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PIPE SYSTEMS

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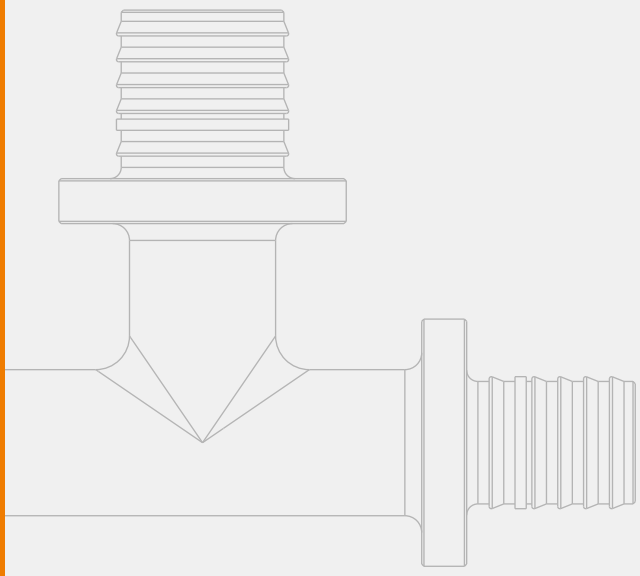
TECE

Pipe Systems

TECEflex

TECHNICAL GUIDELINES



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TECEflex - System Description

System Description

TECEflex is the universal installation system for drinking water, heating, compressed air and gas installations. All-plastic pipes and composite pipes are available. The pipes are connected using axial pressure sleeve technology - without using O-rings.

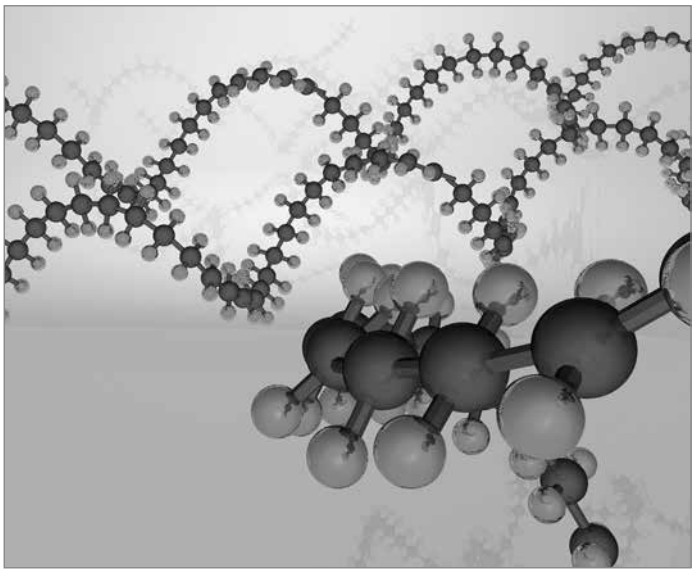
TECEflex offers:
- connection without an O-ring
- connections with low pressure loss using expansion technology
- high pressure and temperature resistance
- no hygiene issues
- error-tolerant and thus totally secure system
- flush-mounting possible
- dimensionally stable, bend-resistant composite pipes
- one fitting for three types of pipe - therefore no danger of a mix-up with the fittings and significantly reduced storage requirement
- axial press-connector with low cross-section constriction

Types of pipe

The TECEflex system offers the right pipe for every installation application:
- composite pipe for drinking water, heating and compressed air applications
- composite pipe - coloured yellow - for the indoor gas installation
- PE-Xc-5S pipe for drinking water, heating and compressed air applications (with internal diffusion block)
- PE-MDXc-5S pipe for underfloor heating (with internal diffusion block)

Electron beam cross-linking

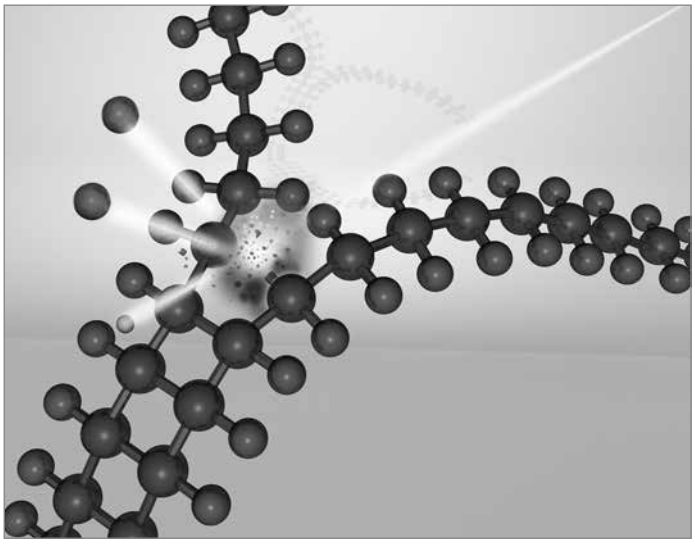
The installation of drinking water, heating, compressed air and gas requires large amounts of pipe material. In addition to being pressure and temperature-resistant, a pipe must be resistant to chemicals and have a service life of at least 50 years. Plastic pipes made of polyethylene are cross-linked to improve their mechanical properties. The cross-linking of polyethylene entails the linkage of the long, loosely adjoining molecules in the polyethylene into a large three-dimensional macromolecule. Polyethylene molecules are very long chains of hydrocarbon compounds.
These chains loosely adjoin one another, the chains are not linked among themselves. Cohesion is only provided by low attractive forces. This two-dimensional structure is the reason that the polyethylene melts. If the plastic is heated, the chains begin to oscillate. As soon as the oscillations increase to the point at which the attractive forces are no longer sufficient, the plastic becomes fluid.



Unlinked PE molecules

The cross-linked macromolecule on the other hand has a three-dimensional structure. The long polyethylene chains are frictionally connected to one another by fixed connections. This molecule structure gives the cross-linked polyethylene its extraordinary properties. The three-dimensional grid doesn't allow the plastic to melt. This is why cross-linked pipes also cannot be welded.

All TECEflex pipes are electron beam cross-linked polyethylene pipes and have proven their worth for years. They fulfil the requirements of the DVGW for drinking water and gas installation and the requirements of DIN CERTCO for heating installations. A TÜV design type approval exists for use in compressed air installations. The pipes are monitored externally by recognised testing institutes and have the most important European permits and certificates.



Molecule structure of cross-linked polyethylene

TECEflex pipes are cross-linked using a high energy electron beam. This method is a purely physical process. Pipes

cross-linked via electron beam are marked with PE-Xc. The “PE” stands for the material polyethylene, the “X” for the cross-linking, the index “c” denotes the cross-linking process.

Memory effect

Cross-linked pipes have a memory effect. This means the plastic tries to return to its original geometry after being deformed. The memory effect makes it possible e.g. to repair kink points in a PE-Xc pipe with an industrial dryer. Unlinked pipes would melt. The memory effect prevents the plastic from flowing under pressure. This constitutes a significant plus in safety for connection technology. The cross-linked plastic of a PE-Xc pipe stays in place even under tension. The memory effect is what makes the O-ring free connection technology of the TECEflex system possible to begin with.

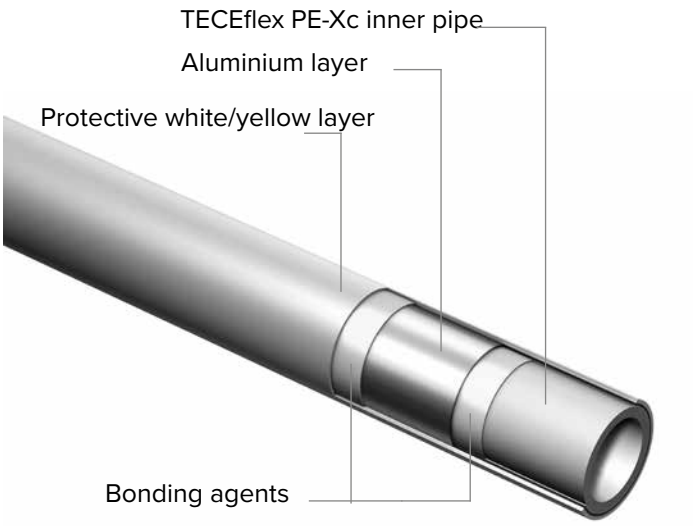
Benefits of electron beam cross-linked PE-Xc pipes

The increased mechanical load-bearing capacity gives the electron beam cross-linked TECEflex pipes the following properties:

- very good long-term behaviour in internal pressure creep rupture strength tests, even at high temperatures
- good thermal ageing stability so no damage from thermo-oxidative ageing is to be expected during proper use
- high resilience to the formation of stress fractures
- good chemical resistance, meaning also resistant to heating water additions, such as e.g. inhibitors
- can be cold-laid without heat treatment
- laying with tight bending radii
- high corrosion resistance
- smooth pipe walls, which means reduced pressure loss and reduced tendency towards encrustation
- good abrasion resistance and tear resistance
- impact-resistant at low temperatures
- no plastic creep behaviour
- suitable for any quality of drinking water as per the Drinking Water Ordinance (TrinkwV 2001)
- neutral odour and taste
- construction-site quality suitable for harsh everyday installation conditions

TECEflex composite pipe PE-Xc/Al/PE-RT

The TECEflex composite pipe is equipped with an especially strong inner pipe made of PE-Xc. This inliner alone would fulfil the requirements for pressure and temperature resilience by itself. The aluminium layer and the PE outer layer confer additional mechanical security. The TECEflex composite pipe’s special construction gives it its unique resistance to buckling so that the pipe can be bent and handled by hand without bending springs.
Only the yellow composite pipes may be used for gas installation. The pipes are marked with W/G 100. Approved for indoor gas installations up to 100 mbar.



Composition of the TECEflex composite pipe

The PE-Xc/AL/PE-RT composite pipe is a pipe with a butt-welded aluminium layer. This combination of materials reduces the thermal length change and simultaneously makes the pipe rigid and bend-resistant.

TECEflex composite pipes can be used as follows:

- in floor and flat distribution
- in cellars, rising pipes and surface-mounting
- in insulation in concealed areas
- in the connection of radiators, including from the skirting board
- as underfloor and wall heating, etc.

Delivery forms:

- Dimensions from 14–63 (14/16/20/25/32/40/50/63)
- as rolls or in rod form
- in corrugated sheath pipe or
- as pre-insulated variants
- coloured yellow for gas installation

Advantages of TECEflex composite pipe:

- universal pipe for sanitation, heating, compressed air and gas = one pipe for all application areas

TECEflex - System Description

- linear extension comparable to a metal pipe
- visually appealing white or yellow outer layer
- easy to lay because of its bend-resistant rigidity
- corrosion resistant
- resistant to heating inhibitors
- external and internal monitoring
- outstanding creep strength
- DVGW, TÜV and DIN CERTCO certified
- suitable for drinking water installations according to application class 2 and 10 bar as per ISO 10508 for hot water applications*
- suitable for heating installations according to application class 5 and 10 bar as per ISO 10508 for high temperature applications*

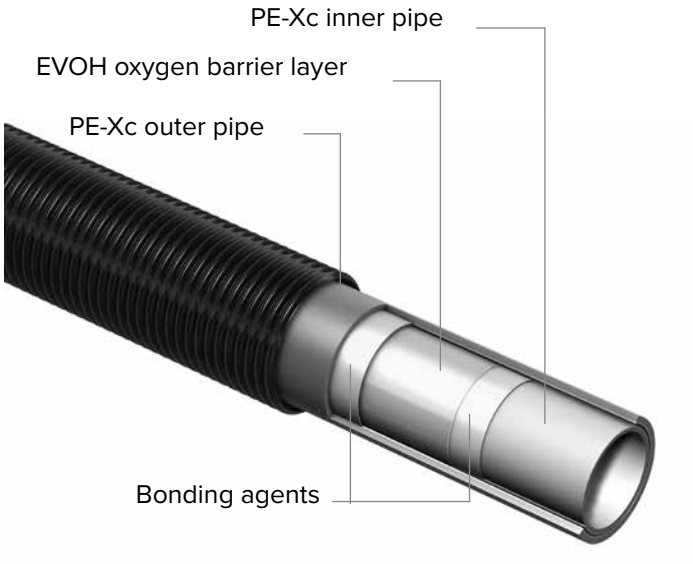
TECEflex PE-Xc 5S pipe

The TECEflex 5S all-plastic pipes are fitted with an internal diffusion block. They are therefore ideally protected against adverse construction site conditions. As a result of the position of the oxygen barrier layer in the middle of the pipe wall, the TECEflex 5S-pipes are insensitive to external humidity, such as condensation water.
The silver PE-Xc 5S pipes can be used for drinking water, heating and compressed air installations.

PE-Xc pipes have enjoyed over 25 years of use in housing technology applications. They stand out in particular on account of their high pressure, temperature and corrosion resistance. The patented TECEflex pressure sleeve technology permits connection without O-rings while allowing for large inner diameters.
The TECEflex PE-Xc 5S pipes may not be used in gas installations.

Delivery forms:
- dimension 16 and 20
- as a roll
- in black corrugated pipe sheathing

Advantages of the TECEflex 5S pipe:
- extremely flexible
- oxygen barrier layer effectively protected by five-layer technology
- oxygen tight to DIN 4726
- external and internal monitoring
- suitable for drinking water installations according to application class 2 and 10 bar as per ISO 10508 for hot water applications*
- suitable for heating installations according to application class 5 and 6 bar as per ISO 10508 for high temperature applications*



Composition of the TECEflex PE-Xc 5S pipe

TECEflex PE-MDXc 5S underfloor heating pipe

The PE-MDXc 5S underfloor heating pipe - in accordance with DIN 16894/95 - is a new development in PE-Xc pipes, featuring special characteristics for use in floor heating systems. Like a PE-Xc pipe, this pipe is designed with electron beam crosslinking, but the use of MD-PE gives the pipe increased flexibility. PE-MDXc heating pipes are designed with five-layer technology. The oxygen barrier is located in the middle of the pipe sheath, providing effective damage protection.

Field of application:
Floor heating and radiator installations

Delivery forms:
- dimension 16
- as 200 and 600 m rolls

Advantages of the TECEflex 5S pipe:
- extremely flexible
- oxygen barrier layer effectively protected by five-layer technology
- oxygen tight to DIN 4724
- external and internal monitoring
- suitable for heating installations according to application class 5 and 4 bar as per ISO 10508 for high temperature applications*

* Applications classes in accordance with ISO 10508 see pages 1-9 ff

Fittings

The TECEflex system offers fittings in three material quality grades. All fittings are suitable for TECEflex aluminium composite pipes as well as for all-plastic pipes.

Properties and features of TECEflex fittings:
- same fittings for all TECEflex composite pipes as well as TECEflex PE-Xc pipes
- no sensitive O-rings or additional sealing rings
- clear cross-section
- fittings comply with DVGW worksheet W 534
- national and international certificates

Red brass

Universal and future-proof – approved for drinking water installations.

The flow-optimised all-round fitting is dimensionally stable and resistant to erosion as well as corrosion through dezincification and stress corrosion cracking. The standardised material complies with generally accepted engineering standards and is recommended by the German Federal Environment Agency (UBA) for drinking water installations. The fitting is ideal for drinking water installations to DIN 1988/DIN EN 806, for gas installations to DVGW TRGI 2008 and TRF 2012, for heating installations and for compressed air installations.

PPSU

The low-cost alternative to metal fittings. The fitting made of high-performance plastic PPSU is corrosion-free and impact-resistant. It is equally suitable for drinking water installations to DIN 1988/DIN EN 806 and heating and compressed air installations.

Brass*

The inexpensive metallic alternative to red brass fittings made of standard brass. The fitting can be used without restriction for heating and compressed air installations and with certain limitations for drinking water installations. It is also suitable for gas installations to DVGW TRGI 2008 and TRF 2012.
The 98/83 Directive on water quality for human consumption set out by the European Community defines a maximum lead content of 0.01 mg/l. Of this, the maximum amount permitted to emanate from the drinking water installation is 0.005 mg/l.
To ensure reliable compliance with the limit value, TECE recommends using red brass, standard brass or PPSU fittings. These three materials are included on the positive list of the German Federal Environment Agency (UBA).

* Please note that some qualities of drinking water may have a corrosive effect on metals. We recommend checking the selection of the material (see technical data section of the tube and the chart on following pages).

TECEflex - System Description

Pressure sleeves

The TECEflex composite pipes and TECEflex PE-Xc pipes are pressed using various pressure sleeves.

- brass-coloured pressure sleeves for TECEflex composite pipes
- silver-coloured pressure sleeves for TECEflex PE-Xc or PE-MDXc 5S pipes

TECEflex system application limits

- suitable for drinking water installations according to application class 2 and 10 bar as per ISO 10508 for hot water applications
- suitable for heating installations according to application class 5 and 10 bar as per ISO 10508 for high temperature applications
- local legislation, standards and guidelines should be observed for gas and liquid gas installations.

The system can be operated at 95 °C for a short time but the TECEflex components may not be subjected to a temperature greater than 100 °C at any time. Open flames are not permitted. With soldered connections on copper pipe, the solder connection must be established first. With the TECEflex system pipe connection, you must wait until the fitting has cooled down.

TECEflex system pipes	Multi-layer composite pipes							
Pipe designation	PE-Xc/AL/PE							
Dimension	14	16	20	25	32	40	50	63
Delivery length – roll in m	120	100	100	50	-	-	-	-
Rods (m) (5 m/pipe)	-	100	70	45	30	15	15	5
Field of application*	HKA, FBH, DLA	TWA, HKA, FBH, DLA, GAS		TWA, HKA, DLA, GAS				
Application class/ operating pressure	2 / 10 bar 5 / 10 bar							
Colour	white	white yellow						
Outside diameter in mm	15	17	21	26	32	40	50	63
Wall thickness in mm	2.60	2.75	3.45	4.00	4.00	4.00	4.50	6.00
Inside diameter in mm	9.8	11.5	14.1	18	24	32	41	51
Available in corrugated protective pipe	yes				-			
Deliverable with insulation λ = 0.040 W/(m · K) - 6 mm - 9 mm - 13 mm	 -- -- --	 yes yes yes			 -- -- --			
Pipe weight empty in kg/m	0.11	0.14	0.21	0.30	0.40	0.53	0.80	1.29
Internal volume in dm^3/m	0.08	0.10	0.16	0.25	0.45	0.80	1.32	2.04
Pipe roughness in mm	0.007							
Thermal conductivity uninsulated in $W/(m^2K)$	0.35							
Coefficient of thermal expansion in mm/(mK)	0.026							
Minimum bending radius in mm (5 x dimension)	70	80	100 (80)**	125	160	200	250	315

* TWA - drinking water systems; HKA - radiator connection; FBH - floor heating; DLA - compressed air systems; GAS - gas installations

The classification of the application classes corresponds to the information in IS0 10508[4].

** Pipes of dimension 20 can also be bent with 4 times the dimension.

TECEflex - System Description

TECEflex system pipes	PE-MDXc 5S heating pipes in accordance with DIN 4724		PE-Xc 5S heating pipes in accordance with DIN EN ISO 15875	
Pipe designation	PE-MDXc 5S		PE-Xc	
Dimension	16	20	16	20
Delivery length – roll in m	200/600	200/600	200	120
Rods (m) (5 m/pipe)	-	-	-	-
Field of application*	FBH, HKA		FBH, HKA	
Application class/ operating pressure	5 / 4 bar		2 / 10 bar 5 / 6 bar	
Colour	mother of pearl		silver	
Outside diameter in mm	16.2	20	16	20
Wall thickness in mm	2.0	2.8	2.2	2.8
Inside diameter in mm	12	14.4	11.6	14.4
Available in corrugated protective pipe	-	-	yes	yes
Deliverable with insulation λ = 0.040 W/(m · K) - 6 mm - 9 mm - 13 mm	 -- -- --		 -- -- --	
Pipe weight empty in kg/m	0.08	0.14	0.09	0.14
Internal volume in dm^3/m	0.11	0.16	0.11	0.16
Pipe roughness in mm	0.007		0.007	
Thermal conductivity uninsulated in $W/(m^2K)$	0.35		0.35	
Coefficient of thermal expansion in mm/(mK)	0.2		0.2	
Minimum bending radius in mm (5 x dimension)	80	100	80	100

* TWA - drinking water systems; HKA - radiator connection; FBH - floor heating; DLA - compressed air systems
The classification of the application classes corresponds to the information in IS0 10508[4].

Technical pipe data TECEflex – Part 2

Operating parameters

If the operating parameters are exceeded then the pipes and connections will be overstressed. The operating parameters must therefore not be exceeded. This should be ensured using suitable safety/regulation devices (e.g. pressure regulators, safety valves or similar).

Application class	Calculation temperature T_D °C	Operating period[b] with T_D Years [a]	T_{max} °C	Operating period with T_{max} Years	T_{mal} °C	Operating period with T_{mal} Hours	Typical application area
1 [a]	60	49	80	1	95	100	Hot water supply (60 °C)
2 [a]	70	49	80	1	95	100	Hot water supply (70 °C)
3 [c]	20	0.5	50	4.5	65	100	Low-temperature floor heating
	30	20					
	40	25					
4 [b]	20	2.5	70	2.5	100	100	Floor heating and low-temperature radiator connection
	40	20					
	60	25					
5 [b]	20	14	90	1	100	100	High-temperature radiator connection
	60	25					
	80	10					

T_D = temperature the pipe system is designed for. T_{max} = maximum temperature permitted for a short time.
T_{mal} = highest possible temperature that may be reached in the event of the fault "mal" (maximum 100 hours in 50 years).

[a] A state can select either class 1 or class 2 according to its national provisions.

[b] If there is more than one operating temperature for the operating duration and the associated temperature for an application class, the corresponding operating duration times should be added. "Plus cumulative" in the table implies a temperature group for the temperature given for an operating period (e.g. the temperature group for a period of 50 years for class 5 is made up as follows: 20 °C over 14 years, followed by 60 °C over 25 years, followed by 80 °C over 10 years, followed by 90 °C over 1 year, followed by 100 °C over 100 h).

[c] Only permitted if the fault temperature cannot exceed 65 °C.

Application classes and classification of operating conditions in accordance with ISO 10508

Areas of application

Drinking water installation

Drinking water presents special requirements for an installation system. It's a consumable and must not be negatively impacted by the installation system materials. The planning and design as well as the operation of drinking water installations must be carried out in accordance with DIN 1988, DIN EN 806, DIN EN 1717/A1 and VDI 6023. The fitter has to make sure that they are installing a piping system that corresponds to the applicable recognised technical regulations. The TECEflex system is DVGW certified and proven suitable for drinking water installations. Among other things, the DVGW certification includes:

- technical inspection of the components
- KTW inspection
- Certification in accordance with worksheet DVGW W270

Field of application

The TECEflex system is suitable for all drinking water qualities in accordance with DIN 50930 Section 6, which comply with the current Drinking Water Ordinance (TrinkwV 2011), DIN 2000 and EU Council Directive 98/83/EG dated 3rd November 1998.

The following components are available for drinking water installations:

- plastic fittings made of PPSU
- flow-optimised metal fittings made of red brass
- Composite pipes with PE-Xc inliners
- All-plastic pipes made of PE-Xc

All materials are recommended by DVGW and recognised across Europe. All metallic components in the TECEflex that come into contact with water comply with the evaluation principles (as at 19/01/2016) of the German Federal Environment Agency (UBA) as per the 4MS material list (as at 05/01/2017).

Material selection

The fitter has satisfied their duty of care when they

- have presented the drinking water analysis as per DIN 50930-6 for the supply area of the building project to be constructed and have inspected the suitability of the TECEflex system,
- have satisfied themselves of the supplier's experience,
- if necessary, receive approval for TECEflex from TECE.

Measures for Legionella prophylaxis

Drinking water installations must be planned, designed and operated with special care in accordance with DIN EN 806 and DIN 1988; VDI 6023 and DVGW worksheet W551 also apply.

The risk of Legionella formation can be minimised by complying with a few simple rules:

- Unnecessary and dead pipe sections where water can stagnate should be immediately disconnected at the outlet.
- Care should be taken during installation to ensure no dirt is introduced into the piping system
- the storage water volume should be designed to be as small as possible.
- Pipes should be selected in the correct dimensions.
- Circulation pipes must not be designed to be too large.
- Circulation pipes must be hydraulically balanced.
- The temperature of the hot water boiler must be at least 60°C.
- The circulation return must not fall below 55 °C.
- The system should be rinsed particularly thoroughly during commissioning.
- No organic materials such as e.g. hemp should remain in the drinking water installation.
- Uninsulated sections of the hot water line should be avoided.
- Care should be taken to ensure the correct function and maintenance of water treatment systems and filters.
- A local hot water supply should be installed if tapping points are far away or used very rarely.
- If cold water lines are located next to hot water lines or heating pipes, they have to be insulated well, so that the cold water cannot heat up.
- Lines carrying cold water should not be laid in hollow spaces in which circulation and heating lines are located.
- For hygiene reasons, pressure tests should not be performed with water but rather oil-free compressed air or inert gas. Pressure tests with water are only permitted immediately prior to the commissioning of the installation. Only drinking water with no hygiene issues should be used for rinsing and the pressure test.

TECEflex – Areas of application

Disinfection of drinking water installations

The suitability of the TECEflex system for drinking water is confirmed by the DVGW certification. The components of the TECEflex system are made from materials recognised and valued across Europe. A drinking water installation planned, designed and operated in accordance with DIN 1988, DIN EN 806, DIN EN 1717/A1 and VDI 6023 has no hygiene issues and in principle requires no disinfection measures. Disinfection is only necessary in exceptional instances and only then to be carried out if there is an urgent requirement (contamination).

This is to be viewed as an immediate emergency measure in order to return the drinking water installation to a usable state. The cause of the microbial contamination - e.g. construction fault or incorrect operation - must be eliminated. The maintenance of the usability of the drinking water installation by repeated disinfection measures must be avoided. In such instances, remodelling works take priority over disinfection measures.
Repeated courses of disinfection have a negative impact on the service life of the installation.

A fundamental distinction is to be made between measures outside of ongoing operation (chemical disinfection) and measures in ongoing operation (thermal disinfection and continuous chemical disinfection).

Thermal disinfection

DVGW worksheet W551 prescribes a three-minute flushing of each tapping point with hot water at a minimum temperature of 70° C. It has been proven in practice that the hot water boiler should be heated to 80 °C to compensate for the temperature losses to the tapping points. Before rinsing the tapping points any existing circulation (if present) must be switched on until the circulation line reaches a minimum of 70 °C. Check that no users could scald themselves during the thermal disinfection. All drinking water installation pipes from the TECEflex system can be promptly disinfected using this method. Restriction of the service life of the TECEflex pipes cannot be ruled out where thermal disinfection is used regularly and consideration should be given to renovation of the drinking water installation.

Chemical disinfection

Chemical disinfection measures should be carried out in compliance with DVGW worksheet W 291. Care should be taken that the active ingredients, concentrations, usage periods and maximum temperatures listed here are complied with. The combination of thermal and chemical disinfection is not permitted. The water temperature during chemical disinfection must not exceed 25 °C.

The TECEflex system can be disinfected using the disinfection agents listed in DVGW worksheet W 551. The dosages must not be exceeded. It should be ensured that nobody draws drinking water during the disinfection process. Following chemical disinfection it MUST be ensured that all disinfection agent residues have been sufficiently rinsed out of the piping network. The water containing the disinfection agent must not be added to the drainage.

Prior to carrying out disinfection measures with chemical agents it should be ensured that all components of the drinking water installation are resistant to the agent. Special attention should be given to stainless steel components. The provisions of DVGW worksheet W 551 must be observed. The manufacturer of the disinfection agent must approve the suitability of the agent for use with PE-Xc pipes and red brass. The manufacturer's specifications must be observed.

The disinfectant effect of the chemical disinfection agent normally results from the oxidative effect of the contents. Regular disinfection means the materials that comprise the drinking water installation could also be attacked. Repeated courses of chemical disinfection have a significant negative impact on the service life of the TECEflex system. The total number should thus be restricted to five disinfection cycles over the total service life of the pipes. Repeated disinfection measures do not conform to the state of the technology. A disinfection measure is only warranted in order to return a drinking water installation to a usable state following contamination.

Agent	Form of delivery	Storage	General safety information *	Max. concentration	Effect duration	Maximum temperature permitted
Hydrogen peroxide H2O2	Watery solution in various concentrations	Away from light, cool, avoid all contamination	Protective gear required for solutions >5%	150 mg/l H2O2	Max. 24 h	Tmax ≤ 25 °C
Sodium hypochlorite	Watery solution with maximum 150 g/l chlorine	Away from light, cool, sealed and in a collection tray	Alkaline, irritant, poisonous, protective gear required	50 mg/l chlorine	Max. 12 h	Tmax ≤ 25 °C
Chlorine dioxide ClO2	Two components: sodium chlorite, sodium peroxide sulphate	Away from light, cool and sealed	Oxidative effect, do not inhale chlorine dioxide has, protective gear required	6 mg/l ClO2	Max. 12 h	Tmax ≤ 25 °C

* The corresponding notes in the manufacturer's safety datasheets must be observed.
** This value must not be exceeded over the total usage period at any point in the installation.

Chemical disinfections, agents and concentrations in accordance with e.g. DVGW W 557

Continuous chemical disinfection

Disinfection of a contaminated drinking water system over a constant given dose of disinfection agents is not expedient according to today's knowledge. It should therefore only be carried out in rare exceptional cases. Here it should be ensured that the requirements of the current Drinking Water Ordinance and the UBA list in accordance with Sec. 11 DWO (TVO) are met. The prescribed limit values would have to be exceeded significantly in order to achieve a relevant effect, however. Continuously added disinfection agents can have a significant effect on the service life of the drinking water installation. This kind of disinfection is advised against due to possible material deterioration. No guarantee can be made in these cases.

Heating installation

The following components are available for heating installations:

- plastic fittings made of PPSU
- Metal fittings made of brass or red brass
- Composite pipes with PE-Xc inliners
- 5S all-plastic pipes made of PE-Xc
- 5S all-plastic pipes made of PE-MDXc

All materials are oxygen tight to DIN 4724/4726.

Compressed air installation

TECEflex moulded and connection parts as well as TECEflex aluminium pipes are suitable for use in compressed air systems. The same fittings and pipes are used in compressed air installations as in drinking water and heating installations.

TECEflex is certified by TÜV Süd as a compressed air system and has the right to display the TÜV seal. This certification also includes TECEflex PPSU fittings.

System-wide connections with armatures, valves, fittings, etc. can be established using TECEflex threaded fittings. The TECEflex is suitable for compressed air with these parameters

- Nominal pressure 16 bar
- Operating pressure 12 bar and
- Maximum peak operating temperature 60° C.

The TÜV Süd certificate is available for download at www.tece.de.

TECEflex - Connection technology

Connection technology

The patented TECEflex pressure sleeve connection is a specially approved connection technique that has been tried and tested for years in sanitary and heating installation. The functional safety is i.a. evidenced by the DVGW system registration DW8501 AQ2007.

Axial pressing technology

TECEflex connections are based on axial pressing technology. Here a pressure sleeve is slid axially over an expanded pipe and the fitting. Since the fittings are inserted into an expanded pipe, they have a larger internal diameter compared to plastic pipe connector sealed with O-rings and are characterised by especially low pressure loss. The sealing effect is achieved solely by the pressing of the full pipe material surface against the fitting. This is why TECEflex fittings don't need O-rings. This thus rules out faults like the ones that occur when working with O-rings. There's no gap or clearance for water to get into and stagnate in. This is especially relevant because stagnating water represents a significant hygiene risk.

Depiction of a TECEflex connection:

1. Unpressed connections can be recognised easily due to loosely attached pressure sleeve
2. Unpressed connections become wet during the pressure test
3. Pressure sleeve at the front, connection tight! The condition of the pressing tools has no impact on the tightness of the connection.

Forced leakage

The TECEflex connection technology fulfils the requirements of DVGW worksheet W 534, paragraph 12.14 of connectors with forced leakage. This means that an unpressed TECEflex connection is easily recognisable by the water coming from it during the pressure test. Additionally, the status of the press seal is visibly clear by the pressure sleeve loosely seated on the pipe and clearly unpressed.
The controlled leakage is tested and certified by DVGW. The DVWG certificate is available for download at www.tece.de.

Installation information

The TECEflex system must be processed only with the accompanying system tools. It is not permitted to connect TECEflex components with third-party pipes or fittings. A warranty claim can only be made for the possible applications outlined in the System Description.

Connection with TECEflex manual tools

TECEflex connections up to dimension 32 can be connected using the TECEflex hand tools.

TECEflex manual tools: Expanding tool with expansion head, pipe cutting pliers, handheld crimping pliers with fork heads (from left)

The following work steps must be performed to ensure a correct TECEflex connection:

Step 1 – Shorten pipe:

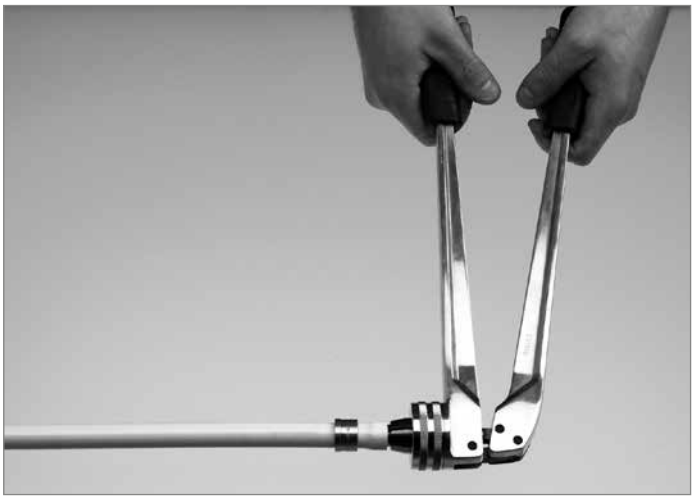
Cut the installation pipe at a right-angle with the TECE pipe cutting pliers (order no.: 8760002 or 720093). It is recommended that the plastic pipe cutters be used for dimension 32 and up (order no.: 8760008).

Note: TECEflex pipes may only be processed using cutting tools in perfect condition.The cutters in particular must be sharp and free of burrs otherwise the installation pipe could be damaged during expansion.

Step 2 - Slide on pressure sleeve:

Slide the TECEflex pressure sleeve over the end of the pipe. Here the flat side of the collet (without outer ring) must face the fitting.

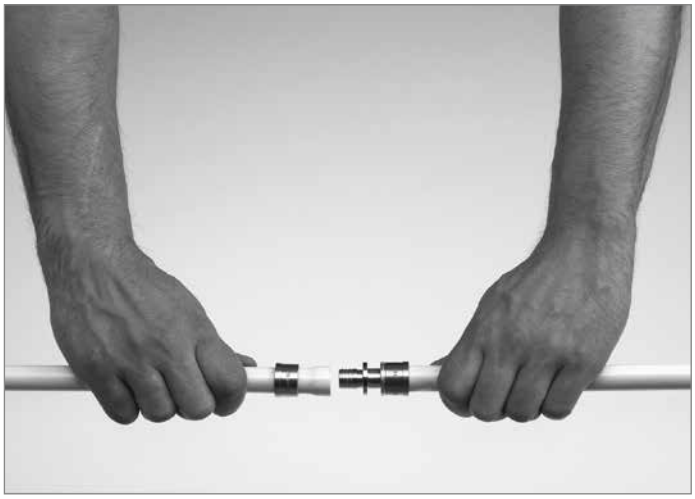
Step 3 – Expand pipe:



Select the expansion head to match the dimension of the pipe and screw on the expanding tool (order no.: 720056). Slide the end of the pipe onto the expansion head up to the stopper and expand.
The TECEflex composite pipes may only be expanded once!

TECEflex - Installation information

Step 4 – Slide on pipe:

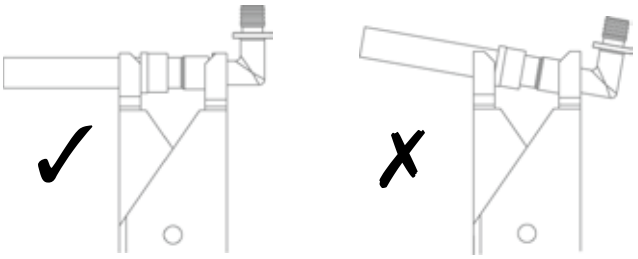


The TECEflex installation pipe must be slid onto the fitting up to the last saw tooth. The pipe does not need to be pushed up to the stopper, the appropriate depth is already set by the expansion. It is not necessary to mark the insertion depth.

Step 5 – Create connection:

Select the fork heads labelled with the pipe dimension and attach them to the handheld crimping pliers using the bolt (order no.: 720050). Push the pressure sleeve towards the end of the pipe by hand as far as it will go, insert the fitting and sleeve into the fork heads. Squeeze the handheld crimping pliers repeatedly to press the pressure sleeve up to the fitting. A remaining gap of approx. 0.5 mm between the fitting and the sleeve is specific to the production and insignificant. The connection is even then perfect if the pipe is not slid up to the pressing collar of the fitting.

Note: Pay attention to the correct positioning of the pressing tool when pressing.The fitting must be seated in the pressing tool fully and a right-angle to avoid damage to the fitting collar.



Pressing: Correct position (on left) – Incorrect position (on right)

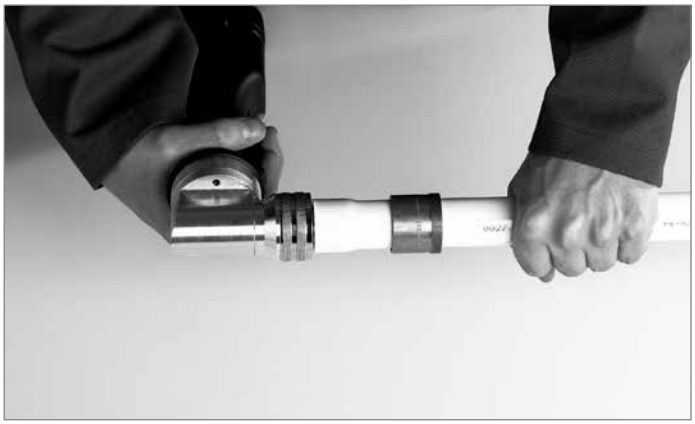
Connection with RazFaz battery-powered tool

The RazFaz tools - one pressing tool and one expansion tool - let you create TECEflex connections up to dimension 32. The light and handy battery-powered tools enable rational working even in narrow mounting situations or pressing directly on the wall.

TECEflex RazFaz battery-operated tools: Expansion tool with expansion heads and pressing tool with pressing forks

The working steps required for a correct connection correspond to the process for “Connection with TECEflex manual tools” (see previous section). Only the expansion (step 3) and pressing (step 5) are carried out with the RazFaz tools.

Step 3 – Expand pipe:



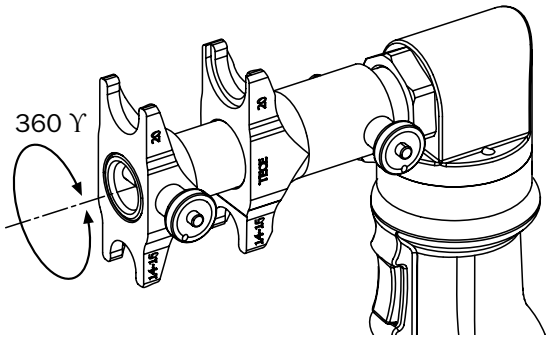
Select the expansion head matching the pipe dimension and screw it onto the RazFaz expansion tool. Now slide the expansion head into the pipe up to the stopper and carry

out the expansion with the pressing tool. The tool must be held right in front of the end of the pipe.

The tool has a final check, which means that the expansion process has to be performed as long as it takes until the expansion head automatically returns to the starting position.

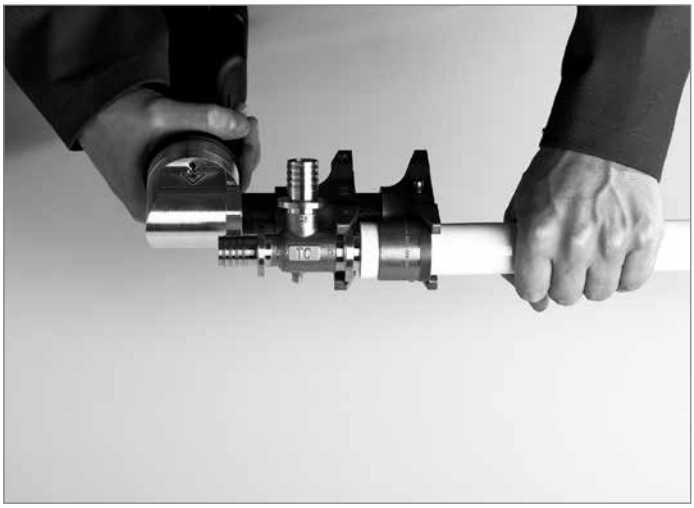
Step 5 – Create connection:

Slide the matching pressing forks onto the pressing tool and lock in with the safety pins. The forks are designed for two dimensions each (14/16–20 and 25–32) and come with seamless 360° rotation.



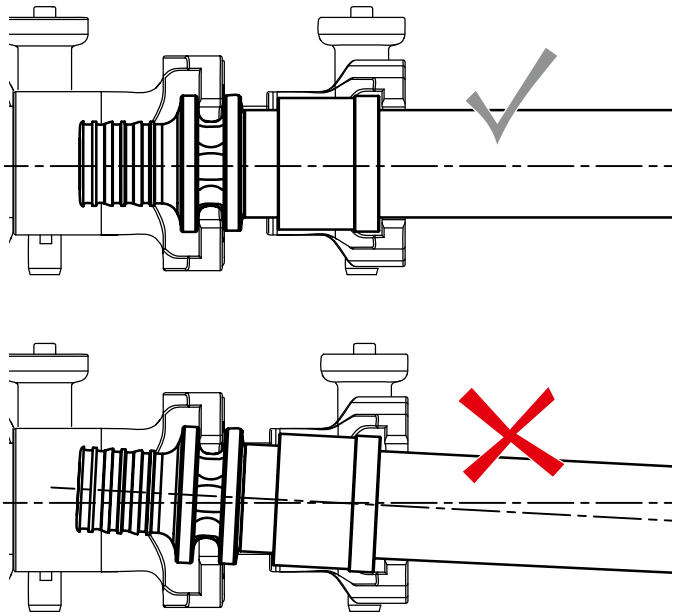
Slide the pressure sleep up to the end of the pipe as far as possible and place the pressing forks straight on the fitting.

Squeeze the pressing tool to slide the pressure sleeve up to the fitting.



The pressing tool also has a final check, which means that the pressing process has to be performed as long as it takes until the pressing forks automatically return to the starting position.

Special care should be taken when pressing PPSU fittings. The pressing forks must always be seated correctly. The tool must not be used diagonally.



The RazFaz tools are high-quality and technically sophisticated hydraulic units. The quality of the TECEflex connection does not depend on the maintenance status of the RazFaz devices. It is still recommended, however, that the devices are maintained on a regular basis. You can find a service address at:

Novopress GmbH & Co. KG
Scharnhorststraße 1
41460 Neuss
Germany

info@novopress.de

TECEflex - Installation information

Connection with pressing tool PMA

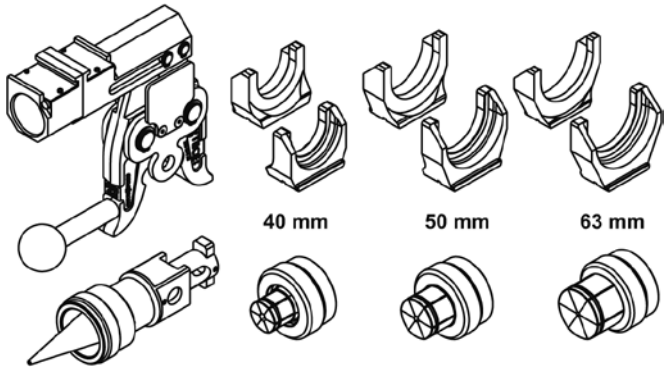
The TECEflex tools for working with dimensions 40–63 require a drive in the form of a commercial pressing machine with a pressing force of at least 32 kN, whereby the pressing force **may not exceed 34 kN**. Damage to the tool cannot be ruled out where higher pressing forces are applied.

TECE recommends the following pressing machines:

Manufacturer (system operator)	Machine type
KLAUKE (Uponor)	UAP1 (UP63, UP75); UAP2 UAP3L; UAP4L UNP2 HPU2 UP2EL (UP50EL) UP2EL14 (UP50EL)
NOVOPRESS (Mapress) (Geberit)	EFP 2 EFP; ECO1; ACO1 ACO 201; ECO 201 ACO 202; ECO 202 AFP 202; EFP 202
NUSSBAUM (Viega)	Type 1; Type 2 Type 3; Type 4 Type 5; Type 5a Presshandy (battery) Picco
REMS/ROLLER	Battery press
ROTHENBERGER	Romax Pressliner (Eco) Romax 3000 Romax AC Eco
GEBERIT	PWH 75

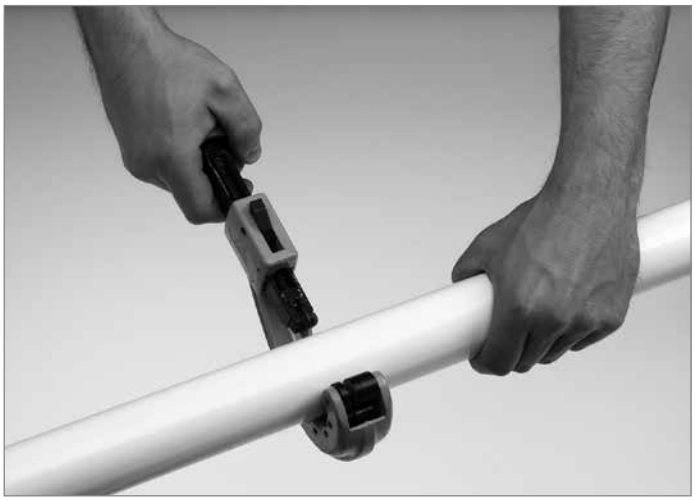
In the event that a pressing machine cannot be found in the list below, approval should be sought from TECE.

Note: A connection is correctly pressed when the pressure sleeve is slid up to the fitting.The guarantee for the press connection therefore does not depend on the status of the pressing tool - the position of the pressure sleeve is the crucial factor.
Please read the manufacturer's safety information for the pressing machine and the TECEflex tools before use and observe these during use.



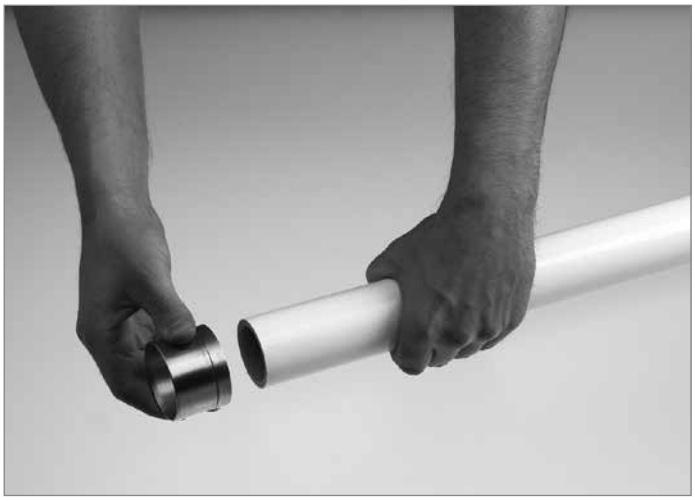
Pressing tool PMA 40 63 TECEflex

The working steps required to form a connection - using the toolset - are analogous to those for using the handheld pressing tools.



The pipe is disconnected with a pipe cutter (order no. 8760008). The pipe cutter is fitted with a special plastic pipe cutting wheel.

Note: TECEflex pipes may only be processed using cutting tools in perfect condition.The cutters in particular must be sharp and free of burrs otherwise the installation pipe could be damaged during expansion.



In the second step, the TECEflex pressure sleeve is slid over the end of the pipe. Here the flat side of the collet (without outer ring) must face the fitting.

Note: Only perform tool changes on an unpowered pressing machine!

Select the expansion tool matching the dimension, insert it into the pressing machine and lock in with the safety bolt. Slide the end of the pipe onto the expansion head up to the stopper and perform the expansion at the pressing machine. The tool must be held straight and right in front of the end of the pipe.

The pipe must be slid onto the fitting up to the last saw tooth. The pipe does not need to be pushed up to the stopper, the appropriate depth is already set by the expansion.

The connection is created in the next step: Insert the pressing machine attachment PMA - with the pressing forks to match the pipe dimension - into the recess on the pressing machine and lock into the place with the safety bolts.

Push the pressure sleeve towards the end of the pipe by hand as far as it will go, insert the fitting and place the pressure sleeve straight between the fork heads. The base body of the sliding jaw must point parallel to the pipe. Squeeze the pressing machine to press the pressure sleeve up to the fitting. A remaining gap of approx. 0.5 mm between the fitting and the sleeve is specific to the production and insignificant.

Reuse of pressed fittings

TECEflex fittings that are already pressed can be reused. The fittings can simply be removed from the pipe by heating the connection up to approx. 180 °C with a hot air dryer.

Please remember the following:

- Only metallic moulded and connection parts can be reused (not PPSU fittings).
- The fitting to be reused must be completed disconnected from the piping system so that the existing installation is not exposed to temperatures above 110 °C.
  If fittings have multiple outlets (e.g. tees or elbows), all connections must be removed.
- The pressure sleeves may not be reused.
- Allow the fitting to cool down sufficiently.
- Never heat with an open flame!
- Never remove the heated pipe end from the connector with bare hands - always use pliers!

TECEflex - Installation Guidelines

Installation Guidelines

For the installation of heating, drinking water, compressed air and gas installations, the applicable technical rulings, standards and provisions should be observed. Installations must only be carried out by specialist companies.

General notes

The following information should be considered when using TECEflex pipes.

Threaded connections

For threaded connections TECE recommends the use of hemp combined with a sealant paste approved for this purpose. Using too much hemp can cause damage to the internal and external threaded components. Care should be taken to ensure no hemp residue remains in the pipe system. If other thread sealants are used, the warranty must be assumed by the sealant manufacturer.

Processing temperatures

The TECEflex system can be handled down to a minimum temperature of 0 °C. With lower temperatures, the ends of the pipe should be warmed up until “lukewarm”. The use of open flames is also prohibited!

Coating of fittings

TECEflex fittings must be fundamentally protected from contact with the wall structure, plasterboard, cement, screed, rapid binders or similar using suitable coverings. Direct contact with the structural shell must be avoided at all costs owing to the sound insulation requirements in accordance with DIN 4109 and VDI 4100.

Kinks and deformities

If a TECEflex pipe develops a kink or deformation due to incorrect handling or unfavourable construction site conditions then the site of the deformation must be repaired or an elbow fitting equipped for tight radii.

Use with poured asphalt

The high temperatures than can occur with the application of poured asphalt (approx. 250 °C) would destroy the pipeline immediately on direct contact. This also applies to the use of pipe-in-pipe systems. Suitable protection measures should therefore be taken. The pipe-in-pipe lines installed on the bare concrete are sufficiently protected against burning when the insulating fibreboards used during work with poured asphalt are laid over the pipes before the asphalt is applied. What is particularly critical is not the open floor areas, however, but the locations at which the lines are guided from the bare concrete into the wall structure. Here the lines are optimally protected when the edge insulation strips are laid in front of the lines so that they maintain a certain distance and the space around the lines can be filled in with sand. These protective measures should be checked once again before the poured asphalt is actually applied in order to avoid irreparable damage to the piping system. During the application of the asphalt the pipes should be flushed with cold water.

Avoidance of air pockets

Pipes must be laid such that no air pockets can form. At the deepest point in the system there must also be a facility for draining the pipeline.

Protection against UV radiation

UV radiation damages the TECEflex pipes over longer periods of time. The pipe packaging offers sufficient protection against UV radiation but is not weather-proof. The pipes should therefore not be stored out in the open. The pipes should not be exposed to sunlight for unnecessary amounts of time. They should be protected against UV light where necessary. TECEflex pipes laid in the open must be protected against sunlight in a black corrugated pipe.

Identification of pipelines

TECE recommends identifying installation pipes in accordance with DIN 2403.

Installing TECEflex in soil

Pipes from TECEflex can be installed in soil under the following conditions:

- The pipelines must be installed in a sand bed.
- The pipelines must be covered in enough fine-grained sand that there is no risk of damage to the pipe from the later application of the filling material.
- Pipelines laid in soil must not be affected by traffic loads.
- The fittings and the pressure sleeves must be protected from direct contact with soil using suitable anti-corrosion agents.
- Wall bushings in soil must be suitable for plastic piping and the pipe secured against removal. They must be installed according to the applicable technical rulings and provisions.

Installation on bitumen sheets

TECEflex pipes must be completely dried before laying these on bitumen sheets or coatings containing solvents. The manufacturer's setting times should be observed.

Arrangement of pipelines

If cold and hot water pipes are laid on top of one another, the pipes carrying hot water must be laid above the cold water line.

Contact with solvents

Direct contact between TECEflex components and solvents or solvent-based paints, dyes, sprays, adhesive strips, etc. should be avoided. Solvents can erode the plastic components in the system.

Potential equalisation

TECEflex composite pipes may not be used as earthing conductors for electrical systems in accordance with VDE 0100.
This means metal pipe installations exchanged in part for a pipe from the TECEflex range (e.g. during renovations) should be checked for correct earthing.

Protection against frost

Filled TECEflex pipes should be protected against frost. The TECEflex system is suitable for the following frost protection agents and concentrations:

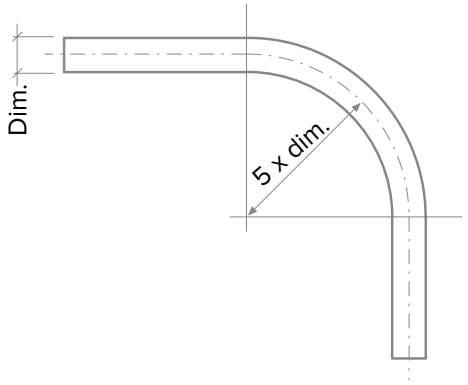
- Ethyl glycol (Antifrogen N): May be used up to a concentration of maximum 50%. TECE recommends restricting the concentration to 35%. A concentration of 50 % Antifrogen N corresponds to frost protection down to a temperature of -38 °C. A concentration of 35 % Antifrogen N corresponds to frost protection down to -22 °C. If Antifrogen N is dosed above 50%, the frost protection effect is reversed. Slurry ice formed at temperatures below -25 °C.
- Propylene glycol: May be used up to a concentration of maximum 25%. Propylene glycol is primarily used in the foodstuffs industry. A concentration of 25% corresponds to frost protection down to -10 °C. Overdosing with propylene glycol can lead to stress fractures in the pipe material.

Heat tracings

Heat tracings as well as self-regulating heater bands approved by manufacturers for plastic piping systems can be used for TECEflex. To ensure optimum heat transfer the heating bands are attached to the TECEflex installation pipe across their full surface using broad aluminium adhesive strips. The manufacturer's instructions should be followed.

Bending radii

The TECEflex composite pipes can be bent in the neutral line with a minimal bending radius - corresponding to 5x the dimension of the pipe.



Minimal bending radius of TECEflex composite pipes

Note:
No pressings may be used near the bend. In addition, a bend should be made before the pressing that lies directly on the fitting.

TECEflex composite pipes can be bent by hand up to dimension 20. Bending springs are not required. Commercial bending tools can be used from dimension 25.

TECEflex pipe dimension	Minimum bending radius in mm
14	70
16	80
20	100 (80)*
25	125
32	160
40	200
50	250
63	315

Bending radii of TECEflex composite pipes

* Pipes of dimension 20 can also be bent with 4 times the dimension.

Thermal length changes

Materials expand when heated and contract when cooling down. The systemic, huge temperature differences mean that the lines in hot water and heating installations must be attached such that the length extension in elbows or special compensating elbows can be balanced out.

Detecting thermal length changes

Thermal length changes are detected using the following formula:

$\Delta l = \alpha \cdot l \cdot \Delta t$

Δl thermal length change of the pipe in mm
α expansion coefficient of the TECEflex pipes
l starting length of the pipe in m
Δt temperature difference in K*

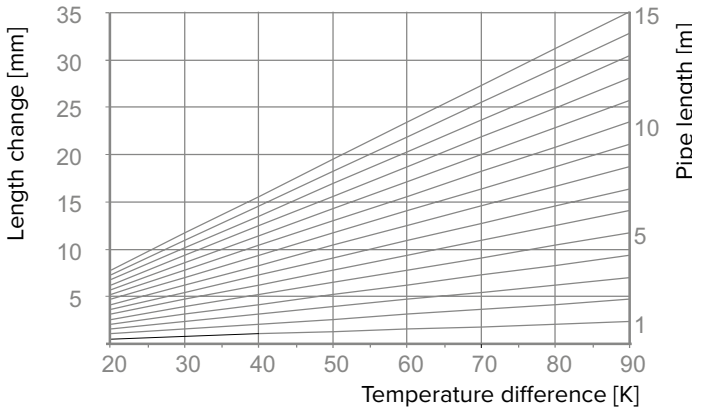
* K = Kelvin is the SI base unit of temperature and relates to absolute zero.
(0 °C = 273.16 K)

Extension coefficient of the TECEflex pipes:
Composite pipes α = 0.026 mm/(mK)
PE-Xc pipes α = 0.2 mm/(mK)

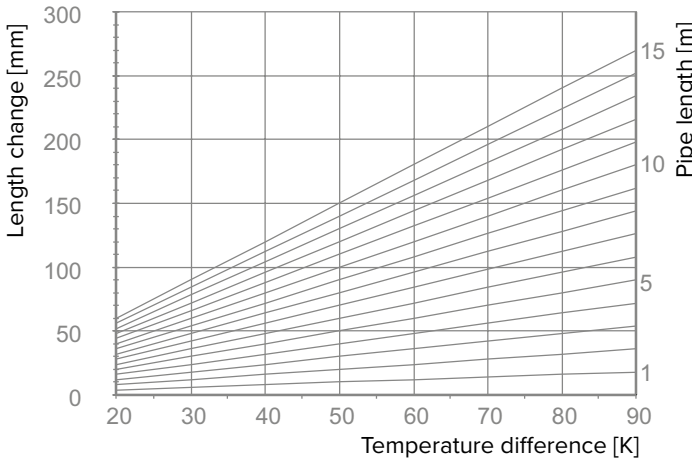
Example: A 12 metre-long TECEflex gas line made of composite pipe is installed at 5 °C in winter.Operating conditions can lead to a temperature of 35 °C.

l 12 m
Δt 35 K - 5 K = 30 K
α 0.026 mm/(mK)
Δl = 0.026 mm/(mK) · 12 m · 30 K = 9.36 mm

Result: The pipe will expand by approx. 10 mm. The expansion must be compensated for via structural conditions. Alternatively, the thermal length extension can be found in the following diagrams.



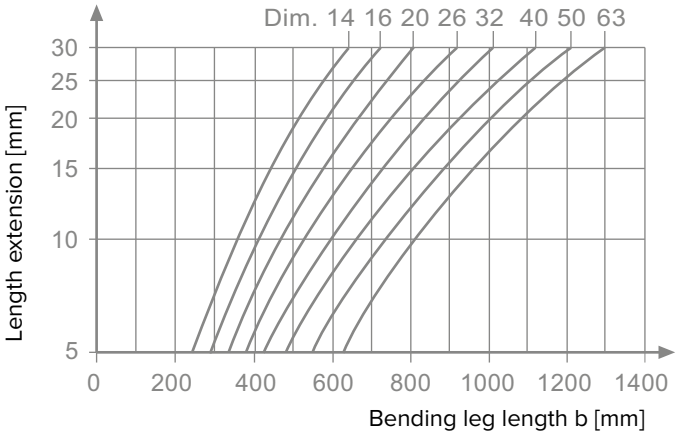
Thermal length extension TECEflex composite pipes



Thermal length extension TECEflex PE-Xc or PE-MD-Xc pipes

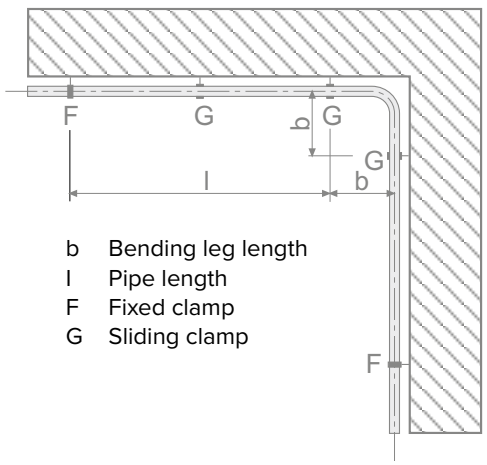
Determining the length of the bending leg

The bending leg length (b) can be found in the following diagram:



Bending leg length for TECEflex pipes

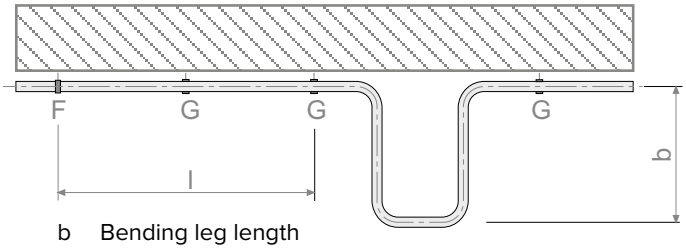
The pipe lengths to be observed can be isolated using fixed and sliding clamps. The length extension in compressed air and gas installations can normally be compensated by pipe design with direction changes.



b Bending leg length
l Pipe length
F Fixed clamp
G Sliding clamp

Compensation of thermal linear extension in a direction change

It can happen that the planned pipe design does not offer sufficient room for movement for the inclusion of thermal linear extension. In this case, compensating bends should be included in the plan that take into account the bending leg lengths.



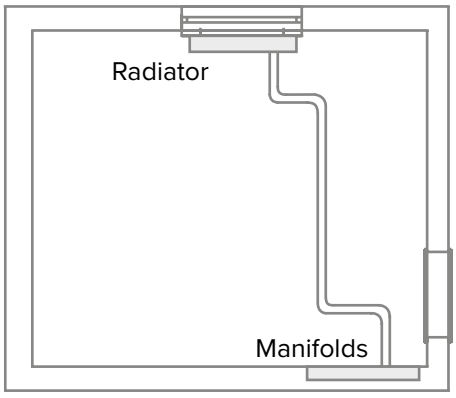
b Bending leg length
l Pipe length
F Fixed clamp
G Sliding clamp

Compensation of thermal linear extension in an extension loop

Example:
The pipe length extension in the aforementioned example is approx. 10 mm. The bending leg length b can be found in the aforementioned diagram. For a TECEflex pipe with a dimension of 20 mm this results in a value of 470 mm. If a sliding clamp of at least 470 mm is fitted to the elbow then no additional compensating elbow is required.

Special installation notes for linear extension

- Only TECEflex composite piping is approved for skirting board systems.
- Take care to ensure sufficient “room to manoeuvre” when connection radiators from the floor or wall in order to include linear extension.
- The connection should always be guided to the radiators in an elbow design.
- PPSU fittings should be installed tension-free. If necessary, suitable attachments should arranged to decouple the PPSU fittings from the influence of the length extension.



Example installation taking into account linear extension

Attaching conduit

TECEflex pipelines are only to be attached using the approved pipe clips for the relevant purpose. Commercially available wall plugs can be used to attach clamps as long as they are used on components with sufficient mechanical stability. The TECEflex pipelines may not be attached to other lines.

Attaching gas lines

Pipe holders made of combustible materials are approved for use with TECEflex gas lines. Commercially available wall plugs can be used to attach clamps as long as they are used on components with sufficient mechanical stability. The TECEflex gas lines may not be attached to other lines. Other lines may also not be attached to gas lines.

Routing of water-bearing TECEflex lines

The routing of TECEflex installation lines must comply with the recognised rules of engineering. The quality of the drinking water must not be negatively affected by the conduit. To prevent the multiplication of microorganisms, the routing and insulation should be selected so that the drinking water is not heated. The cold drinking water pipes - in shafts and pre-walls in particular - should be checked to see if they require additional insulation for hygiene reasons. The drinking water may not be heated above 25 °C.

TECEflex lines on plaster

The type and spacing of the attachment depend on the construction conditions on site. The fixing of the pipelines should be carried out using static perspectives taking into consideration the filled and insulated pipes according to the recognised rules of the technology.

TECEflex pipe dimension	Attachment spacing in m
14	1
16	1
20	1.15
25	1.3
32	1.5
40	1.8
50	2
63	2

Attachment distances for TECEflex lines installed on plaster.

TECEflex - Installation Guidelines

TECEflex dimension	Pipe weight filled in kg/m
14	0.19
16	0.24
20	0.37
25	0.55
32	0.85
40	1.33
50	2.12
63	3.33

TECEflex pipe masses

The pipes should be laid so that they cannot be affected by moisture from other fittings such as drips or condensation.

Concealed TECEflex lines

Depending on the wall composition or quality of the masonry, the thermal length extension of a concealed TECEflex composite pipe can cause damage to the wall. TECE therefore recommends that all concealed TECEflex composite pipes be fitted with pipe insulation. The pre-insulated TECEflex pipes fulfil this requirement.

Alternatively, if no thermal insulation is required, the composite pipes can be laid in corrugated pipe sheathing. These pipes are also part of the TECEflex range.
TECEflex fittings must be fundamentally protected from contact with the wall structure, plasterboard, cement, screed, rapid binders or similar using suitable coverings. Direct contact with the structural shell must be avoided at all costs owing to the sound insulation requirements in accordance with DIN 4109 and VDI 4100.

TECEflex lines in concrete or screed

The pipes are solidly enclosed by concrete or screed so that the linear extension of the pipe material occurs on the inside. Special measures to include thermal linear extension are unnecessary in this instance. If the pipes are laid in the insulation layer between concrete and screed, however, they should be arranged so that the expected linear extension is compensated by the insulation or a pipe guide laid inside the elbow.
Heat insulation and impact sound requirements must be met. The corresponding standards and guidelines must be adhered to. It is therefore advisable to install the TECEflex pipes in a suitable levelling course. The additional installation height must be considered during planning. The fittings must be protected against corrosion.

TECEflex pipes installed on bare floor surfaces or in concrete ceilings should be attached at a maximum distance of one metre. It should be ensured that the TECEflex pipes installed on bare floor surfaces are not damaged by ladders, equipment, wheelbarrows, constant impacts or similar. The pipelines must be inspected immediately before the screed is laid.

TECEflex lines guided through movement joints

If pipelines are guided through building expansion joints, these must be laid in corrugated pipe sheathing. The corrugated pipe sheathing must sit at least 25 cm above the movement joint on all sides. Thermal insulation with a wall thickness of at least 6 mm may be used as an alternative to corrugated sheath piping.

Piperun in floor structures

For planning and laying of pipes in floor structures, the screed trade has described in the guideline titled “Pipes, cable and cable channels on unfinished floors” how piperuns have to be carried out: “Pipelines in the floor assembly must be installed free of junctions, in straight lines as well as axially parallel and parallel to the wall. Even as early as the planning stage heating and drinking water lines should already take priority over electrical lines and conduits should be removed.”

- The pipelines in a pipe route must be grouped together as tightly as possible.
  Caution: The installation should be performed so that cold water lines are not heated over 25 °C if warm pipes are laid directly beside cold drinking water lines.
- The pipe route containing lines laid in parallel inclusive of pipe insulation may be a maximum of 30 cm wide.
- The space between the individual lines should adhere to a minimum distance of 20 cm. The minimum distance of a line to a wall is 20 cm.
- The dimensions given above should be adhered to as closely as possible next to manifold housings.
- Around the door the distance from the door jamb should be a minimum of 10 cm.

Pipes of different thicknesses or other fittings within the line must be balanced to create an even surface for the impact sound insulation.

Sound insulation

The noise behaviour of a drinking water heating installation in relation to the building structure should be taken into consideration during the planning and implementation.

The requirements for sound insulation are governed by local legislation, standards and guidelines.

Sound-insulated installation of the TECEflex system

For water-bearing pipelines, special attention should be paid to structure-borne noise. The installation therefore has to be mounted so as to be decoupled from the building structure:

- Use of pipe attachments that insulate against structure-borne noise.
- Pipes passed through screed or in walls must be equipped with at least 9 mm of insulation. The TECEflex range offers appropriately pre-insulated pipes. Corrugated sheath pipes as coverings do not offer sufficient sound insulation.
- Dry-wall pre-wall installations such as TECEprofil, for example, offer better sound insulation for sanitary items mounted directed on the wall because they are decoupled from the building structure.
- Drinking water and heating installations must only be installed on correspondingly solid walls with a weight of at least 220 kg/m^2.
- The resting pressure should not exceed 5 bar.
- The permitted through-flow values of fittings should be adhered to.
- Water-bearing pipes should not - if possible - be installed on walls connected to rooms requiring protection.

Fire protection

The corresponding local laws, standards and guidelines on fire protection as well as the generally recognised state of the art should be observed and adhered to during the installation.

TECElogo - Planning and design

Dimensioning of drinking water systems

The planning and installation of drinking water systems are governed by local legislation, standards and guidelines.

Hygiene requirements

A drinking water installation must ensure that the water at the tapping point meets the requirements of the Drinking Water Ordinance. All metal fittings intended for use with drinking water are only composed of materials that comply with the UBA's metal evaluation principles (as at 17/03/2017) or the 4MS materials list (as at 05/01/2017). The biological and chemical suitability of the TECEflex system is confirmed by the DVGW certification and additional European approvals. The technical measures to be taken to reduce the growth of Legionella as well as the planning, operation and restoration of drinking water systems are described in the DVGW worksheet W 551. Among others, the following points should be considered during the planning:

Hydraulic design

Dimensioning and planning of drinking water lines with TECEflex is based on local legislation, standards and guidelines. The necessary product-specific information can be found in the following figures and tables.

TECEflex - Planning and application

Loss coefficient of TECEflex fittings

Fitting	Version	Zeta value	Equivalent pipe length (m)
Transition connector	14 mm x ½“	0.8	0.2
Coupling	14 mm	1	0.3
Angle	14 mm	4	1.1
Tee TT	14 mm	0.8	0.2
Tee OT	14 mm	4	1.1
Transition connector	16 mm x ½“	1	0.3
Coupling	16 mm	0.5	0.2
Angle	16 mm	3.2	1.3
Elbow	16 mm	1.1	1.3
Tee TT	16 mm	0.8	0.3
Tee OT	16 mm	3.6	1.5
Transition connector	20 mm x ¾“	1.7	0.6
Coupling	20 mm	0.9	0.5
Angle	20 mm	4.3	2.4
Elbow	20 mm	1.9	2.4
Tee TT	20 mm	1.1	0.6
Tee OT	20 mm	4.7	2.6
Transition connector	25 mm x ¾“	0.8	0.4
Coupling	25 mm	0.3	0.2
Angle	25 mm	2.3	1.7
Elbow	25 mm	1.1	1.7
Tee TT	25 mm	0.6	0.4
Tee OT	25 mm	2.6	1.9
Transition connector	32 mm x 1"	0.5	0.3
Coupling	32 mm	0.2	0.2
Angle	32 mm	2.4	2.5
Elbow	32 mm	0.6	2.5
Tee TT	32 mm	0.3	0.3
Tee OT	32 mm	2.5	2.6
Transition connector	40 mm x 1¼“	0.4	0.4
Coupling	40 mm	0.2	0.2
Angle	40 mm	2.1	2
Elbow	40 mm	0.6	2
Tee TT	40 mm	0.3	0.3
Tee OT	40 mm	2.2	2.2
Transition connector	50 mm x 1½“	0.4	0.5
Coupling	50 mm	0.1	0.2
Angle	50 mm	1.8	2.3
Elbow	50 mm	0.5	2.3
Tee TT	50 mm	0.2	2.3
Tee OT	50 mm	1.9	2.5
Transition connector	63 mm x 2"	0.3	0.6
Coupling	63 mm	0.1	0.2
Angle	63 mm	2.2	3.7
Elbow	63 mm	0.6	3.7
Tee TT	63 mm	0.5	0.8
Tee OT	63 mm	2.2	3.7

Pressure loss tables in the drinking water installation – Dimensions 14/16/20/25 mm

TECEflex composite pipes – Pressure losses due to pipe friction for drinking water lines												
Water speed	Dim. 14			Dim. 16			Dim. 20			Dim. 25		
	V	m	R	V	m	R	V	m	R	V	m	R
			hPa/m			hPa/m			hPa/m			hPa/m
m/s	l/s	kg/h	mbar/m	l/s	kg/h	mbar/m	l/s	kg/h	mbar/m	l/s	kg/h	mbar/m
0.1	0.008	28.3	0.4	0.011	38.0	0.3	0.016	58.6	0.2	0.025	91.6	0.1
0.2	0.012	42.4	0.6	0.016	57.1	0.5	0.024	87.9	0.3	0.038	137.4	0.2
0.2	0.016	56.5	0.8	0.021	76.1	0.6	0.033	117.3	0.4	0.051	183.2	0.5
0.3	0.020	70.7	1.0	0.026	95.1	0.8	0.041	146.6	1.0	0.064	229.0	0.7
0.3	0.024	84.8	1.3	0.032	114.1	1.8	0.049	175.9	1.3	0.076	274.8	1.0
0.4	0.027	99.0	2.8	0.037	133.2	2.3	0.057	205.2	1.7	0.089	320.6	1.3
0.4	0.031	113.1	3.5	0.042	152.2	2.9	0.065	234.5	2.2	0.102	366.4	1.6
0.5	0.035	127.2	4.3	0.048	171.2	3.5	0.073	263.8	2.7	0.115	412.2	2.0
0.5	0.039	141.4	5.1	0.053	190.2	4.2	0.081	293.1	3.2	0.127	458.0	2.4
0.6	0.043	155.5	6.1	0.058	209.3	5.0	0.090	322.5	3.8	0.140	503.8	2.8
0.6	0.047	169.6	7.0	0.063	228.3	5.8	0.098	351.8	4.4	0.153	549.7	3.3
0.7	0.051	183.8	8.1	0.069	247.3	6.7	0.106	381.1	5.1	0.165	595.5	3.8
0.7	0.055	197.9	9.2	0.074	266.3	7.6	0.114	410.4	5.7	0.178	641.3	4.3
0.8	0.059	212.1	10.3	0.079	285.3	8.5	0.122	439.7	6.5	0.191	687.1	4.9
0.8	0.063	226.2	11.6	0.085	304.4	9.6	0.130	469.0	7.3	0.204	732.9	5.5
0.9	0.067	240.3	12.9	0.090	323.4	10.6	0.138	498.4	8.1	0.216	778.7	6.1
0.9	0.071	254.5	14.2	0.095	342.4	11.7	0.147	527.7	8.9	0.229	824.5	6.7
1.0	0.075	268.6	15.6	0.100	361.4	12.9	0.155	557.0	9.8	0.242	870.3	7.4
1.0	0.079	282.7	17.1	0.106	380.5	14.1	0.163	586.3	10.7	0.254	916.1	8.1
1.1	0.082	296.9	18.6	0.111	399.5	15.4	0.171	615.6	11.7	0.267	961.9	8.8
1.2	0.094	339.3	23.5	0.127	456.6	19.4	0.195	703.6	14.8	0.305	1099.3	11.2
1.3	0.102	367.6	27.0	0.137	494.6	22.4	0.212	762.2	17.0	0.331	1190.9	12.9
1.4	0.113	405.3	32.1	0.151	545.3	26.6	0.233	840.4	20.2	0.365	1313.1	15.3
1.5	0.118	424.1	34.8	0.159	570.7	28.8	0.244	879.4	21.9	0.382	1374.1	16.6
1.6	0.126	452.4	39.0	0.169	608.7	32.3	0.261	938.1	24.6	0.407	1465.7	18.6
1.7	0.134	480.7	43.4	0.180	646.8	36.0	0.277	996.7	27.4	0.433	1557.4	20.7
1.8	0.141	508.9	48.0	0.190	684.8	39.8	0.293	1055.3	30.3	0.458	1649.0	23.0
1.9	0.149	537.2	52.9	0.201	722.9	43.8	0.309	1114.0	33.4	0.483	1740.6	25.3
2.0	0.157	565.5	57.9	0.211	760.9	48.0	0.326	1172.6	36.6	0.509	1832.2	27.7
2.1	0.165	593.8	63.2	0.222	799.0	52.4	0.342	1231.2	40.0	0.534	1923.8	30.3
2.2	0.173	622.0	68.6	0.233	837.0	56.9	0.358	1289.9	43.4	0.560	2015.4	32.9
2.3	0.181	650.3	74.3	0.243	875.1	61.7	0.375	1348.5	47.0	0.585	2107.0	35.6
2.4	0.188	678.6	80.2	0.254	913.1	66.5	0.391	1407.1	50.8	0.611	2198.6	38.5
2.5	0.196	706.9	86.3	0.264	951.1	71.6	0.407	1465.7	54.6	0.636	2290.2	41.4
2.6	0.204	735.1		0.275	989.2		0.423	1524.4		0.662	2381.8	44.4
2.7	0.212	763.4		0.285	1027.2		0.440	1583.0		0.687	2473.4	47.5
2.8	0.220	791.7		0.296	1065.3		0.456	1641.6		0.713	2565.0	50.8
2.9	0.228	820.0		0.306	1103.3		0.472	1700.3		0.738	2656.7	54.1
3.0	0.236	848.2		0.317	1141.4		0.489	1758.9		0.763	2748.3	57.5
3.6	0.283	1017.9		0.380	1369.7		0.586	2110.7		0.916	3297.9	80.1
4.0	0.314	1131.0		0.423	1521.8		0.651	2345.2		1.018	3664.4	97.1
4.6	0.361	1300.6		0.486	1750.1		0.749	2697.0		1.171	4214.0	125.3
5.0	0.393	1413.7		0.528	1902.3		0.814	2931.5		1.272	4580.4	146.0

TECEflex - Planning and application

Pressure loss tables in the drinking water installation – Dimensions 32/40/50/63 mm

TECEflex composite pipes – Pressure losses due to pipe friction for drinking water lines												
Water speed	Dim. 32			Dim. 40			Dim. 50			Dim. 63		
	V	m	R	V	m	R	V	m	R	V	m	R
			hPa/m			hPa/m			hPa/m			hPa/m
m/s	l/s	kg/h	mbar/m	l/s	kg/h	mbar/m	l/s	kg/h	mbar/m	l/s	kg/h	mbar/m
0.1	0.045	162.9	0.1	0.080	289.5	0.1	0.132	475.3	0.1	0.204	735.4	0.0
0.2	0.068	244.3	0.2	0.121	434.3	0.1	0.198	712.9	0.1	0.306	1103.1	0.1
0.2	0.090	325.7	0.3	0.161	579.1	0.2	0.264	950.6	0.2	0.409	1470.8	0.1
0.3	0.113	407.2	0.5	0.201	723.8	0.3	0.330	1188.2	0.3	0.511	1838.5	0.2
0.3	0.136	488.6	0.7	0.241	868.6	0.5	0.396	1425.9	0.3	0.613	2206.2	0.3
0.4	0.158	570.0	0.9	0.281	1013.4	0.6	0.462	1663.5	0.5	0.715	2574.0	0.3
0.4	0.181	651.4	1.1	0.322	1158.1	0.8	0.528	1901.2	0.6	0.817	2941.7	0.4
0.5	0.204	732.9	1.4	0.362	1302.9	1.0	0.594	2138.8	0.7	0.919	3309.4	0.5
0.5	0.226	814.3	1.7	0.402	1447.6	1.2	0.660	2376.5	0.8	1.021	3677.1	0.6
0.6	0.249	895.7	2.0	0.442	1592.4	1.4	0.726	2614.1	1.0	1.124	4044.8	0.8
0.6	0.271	977.2	2.3	0.483	1737.2	1.6	0.792	2851.7	1.2	1.226	4412.5	0.9
0.7	0.294	1058.6	2.6	0.523	1881.9	1.8	0.858	3089.4	1.3	1.328	4780.2	1.0
0.7	0.317	1140.0	3.0	0.563	2026.7	2.1	0.924	3327.0	1.5	1.430	5147.9	1.2
0.8	0.339	1221.5	3.4	0.603	2171.5	2.4	0.990	3564.7	1.7	1.532	5515.6	1.3
0.8	0.362	1302.9	3.8	0.643	2316.2	2.6	1.056	3802.3	1.9	1.634	5883.3	1.5
0.9	0.385	1384.3	4.2	0.684	2461.0	2.9	1.122	4040.0	2.2	1.736	6251.0	1.7
0.9	0.407	1465.7	4.7	0.724	2605.8	3.3	1.188	4277.6	2.4	1.839	6618.7	1.8
1.0	0.430	1547.2	5.1	0.764	2750.5	3.6	1.254	4515.3	2.6	1.941	6986.4	2.0
1.0	0.452	1628.6	5.6	0.804	2895.3	3.9	1.320	4752.9	2.9	2.043	7354.2	2.2
1.1	0.475	1710.0	6.1	0.844	3040.1	4.3	1.386	4990.6	3.2	2.145	7721.9	2.4
1.2	0.543	1954.3	7.8	0.965	3474.4	5.4	1.584	5703.5	4.0	2.451	8825.0	3.1
1.3	0.588	2117.2	9.0	1.046	3763.9	6.3	1.716	6178.8	4.6	2.656	9560.4	3.5
1.4	0.648	2334.3	10.7	1.153	4149.9	7.5	1.892	6812.5	5.5	2.928	10541.0	4.2
1.5	0.679	2442.9	11.6	1.206	4342.9	8.1	1.980	7129.4	6.0	3.064	11031.2	4.6
1.6	0.724	2605.8	13.0	1.287	4632.5	9.1	2.112	7604.7	6.7	3.269	11766.6	5.1
1.7	0.769	2768.6	14.5	1.367	4922.0	10.1	2.244	8080.0	7.5	3.473	12502.1	5.7
1.8	0.814	2931.5	16.0	1.448	5211.5	11.2	2.376	8555.2	8.3	3.677	13237.5	6.3
1.9	0.860	3094.3	17.7	1.528	5501.1	12.4	2.508	9030.5	9.1	3.881	13972.9	7.0
2.0	0.905	3257.2	19.4	1.608	5790.6	13.6	2.641	9505.8	10.0	4.086	14708.3	7.7
2.1	0.950	3420.1	21.2	1.689	6080.1	14.8	2.773	9981.1	11.0	4.290	15443.7	8.4
2.2	0.995	3582.9	23.0	1.769	6369.6	16.1	2.905	10456.4	11.9	4.494	16179.1	9.1
2.3	1.040	3745.8	24.9	1.850	6659.2	17.5	3.037	10931.7	12.9	4.698	16914.6	9.9
2.4	1.086	3908.6	26.9	1.930	6948.7	18.9	3.169	11407.0	13.9	4.903	17650.0	10.7
2.5	1.131	4071.5	29.0	2.011	7238.2	20.3	3.301	11882.3	15.0	5.107	18385.4	11.5
2.6	1.176	4234.4	31.1	2.091	7527.8	21.8	3.433	12357.6	16.1	5.311	19120.8	12.4
2.7	1.221	4397.2	33.3	2.171	7817.3	23.4	3.565	12832.9	17.3	5.516	19856.2	13.2
2.8	1.267	4560.1	35.6	2.252	8106.8	25.0	3.697	13308.2	18.5	5.720	20591.6	14.2
2.9	1.312	4722.9	37.9	2.332	8396.3	26.6	3.829	13783.5	19.7	5.924	21327.0	15.1
3.0	1.357	4885.8	40.3	2.413	8685.9	28.3	3.961	14258.7	20.9	6.128	22062.5	16.0
3.6	1.629	5863.0	56.2	2.895	10423.1	39.5	4.753	17110.5	29.2	7.354	26475.0	22.4
4.0	1.810	6514.4	68.1	3.217	11581.2	47.9	5.281	19011.7	35.4	8.171	29416.6	27.2
4.6	2.081	7491.6	88.0	3.700	13318.3	61.9	6.073	21863.4	45.8	9.397	33829.1	35.2
5.0	2.262	8143.0	102.6	4.021	14476.5	72.2	6.601	23764.6	53.4	10.214	36770.8	41.0

Pressure loss tables for the heating installation – Dimensions 14/16/20/25 mm

Pressure loss due to pipe friction in the heating installation												
Connection capacity (W)				Mass flux	Dim. 14		Dim. 16		Dim. 20		Dim. 25	
					v	R	v	R	v	R	v	R
Spread (K)						hPa/m		hPa/m		hPa/m		hPa/m
20 K	15 K	10 K	5 K	kg/h	m/s	mbar/m	m/s	mbar/m	m/s	mbar/m	m/s	mbar/m
200	150	100	50	8.60	0.03	0.13	0.02	0.07				
300	225	150	75	12.90	0.05	0.19	0.03	0.11				
400	300	200	100	17.20	0.06	0.25	0.05	0.14				
600	450	300	150	25.80	0.09	0.38	0.07	0.21				
800	600	400	200	34.39	0.12	0.51	0.09	0.28				
1000	750	500	250	42.99	0.15	0.64	0.11	0.35				
1200	900	600	300	51.59	0.18	0.76	0.14	0.42				
1400	1050	700	350	60.19	0.21	0.89	0.16	0.49				
1600	1200	800	400	68.79	0.24	1.02	0.18	0.56				
1800	1350	900	450	77.39	0.27	1.15	0.20	0.63				
2000	1500	1000	500	85.98	0.30	2.21	0.23	0.70	0.15	0.30		
2300	1725	1150	575	98.88	0.35	2.80	0.26	0.81	0.17	0.34		
2800	2100	1400	700	120.38	0.43	3.91	0.32	1.94	0.21	0.42		
3000	2250	1500	750	128.98	0.46	4.40	0.34	2.18	0.22	0.79		
3500	2625	1750	875	150.47	0.53	5.73	0.40	2.84	0.26	1.02		
4000	3000	2000	1000	171.97	0.61	7.21	0.45	3.57	0.29	1.29	0.19	0.45
4500	3375	2250	1125	193.47	0.68	8.83	0.51	4.37	0.33	1.57	0.21	0.55
5000	3750	2500	1250	214.96	0.76	10.60	0.57	5.24	0.37	1.88	0.23	0.66
5500	4125	2750	1375	236.46	0.84	12.50	0.62	6.17	0.40	2.22	0.26	0.77
6000	4500	3000	1500	257.95	0.91	14.55	0.68	7.18	0.44	2.57	0.28	0.90
6500	4875	3250	1625	279.45	0.99	16.73	0.73	8.25	0.48	2.95	0.31	1.03
7000	5250	3500	1750	300.95	1.06	19.04	0.79	9.38	0.51	3.36	0.33	1.17
7500	5625	3750	1875	322.44			0.85	10.58	0.55	3.78	0.35	1.31
8000	6000	4000	2000	343.94			0.90	11.84	0.59	4.23	0.38	1.47
8500	6375	4250	2125	365.43			0.96	13.16	0.62	4.70	0.40	1.63
9000	6750	4500	2250	386.93			1.02	14.55	0.66	5.19	0.42	1.80
9500	7125	4750	2375	408.43			1.07	16.00	0.70	5.70	0.45	1.98
10000	7500	5000	2500	429.92					0.73	6.23	0.47	2.16
10500	7875	5250	2625	451.42					0.77	6.79	0.49	2.35
11000	8250	5500	2750	472.91					0.81	7.36	0.52	2.55
11500	8625	5750	2875	494.41					0.84	7.96	0.54	2.75
12500	9375	6250	3125	537.40					0.92	9.21	0.59	3.18
13000	9750	6500	3250	558.90					0.95	9.86	0.61	3.40
14000	10500	7000	3500	601.89					1.03	11.23	0.66	3.87
15000	11250	7500	3750	644.88							0.70	4.37
16000	12000	8000	4000	687.88							0.75	4.89
17000	12750	8500	4250	730.87							0.80	5.44
18000	13500	9000	4500	773.86							0.85	6.01
19000	14250	9500	4750	816.85							0.89	6.61
20000	15000	10000	5000	859.85							0.94	7.24
22000	16500	11000	5500	945.83							1.03	8.56

TECEflex - Planning and application

Pressure loss tables for the heating installation – Dimensions 32/40/50/63 mm (part 1)

Pressure loss due to pipe friction in the heating installation												
Connection capacity (W)				Mass flux	Dim. 32		Dim. 40		Dim. 50		Dim. 63	
					v	R	v	R	v	R	v	R
Spread (K)						hPa/m		hPa/m		hPa/m		hPa/m
20 K	15 K	10 K	5 K	kg/h	m/s	mbar/m	m/s	mbar/m	m/s	mbar/m	m/s	mbar/m
7000	5250	3500	1750	300.95	0.18	0.30						
7500	5625	3750	1875	322.44	0.20	0.34						
8000	6000	4000	2000	343.94	0.21	0.38						
8500	6375	4250	2125	365.43	0.22	0.42						
9000	6750	4500	2250	386.93	0.24	0.46						
9500	7125	4750	2375	408.43	0.25	0.51						
10000	7500	5000	2500	429.92	0.26	0.55						
10500	7875	5250	2625	451.42	0.28	0.60						
11000	8250	5500	2750	472.91	0.29	0.65	0.16	0.17				
11500	8625	5750	2875	494.41	0.30	0.70	0.17	0.18				
12500	9375	6250	3125	537.40	0.33	0.81	0.19	0.21				
13000	9750	6500	3250	558.90	0.34	0.87	0.19	0.22				
14000	10500	7000	3500	601.89	0.37	0.99	0.21	0.25				
15000	11250	7500	3750	644.88	0.40	1.11	0.22	0.28				
16000	12000	8000	4000	687.88	0.42	1.24	0.24	0.32				
17000	12750	8500	4250	730.87	0.45	1.38	0.25	0.35				
18000	13500	9000	4500	773.86	0.48	1.53	0.27	0.39				
19000	14250	9500	4750	816.85	0.50	1.68	0.28	0.43				
20000	15000	10000	5000	859.85	0.53	1.84	0.30	0.47				
22000	16500	11000	5500	945.83	0.58	2.17	0.33	0.55				
24000	18000	12000	6000	1031.81	0.63	2.52	0.36	0.64				
26000	19500	13000	6500	1117.80	0.69	2.90	0.39	0.74				
28000	21000	14000	7000	1203.78	0.74	3.31	0.42	0.84				
30000	22500	15000	7500	1289.77	0.79	3.73	0.45	0.95	0.27	0.29		
32000	24000	16000	8000	1375.75	0.85	4.19	0.48	1.06	0.29	0.33		
34000	25500	17000	8500	1461.74	0.90	4.66	0.51	1.18	0.31	0.36		
36000	27000	18000	9000	1547.72	0.95	5.15	0.53	1.30	0.33	0.40		
38000	28500	19000	9500	1633.71	1.00	5.67	0.56	1.43	0.34	0.44		
40000	30000	20000	10000	1719.69			0.59	1.57	0.36	0.48		
42000	31500	21000	10500	1805.67			0.62	1.71	0.38	0.52		
44000	33000	22000	11000	1891.66			0.65	1.85	0.40	0.57		
46000	34500	23000	11500	1977.64			0.68	2.01	0.42	0.62		
48000	36000	24000	12000	2063.63			0.71	2.16	0.43	0.66	0.28	0.23
50000	37500	25000	12500	2149.61			0.74	2.32	0.45	0.71	0.29	0.25
52000	39000	26000	13000	2235.60			0.77	2.49	0.47	0.76	0.30	0.27
54000	40500	27000	13500	2321.58			0.80	2.66	0.49	0.81	0.32	0.29
56000	42000	28000	14000	2407.57			0.83	2.84	0.51	0.87	0.33	0.31
58000	43500	29000	14500	2493.55			0.86	3.02	0.52	0.92	0.34	0.33
60000	45000	30000	15000	2579.54			0.89	3.21	0.54	0.98	0.35	0.35
62000	46500	31000	15500	2665.52			0.92	3.40	0.56	1.04	0.36	0.37
64000	48000	32000	16000	2751.50			0.95	3.60	0.58	1.10	0.37	0.39
66000	49500	33000	16500	2837.49			0.98	3.80	0.60	1.16	0.39	0.41
68000	51000	34000	17000	2923.47			1.01	4.00	0.62	1.22	0.40	0.43
70000	52500	35000	17500	3009.46			1.04	4.22	0.63	1.29	0.41	0.45
72000	54000	36000	18000	3095.44			1.07	4.43	0.65	1.35	0.42	0.48

Pressure loss tables for the heating installation – Dimensions 32/40/50/63 mm (part 2)

Pressure loss due to pipe friction in the heating installation												
Connection capacity (W)				Mass flux	Dim. 32		Dim. 40		Dim. 50		Dim. 63	
					v	R	v	R	v	R	v	R
Spread (K)						hPa/m		hPa/m		hPa/m		hPa/m
20 K	15 K	10 K	5 K	kg/h	m/s	mbar/m	m/s	mbar/m	m/s	mbar/m	m/s	mbar/m
76000	57000	38000	19000	3267.41					0.69	1.49	0.44	0.52
80000	60000	40000	20000	3439.38					0.72	1.63	0.47	0.57
84000	63000	42000	21000	3611.35					0.76	1.78	0.49	0.63
88000	66000	44000	22000	3783.32					0.80	1.93	0.51	0.68
92000	69000	46000	23000	3955.29					0.83	2.09	0.54	0.73
96000	72000	48000	24000	4127.26					0.87	2.25	0.56	0.79
100000	75000	50000	25000	4299.23					0.90	2.42	0.58	0.85
104000	78000	52000	26000	4471.20					0.94	2.59	0.61	0.91
108000	81000	54000	27000	4643.16					0.98	2.77	0.63	0.98
112000	84000	56000	28000	4815.13					1.01	2.96	0.65	1.04
116000	87000	58000	29000	4987.10					1.05	3.15	0.68	1.11
120000	90000	60000	30000	5159.07					1.09	3.35	0.70	1.18
124000	93000	62000	31000	5331.04							0.73	1.25
128000	96000	64000	32000	5503.01							0.75	1.32
132000	99000	66000	33000	5674.98							0.77	1.39
136000	102000	68000	34000	5846.95							0.80	1.47
140000	105000	70000	35000	6018.92							0.82	1.55
144000	108000	72000	36000	6190.89							0.84	1.63
148000	111000	74000	37000	6362.85							0.87	1.71
152000	114000	76000	38000	6534.82							0.89	1.79
156000	117000	78000	39000	6706.79							0.91	1.87
160000	120000	80000	40000	6878.76							0.94	1.96
164000	123000	82000	41000	7050.73							0.96	2.05
168000	126000	84000	42000	7222.70							0.98	2.14
172000	129000	86000	43000	7394.67							1.01	2.23
176000	132000	88000	44000	7566.64							1.03	2.33
180000	135000	90000	45000	7738.61							1.05	2.42
184000	138000	92000	46000	7910.58							1.08	2.52
188000	141000	94000	47000	8082.55							1.10	2.62
192000	144000	96000	48000	8254.51							1.12	2.72
196000	147000	98000	49000	8426.48							1.15	2.82
200000	150000	100000	50000	8598.45							1.17	2.92

TECEflex - Planning and application

Guide values and installation times

The following table contains the guide values for the assembly of pipes and pressure sleeve connectors in running metres, ready laid, including attachment for chase and pre-wall installation in single and multiple-family homes, shown in group minutes.

TECEflex Ø in mm	Installation time for run. m. ready laid, incl. attachment in group minutes
14	5–9
16	5–9
20	6–10
25	7–11
32	8–12
40	14–16
50	16–18
63	18–20

Note: The group minutes stated relate to fitters with system experience.

Rinsing drinking water systems

The pipes must be rinsed thoroughly before the drinking water installation is commissioned. Local legislation, standards and guidelines should be considered here.

Pressure test of drinking water systems

A test pressure should be carried out for drinking water installations in accordance with DIN EN 806-4. The requirements of the pressure test in DIN EN 806-4 are supplemented by VDI/DVGW 6023 and the ZVSHK data sheet “Leak tests of drinking water installation with pressure tests using compressed air, inert gas or water”. Before the pressure test is performed it should be ensured that all components in the installation are freely accessible and visible in order to be able to localise incorrectly installed fittings. If the piping system remains unfilled following a pressure test (e.g. because a regular water replacement cannot be guaranteed at the latest after 72 hours), it is recommended that a pressure test be performed using compressed air or inert gases.

Leak test with oil-free compressed air or inert gas

The pipe connections should be visually inspected before the leak test is performed. Components in the piping system must be suitable for the test pressures or enlarged prior to the line test, replaced by a suitable piece of piping or tested separately at the ends of the pipe in line sections.
After applying the test pressure of 150 mbar (150 hPa), the testing period up to 100 litre line volume must be at least 120 minutes. The testing period must be extended by 20 minutes for every additional 100 litres of line volume.

The testing begins once the test pressure is reached, taking into account a corresponding waiting time for the stabilisation of media and ambient temperature. The seal tightness is determined by the agreement of the start and end test pressures, up to the normal fluctuations caused by the temperature of the medium and the pressure at the pressure gauge.

The pressure gauge used must show a corresponding accuracy of 1 mbar (1 hPa) in the display area for the pressures to be measured. The U-pipe pressure gauge known from the TRGI test or the standpipes can be used here.

Load test

The purpose of this test is to identify faults that could lead to the rupture or dislocation of a connection in the specified piping system under normal operating conditions. The strength test is combined with a visual inspection of all pipe connections. The test consists of filling the piping system to be tested with a medium under pressure (maximum 3 bar).
The load test with increased pressure should be carried out

- at maximum 3 bar for nominal values up to DN 50, and
- Nominal values above DN 50 (up to DN 100) maximum 1 bar

The testing period following the application of the test pressure is 10 minutes.

The state of the pressure gauge must remain constant during the testing period. For TECElogo installations, a steady state should be achieved first before the testing period begins. For other materials, the temperature constant required in the piping system must be reached before the test begins. The pressure gauge used must show an accuracy of 100 mbar (100 hPa) in the display area.

Use of leak detectors

Only use leak detectors (e.g. foam building agents) with a current DVGW certification that are also approved by their respective manufacturers for use with the material PPSU.

Preparation for leak test with water

All pipe connections should be visually inspected before the leak test with water. The testing device should be connected to the deepest point of the installation to be tested.

Only testing devices that can guarantee a maximum measurement accuracy of 0.1 bar (100 hPa) should be used.
The installation should be filled with filtered drinking water (particle size ≤ 150 µm), ventilated and protected against freezing. Shut-off device in front of and behind heat generators and boilers must be closed so the test pressure can be held back from the rest of the system.
If significant disparities arise between the ambient temperature and water temperature (>10 K), a 30 minute waiting period should be implemented following the application of the system test pressure to allow the temperature to equalise. The pressure must be maintained for at least 10 minutes. There must be no pressure drop or visible sign of a loose seal.

Performing the leak test

The pipeline system is first loaded with a test pressure that must be 1.1 x the operating pressure (in relation to the deepest point in the system). The operating pressure is 10 bar (1 MPa) in accordance with DIN EN 806-2. This means a test pressure of 11 bar (1.1 MPa) is required. A subsequent inspection should be performed on the pipe section tested to be able to determine any possible leakage.
After a testing period of 30 minutes, water should be drained to reduce the pressure to 5.5 bar (0.55 MPa), corresponding to 0.5 x the starting test pressure. The testing period at this pressure is 120 minutes. There must be no leak in evidence during this testing period. The test pressure at the pressure gauge must remain constant (Δp = 0). A pressure drop during the testing period indicates there is a leak in the system. The pressure must be maintained and the leaky sites determined. The defect must be rectified and the leak test then repeated.

Please remember:

For hygiene reasons, TECE recommends carrying out a leak test with oil-free compressed air or inert gas in a leak test with drinking water.

Heating systems

A heating system must be rinsed thoroughly prior to commissioning to remove metallic residues or liquids. The TECElogo system is immune to these contaminants but metallic components of the heating system - such as radiators or heat generators - can sustain damage from galvanic corrosion processes.
The leak test is carried out the same way as the leak test for drinking water installations. Here the test pressure must be 1.3 x the operating pressure, however.

TECEflex - Planning and application

Pressuretest log for drinking water installations – in accordance with DIN EN 806-4, supplemented by VDI/DVGW 6023 and ZVSHK data sheet (Leak tests of drinking water installation with pressure tests using compressed air, inert gas or water) – with the test medium oil-free compressed air or inert gas

Construction: _____

Customer: _____

Constructor/Fitter: _____

Pipeline system material: _____

Connection type: _____

Installation pressure: _____ bar

Ambient temperature _____ °C Temperature of test medium _____ °C

Testing medium: ❒ **oil-free compressed air** ❒ **hydrogen** ❒ **carbon dioxide** ❒ _____

The drinking water system has been tested as: ❒ **Total system** ❒ **in** _____ **Sections**

Leak test

Test pressure: 150 mbar

Testing period up to 100 litres line volume: min. 120 minutes
(for every additional 100 litresthe testing period should be increased by 20 minutes)

Pipe volumes: _____ litres

Testing period: _____ minutes

Wait for temperature adjustment and steady state, then begin the testing period.

❒ No pressure drop was detected during the testing period.

Strength test with increased pressure

Test pressure up to andincluding DN 50: 3 bar
Test pressure over DN 50 up to DN 100: 1 bar

Testing period up to 100 litrespipe volume: min. 10 minutes

Testing period: _____ minutes

Wait for temperature adjustment and steady state, then begin the testing period.

❒ No pressure drop was detected during the testing period.

❒ The piping system is sealed.

_____ _____

Location Date

_____ _____

Customer (Signature)

Contractor/Fitter (Stamp/Signature)

Pressuretest log for drinking water installations – in accordance with DIN EN 806-4, supplemented by VDI/DVGW 6023 and ZVSHK data sheet (Leak tests of drinking water installation with pressure tests using compressed air, inert gas or water) – with the test medium drinking water

Construction: _____

Customer: _____

Fitter: _____

Dimension range from _____ mm to _____ mm

Line lengths approx. _____ m

Water temperature: _____ °C

Ambient temperature: _____ °C

The difference between the water temperature and ambient temperature must not be greater than 10 K!

Leak test, part 1

Testing period: 30 minutes

Test pressure: 11 bar (1.1 x operating pressure)

Pressure after 30 minutes

_____ bar

Result

_____

Leak test, part 2

Testing period: 120 minutes

Test pressure: 5.5 bar (0.5 x test pressure, part 1)

Pressure after 120 minutes

_____ bar

Result:

_____

_____

Start of test (date, time)

_____

End of test (date, time)

The VDI/DVGW 6023 requires that the system must be put back into operation within the next 72 hours following the leak test with water.

_____

Commissioning of system (date, time)

_____

Location

_____

Date

_____

Customer
(Signature)

_____

Contractor/Fitter
(Stamp/Signature)

TECEflex - Planning and application

Pressure testlog for heating systems – in accordance with DIN 18380 (VOB)

Construction: _____

Customer: _____

Contractor/Fitter: _____

Dimension range from _____ mm to _____ mm

Line lengths approx. _____ m

Water temperature: _____ °C

Ambient temperature: _____ °C

Preliminary test

Testing period: 60 minutes	Test pressure: 1.3 x operating pressure in bar
Pressure after 30 minutes	_____ bar
Pressure after 60 minutes	_____ bar
Pressure loss over the last 30 minutes	_____ bar (maximum 0.6 bar)
Result of preliminary test	_____

Main test	**Use the test pressure from the preliminary test**
Testing period: 120 minutes	max. permitted pressure drop: 0.2 bar
Pressure at test start	_____ bar
Pressure after 120 minutes	_____ bar
Pressure drop during testing period	_____ bar (maximum 0.2 mbar)
Result of the main test:	_____

_____	_____
Start of test	End of test
_____	_____
Location	Date
_____	_____
Customer/Representative (Signature)	Contractor/Fitter (Stamp/Signature)

Commissioning and instruction log for the drinking water system (page 1 of 2)

Construction project: _____

Customer/Representative: _____

Contractor/Representative: _____

In the absence of the persons named above, the following persons were trained in the use of the following system components and the system was put into operation:

No.	System component, device	Acceptance completed	Comment	n. a.
1	Home connection	❒		❒
2	Main shut-off valve	❒		❒
3	Return flow inhibitor	❒		❒
4	Backflow inhibitor	❒		❒
5	Filter	❒		❒
6	Pressure relief system	❒		❒
7	Distribution lines	❒		❒
8	Risers/Shut-off valves	❒		❒
9	Multi-storey pipes/Shut-off valves	❒		❒
10	Riser pipe aerator/Drip-water pipe	❒		❒
11	Collector units/Drip-water pipe	❒		❒
12	Tapping points with single guard	❒		❒
13	Water heating/Drinking water heater	❒		❒
14	Safety valves/Pressure relief lines	❒		❒
15	Circulation line/Circulation pump	❒		❒
16	Dosing unit	❒		❒
17	Softening unit	❒		❒
18	Pressure booster	❒		❒
19	Fire-extinguishing and protection systems	❒		❒
20	Swimming pool inflow	❒		❒
21	Extraction fittings	❒		❒
22	Consumption devices	❒		❒
23	Drinking water containers	❒		❒
24		❒		❒
25		❒		❒
26		❒		❒
27		❒		❒

TECEflex - Planning and application

Commissioning and instruction log for the drinking water system (page 2 of 2)

Customer's supplementary remarks:

Contractor's supplementary remarks:

The instructions regarding the operation of the system were given, the required operating documents and existing instruction operation and maintenance document according to the aforementioned list were handed over. It has been mentioned that despite careful planning and design of the installation, drinking water of faultless quality can only be achieved at all tapping points if it is ensured that the water is completely replaced in all areas of the installation at regular intervals.

Operator responsibilities: Measures during prolonged absence

Absence	Measures prior to absence	Measures on return
> 3 days	Homes: Closure of multi-storey shut-off valves Single family homes: Closure of the shut-off valve behind the water meter	Once the shut-off valve is open, allow standing water to flow from all tapping points for 5 min (completely open)
> 4 weeks	Homes: Closure of multi-storey shut-off valves Single family homes: Closure of the shut-off valve behind the water meter	It is recommended to arrange a rinse of the home installation
> 6 months	Arrange for the main shut-off valve (home connection) to be closed. Empty lines completely	Arrange a rinse of the home installation
> 1 year	Separation of the connection line from the supply line	Reconnection by water supply company or specialist fitter

Location

Date

Customer/Representative
(Signature)

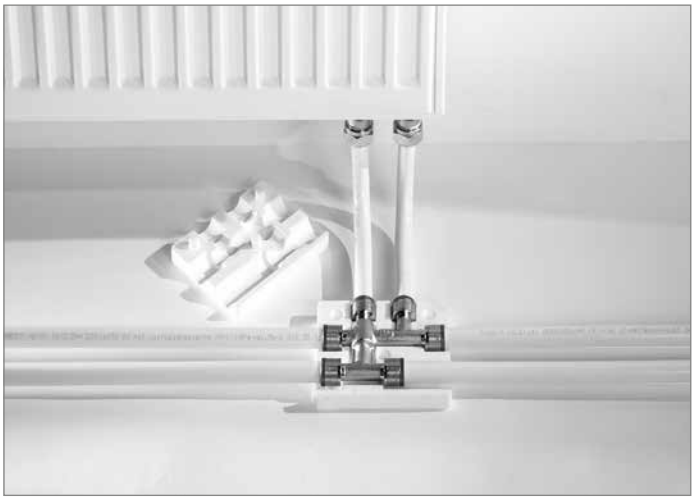
Contractor/Fitter
(Signature)

Radiator connection

The TECEflex system offers a comprehensive range of fittings for rational connection of radiators for most construction situations.

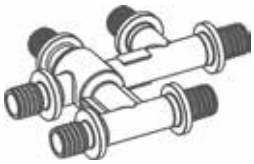
Cross-fitting

The cross-fitting allows the splitting of the flow and return lines from two main lines running parallel to one another. The installation height of the fittings with insulation box is just 35 mm.

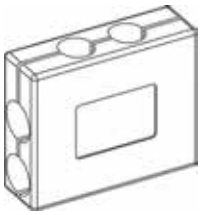


Radiator connection with cross-fitting

The use of cross-fittings not only saves assembly time but also negates the risk of damage to crossed pipes from wheelbarrows, crushing or similar.



Cross-fitting
(order no. 718501/ ...02/...03)



Protection box
(order no. 718020)

Connection from the floor

Radiators can be connected directly from the screed with the TECEflex composite pipe. The length extension of the pipe must be compensated to avoid “popping sounds”. The pipes should therefore be equipped with insulating tubing of at least 6 mm thick.

It is also recommended that a protective cuff be placed around the visible parts of the pipe. This thus avoids damage to the pipes via e.g. vacuuming.

Radiator connection with mounting tees/elbows

The TECEflex range offers assembly tees made of nickel-plated copper for more demanding requirements. The elbow shape means a radiator can be connected using flow and return lines running parallel to one another.

Radiator connection with radiator mounting tee

The nickel-plated copper pipes are connected to the radiator valve block via a pinch screw connection.

Alternatively, if the flow and return lines do not run along the bottom of the radiator, the radiator mounting elbows made of nickel-plated copper can be used.

Radiator connection with radiator mounting elbow

TECEflex - Radiator connection

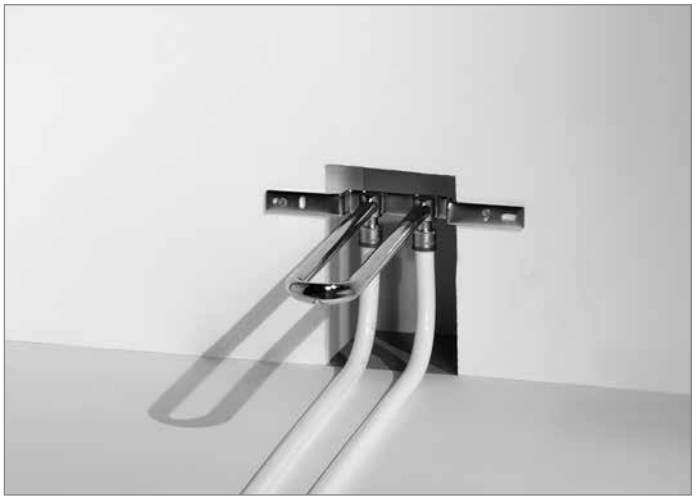
Connection from the wall

The special bending properties of the TECEflex composite pipe make it possible to connect the radiator directly from the wall. The chase in the wall must be able to accommodate the minimum bending radii of TECEflex pipes.

Radiator connection from the wall

Radiator connection using the radiator mounting fitting for compact radiators from the wall

The radiator mounting fitting is equipped with sturdy fastening clips for secure fixing in the wall chase. TECEflex connection technology lets you connect pipes directly in the wall chase.



Radiator connection with radiator mounting unit - ready to push free

Radiator connection with radiator mountingfitting - connected to the valve block

The connection between the flow and return means the heating system can be pressed free without assembly plugs. To assemble the radiator, the U-pipe is suitably shortened and connected to the valve block via a pinch screw connection.
Alternatively, a radiator mounting fitting is available on the floor. It is also equipped with a U-pipe and allows you to push it free without assembly plugs.
TECEflex radiator mounting set dim. 16 x 15 mm Cu

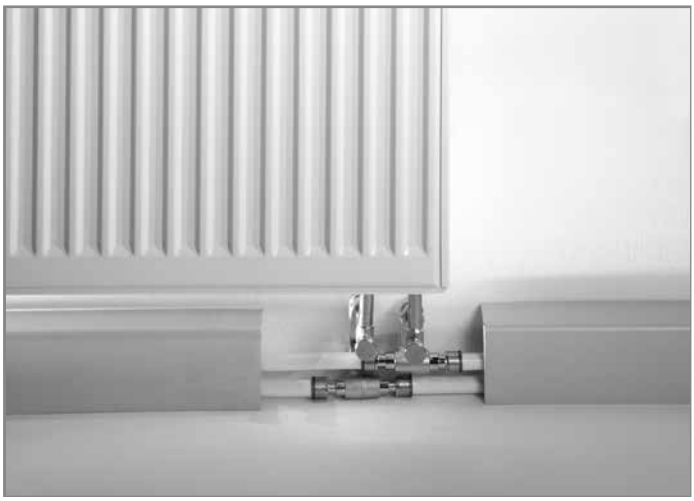
Connection from the wall with mounting unit

The radiator mounting unit can be equipped with pre-insulated pipes for optimum connection from the wall. A further feature is the especially tight radii of the TECEflex pipes.

Radiator connection with mounting unit - connected to the valve block

Radiator connection from the skirting board

The TECEflex range offers a skirting board connection fitting with connection elbows or elbow shut-offs for connection from a skirting board. In the case of renovations, this allows radiators to be connected without any pressing work.
TECEflex composite pipes in skirting board systems may only be used together with brass fittings. TECE recommends using skirting boards from the company HZ.



Radiator connection from the skirting board

TECEflex - Compressed air installation

Compressed air installation

Design sizes for the pressure loss Δp

Compressed air installations with a maximum pressure p_{max} of 8 bar or more should not exceed a total pressure loss through the pipe network to the consumer of ΔP = 0.1 bar. TECE recommends the following values for individual pipeline types:

- Main line Δp ≤ 0.04 bar
- Distribution line Δp ≤ 0.04 bar
- Connection lead Δp ≤ 0.03 bar

The following applies for pipeline networks with maximum pressures ≤ 8:
Pipeline network pressure lost Δp ≤ 1.5 bar of p_{max}.

Oils

Oil may be present in the compressed air depending on the type of compressor. The compressed air is classified according to the maximum oil content permitted. The oil content can vary depending on class from 0.01 to 25 mg/m³ compressed air. The TECEflex system is suitable for all qualities of compressor oil.

Pressure test

TECE recommends performing a pressure test based on the technical rules for pressure tank classification (TRB 522) before commissioning a compressed air network. The test is split into two parts: leak test and strength test. Measures should be implemented to protect those involved in the work. During the test only those work personnel required for the test should be present on site.

Leak test

It should be ensured that all open pipe outlets with stoppers, caps or similar are closed before the leak test is performed. The leak test should test the pipe network. Fittings, tools and pressure tanks should be removed from the network.

Requirements:

- Test pressure 110 mbar
- Testing period up to 100 l pipe volume minimum 30 minutes
- The testing period must be extended by 10 minutes for every additional 100 litres of line volume. The testing period following the application of the test pressure is 15 minutes. The leak test is considered to be passed if the start and end pressure match once the testing period ends.

Strength test

If the leak test was successful then the strength test can be performed directly afterwards. Here the test pressure is increased to 1.1 x the permitted system operating pressure.
The test pressure can be reapplied twice in the first 30 minutes after the test pressure is applied. It must then be maintained for 30 minutes. The pressure loss in this period must not exceed 0.1 mbar.

Planning of a compressed air installation

Compressed air lines should always be installed in as straight a line as possible. The fewer fittings are used, the lower the pressure losses. This is why elbow couplings should be fitted with long hand-bent deflections when installing pipes.

Larger compressed air networks should be split into as many multiple sections as possible. The individual sections should each be fitted with a shut-off valve. This means there is always the option to take individual sections of the piping network out of operation in order to undertake repairs or expansion work.

Larger compressed air networks can make it thoroughly reasonable to integrate a second compressor station. This allows the pipe network to be supplied from a second point. This results in compressed air having shorter distances to travel and the pressure loss is reduced.

Pipeline network without compressed air drying

If drying is not employed in compressed air systems, condensation forms as water droplets. In these instances, the following points should be considered to avoid damage to the compressed air consumers:

- Avoidance of cooldowns.
  The pipe guide should be selected so that the compressed air does not cool down on the way to the consumer. Ideally, the compressed air in the network should gradually warm up. This reduces the relative humidity of the air and avoids condensation forming.
- The compressed air lines must be laid at a gradient of approx. 1.5% to 2% in the direction of flow so the condensation can form at the deepest points in the pipe network.
- Main lines that run directly from the pressure tank should rise vertically. The resulting condensation then runs back into the pressure tank.
- Condensate drains must be installed at the deepest points in the pipe network.

- Connection leads must branch off upwards in the direction of flow.
- A maintenance unit with filter, water separator and pressure regulator should always be installed. Depending on the application, a second compressed air oiler may be necessary.

Pipeline network with dry compressed air

If a compressed air dryer is installed in a compressed air network then the majority of measures concerning treatment of condensation can be ignored. Pipelines may also be laid without a gradient.

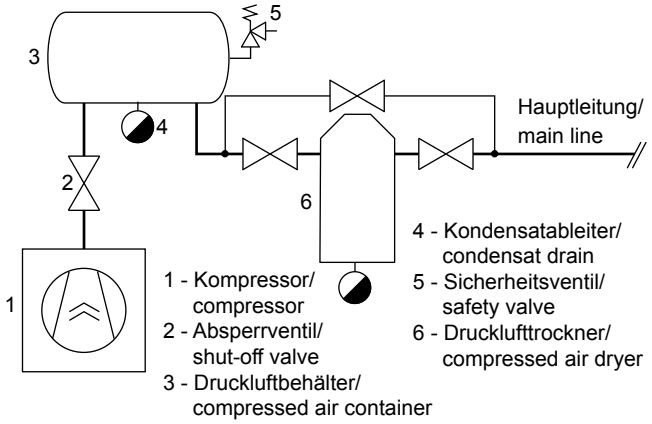
Condensate drains are only necessary on the filter in the compressed air tank and the compressed air dryer. Connection leads can be connected vertically downwards. Installation of a pipe network for dry compressed air is significantly cheaper. The purchase of a compressed air generally pays for itself even with smaller systems.

Compressed air lines

A compressed air line is normally split into three line types:
- Main line
- Distribution line
- Connection lead

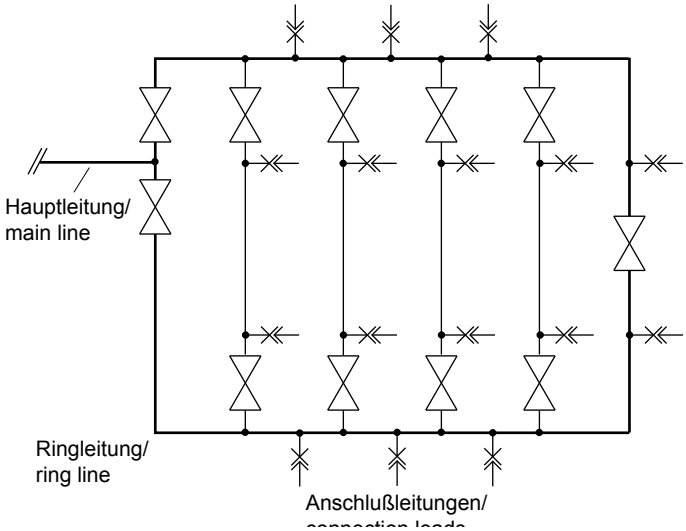
The main line

The main line connects the compressor with the distribution lines. Normally, the compressed air treatment and the compressed air tank are connected to the main line. These transport the total delivery volume of the compressor.
The pressure loss in the main line should not exceed 0.04 mbar.



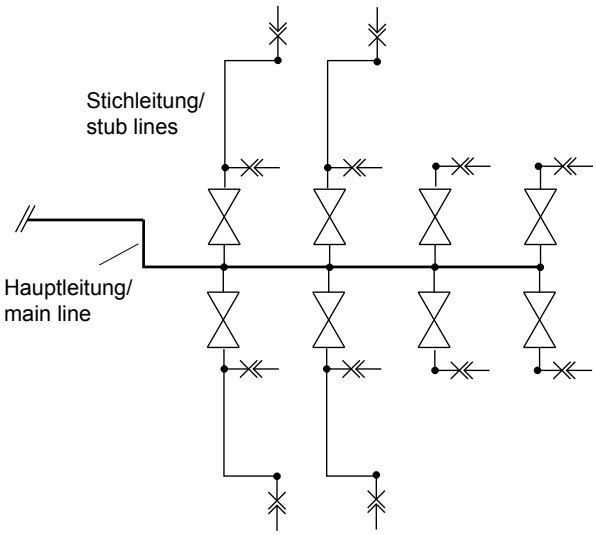
Distribution line as a ring line

If possible, distribution lines should always be fitted as ring lines. This significantly increases the economic efficiency of the system. A ring line forms a closed distribution ring. This makes it possible to block off individual sections from the network without interrupting the supply of compressed air to the other sections. The compressed air has a shorter distance to travel here compared to stub distribution lines. This means you can calculate half the fluidic pipe length and half the volume flow when dimensioning the ring line.



The distribution line as a ring line

The stub lines connect the main line to the connection leads. Stub lines are often used to supply consumers located a little further away. Stub lines are often utilised in order to use fewer raw materials. This advantage is usually balanced out again, however, since they have to have larger dimensions than a ring line. The pressure loss in stub lines must not exceed 0.3 mbar.



TECEflex - Compressed air installation

Connection leads

Connection leads connect the consumers with the supply line. As a rule, the compressed air consumers are operated using different pressures. This is why a pressure regulator is usually installed on the end of a connection lead. Connection leads are always connected to the distribution line from above and then guided downwards as otherwise a large amount of condensation or compressor oil collects in the connection lead. TECE recommends always installing connection leads in dimension 32 for the industrial sector. This dimension only entails low additional costs when compared to smaller measurements and generally always guarantees a secure supply of compressed air. With a connection length up to 10 metres, consumers with a compressed air requirement of up to 1800 litres per minute can be securely connected. The pressure loss in a connection lead should not exceed 0.3 mbar.

Collection pipe

In multiple compressors are connected to a line, this is referred to as a collection pipe. The following points should be observed for these lines:

- Collection pipe with gradient:
  The collection pipe must be laid with a gradient in the direction of flow of approx. 1.5% to 2%. The connection lead must be connected to the collection line from above.
- With longer rising pipes, a water separator with automatic compressor drainage should be installed in order to compensate for the returning condensation.

Calculation basis for compressed air installations

The correct dimensioning and design of a compressed air installation is in every operator's financial interest. Pipelines with dimensions that are too small cause high pressure losses in the pipe network. These must be balanced out again by higher air compression in order to be able to guarantee the necessary performance of the consumers. This would lead to excessively high costs for the system operator, however.

The following parameters influence the internal pipe diameter d_i:

Nominal length (in m)

The pipe length must always be measured precisely. The equivalent pipe length should be used for fittings and moulded parts - the same equivalent pipe length can be used as in gas installation - and added to the pipe length measured.
As an estimate, the measured pipe length can also be multiplied by 1.6 (+60%). The result is the total pipe length needed to calculate the internal pipe diameter:

$L_{total} = L_{straight} \cdot 1.6$

This multiplier is the estimated share of individual resistances from pipe elbows, fittings and armatures.

Volume flow ($\dot{V}$ in l/s)

The greatest possible air through-flow should be assumed when establishing the internal pipe diameter d_i as an increased pressure drop has a particularly strong impact with maximum compressed air requirement.

Operating pressure and overpressure (in bar)

For the calculation of the internal pipe diameter d_i the compressor shut-off pressure p_{max} should be assumed because with the highest pressure the pressure drop Δp is also highest.

Dimensioning

There are various approaches for calculating the required internal pipe diameter. A relatively simple option is to calculate using the approximate formula.

$$d_i = \sqrt[5]{\frac{1{,}6 \cdot 10^3 \cdot \dot{V}^{1{,}85} \cdot L}{10^{10} \cdot \Delta p \cdot p_{max}}}$$

d_i = internal diameter of pipeline [m]
$\dot{V}$ = total volume flow [m^3/s]
L = fluidic pipe length [m]
Δp = intended pressure drop [bar]
p_{max} = compressor shut-off pressure [barabs]

Example 1

The internal pipe diameter d_i of a compressed air installation in a workshop should be calculated using the above approximate formula. The distribution line is built as a stub line. The intended total pressure loss is a Δp of 0.08 bar. The maximum operating pressure (compressor shut-off pressure) is 8 bar abs. The total pipe length is 75 metres, the number of fittings and moulded parts is unknown. A volume flow of 90 m^3/h flows through this pipeline.

First, the fluidic total pipe length is now calculated as follows:

L_{total} = 75 m · 1.6
= 120 m

geg: L =120 metres
$\dot{V}$ = 90 m^3/h => 0.025 m^3/s
Δp = 0.08 bar
p_{max} = 8 bar

$$d_i = \sqrt[5]{\frac{1{,}6 \cdot 10^3 \cdot 0{,}025^{1{,}85} \cdot 120}{10^{10} \cdot 0{,}08 \cdot 8}}$$

=> d_i = 0.032 m ≥ 32 mm

Selected pipe dimension: TECEflex composite pipe dim. 40 (40 x 4 mm)

Example 2

For this example calculation we are using the same workshop as in the first example. The difference, however, is in the fact that the distribution line is installed as a ring line. Smaller pipe diameters are possible with a ring line, so the calculation can be made in this instance using the following adjusted approximate formula:

$$d_i = \sqrt[5]{\frac{1{,}6 \cdot 10^3 \cdot \dot{V}^{1{,}85} \cdot L}{10^{10} \cdot \Delta p \cdot p_{max} \cdot 7{,}21}}$$

The constant 7.21 includes half the fluidic pipe length and half the volume flow.

This then leads to:

$$d_i = \sqrt[5]{\frac{1{,}6 \cdot 10^3 \cdot 0{,}025^{1{,}85} \cdot 120}{10^{10} \cdot 0{,}08 \cdot 8 \cdot 7{,}21}}$$

=> d_i = 0.021 m ≥ 21 mm

Selected pipe dimension: TECEflex composite pipe dim. 32 (32 x 4 mm)

The calculation shows that the use of a ring line as a distribution line means in most instances the pipe dimension can be reduced by at least one dimension.

TECEflex - Annex

Resistance list PPSU

Brand name	Date	Concentration	Manufacturer	Use
Cooling lubricants				
Castrol nonol cooling lubricant		100%	Castrol	unpermitted
Rocol RTD		100%		unpermitted
Cooling lubricant M200 No. 1	June 2009	100%		unpermitted
Disinfection agents				
FINKTEC FT-99 CIP		6%	Finktec GmbH	unpermitted
Mikro Quat		100%	Ecolab	unpermitted
Mikrobac forte		1%, 23 °C	Bode Chemie	permitted
Hydrogen peroxide		35%, 23 °C		permitted
Potassium permanganate KMnO4		15 mg/l, 23 °C		permitted
Sodium hypochlorite NaOCl		> 6%, 23 °C		permitted
Calcium hypochlorite Ca(ClO)2		50 mg/l, 23 °C		permitted
Chlorine dioxide ClO2		6 mg/l, 23 °C		permitted
Aniosteril D2M	June 2009	5%	Laboratoires Anios	permitted
Aniosteril Contact	June 2009	1%	Laboratoires Anios	permitted
Witty W4		2%, 23 °C, 4 h		permitted
Descaler				
DS-40		4%		unpermitted
Boiler noise protection		0.20%		permitted
Calcolith DP		10%, 40 °C, 24 h		permitted
Calcolith TIN-BE		5%, 80 °C, 24 h		permitted
Household descalers (quick descalers)		20%		permitted
LS1		0.60%		permitted
MB1		4%		permitted
Super Concentrate		0.20%		permitted
Superfloc		2%		permitted
Cleaning agents				
Arkopal 110		5%	Hoescht	unpermitted
ANTIKAL		100%	P & G	unpermitted
BREF - Bathroom		100%	Henkel	permitted
BREF - Fresh shower		100%	Henkel	permitted
CAROLIN - gloss cleaner		1.80%	Boltom Belgium	permitted
CAROLIN - aktive fresh		1.90%	Boltom Belgium	permitted
CAROLIN - with linseed oil		1.90%	Boltom Belgium	permitted
CAROLIN - Marseille soap		1.80%	Boltom Belgium	permitted
Meister Proper - lemon		3.40%	P & G	not permitted
Meister Proper - Extra Hygiene		3.50%	P & G	permitted
Meister Proper - sensitive surfaces		2.40%	P & G	unpermitted
Meister Proper - orange peel		3.40%	P & G	unpermitted
Meister Proper - winter fresh		3.40%	P & G	unpermitted
TERRA - stone floors		12%	Henkel	permitted
TERRA - parquet		3.20%	Henkel	permitted
TERRA - high gloss floors	June 2009	100%	Henkel	permitted

Brand name	Date	Concentration	Manufacturer	Use
Seals				
Cimberio Loxeal 58 11 PTFE thread sealant		100%		unpermitted
Dreibond 5331		100%, 23 °C	Dreibond	unpermitted
EPDM rubber O-ring		100%	Join de France	permitted
Easyfit (Griffon)	June 2009	100%	Bison International	unpermitted
Everseal pipe thread sealant		100%, 82 °C	Federal Process Corp.	unpermitted
FACOT PTFE SEAL (PTFE sealant)		100%		unpermitted
Filjoint	June 2009	100%	GEB	unpermitted
FILETPLAST EAU POTABLE	June 2009	100%	GEB	permitted
GEBATOUT 2	June 2009	100%	GEB	permitted
GEBETANCHE 82 (EX-GEB)	June 2009	100%	GEB	unpermitted
Griffon assembly kit		100%	Verhagen-Herlitzius BV.	permitted
Kolmat jointpaste (- 30 up to + 135 °C)		100%	Denso	permitted
Locher Paste Special		100%	Locher & Co AG	permitted
Loctite 5061		100%	Loctite	permitted
Loctite 518 seal eliminator		100%, 82 °C	Loctite	unpermitted
Loctite 5331	June 2009	100%	Loctite	permitted
Loctite 5366 silicomet AS-310		100%	Loctite	permitted
Loctite 542		100%, 23 °C	Loctite	unpermitted
Loctite 55	June 2009	100%	Loctite	unpermitted
Loctite 572 thread sealant	June 2009	100%, 60 °C	Loctite	unpermitted
Loctite 577		100%, 23 °C	Loctite	unpermitted
Loctite Dryseal	Sep. 2008	100%	Loctite	permitted
Manta Tape		100%		permitted
Multipak		100%		permitted
Neo-Fermit		100%	Nissen & Volk	permitted
Neo-Fermit Universal 2000		100%	Nissen & Volk	permitted
Plastic Fermit - sealant		100%	Nissen & Volk	permitted
Precote 4		100%	Omnifit	unpermitted
Precote 80		100%	Omnifit	unpermitted
RectorSeal # 5		100%, 82 °C	RectorSeal Corp.	unpermitted
Red Silicone Sealant (- 65 up to + 315 °C) Silicone sealant		100%	Loctite	permitted
Rite-Lok		100%	Chemence	unpermitted
Scotch-Grip Rubber & Seal Adhesive # 1300		100%, 82 °C	3M	unpermitted
Scotch-Grip Rubber & Seal Adhesive # 2141		100%, 82 °C	3M	unpermitted
Scotch-Grip Rubber & Seal Adhesive # 847		100%, 82 °C	3M	unpermitted
Selet Unyte		100%, 82 °C	Whitman	unpermitted
Tangit metalock	Apr. 2007	100%	Henkel	unpermitted
Tangit Racoretanche	June 2009	100%	Loctite	permitted
Tangit Unilock	June 2009	100%	Henkel	unpermitted
TWINEFLO (PTFE band) + processing medium		100%	Resitape / Ulith	permitted
Twineflon	March 2009	100%	Unith	permitted
Unipack	May 2006	100%		unpermitted
Unipack Packsalve		100%		permitted
Viscotex Locher Paste 2000		100%		permitted

TECEflex – Annex

Brand name	Date	Concentration	Manufacturer	Use
Adhesive				
Atmosfix	July 2009	100%	Atmos	unpermitted
ARMAFLEX 520 ADHESIVE	Dec. 2008	100%, 50 °C		unpermitted
ARMAFLEX HT 625	Dec. 2009	100%, 50 °C		unpermitted
BISON SILIKONENKIT SANITAIR		100%		permitted
Bison-Tix contact adhesive		100%, 23 °C	Perfecta International	unpermitted
CFS SILICONE SEALANT S-200 silicone sealant)		100%		permitted
Colle Mastic hautes Performances	June 2009	100%	Orapi	permitted
Epoxy ST100	July 2007	100%		unpermitted
GENKEM CONTACT ADHESIVE		100%		unpermitted
GOLD CIRCLE SILICONEKIT BOUW TRANSPARENT		100%		permitted
Knauf Sanitär Silicone Kit		100%		permitted
Knauf Silicone Kit for Acrylic	July 2009	100%	Henkel	permitted
Pattex colle rigide PVC		100%		unpermitted
PEKAY GB480 (Vidoglue) adhesive		100%		unpermitted
PEKAY GB685 (Insulglue) adhesive		100%		permitted
Repa R 200		100%		permitted
RUBSON SILIKON SANITÄR TRANSPARENT SET		100%	Rubson	permitted
RUBSON SILIKON SANITÄR TRANSPARENT SET		100%	Rubson	permitted
Hydrophobic wood glue		100%		permitted
Foams				
BISON PUR FOAM	March 2009	100%		unpermitted
Boxer Mounting Foam	Feb 2007	100%		unpermitted
Gunfoam - Winter - Den Braven East sp. z o.o.	Feb 2007	100%		unpermitted
Gunfoam Proby	Feb 2007	100%		unpermitted
Hercusal	Feb 2007	100%		unpermitted
MODIPUR HS 539	July 2009	100%	Wickes	unpermitted
MODIPUR US 24 TEIL 2	July 2009	100%		unpermitted
MODIPUR HS 539 / US 24 TEIL 2 (1/1)	July 2009	100%		unpermitted
PUR Foam (contains diphenylmethane-4,4-diisocyanate)		100%		unpermitted
O.K. - 1 K PUR		100%		unpermitted
Omega Faum - foam	Feb 2007	100%		unpermitted
Proby Mounting Foam	Feb 2007	100%		unpermitted
PURATEC - 1 K PUR		100%		unpermitted
PURATEC - 2 K PUR		100%		unpermitted
Ramsauer PU foam	July 2009	100%		unpermitted
Shaft and Well Foam Klima plus		100%		unpermitted
Soudal Mounting Foam for low temperatures	Feb 2007	100%		unpermitted
SOUDAL Gun Foam Soudalfoam -10	Feb 2007	100%		unpermitted
SOUDAL PU foam	July 2009	100%		unpermitted
Door mounting foam 2-K Klima plus		100%		permitted
TYTAN Professional Gun Foam Winter	Feb 2007	100%		unpermitted
TYTAN Professional for PCV gun foam	Feb 2007	100%		unpermitted
TYTAN Professional Lexy 60 low-pressure	Feb 2007	100%		unpermitted
TYTAN Euro-Line Mounting Foam	Feb 2007	100%		unpermitted
TYTAN Professional for PCV mounting foam	Feb 2007	100%		unpermitted

Brand name	Date	Concentration	Manufacturer	Use
ZIMOWA SUPER PLUS - (mounting foam)	Feb 2007	100%		unpermitted
Greases				
BAYSILONE OIL M 1000		100%		permitted
BECHEM BERUSOFT 30		100%	bechem	permitted
Bechem Berulube Sihaf 2	May 2008	100%	bechem	permitted
Dansoll Silec Blue Silicone Spray		100%	dansoll	permitted
Dansoll Super Silec Sanitär mounting paste		100%	dansoll	permitted
Huile de chenevis		100%		permitted
Kluber Proba 270		100%	Kluber	permitted
Kluber Paralig GTE 703		100%, 80 °C, 96 h	Kluber	permitted
Kluber Syntheso glep1		100%, 135 °C, 120 h	Kluber	unpermitted
KLÜBERSYNTH VR 69-252		100%	Kluber	permitted
Kluber Unislikikone L641		100%	Kluber	permitted
Kluber Unislikikone TKM 1012		100%, 80 °C, 96 h	Kluber	permitted
OKS 462 / 0956409		100%	Kluber	permitted
OKS 477 VALVE GREASE		100%	Kluber	permitted
Laureat Zloty Installator		100%		permitted
Luga Spray (Leif Koch)		100%	Leif Koch	permitted
Rhodorsil 47 V 1000		100%, 80 °C, 96 h		permitted
SiliKon Spray (Motip)		100%	Motip	permitted
silicona lubricante SDP ref S-255		100%		permitted
Silicone oil M 10 - M 100000		100%		permitted
Silicone oil M 5		100%		permitted
Turmisilon GL 320 1-2		100%		permitted
UNISILIKON L250L	June 2008	100%		permitted
Wacker silicone		50%, 95 °C, 96 h	Wacker	unpermitted
Metals				
Copper ions (Cu 2+)		50 ppm		permitted
Solder flux S 39	June 2009	100%		permitted
Solder flux S 65	July 2009	100%		unpermitted
YORKSHIRE FLUX		100%		unpermitted
Degussa Degufit 3000		100%	Degussa	permitted
Aluminium ions (Al 3+)		50 ppm		permitted
Atmosflux	July 2008	100%		permitted
Paint				
Sigma Superprimer TI		100%	Sigma Coatings	permitted
Sigma Amarol		100%	Sigma Coatings	permitted
Decalux		100%	De Keyn Paint	permitted
Permaline		100%	ITI-Trimetal	permitted
Silvatane		100%	ITI-Trimetal	permitted
DULUX water-based high-gloss paint		100%	ICI	unpermitted
DULUX water-based silky gloss paint, satin		100%	ICI	unpermitted
DULUX for microporous wood, silky gloss		100%	ICI	permitted
DULUX floor paint, very tough, silky gloss		100%	ICI	permitted

TECEflex - Annex

Brand name	Date	Concentration	Manufacturer	Use
DULUX metal paint, anti-corrosive, high gloss		100%	ICI	permitted
Hammerite white, silky gloss		100%	ICI	permitted
Hammerite white, high gloss, based on Xyleen		100%	ICI	unpermitted
Hammerite silver-grey high gloss, based on Xyleen		100%	ICI	permitted
Boss Satin		100%	BOSSPAINTS	permitted
Hydrosatin Interior		100%	BOSSPAINTS	permitted
Carat		100%	BOSSPAINTS	permitted
Bolatex		100%	BOSSPAINTS	permitted
Optiprim		100%	BOSSPAINTS	permitted
Elastoprim		100%	BOSSPAINTS	permitted
Plastiprop		100%	BOSSPAINTS	unpermitted
Formule MC		100%	BOSSPAINTS	unpermitted
MAPEGRUNT		100%	Mapei	permitted
DULUX PRIMER		100%	ICI	permitted
UNI-GRUNT		100%	Atlas	permitted
Wall filler and construction products				
Bituperl (insulating filler with bitumen)		100%		permitted
Insulating coat with bitumen		100%		permitted
Cold adhesive for bitumen paper		100%		permitted
Climacoll adhesive for pipe insulation foam		100%		unpermitted
Compactuna		6%		permitted
FERROCLEAN 9390	Feb 2008	100%		permitted
FT-extra		100%		permitted
Giso base primer		100%		unpermitted
KNAUF STUC PRIMER	July 2009	100%		permitted
Mellerud mould killer		100%		permitted
Mineral wool insulation with blocking layer against metal vapour	July 2007	100%		unpermitted
Nivoperl (insulating filler)		100%		permitted
PCI LASTOGUM	Feb 2008	100%		permitted
PCI Seccoral 1K	Feb 2008	100%		permitted
Perfax Rebouche tout	July 2009	100%		permitted
PE pipe insulation foam		100%		permitted
Polyfilla inner wall filler		100%	Polyfilla	permitted
Porion immediate trowel		100%	Henkel	permitted
Porion mortar for repairs		100%	Henkel	unpermitted
Portland Cement - cement		100%	CBR	permitted
RIKOMBI KONTAKT (RIGIPS)		100%		permitted
Self-adhesive insulation PE foam (wrapping tape)		100%		unpermitted
SOPRO FDH 525 (liquid foil)	Sep. 2008	100%		permitted
Stucal Putz		100%	Gyproc	permitted
TANGIT REINIGER	July 2007	100%		unpermitted
TANGIT special cleaner	July 2007	100%		permitted
Tile adhesive		100%		permitted
Universal primer		100%		permitted
Wood-concrete Multiplex Bruynzeel (moisture from...)		100%		unpermitted
Wood pint (moisture from...)		100%		unpermitted

Brand name	Date	Concentration	Manufacturer	Use
Wood MDF medium density fibreboard (moisture from...)		100%		unpermitted
Wood Multiplex sealed watertight (moisture from...)		100%		unpermitted
Anti-Termite				
Aripyreth Oil Solution		100%, 23 °C		permitted
Baktop MC		100%, 23 °C		permitted
Ecolofen CW		100%, 23 °C		permitted
Ecolofen Emulsificable Concentrate - emulsifiable concentrate		100%, 23 °C		permitted
Ecolofen Oil Solution - oil solution		100%, 23 °C		permitted
Grenade MC		100%, 23 °C		permitted
Hachikusan 20WE/AC		100%, 23 °C		permitted
Hachikusan FL		100%, 23 °C		permitted
Kareit Oil Solution - oil solution		100%		permitted
Rarap MC		100%, 23 °C		permitted
Corrosion inhibitors				
BAYROFILM T 185		0.30%		permitted
Copal corrosion inhibitor	April 2007	100%		permitted
KAN-THERM	Sep. 2008	100%		permitted
INIBAL PLUS	Sep. 2008	100%		permitted
NALCO VARIDOS 1PLUS1	Jan 2009	2%, 23 & 95 °C		permitted
Gas leak sprays				
LIQUI MOLY leak seeker spray		100%, 23 °C		permitted
Multitek gas leak spray		100%		unpermitted
Sherlock gas leak detector		100%		permitted
Ulith leak detector spray	Sep. 2008	100%		permitted
LECK-SUCH-SPRAY 400ML (ART. 3350)	Jan 2009	100%, 23 °C & 95 °C		permitted
LECK-SUCH-SPRAY 400ML (ART. 1809)	Jan 2009	100%, 23 °C & 95 °C		permitted
LECKSUCHER PLUS (ART. 890-27)	Jan 2009	100%, 23 °C & 95 °C		permitted
LECKSUCHER 400 ML (ART. 890-20)	Jan 2009	100%, 23 °C & 95 °C		permitted
LECKSUCHERSPRAY ROTEST	Jan 2009	100%, 23 °C & 95 °C		permitted
GUPOFLEX LEAK-SEEKER (ART 301) leak seeker	Jan 2009	100%, 23 °C & 95 °C		permitted
LECKSUCHER 5 L (ART 4120)	Jan 2009	100%, 23 °C & 95 °C		permitted
GUEPO LEAK-SEEKER ETL (ART 121) leak seeker	Jan 2009	100%, 23 °C & 95 °C		permitted
GUEPO LEAK-SEEKER SOAPLESS (ART 131) soapless leak seeker	Jan 2009	100%, 23 °C & 95 °C		permitted
GASLEAK DETECTOR (GRIFFON)	June 2009	100%, 60 °C		permitted
GASLEAK DETECTOR KZ gas leak detector	June 2009	100%, 60 °C		permitted

The information in this table has been compiled to the best of our knowledge and is intended as general information. The results in the table show typical average values from a representative number of individual measurement results. These values should in no way be seen as specifications. Furthermore, TECE assumes no responsibility for the use of products not contained in this list.

TECE

Pipe Systems

TECElogo

TECHNICAL GUIDELINES

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System Description

TECElogo is a universal installation system for drinking water and heating installations. Composite pipes are available in dimensions 16 to 63. The connection technology requires no pressing tools. Handling requires only pipe cutters and a calibrator. The prepared pipe simply slots into the TECElogo connector and the connection is ready.

TECElogo offers:
- connection without pressing tools
- high pressure and temperature resistance
- no hygiene issues
- flush-mounting possible
- dimensionally stable, bend-resistant composite pipes
- fittings can be disassembled and reused

Types of pipe

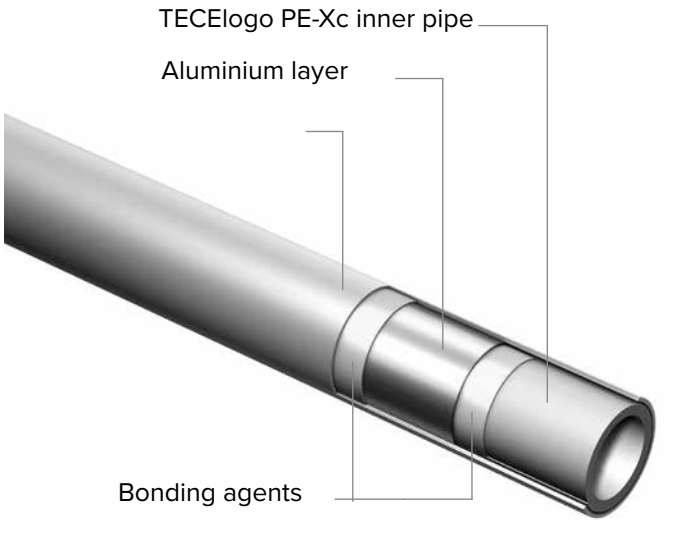
The TECElogo composite pipes are available in two versions:
- PE-Xc composite pipe
- PE-RT composite pipe

Advantages of TECElogo composite pipes:
- universal pipe for drinking water and heating installations
- linear extension comparable to a metal pipe
- visually appealing outer white layer
- easy to lay because of its bend-resistant rigidity
- corrosion resistant
- resistant to heating inhibitors
- external and internal monitoring
- DVGW certified
- potential operating pressure 10 bar

TECElogo composite pipes can be used:
- in floor and flat distribution
- in cellars, rising pipes and surface-mounting
- in insulation in concealed areas
- in radiator connection
- for underfloor and wall heating, etc.

TECElogo PE-Xc composite pipe

The TECElogo PE-Xc composite pipe is a pipe with a butt-welded aluminium layer and PE-Xc inner pipe. This combination of materials reduces the thermal length change and simultaneously makes the pipe rigid and bend-resistant. The use of PE-Xc means this composite pipe demonstrates outstanding creep strength at temperatures up to 90 °C.



Composition of the TECElogo PE-Xc composite pipe

Delivery forms:
- Dimensions 16–63 (16/20/25/32/40/50/63)
- as a roll (up to dim. 25) or in rod form
- in black corrugated pipe sheathing (16/20/25) or
- as pre-insulated variants (16/20/25)

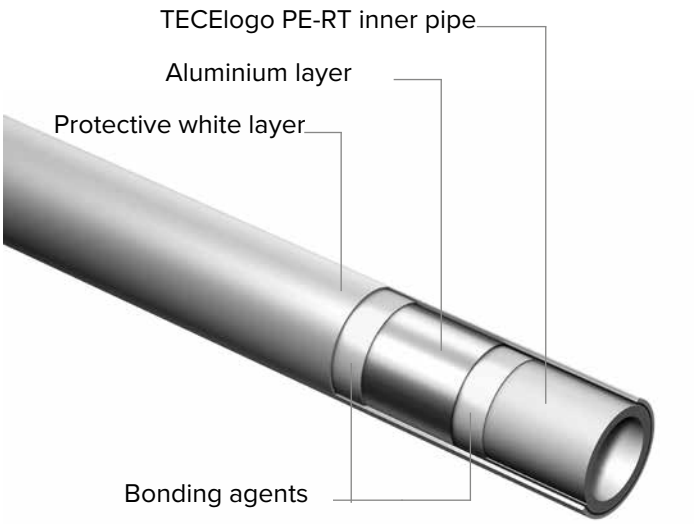
Special advantages of TECElogo PE-Xc pipes

the high mechanical load-bearing capacity gives the electron beam cross-linked TECElogo pipes the following properties:
- very good long-term behaviour in internal pressure creep rupture strength tests, even at higher temperatures
- good thermal ageing stability so no damage from thermo-oxidative ageing occurs during proper use
- good resilience to the formation of stress fractures
- good chemical resistance, which means also resistant to heating water additions, such as e.g. inhibitors
- can be cold-laid without heat treatment
- good abrasion resistance and tear resistance
- impact-resistant at low temperatures
- no plastic creep behaviour

TECElogo PE-RT composite pipe

The TECElogo PE-RT composite pipe is a pipe with a butt-welded aluminium layer and

PE-RT inner pipe. This combination of materials reduces the thermal length change and simultaneously makes the pipe rigid and bend-resistant. The use of PE-RT type 2 means this composite pipe demonstrates outstanding creep strength at temperatures up to 90 °C.



Composition of the TECElogo PE-RT composite pipe

Delivery forms:
- Dimensions 16–25 (16/20/25)
- as rolls or in rod form or
- in black corrugated pipe sheathing (16/20/25)

Fittings

Fittings are available made of red brass, polyphenylsulphone (PPSU) as well as brass (with restriction in drinking water installations - see below).
Properties and features of TECElogo fittings:
- one fitting (red brass and PPSU) for drinking water and heating installations
- no hygiene issues
- mechanically highly durable

Red brass

Universal and future-proof – approved for drinking water installations.
The flow-optimised all-round fitting is dimensionally stable and resistant to erosion as well as corrosion through dezincification and stress corrosion cracking. The standardised material complies with generally accepted engineering standards and is recommended by the German Federal Environment Agency (UBA) for drinking water installations. The threaded TECElogo fitting is equally suitable for drinking water installations to DIN 1988/DIN EN 806 and heating installations.

PPSU

The fitting made of high-performance plastic PPSU is corrosion-free and impact-resistant. It is equally suitable for drinking water installations to DIN 1988/DIN EN 806 and heating installations.

TECElogo - System Description

Brass*

The inexpensive metallic alternative to red brass fittings made of standard brass. The fitting can be used without restriction for heating installations and with certain limitations for drinking water installations.
The 98/83 Directive on water quality for human consumption set out by the European Community defines a maximum lead content of 0.01 mg/l. Of this, the maximum amount permitted to emanate from the drinking water installation is 0.005 mg/l. To ensure reliable compliance with the limit value, TECE recommends using red brass, standard brass or PPSU fittings. These three materials are included on the positive list of the German Federal Environment Agency (UBA).

* Please note that some qualities of drinking water may have a corrosive effect on metals. We recommend checking the selection of the material (see technical data section of the tube and the charts on following pages).

TECElogo connection

A TECElogo connection is very compact and consists of just a few components:

1. Base body – material either:
   a) universal red brass
   b) high-performance PPSU
   c) special brass resistant to dezincification
2. Collet - made of fibre-reinforced polyamide
3. Clamping ring made of PPSU - holds the pipe safely on the base body
4. O-rings - ensure a permanently tight connection

Application limits

The TECElogo system is classified according to the application type. Suitable for drinking water installations in accordance with application class 2 and for heating installations in accordance with application class 5. See also table “Classification of operating conditions ISO 10508”

It has a lifespan of more than 50 years. The assessment is carried out using a standardised temperature group based on real operating temperatures. The TECElogo range contains two qualities of pipe. The pipes differ in the plastic that makes up the inner pipe:

- PE-Xc
- PE-RT

Both pipe qualities are tested and DVGW certified with the TECElogo push-fittings. They fulfil the requirements for class 2 (hot drinking water) and class 5 (heat) in accordance with ISO 10508.

The following applies for TECElogo composite pipes:

- must not be used in solar plants
- unregulated hot water boiler must not be connected directly. A metal pipe of at least 1 m must be installed between the TECElogo and the hot water boiler.
- Suitable measures should be taken with solid fuel boilers to ensure that the temperatures permitted in accordance with ISO 10508 are not exceeded.
- No contact with open flames

TECElogo system pipes	PE-RT composite pipes		
Pipe designation	PE-RT/Al/PE	PE-RT/Al/PE	PE-RT/Al/PE
Dimension	**16**	**20**	**25**
Delivery length – roll in m	100	100	50
Rods (m) (5 m/pipe)	100	70	45
Field of application*	TWA, HKA, FBH	TWA, HKA, FBH	TWA, HKA, FBH
Application class/ operating pressure	2 / 10 bar 5 / 10 bar	2 / 10 bar 5 / 10 bar	2 / 10 bar 5 / 10 bar
Approval	DVGW	DVGW	DVGW
Colour	white	white	white
Outside diameter in mm	16	20	25
Wall thickness in mm	2	2.25	2.5
Inside diameter in mm	12	15.5	20
Available in corrugated protective pipe	yes	yes	yes
Can be delivered with 9 mm insulation λ = 0.040 W/(m · K)	--	--	--
Can be delivered with 13 mm insulation λ = 0.040 W/(m · K)	--	--	--
Pipe weight empty in kg/m	0.10	0.14	0.20
Internal volume in dm^3/m	0.11	0.19	0.31
Pipe roughness in mm	0.007	0.007	0.007
Thermal conductivity uninsulated in W/(m^2 · K)	0.41	0.41	0.41
Coefficient of thermal expansion in mm/(m · K)	0.026	0.026	0.026
Minimum bending radius in mm - without bending spring - with bending spring	 80 64	 100 80	 125 100

* TWA – drinking water system; HKA – radiator connection; FBH - floor heating;

Technical data of TECElogo PE-RT composite pipes.

TECElogo - System Description

TECElogo system pipes	PE-Xc composite pipes*						
Pipe designation	PE-Xc/Al/PE						
Dimension	**16**	**20**	**25**	**32**	**40**	**50**	**63**
Delivery length – roll in m	100	100	50	--	--	--	--
Rods (m) (5 m/pipe)	100	70	45	30	15	15	5
Field of application*	TWA, HKA, FBH						
Application class/ operating pressure	2 / 10 bar; 5 / 10 bar						
Approval	DVGW						
Colour	white						
Outside diameter in mm	16	20	25	32	40	50	63
Wall thickness in mm	2	2.25	2.5	3	4	4.5	6
Inside diameter in mm	12	15.5	20	26	32	41	51
Available in corrugated protective pipe	yes	yes	yes	--	--	--	--
Can be delivered with 6 mm insulation λ = 0.040 W/(m · K)	yes	yes	yes	--	--	--	--
Can be delivered with 9 mm insulation λ = 0.040 W/(m · K)	yes	yes	yes	--	--	--	--
Can be delivered with 13 mm insulation λ = 0.040 W/(m · K)	yes	yes	yes	--	--	--	--
Pipe weight empty in kg/m	0.10	0.14	0.21	0.33	0.53	0.79	1.22
Internal volume in dm^3/m	0.11	0.19	0.31	0.53	0.80	1.32	2.04
Pipe roughness in mm	0.007						
Thermal conductivity uninsulated in W/(m^2 · K)	0.43						
Coefficient of thermal expansion in mm/(m · K)	0.026						
Minimum bending radius in mm - without bending spring - with bending spring	 80 64	 100 80	 125 100	 160 --	 200 --	 250 --	 315 --

* TWA – drinking water system; HKA – radiator connection; FBH – floor heating;

Technical data of TECElogo PE-Xc composite pipes

Application class	Calculation temperature T_D °C	Operating period[b] with T_D Years [a]	T_{max} °C	Operating period with T_{max} Years	T_{mal} °C	Operating period with T_{mal} Hours	Typical application area
1 [a]	60	49	80	1	95	100	Hot water supply (60 °C)
2 [a]	70	49	80	1	95	100	Hot water supply (70 °C)
3 [c]	20	0.5	50	4.5	65	100	Low-temperature floor heating
	30	20					
	40	25					
4 [b]	20	2.5	70	2.5	100	100	Floor heating and low-temperature radiator connection
	40	20					
	60	25					
5 [b]	20	14	90	1	100	100	High-temperature radiator connection
	60	25					
	80	10					

T_D = temperature the pipe system is designed for. T_{max} = maximum temperature permitted for a short time
T_{mal} = highest possible temperature that may be reached in the event of the fault "mal" (maximum 100 hours in 50 years)

[a] A state can select either class 1 or class 2 according to its national provisions.

[b] If there is more than one operating temperature for the operating duration and the associated temperature for an application class, the corresponding operating duration times should be added. "Plus cumulative" in the table implies a temperature group for the temperature given for an operating period (e.g. the temperature group for a period of 50 years for class 5 is made up as follows: 20 °C over 14 years, followed by 60 °C over 25 years, followed by 80 °C over 10 years, followed by 90 °C over 1 year, followed by 100 °C over 100 h).

[c] Only permitted if the fault temperature cannot exceed 65 °C.

Classification of operating conditions (in accordance with ISO 10508)

Areas of application

Drinking water installation

Drinking water presents special requirements for an installation system. It's a consumable and must not be negatively impacted by the installation system materials. The planning and design as well as the operation of drinking water installations must be carried out in accordance with DIN 1988, DIN EN 806, DIN EN 1717/A1 and VDI 6023. The fitter has to make sure that they are installing a piping system that corresponds to the applicable recognised technical regulations. The TECElogo is DVGW certified and proven suitable for drinking water installations. Among other things, the DVGW certification includes:

- technical inspection of the components
- KTW inspection
- Certification in accordance with worksheet DVGW W270

Field of application

The TECElogo system is suitable for all drinking water qualities in accordance with DIN 50930 Section 6, which comply with the current Drinking Water Ordinance (TrinkwV 2011), DIN 2000 and EU Council Directive 98/83/EG dated 3rd November 1998.

The following components are available for drinking water installations:

- plastic fittings made of PPSU
- flow-optimised metal fittings made of red brass
- composite pipes with PE-Xc or PE-RT inliners

All materials are recommended by DVGW and recognised across Europe. All metallic components in the TECElogo that come into contact with water comply with the evaluation principles (as at 19/01/2016) of the German Federal Environment Agency (UBA) as per the 4MS material list (as at 05/01/2017).

Material selection

The fitter has satisfied their duty of care when they

- have presented the drinking water analysis as per DIN 50930-6 for the supply area of the building project to be constructed and have inspected the suitability of the TECElogo system,
- have satisfied themselves of the supplier's experience,
- if necessary, receive approval for TECElogo from TECE.

Measures for Legionella prophylaxis

Drinking water installations must be planned, designed and operated with special care in accordance with DIN EN 806 and DIN 1988; VDI 6023 and DVGW worksheet W551 also apply.

The risk of Legionella formation can be minimised by complying with a few simple rules:

- Unnecessary and dead pipe sections where water can stagnate should be immediately disconnected at the outlet.
- Care should be taken during installation to ensure no dirt is introduced into the piping system
- the storage water volume should be designed to be as small as possible.
- Pipes should be selected in the correct dimensions.
- Circulation pipes must not be designed to be too large.
- Circulation pipes must be hydraulically balanced.
- The temperature of the hot water boiler must be at least 60°C.
- The circulation return must not fall below 55 °C.
- The system should be rinsed particularly thoroughly during commissioning.
- No organic materials such as e.g. hemp should remain in the drinking water installation.
- Uninsulated sections of the hot water line should be avoided.
- Care should be taken to ensure the correct function and maintenance of water treatment systems and filters.
- A local hot water supply should be installed if tapping points are far away or used very rarely.
- If cold water lines are located next to hot water lines or heating pipes, they have to be insulated well, so that the cold water cannot heat up.
- Lines carrying cold water should not be laid in hollow spaces in which circulation and heating lines are located.
- For hygiene reasons, pressure tests should not be performed with water but rather oil-free compressed air or inert gas. Pressure tests with water are only permitted immediately prior to the commissioning of the installation. Only drinking water with no hygiene issues should be used for rinsing and the pressure test.

Disinfection of drinking water installations

The suitability of the TECElogo system for drinking water is confirmed by the DVGW certification. The components of the TECElogo system are made from materials recognised and valued across Europe. A drinking water installation planned, designed and operated in accordance with DIN 1988, DIN EN 806, DIN EN 1717/A1 and VDI 6023 has no hygiene issues and in principle requires no disinfection measures. Disinfection is only necessary in exceptional instances and only then to be carried out if there is an urgent requirement (contamination).

This is to be viewed as an immediate emergency measure in order to return the drinking water installation to a usable state. The cause of the microbial contamination - e.g. construction fault or incorrect operation - must be eliminated. The maintenance of the usability of the drinking water installation by repeated disinfection measures must be avoided. In such instances, remodelling works take priority over disinfection measures.
Repeated courses of disinfection have a negative impact on the lifespan of the installation.

A fundamental distinction is to be made between measures outside of ongoing operation (chemical disinfection) and measures in ongoing operation (thermal disinfection and continuous chemical disinfection).

Thermal disinfection

DVGW worksheet W551 prescribes a three-minute flushing of each tapping point with hot water at a minimum temperature of 70° C. It has been proven in practice that the hot water boiler should be heated to 80 °C to compensate for the temperature losses to the tapping points. Before rinsing the tapping points any existing circulation (if present) must be switched on until the circulation line reaches a minimum of 70 °C. Check that no users could scald themselves during the thermal disinfection. All drinking water installation pipes from the TECElogo system can be promptly disinfected using this method. Restriction of the lifespan of the TECElogo pipes cannot be ruled out where thermal disinfection is used regularly and consideration should be given to renovation of the drinking water installation.

Chemical disinfection

Chemical disinfection measures should be carried out in compliance with DVGW worksheet W 291. Care should be taken that the active ingredients, concentrations, usage periods and maximum temperatures listed here are complied with. The combination of thermal and chemical disinfection is not permitted. The water temperature during chemical disinfection must not exceed 25 °C.

The TECElogo system can be disinfected using the disinfection agents listed in DVGW worksheet W 551. The dosages must not be exceeded. It should be ensured that nobody draws drinking water during the disinfection process. Following chemical disinfection it MUST be ensured that all disinfection agent residues have been sufficiently rinsed out of the piping network. The water containing the disinfection agent must not be added to the drainage.

Prior to carrying out disinfection measures with chemical agents it should be ensured that all components of the drinking water installation are resistant to the agent. Special attention should be given to stainless steel components. The provisions of DVGW worksheet W 551 must be observed. The manufacturer of the disinfection agent must approve the suitability of the agent for use with PE-Xc pipes and red brass. The manufacturer's specifications must be observed.

The disinfectant effect of the chemical disinfection agent normally results from the oxidative effect of the contents. Regular disinfection means the materials that comprise the drinking water installation could also be attacked. Repeated courses of chemical disinfection have a significant negative impact on the lifespan of the TECElogo system. The total number should thus be restricted to five disinfection cycles over the total lifespan of the pipes. Repeated disinfection measures do not conform to the state of the technology. A disinfection measure is only warranted in order to return a drinking water installation to a usable state following contamination.

Agent	Form of delivery	Storage	General safety information *	Max. concentration	Effect duration	Maximum temperature permitted
Hydrogen peroxide H2O2	Watery solution in various concentrations	Away from light, cool, avoid all contamination	Protective gear required for solutions >5%	150 mg/l H2O2	Max. 24 h	Tmax ≤ 25 °C
Sodium hypochlorite	Watery solution with maximum 150 g/l chlorine	Away from light, cool, sealed and in a collection tray	Alkaline, irritant, poisonous, protective gear required	50 mg/l chlorine	Max. 12 h	Tmax ≤ 25 °C
Chlorine dioxide ClO2	Two components: sodium chlorite, sodium peroxide sulphate	Away from light, cool and sealed	Oxidative effect, do not inhale chlorine dioxide has, protective gear required	6 mg/l ClO2	Max. 12 h	Tmax ≤ 25 °C

* The corresponding notes in the manufacturer's safety datasheets must be observed.
** This value must not be exceeded over the total usage period at any point in the installation.

Chemical disinfections, agents and concentrations in accordance with e.g. DVGW W 557

Continuous chemical disinfection

Disinfection of a contaminated drinking water system over a constant given dose of disinfection agents is not expedient according to today's knowledge. It should therefore only be carried out in rare exceptional cases. Here it should be ensured that the requirements of the current Drinking Water Ordinance and the UBA list in accordance with Sec. 11 DWO (TVO) are met. The prescribed limit values would have to be exceeded significantly in order to achieve a relevant effect, however. Continuously added disinfection agents can have a significant effect on the lifespan of the drinking water installation. This kind of disinfection is advised against due to possible material deterioration. No guarantee can be made in these cases.

Heating installation

The TECElogo system is approved for heating installations. The following components are available for this:

- plastic fittings made of PPSU
- metal fittings made of DR brass or red brass
- composite pipes made of PE-Xc and PE-RT for system temperatures up to 90 °C in accordance with ISO 10508
- connection accessories/transitions made of copper

The aluminium layer on the TECElogo composite pipe makes it 100% oxygen-tight.

Connection technology

TECElogo is a secure and quick push-fitting system for composite pipes, making a connection with this is very simple:
1. Cut pipe to length
2. calibrate and mill
3. push it in - and you're done.

The connection is sealed using two sturdy O-rings. The conical shape of the retaining claw makes it easier to slide the pipe in and prevents the connection from coming undone. It holds the pipe secure and tight - without damaging it.
The closed inspection window allows you to check the insertion depth and enables the fitter to be certain of a secure connection.

Handling

Important note: TECElogo must be processed only with the accompanying system tools. The use of tools that are not part of the system is not permitted!

It is not permitted to connect TECElogo components with third-party pipes or fittings. A warranty claim can only be made for the possible applications outlined in the System Description.

Toolbox containing pipe cutters, calibration and chamfering tool as well as disassembly tools

TECE provides two toolsets. These system tools let you create and undo connections for dimensions 16 to 25 and 32 to 63.

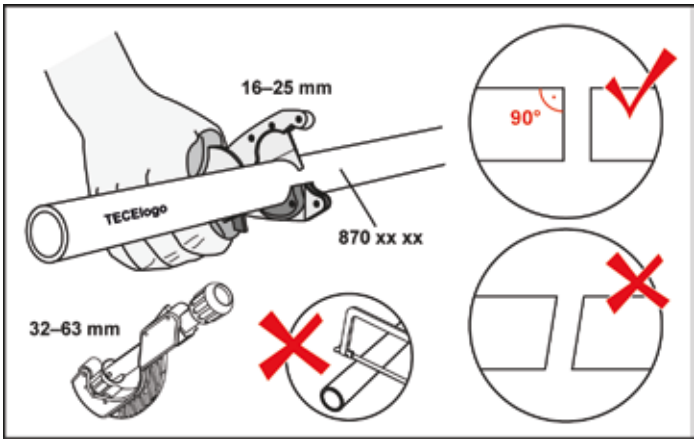
Tool for dim. 16–25:
- TECElogo pipe cutters (to dim. 25)
- TECElogo calibration and chamfering tools
- TECElogo disassembly tools

Tool for dim. 32–63*:
- TECE pipe cutters (dim. 16–63)
- TECElogo calibration and chamfering tools
- TECElogo disassembly tools

Create connection

The following work steps must be followed to ensure a correct TECElogo connection:

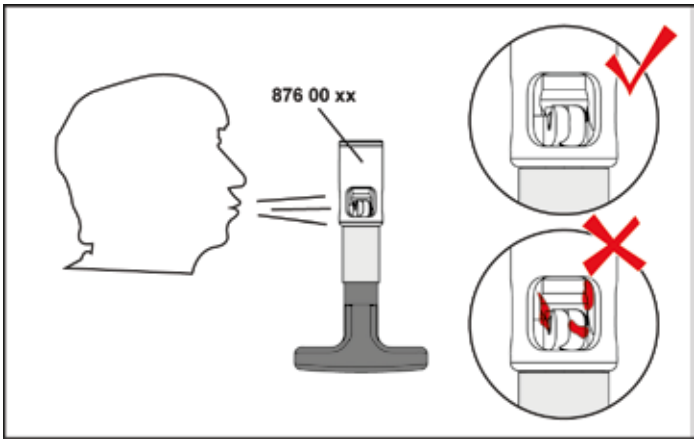
Cut pipe to length



For cutting a TECElogo pipe to length use TECE pipe cutters (order no. 8760002) for the smaller dimensions (up to 25), and use the TECE pipe cutter (order no. 8760008) for the larger dimensions (up to 63)
Cut the pipes at a right-angle. Do NOT use a saw or similar tools!

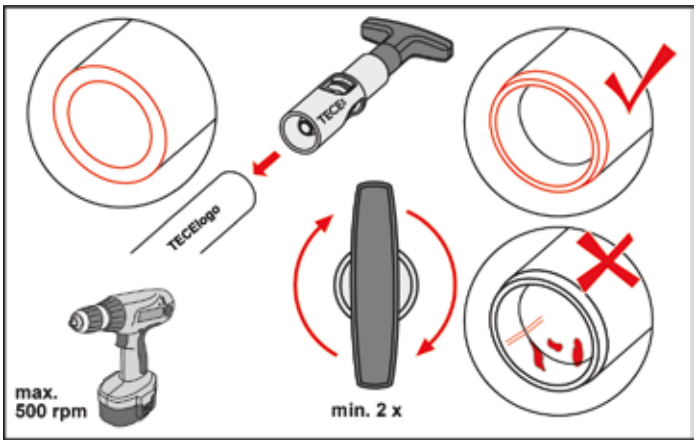
Note: TECElogo pipes may only be processed using the TECE system tools in perfect condition. In particular, the cutter or the cog must be sharp and without burrs - this/these can be replaced if necessary.

Clean calibrator



The TECElogo calibrator must be dirt-free. Clean the calibration and chamfering tool after every calibration (“free blowing”). Residual shavings could otherwise be transferred into the sealing zone on the connector.

Calibrate and chamfer pipe



Place the calibration and chamfering tool matching the pipe dimensions (order no. 87600xx) on the end of a TECElogo pipe and turn clockwise multiple times.

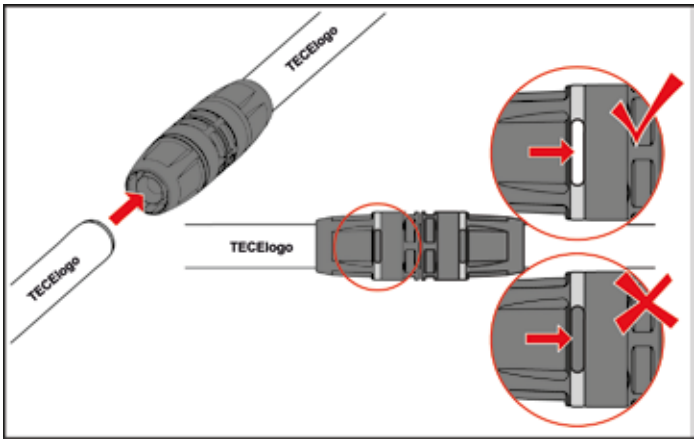
The pipe should then have - inside and out - an even chamfer and be free of burrs. There must be no shavings left on the chamfer, which should be visually checked following calibration (see subsequent photos). In the event of damage (e.g. serrations), the damaged end must be cut off and the pipe recalibrated.

Correctly calibrated pipe

Incorrectly calibrated pipe

The pipe can also be calibrated using a cordless screwdriver. The number of revolutions here must not exceed 500 per minute (500 rpm) however (= level 1).

Pipe insertion and visual check



Check the fitting for dirt and clean or swap if necessary. To avoid dirt, do not remove the hygiene caps of the fitting until immediately before the push-fitting operation. Simply push the TECElogo pipe into the fitting until it reaches the stop.

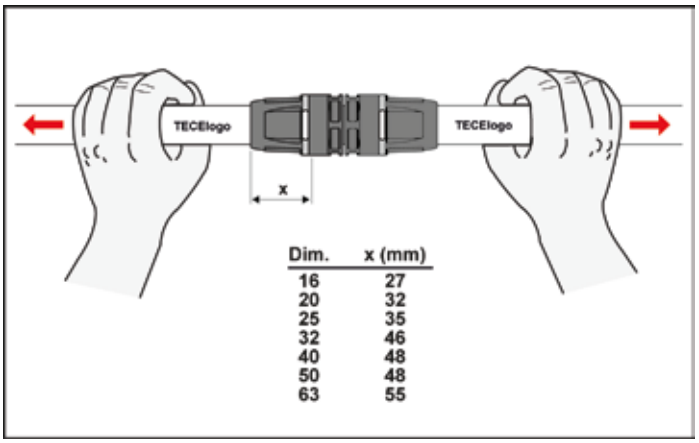
The connection is only completed correctly once the pipe is visible in one of the inspection windows.

If a visual check via the inspection window is not possible (e.g. in poor lighting), mark the push-in depth on the pipe. The pipe must then be pushed in up to this marker.
The spacing between the markers to the pipe end depend on the dimensions of the pipe:

Dimension	Marker spacing in mm
16	27
20	32
25	35
32	46
40	48
50	48
63	55

Marker spacing from pipe end

Check the finished TECElogo push-fitting connection by trying to pull it apart: You must not be able to pull the pipe from the fitting.



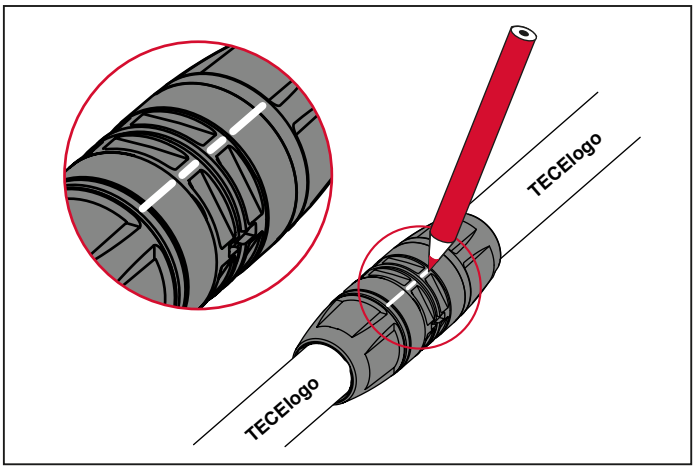
Undo connection and connect again

You can undo the TECElogo system connections if required. With new installations all disconnected parts can be reused. With connections that are only disconnected after a TECElogo installation has been connected, the used pipe ends and O-rings must be replaced but the fitting base body, collets and clamping rings can be reused, however. Additionally, only original TECElogo O-rings should be used - these are available as spare parts.

Note: Only the disassembly tool from the TECElogo system must ever be used for undoing and re-connecting.

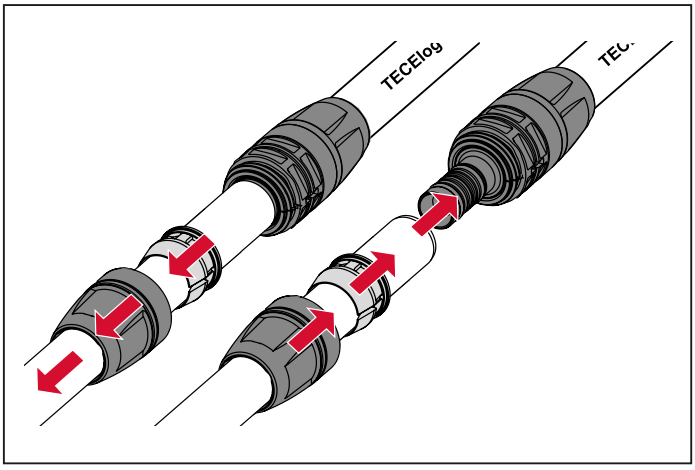
The following working steps are necessary in order to undo and re-establish a connection:

Mark and disconnect the collet



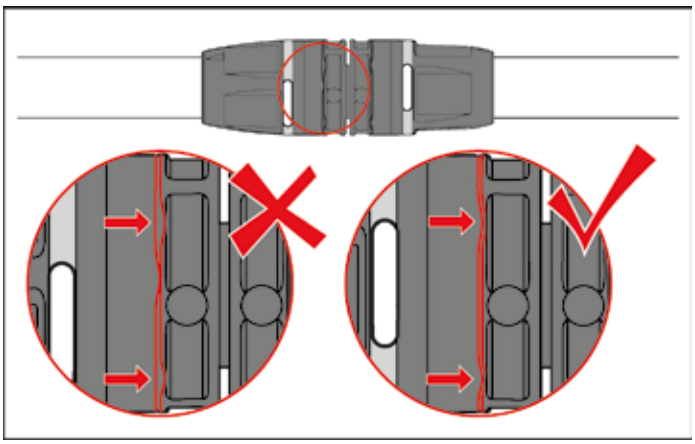
Before undoing a connection, make a continuous marking on the collet and threaded clip. Fix the fitting with the disassembly open-end wrench and unscrew the collet with the dismounting key.

Remove the fitting from the pipe and reattach



Now push back the collet and clamping ring and pull the pipe away from the fitting base body, then remove the clamping ring and collet from the pipe.
Before assembling the fitting, check the base body and remove any dirt or chips. If the O-ring is damaged, it must be replaced.

A. For new installation:
Place the clamping ring on the support with the conical end facing the pipe and tighten by hand with the collet. Then screw the collet on using the disassembly tools tightly enough that the collet noticeably “clicks” into the end position (see following figure) and the markers once again match.



B. After commissioning:
Slide the new O-rings onto the fitting. Place the clamping ring on the support with the conical end facing the pipe and tighten by hand with the collet. Then screw the collet on using the disassembly tools tightly enough that the collet noticeably “clicks” into the end position and the markers once again match.

The subsequent steps - cut, calibrate and chamfer pipe, push it in and conduct visual check - are carried out as outlined in the previous section “Create connection”.

Installation Guidelines

For the installation of heating and drinking water installations, the applicable technical rulings, standards and provisions should be observed. Installations must only be carried out by specialist companies.

General notes

The following information should be considered when using TECElogo pipes.

Threaded connections

For threaded connections TECE recommends the use of hemp combined with a sealant paste approved for this purpose. Using too much hemp can cause damage to the internal and external threaded components. Care should be taken to ensure no hemp residue remains in the pipe system. If other thread sealants are used, the warranty must be assumed by the sealant manufacturer.

Processing temperatures

The TECElogo system can be handled down to a minimum temperature of 0 °C. With lower temperatures, the ends of the pipe should be warmed up until “lukewarm”. The use of open flames is also prohibited!

Coating of fittings

TECElogo fittings must be fundamentally protected from contact with the wall structure, plasterboard, cement, screed, rapid binders or similar using suitable coverings. Direct contact with the structural shell must be avoided at all costs owing to the sound insulation requirements in accordance with DIN 4109 and VDI 4100.

Kinks and deformities

If a TECElogo pipe develops a kink or deformation due to incorrect handling or unfavourable construction site conditions then the site of the deformation must be repaired or an elbow fitting equipped for tight radii.

Use with poured asphalt

The high temperatures than can occur with the application of poured asphalt (approx. 250 °C) would destroy the pipeline immediately on direct contact. This also applies to the use of pipe-in-pipe systems. Suitable protection measures should therefore be taken. The pipe-in-pipe lines installed on the bare concrete are sufficiently protected against burning when the insulating fibreboards used during work with poured asphalt are laid over the pipes before the asphalt is applied. What is particularly critical is not the open floor areas, however, but the locations at which the lines are guided from the bare concrete into the wall structure. Here the lines are optimally protected when the edge insulation strips are laid in front of the lines so that they maintain a certain distance and the space around the lines can be filled in with sand. These protective measures should be checked once again before the poured asphalt is actually applied in order to avoid irreparable damage to the piping system. During the application of the asphalt the pipes should be flushed with cold water.

Avoidance of air pockets

Pipes must be laid such that it no air pockets can form. At the deepest point in the system there must also be a facility for draining the pipeline.

Protection against UV radiation

UV radiation damages the TECElogo pipes over longer periods of time. The pipe packaging offers sufficient protection against UV radiation but is not weather-proof. The pipes should therefore not be stored out in the open. The pipes should not be exposed to sunlight for unnecessary amounts of time. They should be protected against UV light where necessary. TECElogo pipes laid in the open must be protected against sunlight in a black corrugated pipe.

Identification of pipelines

TECE recommends identifying installation pipes in accordance with DIN 2403.

Installation on bitumen sheets

TECElogo pipes must be completely dried before laying these on bitumen sheets or coatings containing solvents. The manufacturer’s setting times should be observed.

Arrangement of pipelines

If cold and hot water pipes are laid on top of one another, the pipes carrying hot water must be laid above the cold water line.

Contact with solvents

Direct contact between TECElogo components and solvents or solvent-based paints, dyes, sprays, adhesive strips, etc. should be avoided. Solvents can erode the plastic components in the system.

Potential equalisation

TECElogo composite pipes may not be used as earthing conductors for electrical systems in accordance with VDE 0100.
This means metal pipe installations exchanged in part for a pipe from the TECElogo range (e.g. during renovations) should be checked for correct earthing.

Protection against frost

Filled TECElogo pipes should be protected against frost. The TECElogo system is suitable for the following frost protection agents and concentrations:

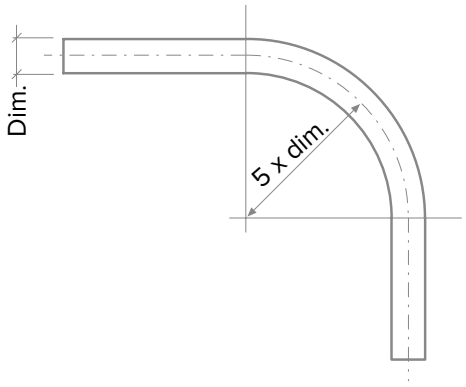
- Ethyl glycol (Antifrogen N): May be used up to a concentration of maximum 50%. TECE recommends restricting the concentration to 35%. A concentration of 50 % Antifrogen N corresponds to frost protection down to a temperature of -38 °C. A concentration of 35 % Antifrogen N corresponds to frost protection down to -22 °C. If Antifrogen N is dosed above 50%, the frost protection effect is reversed. Slurry ice formed at temperatures below -25 °C.
- Propylene glycol: May be used up to a concentration of maximum 25%. Propylene glycol is primarily used in the foodstuffs industry. A concentration of 25% corresponds to frost protection down to -10 °C. Overdosing with propylene glycol can lead to stress fractures in the PE-RT material.

Heat tracings

Heat tracings as well as self-regulating heater bands approved by manufacturers for plastic piping systems in the sanitary sector can be used for TECElogo. To ensure optimum heat transfer the heating bands are attached to the TECElogo installation pipe across their full surface using broad aluminium adhesive strips. The manufacturer's instructions should be followed.

Bending radii

TECElogo composite pipes can be bent by hand up to dimension 25, but commercially available bending tools must be used from dimension 32.
The pipes can be bent in the neutral line with a minimal bending radius - in principle corresponding to 5x the dimension of the pipe - to avoid buckling and kinks.
If bending springs are used during the installation of TECElogo pipes then the minimal bending radius - to 4x the dimension of the pipe - may be reduced:

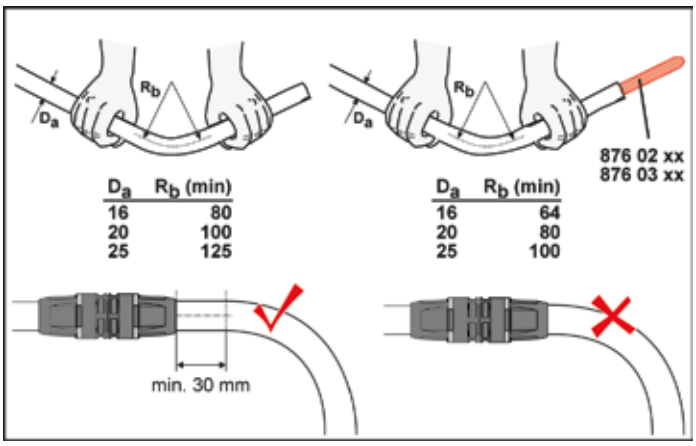


* without bending spring; 4 x dim. with bending spring.

Minimal bending radius of TECElogo composite pipes

Dimension	Minimum bending radius in mm - without bending spring	with bending spring
16	80	64
20	100	80
25	125	100
32	160	--
40	200	--
50	250	--
63	315	--

Bending radii of TECElogo pipes



Bending radii without bending springs (left) and using bending springs (right)

Pipes that have already been push-fitted should not be subsequently bent. If you do need to do this, make sure that the pipe has been pushed onto the fitting straight and without tension. Tension can lead to leaks.

Thermal length changes

Materials expand when heated and contract when cooling down. The systemic, huge temperature differences mean that the lines in hot water and heating installations must be attached such that the length extension in elbows or special compensating elbows can be balanced out.

Detecting thermal length changes

Thermal length changes are detected using the following formula:

$\Delta l = \alpha \cdot l \cdot \Delta t$

Δl thermal length change of the pipe in mm
α expansion coefficient of the TECElogo pipes
l starting length of the pipe in m
Δt temperature difference in K*

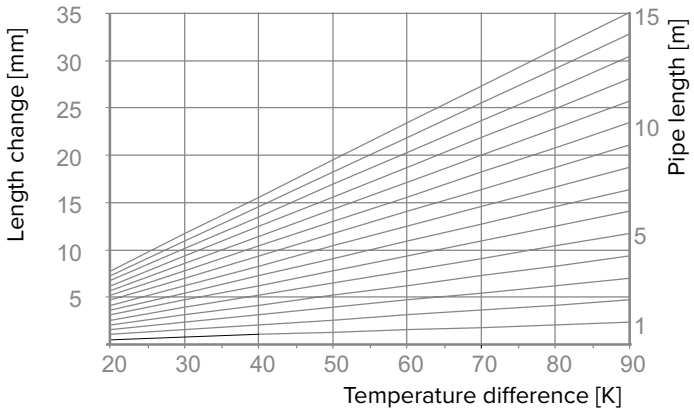
* K = Kelvin is the SI base unit of temperature and relates to absolute zero.
(0 °C = 273.16 K)

Expansion coefficient of the TECElogo pipes:
Composite pipes α = 0.026 mm/(mK)

Example: A 12 metre-long TECElogo heating line made of composite pipe is installed at 5 °C in winter. Operating conditions can lead to a temperature of 70 °C.

l 12 m
Δt 70 K - 5 K = 65 K
α 0.026 mm/mK
Δl = 0.026 mm/mK · 12 m · 65 K = 20.28 mm

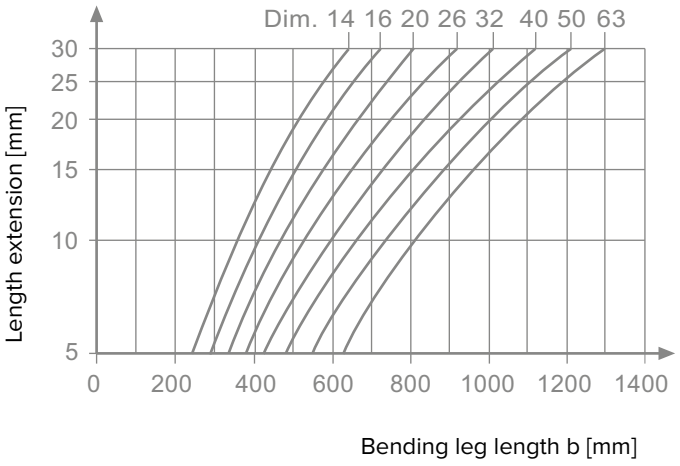
Result: The pipe will expand by approx. 20 mm. The expansion must be compensated for via structural conditions. Alternatively, the thermal length extension can be found in the following diagram.



Thermal length extension for TECElogo composite pipes

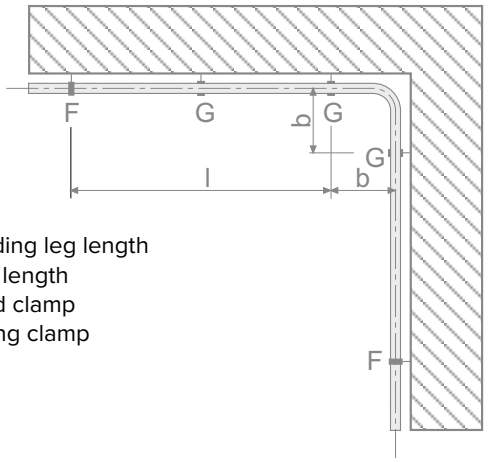
Determining the length of the bending leg

The bending leg length (b) can be found in the following diagram:



Bending leg length for TECElogo pipes

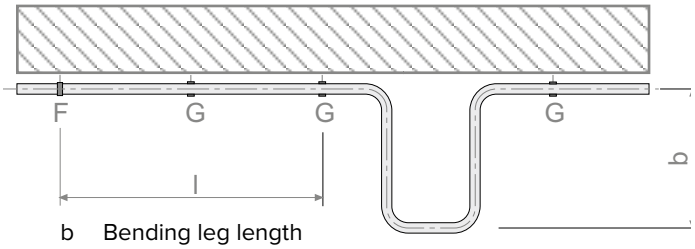
The pipe lengths to be observed can be isolated using fixed and sliding clamps.



b Bending leg length
l Pipe length
F Fixed clamp
G Sliding clamp

Compensation of thermal linear extension in a direction change

It can happen that the planned pipe design does not offer sufficient room for movement for the inclusion of thermal linear extension. In this case, compensating bends should be included in the plan that take into account the bending leg lengths.



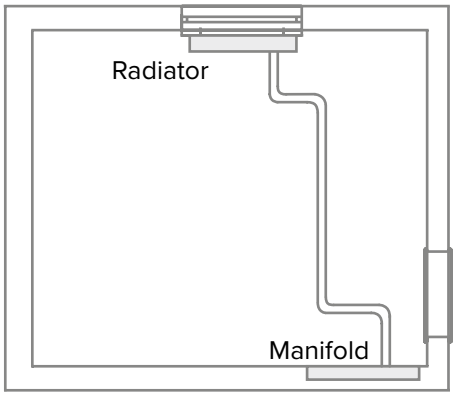
b Bending leg length
l Pipe length
F Fixed clamp
G Sliding clamp

Compensation of thermal linear extension in an extension loop

Example: The pipe length extension in the aforementioned example is approx. 20 mm. The bending leg length b can be found in the aforementioned diagram. For a TECElogo pipe with a dimension of 20 mm this results in a value of 670 mm. If a sliding clamp of at least 670 mm is fitted to the elbow then no additional compensating elbow is required.

Special installation notes for linear extension

- Take care to ensure sufficient “room to manoeuvre” when connection radiators from the floor or wall in order to include linear extension.
- The connection should always be guided to the radiators in an elbow design.
- TECElogo fittings should be installed tension-free. If necessary, suitable attachments should arranged to decouple the fittings from the influence of the length extension.



Example installation taking into account linear extension

Attaching conduit

TECElogo pipelines are only to be attached using the approved pipe clips for the relevant purpose. Commercially available wall plugs can be used to attach clamps as long as they are used on components with sufficient mechanical stability. The TECElogo pipelines may not be attached to other lines.

Routing of water-bearing TECElogo lines

The routing of TECElogo installation lines must comply with the recognised rules of engineering. The quality of the drinking water must not be negatively affected by the conduit.

TECElogo lines on plaster

The type and spacing of the attachment depend on the construction conditions on site. The fixing of the pipelines should be carried out using static perspectives taking into consideration the filled and insulated pipes according to the recognised rules of engineering.

TECElogo dim.	Attachment spacing in m
16	1
20	1.15
25	1.3
32	1.5
40	1.8
50	2.0
63	2.0

Attachment distances for TECElogo lines installed on plaster

TECElogo dim.	Pipe weight empty in kg/m
16	0.21
20	0.34
25	0.52
32	0.86
40	1.33
50	2.09
63	3.26

Pipe masses TECElogo

The pipes should be laid so that they cannot be affected by moisture from other fittings such as drips or condensation.

Concealed TECElogo lines

Depending on the wall composition or quality of the masonry, the thermal length extension of a concealed TECElogo composite pipe can cause damage to the wall. TECE therefore recommends that all concealed TECElogo composite pipes be fitted with pipe insulation. The pre-insulated TECElogo pipes (only PE-Xc) fulfil this requirement. Alternatively, if no thermal insulation is required, the composite pipes can be laid in corrugated pipe sheathing. These pipes are also part of the TECElogo range. TECElogo fittings must be fundamentally protected from contact with the wall structure, plasterboard, cement, screed, rapid binders or similar using suitable coverings.

Direct contact with the structural shell must be avoided at all costs owing to the sound insulation requirements in accordance with DIN 4109 and VDI 4100.

TECElogo lines in concrete or screed

The pipes are solidly enclosed by concrete or screed so that the linear extension of the pipe material occurs on the inside. Special measures to include thermal linear extension are unnecessary in this instance. If the pipes are laid in the insulation layer between concrete and screed, however, they should be arranged so that the expected linear extension is compensated by the insulation or a pipe guide laid inside the elbow.
Heat insulation and impact sound requirements must be met. The corresponding standards and guidelines must be adhered to. It is therefore advisable to install the TECElogo pipes in a suitable levelling course. The additional installation height must be considered during planning. The fittings must be protected against corrosion.
TECElogo pipes installed on bare floor surfaces or in concrete ceilings should be attached at a maximum distance of one metre. It should be ensured that the TECElogo pipes installed on bare floor surfaces are not damaged by ladders, equipment, wheelbarrows, constant impacts or similar. The pipelines must be inspected immediately before the screed is laid.

TECElogo lines guided through movement joints

If pipelines are guided through building expansion joints, these must be laid in corrugated pipe sheathing. The corrugated pipe sheathing must sit at least 25 cm above the movement joint on all sides. Thermal insulation with a wall thickness of at least 6 mm may be used as an alternative to corrugated piping.

Piperun in floor structures

For planning and laying of pipes in floor structures, the screed trade has described in the guideline titled “Pipes, cable and cable channels on unfinished floors” how piperuns have to be carried out: “Pipelines in the floor assembly must be installed free of junctions, in straight lines as well as axially parallel and parallel to the wall. Even as early as the planning stage heating and drinking water lines should already take priority over electrical lines and conduits should be removed.”

- The pipelines in a pipe route must be grouped together as tightly as possible.
- The pipe route containing lines laid in parallel inclusive of pipe insulation may be a maximum of 30 cm wide.
- The space between the individual lines should adhere to a minimum distance of 20 cm. The minimum distance of a line to a wall is 20 cm.
- The dimensions given above should be adhered to as closely as possible next to manifold housings.
- Around the door the distance from the door jamb should be a minimum of 10 cm.

Pipes of different thicknesses or other fittings within the line must be balanced to create an even surface for the impact sound insulation.

Sound insulation

The noise behaviour of a drinking water heating installation in relation to the building structure should be taken into consideration during the planning and implementation.

The requirements for sound insulation are governed by local legislation, standards and guidelines.

Sound-insulated installation of the TECElogo system

For water-bearing pipelines, special attention should be paid to structure-borne noise. The installation therefore has to be mounted so as to be decoupled from the building structure:

- Use of pipe attachments that insulate against structure-borne noise.
- Pipes passed through screed or in walls must be equipped with at least 9 mm of insulation. The TECElogo range offers appropriately pre-insulated pipes. Corrugated sheath pipes as coverings do not offer sufficient sound insulation.
- Dry-wall pre-wall installations such as TECEprofil, for example, offer better sound insulation for sanitary items mounted directed on the wall because they are decoupled from the building structure.
- Drinking water and heating installations must only be installed on correspondingly solid walls with a weight of at least 220 kg/m^2.
- The resting pressure should not exceed 5 bar.
- The permitted through-flow values of fittings should be adhered to.
- Water-bearing pipes should not - if possible - be installed on walls connected to rooms requiring protection.

Fire protection

The corresponding local laws, standards and guidelines on fire protection as well as the generally recognised state of the art should be observed and adhered to during the installation.

Planning and design

Dimensioning of drinking water systems

The planning and installation of drinking water systems are governed by local legislation, standards and guidelines.

Hygiene requirements

A drinking water installation must ensure that the water at the tapping point meets the requirements of the Drinking Water Ordinance. All metal fittings intended for use with drinking water are only composed of materials that comply with the UBA's metal evaluation principles (as at 17/03/2017) or the 4MS materials list (as at 05/01/2017). The biological suitability of the TECElogo system is confirmed by the DVGW approval. The technical measures to be taken to reduce the growth of Legionella as well as the planning, operation and restoration of drinking water systems are described in the DVGW worksheet W 551.

Hydraulic design

Dimensioning and planning of drinking water lines with TECElogo is based on local legislation, standards and guidelines. The necessary product-specific information can be found in the following figures and tables.
The first table shows the loss values for TECElogo fittings.

Item	Moulded part	Dimension						
		16	20	25	32	40	50	63
1	Pipe	2.3	1.6	1.3	0.9	0.7	0.7	0.6
2	Coupling	3.9	3.6	1.2	3.4	2.0	0.9	0.8
3	reduc. Coupling (1 dimension)	–	3.9	3.7	1.7	3.6	2.0	1.8
4	Elbow 90 °C	22.8	14.6	7.0	13.7	7.9	5.5	5.6
5	Tee any – Through-type	4.4	4.5	1.5	4.0	2.2	1.1	1.0
6	Tee any – Outlet	13.9	14.7	6.9	13.4	7.9	5.3	5.8
7	Tee any – Manifold	15.2	15.1	7.6	14.1	8.2	6.0	5.9

Zeta values [ ] for TECElogo moulded parts (where v=2 m/s)

Item	Moulded part	Dimension						
		16	20	25	32	40	50	63
1	Pipe	1.0	1.0	1.0	1.0	1.0	1.0	1.3
2	Coupling	1.7	2.3	0.9	3.8	2.9	1.3	1.7
3	reduc. Coupling (1 dimension)	–	2.4	2.8	1.9	5.1	2.9	3.9
4	Elbow 90 °C	9.9	9.1	5.4	15.2	11.3	7.9	12.2
5	Tee any – Through-type	1.9	2.8	1.2	4.4	3.1	1.6	2.2
6	Tee any – Outlet	6.0	9.2	5.3	14.9	11.3	7.6	12.6
7	Tee any – Manifold	6.6	9.4	5.8	15.7	11.7	8.6	12.8

Equivalent pipe lengths [m] for TECElogo moulded parts (where v=2 m/s)

Pressure loss tables in the drinking water installation – Dimensions 16/20/25 mm

TECElogo composite pipes – Pressure losses due to pipe friction in drinking water lines									
Water speed	Dim. 16			Dim. 20			Dim. 25		
	V	m	R	V	m	R	V	m	R
			hPa/m			hPa/m			hPa/m
m/s	l/s	kg/h	mbar/m	l/s	kg/h	mbar/m	l/s	kg/h	mbar/m
0.10	0.011	40.7	0.3	0.019	67.9	0.2	0.031	113.1	0.1
0.20	0.023	81.4	0.6	0.038	135.9	0.6	0.063	226.2	0.4
0.30	0.034	122.1	1.7	0.057	203.8	1.2	0.094	339.3	0.9
0.40	0.045	162.9	2.8	0.075	271.7	2.0	0.126	452.4	1.4
0.50	0.057	203.6	4.1	0.094	339.6	2.9	0.157	565.5	2.1
0.60	0.068	244.3	5.6	0.113	407.6	4.0	0.188	678.6	2.9
0.70	0.079	285.0	7.3	0.132	475.5	5.2	0.220	791.7	3.8
0.80	0.090	325.7	9.2	0.151	543.4	6.6	0.251	904.8	4.8
0.90	0.102	366.4	11.2	0.170	611.4	8.1	0.283	1017.9	5.9
1.00	0.113	407.2	13.5	0.189	679.3	9.8	0.314	1131.0	7.1
1.10	0.124	447.9	16.0	0.208	747.2	11.6	0.346	1244.1	8.4
1.20	0.136	488.6	18.6	0.226	815.1	13.5	0.377	1357.2	9.8
1.30	0.147	529.3	21.4	0.245	883.1	15.5	0.408	1470.3	11.3
1.40	0.158	570.0	24.4	0.264	951.0	17.7	0.440	1583.4	12.9
1.50	0.170	610.7	27.6	0.283	1018.9	20.0	0.471	1696.5	14.5
1.60	0.181	651.4	31.0	0.302	1086.9	22.4	0.503	1809.6	16.3
1.70	0.192	692.2	34.5	0.321	1154.8	25.0	0.534	1922.7	18.2
1.80	0.204	732.9	38.2	0.340	1222.7	27.7	0.565	2035.8	20.1
1.90	0.215	773.6	42.0	0.359	1290.7	30.5	0.597	2148.8	22.2
2.00	0.226	814.3	46.0	0.377	1358.6	33.4	0.628	2261.9	24.3
2.10	0.238	855.0	50.2	0.396	1426.5	36.4	0.660	2375.0	26.5
2.20	0.249	895.7	54.6	0.415	1494.4	39.6	0.691	2488.1	28.8
2.30	0.260	936.4	59.1	0.434	1562.4	42.9	0.723	2601.2	31.2
2.40	0.271	977.2	63.8	0.453	1630.3	46.3	0.754	2714.3	33.7
2.50	0.283	1017.9	68.6	0.472	1698.2	49.8	0.785	2827.4	36.3
2.60	0.294	1058.6	73.6	0.491	1766.2	53.5	0.817	2940.5	39.0
2.70	0.305	1099.3	78.8	0.509	1834.1	57.2	0.848	3053.6	41.7
2.80	0.317	1140.0	84.1	0.528	1902.0	61.1	0.880	3166.7	44.6
2.90	0.328	1180.7	89.6	0.547	1969.9	65.1	0.911	3279.8	47.5
3.00	0.339	1221.5	95.3	0.566	2037.9	69.2	0.942	3392.9	50.5
3.10	0.351	1262.2	101.1	0.585	2105.8	73.5	0.974	3506.0	53.6
3.20	0.362	1302.9	107.0	0.604	2173.7	77.8	1.005	3619.1	56.8
3.30	0.373	1343.6	113.1	0.623	2241.7	82.3	1.037	3732.2	60.0
3.40	0.385	1384.3	119.4	0.642	2309.6	86.9	1.068	3845.3	63.4
3.50	0.396	1425.0	125.9	0.660	2377.5	91.6	1.100	3958.4	66.8
3.60	0.407	1465.7	132.5	0.679	2445.4	96.4	1.131	4071.5	70.3
3.70	0.418	1506.5	139.2	0.698	2513.4	101.3	1.162	4184.6	73.9
3.80	0.430	1547.2	146.1	0.717	2581.3	106.3	1.194	4297.7	77.6
3.90	0.441	1587.9	153.2	0.736	2649.2	111.5	1.225	4410.8	81.4
4.00	0.452	1628.6	160.4	0.755	2717.2	116.7	1.257	4523.9	85.2
4.10	0.464	1669.3	167.8	0.774	2785.1	122.1	1.288	4637.0	89.1
4.20	0.475	1710.0	175.3	0.793	2853.0	127.6	1.319	4750.1	93.2
4.30	0.486	1750.7	183.0	0.811	2921.0	133.2	1.351	4863.2	97.3
4.40	0.498	1791.5	190.8	0.830	2988.9	138.9	1.382	4976.3	101.4
4.50	0.509	1832.2	198.8	0.849	3056.8	144.7	1.414	5089.4	105.7
4.60	0.520	1872.9	206.9	0.868	3124.7	150.7	1.445	5202.5	110.0
4.70	0.532	1913.6	215.2	0.887	3192.7	156.7	1.477	5315.6	114.5
4.80	0.543	1954.3	223.7	0.906	3260.6	162.9	1.508	5428.7	119.0
4.90	0.554	1995.0	232.3	0.925	3328.5	169.2	1.539	5541.8	123.6
5.00	0.565	2035.8	241.0	0.943	3396.5	175.5	1.571	5654.9	128.2

Pressure loss tables in the drinking water installation – Dimensions 32/40/50/63 mm

TECElogo composite pipes – Pressure losses due to pipe friction in drinking water lines												
Water speed	Dim. 32			Dim. 40			Dim. 50			Dim. 63		
	V	m	R	V	m	R	V	m	R	V	m	R
			hPa/m			hPa/m			hPa/m			hPa/m
m/s	l/s	kg/h	mbar/m	l/s	kg/h	mbar/m	l/s	kg/h	mbar/m	l/s	kg/h	mbar/m
0.10	0.053	191.1	0.1	0.080	289.5	0.1	0.132	475.3	0.1	0.204	735.4	0.0
0.15	0.080	286.7	0.2	0.121	434.3	0.1	0.198	712.9	0.1	0.306	1103.1	0.1
0.20	0.106	382.3	0.3	0.161	579.1	0.2	0.264	950.6	0.2	0.409	1470.8	0.1
0.25	0.133	477.8	0.5	0.201	723.8	0.3	0.330	1188.2	0.3	0.511	1838.5	0.2
0.30	0.159	573.4	0.6	0.241	868.6	0.5	0.396	1425.9	0.3	0.613	2206.2	0.3
0.35	0.186	669.0	0.8	0.281	1013.4	0.6	0.462	1663.5	0.5	0.715	2574.0	0.3
0.40	0.212	764.5	1.0	0.322	1158.1	0.8	0.528	1901.2	0.6	0.817	2941.7	0.4
0.45	0.239	860.1	1.3	0.362	1302.9	1.0	0.594	2138.8	0.7	0.919	3309.4	0.5
0.50	0.265	955.7	1.5	0.402	1447.6	1.2	0.660	2376.5	0.8	1.021	3677.1	0.6
0.55	0.292	1051.2	1.8	0.442	1592.4	1.4	0.726	2614.1	1.0	1.124	4044.8	0.8
0.60	0.319	1146.8	2.1	0.483	1737.2	1.6	0.792	2851.7	1.2	1.226	4412.5	0.9
0.65	0.345	1242.4	2.4	0.523	1881.9	1.8	0.858	3089.4	1.3	1.328	4780.2	1.0
0.70	0.372	1337.9	2.7	0.563	2026.7	2.1	0.924	3327.0	1.5	1.430	5147.9	1.2
0.75	0.398	1433.5	3.1	0.603	2171.5	2.4	0.990	3564.7	1.7	1.532	5515.6	1.3
0.80	0.425	1529.1	3.4	0.643	2316.2	2.6	1.056	3802.3	1.9	1.634	5883.3	1.5
0.85	0.451	1624.6	3.8	0.684	2461.0	2.9	1.122	4040.0	2.2	1.736	6251.0	1.7
0.90	0.478	1720.2	4.2	0.724	2605.8	3.3	1.188	4277.6	2.4	1.839	6618.7	1.8
0.95	0.504	1815.8	4.7	0.764	2750.5	3.6	1.254	4515.3	2.6	1.941	6986.4	2.0
1.00	0.531	1911.3	5.1	0.804	2895.3	3.9	1.320	4752.9	2.9	2.043	7354.2	2.2
1.05	0.557	2006.9	5.6	0.844	3040.1	4.3	1.386	4990.6	3.2	2.145	7721.9	2.4
1.20	0.637	2293.6	7.0	0.965	3474.4	5.4	1.584	5703.5	4.0	2.451	8825.0	3.1
1.30	0.690	2484.7	8.1	1.046	3763.9	6.3	1.716	6178.8	4.6	2.656	9560.4	3.5
1.43	0.761	2739.6	9.7	1.153	4149.9	7.5	1.892	6812.5	5.5	2.928	10541.0	4.2
1.50	0.796	2867.0	10.5	1.206	4342.9	8.1	1.980	7129.4	6.0	3.064	11031.2	4.6
1.60	0.849	3058.2	11.8	1.287	4632.5	9.1	2.112	7604.7	6.7	3.269	11766.6	5.1
1.70	0.903	3249.3	13.1	1.367	4922.0	10.1	2.244	8080.0	7.5	3.473	12502.1	5.7
1.80	0.956	3440.4	14.5	1.448	5211.5	11.2	2.376	8555.2	8.3	3.677	13237.5	6.3
1.90	1.009	3631.6	16.0	1.528	5501.1	12.4	2.508	9030.5	9.1	3.881	13972.9	7.0
2.00	1.062	3822.7	17.6	1.608	5790.6	13.6	2.641	9505.8	10.0	4.086	14708.3	7.7
2.10	1.115	4013.8	19.2	1.689	6080.1	14.8	2.773	9981.1	11.0	4.290	15443.7	8.4
2.20	1.168	4205.0	20.8	1.769	6369.6	16.1	2.905	10456.4	11.9	4.494	16179.1	9.1
2.30	1.221	4396.1	22.6	1.850	6659.2	17.5	3.037	10931.7	12.9	4.698	16914.6	9.9
2.40	1.274	4587.2	24.4	1.930	6948.7	18.9	3.169	11407.0	13.9	4.903	17650.0	10.7
2.50	1.327	4778.4	26.3	2.011	7238.2	20.3	3.301	11882.3	15.0	5.107	18385.4	11.5
2.60	1.380	4969.5	28.2	2.091	7527.8	21.8	3.433	12357.6	16.1	5.311	19120.8	12.4
2.70	1.434	5160.6	30.2	2.171	7817.3	23.4	3.565	12832.9	17.3	5.516	19856.2	13.2
2.80	1.487	5351.8	32.2	2.252	8106.8	25.0	3.697	13308.2	18.5	5.720	20591.6	14.2
2.90	1.540	5542.9	34.4	2.332	8396.3	26.6	3.829	13783.5	19.7	5.924	21327.0	15.1
3.00	1.593	5734.0	36.5	2.413	8685.9	28.3	3.961	14258.7	20.9	6.128	22062.5	16.0
3.60	1.911	6880.8	50.9	2.895	10423.1	39.5	4.753	17110.5	29.2	7.354	26475.0	22.4
4.00	2.124	7645.4	61.7	3.217	11581.2	47.9	5.281	19011.7	35.4	8.171	29416.6	27.2
4.60	2.442	8792.2	79.8	3.700	13318.3	61.9	6.073	21863.4	45.8	9.397	33829.1	35.2
5.00	2.655	9556.7	93.0	4.021	14476.5	72.2	6.601	23764.6	53.4	10.214	36770.8	41.0

Pressure loss tables for the heating installation – Dimensions 16/20/25 mm

TECElogo composite pipes – Pressure loss due to pipe friction in the heating installation										
Connection capacity (W)				Mass flux	Dim. 16		Dim. 20		Dim. 25	
					v	R	v	R	v	R
Spread (K)						hPa/m		hPa/m		hPa/m
20 K	15 K	10 K	5 K	kg/h	m/s	mbar/m	m/s	mbar/m	m/s	mbar/m
200	150	100	50	8.60	0.02	0.06				
300	225	150	75	12.90	0.03	0.09				
400	300	200	100	17.20	0.04	0.12				
600	450	300	150	25.80	0.06	0.18				
800	600	400	200	34.39	0.08	0.25				
1000	750	500	250	42.99	0.11	0.31				
1200	900	600	300	51.59	0.13	0.37				
1400	1050	700	350	60.19	0.15	0.43				
1600	1200	800	400	68.79	0.17	0.49				
1800	1350	900	450	77.39	0.19	0.55				
2000	1500	1000	500	85.98	0.21	0.61	0.13	0.22		
2300	1725	1150	575	98.88	0.24	0.71	0.15	0.25		
2800	2100	1400	700	120.38	0.30	1.65	0.18	0.31		
3000	2250	1500	750	128.98	0.32	1.86	0.19	0.33		
3500	2625	1750	875	150.47	0.37	2.42	0.22	0.72		
4000	3000	2000	1000	171.97	0.42	3.04	0.25	0.91	0.15	0.27
4500	3375	2250	1125	193.47	0.48	3.72	0.28	1.11	0.17	0.33
5000	3750	2500	1250	214.96	0.53	4.46	0.32	1.33	0.19	0.40
5500	4125	2750	1375	236.46	0.58	5.26	0.35	1.56	0.21	0.47
6000	4500	3000	1500	257.95	0.63	6.11	0.38	1.82	0.23	0.55
6500	4875	3250	1625	279.45	0.69	7.02	0.41	2.08	0.25	0.63
7000	5250	3500	1750	300.95	0.74	7.98	0.44	2.37	0.27	0.71
7500	5625	3750	1875	322.44	0.79	9.00	0.47	2.67	0.29	0.80
8000	6000	4000	2000	343.94	0.85	10.07	0.51	2.98	0.30	0.89
8500	6375	4250	2125	365.43	0.90	11.20	0.54	3.31	0.32	0.99
9000	6750	4500	2250	386.93	0.95	12.37	0.57	3.66	0.34	1.09
9500	7125	4750	2375	408.43	1.00	13.60	0.60	4.02	0.36	1.20
10000	7500	5000	2500	429.92			0.63	4.39	0.38	1.31
10500	7875	5250	2625	451.42			0.66	4.78	0.40	1.42
11000	8250	5500	2750	472.91			0.70	5.18	0.42	1.54
11500	8625	5750	2875	494.41			0.73	5.60	0.44	1.67
12500	9375	6250	3125	537.40			0.79	6.48	0.48	1.93
13000	9750	6500	3250	558.90			0.82	6.94	0.49	2.06
14000	10500	7000	3500	601.89			0.89	7.90	0.53	2.35
15000	11250	7500	3750	644.88					0.57	2.65
16000	12000	8000	4000	687.88					0.61	2.96
17000	12750	8500	4250	730.87					0.65	3.29
18000	13500	9000	4500	773.86					0.68	3.64
19000	14250	9500	4750	816.85					0.72	4.00
20000	15000	10000	5000	859.85					0.76	4.37
22000	16500	11000	5500	945.83					0.84	5.17

Pressure loss tables for the heating installation – Dimensions 32/40/50/63 mm (part 1)

TECElogo composite pipes – Pressure loss due to pipe friction in the heating installation												
Connection capacity (W)				Mass flux	Dim. 32		Dim. 40		Dim. 50		Dim. 63	
					v	R	v	R	v	R	v	R
Spread (K)						hPa/m		hPa/m		hPa/m		hPa/m
20 K	15 K	10 K	5 K	kg/h	m/s	mbar/m	m/s	mbar/m	m/s	mbar/m	m/s	mbar/m
7000	5250	3500	1750	300.95	0.18	0.30						
7500	5625	3750	1875	322.44	0.20	0.34						
8000	6000	4000	2000	343.94	0.21	0.38						
8500	6375	4250	2125	365.43	0.22	0.42						
9000	6750	4500	2250	386.93	0.24	0.46						
9500	7125	4750	2375	408.43	0.25	0.51						
10000	7500	5000	2500	429.92	0.26	0.55						
10500	7875	5250	2625	451.42	0.28	0.60						
11000	8250	5500	2750	472.91	0.29	0.65	0.16	0.17				
11500	8625	5750	2875	494.41	0.30	0.70	0.17	0.18				
12500	9375	6250	3125	537.40	0.33	0.81	0.19	0.21				
13000	9750	6500	3250	558.90	0.34	0.87	0.19	0.22				
14000	10500	7000	3500	601.89	0.37	0.99	0.21	0.25				
15000	11250	7500	3750	644.88	0.40	1.11	0.22	0.28				
16000	12000	8000	4000	687.88	0.42	1.24	0.24	0.32				
17000	12750	8500	4250	730.87	0.45	1.38	0.25	0.35				
18000	13500	9000	4500	773.86	0.48	1.53	0.27	0.39				
19000	14250	9500	4750	816.85	0.50	1.68	0.28	0.43				
20000	15000	10000	5000	859.85	0.53	1.84	0.30	0.47				
22000	16500	11000	5500	945.83	0.58	2.17	0.33	0.55				
24000	18000	12000	6000	1031.81	0.63	2.52	0.36	0.64				
26000	19500	13000	6500	1117.80	0.69	2.90	0.39	0.74				
28000	21000	14000	7000	1203.78	0.74	3.31	0.42	0.84				
30000	22500	15000	7500	1289.77	0.79	3.73	0.45	0.95	0.27	0.29		
32000	24000	16000	8000	1375.75	0.85	4.19	0.48	1.06	0.29	0.33		
34000	25500	17000	8500	1461.74	0.90	4.66	0.51	1.18	0.31	0.36		
36000	27000	18000	9000	1547.72	0.95	5.15	0.53	1.30	0.33	0.40		
38000	28500	19000	9500	1633.71	1.00	5.67	0.56	1.43	0.34	0.44		
40000	30000	20000	10000	1719.69			0.59	1.57	0.36	0.48		
42000	31500	21000	10500	1805.67			0.62	1.71	0.38	0.52		
44000	33000	22000	11000	1891.66			0.65	1.85	0.40	0.57		
46000	34500	23000	11500	1977.64			0.68	2.01	0.42	0.62		
48000	36000	24000	12000	2063.63			0.71	2.16	0.43	0.66	0.28	0.23
50000	37500	25000	12500	2149.61			0.74	2.32	0.45	0.71	0.29	0.25
52000	39000	26000	13000	2235.60			0.77	2.49	0.47	0.76	0.30	0.27
54000	40500	27000	13500	2321.58			0.80	2.66	0.49	0.81	0.32	0.29
56000	42000	28000	14000	2407.57			0.83	2.84	0.51	0.87	0.33	0.31
58000	43500	29000	14500	2493.55			0.86	3.02	0.52	0.92	0.34	0.33
60000	45000	30000	15000	2579.54			0.89	3.21	0.54	0.98	0.35	0.35
62000	46500	31000	15500	2665.52			0.92	3.40	0.56	1.04	0.36	0.37
64000	48000	32000	16000	2751.50			0.95	3.60	0.58	1.10	0.37	0.39
66000	49500	33000	16500	2837.49			0.98	3.80	0.60	1.16	0.39	0.41
68000	51000	34000	17000	2923.47			1.01	4.00	0.62	1.22	0.40	0.43
70000	52500	35000	17500	3009.46			1.04	4.22	0.63	1.29	0.41	0.45
72000	54000	36000	18000	3095.44			1.07	4.43	0.65	1.35	0.42	0.48
76000	57000	38000	19000	3267.41					0.69	1.49	0.44	0.52
80000	60000	40000	20000	3439.38					0.72	1.63	0.47	0.57
84000	63000	42000	21000	3611.35					0.76	1.78	0.49	0.63
88000	66000	44000	22000	3783.32					0.80	1.93	0.51	0.68
92000	69000	46000	23000	3955.29					0.83	2.09	0.54	0.73
96000	72000	48000	24000	4127.26					0.87	2.25	0.56	0.79
100000	75000	50000	25000	4299.23					0.90	2.42	0.58	0.85
104000	78000	52000	26000	4471.20					0.94	2.59	0.61	0.91
108000	81000	54000	27000	4643.16					0.98	2.77	0.63	0.98
112000	84000	56000	28000	4815.13					1.01	2.96	0.65	1.04
116000	87000	58000	29000	4987.10					1.05	3.15	0.68	1.11
120000	90000	60000	30000	5159.07					1.09	3.35	0.70	1.18

Pressure loss tables for the heating installation – Dimensions 32/40/50/63 mm (part 2)

TECElogo composite pipes – Pressure loss due to pipe friction in the heating installation												
Connection capacity (W)				Mass flux	Dim. 32		Dim. 40		Dim. 50		Dim. 63	
					v	R	v	R	v	R	v	R
Spread (K)						hPa/m		hPa/m		hPa/m		hPa/m
20 K	15 K	10 K	5 K	kg/h	m/s	mbar/m	m/s	mbar/m	m/s	mbar/m	m/s	mbar/m
124000	93000	62000	31000	5331.04							0.73	1.25
128000	96000	64000	32000	5503.01							0.75	1.32
132000	99000	66000	33000	5674.98							0.77	1.39
136000	102000	68000	34000	5846.95							0.80	1.47
140000	105000	70000	35000	6018.92							0.82	1.55
144000	108000	72000	36000	6190.89							0.84	1.63
148000	111000	74000	37000	6362.85							0.87	1.71
152000	114000	76000	38000	6534.82							0.89	1.79
156000	117000	78000	39000	6706.79							0.91	1.87
160000	120000	80000	40000	6878.76							0.94	1.96
164000	123000	82000	41000	7050.73							0.96	2.05
168000	126000	84000	42000	7222.70							0.98	2.14
172000	129000	86000	43000	7394.67							1.01	2.23
176000	132000	88000	44000	7566.64							1.03	2.33
180000	135000	90000	45000	7738.61							1.05	2.42
184000	138000	92000	46000	7910.58							1.08	2.52
188000	141000	94000	47000	8082.55							1.10	2.62
192000	144000	96000	48000	8254.51							1.12	2.72
196000	147000	98000	49000	8426.48							1.15	2.82
200000	150000	100000	50000	8598.45							1.17	2.92

Rinsing drinking water systems

The pipes must be rinsed thoroughly before the drinking water installation is commissioned. Local legislation, standards and guidelines should be considered here.

Pressure test of drinking water systems

A test pressure should be carried out for drinking water installations in accordance with DIN EN 806-4. The requirements of the pressure test in DIN EN 806-4 are supplemented by VDI/DVGW 6023 and the ZVSHK data sheet “Leak tests of drinking water installation with pressure tests using compressed air, inert gas or water”. Before the pressure test is performed it should be ensured that all components in the installation are freely accessible and visible in order to be able to localise incorrectly installed fittings. If the piping system remains unfilled following a pressure test (e.g. because a regular water replacement cannot be guaranteed at the latest after 72 hours), it is recommended that a pressure test be performed using compressed air or inert gases.

Leak test with oil-free compressed air or inert gas

The pipe connections should be visually inspected before the leak test is performed. Components in the piping system must be suitable for the test pressures or enlarged prior to the line test, replaced by a suitable piece of piping or tested separately at the ends of the pipe in line sections.
After applying the test pressure of 150 mbar (150 hPa), the testing period up to 100 litre line volume must be at least 120 minutes. The testing period must be extended by 20 minutes for every additional 100 litres of line volume.
The testing begins once the test pressure is reached, taking into account a corresponding waiting time for the stabilisation of media and ambient temperature. The seal tightness is determined by the agreement of the start and end test pressures, up to the normal fluctuations caused by the temperature of the medium and the pressure at the pressure gauge.
The pressure gauge used must show a corresponding accuracy of 1 mbar (1 hPa) in the display area for the pressures to be measured. The U-pipe pressure gauge known from the TRGI test or the standpipes can be used here.

Load test

The purpose of this test is to identify faults that could lead to the rupture or dislocation of a connection in the specified piping system under normal operating conditions.
The strength test is combined with a visual inspection of all pipe connections. The test consists of filling the piping system to be tested with a medium under pressure (maximum 3 bar).
The load test with increased pressure should be carried out

- at maximum 3 bar for nominal values up to DN 50, and
- Nominal values above DN 50 (up to DN 100) maximum 1 bar

The testing period following the application of the test pressure is 10 minutes.

The state of the pressure gauge must remain constant during the testing period. For TECElogo installations, a steady state should be achieved first before the testing period begins. For other materials, the temperature constant required in the piping system must be reached before the test begins. The pressure gauge used must show an accuracy of 100 mbar (100 hPa) in the display area.

Preparation for leak test with water

All pipe connections should be visually inspected before the leak test with water. The testing device should be connected to the deepest point of the installation to be tested. Only testing devices that can guarantee a maximum measurement accuracy of 0.1 bar (100 hPa) should be used.
The installation should be filled with filtered drinking water (particle size ≤ 150 µm), ventilated and protected against freezing. Shut-off devices in front of and behind heat generators and boilers must be closed so the test pressure can be held back from the rest of the system.
If significant disparities arise between the ambient temperature and water temperature (>10 K), a 30 minute waiting period should be implemented following the application of the system test pressure to allow the temperature to equalise. The pressure must be maintained for at least 10 minutes. There must be no pressure drop or visible sign of a loose seal.

Performing the leak test

The pipeline system is first loaded with a test pressure that must be 1.1 x the operating pressure (in relation to the deepest point in the system). The operating pressure is 10 bar (1 MPa) in accordance with DIN EN 806-2. This means a test pressure of 11 bar (1.1 MPa) is required. A subsequent inspection should be performed on the pipe section tested to be able to determine any possible loose seals.
After a testing period of 30 minutes, water should be drained to reduce the pressure to 5.5 bar (0.55 MPa), corresponding to 0.5 x the starting test pressure. The testing period at this pressure is 120 minutes. There must be no leak in evidence during this testing period. The test pres-

sure at the pressure gauge must remain constant (Δp = 0). A pressure drop during the testing period indicates there is a leak in the system. The pressure must be maintained and the leaky sites determined. The defect must be rectified and the leak test then repeated.

Please remember:

For hygiene reasons, TECE recommends carrying out a leak test with oil-free compressed air or inert gas in a leak test with drinking water.

Heating systems

A heating system must be rinsed thoroughly prior to commissioning to remove metallic residues or liquids. The TECElogo system is immune to these contaminants but metallic components of the heating system - such as radiators or heat generators - can sustain damage from galvanic corrosion processes.
The leak test is carried out the same way as the leak test for drinking water installations. Here the test pressure must be 1.3 x the operating pressure, however.

Commissioning and instruction log for the drinking water system (page 1 of 2)

Construction project: _____

Customer/Representative: _____

Contractor/Representative: _____

In the absence of the persons named above, the following persons were trained in the use of the following system components and the system was put into operation:

No.	System component, device	Acceptance completed	Comment	n. a.
1	Home connection	✓		✓
2	Main shut-off valve	✓		✓
3	Return flow inhibitor	✓		✓
4	Backflow inhibitor	✓		✓
5	Filter	✓		✓
6	Pressure relief system	✓		✓
7	Distribution lines	✓		✓
8	Risers/Shut-off valves	✓		✓
9	Multi-storey pipes/Shut-off valves	✓		✓
10	Riser pipe aerator/Drip-water pipe	✓		✓
11	Collector units/Drip-water pipe	✓		✓
12	Tapping points with single guard	✓		✓
13	Water heating/Drinking water heater	✓		✓
14	Safety valves/Pressure relief lines	✓		✓
15	Circulation line/Circulation pump	✓		✓
16	Dosing unit	✓		✓
17	Softening unit	✓		✓
18	Pressure booster	✓		✓
19	Fire-extinguishing and protection systems	✓		✓
20	Swimming pool inflow	✓		✓
21	Extraction fittings	✓		✓
22	Consumption devices	✓		✓
23	Drinking water containers	✓		✓
24		✓		✓
25		✓		✓
26		✓		✓
27		✓		✓

Commissioning and instruction log for the drinking water system (page 2 of 2)

Customer's supplementary remarks:

Contractor's supplementary remarks:

The instructions regarding the operation of the system were given, the required operating documents and existing instruction operation and maintenance document according to the aforementioned list were handed over. It has been mentioned that despite careful planning and design of the installation, drinking water of faultless quality can only be achieved at all tapping points if it is ensured that the water is completely replaced in all areas of the installation at regular intervals.

Operator responsibilities: Measures during prolonged absence

Absence	Measures prior to absence	Measures on return
> 3 days	Homes: Closure of multi-storey shut-off valves Single family homes: Closure of the shut-off valve behind the water meter	Once the shut-off valve is open, allow standing water to flow from all tapping points for 5 min (completely open)
> 4 weeks	Homes: Closure of multi-storey shut-off valves Single family homes: Closure of the shut-off valve behind the water meter	It is recommended to arrange a rinse of the home installation
> 6 months	Arrange for the main shut-off valve (home connection) to be closed. Empty lines completely	Arrange a rinse of the home installation
> 1 year	Separation of the connection line from the supply line	Reconnection by water supply company or specialist fitter

Location

Date

Customer/Representative
(Signature)

Contractor/Fitter
(Signature)

Pressuretest log for drinking water installations – in accordance with DIN EN 806-4, supplemented by VDI/DVGW 6023 and ZVSHK data sheet (Leak tests of drinking water installation with pressure tests using compressed air, inert gas or water) – with the test medium oil-free compressed air or inert gas

Construction project: _____

Customer: _____

Contractor/Fitter: _____

Pipeline system material: _____

Connection type: _____

Installation pressure: _____ bar

Ambient temperature _____ °C Temperature of test medium _____ °C

Testing medium: ❒ **oil-free compressed air** ❒ **hydrogen** ❒ **carbon dioxide** ❒ _____

The drinking water system has been tested as: ❒ **Total system** ❒ **in** _____ **Sections**

Leak test

Test pressure: 150 mbar

Testing period up to 100 litres line volume: min. 120 minutes

(for every additional 100 litresthe testing period should be increased by 20 minutes)

Pipe volumes: _____ litres

Testing period: _____ minutes

Wait for temperature adjustment and steady state, then begin the testing period.

❒ No pressure drop was detected during the testing period.

Strength test with increased pressure

Test pressure up to andincluding DN 50: 3 bar
Test pressure over DN 50 up to DN 100: 1 bar

Testing period up to 100 litrespipe volume: min. 10 minutes

Testing period: _____ Minutes

Wait for temperature adjustment and steady state, then begin the testing period.

❒ No pressure drop was detected during the testing period.

❒ The piping system is sealed.

_____ _____

Location Date

_____ _____

Customer (Signature) Contractor/Fitter (Stamp/Signature)

Pressuretest log for drinking water installations – in accordance with DIN EN 806-4, supplemented by VDI/DVGW 6023 and ZVSHK data sheet (Leak tests of drinking water installation with pressure tests using compressed air, inert gas or water) – with the test medium drinking water

Construction project: _____

Customer: _____

Fitter: _____

Dimension range from _____ mm to _____ mm

Line lengths approx. _____ m

Water temperature: _____ °C

Ambient temperature: _____ °C

The difference between the water temperature and ambient temperature must not be greater than 10 K!

Leak test, part 1

Testing period: 30 minutes

Test pressure: 11 bar (1.1 x operating pressure)

Pressure after 30 minutes

_____ bar

Result

_____

Leak test, part 2

Testing period: 120 minutes

Test pressure: 5.5 bar (0.5 x test pressure, part 1)

Pressure after 120 minutes

_____ bar

Result:

_____

_____

Start of test (date, time)

_____

End of test (date, time)

The VDI/DVGW 6023 requires that the system must be put back into operation within the next 72 hours following the leak test with water.

_____

Commissioning of system (date, time)

_____

Location

_____

Date

_____

Customer
(Signature)

_____

Contractor/Fitter
(Stamp/Signature)

Pressure testlog for heating systems – in accordance with DIN 18380 (VOB)

Construction project: _____

Customer: _____

Fitter: _____

Dimension range from _____ mm to _____ mm

Line lengths approx. _____ m

Water temperature: _____ °C

Ambient temperature: _____ °C

Preliminary test

Testing period: 60 minutes	Test pressure: 1.3 x operating pressure in bar
Pressure after 30 minutes	_____ bar
Pressure after 60 minutes	_____ bar
Pressure loss over the last 30 minutes	_____ bar (maximum 0.6 bar)
Result of preliminary test	_____

Main test

Use the test pressure from the preliminary test

Testing period: 120 minutes	max. permitted pressure drop: 0.2 bar
Pressure at test start	_____ bar
Pressure after 120 minutes	_____ bar
Pressure drop during testing period	_____ bar (maximum 0.2 mbar)
Result of the main test:	_____

_____ _____

Start of test End of test

_____ _____

Location Date

_____ _____

Customer
(Signature)

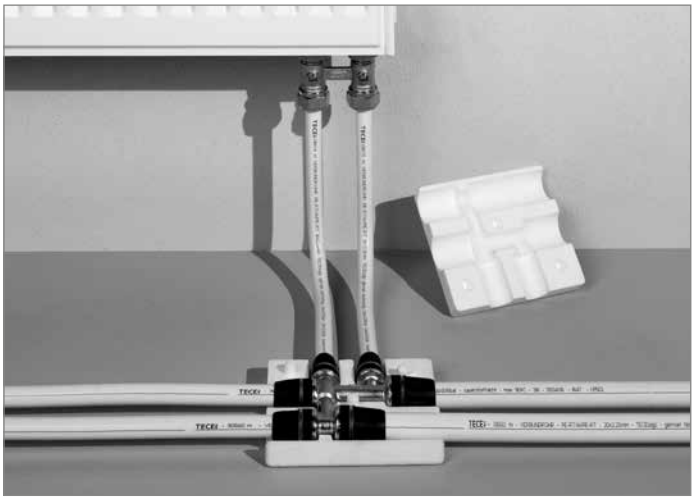
Contractor/Fitter
(Stamp/Signature)

Radiator connection

The TECElogo system offers a comprehensive range of fittings for rational connection of radiators for most construction situations.

Cross-fitting

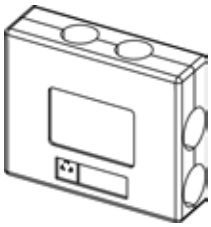
The cross-fitting allows the splitting of the flow and return lines from two main lines running parallel to one another. The installation height of the fittings with insulation box is just 35 mm.



Radiator connection with cross-fitting

The use of cross-fittings not only saves assembly time but also negates the risk of damage to crossed pipes from wheelbarrows, crushing or similar.

Cross-fitting
(order no. 874 01 01/...02/...03)



Protective box
(order no. 874 01 00)

Connection from the floor

Radiators can be connected directly from the screed with the TECElogo composite pipe. The length extension of the pipe must be compensated to avoid “popping sounds”. The pipes should therefore be equipped with insulating tubing of at least 6 mm thick.

It is also recommended that a protective cuff be placed around the visible parts of the pipe. This thus avoids damage to the pipes via e.g. vacuuming.
TECElogo composite pipes must be guided from the screed with the help of a pipe insertion elbow.

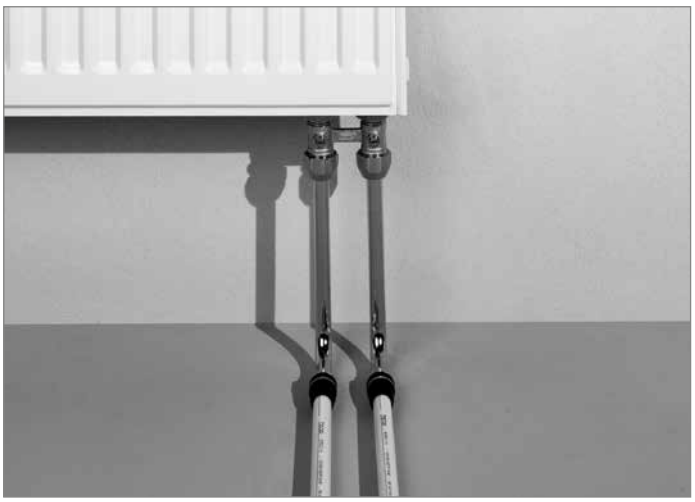
Radiator connection with mounting tees/elbows

The TECElogo range offers assembly tees made of nickel-plated copper for more demanding requirements. The elbow shape means a radiator can be connected using flow and return lines running parallel to one another.

Radiator connection with radiator mounting tee

The nickel-plated copper pipes are connected to the radiator valve block via a pinch screw connection.

Alternatively, if the flow and return lines do not run along the bottom of the radiator, the radiator mounting elbows made of nickel-plated copper can be used.



Radiator connection with radiator mounting elbow

TECElogo - Radiator connection

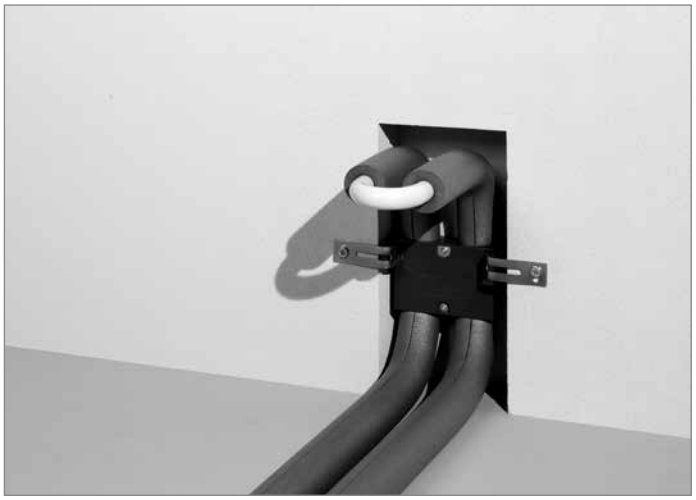
Connection from the wall

The special bending properties of the TECElogo composite pipe make it possible to connect the radiator directly from the wall. The chase in the wall must be able to accommodate the minimum bending radii of TECElogo pipes.

Radiator connection from the wall

Connection from the wall with mounting unit

The radiator mounting unit can be equipped with pre-insulated pipes for optimum connection from the wall. A further feature is the especially tight radii of the TECElogo pipes.

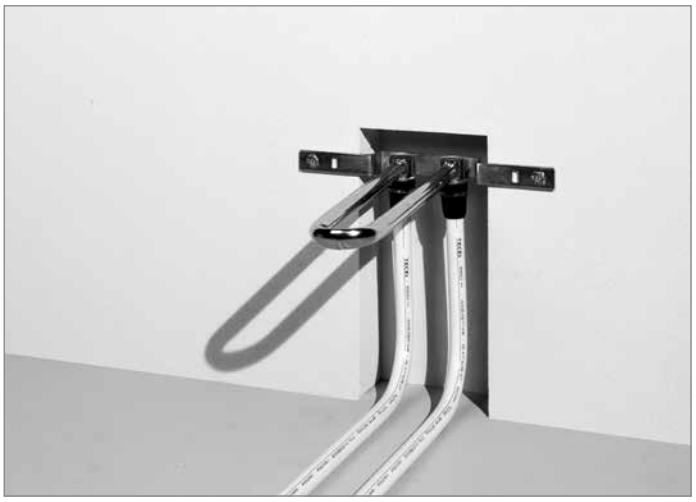


Radiator connection with mounting unit - ready to push free

Radiator connection with mounting unit - connected to the valve block

Radiator connection using the radiator mounting fitting for compact radiators from the wall

The radiator mounting fitting is equipped with sturdy fastening clips for secure fixing in the wall chase. TECElogo connection technology lets you connect pipes directly in the wall chase.



Radiator connection with radiator mounting unit, wall-mounting - ready to push free

Radiator connection with radiator mounting unit, wall-mounting - connected to the valve block

The connection between the flow and return means the heating system can be pressed free without assembly plugs. To assemble the radiator, the U-pipe is suitably shortened and connected to the valve block via a pinch screw connection.

Alternatively, a radiator mounting fitting is available on the floor. It is also equipped with a U-pipe and allows you to push it free without assembly plugs.

Radiator connection with radiator mounting unit, floor-mounting - ready to push free

Radiator connection with radiator mounting unit, floor-mounting - connected to the valve block

Annex

Resistance list PPSU

Brand name	Date	Concentration	Manufacturer	Use
Cooling lubricants				
Castrol nonol cooling lubricant		100%	Castrol	not permitted
Rocol RTD		100%		not permitted
Cooling lubricant M200 No. 1	June 2009	100%		not permitted
Disinfection agents				
FINKTEC FT-99 CIP		6%	Finktec GmbH	not permitted
Mikro Quat		100%	Ecolab	not permitted
Mikrobac forte		1%, 23 °C	Bode Chemie	permitted
Hydrogen peroxide		35%, 23 °C		permitted
Potassium permanganate KMnO4		15 mg/l, 23 °C		permitted
Sodium hypochlorite NaOCl		> 6%, 23 °C		permitted
Calcium hypochlorite Ca(ClO)2		50 mg/l, 23 °C		permitted
Chlorine dioxide ClO2		6 mg/l, 23 °C		permitted
Aniosteril D2M	June 2009	5%	Laboratoires Anios	permitted
Aniosteril Contact	June 2009	1%	Laboratoires Anios	permitted
Witty W4		2%, 23 °C, 4 h		permitted
Descaler				
DS-40		4%		not permitted
Boiler noise protection		0.20%		permitted
Calcolith DP		10%, 40 °C, 24 h		permitted
Calcolith TIN-BE		5%, 80 °C, 24 h		permitted
Household descalers (quick descalers)		20%		permitted
LS1		0.60%		permitted
MB1		4%		permitted
Super Concentrate		0.20%		permitted
Superfloc		2%		permitted
Cleaning agents				
Arkopal 110		5%	Hoescht	not permitted
ANTIKAL		100%	P & G	not permitted
BREF - Bathroom		100%	Henkel	permitted
BREF - Fresh shower		100%	Henkel	permitted
CAROLIN - gloss cleaner		1.80%	Boltom Belgium	permitted
CAROLIN - aktive fresh		1.90%	Boltom Belgium	permitted
CAROLIN - with linseed oil		1.90%	Boltom Belgium	permitted
CAROLIN - Marseille soap		1.80%	Boltom Belgium	permitted
Meister Proper - lemon		3.40%	P & G	not permitted
Meister Proper - Extra Hygiene		3.50%	P & G	permitted
Meister Proper - sensitive surfaces		2.40%	P & G	not permitted
Meister Proper - orange peel		3.40%	P & G	not permitted
Meister Proper - winter fresh		3.40%	P & G	not permitted
TERRA - stone floors		12%	Henkel	permitted
TERRA - parquet		3.20%	Henkel	permitted
TERRA - high gloss floors	June 2009	100%	Henkel	permitted
Seals				

Brand name	Date	Concentration	Manufacturer	Use
Cimberio Loxeal 58 11 PTFE thread sealant		100%		not permitted
Dreibond 5331		100%, 23 °C	Dreibond	not permitted
EPDM rubber O-ring		100%	Join de France	permitted
Easyfit (Griffon)	June 2009	100%	Bison International	not permitted
Everseal pipe thread sealant		100%, 82 °C	Federal Process Corp.	not permitted
FACOT PTFE SEAL (PTFE sealant)		100%		not permitted
Filjoint	June 2009	100%	GEB	not permitted
FILETPLAST EAU POTABLE	June 2009	100%	GEB	permitted
GEBATOUT 2	June 2009	100%	GEB	permitted
GEBETANCHE 82 (EX-GEB)	June 2009	100%	GEB	not permitted
Griffon assembly kit		100%	Verhagen-Herlitzius BV.	permitted
Kolmat jointpaste (- 30 up to + 135 °C)		100%	Denso	permitted
Locher Paste Special		100%	Locher & Co AG	permitted
Loctite 5061		100%	Loctite	permitted
Loctite 518 seal eliminator		100%, 82 °C	Loctite	not permitted
Loctite 5331	June 2009	100%	Loctite	permitted
Loctite 5366 silicomet AS-310		100%	Loctite	permitted
Loctite 542		100%, 23 °C	Loctite	not permitted
Loctite 55	June 2009	100%	Loctite	not permitted
Loctite 572 thread sealant	June 2009	100%, 60 °C	Loctite	not permitted
Loctite 577		100%, 23 °C	Loctite	not permitted
Loctite Dryseal	Sep. 2008	100%	Loctite	permitted
Manta Tape		100%		permitted
Multipak		100%		permitted
Neo-Fermit		100%	Nissen & Volk	permitted
Neo-Fermit Universal 2000		100%	Nissen & Volk	permitted
Plastic Fermit - sealant		100%	Nissen & Volk	permitted
Precote 4		100%	Omnifit	not permitted
Precote 80		100%	Omnifit	not permitted
RectorSeal # 5		100%, 82 °C	RectorSeal Corp.	not permitted
Red Silicone Sealant (- 65 up to + 315 °C) Silicone sealant		100%	Loctite	permitted
Rite-Lok		100%	Chemence	not permitted
Scotch-Grip Rubber & Seal Adhesive # 1300		100%, 82 °C	3M	not permitted
Scotch-Grip Rubber & Seal Adhesive # 2141		100%, 82 °C	3M	not permitted
Scotch-Grip Rubber & Seal Adhesive # 847		100%, 82 °C	3M	not permitted
Selet Unyte		100%, 82 °C	Whitman	not permitted
Tangit metalock	Apr. 2007	100%	Henkel	not permitted
Tangit Racoretanche	June 2009	100%	Loctite	permitted
Tangit Unilock	June 2009	100%	Henkel	not permitted
TWINEFLO (PTFE band) + processing medium		100%	Resitape / Ulith	permitted
Twineflon	March 2009	100%	Unith	permitted
Unipack	May 2006	100%		not permitted
Unipack Packsalve		100%		permitted
Viscotex Locher Paste 2000		100%		permitted

Brand name	Date	Concentration	Manufacturer	Use
Adhesive				
Atmosfix	July 2009	100%	Atmos	not permitted
ARMAFLEX 520 ADHESIVE	Dec. 2008	100%, 50 °C		not permitted
ARMAFLEX HT 625	Dec. 2009	100%, 50 °C		not permitted
BISON SILIKONENKIT SANITAIR		100%		permitted
Bison-Tix contact adhesive		100%, 23 °C	Perfecta International	not permitted
CFS SILICONE SEALANT S-200 silicone sealant)		100%		permitted
Colle Mastic hautes Performances	June 2009	100%	Orapi	permitted
Epoxy ST100	July 2007	100%		not permitted
GENKEM CONTACT ADHESIVE		100%		not permitted
GOLD CIRCLE SILICONEKIT BOUW TRANSPARENT		100%		permitted
Knauf Sanitär Silicone Kit		100%		permitted
Knauf Silicone Kit for Acrylic	July 2009	100%	Henkel	permitted
Pattex colle rigide PVC		100%		not permitted
PEKAY GB480 (Vidoglue) adhesive		100%		not permitted
PEKAY GB685 (Insulglue) adhesive		100%		permitted
Repa R 200		100%		permitted
RUBSON SILIKON SANITÄR TRANSPARENT SET		100%	Rubson	permitted
RUBSON SILIKON SANITÄR TRANSPARENT SET		100%	Rubson	permitted
Hydrophobic wood glue		100%		permitted
Foams				
BISON PUR FOAM	March 2009	100%		not permitted
Boxer Mounting Foam	Feb 2007	100%		not permitted
Gunfoam - Winter - Den Braven East sp. z o.o.	Feb 2007	100%		not permitted
Gunfoam Proby	Feb 2007	100%		not permitted
Hercusal	Feb 2007	100%		not permitted
MODIPUR HS 539	July 2009	100%	Wickes	not permitted
MODIPUR US 24 TEIL 2	July 2009	100%		not permitted
MODIPUR HS 539 / US 24 TEIL 2 (1/1)	July 2009	100%		not permitted
PUR Foam (contains diphenylmethane-4,4-diisocyanate)		100%		not permitted
O.K. - 1 K PUR		100%		not permitted
Omega Faum - foam	Feb 2007	100%		not permitted
Proby Mounting Foam	Feb 2007	100%		not permitted
PURATEC - 1 K PUR		100%		not permitted
PURATEC - 2 K PUR		100%		not permitted
Ramsauer PU foam	July 2009	100%		not permitted
Shaft and Well Foam Klima plus		100%		not permitted
Soudal Mounting Foam for low temperatures	Feb 2007	100%		not permitted
SOUDAL Gun Foam Soudalfoam -10	Feb 2007	100%		not permitted
SOUDAL PU foam	July 2009	100%		not permitted
Door mounting foam 2-K Klima plus		100%		permitted
TYTAN Professional Gun Foam Winter	Feb 2007	100%		not permitted
TYTAN Professional for PCV gun foam	Feb 2007	100%		not permitted
TYTAN Professional Lexy 60 low-pressure	Feb 2007	100%		not permitted
TYTAN Euro-Line Mounting Foam	Feb 2007	100%		not permitted
TYTAN Professional for PCV mounting foam	Feb 2007	100%		not permitted

Brand name	Date	Concentration	Manufacturer	Use
ZIMOWA SUPER PLUS - (mounting foam)	Feb 2007	100%		not permitted
Greases				
BAYSILONE OIL M 1000		100%		permitted
BECHEM BERUSOFT 30		100%	bechem	permitted
Bechem Berulube Sihaf 2	May 2008	100%	bechem	permitted
Dansoll Silec Blue Silicone Spray		100%	dansoll	permitted
Dansoll Super Silec Sanitär mounting paste		100%	dansoll	permitted
Huile de chenevis		100%		permitted
Kluber Proba 270		100%	Kluber	permitted
Kluber Paralig GTE 703		100%, 80 °C, 96 h	Kluber	permitted
Kluber Syntheso glep1		100%, 135 °C, 120 h	Kluber	not permitted
KLÜBERSYNTH VR 69-252		100%	Kluber	permitted
Kluber Unislikikone L641		100%	Kluber	permitted
Kluber Unislikikone TKM 1012		100%, 80 °C, 96 h	Kluber	permitted
OKS 462 / 0956409		100%	Kluber	permitted
OKS 477 VALVE GREASE		100%	Kluber	permitted
Laureat Zloty Installator		100%		permitted
Luga Spray (Leif Koch)		100%	Leif Koch	permitted
Rhodorsil 47 V 1000		100%, 80 °C, 96 h		permitted
SiliKon Spray (Motip)		100%	Motip	permitted
silicona lubricante SDP ref S-255		100%		permitted
Silicone oil M 10 - M 100000		100%		permitted
Silicone oil M 5		100%		permitted
Turmisilon GL 320 1-2		100%		permitted
UNISILIKON L250L	June 2008	100%		permitted
Wacker silicone		50%, 95 °C, 96 h	Wacker	not permitted
Metals				
Copper ions (Cu 2+)		50 ppm		permitted
Solder flux S 39	June 2009	100%		permitted
Solder flux S 65	July 2009	100%		not permitted
YORKSHIRE FLUX		100%		not permitted
Degussa Degufit 3000		100%	Degussa	permitted
Aluminium ions (Al 3+)		50 ppm		permitted
Atmosflux	July 2008	100%		permitted
Paint				
Sigma Superprimer TI		100%	Sigma Coatings	permitted
Sigma Amarol		100%	Sigma Coatings	permitted
Decalux		100%	De Keyn Paint	permitted
Permaline		100%	ITI-Trimetal	permitted
Silvatane		100%	ITI-Trimetal	permitted
DULUX water-based high-gloss paint		100%	ICI	not permitted
DULUX water-based silky gloss paint, satin		100%	ICI	not permitted
DULUX for microporous wood, silky gloss		100%	ICI	permitted

Brand name	Date	Concentration	Manufacturer	Use
DULUX floor paint, very tough, silky gloss		100%	ICI	permitted
DULUX metal paint, anti-corrosive, high gloss		100%	ICI	permitted
Hammerite white, silky gloss		100%	ICI	permitted
Hammerrite white, high gloss, based on Xyleen		100%	ICI	not permitted
Hammerite silver-grey high gloss, based on Xyleen		100%	ICI	permitted
Boss Satin		100%	BOSSPAINTS	permitted
Hydrosatin Interior		100%	BOSSPAINTS	permitted
Carat		100%	BOSSPAINTS	permitted
Bolatex		100%	BOSSPAINTS	permitted
Optiprim		100%	BOSSPAINTS	permitted
Elastoprim		100%	BOSSPAINTS	permitted
Plastiprop		100%	BOSSPAINTS	not permitted
Formule MC		100%	BOSSPAINTS	not permitted
MAPEGRUNT		100%	Mapei	permitted
DULUX PRIMER		100%	ICI	permitted
UNI-GRUNT		100%	Atlas	permitted
Wall filler and construction products				
Bituperl (insulating filler with bitumen)		100%		permitted
Insulating coat with bitumen		100%		permitted
Cold adhesive for bitumen paper		100%		permitted
Climacoll adhesive for pipe insulation foam		100%		not permitted
Compactuna		6%		permitted
FERROCLEAN 9390	Feb 2008	100%		permitted
FT-extra		100%		permitted
Giso base primer		100%		not permitted
KNAUF STUC PRIMER	July 2009	100%		permitted
Mellerud mould killer		100%		permitted
Mineral wool insulation with blocking layer against metal vapour	July 2007	100%		not permitted
Nivoperl (insulating filler)		100%		permitted
PCI LASTOGUM	Feb 2008	100%		permitted
PCI Seccoral 1K	Feb 2008	100%		permitted
Perfax Rebouche tout	July 2009	100%		permitted
PE pipe insulation foam		100%		permitted
Polyfilla inner wall filler		100%	Polyfilla	permitted
Porion immediate trowel		100%	Henkel	permitted
Porion mortar for repairs		100%	Henkel	not permitted
Portland Cement - cement		100%	CBR	permitted
RIKOMBI KONTAKT (RIGIPS)		100%		permitted
Self-adhesive insulation PE foam (wrapping tape)		100%		not permitted
SOPRO FDH 525 (liquid foil)	Sep. 2008	100%		permitted
Stucal Putz		100%	Gyproc	permitted
TANGIT REINIGER	July 2007	100%		not permitted
TANGIT special cleaner	July 2007	100%		permitted
Tile adhesive		100%		permitted
Universal primer		100%		permitted
Wood-concrete Multiplex Bruynzeel (moisture from...)		100%		not permitted

Brand name	Date	Concentration	Manufacturer	Use
Wood pint (moisture from...)		100%		not permitted
Wood MDF medium density fibreboard (moisture from...)		100%		not permitted
Wood Multiplex sealed watertight (moisture from...)		100%		not permitted
Anti-Termite				
Aripyreth Oil Solution		100%, 23 °C		permitted
Baktop MC		100%, 23 °C		permitted
Ecolofen CW		100%, 23 °C		permitted
Ecolofen Emulsificable Concentrate - emulsifiable concentrate		100%, 23 °C		permitted
Ecolofen Oil Solution - oil solution		100%, 23 °C		permitted
Grenade MC		100%, 23 °C		permitted
Hachikusan 20WE/AC		100%, 23 °C		permitted
Hachikusan FL		100%, 23 °C		permitted
Kareit Oil Solution - oil solution		100%		permitted
Rarap MC		100%, 23 °C		permitted
Corrosion inhibitors				
BAYROFILM T 185		0.30%		permitted
Copal corrosion inhibitor	April 2007	100%		permitted
KAN-THERM	Sep. 2008	100%		permitted
INIBAL PLUS	Sep. 2008	100%		permitted
NALCO VARIDOS 1PLUS1	Jan 2009	2%, 23 & 95 °C		permitted
Gas leak sprays				
LIQUI MOLY leak seeker spray		100%, 23 °C		permitted
Multitek gas leak spray		100%		not permitted
Sherlock gas leak detector		100%		permitted
Ulith leak detector spray	Sep. 2008	100%		permitted
LECK-SUCH-SPRAY 400ML (ART. 3350)	Jan 2009	100%, 23 °C & 95 °C		permitted
LECK-SUCH-SPRAY 400ML (ART. 1809)	Jan 2009	100%, 23 °C & 95 °C		permitted
LECKSUCHER PLUS (ART. 890-27)	Jan 2009	100%, 23 °C & 95 °C		permitted
LECKSUCHER 400 ML (ART. 890-20)	Jan 2009	100%, 23 °C & 95 °C		permitted
LECKSUCHERSPRAY ROTEST	Jan 2009	100%, 23 °C & 95 °C		permitted
GUPOFLEX LEAK-SEEKER (ART 301) leak seeker	Jan 2009	100%, 23 °C & 95 °C		permitted
LECKSUCHER 5 L (ART 4120)	Jan 2009	100%, 23 °C & 95 °C		permitted
GUEPO LEAK-SEEKER ETL (ART 121) leak seeker	Jan 2009	100%, 23 °C & 95 °C		permitted
GUEPO LEAK-SEEKER SOAPLESS (ART 131) soapless leak seeker	Jan 2009	100%, 23 °C & 95 °C		permitted
GASLEAK DETECTOR (GRIFFON)	June 2009	100%, 60 °C		permitted
GASLEAK DETECTOR KZ gas leak detector	June 2009	100%, 60 °C		permitted

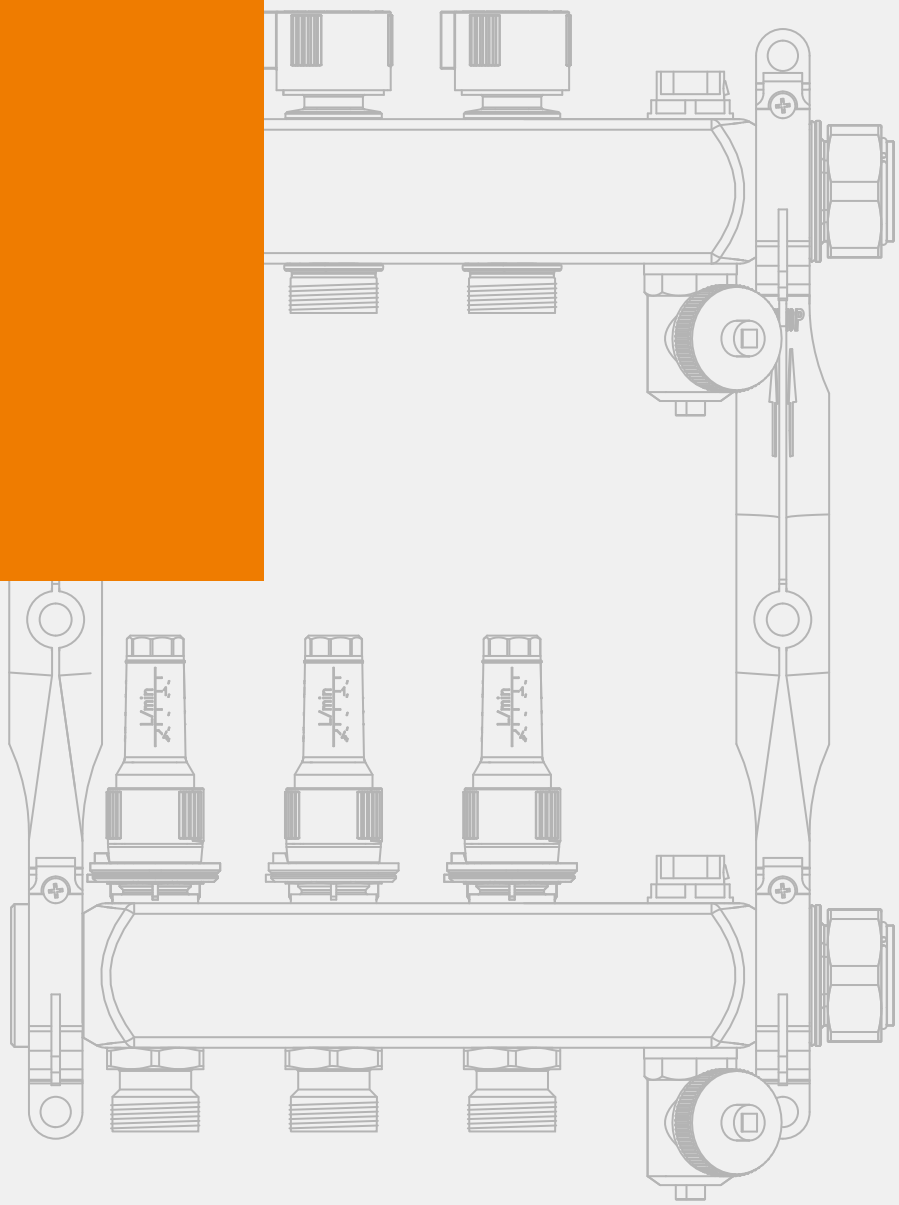
The information in this table has been compiled to the best of our knowledge and is intended as general information. The results in the table show typical average values from a representative number of individual measurement results. These values should in no way be seen as specifications. Furthermore, TECE assumes no responsibility for the use of products not contained in this list.

TECE

Pipe systems

TECEfloor

TECHNICAL GUIDELINES



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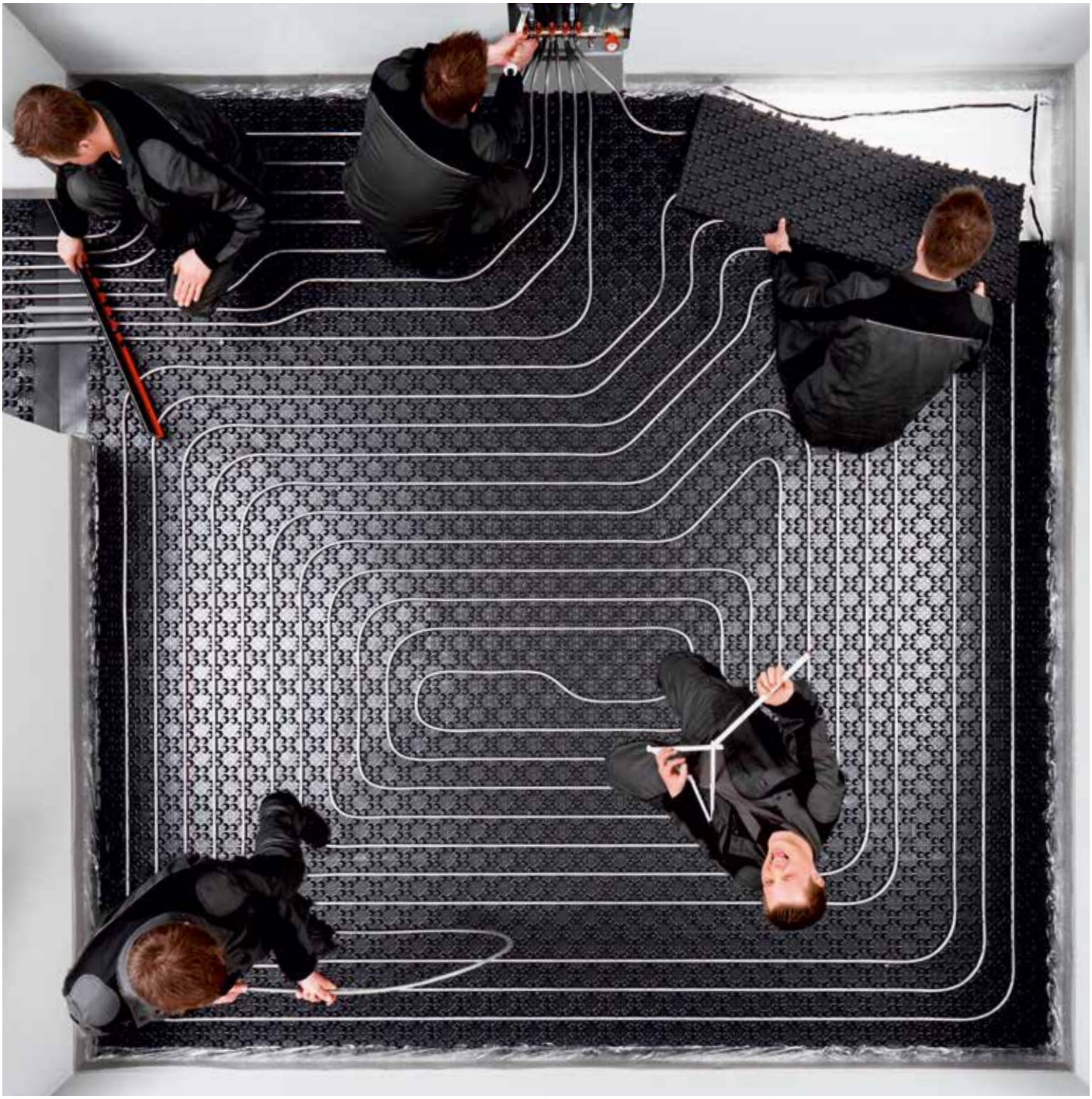
System description

The TECEfloor heating system is a low-temperature heat distribution system for heating living spaces in new builds and renovations. Heat is evenly distributed across the entire floor construction, creating an optimum indoor climate. Due to the high level of radiation compared to static heating systems, an optimum level of comfort is maintained even at significantly lower room temperatures. This enables energy savings of 6 to 12 %.

Considerable advantages

- low investment and operating costs
- high degree of comfort
- free scope for interior design
- Low-temperature system (more efficient use with renewable energies)

The TECE floor heating system ensures comfort, energy efficiency and economy, all at once. It is distinguished by high flexibility and straightforward assembly. The consistently high quality standards of the individual components and the entire system meet the respective standard requirements.



The complete TECEfloor system

TECEfloor, the new floor heating system from TECE

When it comes to floor heating, TECE has long been a specialist: in the 1980s, the company launched the first diffusion-tight composite aluminium pipes on the market. TECE is now back with the TECEfloor range for floor heating.

TECEfloor is a complete system

It comprises heating pipes, installation accessories, manifolds and controls.

TECEfloor emphasises quality

All components are carefully selected and have been tested for 100 % compatibility.

“Silver Line Quality” (SLQ)

The high quality standards are manifested by the “Silver Line Quality” (SLQ) label which stands for tested quality and guaranteed compatibility of all components.

SLQ standard – for water-bearing and functional parts

The strict production tolerances of the heating pipes in TECEfloor are perfectly tailored to the support and clamping ring of the clamped joint. The O-ring on the clamped joint provides accurately dimensioned sealing in the manifold's Eurocone. In the servomotor, not only the union nut but also the lifting and closing dimensions are adjusted to match the manifold's valve insert.

Planning information

Standards and guidelines

When planning and designing TECEfloor heating systems, local laws, standards and guidelines must be observed.

Constructional requirements

Before installing the TECEfloor heating system, the following constructional requirements must be met:

- the rooms must be roofed over, with windows and doors mounted
- interior plastering must have been completed
- an installation mark must be marked in all rooms
- electricity and water connections must be available
- the load-bearing subsurface must be sufficiently firm and dry
- flatness tolerances must be observed
- recesses must be available for heating circuit manifolds and heating pipes
- any necessary joint plans must be available

Note: For a clear distribution of roles and to avoid the overlapping of trades, the Federal Association of Surface Heating and Surface Cooling (BVF) has defined specifications which can be found in its technical information entitled “Interface coordination on heated flooring constructions”.

System pipes

The quality of area heating systems depends largely on the quality of the heating pipes used. They must be resistant to cracking caused by stress, provide an oxygen barrier and be free of corrosion.

Continuous quality control at TECE's renowned, in-house testing laboratory enables TECE to offer the highest level of reliability on all of its heating pipes, ensuring that the pipes continue to work flawlessly even after many years of operation.

Four types of heating pipes are available for use in area heating systems:

- crosslinked SLQ PE-Xc floor heating pipes
- non-crosslinked SLQ PE-RT type 2 floor heating pipes
- SLQ PE-RT/AL/PE composite metal pipes
- crosslinked PE-MDXc 5S floor heating pipes

These four types of pipe boast outstanding characteristics, such as a long service life, resistance to corrosion and scaling, the ability to withstand chemicals, and flexibility — in addition to being extremely easy to install.

The TECE material laboratory continuously monitors the quality of TECEfloor pipes and connectors. This is supplemented by semi-annual tests carried out by independent institutions. Pipes and connectors are tested in conformity with DIN standards.

Certificate/type	Class (Cl.)/operating pressure
3V355 PE-Xc	Cl. 4/6 bar; Cl. 5/6 bar
3V353 PE-RT	Cl. 4/6 bar; Cl. 5/6 bar
3V373 MPX-5S	Cl. 4/4 bar; Cl. 5/4 bar
3V377 Al-PE-RT	Cl. 4/6 bar

SLQ PE-Xc floor heating pipe

SLQ PE-Xc floor heating pipes made from electron beam crosslinked, high-density polyethylene are manufactured in accordance with DIN 16892, and offer an oxygen barrier in accordance with DIN 4726. The special physical crosslinking between molecular chains provides high resistance to both temperature and pressure. The material reliably prevents cracks from forming at nicks and scratches.

The heating pipes are available in dimensions 14 x 2 mm, 16 x 2 mm, 17 x 2 mm and 20 x 2 mm. The minimum bending radius is 5 x d.

SLQ PE-RT type 2 floor heating pipe

SLQ PE-RT floor heating pipes made from non-crosslinked polyethylene are manufactured in accordance with DIN 16833 and offer an oxygen barrier in accordance with DIN 4726. For the PE-RT heating pipes, specially modified polyethylene is used which has a molecular structure and composition that provide excellent thermal stability and high mechanical strength.

The heating pipes are available in dimensions 14 x 2 mm, 16 x 2 mm, 17 x 2 mm and 20 x 2 mm. The minimum bending radius is 5 x d.

SLQ PE-RT/AL/PE composite metal pipes

The five-layer SLQ PE-RT/AL/PE composite metal pipes consist of a non-crosslinked PE-RT type 2 inner pipe, a bonding layer, a butt-welded aluminium core pipe, another bonding layer and a PE outer sheath. They are manufactured in accordance with DIN 16836 and have an oxygen barrier that eliminates all oxygen permeability. In real-life applications, the composite metal heating pipes retain their shape while still allowing flexible installation.
In addition to these optimal pipe laying characteristics, they also offer extremely low coefficients of linear expansion. They are ideal for dry-wall construction, dimpled sheets and wall heating.

This heating pipe is available in size 16 x 2 mm. The minimum bending radius is 5 x d.

SLQ PE-MDXc 5S floor heating pipe

The PE-MDXc 5S floor heating pipe — in accordance with DIN 16894/95 — is the next development in PE-Xc pipes and has special characteristics for use in floor heating systems. Similarly to a PE-Xc pipe, this pipe is designed with electron beam crosslinking, but the use of MD-PE gives the pipe extraordinary flexibility.
PE-MDXc heating pipes are designed with five-layer technology. The oxygen barrier is located in the middle of the pipe sheath, providing effective
protection from damage.

This heating pipe comes in size 16 x 2 mm. The minimum bending radius is 5 x d.

Application classes and classification of operating conditions in accordance with ISO 10508

Application class	Calculation temperature T_D °C	Operating period[b] at T_D Years [a]	T_{max} °C	Operating period at T_{max} Years	T_{max} °C	Operating period at T_{mal} Hours	Typical application area
1 [a]	60	49	80	1	95	100	Hot water supply (60°C)
2 [a]	70	49	80	1	95	100	Hot water supply (70°C)
3 [c]	20	0.5	50	4.5	65	100	Low-temperature floor heating
	30	20					
	40	25					
4 [b]	20	2.5	70	2.5	100	100	Floor heating and low-temperature radiator connection
	40	20					
	60	25					
5 [b]	20	14	90	1	100	100	High-temperature radiator connection
	60	25					
	80	10					

T_D = temperature, for which the pipe system has been designed.
T_{max} = maximum temperature which may occur for short periods only
T_{mal} = highest possible temperature which may occur in the event of a fault (maximum 100 hours in 50 years)

[a] A country may choose class 1 or class 2 depending on its national regulations.

[b] If more than one calculation temperature exists for an application class for the operating period and the related temperature, the corresponding times of the operating period must be added. "Plus cumulative" in the table implies a temperature group for the given temperature for an operating period (e.g. the temperature group for a period of 50 years for class 5 is made up as follows: 20 °C over 14 years, followed by 60 °C over 25 years, followed by 80 °C over 10 years, followed by 90 °C over 1 year, followed by 100 °C over 100 hours).

[c] Only permitted if the temperature during a fault cannot exceed 65 °C.

Connection technology

All fittings and screw connections for connecting and fastening the SLQ floor heating pipes are carefully designed and adapted, and have been extensively tested according to all the applicable test requirements. Of course, pipe and connection technology is quality-monitored on a continual basis by external institutes. Long-term and dependable functionality is thus assured in the best possible way.

Connections in screed

When installing floor heating systems, the questions constantly arises as to whether connections are permissible in screed. Surprisingly, pipe connections under screed, e.g. on radiator connections or potable water installations are not questioned.

Detachable connections which are not permanently leak-proof, must remain accessible in accordance with DIN 18380:2010-04 (German Construction Contract Procedures ["VOB"], Part C, 3.2.7). Inversely, permanently leak-proof connections may be installed in the structure. This is common practice with radiator connections and potable water installations.

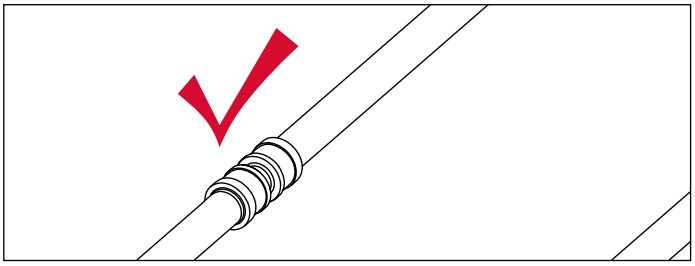
Whether or not a connection is permanently leak-proof is indicated by the test procedure of the respective pipe standard. For instance, for PE-Xc pipes, the DIN EN ISO 15875-5 "Plastic pipe systems for hot and cold water installation. Crosslinked polyethylene (PE-X). Fitness for purpose of the system" procedure applies. In this procedure, the test requirements for the pipe with connector are described in point 4. If these conditions are satisfied, the connection is considered to be leak-proof within the scope of this standard.

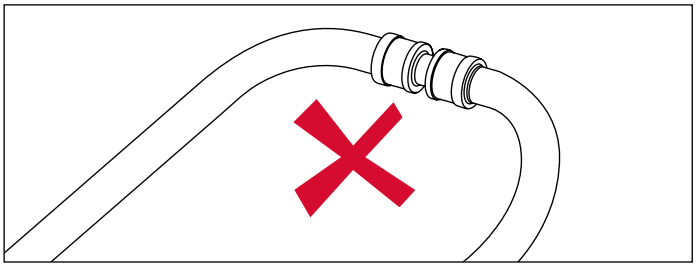
The results of an independent test can be confirmed within the framework of a certificate, e.g. "DIN CERTCO". The system is then subject to regular monitoring by an independent institute.

Metal connections must be protected from substances which could damage them. In accordance with DIN 18380 (VOB, part C, 3.1.9), the use of these substances is not permitted, nevertheless it is highly recommended to preventively cover connections in screed with masking tape to protect them from coming into contact with any substances of a destructive nature, such as plaster or chloride-containing quick binders.
Finally, the position of all connections in the screed in accordance with DIN EN 1264-4 should be recorded in a revision drawing.

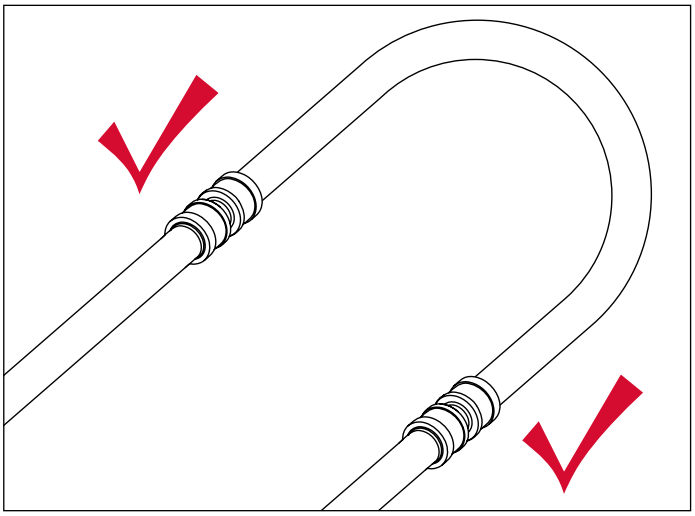
Assembly instructions

Couplings should not be installed in the elbows or bends:

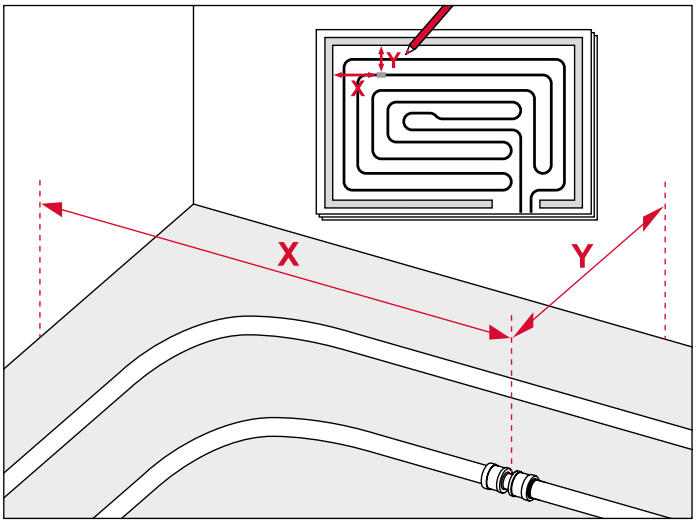




if necessary, two couplings should be precisely installed along the reversal pipes:



As described above in the "Connections in screed" section, the position of the couplings should be recorded in the revision plan.



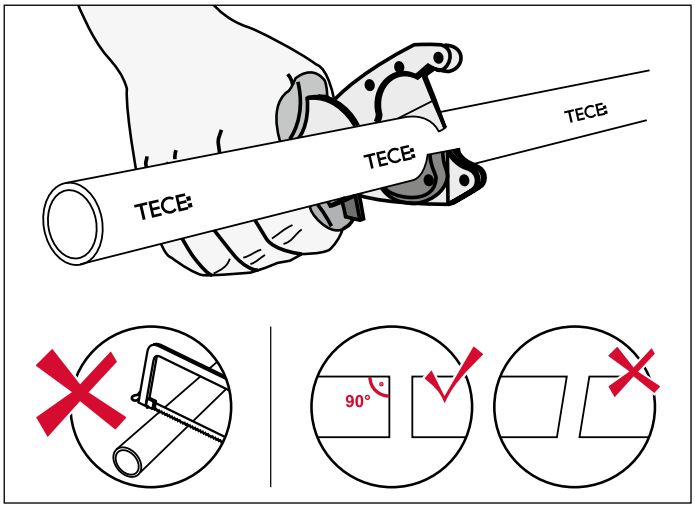
TECEfloor – Connection technology

The following table shows the correct connection technology for all available SLQ floor heating pipes:

Connection technology	SLQ PE-RT type 2 floor heating pipe 7712 xx xx	SLQ PE-Xc floor heating pipe 7713 xx xx	SLQ MDXc 5S floor heating pipe 7714 xx xx	SLQ Al/PE-RT floor heating pipe 7715 xx xx
SLQ Eurocone clamping ring connection 	✓	✓	✓	✓
SLQ pressure sleeve coupling 	✓	✓	✓	✗
PPSU pressure sleeve coupling 	✗	✗	✗	✓
TECElogo coupling 	✗	✗	✓	✓

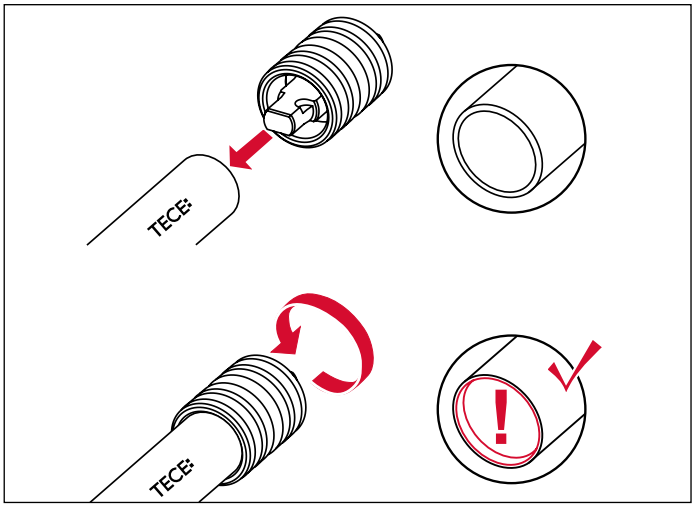
SLQ Eurocone clamping ring connection

SLQ Eurocone clamping ring connections, which are quality-monitored and tested for compatibility, are equipped with a plastic clamping ring. This excludes the risk of damage to the end of the pipe caused by sharp edges and burrs. In addition, the screw connection is designed with a “fixed” attachment point. This reliably prevents over-tightening and over-crimping. The nickel-plated union nuts of the SLQ Eurocone clamping ring connection are marked with a system ID and dimensions (e.g. SLQ 16). This prevents them from being used erroneously with other pipe systems or pipe dimensions.
The tested SLQ system also includes a calibrator, specially developed for the SLQ range, and optimally adapted to the pipe and clamped joint.



Assembly

- Use pipe scissors to separate the pipe at right angles.
- Deburr and calibrate the end of the pipe prior to assembly.
- Mount the union nut with the clamping ring.
- Carefully mount the nozzle onto the pipe by rotating it.
- Tighten the union nut up to the stop, SW 27.
- The connection pipes should be positioned vertically or horizontally to the screw connection.
- If necessary, align and attach the pipe.



SLQ pressure sleeve coupling for all-plastic pipes

The equally reliable and easily processed SLQ pressure sleeve coupling falls back upon TECEflex technology which has proven itself for many years. Therefore, the expanding tool and crimping pliers from the TECEflex range can be used. Special expanding heads are available from the SLQ range for the 17 x 2.0 mm and 20 x 2.0 mm pipes.
For installation information, see the TECEflex chapter.

PPSU pressure sleeve coupling for SLQ composite pipes

The PPSU pressure sleeve coupling for Al/PE-RT underfloor heating pipes is based on tried and tested TECEflex technology, and should be installed using well-known TECEflex tools.

For installation information, see the TECEflex chapter.

TECEfloor push-fit coupling 16 x 16, TECElogo type for SLQ MDXc and composite pipes

For quick, easy and twist-free connection of TECEfloor system pipes: order no. 771416xx and 771516xx. Push fitting based on innovative TECElogo technology.

Twist-free and resistant to temperature changes.
Only use with the corresponding system pipes and system tool.
For installation information, see the TECElogo chapter.

Note:

Our technical information **“TECEfloor Universal panel”** is available for downloading as a separate PDF file.

System panels

Dimpled panel system

The TECEfloor dimpled panel system comes in three different designs. The dimpled panel 30-2 with 30-mm-thick impact noise insulation on the underside, the dimpled panel 11 with 11-mm-thick thermal insulation on the underside, and the dimpled sheet without insulation on the underside. All three design types have a polystyrene mutifunctional cover sheet on the top side, which has an extremely good pipe-holding capacity, provides an excellent base for walking on, and ensures a secure seal against liquid screed and moisture. The special dimpled contour allows installation spacings of 6 cm and multiples thereof, and can incorporate heating pipes with dimensions 14, 16 and 17 mm. Installation is carried out in the floor construction under the load distribution layer made of cement or calcium sulphate screed.

Dimpled panel 30-2

The dimpled panel 30-2 is a highly effective thermal and impact noise insulation system. It satisfies the minimum insulation requirements of DIN EN 1264-4 for ceilings above heated rooms, and achieves an impact sound improvement of 28 dB. Higher insulation requirements in accordance with EnEV or higher sound insulation requirements must be checked and provided at the installation site. The maximum permissible moving load of the dimpled panel 30-2 is 5 kN/m^2.

Dimpled panel 11

Dimpled panels 11 are used in areas with high moving loads of up to 30 kN/m^2. They have 11 mm-thick thermal insulation on the underside which has no impact sound properties. The thermal resistance of the panel is R = 0.31 m^{2}K/W.

Dimpled sheet

The dimpled sheet has been designed for laying on top of the on-site insulation.

Technical data

	Dimpled panel 30-2	Dimpled panel 11	Dimpled sheet
Insulation material	EPS 040 DES sg	EPS 035 DEO	-
Multi-functional sheet material	PS sheet	PS sheet	PS sheet
Installation dimension (length x width)	1,440 x 840	1,440 x 840	1,440 x 840
Insulation thickness under heating pipe	30 mm	11 mm	-
Installation spacings	6 cm grid	6 cm grid	6 cm grid
Thermal resistance	0.75 m^{2}K/W	0.31 m^{2}K/W	-
Impact sound improvement**	28 dB	-	-
Building material class according to DIN 4102	B2	B2	B2
Max. area load	5 kN/m^2	30 kN/m^2	*

* depending on the insulation used
** on a solid ceiling and screed applied on top of the impact noise insulation with a mass of ≥ 70 kg/m^2

Tacking sheet system

The TECEfloor tacking sheet system is available in two different designs: as roll insulation 30-2 and as roll insulation 30-3 with 30 mm-thick impact noise insulation. Both design types consist of a slotted insulation board on the underside and a laminated composite sheet on the top. The tacking sheet layer made of woven fabric forms the basis for quick, easy and secure laying of heating pipes. A line grid is printed on the top side of the sheet, allowing installation spacings of 5 cm and multiples thereof. Special tacking pins facilitate the installation of heating pipes with dimensions 14 x 2 mm, 16 x 2 mm and 17 x 2 mm. Installation is carried out in the floor construction under the load distribution layer made of cement or calcium sulphate screed.

Roll insulation 30-2

Roll insulation 30-2 is a highly effective thermal and impact noise insulation system. It satisfies the minimum insulation requirements of DIN EN 1264-4 for ceilings above heated rooms, and improves insulation against impact sound by 28 dB. Higher insulation requirements in accordance with EnEV or higher sound insulation requirements must be checked and provided at the installation site. The maximum permissible moving load of tacking sheet 30-2 is 5 kN/m^2.

Roll insulation 30-3

Roll insulation 30-3 is always used wherever additional thermal insulation is required. With a thermal resistance of 0.67 m^{2}K/W, this roll insulation used on its own does not meet the minimum insulation requirements of DIN EN 1264. Roll insulation 30-3 improves insulation against impact sound by 29 dB . The maximum permissible moving load of tacking sheet 30-2 is 4 kN/m^2.

Technical data

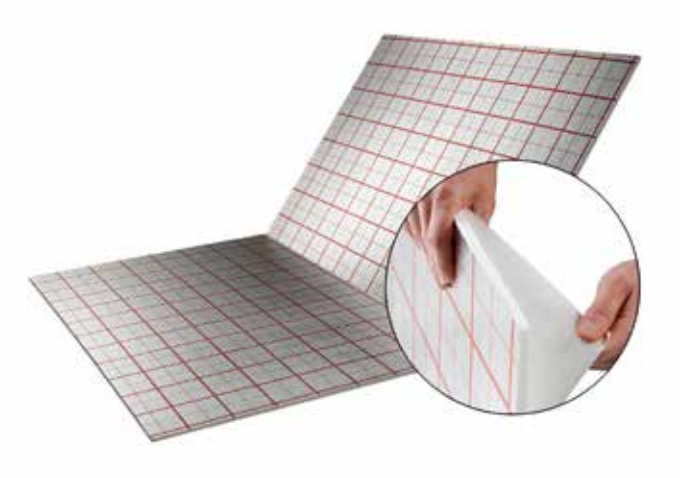
	Roll insulation 30-2	Roll insulation 30-3
Insulation material	EPS 040 DES sg	EPS 045 DES sm
Woven film material	PE	PE
Installation dimension (length x width)	10 x 1 m	10 x 1 m
Insulation thickness under heating pipe	30 mm	30 mm
Installation spacings	5 cm grid	5 cm grid
Thermal resistance	0.75 m^{2}K/W	0.67 m^{2}K/W
Impact sound improvement**	28 dB	29 dB
Building material class according to DIN 4102	B2	B2
Max. area load	5.0 kN/m^2	4.0 kN/m^2

* depending on the insulation used

** on a solid ceiling and screed applied on top of the impact noise insulation with a mass of ≥ 70 kg/m^2

TECEfloor tacking sheet 10plus

10 mm-thick EPS folding tacking sheet for universal application on insulation at the installation site, such as suitable mineral wool, EPS and PUR insulation, or in renovations on existing screed.



- Made from expanding polystyrene EPS, nominal value of the thermal conductivity 0.034 W/mK (DIN EN 13163; DIN EN 126667), R λ = 0.285 W/(m^{2}K
- Compression strength at 10% compression 150 kPA CS(10/Y) 150 (DIN EN 826; DIN EN 13163), EPS Euroclass E (DIN EN 13501-1)
- Coated with a highly tear-resistant, finely woven, fibre-reinforced multi-layer composite woven film made of polyethylene (DIN EN 1264-4), highly adhesive, for the extremely high holding forces of the TECEfloor 10plus tacking pins.
- One-sided, self-adhesive 30-mm-thick film overlap, grid markings 5 and 10 cm, EPS strength: 10 mm,
- Dimensions: 1.60 x 1.20 m (1.92 m^2), delivered folded to 0.80 x 1.20 m, optional: underside with self-adhesive coating.

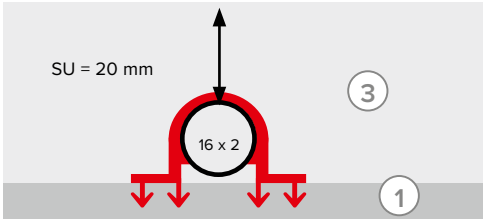
Advantages:

- Universally applicable on many types of insulation material
- Special solutions for renovations
- Easy to handle when cutting and installing
- Clear separation of installing and sreed-laying trade
- Up to 200 m^2 on a Euro-pallet — facilitates transport and reduces storage space

TECEfloor – System panels

One of the many laying options: TECEfloor 10 plus on mineral wool insulation improves impact sound insulation by more than 30 dB.

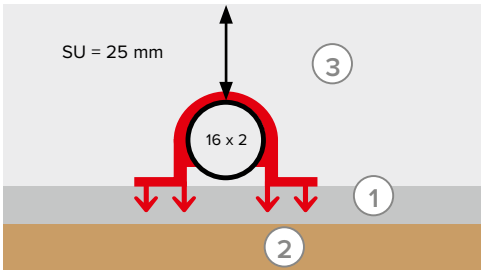
The 10plus tacking sheet is also optionally available with a self-adhesive back.



46 mm

R=0.29 m^2 K/W

Individual load to **3 kN**, area load to **3 kN/m^2**
In acc. with DIN 1991-1-1N/A, areas belonging to categories A2, A3, B1, B2 and D1.



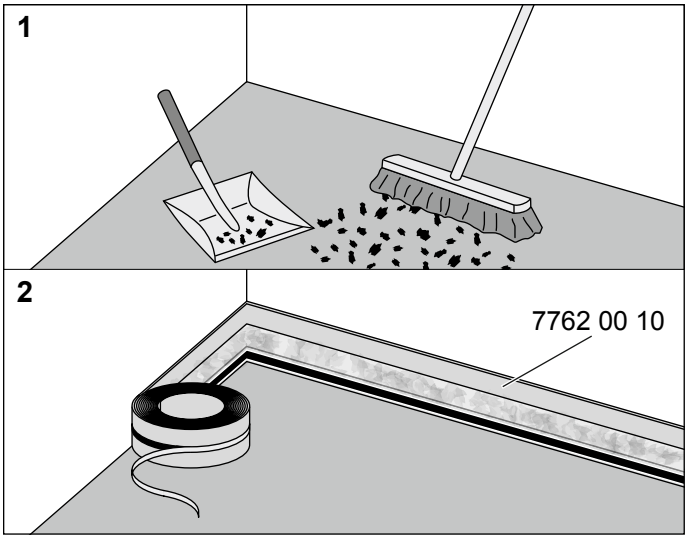
63 mm

R=0.59 m^2 K/W

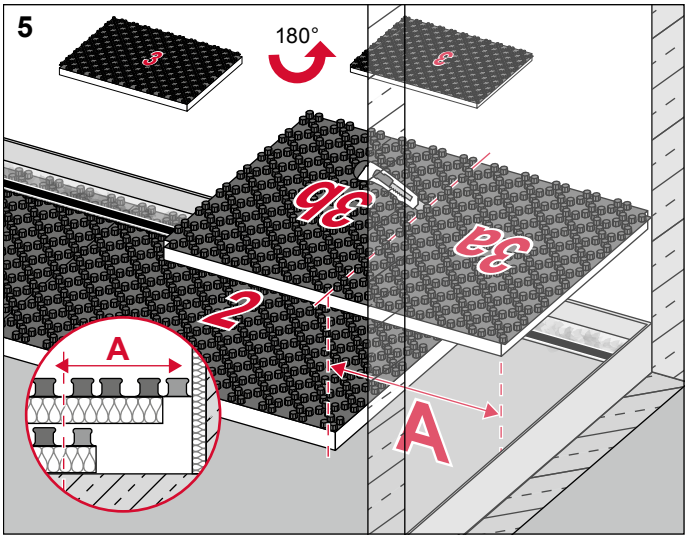
Individual load to **1 kN**, area load to **2 kN/m^2**
In acc. with DIN 1991-1-1N/A, areas belonging to categories A2, A3 (living rooms and areas).

1) TECEfloor tacking sheet 10plus
2) Knauf mineral wool TP-GP-12-1
3) Knauf 425 levelling screed

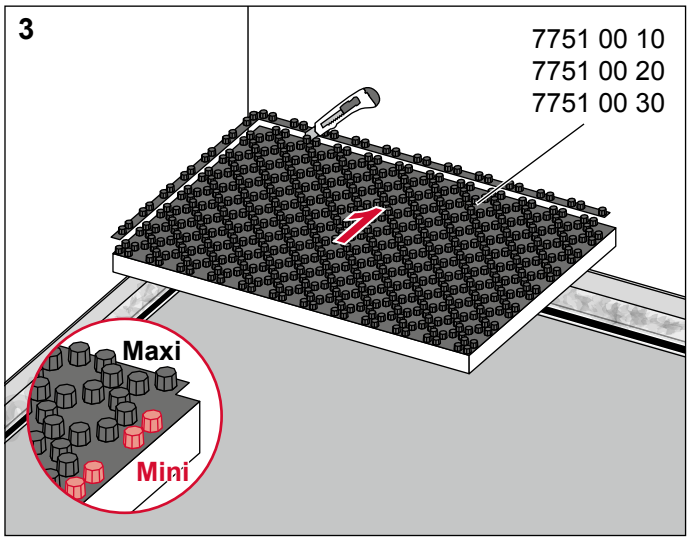
Dimpled panel system assembly instructions



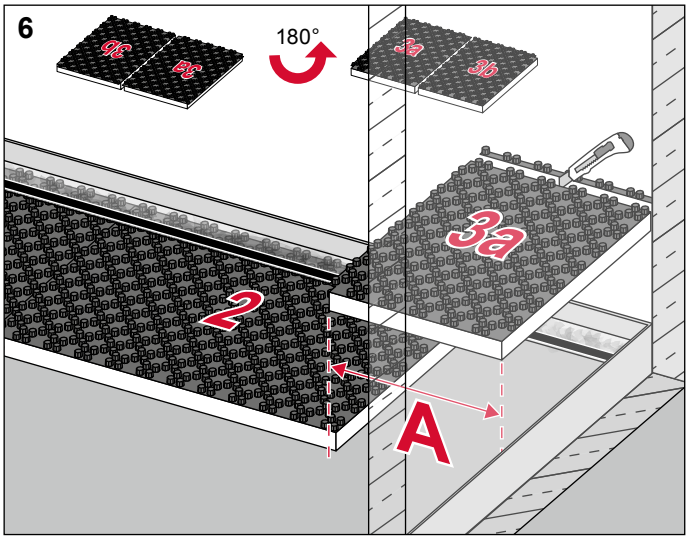
Clean the bare floors and attach the edge insulation strips.



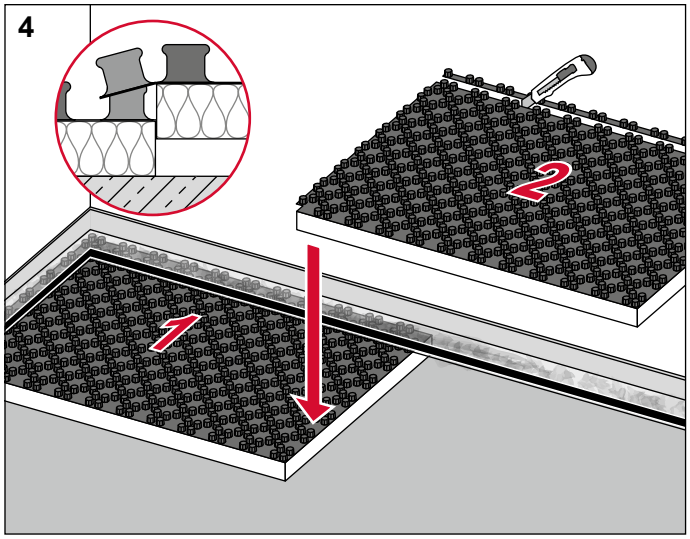
Turn the last panel by 180° to calculate dimension “A” (see details).



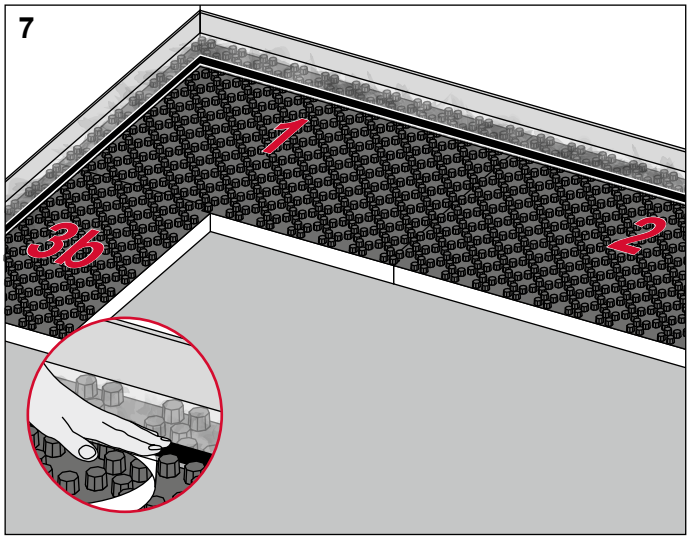
Separate overlap of 1st dimpled panel as illustrated.



Turn the panel back again, separate the overlap and combine as above.

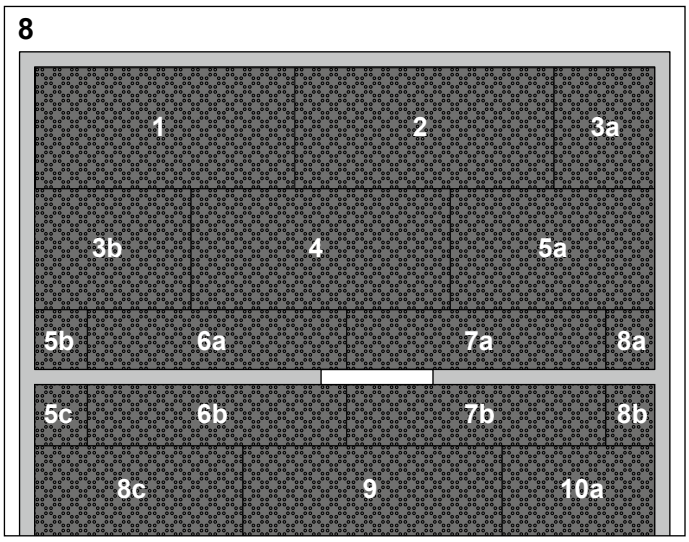


Separate the 2nd and additional dimpled panels along the first installed row on the long side, and combine by means of the snap fastener principle.



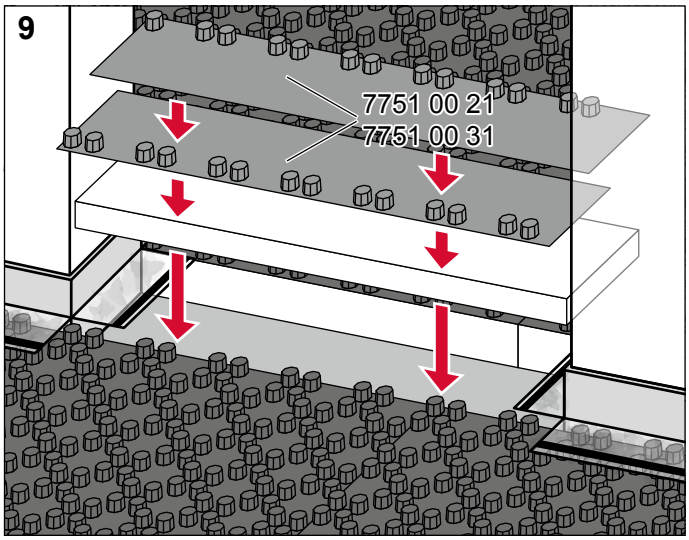
2. Start the next row using the cut-off piece.

8



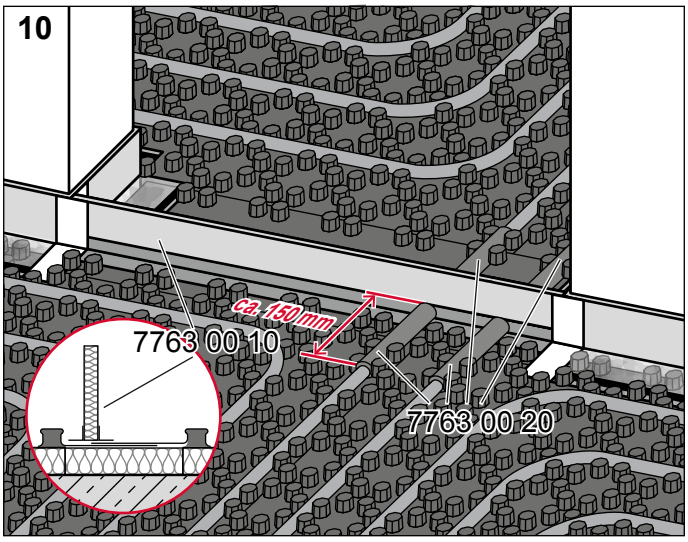
Lay the dimpled panels on the surface as shown. Use any cut-off pieces in other areas, where possible.

9



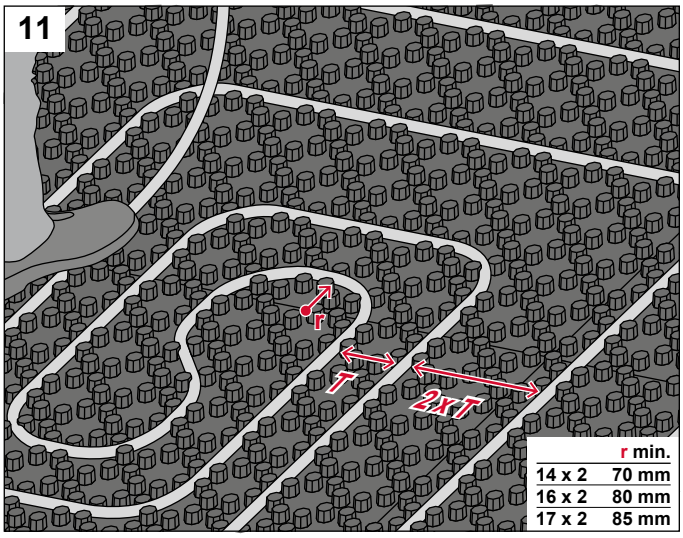
Overlap compensating elements over the customer's own insulation strips.

10



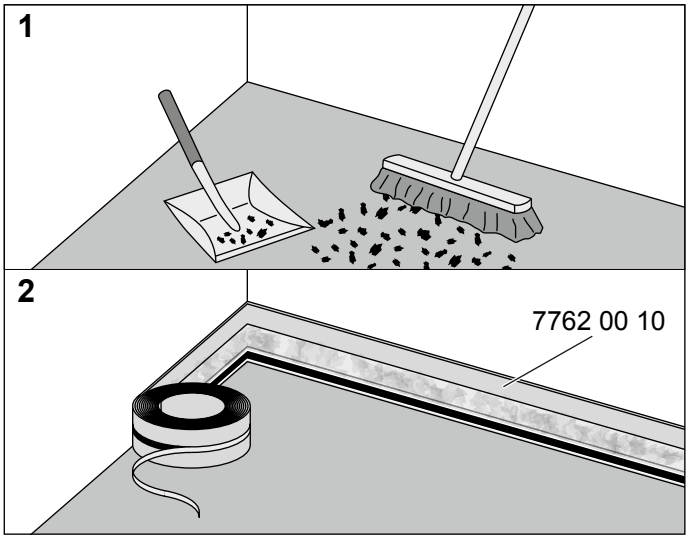
Position the joint pipe protection and expansion gap profile in the joints and between the screed areas.

11

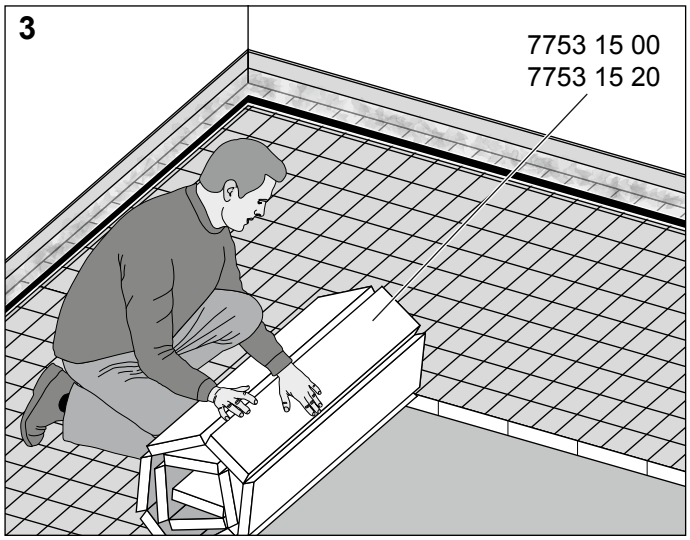


Lay pipes according to the plan, and observe bending radii!

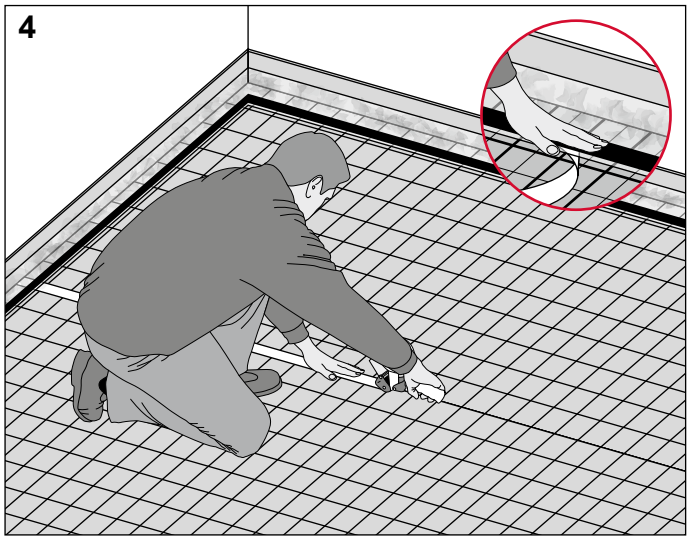
Tacking sheet system assembly instructions



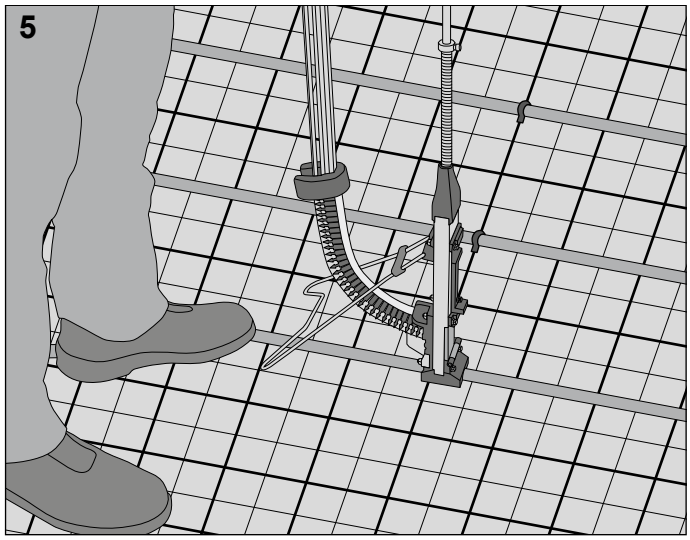
Clean the bare floors and attach the edge insulation strips.



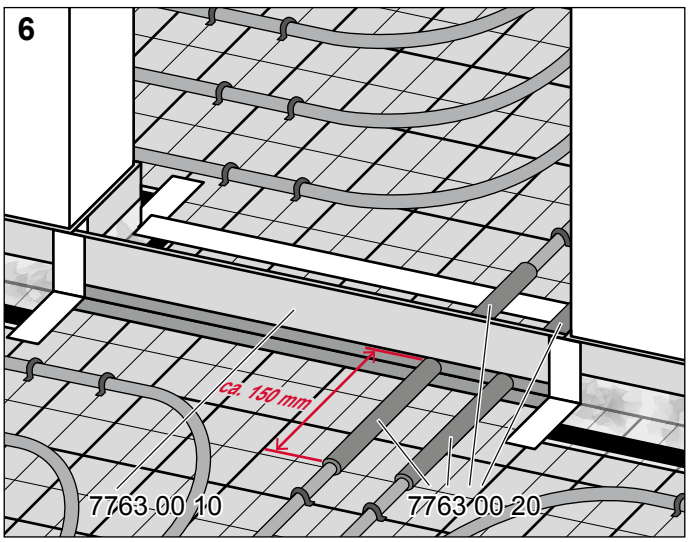
Unroll the roll insulation, applying additional insulation beforehand, if necessary.



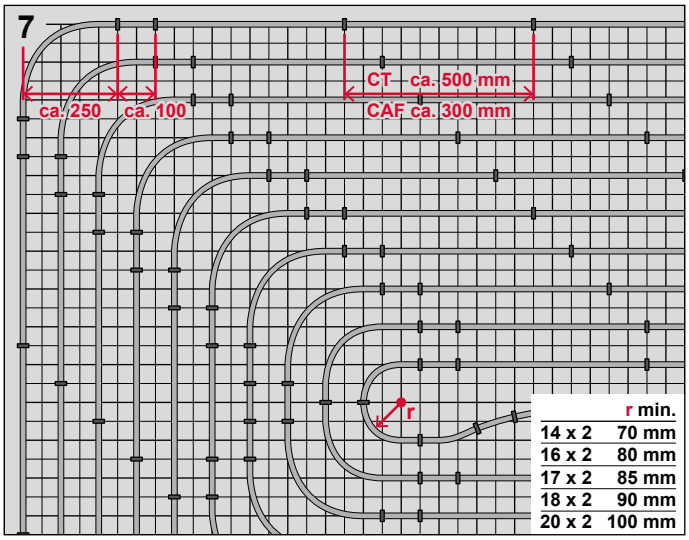
Cover any welts and joints to the edge insulation strips with adhesive tape.



Lay pipes according to the plan and attach to roll insulation using tacking pins (distance in cement screed max. 500 mm, in calcium sulphate screed max. 300 mm).

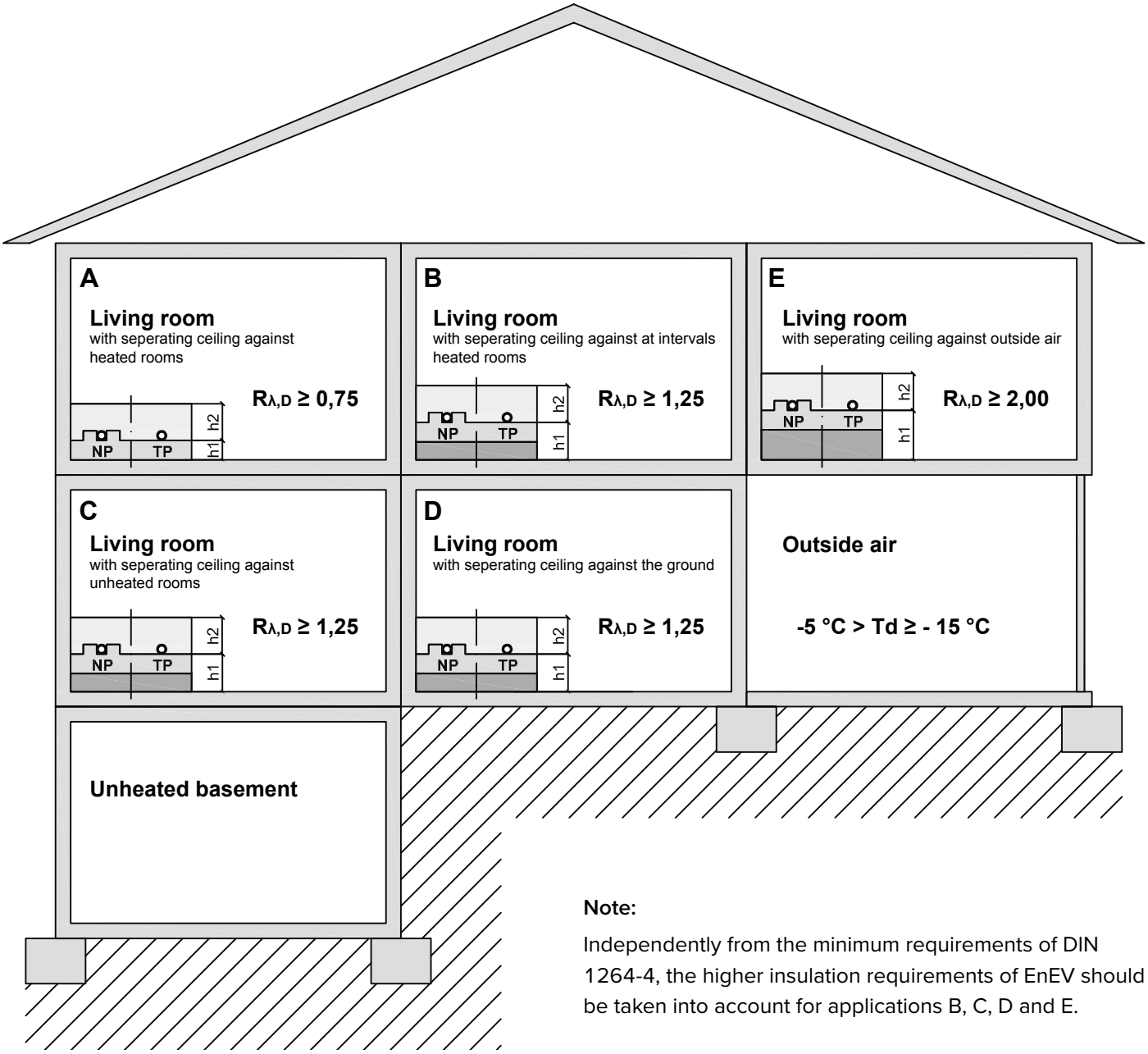


Position the joint pipe protection and expansion gap profile in the joints and between the screed areas.



For additional installation spacings, etc., see the assembly instructions.

Minimum insulation requirement in accordance with DIN EN 1264-4



Note:

Independently from the minimum requirements of DIN 1264-4, the higher insulation requirements of EnEV should be taken into account for applications B, C, D and E.

Minimum screed layer heights h_2 according to DIN 18560-2

Area load	C	CT F4	CT F5	CAF F4	CAF F5
≤ 2 kN/m²	≤ 5 mm	45 + d	40 + d	40 + d	35 + d
≤ 3 kN/m²	≤ 5 mm	65 + d	55 + d	50 + d	45 + d
≤ 4 kN/m²	≤ 3 mm	70 + d	60 + d	60 + d	50 + d
≤ 5 kN/m²	≤ 3 mm	75 + d	65 + d	65 + d	55 + d

C = max. permissible insulation compressibility of insulating layers
CT F4/CT F5 = cement screed (CT) with flexural tensile strength F4/F5
CAF F4/CAF F5 = calcium sulphate flow screed with flexural tensile strength F4/F5
d = outer diameter of heating pipes or height of dimple

Minimum thickness h_1 (according to DIN 1264-4)

	Application		
System	**A**	**B, C and D**	**E**
TECEfloor dimpled panel 30-2	30 mm	30 mm	30 mm
Minimum additional insulation according to DIN EN 1264-2 (installation site)	-	e. g. 20 mm EPS WLG 040	e. g. 50 mm EPS WLG 040
Thermal resistance $(R)_{\lambda,D}$	0.75 m^2K/W	1.25 m^2K/W	2.00 m^2K/W
Minimum thickness h_1	30 mm	50 mm	80 mm
TECEfloor dimpled panel 11*	11 mm	11 mm	11 mm
Minimum additional insulation according to DIN EN 1264-2 (installation site)	e. g. 20 mm EPS WLG 040	e. g. 40 mm EPS WLG 040	e. g. 70 mm EPS WLG 040
Thermal resistance $(R)_{\lambda,D}$	0.81 m^2K/W	1.31 m^2K/W	2.06 m^2K/W
Minimum thickness h_1	31 mm	51 mm	81 mm
TECEfloor dimpled sheet*	-	-	-
Minimum additional insulation according to DIN EN 1264-2 (installation site)	e. g. 30 mm EPS WLG 040	e. g. 50 mm EPS WLG 040	e. g. 80 mm EPS WLG 040
Thermal resistance $(R)_{\lambda,D}$	0.75 m^2K/W	1.25 m^2K/W	2.00 m^2K/W
Minimum thickness h_1	30 mm	50 mm	80 mm
TECEfloor tacking sheet 30-2	30 mm	30 mm	30 mm
Minimum additional insulation according to DIN EN 1264-2 (installation site)	-	e. g. 20 mm EPS WLG 040	e. g. 50 mm EPS WLG 040
Thermal resistance $(R)_{\lambda,D}$	0.75 m^2K/W	1.25 m^2K/W	2.00 m^2K/W
Minimum thickness h_1	30 mm	50 mm	80 mm
TECEfloor tacking sheet 30-3	30 mm	30 mm	30 mm
Minimum additional insulation according to DIN EN 1264-2 (installation site)	e. g. 5 mm EPS WLG 040	e. g. 25 mm EPS WLG 040	e. g. 55 mm EPS WLG 040
Thermal resistance $(R)_{\lambda,D}$	0.795 m^2K/W	1.29 m^2K/W	2.71 m^2K/W
Minimum thickness h_1	35 mm	55 mm	85 mm
TECEfloor tacking sheet 10plus	10 mm	10 mm	10 mm
Minimum additional insulation according to DIN EN 1264-2 (installation site)	20 mm EPS DES WLG 040	20 mm EPS DES WLG 040 + 20 mm EPS DEO WLG 040	20 mm EPS DES WLG 035 + 30 mm PUR WLG 025
Thermal resistance	0.789 m^2K/W	1.286 m^2K/W	2.057 m^2K/W
Minimum thickness h_1	30 mm	50 mm	60 mm

* no impact noise (in the event of an impact noise requirement, provide additional insulation)

Thermal conductivity group: Insulating materials are classified into thermal conductivity groups according to the rated value of the thermal conductivity which simplifies calculation and use. The thermal conductivity group is derived directly from the rated value λ(R): λ(R) with 0.040 W/(m·K) = TCG 040.

Thermal resistance R_λ of TECEfloor system panels

TECEfloor system panels	Thermal resistance R_λ
Dimpled panel 30-2	$R_{\lambda,SP}$ = 0.75 W/m^2K
Dimpled panel 11	$R_{\lambda,SP}$ = 0.31 W/m^2K
Dimpled sheet	$R_{\lambda,SP}$ = 0.00 W/m^2K
Tacking sheet 30-2	$R_{\lambda,SP}$ = 0.75 W/m^2K
Tacking sheet 30-3	$R_{\lambda,SP}$ = 0.67 W/m^2K
Tacking sheet 10plus	$R_{\lambda,SP}$ = 0.286 W/m^2K

Note:

When selecting additional insulation, in conjunction with the TECEfloor system panels, the minimum requirements according to EN 1264 must be taken into account. Requirements derived from considering the building in its entirety according to EnEV must be stipulated by the designer. The overall insulation structure for underfloor heating must be appropriately adapted to the building's specific requirements.

Example:

Detached house with TECEfloor heating system with dimple system 30-2, pipe dimension 14 x 2 mm
Architect's specifications:

- Separating ceiling on upper floor above heated ground floor:
  no requirements according to EnEV
- Ground floor ground slab (against the ground):
  U-value according to energy performance certificate:
  0.28 W/m²K
  ⇒ $R_{\lambda,D}$ = 1/U = 1/0.28 W/m²K = 3.57 m²K/W
- Ground slab installation height: 160 mm top edge of screed

Calculation of additional insulation required or thermal conductivity group:

1. Separating ceiling on upper floor above heated ground floor

   $R_{\lambda,D}$ total thermal insulation: 0.75 m²K/W
   (in accordance with DIN 1264-4)
   $R_{\lambda,SP}$ TECEfloor dimpled panel 30-2: - 0.75 m²K/W
   $R_{\lambda,ZD}$ additional insulation: = 0 m²K/W

   ⇒ no additional insulation required

2. Ground floor ground slab (against the ground)

   Floor construction:
   160 mm top edge of screed
   - 60 mm heating screed
   - 30 mm TECEfloor dimpled panel 30-2
   = 70 mm additional insulation

   $R_{\lambda,D}$ total thermal insulation: 3.57 m²K/W
   $R_{\lambda,SP}$ TECEfloor dimpled panel 30-2: - 0.75 m²K/W
   $R_{\lambda,ZD}$ additional insulation: = 2.82 m²K/W

   $R_{\lambda,ZD} = d_{ZD} / \lambda_{ZD}$
   => $\lambda_{ZD} = d_{ZD} / R_{\lambda,ZD}$ = 0.07 /2.82 = 0,0248 W/mK

   ⇒ Selected thermal insulation:
   70 mm PUR, WLG 025

$R_{\lambda,D}$ required thermal resistance of overall insulation in m²K/W (according to DIN EN 1264-4 or EnEV energy performance certificate)
$R_{\lambda,SP}$ thermal resistance of TECEfloor system panel in m²K/W
$R_{\lambda,ZD}$ required thermal resistance of additional insulation in m²K/W
d_{ZD} thickness of additional insulation in m
λ_{ZD} thermal conductivity of additional insulation in W/mK

Heating circuit manifold and manifold housing

TECEfloor stainless steel heating circuit manifold with flow rate indicator

The TECEfloor heating circuit manifold has a large chamber volume, a polished surface, a sound-absorbent plastic holder with a quick assembly function and union nut 1" flat sealing.

It features integrated return valves with double O-ring sealing on the valve tappet, a valve disk with O-ring sealing for permanently reliable closing of the heating circuits, and a flow metre with shut-off, 0.5-4 litres with locking mechanism to DIN EN 1264-4.
The viewing glasses can be replaced under system pressure.
The batch indication enables tracking and unique identification of the manifold even after many years of operation (supply of accessories and spare parts).
SLQ quality-monitored and tested for compatibility.
Every manifold is 100% tested for tightness and function.
Made in Germany

TECEfloor stainless steel heating circuit manifold type Logo with flow rate indicator

Al/PE-RT
MDXc

The TECEfloor heating circuit manifold type Logo has outlets with “Type Logo” pre-assembled push fittings for quick and twist-free connection of the TECEfloor heating pipe, dim. 16, types SLQ Al/PE-RT and SLQ MDXc 5S.
Push fitting with Eurocone connection can be subsequently removed with ease using the system tool.

Only use in conjunction with the corresponding system tool. Specially for TECEfloor heating pipe, dim. 16, types SLQ Al/PE-RT and SLQ MDXc 5S.

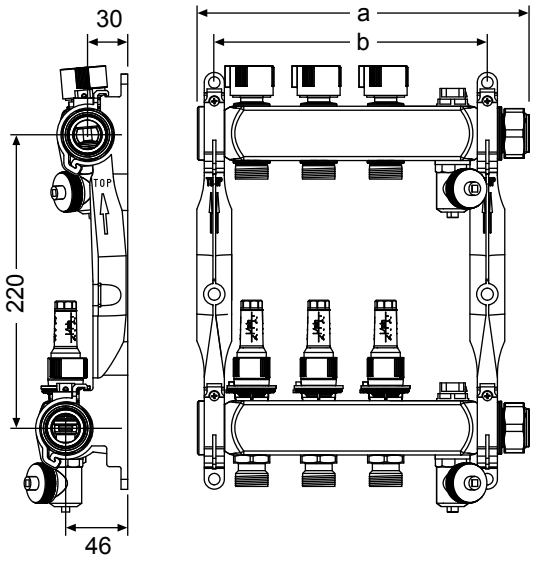
Kvs value flow and return valve: 1.2 m^3/h
distance to heating circuit: 50 mm

Operating conditions:

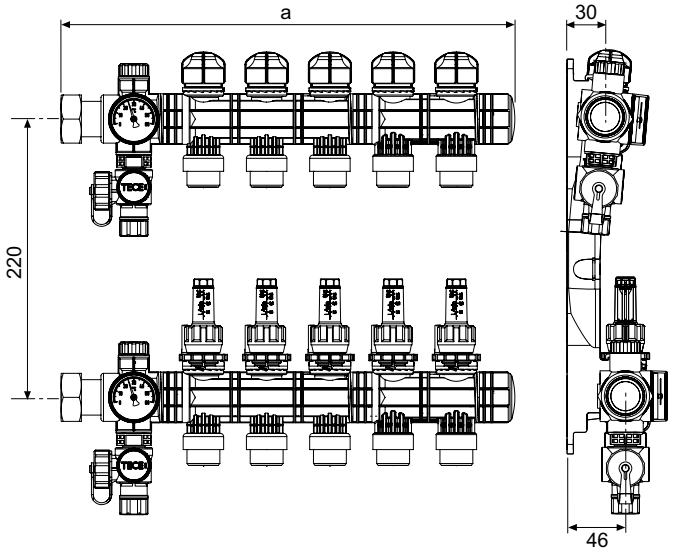
90 °C/3 bar
80 °C/4 bar
70 °C/5 bar
60 °C/6 bar
max. test pressure: 10 bar (< 30 °C)

Dimensions of heating circuit manifold according to heating circuit:

Heating circuits	a (in mm)	b (in mm)
2	198	154
3	248	204
4	298	254
5	348	304
6	398	354
7	448	404
8	498	454
9	548	504
10	598	554
11	648	604
12	698	654



SLQ plastic heating circuit manifold with flow rate indicator



As a modular manifold, the SLQ plastic heating circuit manifold consists of a base module and one or more 2-way or 3-way connection modules with integrated valve technology.
Base module, primary side flat sealing with union nut G1, flow and return thermometer, two rotatable filling and emptying units and two bleed valves for manual air release. Includes manifold wall holder with sound insulation inserts in accordance with DIN 4109 and mounting set.
Connection modules with finely-regulating and flow meter (0–3.5 l/min) with shut-off in the flow part, and thermostat valves M 30 x 1.5 mm (supplied with protective cap), suitable for holding thermoelectric servomotors in the return part. Heating circuit outlets with ¾" Eurocone connection.

Kvs value flow and return valve: 0.75 m^3/h
distance to heating circuit: 50 mm

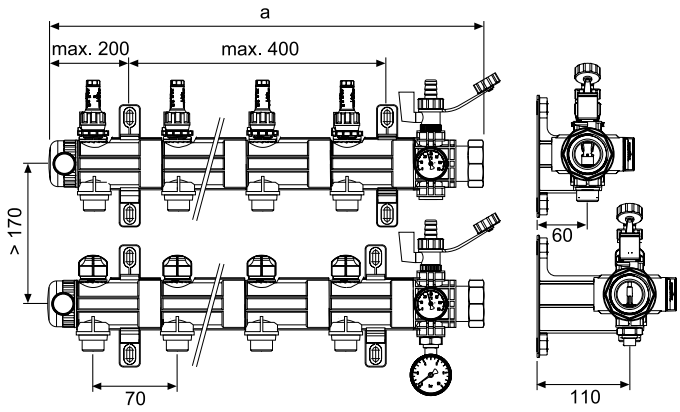
Operating conditions:

max. operating pressure: 6 bar (3 bar)
max. operating temperature: 60 °C (90 °C)
min. operating temperature: 6 °C
max. test pressure: 10 bar (< 30 °C)

Dimensions of heating circuit manifold according to heating circuit:

Heating circuits	a (in mm)
2	202
3	252
4	302
5	352
6	402
7	452
8	502
9	552
10	602
11	652
12	702

SLQ industrial plastic heating circuit manifold with flow rate indicator



Note: A wall mount set should be provided every 400 mm. This must be ordered separately, if required.

Dimensions of heating circuit manifold according to heating circuit:

Heating circuits	a (in mm)
2	250
3	320
4	390
5	460
6	530
7	600
8	670
9	740
10	810
11	880
12	950
13	1020
14	1090
15	1160
16	1230
17	1300
18	1370
19	1440
20	1510

The SLQ industrial plastic heating circuit manifold 1 ½" has a modular design: With the base module, up to 20 flow and return modules can be combined into one manifold.
On the primary side, the industrial plastic heating circuit manifold can be connected via a flat sealing union nut connection 1 ½". Corresponding ball valves 1 ½" MT/1 ½" FT are available for this. On the secondary side, the heating circuits are connected via a ¾" Eurocone thread.
In the flow direction, the heating circuit modules are equipped with a flow meter (4–20 l/min) with shut-off, and in the return direction, with valve cores (M 30 x 1.5) with a shut-off valve.

Kv value of flow and return valves (together): 2.09 m^3/h
distance to heating circuit: 70 mm

Operating conditions:

max. operating pressure: 6 bar (3 bar)
max. operating temperature: 60° C (90 °C)
max. test pressure (24 hours): 6 bar (< 30 °C)

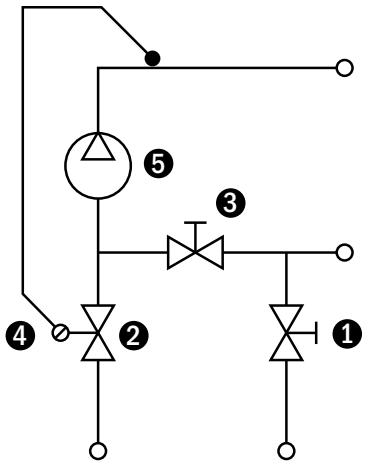
Fixed value control 20-55°C

As a manifold station, the TECE floor fixed value control regulates the temperature of the water in the secondary floor heating area via a thermostat head with a flow sensor. This remains below the water temperature on the primary side as long as this — generally weather-compensating water temperature – remains above the value set on the fixed value control.
If the water temperature on the primary side drops due to the heating curve setting being below the set fixed value temperature, the flow temperature on the secondary side in the underfloor heating circuit will also drop. The station is designed according to pressure loss, flow rate and spread to provide an output of approx. 10 kW.
To hydraulically harmonise the connected underfloor heating with the rest of the heating installation, the TECEfloor fixed value control is equipped with a control valve (1) in the primary return, and a balance valve (3) in the underfloor heating circuit return.

The pre-mounted and electronically-controlled circulating pump ES 25-60 is fitted with a permanent magnet synchronous motor which can be set via a simple push button to the following operating modes:

- constant pressure 300 mbar
- constant pressure 400 mbar
- proportional pressure
- and continuous

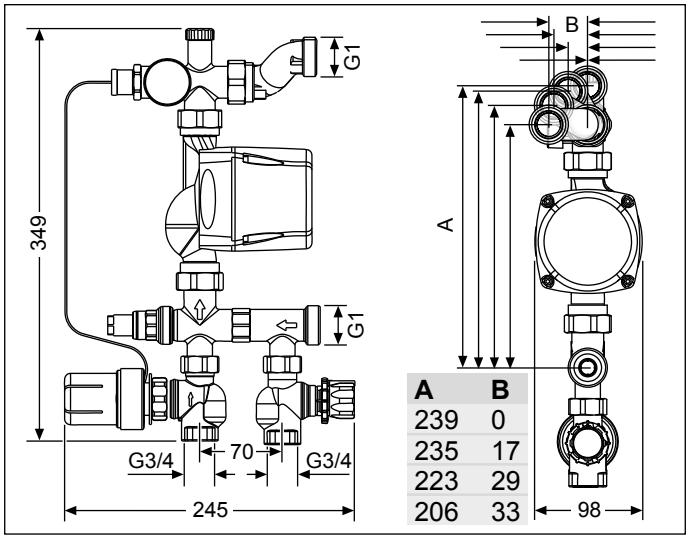
Secondary connection to manifold R 1"", flat-sealing



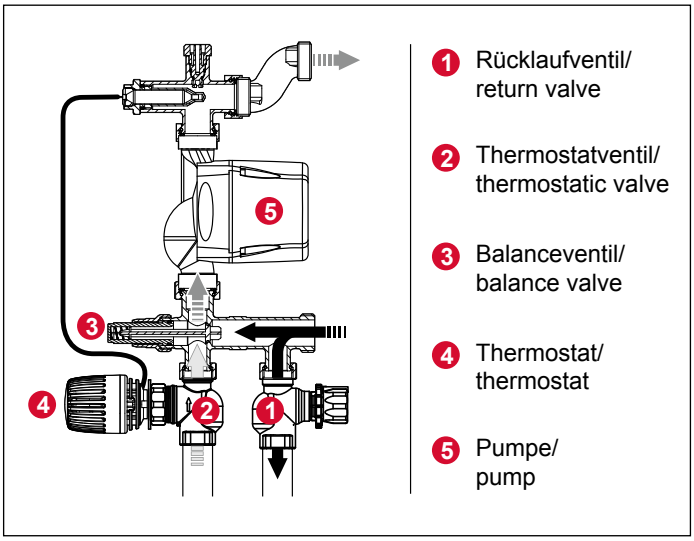
Temperatur	Temperature	
Primär	Primary	20-90° C
Sekundär	Secondary	20-55° C
p max.	p max.	6 bar

Pumpe	Pump	
U	U	230 V, 50 Hz
Q	Q	2,7 m³/h
H	H	6 mWs
P	P	8,4 … 53 W
Glykol	Glycol	max. 40 vol%

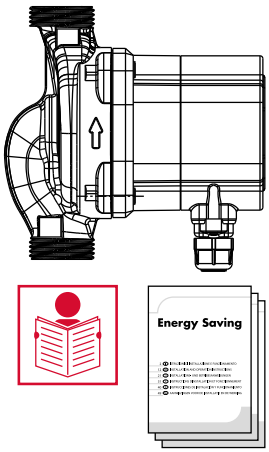
Ventile	Valves	
Rücklaufventil	Return valve	kvs 2,7 m³/h
Thermostatventil	Thermostic valve	kvs 2,7 m³/h

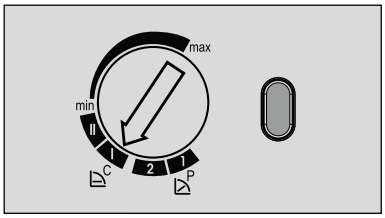


A	B
239	0
235	17
223	29
206	33

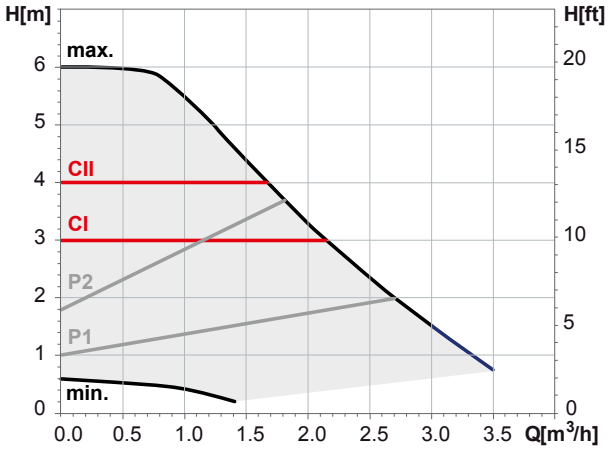


Pumpe / Pump / Bomba / Hacoc / Pompe / Pompa di circolazione / Pompa





Programm	LED Light
P1 / P2 = Δp variabel	green
C1 / C2 = Δp constant	**orange**
Min-Max	blue
Error	red
Air control	white (flashing)



Manifold housing UP 110 (flush-mounted)

Flush-mounted manifold housing made of galvanized sheet steel for accommodating the SLQ heating circuit manifold. With lateral, pre-punched holes for manifold main connection and removable screed baffle plate. Powder-coated door and frame similar to RAL 9010.
Housing, height-adjustable from 705–775 mm, depth-adjustable from 110–150 mm. C-rail for mounting heating circuit manifold.

Manifold housing UP 80 (flush-mounted)

similarly to manifold housing UP 110, but depth-adjustable by 80–120 mm

Housing type	UP 110	UP 80
Housing depth, interior	110-150 mm	80-120 mm
Installation height	705-775 mm	705-775 mm
Required niche depth	115-155 mm	80-125 mm
Required niche height	710-780 mm	710-780 mm

Manifold housing AP 125 (wall-mounted)

Wall-mounted manifold housing made of galvanized sheet steel for accommodating the SLQ heating circuit manifold. Powder-coated, similar to RAL 9010. C-rail for mounting heating circuit manifold.
Housing height: 618 mm
Housing depth: 125 mm

Housing type UP 125

Interior width	500	730	880	1030
No. heating manifolds incl. ball valve*	2–4	5-9	10-11	12
No. heating manifolds incl. corner ball valve*	2–3	4–8	9–11	12
No. heating manifolds incl. corner calorimeter set*	2	3–7	8–10	11–12
No. heating manifolds incl. fixed value control*	–	2–6	7–9	10–12

* Recommended housing width
= fittings + mounting distance on both sides (2 x ≥ approx. 50 mm)

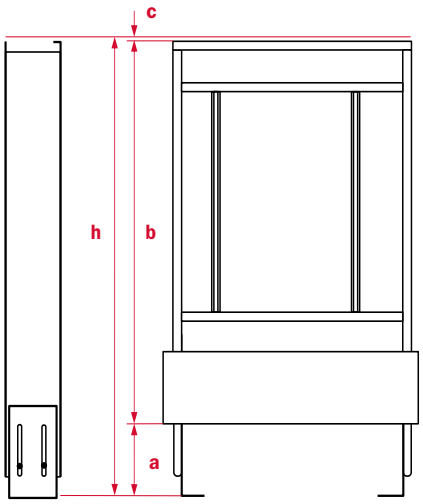
Housing depth:	125 mm
Housing height:	618 mm

Dimensions of manifold housing UP 80/UP 110

Interior width	400	540	690	840	990	1140
required niche width	445	585	735	885	1035	1185
No. heating manifolds incl. ball valve*	2	3–5	6–8	9–11	12	–
No. heating manifolds incl. corner ball valve*	–	2–4	5-7	8–10	11–12	–
No. heating manifolds incl. corner calorimeter set*	–	2–3	4–6	7–9	10–12	–
No. heating manifolds incl. fixed value control*	–	2	3–5	6–8	9–11	12

* Recommended housing width = fittings + mounting distance on both sides (2 x ≥ approx. 50 mm)

TECEfloor – Heating circuit manifold and manifold housing

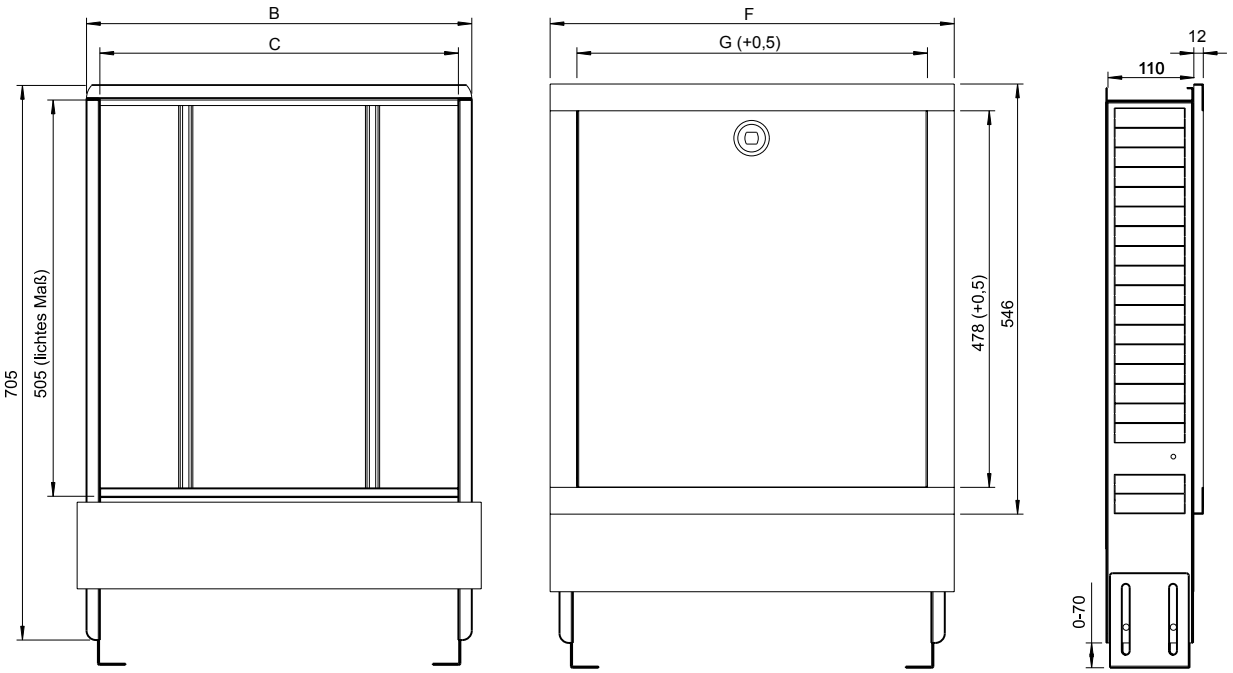


a = top edge of floor structure
+ b = 640 mm
+ c = mortar filling gap (e.g. 10 mm)

h = niche height

Dimension tables and drawings

Type	400	600	750	900	1050	1200
B	435	574	724	874	1024	1174
C	401	540	690	840	990	1040
F	459	598	748	898	1048	1198
G	391	530	680	830	980	1130



Individual room controller

Note: Please observe the information in the assembly instructions attached. Disconnect the wiring from the mains prior to carrying out any work.

System components

- TECEfloor room thermostat, analogue (24 V or 230 V, heating or heating/cooling)

- TECEfloor room thermostat LC display (24 V or 230 V, Standard or Control)

- TECEfloor connection unit (24 V or 230 V, Standard or Standard Plus)

- TECEfloor servomotor (24 V or 230 V)

TECEfloor room thermostat

TECEfloor room thermostats are high quality room temperature controls for measuring and regulating the required room temperature to achieve maximum user comfort. The room thermostat is available for operating voltages 24 V and 230 V. Easy individual room control is possible with servomotors which can be directly connected. In conjunction with the TECEfloor connection unit, it is possible to create a perfectly harmonised overall system for regulating surface temperatures.

TECEfloor room thermostat, analogue

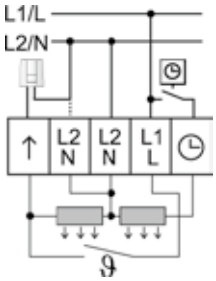
- Available in two versions: Heating (RT-A) and heating/cooling (RT-A HK)
- available in a choice of 24 V or 230 V
- flat design and small footprint (86 x 86 x 29 mm)
- stand alone controls or controls integrated into the system
- set-back input for reducing the room temperature
- target value calibration
- limitation of the target value setting range
- valve safeguard and frost protection function
- changeover input (only RT-A HK)
- high-quality, modern design
- high functional safety

Technical data

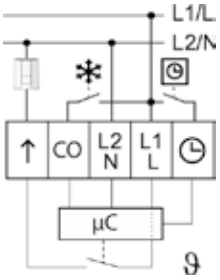
Operating voltage:	24 V ± 20 %, 50 Hz 230 V ± 10%, 50 Hz
Safety feature:	24 V: T1A 230 V: T2AH
Switching element:	24 V: Triac 230 V: relay
Switching capacity:	24 V: 1 A ohmic load 230 V: 2 A ohmic load
Temperature setting range:	10°C - 28 °C
target value calibration:	±2 K
Set-back temperature:	2 K
Temperature measurement:	0 - 40 °C
Measurement accuracy:	±0.5 K
Ambient temperature:	0 - 50 °C
CE conformity in accordance with:	EN 60730
Protection class:	24 V: III 230 V: II
Degree of protection:	IP 20
Weight:	90 g
Dimensions (W x H x D):	86 x 86 x 29 mm

Frost protection function: From + 6 °C in heating mode, not active in cooling mode.
Controller with heating/cooling function only:
Valve safeguard function: Every two weeks for 6 minutes after the last actuation

Electrical connection



RT-A wiring diagram



RT-A HK wiring diagram

- Mains connection (power supply via TECEfloor connection unit or an external voltage source)
- Set-back input (receives an external set-back signal for time-controlled lowering of the room temperature of a TECEfloor room thermostat RT-D Control, or an external system clock)
- Changeover-input (switches between heating and cooling via an external potential-free contact)
- Connection for servomotor (integrated valve safeguard function)

Note: On the 24 V version, a 50 VA transformer is also required.

TECEfloor room thermostat, LC display

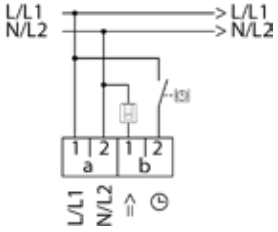
- available in two versions: RT-D Standard and RT-D Control
- available in a choice of 24 V or 230 V
- large, clearly arranged LC display (with background lighting, RT-D Control version only)
- flat design and small footprint (86 x 86 x 31 mm)
- stand alone controls or controls integrated into the system
- equipment for heating and cooling systems
- Smart Start/Smart Stop function
- configurable operating modes
- heating and cooling mode comfort program
- configurable set-back temperature
- correction of actual temperature measurement
- limitation of the target value setting range
- valve safeguard and frost protection function
- connection for an external temperature sensor
- Changeover input
- high-quality, modern design
- suitable for NC and NO operation
- high functional safety

Technical data

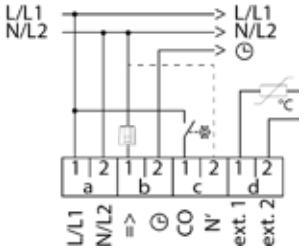
Operating voltage:	24 V ± 20 %, 50 Hz 230 V ± 10 %, 50 Hz
Safety feature:	24 V: T1A 230 V: T1AH
Switching element:	24 V: Triac 230 V: relay
Switching capacity:	1 A ohmic load
Temperature setting range:	5 - 30 °C
Terminals:	0.22 mm^2 to 1.5 mm^2
Set-back difference:	RT-D Standard: 2 K RT-D Control: configurable
Temperature measurement:	0 - 40°C
Ambient temperature:	0 - 50 °C
CE conformity in accordance with:	EN 60730
Protection class:	24 V: III 230 V: II
Degree of protection:	IP 20
Weight:	105 g
Dimensions (W x H x D):	86 x 86 x 31 mm

Valve safeguard function:	Every two weeks for 10 minutes after the last actuation.
Frost protection function:	From +5°C in heating mode. Not active in cooling mode

Electrical connection



RT-D Standard wiring plan



RT-D Control wiring plan

- Mains connection (power supply via TECEfloor connection unit or an external voltage source)
- Set-back input (RT-D Standard version, receives external time signal for time-controlled lowering of the room temperature)
- Set-back output (RT-D Control version, transmits the internal time signal to other components of the TECEfloor room thermostat range
- Changeover-input (RT-D Control design, switches between heating and cooling via an external signal (potential-free contact))
- Connection for servomotor (integrated valve safeguard function or integrated frost protection function)
- Connection of an external sensor (monitoring of room or floor temperature and minimum floor temperature regulation)

TECEfloor connection unit

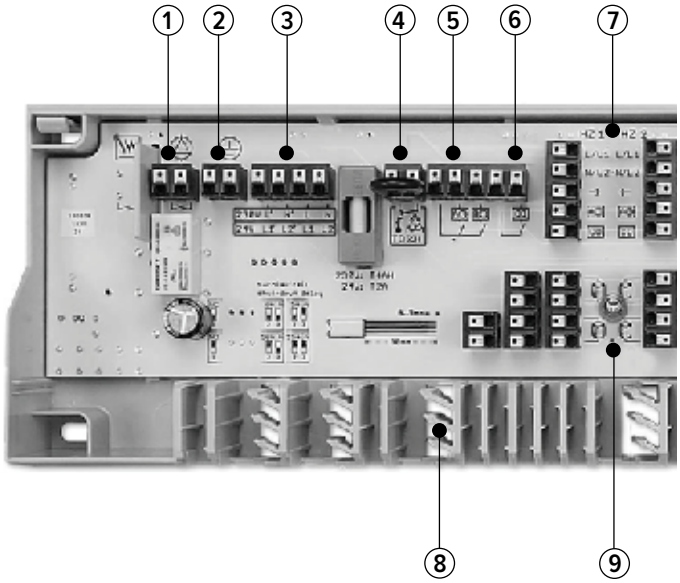
The TECEfloor connection unit is the central base of the TECEfloor individual room controller for regulating surface temperatures of heating and cooling systems. The base can be wired to all system components such as the controller and servomotors with very little effort. The system components are supplied directly via the unit's power supply. All the controller's switching commands are transmitted directly to the connected components via the TECEfloor connection unit. This high quality connection unit is available with 6 or 10 zones in 24 V or 230 V. Two designs are available to satisfy all installation requirements. Standard version for heating mode with set-back channel, or enhanced Standard Plus version with comprehensive functions for energy-efficient heating/cooling mode which protects the system.

- Available in two versions: Standard or Standard Plus,
- Version with 6 or 10 zones
- available in a choice of 24 V or 230 V
- up to 18 servomotors can be connected
- equipment for heating and/or cooling systems
- easy, intuitive installation and operation
- tried and trusted cabling, and standard-compliant tension relief
- screwless terminal connection technology
- clearly arranged terminals
- set-back channel for time-controlled lowering of the room temperature
- pump or boiler controller
- fixed follow-up time for pump or boiler controller
- connection for a temperature limiter or dew point sensor
- control direction of servomotors to be connected: NC or NO (NC: without current / NO: with current)
- high functional safety
- maintenance-free

Technical data

Operating voltage:	
- Standard:	24 V ± 20 %, 50 Hz
	230 V ± 10 %, 50 Hz
- Standard Plus:	24 V ± 20 %, 50 Hz
	230 V ± 10 %, 50 Hz
Power input:	24 V: max. 30 VA
	230 V: max. 50 VA
Safety feature:	24 V: T2A
	230 V: T4AH
Number of heating zones:	6 or 10
Servomotors to be connected:	
- Type	NC or NO
	24 V or 230 V
- 6 heating areas:	max. 15 to 2 W (230 V)
	max. 12 to 2 W (24 V)
- 10 heating areas:	max. 18 to 2 W (230 V)
	max. 12 to 2 W (24 V)
- Nominal load of all motors:	max. 24 W (at 24 V)
	max. 36 W (at 230 V)
Control direction:	NC or NO (Standard)
	NC (Standard Plus)
Ambient temperature:	0 to +50 °C
Protection class:	24 V: III
	230 V: II
Protection class:	IP 20

Electrical connection



TECEfloor connection unit (Standard Plus)

1. **Pump controller* (pump control via a potential-free contact)**
2. **Protective conductor adapter plug* (adapter plug terminal for the protective conductor of an electrical consumer such as a boiler or pump (230 V version only))**
3. **Power supply/mains feed-through terminal (mains connection of TECEfloor connection unit, mains feed-through terminal for connecting an electrical consumer such as a pump or boiler (230 V version only), mains feed-through terminal for connecting a dew point sensor (24 V version only))**
4. **Temperature limiter/dew point sensor***
5. **Set-back channel — connection for an external system clock (transmission of up to two timer signals for time-controlled lowering of the room temperature to a connected controller via a potential-free contact. Alternatively, up to two TECEfloor RT-D Control room thermostats (point 7) can be used as a timer.**
6. **Changeover heating/cooling* switching of entire individual room controller between heating and cooling, transmission of an external signal via a potential-free contact, transmission of change-over signal to a connected controller**
7. **Connection for controller (power supply for connected controller)**
8. **Cabling and tension relief (integrated cabling and tension relief in accordance with DIN EN 60730)**
9. **Connection for servodrives (power supply for connected servodrives)**

*Standard Plus only

TECEfloor radio-controlled unit for individual room control

Note: Please observe the information in the assembly instructions attached. Disconnect the wiring from the mains prior to carrying out any work.

System components

- TECEfloor radio-controlled room thermostat, analogue (RTF-A)

- TECEfloor radio-controlled room thermostat LC display (RTF-D)

- TECEfloor radio-controlled base unit including transformer, 24 V

- TECEfloor servomotor (24 V or 230 V)

TECEfloor radio-controlled room thermostats

TECEfloor radio-controlled room thermostats, analogue (RTF-A) with LC display (RTF-D) are high quality room temperature controls for measuring and regulating the required room temperature to achieve maximum user comfort.

On the RTF-A, the required room temperature in the allocated heating zone can be set easily by means of an easy-to-read dial with soft-lock. Sliders beneath the dial are used to limit the possible setting range and perform a target value comparison.

The RTF-D also guarantees the bidirectional exchange of data with the radio base station for calling up numerous status messages and displaying them on the large, clearly arranged display. The thermostat is operated by means of a dial with turn and press mechanism, soft-lock and the clearly arranged, language-neutral indicator on the high quality display.

TECEfloor radio-controlled room thermostat, analogue

- optimum value for money
- patented target value comparison
- setting range 10 to 28 °C
- reliable 868 MHz radio technology for optimum positioning without any cabling at all
- flat design and small footprint (86 mm x 86 mm x 26 mm)
- dial with ¼ degree soft-lock
- wall- and flush-mounted container (Germany and Switzerland)
- with limitation of the room temperature setting range to a maximum and/or minimum value

Technical data

Power supply:	2 x LR03/AAA (Micro) alkaline battery
Battery life:	> 2 years
Radio technology:	radio, 868 MHz, SRD band
Temperature setting range:	10 °C - 28 °C
Temperature measurement:	0 - 40 °C
Measurement accuracy:	±0.3 K
Ambient temperature:	0 - 50 °C
Ambient humidity:	5 % to 80 % (non-condensing)
Protection class:	III
Degree of protection:	IP 20
Weight:	90 g
Dimensions (W x H x D):	86 x 86 x 20 (26) mm
Colour:	RAL 9010 (pure white)

TECEfloor radio-controlled room thermostat with LC display

- flat design and small footprint (86 mm x 86 mm x 26.5 mm)
- self-explanatory, language-neutral operation and user prompting
- large, clearly arranged LC display (60 mm x 40 mm)
- continuous display of room temperature, system time and operating status
- reliable 868 MHz radio technology for optimum positioning without any cabling at all
- 3 menu levels (Lifestyle functions, Settings and Service) for greater reliability
- limitation of the room temperature setting range
- convenient operation with dial (turn and press mechanism with dynamic soft-lock)
- wall- and flush-mounted container (Germany and Switzerland)
- setting range 5 to 30 °C
- optional remote sensor or integrated infra-red sensor for monitoring the floor temperature
- high-quality design version with real glass cover

Technical data

Power supply:	2 x LR03/AAA (Micro) alkaline battery
Battery life:	> 2 years
Radio technology:	radio, 868 MHz, SRD band
Temperature setting range:	5 °C - 30 °C
Temperature measurement:	0 - 40 °C
Measurement accuracy:	±0.3 K
Ambient temperature:	0 - 50 °C
Ambient humidity:	5 % to 80 % (non-condensing)
Protection class:	III
Degree of protection:	IP 20
Weight:	115 g
Dimensions (W x H x D):	86 x 86 x 21.5 (26.5) mm
Colour:	RAL 9010 (pure white)

TECEfloor radio-controlled base unit

The TECEfloor system radio is the intelligent control for individual rooms of the future, for maximum comfort and energy efficiency when regulating surface temperatures.

The TECEfloor radio-controlled base units 24 V with 4 or 8 zones are the system's intelligent regulation and connection units for processing central information and communicating with all system components. They capture and utilise a large amount of measurement data for individual, energy-efficient temperature regulation in each room, achieving maximum user comfort. The 868 MHz radio technology guarantees reliable, bidirectional communication between the assigned room controllers, base stations and connected drives with minimal radio load. Even in the standard version, the highly developed system software meets all the demands of current and future systems — adaptations and updates for a technologically-changing environment can be conveniently carried out via a MicroSD card slot.

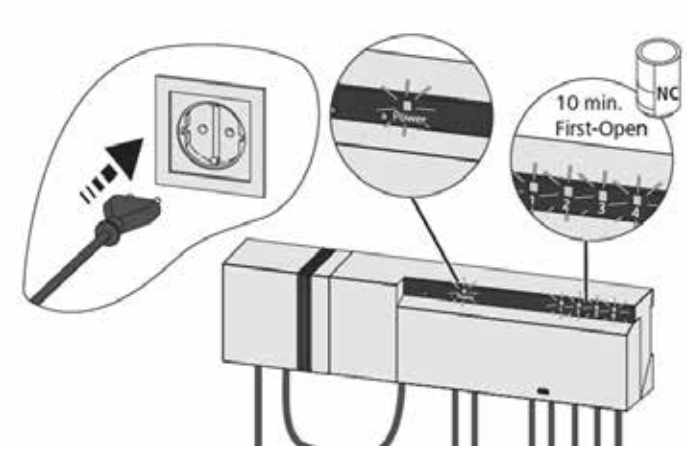
The Ethernet version is not just easily integrated into the home network and conveniently controlled by PC and/or Smartphone or over the Internet. The XML interface also enables integration into higher-level building control and home automation systems.

- high-quality, modern design
- versions with 4 and 8 zones
- All-in-one – fully equipped for heating and/or cooling systems even in the standard version
- Coupling of up to 7 base stations via radio and or syBUS
- automatic Plug&Play configuration even for future extensions to the system
- easy, intuitive installation, operation and maintenance
- connection for up to 12 x 2 W servo motors (1 to 2 per zone)
- initial state can be selected as NC or NO
- tried and trusted cabling and tension relief
- screwless plug/terminal connection technology
- MicroSD card slot for individual adjustments by means of MicroSD cards over an online service
- easy to operate, program and initialise
- perfect interaction of several base stations over Bus
- integrated system clock
- Ethernet version only: Smart Home ready, therefore easy to integrate via XML into higher-level home automation systems
- Ethernet version only: easy to integrate into the home network
- Ethernet version only: web-based application software for convenient control via PC, Smartphone or the Internet
- Smart Start function for even more energy-efficient operation

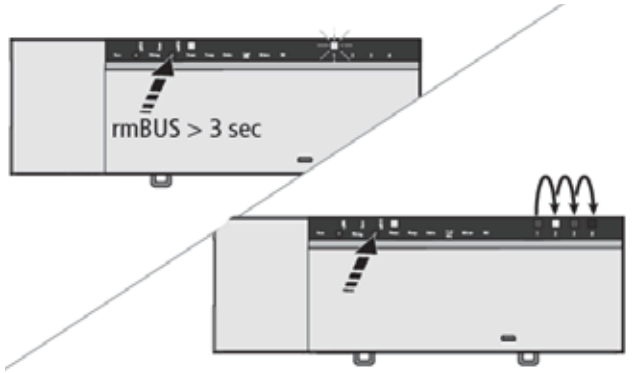
Technical data

Max. number of heating zones:	4 to 8
Operating voltage:	24 V / ± 20 % / 50 Hz
Power input	0.6 W or 1.4 W
Idle speed/with transformer:	limited
max. power input (without pump):	50 W (limited by system transformer)
Safety feature:	5 x 20 mm, T2A
Protection class:	II
Degree of protection:	IP20
Radio technology:	radio, 868 MHz, SRD band
Max. number of heating zones:	6 to 12
max. nominal load of all drives:	24 W (12 x 2 W)
Control mode:	PI/2-point adjustable
Control accuracy:	±1 K
Control oscillation:	±0.2 K
Perm. ambient temperature:	0 to 60 °C
Perm. ambient humidity:	5 to 80 % (non-condensing)
Mains connection version:	System transformer with Euro plug

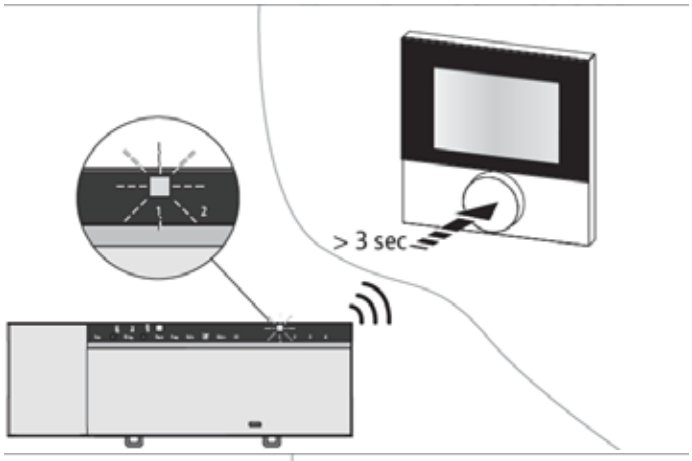
Start-up (pairing of components)

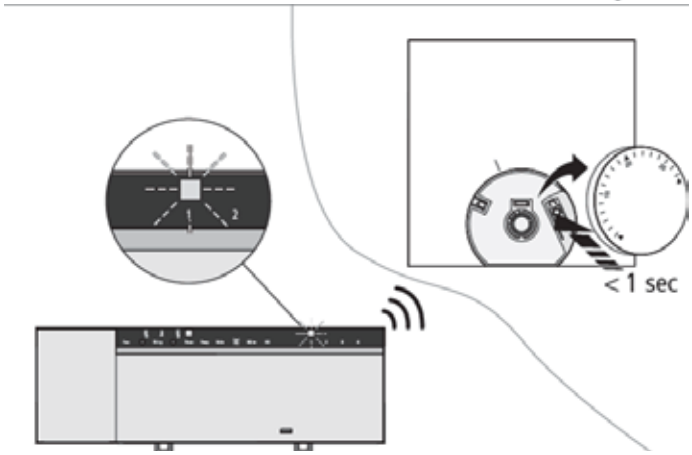


Switch on mains voltage (the base station initialises the installation mode for 30 minutes.)
If the base station is parameterised for NC drives, all heating zones are driven for 10 minutes, to unlock the First Open function of NC drives.



Activate the pairing function on the base station for the required heating zones.





Press the dial (RTF-D) or pairing button under the setpoint adjuster (RTF-A) on the radio-controlled room thermostat for a few seconds to activate the pairing function.
The base unit and room controller are connected to each other.

One room controller can be assigned to several heating zones. It is not possible to assign several room controllers to one zone.

TECEfloor design RTL box

TECEfloor RTL box is a high-quality room temperature control with a real glass cover and an attractive aluminium thermostat head. It is ideal for performing decentralised individual room control of floor and wall heating systems in combination with radiator heating systems. The high radiator water temperatures can be limited (via an integrated return temperature limiter) to a suitable temperature level for the floor heating.
With its compact design, it is not only up to 60 % smaller than standard RTL boxes, but is also pleasing with its sophisticated depth adjustment which ensures that its appearance never changes. This makes it the first RTL box to offer the option of installation at standard switch height. Operation at floor level is a thing of the past.

TECEfloor design RTL box

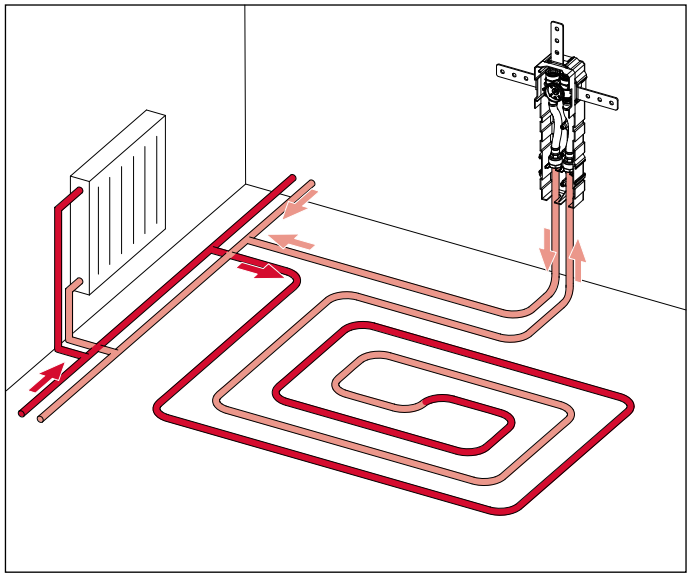
- real glass cover in white or black
- anodised aluminium thermostat head
- flat design and small footprint (124 x 104 x 7 mm)
- individual room control without auxiliary energy
- integrated return temperature limiter
- integrated stop and control valve
- integrated air release
- 25 mm depth adjustment
- minimum installation depth of just 50 mm
- suitable for dry-wall and brick-wall installation

Function

From a control technology point of view, the integrated thermostat valve in the TECEfloor RTL box is a continuous proportional controller (P controller) which does not require auxiliary energy. It does not need any electrical connection or other outside source. The change in room air temperature (controlled variable) is proportional to the change in valve stroke (correcting variable). If the room air temperature increases, e.g. due to the sun's rays, the liquid in the temperature sensor expands, affecting the corrugated sheath pipe. Via the valve spindle, this restricts the water supply in the underfloor heating circuit. If the room air temperature drops, the process is reversed. The TECEfloor RTL box is also equipped with a return temperature limiter (RTL), which prevents the set return temperature from being exceeded. The valve opens if the value falls below the set limiting value.

Instructions for use

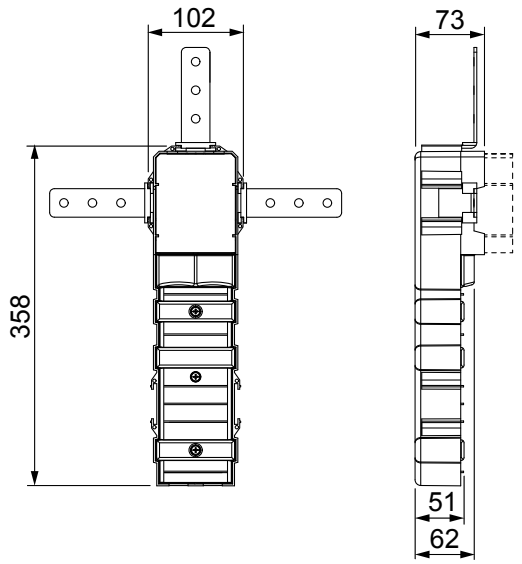
- The TECEfloor RTL box should always be installed behind the surface heating circuit, i.e. in the return direction. Observe the flow direction



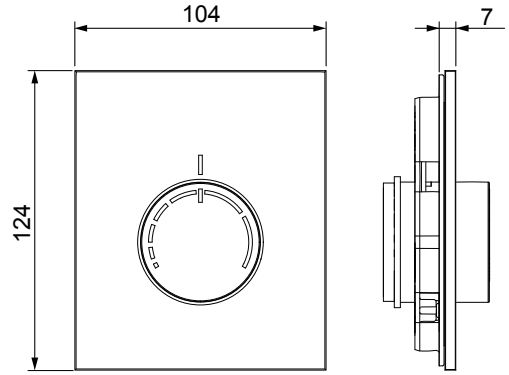
- The TECEfloor Design RTL box offers individual room control by means of an automatic thermostat and, at the same time, limits the temperature of the heating area by means of the return temperature limiter.
- Hydraulic compensation is performed at the preconfigurable valve insert. The TECEfloor Design RTL box can be operated without additional heaters if the thermal output of the radiant heating is sufficient.
- The TECEfloor Design RTL box is, depending on pipe loss, suitable for heating circuits of up to approx. 20 m^2 or approx. 120 m with an inner diameter of 12 mm.
- If used in combination with radiator heating, the flow temperature must not exceed 70 °C so that the max.
- screed temperature of 55 °C is not exceeded in the pipe area.
- The RTL box thermostat must be protected from heating by external sources. Do not install near other sources of heat, e.g. additional heaters. Protect from direct sunlight. Do not install in areas where there are draughts.
- The floor heating pipes are connected via suitable Eurocone clamping ring connections.
- To ensure quiet operation of the system, the pressure difference over the valve must not exceed 0.2 bar.
- Cement and anhydrite screed must be heated in accordance with EN 1264-4.

TECEfloor – Design RTL box

Dimensions



Bare-wall set dimensions



Fine assembly set dimensions

Setting range

Return temperature limit:	1 – 4 or 20 – 48 °C
(factory settings:	2.5 = 40 °C)
Room temperature control:	10 – 30 °C
Control valve:	1 – 4
(factory settings:	4 = fully open)

Accessories

Edge insulation strip

For sound insulation and to compensate for thermal expansion of the screed layer in accordance with DIN 18560. The edge insulation strips, made of closed cell polyethylene foam with adhesive tape and a special film apron, guarantee high adhesiveness and quick installation. Suitable for cement and flow screed.

Thickness: 10 mm
Height: 150 mm
Length: 40 m roll

Movement joint profile

To create permanently elastic screed joints and to limit screed areas. Suitable for cement and flow screed.

Thickness: 10 mm
Height: 100 mm

To protect the floor heating pipes, cut approx. 30 cm-long pipe sleeves made of pipe joint protection, and tape in the area of the movement joints above the connection lines.

TECEfloor screed accessories

Screed additive

Plasticizing additive especially for the production of cement and calcium sulphate-bonded heating screeds (not suitable for flow screeds). In addition to higher bending tension and compression strength, adding the screed additive to the mixing water significantly improves processing of the mortar and reduces the quantity of the mixing water while achieving the same mortar consistency.
Requirement: 0.03 kg/m^2 per cm screed thickness.

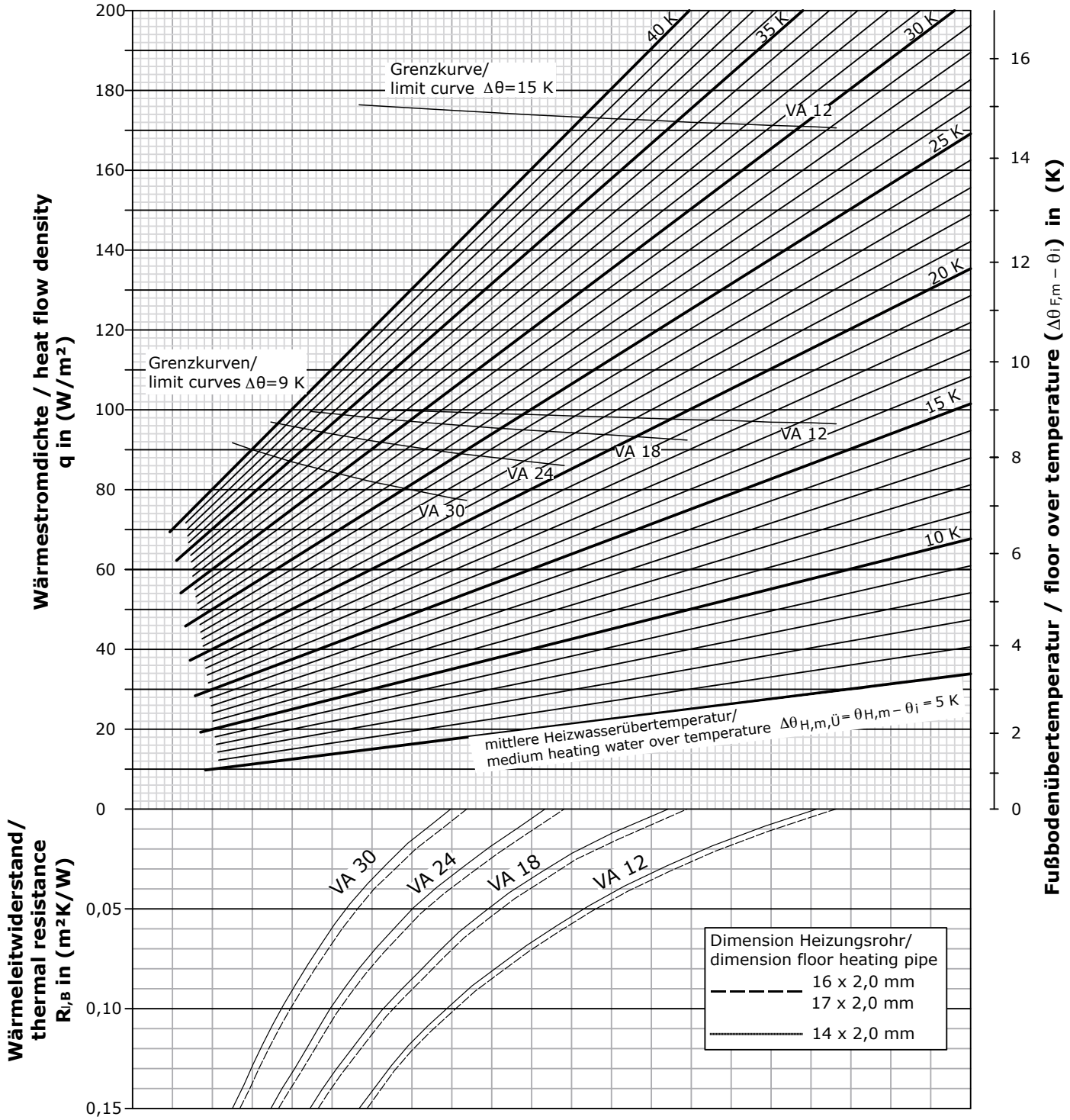
Additional screed additives do not need to be added; observe the instructions for use.

Special screed additive

Strengthening, modifying additive to produce thin-bed cement screeds.
Requirement: 0.25-0.30 kg/m^2 per cm screed thickness.
Minimum pipe overlap 30 mm.

Heat output diagram for TECEfloor dimple system

(45 mm screed cover)



Limit curves Δθ = 9 K applies to residence zones

- Indoor temperature θ_i = 20 °C with max. surface temperature $\theta_{F,max}$ = 29 °C
- Indoor temperature θ_i = 24 °C with max. surface temperature $\theta_{F,max}$ = 33 °C

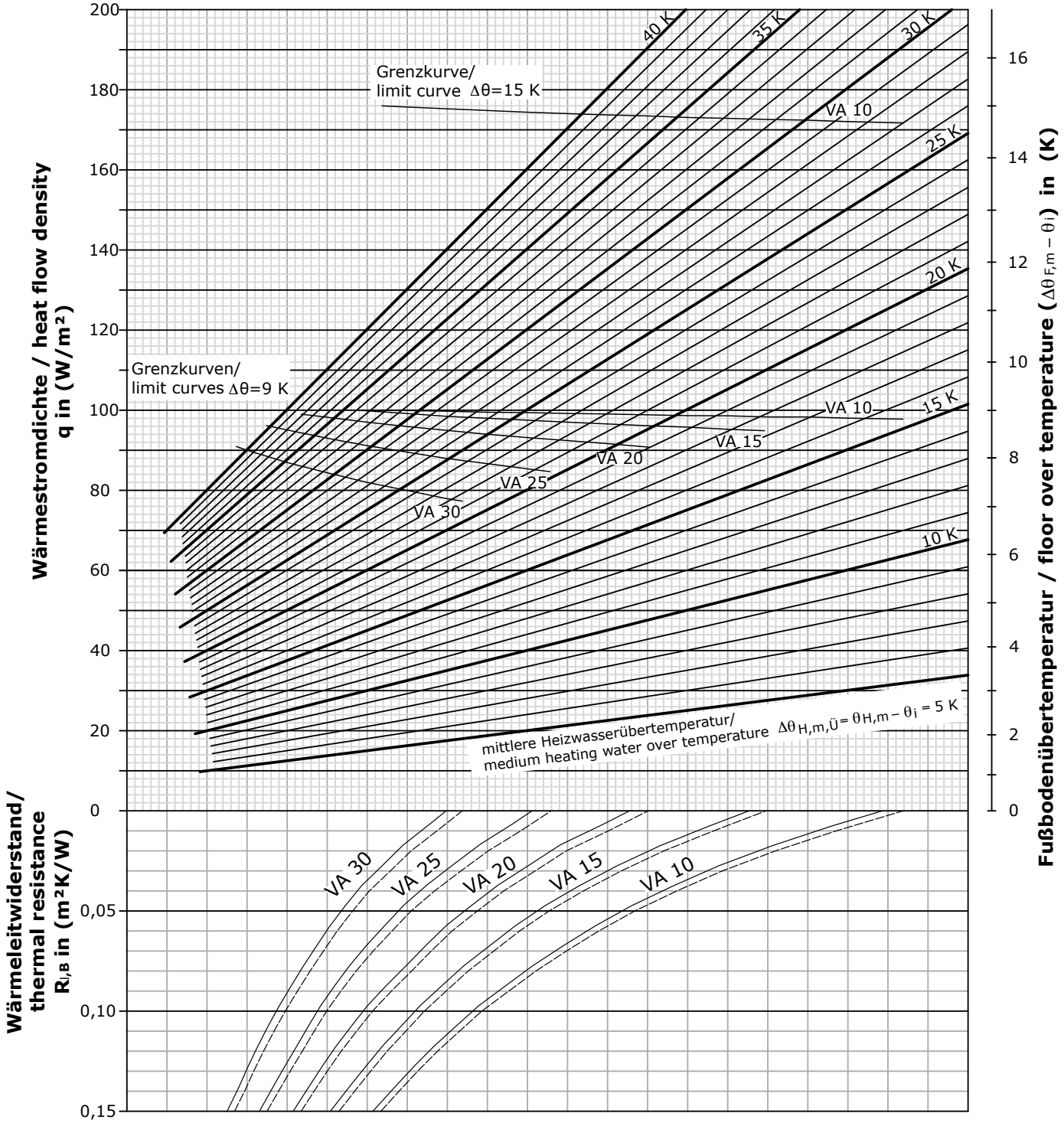
Limit curves Δθ = 15 K applies to edge zones

- Indoor temperature θ_i = 20 °C with max. surface temperature $\theta_{F,max}$ = 35 °C

The limit curves must not be exceeded, i.e. the flow temperature of the design may be max. 2.5 K above the heating limit temperature.

Heat output diagram for TECEfloor tacking system

(45 mm screed cover)



Limit curves Δθ = 9 K applies to living areas

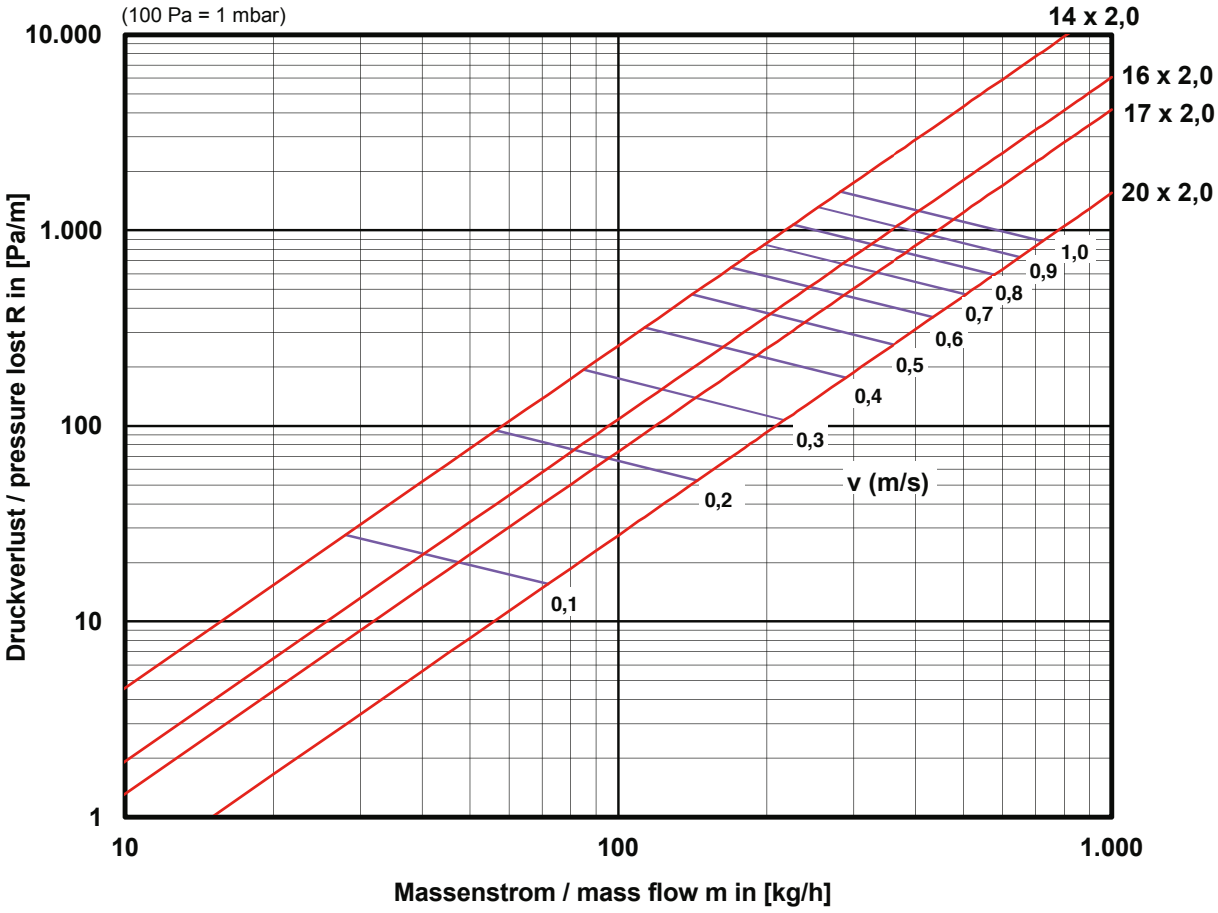
- Indoor temperature θ_i = 20 °C with max. surface temperature $\theta_{F,max}$ = 29 °C
- Indoor temperature θ_i = 24 °C with max. surface temperature $\theta_{F,max}$ = 33 °C

Limit curves Δθ = 15 K applies to edge areas

- Indoor temperature θ_i = 20 °C with max. surface temperature $\theta_{F,max}$ = 35 °C

The limit curves must not be exceeded, i.e. the flow temperature of the design may be max. 2.5 K above the heating limit temperature.

Pressure loss diagram for SLQ floor heating pipes



Quick design table for TECEfloor dimple system

(45 mm screed cover)

Flow and return temperature				35/27°C				40/30°C			
Thermal resistance	Room temperature	Spacing	Heating pipe requirement	max. heat flux density	average surface temperature	max. heating circuit area	max. heating circuit area	max. heat flux density	average surface temperature	max. heating circuit area	max. heating circuit area
Rl,B	ti	VA	L	q	to	Dim. 14	Dim. 16	q	to	Dim. 14	Dim. 16
m^2K/W	°C	(cm)	(m)	(W/m^2)	(°C)	(m^2)	(m^2)	(W/m^2)	(°C)	(m^2)	(m^2)
0.01	20°C	12	8.3	**60**	25.7	10.4	14.9	**82**	27.5	9.7	13.8
		18	5.6	**50**	24.8	13.5	19.3	**69**	26.4	12.4	17.6
		24	4.2	**43**	24.2	16.3	23.3	**59**	25.6	15.1	21.6
		30	3.3	**37**	23.7	19.5	27.9	**50**	24.9	18.3	26.1
	24°C	12	8.3	**38**	27.7	14.6	20.5	**60**	29.7	12.2	17.3
		18	5.6	**32**	27.2	18.9	26.5	**50**	28.8	15.8	22.3
		24	4.2	**28**	26.8	22.6	31.9	**43**	28.2	19.2	27.4
		30	3.3	**23**	26.4	27.9	39.6	**37**	27.7	23.1	32.7
0.05	20°C	12	8.3	**48**	24.7	12.4	17.4	**65**	26.1	11.5	16.3
		18	5.6	**41**	24.0	15.7	22.1	**56**	25.3	14.6	20.7
		24	4.2	**36**	23.6	18.7	26.6	**49**	24.7	17.5	24.7
		30	3.3	**31**	23.1	22.2	31.8	**43**	24.2	20.4	29.1
0.10	20°C	12	8.3	**38**	23.7	14.6	20.5	**52**	25.0	13.7	19.2
		18	5.6	**34**	23.4	18.0	25.4	**46**	24.4	16.9	23.8
		24	4.2	**30**	23.0	21.6	30.5	**41**	24.0	19.9	28.3
		30	3.3	**27**	22.7	24.9	35.1	**37**	23.7	23.1	32.7
0.15	20°C	12	8.3	**32**	23.2	16.6	23.3	**44**	24.2	15.4	21.6
		18	5.6	**29**	22.9	20.2	28.4	**40**	23.9	18.7	26.3
		24	4.2	**26**	22.6	24.0	33.6	**36**	23.6	22.1	31.0
		30	3.3	**23**	22.4	27.9	39.6	**32**	23.2	25.5	36.3

Flow and return temperature				45/35°C				50/40°C			
Thermal resistance	Room temperature	Spacing	Heating pipe requirement	max. heat flux density	average surface temperature	max. heating circuit area	max. heating circuit area	max. heat flux density	average surface temperature	max. heating circuit area	max. heating circuit area
Rl,B	ti	VA	L	q	to	Dim. 14	Dim. 16	q	to	Dim. 14	Dim. 16
m^2K/W	°C	(cm)	(m)	(W/m^2)	(°C)	(m^2)	(m^2)	(W/m^2)	(°C)	(m^2)	(m^2)
0.01	20°C	12	8.3	**109**	29.7	7.8	11.2	**136**	31.9	6.6	9.5
		18	5.6	**92**	28.3	9.9	14.2	**115**	30.2	8.3	12.1
		24	4.2	**78**	27.1	12.0	17.5	**98**	28.9	10.1	14.6
		30	3.3	**67**	26.2	14.4	21.0	**84**	27.7	12.0	17.4
	24°C	12	8.3	**87**	31.9	9.4	13.2	**114**	34.1	7.6	10.8
		18	5.6	**73**	30.8	11.9	16.9	**96**	32.7	9.5	13.9
		24	4.2	**63**	29.9	14.4	20.6	**83**	31.5	11.5	16.8
		30	3.3	**54**	29.2	17.4	24.9	**70**	30.5	13.8	20.1
0.05	20°C	12	8.3	**87**	27.9	9.4	13.2	**108**	29.7	7.9	11.3
		18	5.6	**75**	26.9	11.7	16.6	**94**	28.4	9.7	14.0
		24	4.2	**65**	26.1	13.9	20.2	**82**	27.5	11.5	16.8
		30	3.3	**57**	25.4	16.5	23.7	**71**	26.6	13.8	20.1
0.10	20°C	12	8.3	**70**	26.6	10.9	15.5	**87**	27.9	9.4	13.2
		18	5.6	**62**	25.8	13.5	19.1	**77**	27.0	11.3	16.4
		24	4.2	**55**	25.2	15.8	22.8	**68**	26.3	13.4	19.4
		30	3.3	**49**	24.7	18.6	26.4	**61**	25.8	15.6	22.5
0.15	20°C	12	8.3	**59**	25.6	12.5	17.5	**74**	26.8	10.6	14.9
		18	5.6	**53**	25.1	15.1	21.4	**66**	26.1	12.8	18.4
		24	4.2	**48**	24.7	17.8	25.2	**60**	25.7	14.9	21.4
		30	3.3	**43**	24.2	20.4	29.1	**53**	25.0	17.4	24.9

The TECEfloor performance table enables you to quickly calculate the required spacing and max. heating circuit size.

Procedure:
1. Determine the required flow and return temperature.
2. Determine the thermal resistance of the top floor covering and the indoor temperature
3. Compare the required heating output (e.g. from the heat load analysis) with the max. heat flux density.
4. Read off the required spacing VA and maximum heating circuit area (dim. 14 or dim. 16)

When creating the design, the max. surface temperatures must be taken into account:
Living zones: 29°C/edge zones (max. 1 m): 35°C/bathrooms: 33°C

The following data has been taken into account in the performance tables:
- screed cover over pipes: 45 mm
- underlying room heated in the same way (insulation: R = 0.75 m^2K/W)
- max. heating circuit area at 200 mbar pressure loss (incl. 2 x 5 m connection line)

Quick design table for TECEfloor tacking system

(45 mm screed cover)

Flow and return temperature				35/27°C				40/30°C			
Thermal resistance	Room temperature	Spacing	Heating pipe requirement	max. heat flux density	average surface temperature	max. heating circuit area	max. heating circuit area	max. heat flux density	average surface temperature	max. heating circuit area	max. heating circuit area
Rl,B	ti	VA	L	q	to	Dim. 14	Dim. 16	q	to	Dim. 14	Dim. 16
m^2K/W	°C	(cm)	(m)	(W/m^2)	(°C)	(m^2)	(m^2)	(W/m^2)	(°C)	(m^2)	(m^2)
0.01	**20°C**	10	10.0	**64**	26.0	9.5	13.4	**87**	27.9	8.8	12.5
		15	6.6	**56**	25.4	11.7	16.7	**76**	27.0	11.0	15.6
		20	5.0	**48**	24.7	14.4	20.4	**66**	26.2	13.2	18.8
		25	4.0	**42**	24.2	16.8	24.0	**58**	25.5	15.5	22.3
		30	3.3	**37**	23.7	19.5	27.9	**50**	24.9	18.3	26.1
	24°C	10	10.0	**41**	28.0	13.1	18.4	**64**	30.0	11.1	15.5
		15	6.6	**35**	27.5	16.7	23.4	**56**	29.3	13.8	19.5
		20	5.0	**31**	27.1	19.8	28.0	**48**	28.7	16.8	23.8
		25	4.0	**27**	26.7	23.5	33.3	**42**	28.1	19.8	28.0
		30	3.3	**23**	26.4	27.9	39.6	**37**	27.7	23.1	32.7
0.05	**20°C**	10	10.0	**51**	24.9	11.2	15.7	**69**	26.4	10.5	14.8
		15	6.6	**45**	24.4	13.8	19.5	**61**	25.8	12.9	18.3
		20	5.0	**40**	23.9	16.4	23.4	**54**	25.2	15.4	21.8
		25	4.0	**35**	23.5	19.3	27.5	**48**	24.7	18.0	25.5
		30	3.3	**31**	23.1	22.2	31.8	**43**	24.2	20.4	29.1
0.10	**20°C**	10	10.0	**40**	23.9	13.4	18.7	**55**	25.3	12.4	17.4
		15	6.6	**36**	23.6	16.4	23.0	**50**	24.8	15.0	21.2
		20	5.0	**33**	23.3	19.0	26.8	**45**	24.3	17.6	25.0
		25	4.0	**30**	23.0	21.8	30.8	**41**	23.9	20.3	28.8
		30	3.3	**27**	22.7	24.9	35.1	**37**	23.7	23.1	32.7
0.15	**20°C**	10	10.0	**33**	23.3	15.3	21.4	**46**	24.4	14.0	19.6
		15	6.6	**30**	23.0	18.8	26.1	**42**	24.2	17.1	24.0
		20	5.0	**28**	22.8	21.4	30.0	**38**	23.7	20.0	28.2
		25	4.0	**25**	22.6	25.0	35.0	**35**	23.5	22.8	32.0
		30	3.3	**23**	22.4	27.9	39.6	**32**	23.2	25.5	36.3

Flow and return temperature				45/35°C				50/40°C			
Thermal resistance	Room temperature	Spacing	Heating pipe requirement	max. heat flux density	average surface temperature	max. heating circuit area	max. heating circuit area	max. heat flux density	average surface temperature	max. heating circuit area	max. heating circuit area
Rl,B	ti	VA	L	q	to	Dim. 14	Dim. 16	q	to	Dim. 14	Dim. 16
m^2K/W	°C	(cm)	(m)	(W/m^2)	(°C)	(m^2)	(m^2)	(W/m^2)	(°C)	(m^2)	(m^2)
0.01	**20°C**	10	10.0	**117**	30.3	7.1	10.1	**145**	32.7	6.0	8.6
		15	6.6	**101**	29.2	8.9	12.6	**127**	31.2	7.4	10.7
		20	5.0	**88**	28.0	10.6	15.2	**110**	29.8	8.8	12.8
		25	4.0	**77**	27.1	12.3	18.0	**96**	28.7	10.3	15.0
		30	3.3	**67**	26.3	14.4	21.0	**84**	27.7	12.0	17.4
	24°C	10	10.0	**93**	32.4	8.4	11.9	**122**	34.8	6.8	9.7
		15	6.6	**81**	31.5	10.5	14.9	**107**	33.6	8.4	12.0
		20	5.0	**70**	30.6	12.6	18.0	**93**	32.4	10.0	14.6
		25	4.0	**62**	29.8	14.8	21.0	**81**	31.4	11.8	17.3
		30	3.3	**53**	29.1	17.4	24.9	**70**	30.5	13.8	20.1
0.05	**20°C**	10	10.0	**92**	28.3	8.5	12.0	**115**	30.2	7.2	10.2
		15	6.6	**81**	27.5	10.5	14.9	**102**	29.1	8.7	12.6
		20	5.0	**72**	26.7	12.4	17.6	**90**	28.1	10.4	15.0
		25	4.0	**64**	26.0	14.3	20.5	**80**	27.3	12.0	17.3
		30	3.3	**57**	25.4	16.5	23.7	**71**	26.6	13.8	20.1
0.10	**20°C**	10	10.0	**73**	26.8	10.1	14.2	**92**	28.3	8.5	12.0
		15	6.6	**66**	26.2	12.2	17.3	**83**	27.6	10.2	14.7
		20	5.0	**60**	25.7	14.2	20.2	**75**	26.9	12.0	17.2
		25	4.0	**54**	25.2	16.3	23.5	**67**	26.3	13.8	20.0
		30	3.3	**49**	24.7	18.6	26.4	**61**	25.8	15.6	22.5
0.15	**20°C**	10	10.0	**61**	25.8	11.5	16.1	**76**	27.0	9.8	13.7
		15	6.6	**56**	25.3	13.8	19.5	**69**	26.5	11.9	16.8
		20	5.0	**51**	24.9	16.0	22.8	**63**	26.0	13.6	19.6
		25	4.0	**47**	24.5	18.3	26.0	**58**	25.5	15.5	22.3
		30	3.3	**43**	24.2	20.4	29.1	**53**	25.1	17.4	24.9

Example: TECEfloor quick design

Construction project: Example house
TECEfloor laying system: tacking sheet 30-2
Flow and return temperature: 40/30 °C
TECEfloor pipe: PE-Xc 14 x 2.0 mm

1	Name of room		Office	Bedroom	Kitchen	Living room	Bath-room	Toilet	Hall	∑
2	Room number		1	3	4	5	6	7	8	
4	Standard indoor temperature	°C	20	20	20	20	24	20	20	
5	Room area	m^2	14.5	20.0	12.5	34.0	8.0	3.0	10.5	102.5
6	Floor area to be heated	m^2	14.5	20.0	12.5	34.0	6.2	3.0	10.5	100.7
7	Heating load (according to DIN 12831)	W	754	960	700	1496	608	195	546	5259
8	Required heat flux density	W/m^2	50.0	48.0	56.0	44.0	98.0	65.0	52.0	
9	Flooring resistance	m^2K/W	0.1	0.1	0.01	0.1	0.01	0.01	0.05	
10	Spacing	cm	15	15	20	20	10	20	20	
11	Max. heat flux density	W/m^2	50	50	66	45	64	66	54	
12	Average surface temperature	°C	24.8	24.8	26.2	24.3	30.0	26.2	25.2	
13	Max. heating circuit area	m^2	15.0	15.0	13.2	17.6	11.1	13.2	15.4	
14	Number of floor heating circuits	m	1	2	1	2	1	1	1	9+1
15	Length of pipe per heating circuit	m	97	67	63	85	62	15	53	592
16	Connection line per heating circuit	m	10	16	6	12	12	8	2	94
17	Heat flow per heating circuit (↑u.↓)	W	880	655	844	939	521	329	623	6385
18	Mass flow per heating circuit	l/min	1.3	0.9	1.2	1.3	0.7	0.5	0.9	9.1

Note:
1. Areas underneath baths and shower trays are omitted.
2. In bathrooms, there is a residual heating load of approx. 211 W (64 W/m^2 x 6.2 m^2 = 397 W - 608 W = 211 W).
3. The residual heating load in the bathroom is covered by the additional bathroom radiator. Provide an additional manifold outlet.
4. Connection lines may need to be insulated to protect them from too high levels of heat dissipation.

List of materials:

	Amount		Order amount		Delivery units	
TECEfloor tacking sheet 30-2	102.5	m^2	110	m^2	10	m^2
TECEfloor tacking pins	2058	pc.	2,200	pc.	200	pc.
TECEfloor adhesive tape	3	pc.	3	pc.	1	pc.
TECEfloor pipe 14 x 2	686	m	900	m	300/600	m
TECEfloor stainless steel manifold HCM 10	1	pc.	1	pc.	1	pc.
TECEfloor manifold housing 110-5, flush-mounted	1	pc.	1	pc.	1	pc.
TECEfloor clamping ring connections 14 x 2	20	pc.	20	pc.	10	pc.
TECEfloor corner ball valve 1“	1	Set	1	Set	1	Set
TECEfloor edge insulation strips	120	m	200	m	100	m
TECEfloor movement joint profile	15	m	18	m	18	m
TECEfloor pipe joint protection	10	m	12	m	12	m
TECEfloor pipe bend guides	20	pc.	25	pc.	25	pc.
TECEfloor terminal strip	2	pc.	2	pc.	1	pc.
TECEfloor servomotor	9	pc.	9	pc.	1	pc.
TECEfloor room thermostat	7	pc.	7	pc.	1	pc.
TECEfloor screed additive	18.5	kg	20	kg	10	kg
Additional notes						

Functional heating protocol for TECE floor heating

According to DIN EN 1264 part 4, anhydrite and cement screed should be heated before installing floor coverings. For cement screed, this should be done 21 days at the earliest, and for anhydrite screed, 7 days at the earliest (according to the manufacturer's instructions) after the screed work has been completed.
Note: Reductions to the above-mentioned drying times and/or any changes to the heating sequence described below (temperature, number and duration of heating steps) require written approval by the screed manufacturer and/or the screed layer before commencing the heating phase.

Construction project: _____

Heating installation company: _____

Screed laying company: _____

TECE laying system: _____

TECE pipe (type/nominal dimension/spacing): _____

Screed type: ❒ Cement screed _____ cm thick ❒ Anhydrite screed _____ cm thick

Date of screed application: _____

Outdoor temperature before start of functional heating: _____

Room temperature before start of functional heating: _____

1. Start flow temperature of 20–25 °C set and maintained constantly for 3 days:

Started on: _____ Ended on: _____

2. Max. available design temperature set and maintained for at least 4 days (not reduced at night time):

Started on: _____ Ended on: _____

Functional heating performed flawlessly: ❒ Yes ❒ No

Heating interrupted on: _____

Identified defects: _____

_____	_____
Place, date	Place, date
_____	_____
Client/representative (Signature)	Contractor/Installer (Stamp/signature)

Note: After completion of the functional heating process, it cannot be guaranteed that the screed has reached the degree of humidity required to create suitable conditions for laying the floor covering. Therefore, the suitability of the screed for laying the floor covering must be checked by the floor layer.

Pressure test protocol for TECE underfloor heating

Construction project: _____

Heating installation company: _____

1. System data

Heat source type and output: _____

Manufacturer: _____

Installation site: _____

max. operating pressure: _____ max. operating temperature: _____

2. Pressure test

	completed
a. Close ball valve on manifold	❒
b. Fill and purge each heating circuit, one after the other	❒
c. Bleed air from the system	❒
d. Apply the test pressure: The test pressure must be twice as high as the operating pressure but at least 6 bar (according to DIN EN 1264 part 4)	❒
e. Apply pressure again after 2 hours as a drop in pressure may occur due to pipe expansion	❒
f. Test time: 12 hours	❒
g. The pressure test is successful if no water leaks out anywhere from the pipe and the test pressure has not dropped by more than 0.1 bar per hour.	❒

Note: During laying of screed, the max. operating pressure must be maintained so that any leaks can be detected immediately.

3. Certification

The pressure test was performed correctly. No leaks were detected during the test, and none of the components permanently changed shape.

_____	_____
Place, date	Place, date
_____	_____
Client/representative (Signature)	Contractor/Installer (Stamp/signature)

More information on
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