6-36 No direct transition from stainless steel system to RAUTITAN system up to size 32 or with threads up to R1/Rp1

1 Stainless steel system 2 RAUTITAN system with RAUTITAN MX adapters (brass)

6.5 Connection to fittings

Fig. 6-37 Adapter with RAUTITAN MX swivel connector

Equipment and fittings can be easily connected by using adapters with swivel connector.

RAUTITAN pipe size	RAUTITAN MX adapter with flat-sealed swivel connector		Fittings with male threads for connection to metal pipe with thread according to DIN 3546, Part 1
	Article No.	Article description	
16	139551-002	16 - G½	-
16	137144-001	16 - G¾	G¾
20	139561-002	20 - G½	-
20	139571-002	20 - G¾	G¾
25	139912-001	25 - G¾	-
25	139922-001	25 - G1	G1
32	139932-001	32 - G1	-
32	241475-001	32 - G1¼	G1¼
32	137154-001	32 - G1½	-
40	137265-001	40 - G1½	G1½
40	137164-001	40 - G2	-
50	137275-001	50 - G1¾	G1¾
63	137285-001	63 - G2⅜	G2⅜

Tab. 6-7 RAUTITAN MX fitting adapter range with swivel connector

6.6 Installation notes for connection components

- Avoid over-tightening 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 AS 1722.1, 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 that different thread types are capable of being combined (according to AS 1722.1, ISO 7-1, DIN EN 10226-1 and 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 threaded fitting adapters are according to:
- 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 thread

Installation temperature
- Minimum installation temperature is -10°C
- Maximum installation temperature is +50°C.

Aligning the fittings

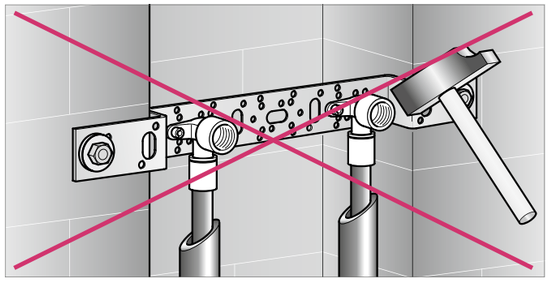


Fig. 6-38 Do not align using a hammer

Only align fittings with suitable tools, e.g. pipe nipples or open-end wrenches.

Protection against corrosion and damage

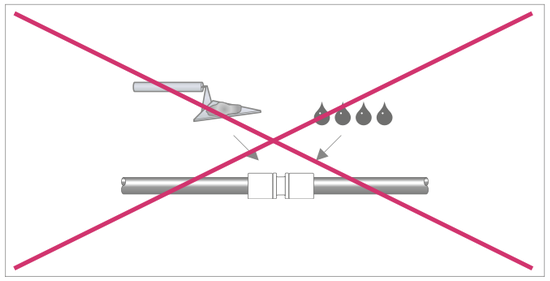


Fig. 6-39 Avoid the risk of corrosion

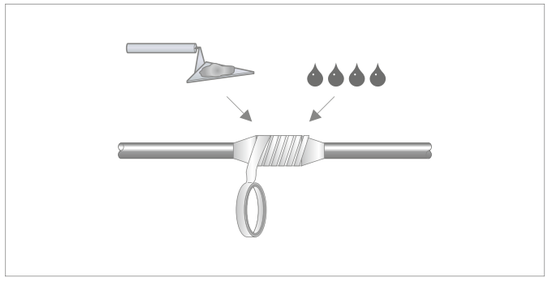


Fig. 6-40 Protect connection components against corrosion

Installation within concrete/screed floors

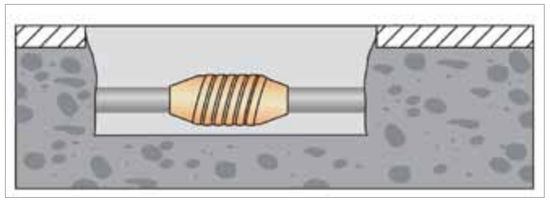


Fig. 6-41 installation of RAUTITAN system within concrete/screed floor with corrosion protection system

Installation of RAUTITAN system within concrete/screed floors are allowed, provided specific requirements from local installation standards are fulfilled and adequate protection from mechanical damage and chemical damage are provided.

- 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 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 PPSU and PVDF materials
- Only use sealants, thread sealants, adhesive tape and flux, which were approved by the respective manufacturer for PPSU and PVDF materials.
- 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 water-soluble chloride ions.
- Use sealants which do not release water-soluble chloride ions (e.g. hemp).
- To avoid a crevice corrosion of the fittings RAUTITAN SX we recommend to use hemp as thread sealant.

Water additives
Piping can be damaged if inhibitors, antifreeze agents or other water heater additives are used.
Approval must be obtained from the respective manufacturers and from our Technical Applications Department.
In this case, please consult your REHAU sales office.

7 INSTALLATION TOOLS RAUTOOL

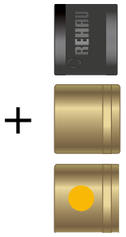
- Before using tools, read and observe the information in the operating instructions completely.
- If these operating instructions are no longer present with the tool or are not longer available, order a copy or download them from the internet.
- Do not use damaged tools or partially functioning tools; send these for repair to your REHAU sales office.

Operating instructions can be downloaded online from www.rehau.com.au.

The scope of delivery of RAUTOOL installation tools can be seen from the product book.

- RAUTOOL installation tools are specially designed and manufactured to work with REHAU programs.
- Development and supervision directly from REHAU.
- RAUTOOL installation tools are continuously improved and developed.
- Different drive methods of RAUTOOL installation tools can be selected.
- For joint size 16/20, 25/32 and 40:
  - Hydraulic or manual expansion is possible.
- For joint size 16–32:
  - Double compression jaws, 2 pipe sizes can be worked on without refitting the tool.
- Flexible and good tool handling
  - Compact design.
  - 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 is 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 REHAU pipe cutters. The use of roller pipe cutters is not necessary.

Notes on the compression jaws size 40

Compression jaws for RAUTITAN PX compression sleeves, size 40					
Compression jaws, new Ø 40		Compression sleeves Ø 40	Compression jaws, old Ø 40		Compression sleeve RAUTITAN PX Ø 40
Compression jaws set 40 (Black) 201801-001 201803-001			Compression jaws set 40 (Gold-yellow) 137805-001 138223-001		
Compression jaws set M1 40 (Black) 201798-001 201804-001			Compression jaws set M1 40 (Gold-yellow) 137374-001 138333-001		
Compression jaws set G1/G2 40 (Black) 201802-001			Compression jaws set G1/G2 40 (Gold-yellow) 137964-001		

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

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

Previous compression jaws (gold-yellow) of other sizes, e.g. 16, 20, 25, 32, 50 and 63, can still be used without restriction.

- 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 other tools are to be used when making the joint, these must be approved by the corresponding manufacturer for use with RAUTITAN system and especially for use with RAUTITAN PX fittings and compression sleeves.

Compression sleeve tools: RAUTOOL
- For RAUTITAN system
- For REHAU underfloor heating/cooling
- For special ranges, e.g. REHAU industrial piping system, RAUTHERMEX for district heating
- Various attachment sets and accessories (see product book)

7.1 RAUTOOL M1

Fig. 7-1 RAUTOOL M1

- Manual tool
- Sizes 16–40

Only use the compression jaws M1 with the RAUTOOL M1.

7.2 RAUTOOL H2

Fig. 7-2 RAUTOOL H2

- Mechanical-hydraulic tool
- Sizes 16–40
- Drive with foot/hand pump
- Ergonomic swivel joints on tool cylinder

7.3 RAUTOOL A3

Fig. 7-3 RAUTOOL A3

- Battery-operated hydraulic tool
- Sizes 16–40
- Drive with 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

Fig. 7-4 RAUTOOL A-light2

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

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. Expander tool and expander heads of expanding system RO are compatible with each other for all tools up to size 32.

7.5 RAUTOOL E3

Fig. 7-5 RAUTOOL E3

- Electro-hydraulic tool
- 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

Fig. 7-6 RAUTOOL G2

- Tool for the pipe sizes 50–63 (optionally available for size 40 x 5.5)
- Drive with 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

Fig. 7-7 RAUTOOL M-light

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

7.8 RAUTOOL K10 x 1.1

Fig. 7-8 RAUTOOL K10 x 1.1

- Manual combination tool for expanding and clamping heating pipe RAUTHERM S 10.1 x 1.1 mm
- Size 10.1 x 1.1

7.9 RAUTOOL K14 x 1.5

Fig. 7-10 RAUTOOL K14 x 1.5

- Manual combination tool for expanding and clamping heating pipe RAUTHERM S 14 x 1.5 mm
- Size 14 x 1.5

8 PIPE CUTTERS

- Check the blade of the pipe cutters regularly for damage and replace the blade or the cutters as necessary. Damaged or blunt blades can cause burrs or notches on the pipe, which can tear when the pipe is expanded.
- If the pipe was cut improperly, re-cut the pipe to ensure a square and bur-free cut.
- If cracks occur at the expanded zone, cut off the damaged pipe end and repeat the expansion procedure.

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 good working condition.

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

Pipe dimensions		**16/20**	**25 to 40**
Universal pipe	stabil		
Gas pipe	gas		
		Pipe cutter 16/20 RAUTITAN	Pipe cutter 40 stabil

Pipe dimension		**to 20**	**to 25**	**to 40**	**40 to 63**
Hot & cold water pipe	platinum				
Hot water pipe	red				
Heating pipe	pink				
Rainwater pipe	green				
Recycled water pipe	lilac				
Heating pipe	RAUTHERM S				
		Pipe cutter 16/20 RAUTITAN	Pipe cutter 25	Pipe cutter 40 stabil	Pipe cutter 63

Tab. 8-1 Selection of pipe cutters

8.1 Pipe cutters 16/20 RAUTITAN

Fig. 8-1 Cutting universal pipe RAUTITAN stabil with pipe cutter 16/20 RAUTITAN

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

Only use pipe cutter 16/20 RAUTITAN when cutting universal pipe RAUTITAN stabil and gas pipes RAUTITAN gas stabil sizes 16 and 20.

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

Fig. 8-2 Calibrating mandrel

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

8.2 Pipe cutter 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 cutter 40 stabil

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

8.4 Pipe cutter 63

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

9 EXPANDING TOOLS

9.1 Expander heads and expander bits for pipes

	Expander heads	Expander bits	Expander head for RAUTOOL G2
Pipe sizes	16/20/25/32	40	
Universal pipe stabil Gas pipe gas			–
Pipe sizes	16/20/25/32	40	40/50/63
Hot and cold water pipe platinum Hot water pipe red Heating pipe pink Rainwater pipe green Recycled water pipe lilac			
Pipe size	17/20/25/32		
Heating pipe RAUTHERM S		RAUTHERM S pipe 16 x 2.0 is expanded with expander head 16 x 2.2 (blue colour code).	

Tab. 9-1 Selection of expander tools

Expander head for RAUTITAN radiator connection sets

Fig. 9-1 Expander head 15 x 1.0 RO

Stainless steel or copper pipes 15 x 1.0 of RAUTITAN radiator connection sets. The operating instruction of 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.

Expander set 16/20

Fig. 9-2 Expander set 16/20

The expander set 16/20 can be used in combination with RAUTOOL H2/A2/A3/A-light/A-light2 and RAUTOOL E2/E3 to expand RAUTITAN platinum, RAUTITAN red, RAUTITAN pink, RAUTITAN green, RAUTITAN lilac and RAUTHERM S 16 x 2.0 mm.

Differences between expander heads

- Expander head for universal pipe RAUTITAN stabil and gas pipe RAUTITAN gas stabil
  - Green colour code
  - Black retaining nuts for sizes 16–32
  - Expansion segments are beveled
- Expander head for RAUTITAN platinum, RAUTITAN red, RAUTITAN pink, RAUTITAN green, RAUTITAN lilac and RAUTHERM S 16 x 2.0mm
  - Blue colour code
  - Silver retaining nut for sizes 16-32
  - Expansion segments are not beveled
- Expander head for heating pipe RAUTHERM S
  - Red colour code (except for size 16, blue colour code)
  - Silver retaining nut for sizes 17–32
  - Expansion segments are not beveled
- Expander head 15 x 1.0 RO for RAUTITAN radiator connection sets
  - No colour code
  - For expansion of connection sets made of stainless steel or copper

Notes on dual expander head 16/20

The production of a dual expander head with silver retainer nut and blue-colored ring has ceased. A new dual expander head with black retainer nut and blue-colored ring replaces the old dual expander head.

Hot & cold water pipe platinum Hot water pipe red Heating pipe pink Rainwater pipe green Recycled water pipe lilac	+ 	

Tab 9-2 Use of new dual expander head with black retainer nut with RAUTITAN pipes

The old expander head has to be exchanged with the new dual expander head. The old dual expander head is not to be used to expand RAUTITAN PE-Xa pipes.

9.2 Expander bits

When combined with RAUTOOL 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 and gas pipe RAUTITAN gas stabil in size 40 with expander bit 40 x 6.0.
- Expansion is only possible with RAUTOOL H2, E2, A2, A3, A-light and A-light2.
- Expansion is not possible with RAUTOOL G1/G2 and M1.

9.3 Safety advice on the expander heads

- Do not use defective expander 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 expansion test to test the expansion evenness (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 tool.
- 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 expansion procedure.
- Observe the allocation of expander heads to the respective pipe types and sizes.

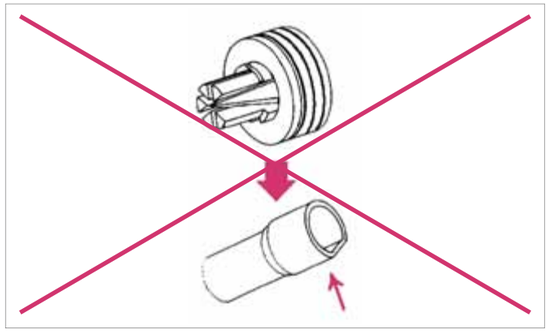


Fig. 9-3 Damage to the pipe material due to defective expander tool

- Accessories (brush, lubricating grease, etc.) are included in the tool case.
- RAUTITAN pink and RAUTHERM S pipes for heating and cooling are equipped with an oxygen diffusion barrier. The oxygen diffusion barrier is not always as flexible as the crosslinked polyethylene base pipe. The diffusion barrier may tear slightly when the pipe is expanded at low temperatures. These tears do not have an effect on the pipe's performance and have no effect on the reliability of the compression sleeve joint. As the tears are located at the compression sleeve joint and are enclosed at both sides with the fitting or compression sleeve, they have no notable effect on the oxygen-tightness as specified in DIN 4726.

10 MAKING THE COMPRESSION SLEEVE JOINT

The REHAU compression sleeve jointing technology for sizes 16-32 mm is described below. Directions for tool handling and making the joint in other pipe sizes are described in the respective operating instructions.

- Only make compression sleeve joints with RAUTOOL. If foreign tools are to be used when making the joint, these must be approved by the corresponding manufacturer for use with RAUTITAN system and especially for use with RAUTITAN PX fittings and compression sleeves.
- Only make the joint with the appropriate installation tools.
- Please observe the Technical Information and the corresponding operating instructions and instruction leaflets for information on handling the tools and making joints.
- Do not use dirty or damaged connection components or tools.
- The battery and mains operated tools such as A-light 2, A3, E3, G2 are not suitable for permanent operation. After approx. 50 consecutive clamping operations, a break of at least 15 min. is required to allow the tool to cool down.
- The range of connection components can be found in the latest product book.

Installation temperature
- Minimum installation temperature is –10 °C.
- Maximum installation temperature is +50 °C.

For easier installation in extremely low temperature (close to the minimum installation temperature), REHAU recommends using hydraulic-based operation RAUTOOL.

Operating instructions can be downloaded from www.rehau.com.au.

- Universal REHAU compression sleeve jointing technology
- Permanently sealed joint
- Without O-ring (self sealing pipe material)
- Easy visual inspection
- Can be immediately pressurised
- Pipe doesn't need to be calibrated or deburred
- Robust jointing technology, highly suitable for construction sites

10.1 Cutting the pipe

The universal pipe RAUTITAN stabil 40 x 6.0 and gas pipe RAUTITAN gas stabil 40 x 6.0 have shorter expansion lengths than the other RAUTITAN pipes size 40.
When correctly expanded and the fitting inserted fully, the distance between the expanded pipe end to the fitting collar is approximately 6 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 squarely and without burrs.
   Maintain a safe distance between your holding hand and the pipe cutter.

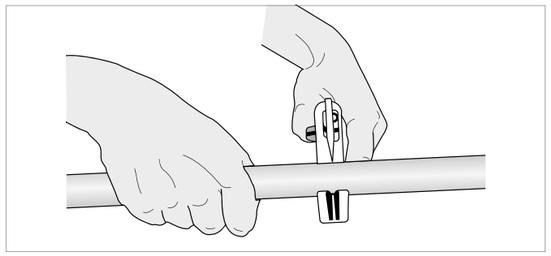


Fig. 10-1 Cut the pipe at right angle

4. Make sure the jointing and further processing steps are carried out only on a straight pipe section (without bends).
   The straight pipe section must be at least three times the compression sleeve length and shall be free from any foreign material (e.g. lubricant, adhesive or adhesive tape).

10.2 Sliding the compression sleeve onto the pipe

Slide the compression sleeve onto the pipe:
- RAUTITAN PX compression sleeve can be compressed towards the fitting from both ends, the orientation does not matter.
- Brass compression sleeve should be compressed with the chamfered side facing the fitting.

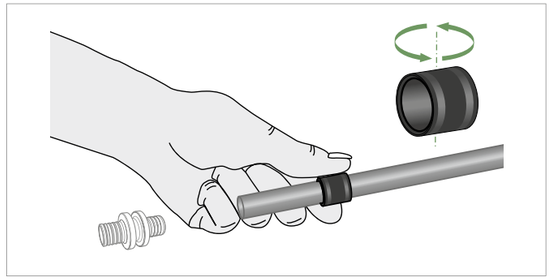


Fig. 10-2 Slide the RAUTITAN PX compression sleeve onto the pipe,

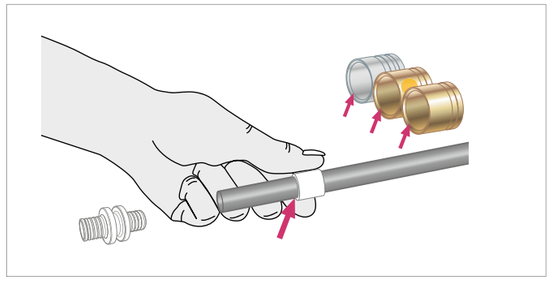


Fig. 10-3 Slide the brass compression sleeve onto the pipe, with chamfered side facing the joint

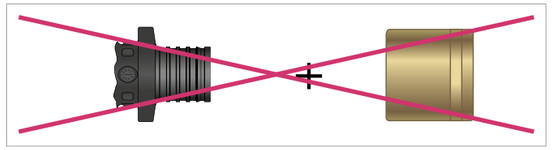


Fig. 10-4 Unapproved combination: RAUTITAN PX with RAUTITAN MX compression sleeve

Always slide the brass compression sleeve onto the pipe with the chamfered side facing the joint.

10.3 Expanding the pipe with the expander

- Follow the safety advice of expander heads (see page 46).
- Check the expander heads for freedom of movement and dirt, clean if necessary.
- Screw the expander heads fully onto the expansion tool (must not be detached when turning in the pipe).
- Maintain a minimum distance between the pipe end and the compression sleeve (at least twice the length of the compression sleeve).
- Expand the pipe at ambient temperature and insert fitting into the expanded pipe.
- Only insert compression sleeve fitting from REHAU (not other objects) into the expanded pipe end.
- Expand the pipe only with a complete and intact expander head.
- 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. Check the blade of pipe cutter for damage and replace the blade or the cutter if necessary.

The pipe must have an even temperature before expansion. Avoid local heating (e.g. by inspection lights, etc.).
Expand the pipe at ambient temperature and insert the fitting.

1. Slide the compression sleeve onto the pipe, maintain a minimum distance between the pipe end and the compression sleeve of at least twice the compression sleeve length.

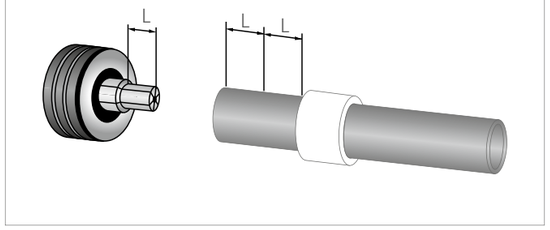


Fig. 10-5 Minimum distance: between pipe end and compression sleeve

2. Always insert the segments of the expander head completely into the pipe.
   Avoid skewing the expander head.
3. Expand the pipe once.

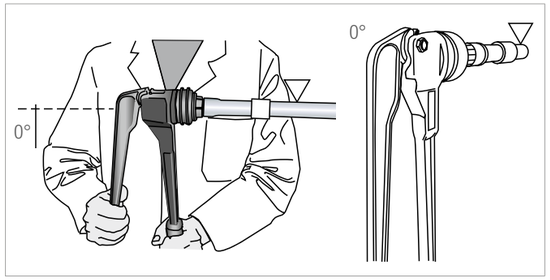


Fig. 10-6 Expand the pipe once

4. Rotate the expander tool by approx. 30°. The pipe remains in position.
5. Expand the pipe once again.

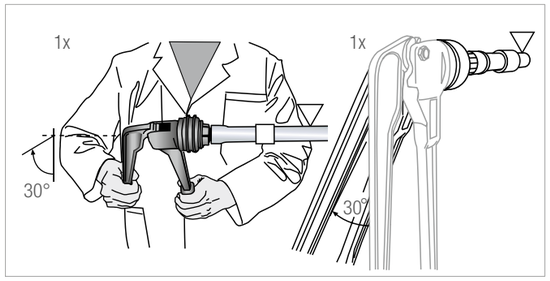


Fig. 10-7 Rotate the expander tool 30° at the same pipe position and expand the pipe once again.

10.4 Inserting the fitting into the expanded pipe

When the pipe has been correctly expanded, the fitting can be inserted 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 the joints which have not yet been clamped carefully when placing them onto the tool and during compression, so that they do not fall apart.

Push the fitting completely (as far as the pre-stop) into the expanded pipe right after expansion.

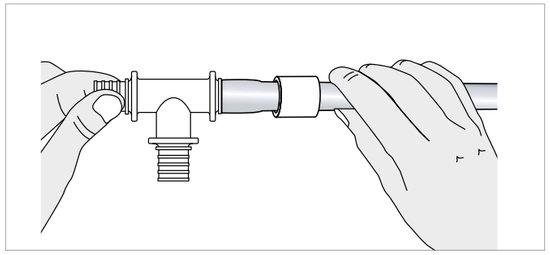
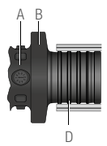
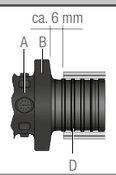
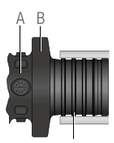
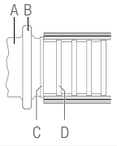
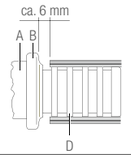
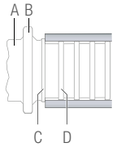
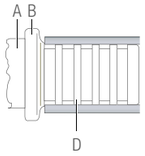


Fig. 10-8 Insert the fitting into the expanded pipe

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

An exception is made when inserting RAUTITAN PX fittings into universal pipe RAUTITAN stabil, size 40. The last sealing rib may not be fully covered.

Pipe size		16 – 32	40	50 – 63
Correct position of the pipe on RAUTITAN PX fitting				
Universal pipe	RAUTITAN stabil			–
Hot and cold water pipe	RAUTITAN platinum			–
Hot water pipe	RAUTITAN red			
Heating pipe	RAUTITAN pink			
Rainwater pipe	RAUTITAN green			
Recycled water pipe	RAUTITAN lilac			
Correct position of pipe on RAUTITAN MX, RAUTIAN SX, RAUTITAN RX, RAUTITAN gas fittings and heating/cooling				–
Universal pipe	RAUTITAN stabil			
Gas pipe	RAUTITAN gas stabil			
Hot and cold water pipe	RAUTITAN platinum			
Hot water pipe	RAUTITAN red			
Heating pipe	RAUTITAN pink			
Rainwater pipe	RAUTITAN green			
Recycled water pipe	RAUTITAN lilac			
Heating pipe	RAUTHERM S			

Tab. 10-1 Correct position of pipe on fitting

A=Fitting body B=Fitting collar C=Pre-stop D=Sealing rib

10.5 Placing the fitting into the compression tool

Place the compression sleeve joint onto the compression tool.

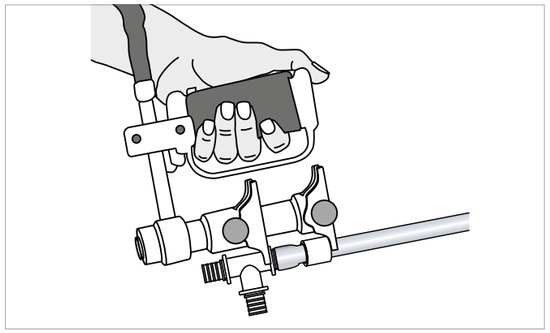


Fig. 10-9 Place the fitting and compression sleeve in between the jaws.

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

Bulging of the 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 RAU-PE-Xa pipes (not for universal pipes RAUTITAN stabil or RAUTITAN gas stabil), the pipe material may pull together during compression. In this case, stop pushing the brass compression sleeve shortly before bulge (approx. 2 mm distance from the fitting collar).

10.6 Compress the compression sleeve up to the fitting collar

- Only perform jointing on a straight pipe section (not on pipe bend). The straight pipe section must be at least three-times the compression sleeve length.
- Do not jam joints which are not clamped properly after placing them into the tool jaws and always maintain full contact with the tool jaws.
- Compress the compression sleeve fully up 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 up to the fitting collar.
3. Carry out visual inspection on the joint for damages and incomplete compression of the compression sleeve.

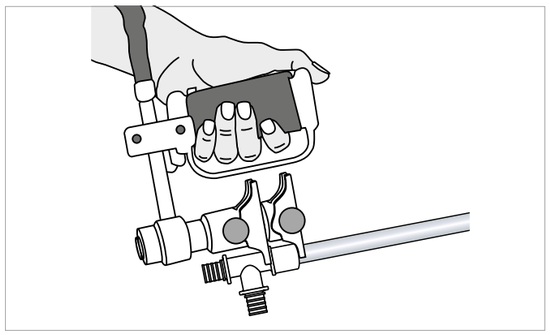


Fig. 10-10 Compress the compression sleeve

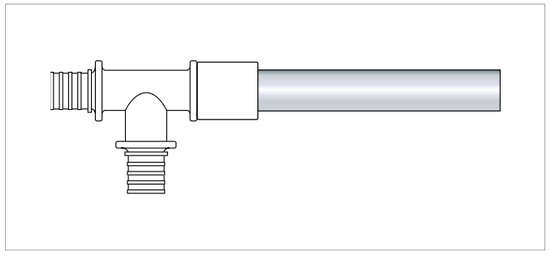


Fig. 10-11 Complete compression sleeve joint

- Clean and lubricate 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 from the existing piping using the pipe cutter. Maintain a safe distance between your holding hand and the pipe cutter.

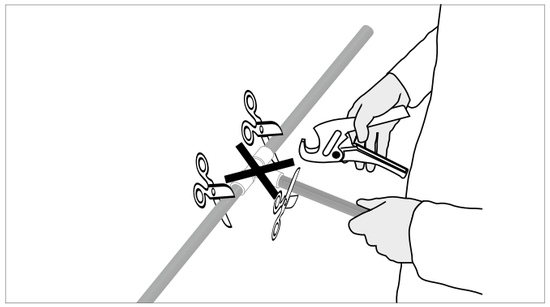


Fig. 11-1 Cutting out joint

11.2 Usability of cut-out joints

Usability of the parts of a detached compression sleeve joint	
Reusable	**Not reusable** Dispose of together with all cut-out pipe parts
RAUTITAN system Fittings underfloor heating/cooling	Compression sleeves Fittings RAUTITAN PX Fittings RAUTITAN gas

Tab. 11-1 Usability of detached compression sleeve joints

Removed metal fittings from gas installations
- Already processed connection components from gas installations should not be reused or detached.
- Dispose cut-out connection components.

Removed metal fittings from water installations
- Dispose used RAUTITAN PX fittings and RAUTITAN PX compression sleeves.
- Only reuse removed metal fittings in perfect condition within the same application type from which they were removed from.
- Removed metal fittings from water installations should not be used in gas installations, even when the fitting has a yellow marking.
- Dispose detached compression sleeves with the detached pipe sections.

11.3 Detaching the cut-out joint from water services and heating installation

11.3.1 Heating the joint to be detached

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

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

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

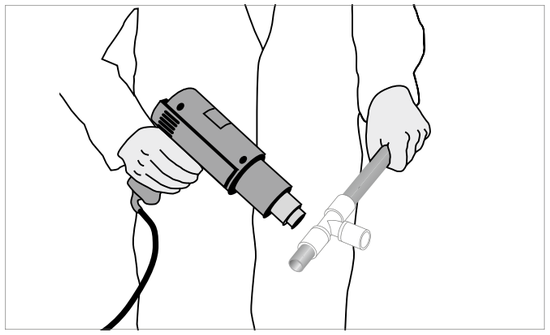


Fig. 11-2 Heating up the joint which is to be detached.

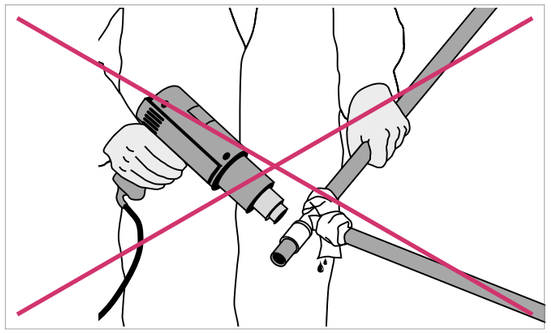


Fig. 11-3 Not permissible heating up procedure

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!

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 metal fitting can be reused.
   - Do not reuse detached compression sleeves and pipe sections.
3. Dispose the compression sleeves with the detached pipe sections.

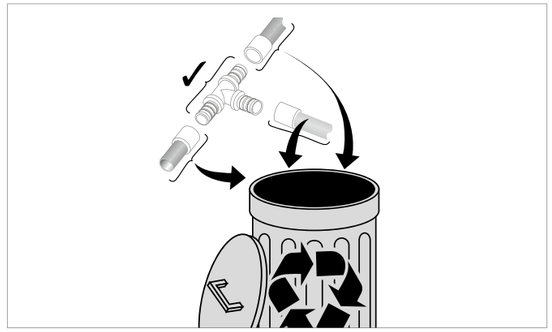


Fig. 11-4 Disposing cut out pipe sections and compression sleeves

12 BENDING THE PIPES

12.1 Bending the universal pipe RAUTITAN stabil and gas pipe RAUTITAN gas stabil

stabil | gas stabil

Fig. 12-1 Bent universal pipes RAUTITAN stabil

The universal pipe RAUTITAN stabil and gas pipe RAUTITAN gas 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 outer pipe diameter.
- When bending with a spiral spring, the minimum bending radius is three times the outer pipe diameter.
- The minimum bending radius is measured with respect to the centre of the pipe.
- Make sure to comply with the specified minimum bending radii.
- After bending, ensure that there are no kinks, wrinkles or bulges and that the outer PE sheath and aluminium layer are undamaged.

At installation temperature below 0 °C, pipe bends must be over-bent more strongly.
Only cold bending of pipes RAUTITAN stabil and RAUTITAN gas stabil is allowed.

Pipe	Universal pipe RAUTITAN stabil and Gas pipe RAUTITAN gas stabil stabil / gas stabil with bending tool (90°) 3 x d		Universal pipe RAUTITAN stabil and Gas pipe RAUTITAN gas stabil stabil / gas stabil bent by hand (90°) 5 x d	
Pipe sizes	Bending radius R [mm]	Arc B [mm]	Bending radius R [mm]	Arc B [mm]
16	48.6	76	81	127
20	60	94	100	157
25	75	118	125	196
32	96	151	160	251
40	120	188	200	314

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

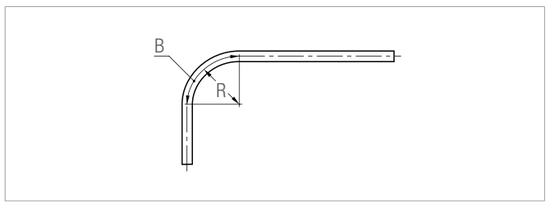


Fig. 12-2

R Bending radius
B Arc

Approved bending tools for universal pipe RAUTITAN stabil and gas pipe RAUTITAN gas stabil

stabil | gas stabil

Pipe size [mm]	Source Manufacturer	Model description	Article number
16/20	See price list REHAU sales office	Internal spiral spring 16 stabil Internal spiral spring 20 stabil	247484-001 247494-001
16/20	Hummel, D-79178 Waldkirch	External spiral spring 17 External spiral spring 20	2901170203 2901202503
16/20/25	H. Wegerhoff /ALARM, D-42810 Remscheid	One-hand pipe bending tool	2501 00
16/20/25	Roller, D-71332 Waiblingen	Roller Polo	153022
16/20/25	CML Germany, D-73655 Plüderhausen	Ercolina Junior	0130G
16/20/25	REMS, D-71332 Waiblingen	REMS Swing	153022
16/20/25/32/40	CML Germany, D-73655 Plüderhausen	Ercolina Jolly	0101
40	REMS, D-71332 Waiblingen	Curvo	580025
40	Rothenberger, D-69779 Kelkheim	Robull MSR	5.7900
40	Tinsel, D-73614 Schorndorf	UNI 42	–
16/20/25/32	Tinsel, D-73614 Schorndorf	OB 85	–

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

12.2 Bending RAUTITAN platinum, RAUTITAN red, RAUTITAN pink, RAUTITAN green and RAUTITAN lilac

RAUTITAN platinum | RAUTITAN red | RAUTITAN pink | RAUTITAN green | RAUTITAN lilac

Fig. 12-3 Pipe bend bracket for plumbing (3–4 x d) - 90° or 45° for sizes 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 for plumbing (4 x d) - 90° and pipe bend bracket for plumbing/heating (5 x d) - 90° each in size 32

Hot bending of heating pipe RAUTITAN pink can damage the oxygen diffusion barrier.

Only bend heating pipe RAUTITAN pink at ambient temperature.

Using an elbow fitting is not always required for sizes between 16 to 32. With pipe bend brackets, 90° and 45° bend can be formed at ambient temperature.

For pipe sizes 40 to 63, we recommend using elbow fittings.

Minimum bending radius

When manual bending by hand is done, the minimum bending radius is eight times the outer pipe diameter.

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

The minimum bending radius is with measured respect to the centre of the pipe.

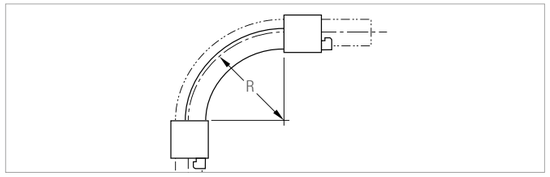


Fig. 12-6 Pipe bend bracket for plumbing 90 degrees, for size 16– 32 and pipe bend bracket for plumbing/heating 5 x d 90 degree for size 32
R Bending radius

Pipe	Drinking water installation with pipe bend bracket for plumbing 90° approximately 3-4 x d	Drinking water and heating installation with pipe bend bracket for plumbing/heating 90° 5 x d	Bent by hand (90°) 8 x d
RAUTITAN platinum	Hot & cold water pipe	Hot & cold water pipe	Hot & cold water pipe
RAUTITAN red	Hot water pipe	Hot water pipe	Hot water pipe
RAUTITAN pink	-	Heating pipe	Heating pipe
RAUTITAN green	Rainwater pipe	Rainwater pipe	Rainwater pipe
RAUTITAN lilac	Recycled water pipe	Recycled water pipe	Recycled water pipe

Pipe size	Bending radius R	Arc B	Bending radius R	Arc B	Bending radius R	Arc B
16	48	75	80	126	128	201
20	60	94	100	157	160	251
25	75	118	125	196	200	314
32	112	176	160	251	256	402

Tab. 12-3 Minimum bending radius for RAU-PE-Xa pipes

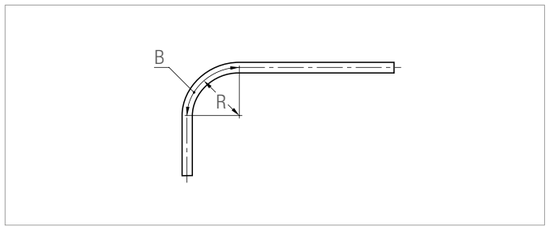


Fig. 12-7
R Bending radius
B Arc

12.3 Bending heating pipe RAUTHERM S

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 latest product book as well as in the Technical Information “Underfloor heating/cooling”.

Hot bending heating pipe RAUTHERM S can damage the oxygen diffusion barrier.

- Only bend RAUTHERM S pipe at ambient temperature.
- Use the unwinding unit for easy pipe laying.

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

Tab. 12-4 Minimum bending radius of RAUTHERM S

13 PIPE SUPPORT CHANNEL

13.1 Benefits of using pipe support channel

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

13.2 Functionality

The pipe support channel covers 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 expansion in length.

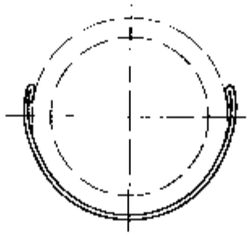


Fig. 13-1 Cross-section of pipe support channel

13.3 Assembly of the pipe support channel

Do not fit pipe support channel or pipe fasteners close to the deflection legs so the pipe can still bend.

Pipe cover

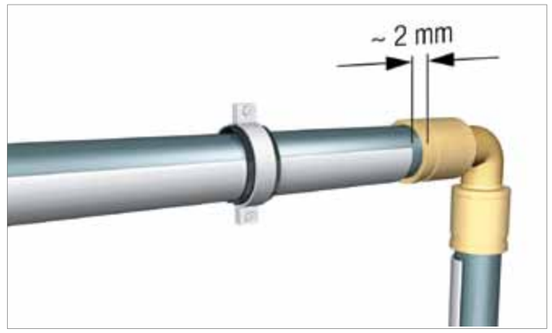


Fig. 13-2 Let the pipe support channel end approx. 2 mm before compression sleeve

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 expansion length.

Pipe clamp intervals

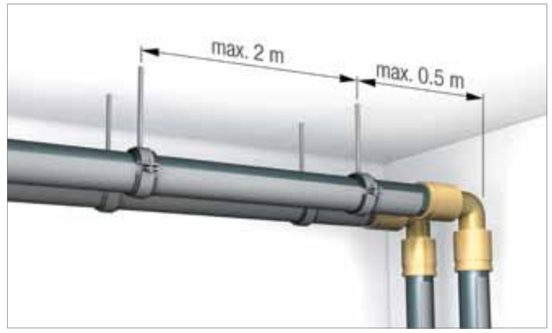


Fig. 13-3 Maximum pipe clamp intervals

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

Fitting cover

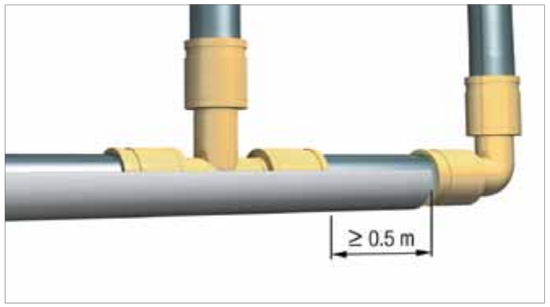


Fig. 13-4 Minimum overlapping of 0.5 m

Fittings with brass compression sleeve sizes 50 and 63 can be clipped by the pipe support channel if the pipe support channel projects at least 0.5 m beyond the compression sleeve. With this kind of installation, cutting off the pipe support channel at the fitting is not necessary.

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

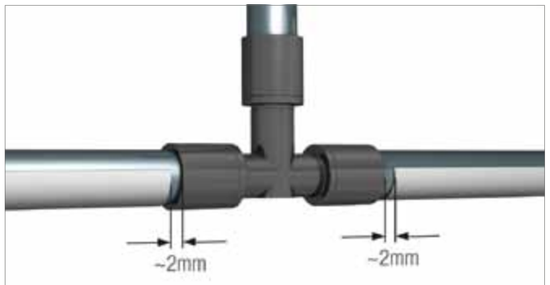


Fig. 13-5 Do not clip over RAUTITAN PX compression sleeve

Assembly of the pipe support channels

Reduced retaining force of the pipe support channel can cause greater thermal 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 your holding hand and the cutting tool. Saw pipe support channels from the rounded rear side, not the open side so that they are not bent open at their bordered ends.

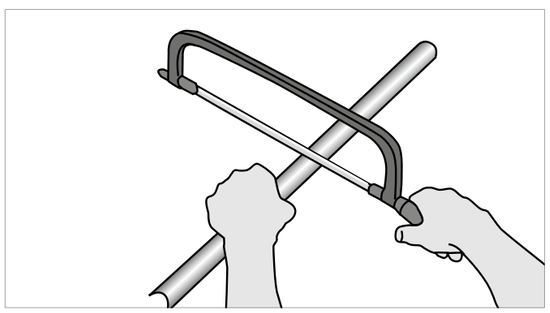


Fig. 13-6 Cutting off pipe support channel

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.

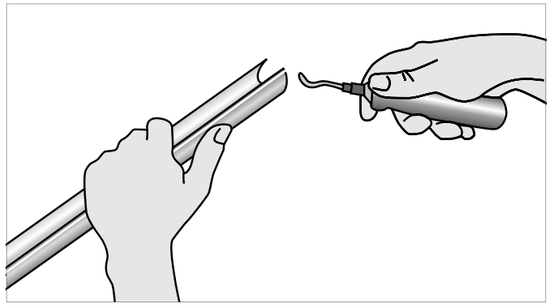


Fig. 13-7 Deburring of pipe support channel

4. Clip the pipe support channel onto the pipe (by hand or using a pliers or pipe wrench with plastic jaws).
   Do not overlap the ends of pipe support channels.

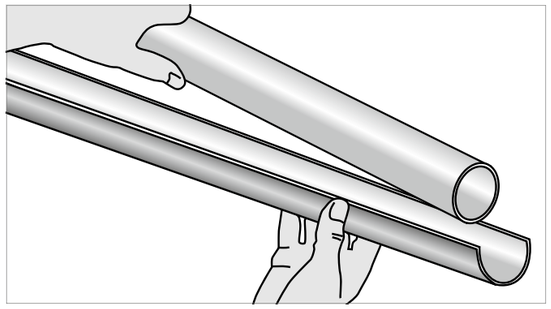


Fig. 13-8 Clipping in pipe support channel

5. To join support channels together, use cut-offs clipped over both ends.

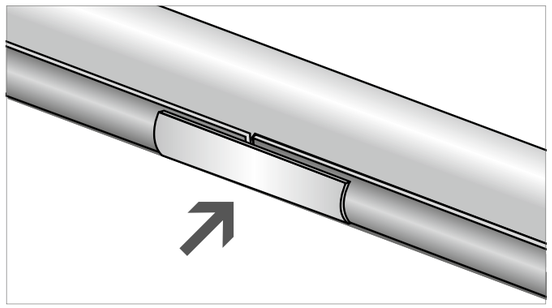


Fig. 13-9 Joining two pipe support channels

Even short cut-offs of the pipe support channel can be used for clipping over joints, ensuring an almost waste-free installation.

14 PIPE SUPPORT AND FIXING

14.1 Pipe brackets and clips

Use only pipe brackets and clips with the following properties:

- Suitable for plastic pipes
- Improved acoustic properties through rubber lining
- Correct size (to allow easy gliding of pipe without pulling the rubber lining out)
- Free of burrs

14.2 Anchor points

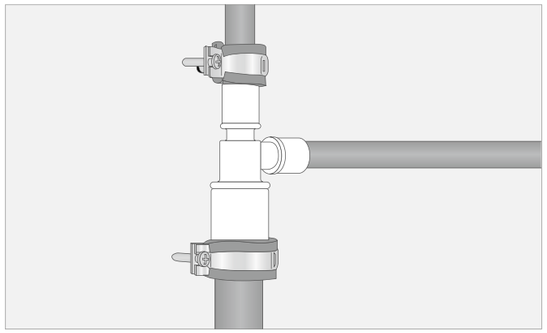
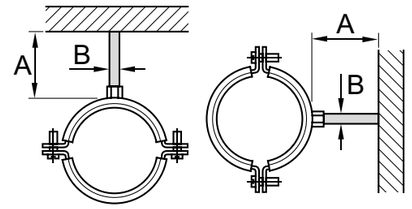


Fig. 14-1 Anchor point made by pipe clamps

- Observe the instruction and guideline from the pipe bracket/clip manufacturer.
- Adapt the guideline values for design and installation of pipe brackets and clip (as per Table 14-1) to the building requirements and bracket/clip manufacturer's recommendations.
- Anchor points can be used to restrict the thermal linear expansion into one direction.
- Long pipe run can be divided into several sections by adding several anchor points.
- Anchor points can be fixed at tees, elbows or connectors. Anchor points can be fixed by installing a pipe bracket directly before each compression sleeve of the fitting.

Do not install pipe brackets on the compression sleeves.

Pipe size [mm]	B Thread diameter or pipe nipple diameter	A Maximum distance of wall/ceiling to the pipe clamp [mm]
		
16	M8	100
	M10	150
	M12	200
	M16	300
20	M10	100
	M12	150
	M16	250
25	M12	100
	M16	200
32	M16	100
	R ½	150
40	R ½	100
	R¾	150
	R1	220
50	R¾	100
	R1	200
63	R1	150

Tab. 14-1 Guideline values for fixing parameters of anchor points

14.3 Spacing between brackets and clips

Choose the correct pipe spacing intervals according to the guideline values (see Table 14-2) for installation with or without pipe support channels.

14.4 Exposed installation

When installing pipe at exposed areas or installing long piping without change in direction, we recommend using pipe support channel for RAU-PE-Xa pipes.

- For installation without pipe support channel, install anchor points at 6 m intervals.
- Ensure that there is sufficient space for piping to expand.

For installation of RAU-PE-Xa pipes without pipe support channel, pipe sagging is to be anticipated.

RAU-PE-Xa pipes	Size	Horizontal installation			Vertical installation		
		Concealed	Exposed	REHAU support channel	Concealed	Exposed	REHAU support channel
		Max. recommended spacing of bracket and clips (m)			Max. recommended spacing of bracket and clips (m)		
RAUTITAN platinum	16	0.60	0.30	2.0	1.20	1.20	2.0
RAUTITAN red	20	0.70	0.40	2.0	1.40	1.40	2.0
RAUTITAN pink	25	0.75	0.50	2.0	1.50	1.50	2.0
RAUTITAN green	32	0.85	0.70	2.0	1.70	1.50	2.0
RAUTITAN lilac	40	0.90	0.90	2.0	1.80	1.50	2.0
RAUTHERM S	50	1.05	1.05	2.0	2.10	1.50	2.0
	63	1.10	1.10	2.0	2.20	1.50	2.0

Tab. 14.2 Recommended spacings of pipe bracket/clip for RAU-PE-Xa pipes

Multilayer composite pipe	Size	Max. recommended spacing for bracket and clips (m)
RAUTITAN stabil	16	1.00
RAUTITAN gas stabil	20	1.25
	25	1.50
	32	1.75
	40	2.00

Tab. 14.3 Recommended spacings of pipe bracket/clip for metal composite pipes

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 water services, heating installation and gas piping. This also applies to RAUTITAN piping systems.
The thermal expansion and contraction occur mainly due to the different installation, ambient and operating temperatures. During installation, appropriate pipe routing with provisions for movement (e.g. at changes of direction) and corresponding space for piping expansion 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 expansion/contraction when installing with:
  - RAUTITAN stabil
  - RAUTITAN gas stabil
  - RAU-PE-Xa pipes with pipe support channel
- Short deflection legs are possible with flexible RAU-PE-Xa pipes
- Simple installation of pipe support channel

15.3 Calculation of length changes

The thermal change in length is calculated with the following equation:
$\Delta L = \alpha \cdot L \cdot \Delta T$
ΔL = Length change in mm
α = Coefficient of linear thermal expansion in $\frac{mm}{m \cdot K}$
L = Length of piping in m
ΔT = Temperature difference in K or °C
The coefficient of linear thermal expansion must be selected according to the installed pipe type and if pipe support channel is installed.

Determining the pipe length
The pipe length L is the actual installed pipe length on site between anchor points, expansion bends or loops. Sometimes it may be necessary to divide the pipe run into several sections by adding anchor points or expansion bends and loops to keep the thermal expansion low.

Determining the temperature difference ΔT
In determining of temperature difference ΔT, the installation 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.

Pipe type	Pipe size	Coefficient of linear thermal expansion α [$\frac{mm}{m \cdot K}$]	Material constant C
		$\Delta L = \alpha \cdot L \cdot \Delta T$	$L_{BS} = C \cdot \sqrt{d_a \cdot \Delta L}$
RAUTITAN stabil RAUTITAN gas stabil	16–40	0.026	33
RAUTITAN platinum	16–63 without REHAU support channel	0.15	12
RAUTITAN red	16–40 with REHAU support channel	0.04	–
RAUTITAN pink	50–63 with REHAU support channel	0.1	–
RAUTITAN green RAUTITAN lilac			
RAUTHERM S	10–32 without REHAU support channel	0.15	12

Tab. 15-1 Coefficient of linear thermal expansion (approximate values) and material constants for deflection leg calculation (approximate values)

16 DEFLECTION LEGS

Thermal length changes can be accommodated by deflection legs.
RAU-PE-Xa pipes are particularly suitable for this due to their flexibility.
A deflection leg is the freely moveable pipe length, which can take up the required thermal length changes. 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 piping lengths, additional deflection legs must be installed in the piping to compensate the thermal length changes.

Do not fit pipe support channels or pipe brackets close to deflection legs so it will not be prevented from bending.

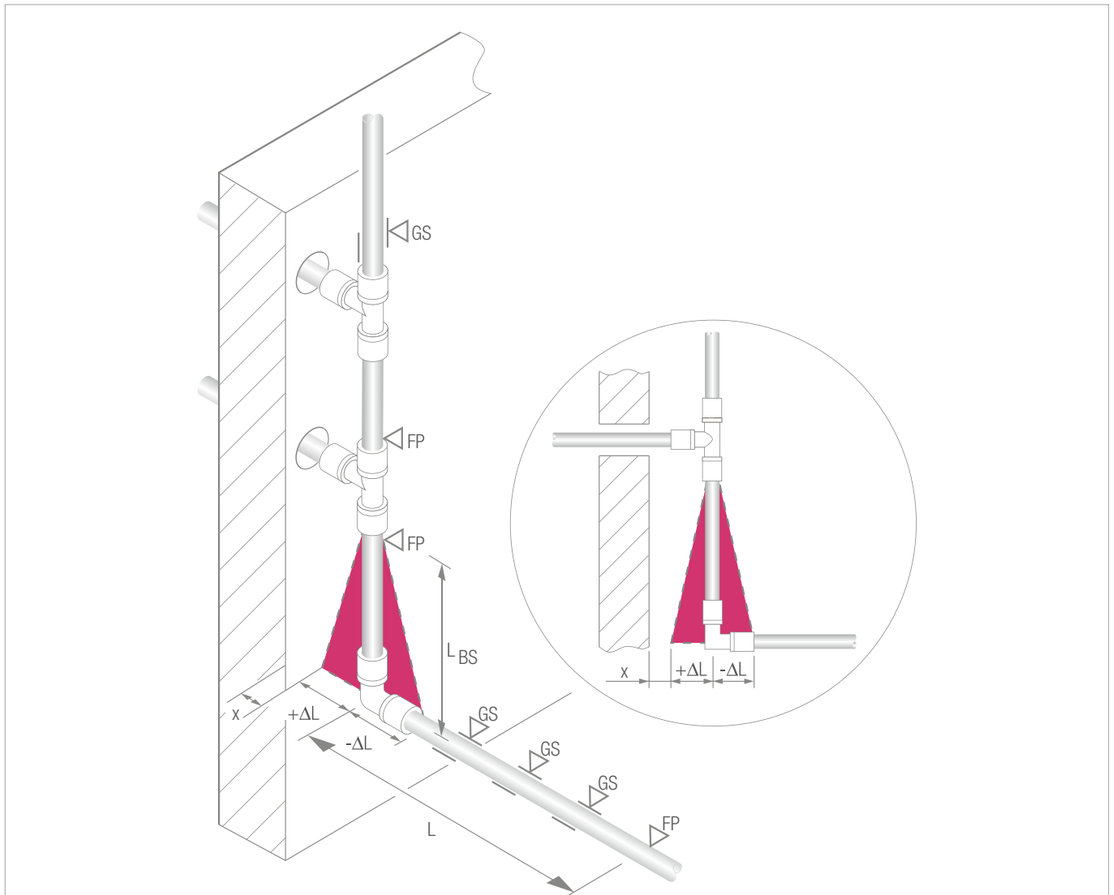


Fig. 16-1 Deflection legs

- L_{BS} *Length of deflection leg*
- *ΔL Thermal length change*
- *L Pipe length*
- *x Minimum distance of the pipe from the wall*
- *FP Anchor point*
- *GS Sliding point*

16.1 Calculation of deflection leg length

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

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

L_{BS} = Length of deflection leg
d_a = Outside pipe diameter in mm
ΔL = Length change in mm
C = Material constant of piping material

For approximate values for material constant C, see Table 15-1.

Do not fit pipe support channels or pipe brackets close to the deflection legs so it will not be prevented from bending.

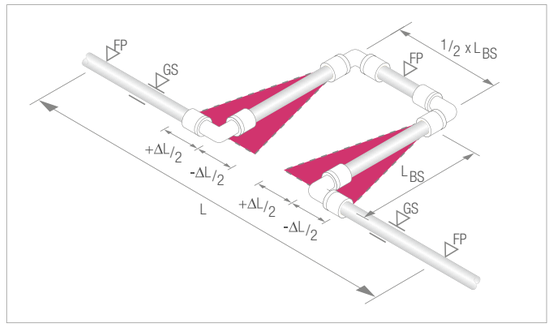


Fig. 16-2 U expansion bends.

L_{BS} = Length of deflection leg
ΔL = Thermal length change
L = Pipe length
FP = Anchor point
GS = Sliding point

16.2 Calculation examples

The pipe length L, for which the thermal length change is to be accommodated at a deflection length, is 7 m.

The temperature difference between the minimum and maximum values (installation temperature and subsequent operating temperature) is 50 K.
The installed pipe outer diameter is 25 mm.

What length of deflection leg is required according to the installed pipe type?

Calculation of deflection leg length with RAUTITAN stabil and RAUTITAN gas stabil

stabil
gas

$\Delta L = \alpha \cdot L \cdot \Delta T$
$\Delta L = 0.026 \frac{mm}{m.K} \cdot 7m \cdot 50L$
$\Delta L = 9.1mm$
$L_{BS} = C \cdot \sqrt{d_a \cdot \Delta L}$
$L_{BS} = 33 \cdot \sqrt{25mm \cdot 9.1mm}$
$L_{BS} = 498$ mm

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

platinum
red
pink
green
lilac

$\Delta L = \alpha \cdot L \cdot \Delta T$
$\Delta L = 0.04 \frac{mm}{m.K} \cdot 7m \cdot 50L$
$\Delta L = 14mm$
$L_{BS} = C \cdot \sqrt{d_a \cdot \Delta L}$
$L_{BS} = 12 \cdot \sqrt{25mm \cdot 14mm}$
$L_{BS} = 224$ mm

Assessment of the results

RAUTITAN stabil and RAUTITAN gas stabil have lower thermal change length than RAU-PE-Xa pipes due to its aluminium sheath. However, the required deflection leg length for RAU-PE-Xa is shorter due to the flexible pipe material.
For metallic pipe materials, a substantially larger deflection leg is required for the same operating parameters during installation, due to the significantly higher material constant (C), than for other RAUTITAN pipes system.

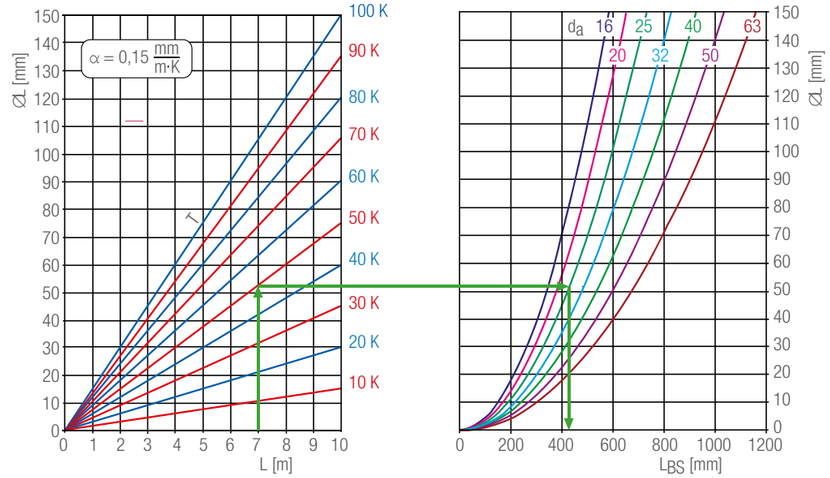


Fig.16-3 Linear expansion and deflection leg length of RAUTITAN PE-Xa pipes size 16 - 63 mm without support channel

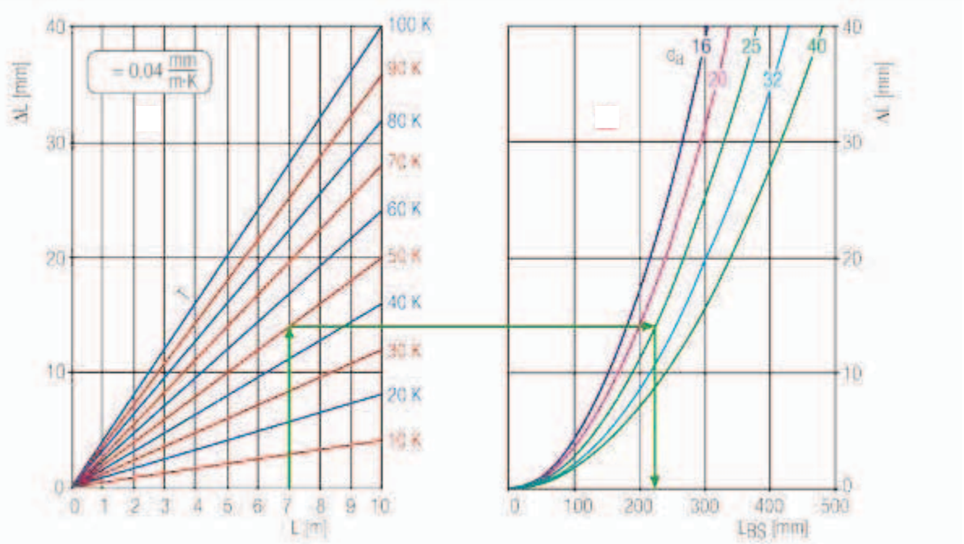


Fig. 16-4 Linear expansion and deflection leg length of RAUTITAN PE-Xa pipes size 16 - 40 mm with support channel

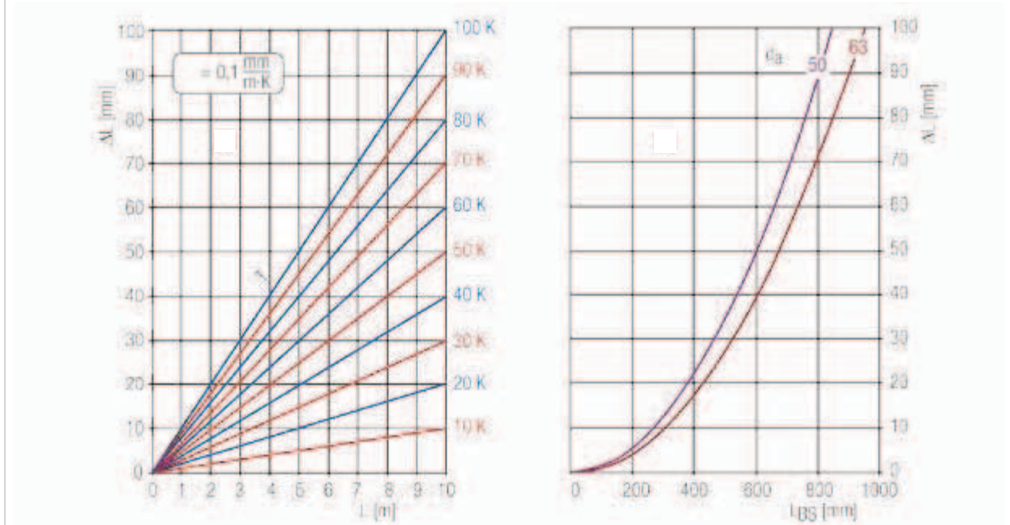


Fig. 16-5 Linear expansion and deflection leg length of RAUTITAN PE-Xa pipes size 50 - 63 mm with support channel

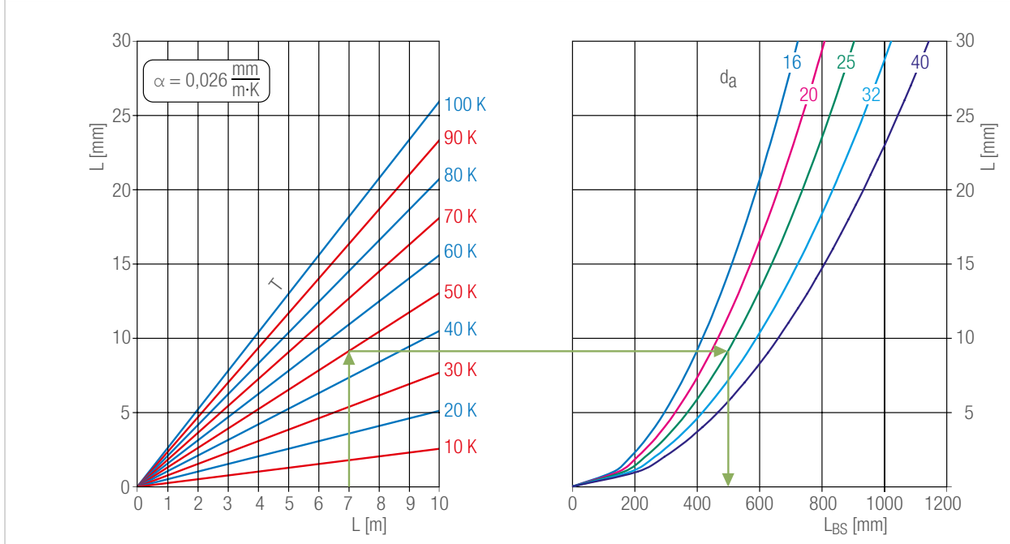


Fig. 16-6 Linear expansion and deflection leg length of RAUTITAN multilayer pipes size 16 - 40 mm

17 FIRE SAFETY

The Building Codes of Australia and New Zealand both stipulate that service penetrations must not reduce the fire resistance level/rating of the building element they penetrate.

In Australia, the verification requirements for service penetrations are specified in the Building Code under Clause C 3.15 “Openings for service installations”.

The approved Document for New Zealand Building Code Fire Safety Clause C lists - under part 6.17 and Annex C 7.1.2 - the requirement tests to prove a selected combination of the fire stop and pipe achieve the required fire resistance rating.

Applicable test methods are detailed in AS 1530.4 (methods for fire tests on building materials, components and structures – Part 4: Fire-resistant tests of elements of building construction).

Every service penetration reacts differently in the event of fire. As this is the case, test results are only applicable to the tested wall or floor construction, installed pipes and the applied fire stops. A fire safety engineer responsible for a particular building can at his discretion accept test results from a different test setup, if he deems the construction in question to be achieving a better fire rating than the one that was tested.

REHAU recommends to only use the fire protection methods which have been specifically tested with the RAUTITAN pipe system. REHAU cannot accept responsibility or liability for the correct manufacture or installation of fire protection systems.

Tables 18-1 and 18-2 show the fire ratings which were achieved when RAUTITAN water services system were fire protected with retrofit UniCollars from Promat’s Promaseal product range.

RAUTITAN PE-Xa pipes Fire Resistance Ratings / Levels	**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**
	Load bearing / Integrity / Insulation						
Wall construction: 2-hour fire-rated insulated plasterboard partition 128 mm thick and infilled with Rockwool Fibertex 350 of density 60kg/m³ – protected by fire collar on both sides	- / 240 / 180	Not tested	- / 240 / 180	Not tested	Not tested	- / 240 / 180	- / 240 / 180
Wall construction: 128 mm thick steel stud plasterboard – protected by fire collar on both sides	Not tested	- / 180 / 180	- / 180 / 120	Not tested	- / 180 / 120	- / 180 / 120	Not tested
Floor construction: 120 mm thick concrete floor slab – protected by fire collar on the fire exposed side only	- / 240 / 180	- / 180 / 120	Not tested	- / 240 / 180	- / 240 / 180	Not tested	- / 240 / 180

Tab. 17-1 Fire resistant ratings/levels achieved by RAUTITAN PE-Xa pipes and Promaseal UniCollar retrofit fire collars

RAUTITAN multilayer pipes Fire Resistance Ratings / Levels	**16.2 x 2.6**	**20 x 2.9**	**25 x 3.7**	**32 x 4.7**	**40 x 6.0**
	Load bearing / Integrity / Insulation				
Wall construction: 128 mm thick steel stud plasterboard – protected by fire collar on both sides	- / 180 / 180	- / 180 / 120	- / 180 / 120	- / 180 / 60	- / 180 / 30
Floor construction: 120 mm thick concrete floor slab – protected by fire collar on the fire exposed side only	- / 240 / 180	- / 240 / 120	- / 240 / 90	- / 180 / 120	- / 120 / 30

Tab. 17-2 Fire resistant ratings/levels achieved by RAUTITAN stabil pipes and Promaseal UniCollar retrofit fire collars

18 INSTALLATION ADVICE

Detailed information on planning, installation and execution of REHAU systems for underfloor heating/cooling with RAUTITAN pipes and heating pipes RAUTHERM S can be found in the Technical Information “Underfloor heating/cooling”.

18.1 Installation within concrete/screed floors

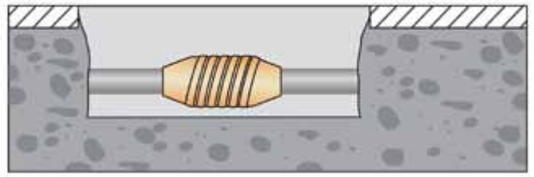


Fig. 18-1 Installation of RAUTITAN system within concrete/screed floor with corrosion protection system

Installation of RAUTITAN systems within concrete/screed floors are allowed, provided specific requirements from local installation standards are fulfilled and adequate protection from mechanical damage and chemical damage are provided.

18.2 Exposure to excessive heat

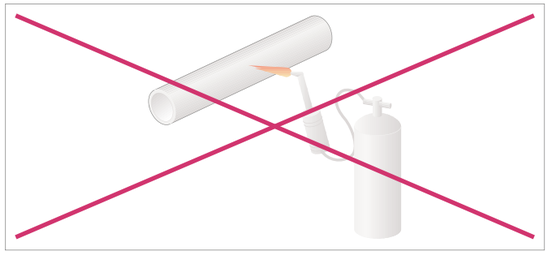


Fig. 18-2 Protect piping against exposure to excessive heat

During construction, maintenance or repair work in close proximity to heat care must be taken not to expose RAUTITAN pipe systems to a naked flame (soldering), flood lights or other localised heat sources. This can result in permanent damage or a significant reduction in performance life.

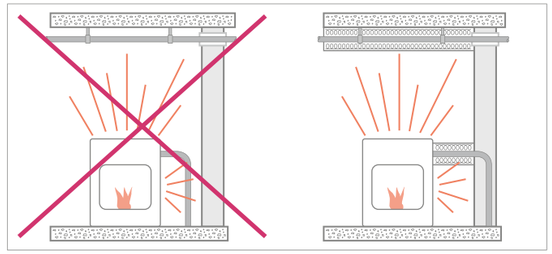


Fig. 18-3 Protection against temperature-induced stress

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

18.3 External installation

All external installations, in-ground and above ground, shall follow the applicable national water and gas installation standards and must be protected as required by these codes.

.Gas installation

RAUTITAN gas is an indoor system, which must not be installed externally, except for the below installations:

- In-ground installations after gas meter
- Above ground installation after an externally located gas meter
- Connection to an external gas appliance above ground
- Connection to an above ground LPG tank

Water installation

RAUTITAN water systems are indoor systems, which must not be installed externally, except for the below installations:

- In-ground installations after water meter
- Short pipe length after connection to water meter before going below the ground
- Connection to an externally located water heater

→ For each of the excepted external installations, adequate protection is required.

18.3.1 Exception for external installation above ground

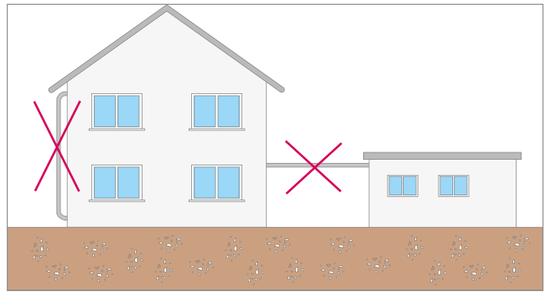


Fig. 18 -4 External installation prohibited

For the excepted external and above ground installations of the RAUTITAN system, the following must be ensured:

- The length of pipe installed above ground shall be kept to an absolute minimum. It shall not exceed 2 meters. Below ground installation should always be preferred.
- All pipe and connections must be adequately protected from corrosion, frost and excessive temperature.
- The system components must be protected from any mechanical and physical damages. Consideration shall be given to the type and level of damage which is likely to occur during the long term operation of the system, e.g. UV-radiation, lawn mower, etc.

For joints installed above ground and inside a conduit, PE tape is a sufficient means of protection against corrosion, as long as adequate ventilation is ensured.

18.3.2 Exception for external installation below ground

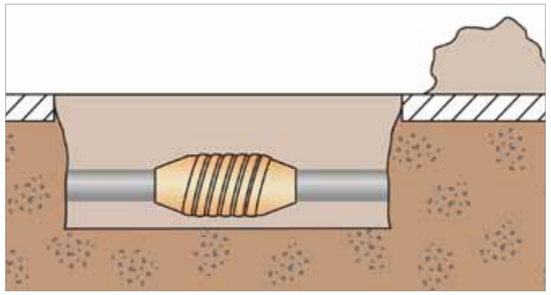


Fig. 18-5 Installation of RAUTITAN system below ground with fittings wrapped with corrosion protection system

RAUTITAN pipes can be installed in the ground if adequate protection according to national gas and water installation standard is provided against:

- Mechanical damage
- Chemical damage
- Contamination

In-ground installations of RAUTITAN systems with jointings must be protected according to national gas and water installation standard against:

- Mechanical damage
- Corrosion
- Chemical damage, e.g chemical termite treatments
- Contamination

The quality of bedding and backfill must also be in accordance with the valid national installation standards.

Proper corrosion protection of the fittings can be achieved by using a recognised corrosion protection system, such as the butyl-tape based DEKOTEC N15/PE5 system or equivalent.

The RAUTITAN pipes below can be installed below ground with adequate corrosion protection on the jointings that contains brass components:

- RAUTITAN platinum
- RAUTITAN red
- RAUTITAN green
- RAUTITAN lilac
- RAUTITAN stabil
- RAUTITAN gas stabil
- RAUTITAN PE-Xa pipes with RAUTITAN PX fittings and compression sleeves only need to be protected against mechanical damage

RAUTITAN pink with oxygen barrier layer is not allowed to be installed below ground.

Chemical damage

If chemical damage is likely to occur, e.g. from termite treatments, the RAUTITAN system must be adequately protected using a suitable conduit, e.g. PVC pipes or equivalent.

Inadequate corrosion protection

Inadequate corrosion protection of jointing areas can cause corrosion of multilayer pipe and fittings. Corroded components can cause jointing failure and lead to leakage.

When using a Corrosion Protection System, always ensure the following:

- The corrosion protection system is chemically compatible with all RAUTITAN PE-Xa, RAUTITAN multilayer system components, RAUTITAN MX fitting and compression sleeve, RAUTITAN PX fittings and compression sleeve.
- There is no adverse effect on the adhesion of the outer PE-layer to the aluminum layer of the RAUTITAN multilayer pipe.
- It's fully suitable for the given ground conditions, e.g. damp soil.
- The system includes an approved cavity filler/mastique which can be applied to profile the joint, allowing smooth application of the protection tape without any cavities between the tape and fitting.
- Mechanical protection is provided to avoid any damage to the corrosion protection tape e.g. by backfill material.
- In addition to complete coverage of the joint itself, the corrosion protection system has to cover at least 150 mm of the pipe on each side of the brass fitting.
- Confirmation from manufacturer that the corrosion protection system is suitable for the intended application.

During in-ground installation, if the outer PE layer of RAUTITAN multilayer pipe (RAUTITAN gas stabil / RAUTITAN stabil) is damaged and the aluminium layer is exposed to the soil, the aluminium layer may corrode with time. The corrosion of the aluminium layer may be visually unpleasant but this does not affect the long term pressure resistance and performance of the RAUTITAN multilayer pipe.

After the buried RAUTITAN multilayer system has been put into operation, any repair or extension work is no longer permitted. Any repair or extension work on the buried multilayer system may compromise the joint integrity and lead to leakage.

18.3.3 Installation procedure of corrosion protection system

Incorrect application of the system components can compromise its performance and result in gas fitting corrosion. Corroded components can cause joint failure and lead to leakage.

- For more detailed information on correct handling and application, carefully read the individual instruction leaflets supplied with each component of the Corrosion Protection System prior to use.
- REHAU requires a minimum protection extension of 150 mm to each side of the joint. This minimum requirement overrules some of the manufacturers' instruction.

The procedure of corrosion protection system given below is only an example specific to DEKOTEC N15/PE5 system. Other equivalent corrosion protection systems may have different procedure and tape colours. Please follow the procedures given by corrosion protection systems' manufacturers.

18.3.3.1 Surface preparation of protection area

- Clean the protection area, ensure that it is dry and free from grease and dust.

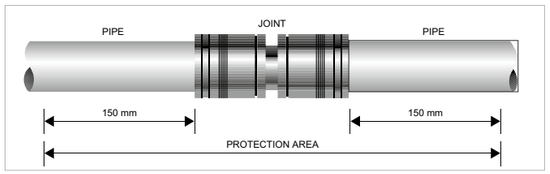


Fig. 18.6 Protection area for corrosion protection system

- Completely remove any contamination which might act as a release agent (e.g. grease, oil, coupling agents, paint, cement, varnish, etc.) prior to tape application.
- Roughen the cleaned pipe surface 150 mm on each side of the joint using coarse emery cloth. Remove any grinding dust afterwards.

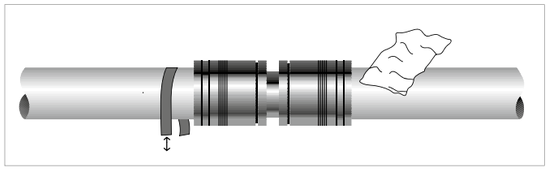


Fig. 18-7 Roughen the pipe surface and clean the grinding dust after the roughening process

18.3.3.2 Installation within concrete/screed floors

- Thoroughly stir the corrosion protection primer in original container to ensure uniformity prior to application.
- Using a brush or roller apply an even coating of primer to the cleaned and dried surface over the entire protection area. Surfaces have to be uniformly coated and cover must extend for a minimum of 150 mm on each side of the fitting (complete protection area).
- After use immediately seal the primer container.
- Clean the brush or roller with suitable solvent (e.g. white spirit).

Fig. 18-8 Primed protection area surface

- Let primer coating dry until it is tack free and all solvents have evaporated.
- The drying time depends on ambient temperature and air movement.
- The primed surface should be wrapped within 8 hours. Otherwise or in case of contamination (e.g. dust) the primer coating has to be renewed.

18.3.3.3 Profiling the protection area

- Gaps and voids between pipe/fitting and the corrosion protection tape must be avoided to ensure proper protection.
- The fitting has to be contoured to ensure full contact between the corrosion protection tape and the substrate being protected. Corrosion protection mastique is to be used for profiling as part of the corrosion protection system.

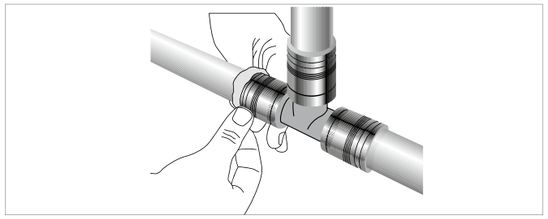


Fig. 18-9 Filling the gaps between fitting and pipe with mastique

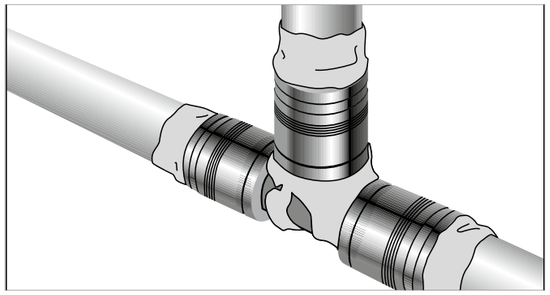


Fig.18-10 Profiled protection area

18.3.3.4 First wrap of the protection area

- Starting at one end of the protection area (minimum 150 mm from compression sleeve) apply the inner tape (grey colour) with one circumferential wrap and continue wrapping it spirally with minimum 50% overlap across the complete protection area.

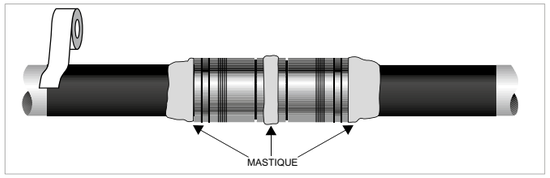


Fig.18-11 Wrapping the protection area with the first tape (grey colour)

- Apply slight pressure while wrapping to ensure good bonding to the substrate.
- Keep the tape under tension to avoid any kinks and creases. A good indicator for sufficient tension is if the tape's width is narrowed by approximately 1% during application. Remove the separating foil.
- The tape wrapping shall cover the complete jointing and extend by at least 150 mm beyond the protected joint onto the pipe (protection area).

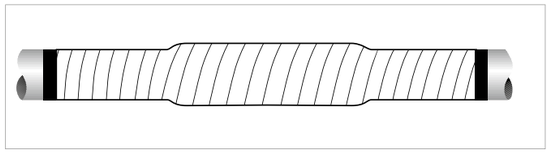


Fig. 18-12 First tape wrapping of complete protection area

18.3.3.5 Final wrap of protection area

- The outer wrap (black/grey tape) must at least fully cover the first wrap. Position the black/grey tape at one end of the protection area with half of it covering the inner wrap and the grey surface facing the inner wrap, the black side facing outward.

Fig. 18-13 Wrapping the protection area with black/grey tape

- Apply one circumferential wrap and continue wrapping it spirally with minimum 50% overlap across the complete protection area.
- Keep the tape under tension to avoid any kinks and creases. A good indicator for sufficient tension is if the tape's width is narrowed by approximately 1% during application.
- The tape wrapping should cover the complete pipe and extend by at least 150 mm beyond the protected joint (protection area).

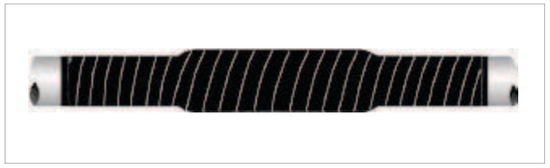


Fig. 18-14 Fully protected joint with corrosion protection system

No wrinkles, creases or kinks are allowed in the finished wrapping on visual testing.

18.4 Installation in areas exposed to UV radiation

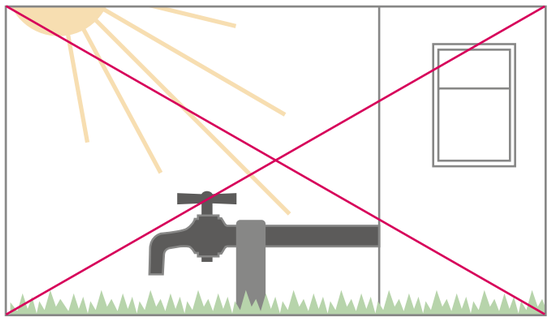


Fig. 18-15 Unprotected installation in areas exposed to UV radiation is not premitted
Example: Outdoors

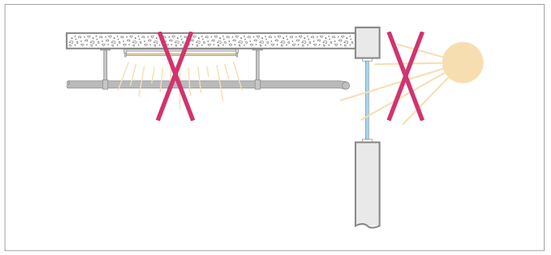


Fig. 18-16 Unprotected installation in areas exposed to UV radiation is not premitted
Example: Outdoors

- Store and transport pipes with protection against UV radiation.
- Protect piping from UV rays in areas where UV radiation can occur (e.g. sunlight, neon light).
- Refer to the Technical Information RAUTITAN - THE NEW GENERATION for additional information about the protection of the RAUTITAN gas pipes in areas exposed to UV radiations.

18.5 Light transmission

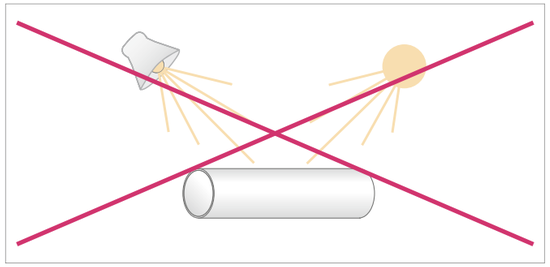


Fig. 18-17 Fully protected joint with corrosion protection system

RAUTITAN platinum, green, lilac and red pipes are permeable to light. Light exposure can be detrimental to the hygiene of drinking water. Protect pipes against exposure to light (e.g. close to windows and lamps).

18.6 Installation in combination with bitumen sheets and coatings

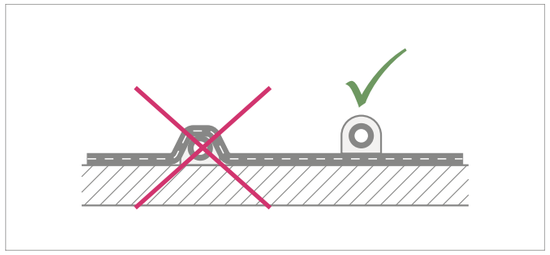


Fig. 18-18 Only install pipes on top of bitumen sheet

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

- Allow the bitumen sheets or bituminous coatings that contain solvents to dry completely before installing the pipes.
- Adhere to the setting time specified by the manufacturer.
- Before laying the pipes, ensure that neither the pipes nor the drinking water are adversely affected.
- Protect the pipe adequately from heating while laying the pipes near flaming bitumen sheets.

18.7 Heat trace system

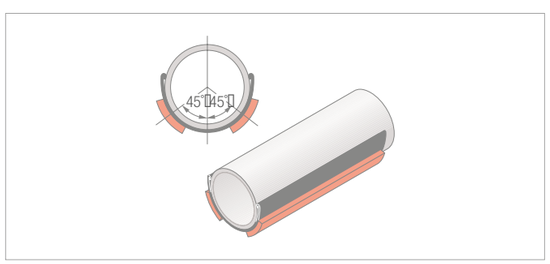


Fig. 18-19 Example of trace heating fitted to RAUTITAN pipe with support channel

- If pipes are installed with 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 trace strips on pipes, observe the installation instructions of the heat trace manufacturer.

18.8 Installation in areas with asphalt screed

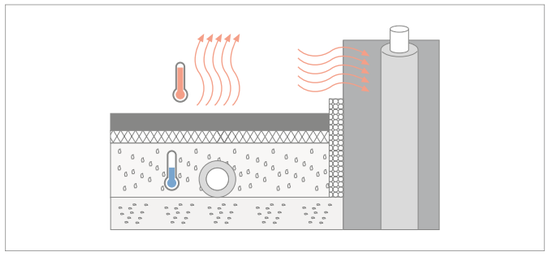


Fig. 18-20 Installation under hot asphalt screed

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

- Do not insert RAUTITAN gas pipes under hot asphalt screed.
- Take the appropriate measures to ensure that drinking water and heating piping (e.g. pipes, fittings, compression sleeves, joints) and pipe insulation do not at any point exceed 100 °C.

Always agree with the contractor laying the hot asphalt screed on the suitable insulation and protective measures to prevent any damage to the pipes due to excessive heat.

18.9 Potential equalization

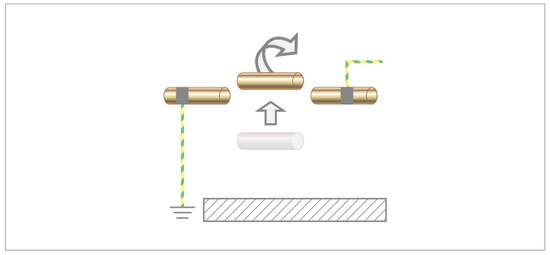


Fig. 18-21 Potential equalization while replacing pipes

RAUTITAN piping must not be used as an earthing conductor for electrical units.

After replacement of existing metal pipe installations with RAUTITAN system, the function of potential equalization and the effectiveness of the electrical safety devices must be verified by an electrician.

19 STANDARDS, REGULATIONS AND GUIDELINES

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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 extensive 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):

AS 1530.4
Methods for fire tests on building materials, components and structures - Fire-resistance test of elements of construction

AS 1722.1
Pipe threads of Whitworth form - Sealing pipe threads

AS 1722.2
Pipe threads of Whitworth form - Fastening pipe threads

AS 2345
Dezincification resistance of copper alloys

AS/NZS 2537
Mechanical jointing fittings for use with cross-linked polyethylene (PE-X) pipe for hot and cold water applications

AS 3688
Water supply - Metallic fittings and end connectors

AS/NZS 2492
Cross-linked polyethylene (PE-X) pipes for pressure applications

AS 4176
Multilayer pipes for pressure applications

AS/NZS 3718
Water supply - Tape ware

AS/NZS 4020
Testing of products for use in contact with drinking water

AS/NZS 3500
Plumbing and drainage set

AS/NZS 5601.1
Gas installation

Australian Drinking Water Guidelines

BCA/NCC
Building code of Australia/National Cunstruction Code

PCA/NCC
Plumbing Code of Australia/National Construction Code

BS 7291
Thermoplastics pipes and associated fittings for hot and cold water for domestic purposes and heating installations in buildings

NZBC
New Zealand Building Code

DIN 1045
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 3586
Thermally activated shutting-off devices for gas - Requirements and testing

DIN 4102
Fire behaviour of building materials and components

DIN 4108
Thermal insulation 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
Corrosion of metals – Corrosion of metallic under corrosion load by water inside of tubes, tanks and apparatus - Part 6: Influence of the composition of drinking water.

DIN 68 800
Protection of timber used in buildings

DIN EN 10088
Stainless steels

DIN EN 10226
Pipe threads where pressure-tight joints are made on the threads

DIN EN 12164
Copper and copper alloys – Rod for free machining purposes

DIN EN 12165
Copper and copper alloys – Wrought and unwrought forging stock

DIN EN 12168
Copper and copper alloys - Hollow rod for free machining purposes

DIN EN 12502-1
Protection of metallic materials against corrosion – Guidance on the assessment of corrosion likelihood in water distribution and storage systems

DIN EN 1264
Floor heating

DIN EN 12828
Heating systems in buildings – Design of water-based heating 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
Heating systems in buildings

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 V 4108-6
Thermal protection and energy-economy in buildings

DIN VDE 0100
(Summary)
Electrical systems in building
Setting up high-voltage current systems
Setting up low-voltage current 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 G 459-1
Gas service pipes for pressures up to 4 bar; Design and construction

DVGW G 260
Gas quality

DVGW G 465-4
Gas leak detection and gas concentration measuring appliances for leakage survey on gas supply systems

DVGW G 600 / DVGW-TRGI 2008
Technical rules for gas installations

DVGW G 617
Calculation guidelines for sizing of the piping system of gas installations

DVGW GW 393
Extensions (pipe connectors) from copper materials for gas and drinking water installations - Requirements and testing

DVGW VP 305-1
Gas flow monitors for the gas installation

DVGW VP 625
Pipe connectors and connections for internal gas lines from multi-layer connector pipes according to DVGW-VP 632 - Requirements and testing

DVGW VP 626
Pipe connectors and connections for internal gas lines from crosslinked polyethylene (PE-X) according to DVGW-VP 624 - Requirements and testing

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 98/83/EC of 3 November 1998 on the quality of water intended for human consumption

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

TRF
Technical regulations on liquid gas installations

TrinkwV
Drinking Water Ordinance

VDI 2035
Prevention of damage in water heating installations

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)

NOTES

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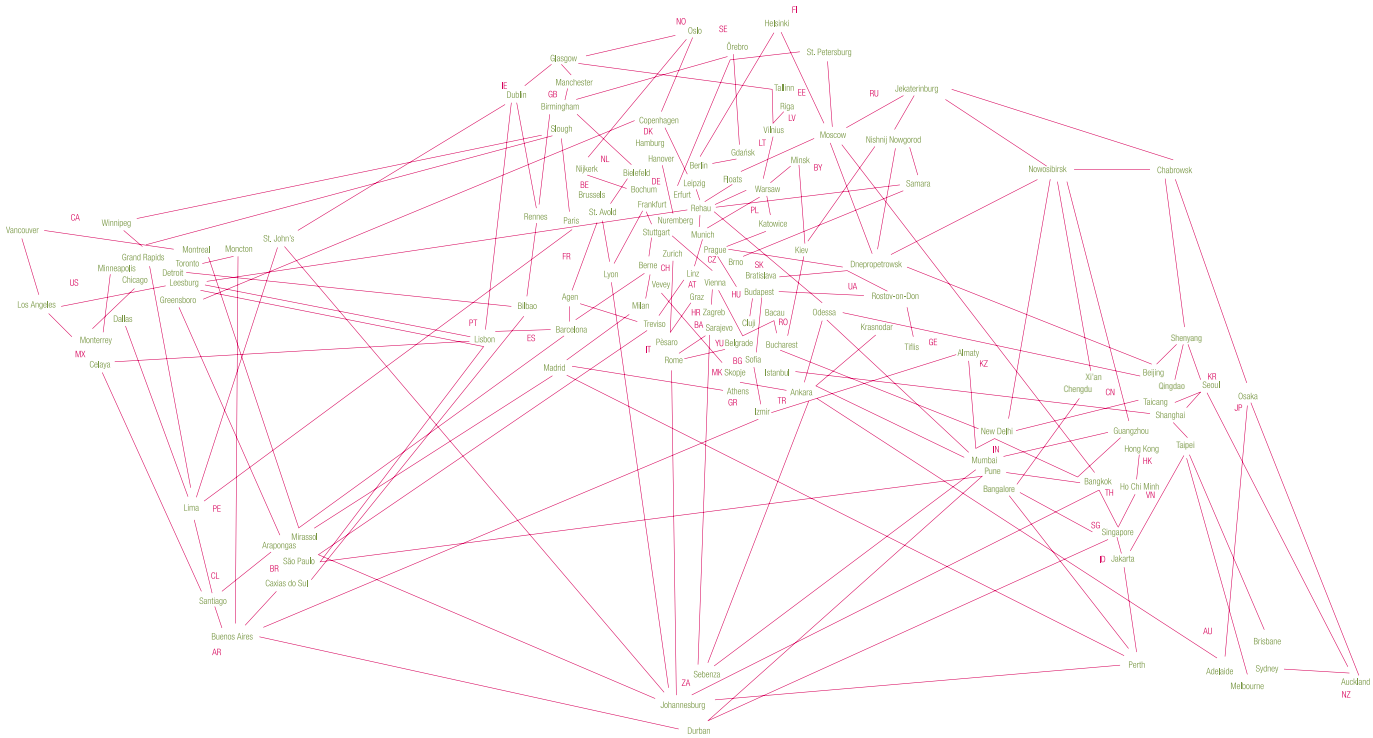

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