TECE

Pipe Systems

TECElogo

TECHNICAL GUIDELINES

Contents

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

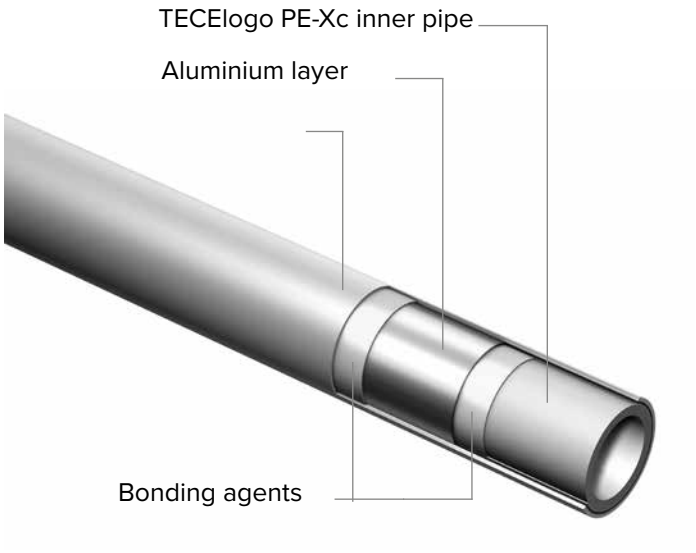
The TECElogo composite pipes are available in two versions:
- PE-Xc composite pipe
- PE-RT composite pipe

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)

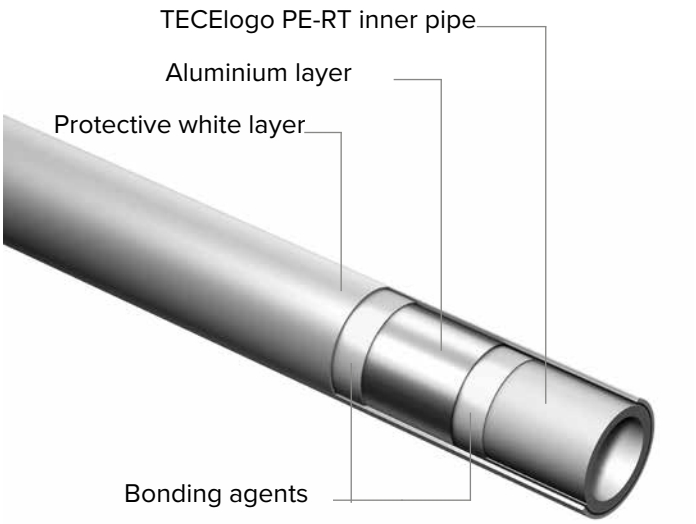
Special advantages of TECElogo PE-Xc pipes

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.

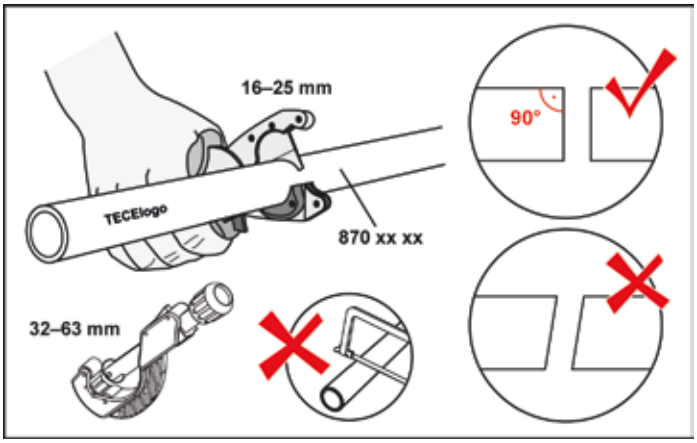
Tool for dim. 16–25:
- TECElogo pipe cutters (to dim. 25)
- TECElogo calibration and chamfering tools
- TECElogo disassembly tools

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:

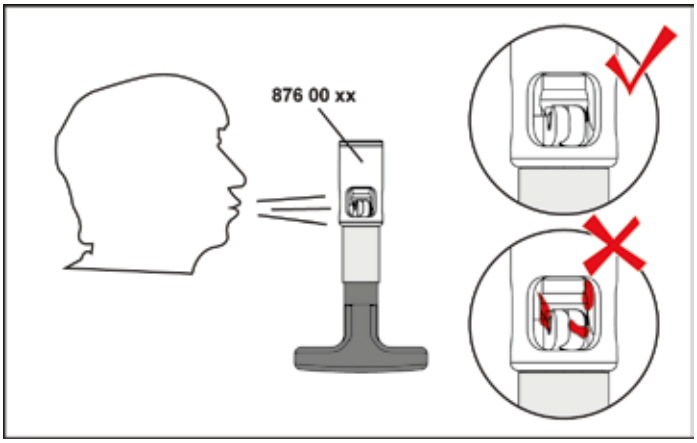
Cut pipe to length



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!

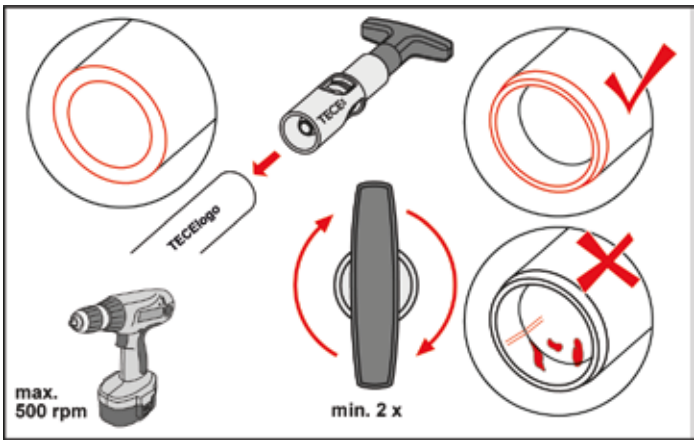
Note: TECElogo pipes may only be processed using the TECE system tools in perfect condition. In particular, the cutter or the cog must be sharp and without burrs - this/these can be replaced if necessary.

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.

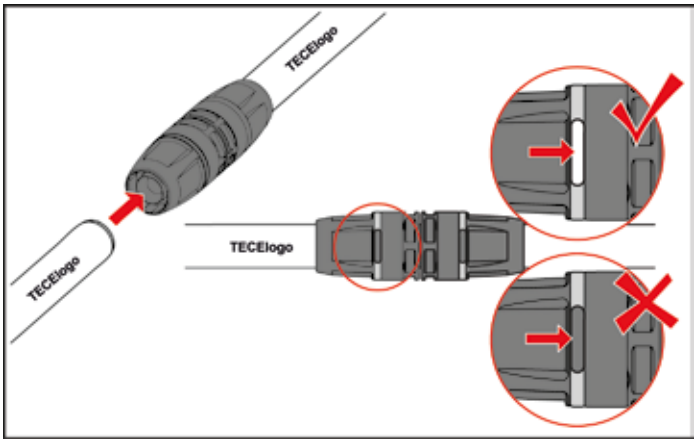
The pipe should then have - inside and out - an even chamfer and be free of burrs. There must be no shavings left on the chamfer, which should be visually checked following calibration (see subsequent photos). In the event of damage (e.g. serrations), the damaged end must be cut off and the pipe recalibrated.

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.

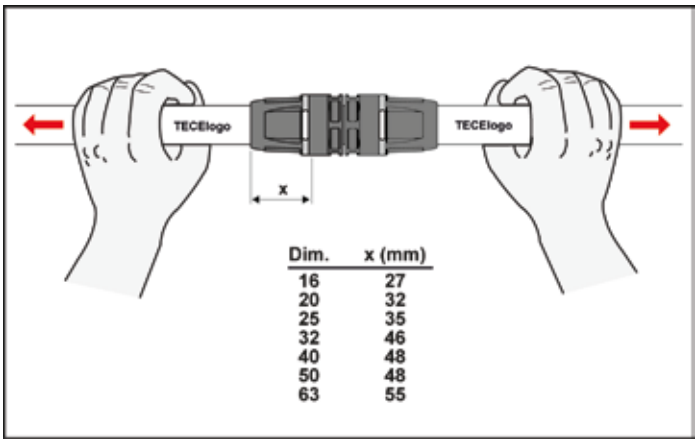
The connection is only completed correctly once the pipe is visible in one of the inspection windows.

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.



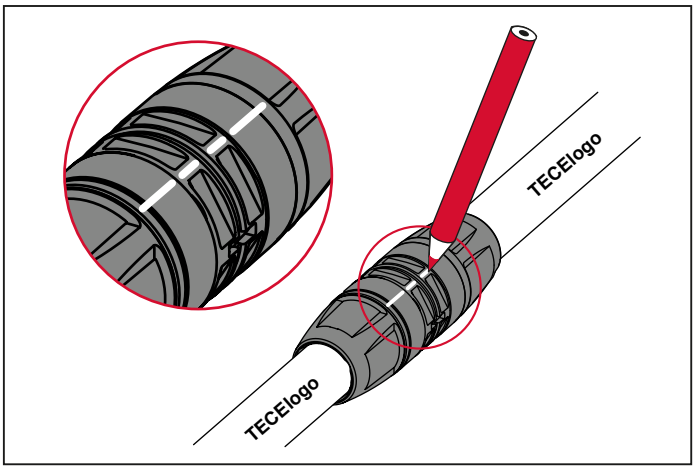
Undo connection and connect again

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.

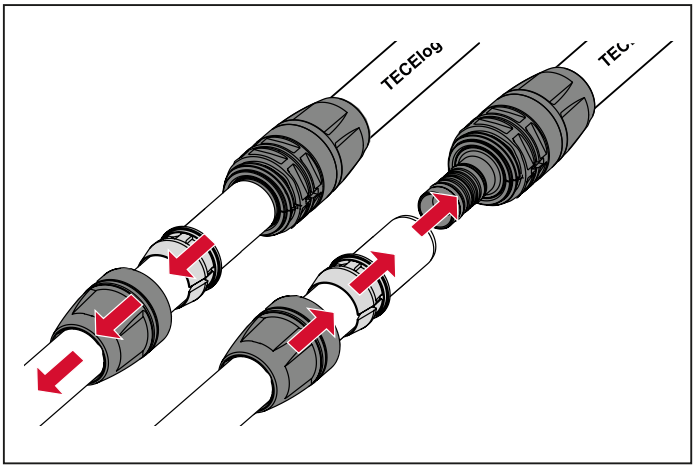
The following working steps are necessary in order to undo and re-establish a connection:

Mark and disconnect the collet



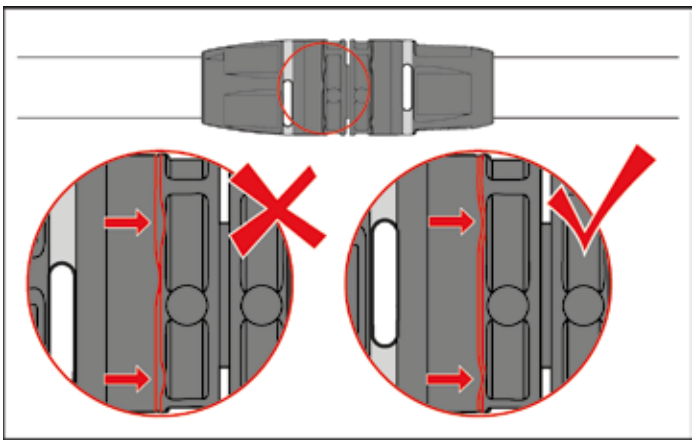
Before undoing a connection, make a continuous marking on the collet and threaded clip. Fix the fitting with the disassembly open-end wrench and unscrew the collet with the dismounting key.

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:

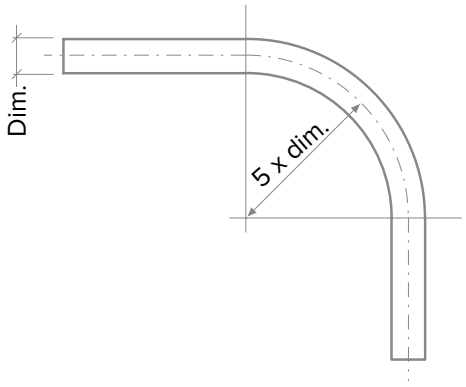
- Ethyl glycol (Antifrogen N): May be used up to a concentration of maximum 50%. TECE recommends restricting the concentration to 35%. A concentration of 50 % Antifrogen N corresponds to frost protection down to a temperature of -38 °C. A concentration of 35 % Antifrogen N corresponds to frost protection 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:

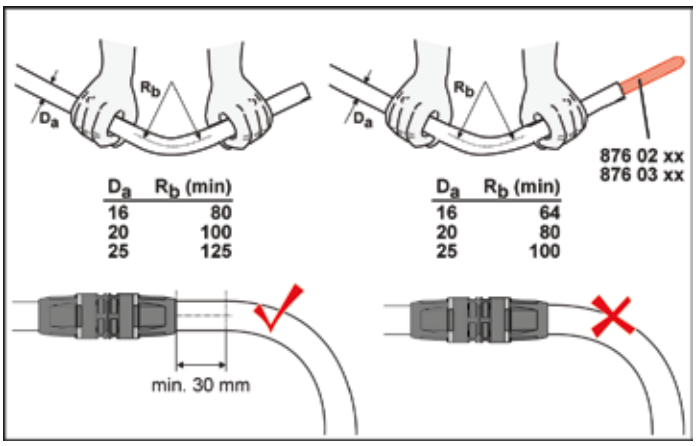


* without bending spring; 4 x dim. with bending spring.

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*

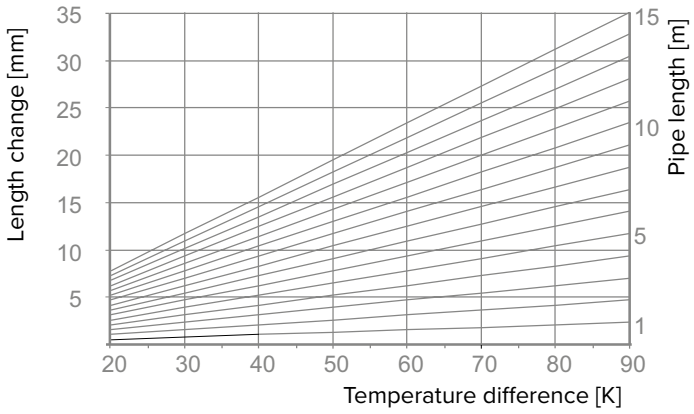
* K = Kelvin is the SI base unit of temperature and relates to absolute zero.
(0 °C = 273.16 K)

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

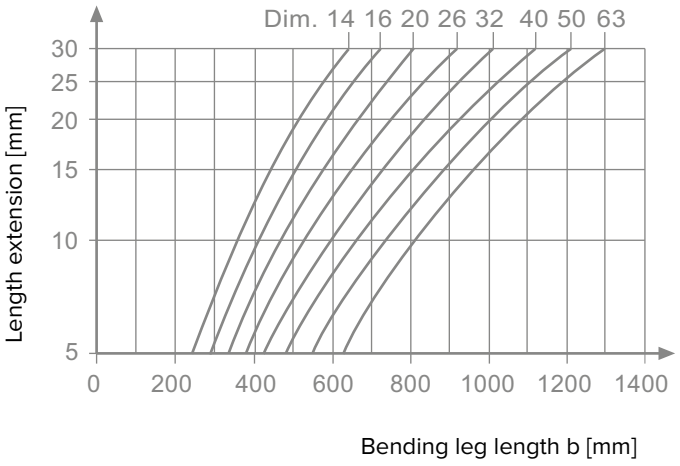
Result: The pipe will expand by approx. 20 mm. The expansion must be compensated for via structural conditions. Alternatively, the thermal length extension can be found in the following diagram.



Thermal length extension for TECElogo composite pipes

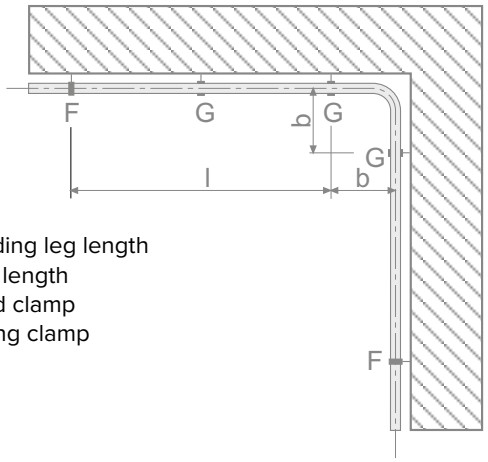
Determining the length of the bending leg

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



Bending leg length for TECElogo pipes

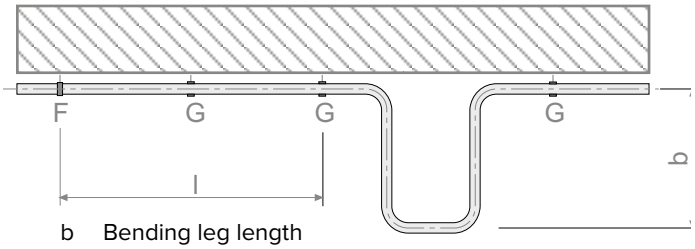
The pipe lengths to be observed can be isolated using fixed and sliding clamps.



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.



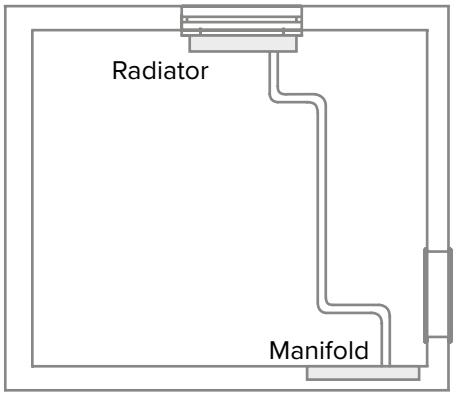
b Bending leg length
l Pipe length
F Fixed clamp
G Sliding clamp

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)

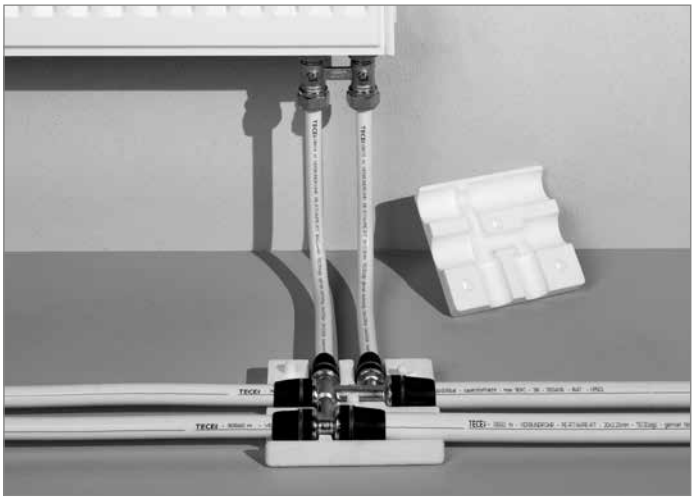
Contractor/Fitter
(Stamp/Signature)

Radiator connection

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

Cross-fitting

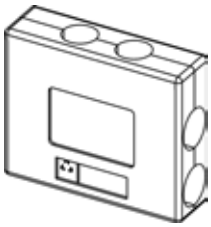
The cross-fitting allows the splitting of the flow and return lines from two main lines running parallel to one another. The installation height of the fittings with insulation box is just 35 mm.



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.

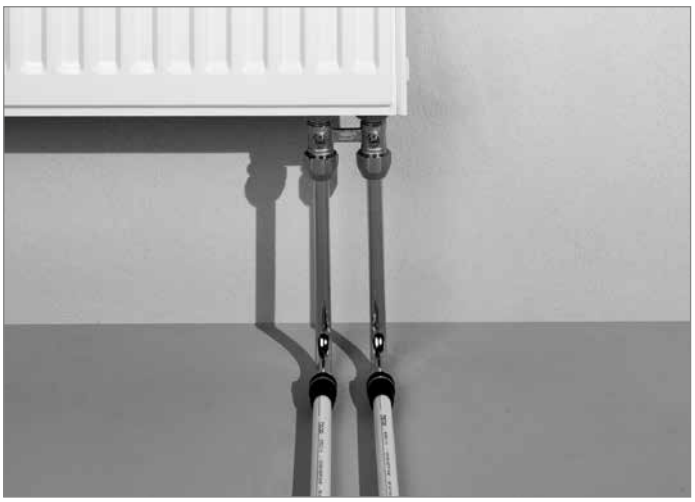
Radiator connection with mounting tees/elbows

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

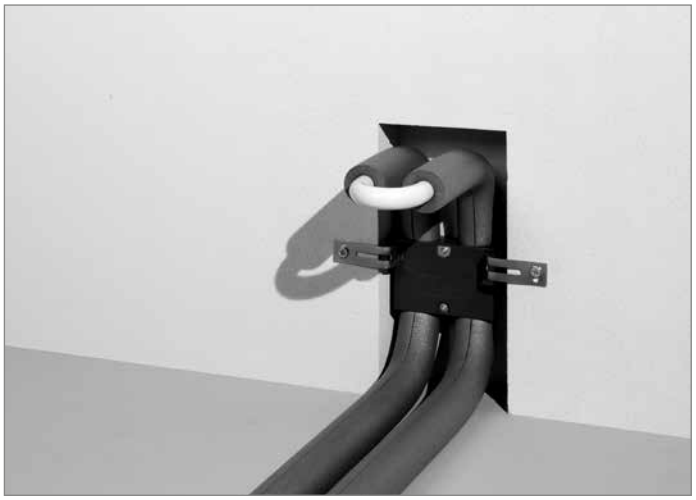
Connection from the wall

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.

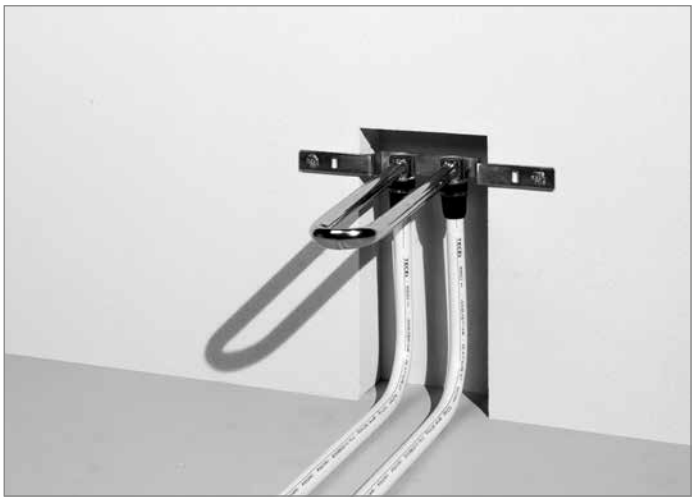


Radiator connection with mounting unit - ready to push free

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.