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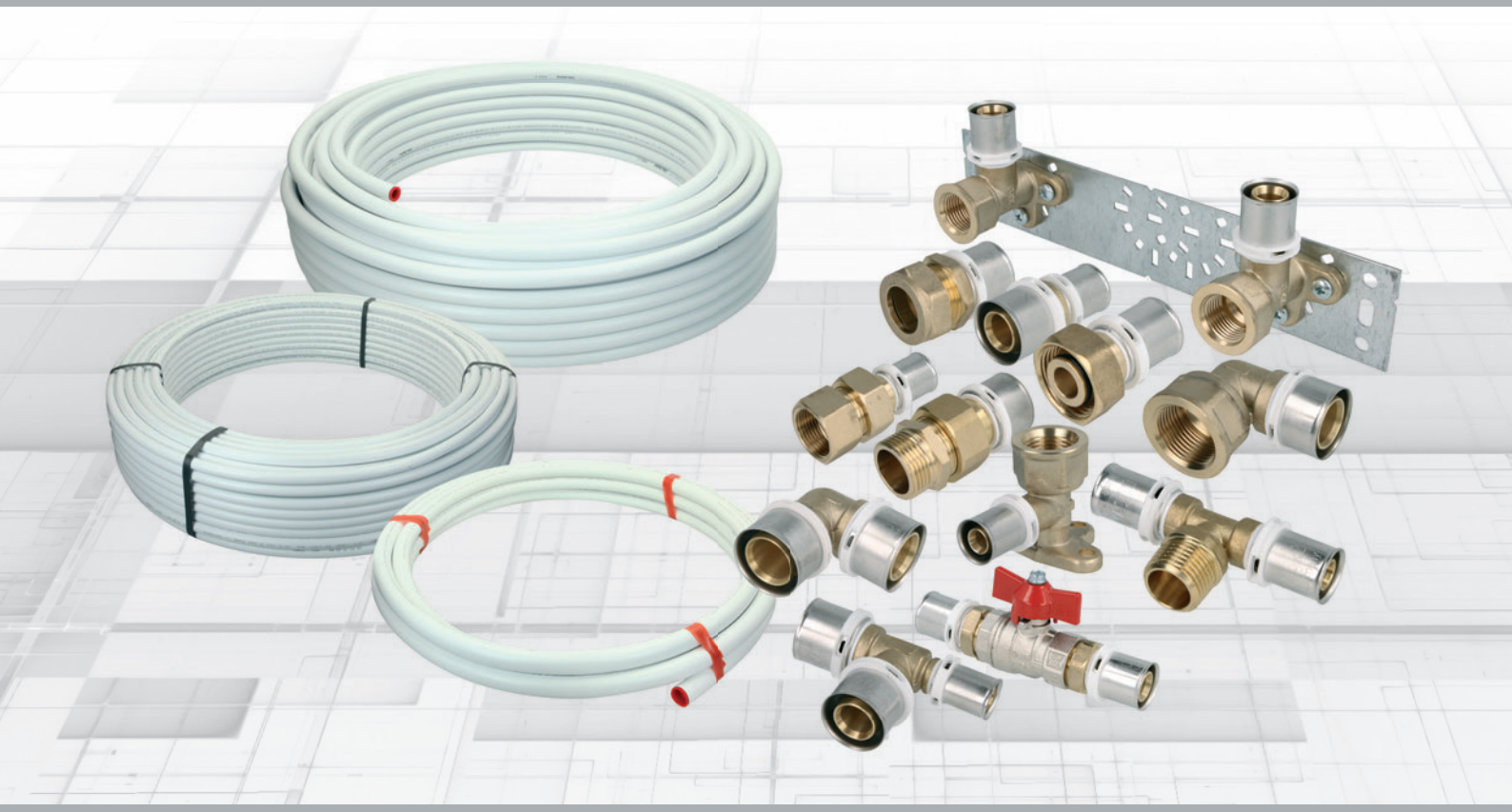
SilverTec®



GB

SilverTec
Aluminium multi-layer composite piping and press fittings

Technical manual

www.oeg.net

GB

Contents

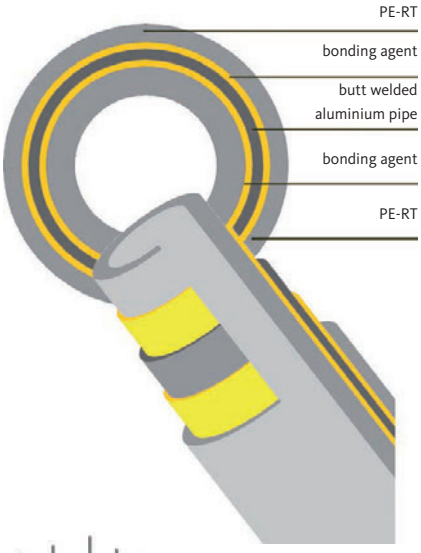
The SilverTec aluminium multi-layer composite pipe has been developed to withstand the large spectrum of temperatures and pressures in cold and hot water systems.

Structure

A basic polyethylene pipe is extruded and a bonding agent is applied.
An aluminium strip is moulded around the pipe, longitudinally butt welded and calibrated onto the inner pipe. Subsequently, another bonding layer and a coating made of polyethylene are applied.
The weld seam is tested inline during the production process. The internal diameter of the finished product is controlled by a ball.

Materials

PE-RT – FLEXIBILITY AT ANY TEMPERATURE.
The pipe material PE-RT (raised temperature) has been especially developed for applications in cold and hot water systems. Only the purest material qualities from renowned raw material manufacturers are used. The material with its cross-linked structure has a high thermal resistance and is therefore particularly suitable for the use in this area.



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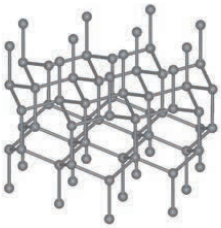
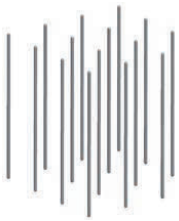


Physically cross-linked: better structure



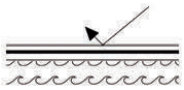
Physically not cross-linked: worse structure

High-temperature resistant polyethylene (PE-RT) enhances the typical features of polyethylene. Due to its molecular makeup and its process properties, it remains extremely stable even at high temperatures. Therefore, it is perfectly suited for applications in cold and hot water systems. In comparison to conventional pipe materials like e.g. copper or C-steel, the combination of PE-RT, aluminium and bonding agent provides great advantages in the processing and for the efficiency of installations. All materials have been tested for the use in drinking water installations and are physiologically safe.

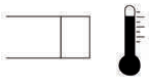
1.1 Structure, materials and advantages

Advantages of aluminium multi-layer composite piping
The SilverTec pipe system is intended for universal use and provides the processor with some important advantages:

100% diffusion-tight
The SilverTec multi-layer composite pipe is 100% diffusion-tight due to its inside butt welded aluminium pipe (oxygen barrier).

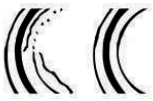


Low thermal expansion
Due to the inside aluminium pipe, thermal expansion is significantly reduced compared to conventional plastic pipes. It is equivalent to that of metal pipes (0.0024 mm/m x K).

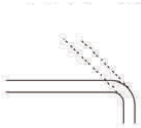


Physically cross-linked plastic inside and outside (PE-RT)
The SilverTec multi-layer composite pipe has the same plastic quality inside and outside.
So varying ageing processes or material properties are excluded.

No material abrasion, no deposits
Due to the low degree of roughness of cross-linked plastic, there are no material degradations or deposits that could change the pipe cross-section.

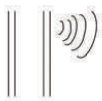


Form stability, hardly any moulded parts necessary for changes in direction
The SilverTec multi-layer composite pipe can be easily bent by hand and remains in the desired shape without spring-back. Changes in direction can be performed without needing any moulded parts. Only in rase cases, special moulded parts may be necessary.

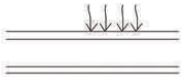


Load capacity of +70 °C at a pressure of 10 bar
The SilverTec multi-layer composite pipe has a load capacity of +70 °C at a pressure of 10 bar. Short-term temperature peaks are possible at +95 °C according to DVGW worksheet W542 and W543.

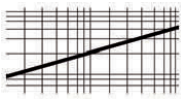
Sound insulation measures
Due to the smooth inner pipe wall, there is no audible flow noise. Fittings, moulded parts and valves can be decoupled from the buildings's base body by an appropriate insulation (DIN 4109 / EnEV).



Corrosion resistance
SilverTec fittings and the SilverTec multi-layer composite piping complement each other in their corrosion resistance. Their programme components are suitable for all types of drinking water.



Service life
The SilverTec multi-layer composite pipe is designed for a service life of at least 50 years based on the above-mentioned load capacity (+70 °C at a pressure of 10 bar, short-term +95 °C) and if professionally installed and pressure tested according to DIN 1988.



Complies with the UBA positive list (DVGW and KIWA approval)

TECHNICAL DATA ALUMINIUM MULTI-LAYER COMPOSITE PIPING (as of 3/2019)

Dimension (mm)	16x2.0	20x2.0	26x3.0	32x3.0
Approvals / Tests	DVGW KIWA	DVGW KIWA	DVGW KIWA	DVGW KIWA
Colour	white	white	white	white
Pipe structure in layers	5	5	5	5
External pipe diameter (mm)	16.0	20.0	26.0	32.0
Pipe wall thickness (mm)	2.0	2.0	3.0	3.0
Internal pipe diameter (mm)	12.0	16.0	20.0	26.0
Thickness of aluminium layer (mm)	0.20	0.25	0.35	0.50
Smallest bending radius (mm) without bending aid (T = +20 °C)	80	100	260	-
Weight per meter (g / m)	105	140	260	350
Water content (l / m)	0.113	0.201	0.314	0.531
Linear expansion coefficient (mm / (m K))	0.023	0.023	0.023	0.023
Thermal resistance (m2 K / W)	0.0045	0.0045	0.0045	0.0045
Thermal conductivity (W / m K)	0.44	0.46	0.45	0.48
Max. operating temperature, over 50 years (°C)	70.0	70.0	70.0	70.0
Max. operating temperature, max. 1 year (°C)	95	95	95	95
Fail-safe temperature, max. 100 hours (°C)	110	110	110	110
Max. operating pressure, over 50 years (bar)	10	10	10	10
Max. operating pressure, max. 1 year (bar)	12	12	12	12
Surface roughness (mm)	0.007	0.007	0.007	0.007
Oxygen permeability (g / m^3 d)	<0.1	<0.1	<0.1	<0.1

2 SilverTec Press fittings

2.1 Structure and advantages

SilverTec press fittings contour TH for multi-layer composite piping

The fittings of the SilverTec TH-series are designed for quick assembly with maximum safety.

Two O-rings and three control windows in the stainless steel sleeves of the fittings ensure a custom-fit insertion depth of the pipe. Thus a permanent and tight joint is created. A stable plastic ring allows for safe pressing even in positions difficult to access.

Advantages of SilverTec press fittings contour TH:

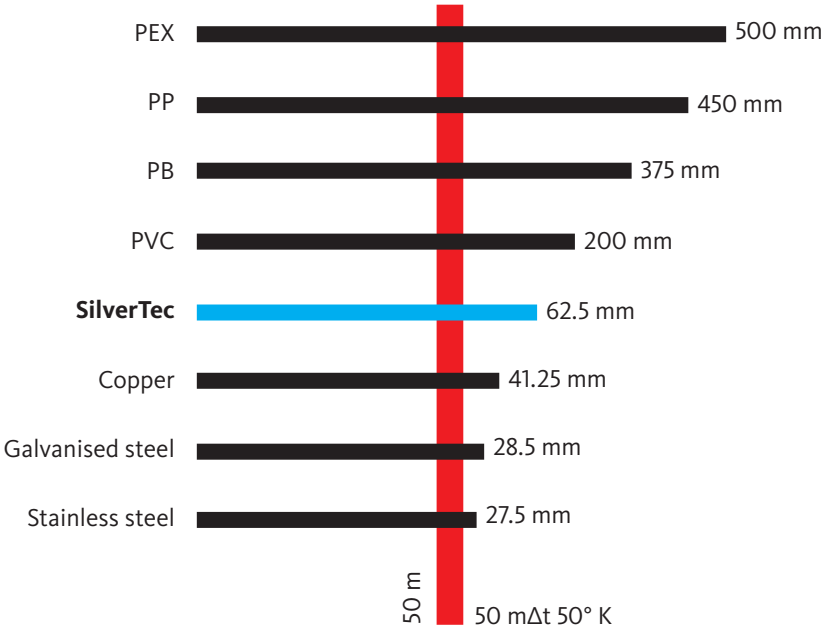
- Any unpressed joints can be identified during the pressure test due to the forced leakage of the system.
- The free passage leads to low pressure losses and virtually no water flow noises.
- All materials of the SilverTec press fittings are approved for drinking water applications, comply with the UBA positive list and have a DVGW approval.

2.2 Technical data, zeta values

Loss coefficients ζ

Component	Symbol	DIM 16	DIM 20	DIM 26	DIM 32
T-piece flow separation		9.8	7.6	5.5	3.4
T-piece passage Coupling		5.4	4.2	3.1	2.6
T-piece counter flow at flow separation		12.2	8.5	6.8	5.1
T-piece counter flow at flow merging		12.2	8.5	6.8	5.1
Elbow 90°		8.7	6.3	4.5	2.9
Pipe bend		1.3	0.9	0.7	0.4
Adapter reduction		8.3	6.3	5.1	2.8
Wall plate		5.5	5.4	-	-

Linear expansion of different pipe materials at 50 m and Δt 50° K



Pipe wall roughness values of different materials:

Copper

k new	0.0015 mm
k used	0.03 mm

SilverTec / Plastic

k new	0.007 mm
k used	0.007 mm

Galvanised steel pipe

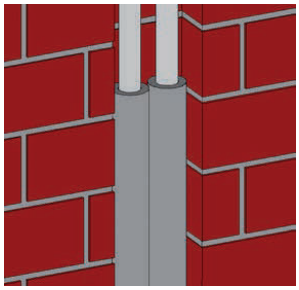
k new	0.15 – 0.16 mm
k used	bis 4.0 mm

Seamless steel pipes

k new	0.02 – 0.06 mm
k used	bis 4.0 mm

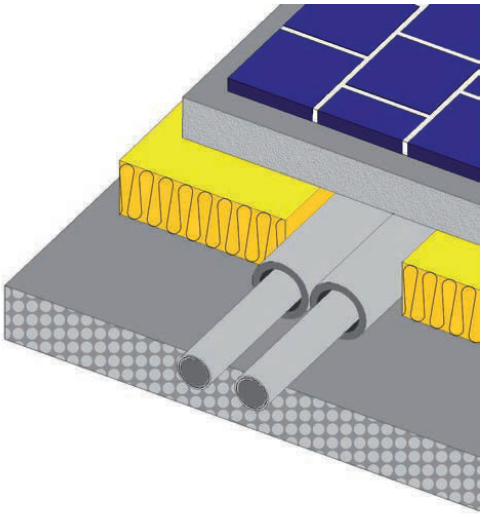
In accordance with German energy-saving regulations (EnEV)

50%	Insulation	100%
Risers in duct or concealed between heated rooms of different users		Laying against unheated rooms, ground and outside air



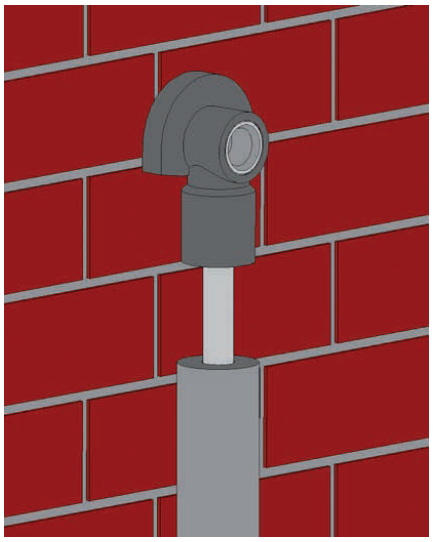
3.4 Floor construction

Pre-insulated SilverTec multi-layer composite piping

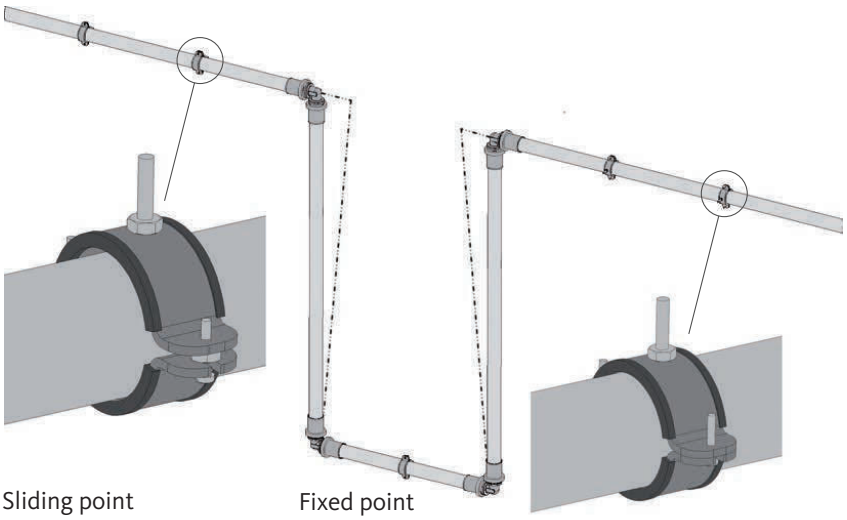


3.5 Sound insulation according to DIN EnEV

Insulation according to EnEV



3.6 Linear expansion

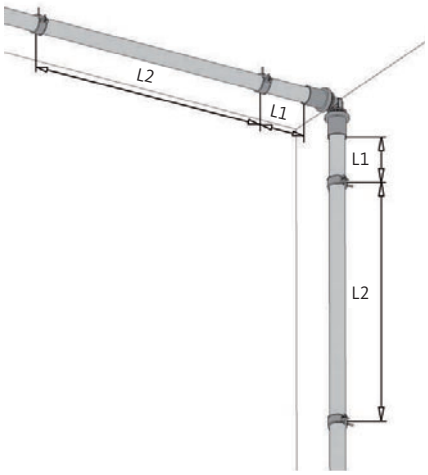


Sliding point

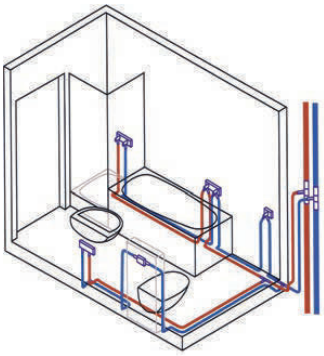
Fixed point

Insulation according to EnEV

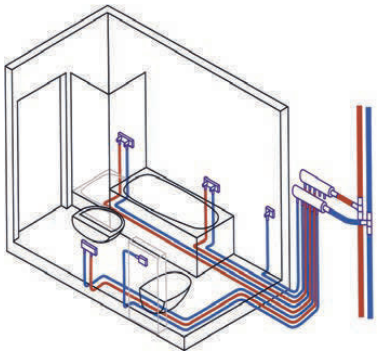
DN	Pipe dimensions mm	L2 (cm) maximum fixing distance vertical	horizontal
16	16 x 2.00	135	150
20	20 x 2.00	150	175
26	26 x 3.00	165	200
32	32 x 3.00	200	200



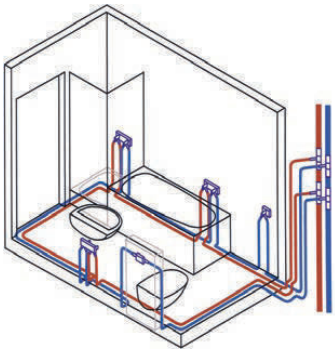
Group connection



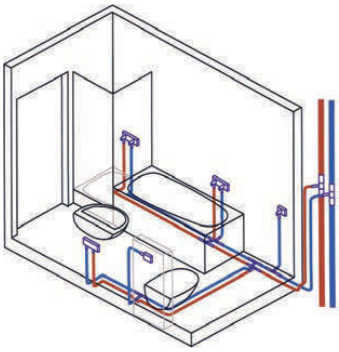
Distribution system



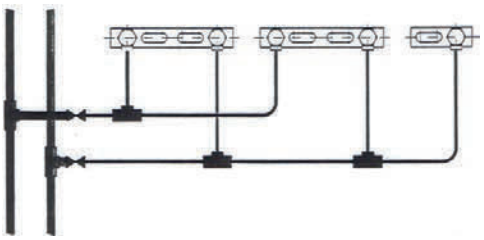
Ring line



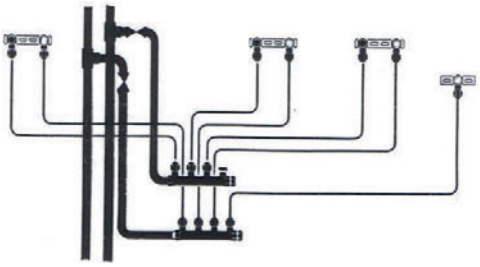
T-piece installation



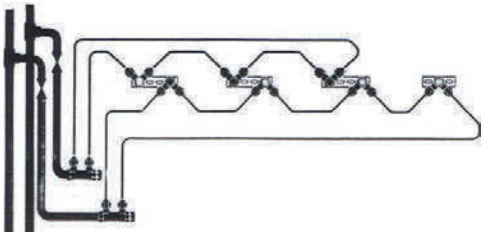
3.9 Installation examples



Conventional distribution system



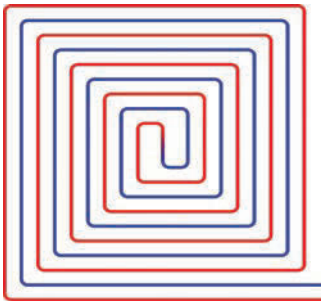
Single distribution system



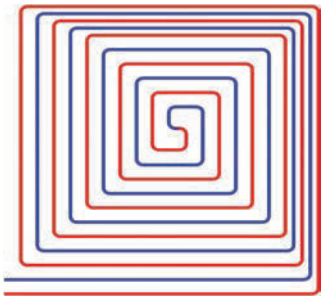
Ring line system

Underfloor heating

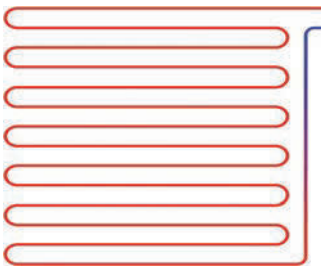
Bifilar laying
Spiral-shaped structure with reversion loop in heating circuit centre. The balanced laying of flow and return results in a very uniform heat distribution.



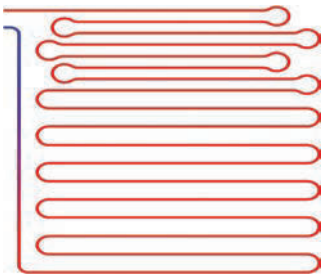
Bifilar laying with rim zone
Spiral-shaped structure with included rim zone on two sides of the room.



Meander-shaped laying
Serpentine structure with reversion loop at heating circuit end. The continuous laying without return integration leads to a higher temperature at the beginning of the heating circuit.



Meander-shaped laying with rim zone
In this laying pattern, the rim zone intensifies the temperature increase at the beginning of the heating circuit.



3.11 Calculation example

Two-pipe heating with radiators
Considering maximum flow velocities, the following heat output / volume flows can be connected:

Recommendation:	Radiator-connecting lines	≤ 0.3 m/s
	Heating distribution lines	≤ 0.5 m/s
	Heating risers and cellar pipes	≤ 1.0 m/s
	Observe pressure loss Δp!	

Radiator-connecting lines

Pipe dimensions in mm ø	16x2.0
Volume flow Vmax in l/h	130
Flow velocity max. in m/s	0.30
Heat output QN in Kcal/h Δt +20 °C	2,600
Heat output QN in watts Δt +20 °C	3,023

Heating distribution lines

Pipe dimensions in mm ø	16x2.0	20x2.0	26x3.0	32x3.0
Volume flow Vmax in l/h	220	450	700	900
Flow velocity max. in m/s	0,50	0.50	0.50	0.50
Heat output QN in Kcal/h Δt +20 °C	4,400	6,800	14,500	18,000
Heat output QN in watts Δt +20 °C	5,116	7,890	16,800	20,930

Heating risers and cellar pipes

Pipe dimensions in mm ø	16x2.0	20x2.0	26x3.0	32x3.0
Volume flow Vmax in l/h	440	900	1,400	1,800
Flow velocity max. in m/s	1.00	1.00	1.00	1.00
Heat output QN in Kcal/h Δt +20 °C	8,800	13,600	29,000	36,000
Heat output QN in watts Δt +20 °C	10,233	15,780	33,600	41,860

Calculation example for volume flow (flow rate in l/h)

$$\frac{\text{Heat output: QN/W x 0.86}}{\text{Temperature difference: Δt (TV-TR)}} = \text{Volume flow V in l/h}$$

$$\frac{\text{QN = 1,000 W x 0.86}}{\text{Δt +20 °C}} = \text{V = 43 l/h}$$

Note:
With system-bound heating circuits (single-pipe heating), the total ring volume flow of all radiators must be observed!

SilverTec press fittings are ideal to create pipe joints really quickly. The only things you need are aluminium multi-layer composite piping, a pipe cutter, a calibrator and a suitable press machine.
By using a pipe cutter, the aluminium multi-layer composite pipe is cut to length. Subsequent calibrating ensures that the pipe end is absolutely round again and also deburred after the cut. At the same time, the pipe is chamfered on the inside so that the fitting can be inserted into the pipe without damaging the O-ring.
Final certainty of a safe pressing is given by three openings (control windows) at the end of the stainless steel sleeve indicating a perfect seat of the pipe within the fitting.

1. Cutting the pipe to length
The pipe can be cut to the desired length with a suitable tool. The cross-section area of the cut must be at the right angle to the pipe. Angular cuts are to be avoided. Handsaws and jigsaws or blunt tools are unsuitable for cutting.

2. Calibrating and deburring the pipe
After cutting to length, the pipe must be calibrated and deburred. For this purpose, the calibrator is first inserted into the pipe up to the stop. Then deburring is carried out by turning the calibrator. By turning, material is removed on the pipe interior so that a cone is formed at the pipe making the insertion of the fitting easier and protecting the O-ring from being damaged.

3. Mounting the fitting
Insert the fitting into the pipe end up to the stop by applying adequate pressure and in axial direction. The correct insertion depth can be checked through the three control windows of the stainless steel sleeve. Do not use any additional lubricants.

4. Pressing
By means of a suitable pressing tool and a size-compliant pressing jaw based on the fitting dimension, the pressing process is carried out until the pressing jaw has fully closed and the process is finished. Check the connection afterwards.

Notes ...

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D Kostenfreie Bestell- und Service-Hotline:
Fon 0800 6 343662 • Fax 0800 6 343292

GB Free service number:
Phone 00 800-63 43 66 24 • Fax 00 800-63 43 29 24

FR N° gratuits:
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Tel. 0800 0 226647 • Fax 0800 0 225240

OEG GmbH
Industriestraße 1 • D-31840 Hess. Oldendorf
info@oeg.net • www.oeg.net