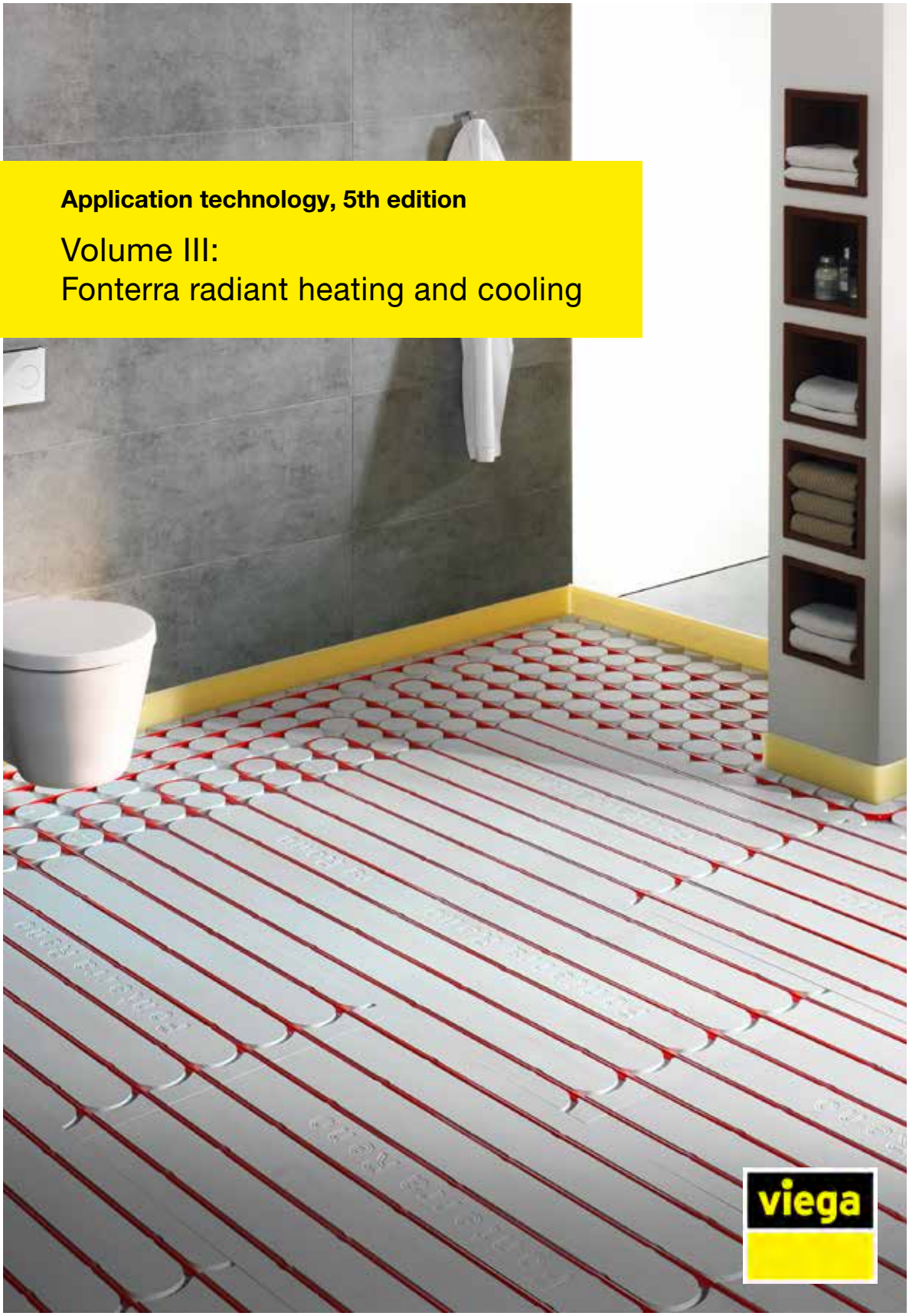
Application technology, 5th edition

Volume III:
Fonterra radiant heating and cooling

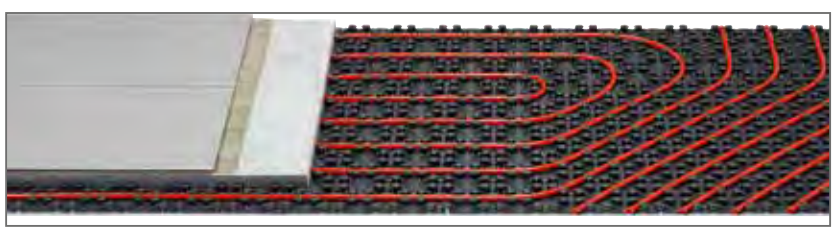


Fonterra Base Flat 12

Planning

System description

Fonterra Base Flat 12 is a screed underfloor heating system with extremely thin layers when combined with Fonterra Base snap plates 12/15, ND 11, and smart, and a special screed additive in powder form which the screed installer simply adds when mixing the cement screed.
By adding the Fonterra screed additive Base Flat 12, the screed thickness can be reduced to a minimum (15 mm over dimple). The specific modification of the screed makes sure that surfaces installed in this way can be walked on after only 48 hours. Functional heating can start after approx. 5 days only. Thus, floor covering work can be done much earlier, significantly reducing the waiting times for the subsequent trade lots.
Further benefits are the small screed thickness and the resulting low weight and fast reaction time of the system.
The time-proven dimpled structure of the Fonterra Base 12/15 panels furthermore allows diagonal laying without additional fixing.



Representation of the system structure

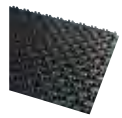
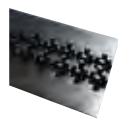
Fig. 27: Representation of the system structure

System features

- Special thin-layer system for cement screeds combined with Fonterra Base screed additive Flat 12
- Use of the Fonterra Base snap plates 12/15, ND 11, and smart and the Fonterra Base screed additive Flat 12
- Max. payload of the system 2 kN/m²
- Suitable and approved on-site insulation can be used
- Hard enough to walk on after 48 hours only, min. setting time five days
- PB pipe 12 x 1.3 mm, oxygen seal acc. to DIN 4726
- Heating circuit length max. 80 m
- Extremely thin screed layer for reduced area weight
- Fast reaction times thanks to small pipe coverage

System components

Fonterra Base Flat 12

Panels/pipe	
 Fonterra Base snap plate 12/15	 PB pipe 12 x 1.3 mm
 Fonterra Base manifold/door set 12/15	
Accessories	
 Fonterra Base screed additive Flat 12	 Edge insulation strip 90/10 mm
 Expansion joint profile 10/80	 Joint protection 12
 Round profile	

System components

Name	Article number
PB pipe 12 x 1.3 mm, 120 mm	707712
PB pipe 12 x 1.3 mm, 240 mm	615680
PB pipe 12 x 1.3 mm, 650 mm	616502
Fonterra Base snap plate 12/15 ND 11	664459
Fonterra Base snap plate 12/15 smart	664466
Fonterra Base manifold/door set 12/15 ND 11	664510
Fonterra Base manifold/door set 12/15 smart	664527
Edge insulation strip 90/10 mm	706906
Round profile 15 mm	609535
Expansion joint profile 10/80	609542
Joint protection 12	609511
Measuring point indication	569082
Plastic dowel 75 mm	609719
Clamping rail 12 mm	609429
Fonterra Base screed additive Flat 12	704513

Tab. 7: System components

Tools for installation

Name	Article number
Pipe reel	562359 or 754761
Pipe cutter for plastic pipes	652005
Press jaw 12	616915
Hand press tool 12	401436
Press machine, e.g. Pressgun Picco	735470

Tab. 8: Tools for installation

Technical data

Technical data system panels

System panels Base 12			ND 11 EPS 035 DEO 150 kPa	smart
Dimensions (usable size)		[mm]	1320 x 880	
Panel height (incl. dimples)		[mm]	30	20
Footfall noise reduction		[dB]	—	—
Max. payload			45	—
Thermal resistivity		[K/W]	0,32	—
Fire rating class			B 2	
Material (foam and foil)			PS	
Laying grid	diagonal	[cm]	7,5	
	rectangular	[cm]	5,5	

Tab. 9: Technical data system panels

Technical data system pipes

System pipes		PB 12 x 1.3
Dimensions	[mm]	12 x 1.3
Minimum bending radius		5 x d_a
Operating conditions according to ISO 10508	[MPa/bar]	
Class 4		1/10
Class 5		0.8/8
Max. operating temperature	[°C]	95
Mounting temperature	[°C]	≥ -5
Water volume	[l/m]	0,069
Heat conductivity λ	[W/(m·K)]	0,22
Linear coefficient of length expansion	[K^{-1}]	1.3×10^{-4}
Weight	[g/m]	50

Tab. 10: Technical data system pipes

Notes on dimensioning

Material requirement Fonterra Base Flat 12

System components	Available quantities/packing units	Pro-rata requirement
PB pipe 12 x 1.3 mm	120 m 240 m 650 m	depending on installation clearance
Fonterra Base snap plate 12/15, ND 11	8 pieces	0.86 pc./m²
Fonterra Base snap plate 12/15, smart	8 pieces	0.86 pc./m²
Edge insulation strip 90/10 mm	200 m	if required 1.00 m/m²
Measuring point indication	50 pieces	3 pc./200 m² or per apartment
Round profile 15 mm	25 m	if required
Expansion joint profile 10/80 mm	8 pieces	if required
Fonterra Base screed additive Flat 12	12 kg	0.70 kg/m² *

Tab. 11: Material requirement Fonterra Base Flat 12

* Approximate values per m² for screed, 15 mm snap coverage and payload ≤ 2 kN/m²

Pipe requirement, mounting times and heating circuit lengths Fonterra Base

Surface heating pipe	Installation clearance [cm]		
	11	16,5	22
PB pipes required [m/m²]	8,8	5,9	4,4
Mounting time in group minutes/m² for PB pipe	5,0	4,0	3,5
Heating circuit length* PB 12 x 1.3 mm	up to 80 m**		

Tab. 12: Pipe requirement, mounting times and heating circuit lengths Fonterra Base Flat

* Connection lengths to the manifold must be considered

** with 80 W/m² and Δλ = 10 K

Thin layer cement screed

	Thin layer cement screed with screed additive model 1456
Ratio in relation to the cement weight	7 to 8 weight %
Application quantity	approx. 0.70 kg/m²
Mortar consistency	plastic
Hard enough to walk on after	2 days
Start of functional heating	after 5 days with RT greater +15 °C after 7 days with RT greater 5-15 °C
Functional heating	2 days with 25 °C, 2 days with 35 °C, 3 days max. design supply temperature

Tab. 13: Thin-layer cement screed with screed additive

Do not add any other screed additives. Compliance with the instructions for use is mandatory.

Floor structures

Fonterra Base Flat 12 is a special feature among the screed systems. It was designed specifically for extremely thin-layer structures combined with the screed additive Base Flat. The system structures shown do not meet the minimum requirements of DIN EN 1264-4, EnEV, and DIN 4108. If compliance is required, it must be provided by means of the existing sub-construction.
The reduction of the screed layer to 15 mm over dimple can only be achieved by addition of the specific screed additive model 1456.
The max. payload of the Fonterra Base Flat 12 system is 2 kN/m². It is tested and approved for private residential buildings.

Floor structure Base Flat 12 with Fonterra Base snap plate, ND 11

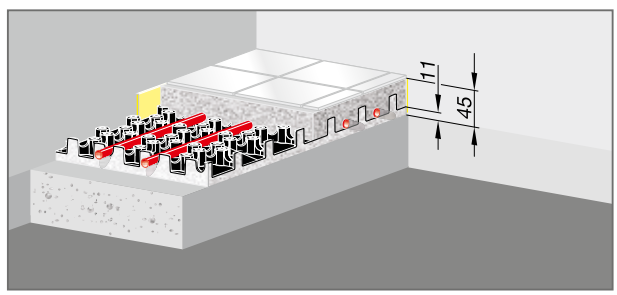


Fig. 28: Floor structure Base Flat 12 with Fonterra Base snap plate, ND 11

45 mm total height

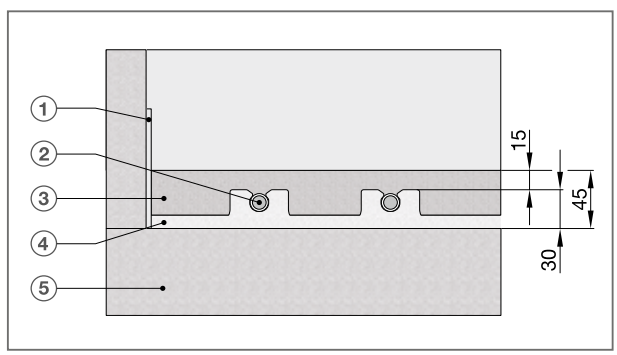


Fig. 29: Total height 45 mm

Key

① Edge insulation strip RDS 90/10 mm
② PB pipe 12 x1.3 mm
③ Cement screed with Fonterra Base screed additive Flat 12
④ System panel Base 12/15 ND 11
⑤ Raw floor

Floor structure Base Flat 12 with Fonterra Base snap plate, smart

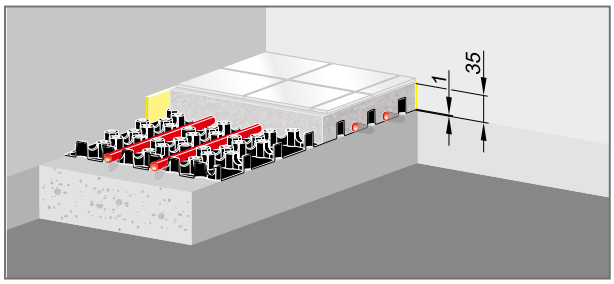


Fig. 30: Floor structure Base Flat 12 with Fonterra Base snap plate, smart

35 mm total height

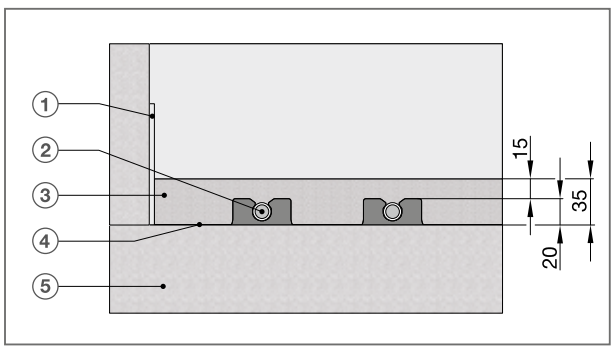


Fig. 31: Total height 35 mm

Key
① Edge insulation strip RDS 90/10 mm
② PB pipe 12 x 1.3 mm
③ Cement screed with Fonterra Base screed additive Flat 12
④ System panel Base 12/15 smart
⑤ Raw floor

Optionally, footfall sound insulation Knauf Fasoperl TS (11 mm) made of mineral fibre, or a wood fibre insulation panel, e.g. Knauf Fasoperl A 8 (8 mm), can be installed on site under the Base 12/15 system panel.

Output data Fonterra Base Flat 12

Supply temperature	Room temperature δ_i [°C]	Floor covering $R_{\lambda,B}$ = 5)		Heat flow density [W/m²]	35	40	45	50	55	60	65	70	75	80	85	90	95	100
				Mean floor surface temperature RT 20 °C [1] [°C]		24		25		26		27		28			29	
				Mean floor surface temperature RT 24 °C [2]		28		29		30		31		32			33	
35 °C	20	0.02		IC [3]	22			16.5		11								
				max. IA [4]	18.2	17.1	12.3	13.3	10.2	9.1	8.3	6.4	5.3					
		0.05		IC [3]	22		16.5		11									
				max. IA [4]	18.2	13.3	13.6	10.3	9.1	7.9	5.8							
		0.10		IC [3]	22	16.5		11										
				max. IA [4]	14.4	13.0	9.1	8.9	6.5									
		0.15		IC [3]	16.5		11											
				max. IA [4]	13.6	9.1	8.4	5.7										
	24	0.02		IC [3]	16.5		11											
				max. IA [4]	13.6	10.1	9.1	7.4	5.4									
40 °C	20	0.02		IC [3]				22			16.5			11				
				max. IA [4]				17.8	15.8	13.3	13.5	11.5	9.6	9.1	8.7	7.3	6.5	5.1
		0.05		IC [3]			22			16.5			11					
				max. IA [4]			18.2	16.8	13.0	13.4	11.3	9.1	9.1	7.9	6.4	4.8		
		0.10		IC [3]		22		16.5			11							
				max. IA [4]		18.2	15.9	13.6	12.5	9.2	9.1	7.9	6.1					
		0.15		IC [3]	22		16.5		11									
				max. IA [4]	18.2	15.7	13.6	11.4	9.1	8.7	5.8							
	24	0.02		IC [3]		22		16.5			11							
				max. IA [4]		18.2	14.7	13.6	11.6	9.2	9.1	7.9	6.9	5.1				
45 °C	20	0.02		IC [3]								22			16.5			11
				max. IA [4]							15.1	14.4	13.1	10.3	11.4	11.0	9.5	8.9
		0.05		IC [3]						22				16.5		11		
				max. IA [4]						15.9	15.1	12.0	9.0	11.9	9.5	9.1	9.1	7.9
		0.10		IC [3]				22			16.5			11				
				max. IA [4]				17.8	16.7	13.3	13.5	11.5	9.6	9.1	8.7	7.3	5.3	3.7
		0.15		IC [3]			22		16.5			11						
				max. IA [4]			18.2	15.8	13.6	13.4	9.6	9.1	8.9	6.6	4.9			
	24	0.02		IC [3]					22			16.5			11			
				max. IA [4]					16.7	15.0	11.7	12.9	11.0	9.2	9.1	8.4	7.6	6.3
50 °C	20	0.02		IC [3]												22		
				max. IA [4]											12.8	12.3	11.3	9.0
		0.05		IC [3]									22				16.5	
				max. IA [4]									13.8	13.3	12.1	9.6	10.7	10.3
		0.10		IC [3]						22				16.5			11	
				max. IA [4]						15.8	15.1	14.4	11.5	11.9	11.4	9.2	9.1	8.9
		0.15		IC [3]				22				16.5			11			
				max. IA [4]				17.8	16.7	15.8	12.6	12.9	11.7	9.1	9.1	8.4	7.1	5.7
	24	0.02		IC [3]								22				16.5		
				max. IA [4]								14.4	13.8	11.8	9.9	11.0	10.1	8.9

Tab. 14: Output data Fonterra Base Flat 12

105	110	115	120	125	130	135	140	145	150	155	160	165
	30		31		32			33		34		35
11												
8.6	7.9	7.2	6.1	5.0								
11												
6.7	5.7	4.7										
11												
5.6												
16.5			11									
10.0	9.7	9.0	7.9	7.7	7.5	7.3	7.0	6.3	5.3	4.4		
16.5	11											
8.9	8.3	8.1	7.9	7.3	6.3	5.2	4.1					
11												
8.1	6.5	5.3										
11												
3.6												
11												
8.6	8.3	8.1	7.1	6.2	4.9							

Key for the output data Base with PB pipe 12 x 1.3mm

[1] RT 20 °C	Room temperature = 20 °C (living rooms)
[2] RT 24 °C	Room temperature = 24 °C (bathrooms)
[3] IC	Installation clearance [cm]
[4] max. IA [m²]	max. installation area [m²]
[5] Floor covering	Thermal resistivity of floor covering $R_{\lambda,B}$ = 0.02 m² K/W: with tiles 5 mm $R_{\lambda,B}$ = 0.05 m² K/W: with parquet 10 mm $R_{\lambda,B}$ = 0.10 m² K/W: with carpet 7 mm $R_{\lambda,B}$ = 0.15 m² K/W: with thick carpet

Tab. 15: Key for the output data Base with PB pipe 12 x 1.3mm

Reading example Base Flat 12

Supply temperature	40 °C
Room temperature	20 °C
Floor covering	Rλ,B = 0.1 m² K/W
Floor heating area	16 m²
Heat flow density	50 W/m²
mean floor surface temperature	25 °C
Recommended installation clearance	IC 16.5
Max. heating circuit area	13.6 m²
16.0 m² must be covered; therefore	**2 heating circuits**

Tab. 16: Reading example Base Flat 12

Pressure loss diagram PB pipe 12 x 1.3 mm

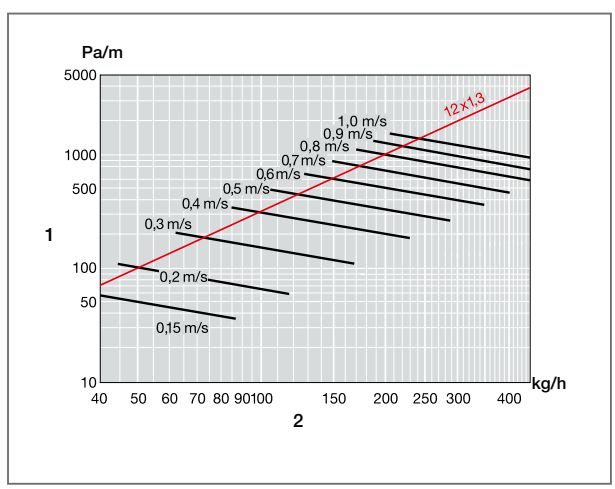


Fig. 32: Pressure loss diagram PB pipe 12 x 1.3 mm

Key
① Pressure gradient R [Pa/m]
② Mass flow m [kg/h] (fluid: water)

Output diagrams Fonterra Base Flat 12

Heating pipe PB 12 x 1.3 mm, cement screed with Fonterra Base screed additive Flat 12 with 15 mm coverage over dimple

$R_{\lambda,B}$ = 0.02 m² K/W

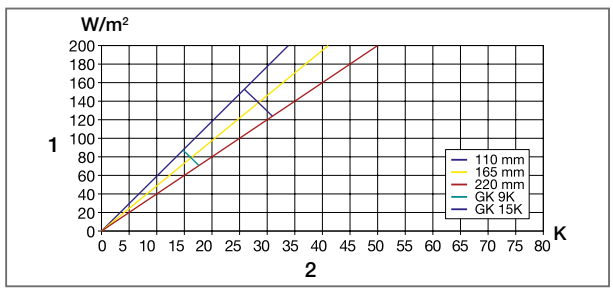


Fig. 33: $R_{\lambda,B}$ = 0.02 m² K/W

$R_{\lambda,B}$ = 0.05 m² K/W

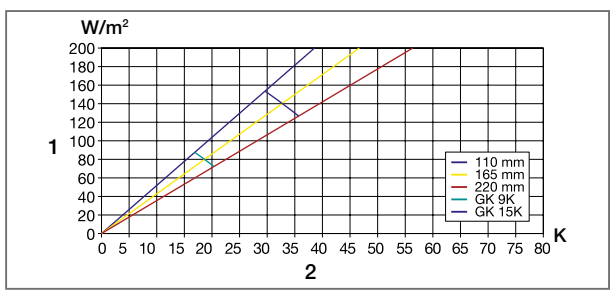


Fig. 34: $R_{\lambda,B}$ = 0.05 m² K/W

$R_{\lambda,B}$ = 0.10 m² K/W

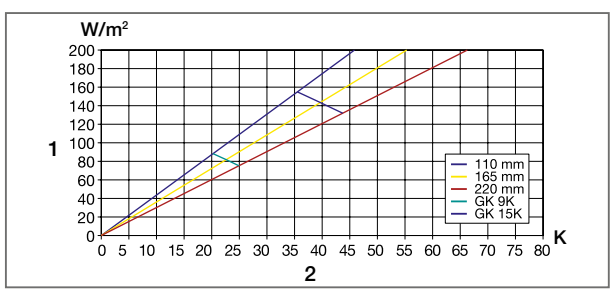


Fig. 35: $R_{\lambda,B}$ = 0.10 m² K/W

$R_{\lambda,B}$ = 0.15 m² K/W

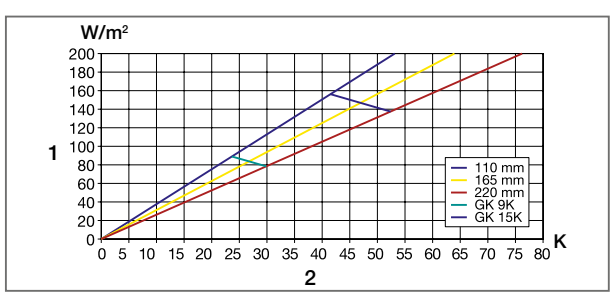


Fig. 36: $R_{\lambda,B}$ = 0.15 m² K/W

Key

① Heat flow density [W/m2] ② Overtemperature of fluid [K]

Mounting

Structural requirements

- Laws, directives, and statutory regulations are not only applicable for new buildings but also for structural changes of a certain magnitude to existing buildings. For all of Germany, they are defined in a Model Building Regulation, or in the building regulations of the respective Federal State.
- Plastering work must be completed, and the wall plaster must be applied up to the raw concrete floor.
- Any concerns must be raised immediately. Do not start any work before all defects have been remedied.
- When planning the heating circuits, coordinate the heating circuits and the screed fields. Diagonal crossing of movement joints in the substrate by heating pipes is not permitted.
- Windows and external doors must be installed.
- By means of the setting out point specified for constructional purposes, check for each storey that the required construction height is available everywhere.
- To receive the floating heating screed, the underground must be sufficiently dry and have a level surface. It must be free of raised points, pipelines etc. which may result in differences in the screed thickness. The tolerances of the elevation and the inclination of the load-bearing underground must be executed according to DIN 18202, Table 3 line 2a "Measuring tolerances in buildings". Compensation must be provided to level out the surface for reception of the system panels. When applying a compensation layer, manufacturer's instructions regarding the priming or bonding coat and the additional weight load must be taken into consideration.
- In accordance with DIN 18560 part 2, "Waterproofing against soil moisture" and "non-pressing water" must be specified by the building planner and provided before installing the screed (see DIN 18195-4 and DIN 18195-5). The work should be done by a qualified installation company.
- It is imperative that polystyrene heat insulation is protected with a PE foil against building waterproofing containing bitumen.
- The planner must specify whether a diffusion-resistant foil must additionally be installed below the surface heating as a precaution against any subsequent building defects from residual moisture.
- Closed rooms free of air draughts are the precondition for deformation-free drying of the system areas. Protect freshly installed surfaces from sunlight and heat. Even air exchange should be present during drying.

Storage

- Before installation, Fonterra system panels should be stored laying flat on a clean, dry, and frost proof underground.
- Wait until immediately before mounting the panels before you remove the packaging.

Installation of a surface heating system

- On take-over of the construction site before the start of the installation work, the underground must be cleaned. Check for cleanliness, setting out point, and levelness tolerances.
- Attach edge insulation strips continuously along all the enclosing walls and fittings such as door frames, pillars etc.
- Laying the Viega Fonterra system elements starts in the left corner of the room. Observe the Viega mounting instructions.
- To prevent raising of the system surfaces at the edges, lay the system pipes free of tension.
- Thanks to the overlapping of the snap plates, the installed layer is completely closed and suitable for cement screed application once the pipes for the underfloor heating have been laid.
- Cover the entire surface free of joints and hollow spaces.
- Mask any open spaces existing for object-specific reasons.

Connection to the manifold

To provide for unobstructed routing of the pipes in the manifold area, manifolds should be installed in a very central position. According to DIN EN 1264-4, the heating and cooling circuit manifolds must be arranged in such a way that the supply pipes are as short as possible. Otherwise, the supply pipes may have a negative effect on the regulation of the room temperature.
For manifolds with up to six heating circuits, the supply lines can be installed in the Fonterra Base snap plate 12/15. Manifolds with more than six heating circuits can be connected with the Base manifold-door set; here, use a clamping rail 12 (model 1234) to fix the supply lines.

Edge insulation strip

With heating screeds, the edge insulation strips must allow for at least 5 mm of movement. Corresponding edge insulation strips (edge joints) must be installed at the walls and other upright building elements, such as door frames or columns etc. Here, the adhesive film of the edge insulation strip must be at screed level and it must not be above the finished screed.

Wait for completion of the floor covering before trimming off any parts of the edge insulation strip projecting beyond the surface of the ends of the floor (DIN EN 1264-4 – special service acc. to VOB (Construction Tendering and Contract Regulations) part C, or DIN 18299).
Gaps cause noise bridges and may result in cracking of screed and floor covering.

For Fonterra Base Flat 12, use edge insulation strip 90/10 mm. Attach it so that it extends from the underground to the upper edge of the floor covering.

Arrange the film flaps of the edge insulation strip free of tension under the Fonterra Base snap plate 12/15. When on-site footfall sound insulation is used, place the film flap upon it.
When fixing the edge insulation strip, take care not to produce any noise bridges.(DIN 18560)

System structure

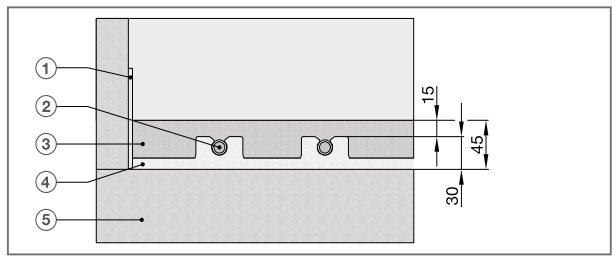


Fig. 37: System structure

Key
① Edge insulation strip 90/10
⑧ System pipe 12 x 1.3 mm
③ Cement screed with Base Flat screed additive
④ System panel Base 12 / 15 ND 11
⑤ Load-bearing underground

Additional insulation layers

Since Fonterra Base Flat 12 is a special system for screed structures in an extremely thin layer, only approved additional insulations may be used.

Footfall sound insulation Knauf Fasoperl TS (11 mm) made of mineral fibre, or a wood fibre insulation panel, e.g. Knauf Fasoperl A 8 (8 mm), can be installed on site under the Fonterra Base snap plate 12/15 smart.

Pipes on the underground are not permitted, and cannot be integrated in insulation layers.

Screeds and screed additives
Floating screeds must meet the general requirements defined in DIN EN 13813 and DIN 18560-1.
By means of the special Fonterra Base screed additive, the total system height can be reduced to a snap coverage of 15 mm.

Fonterra Base Flat 12 complies with building type A according to DIN 18560
- Systems with pipes within the screed

Building type A

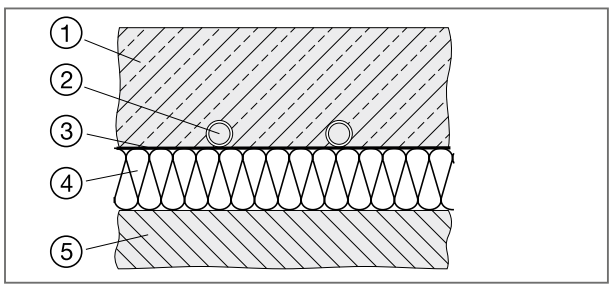


Fig. 38: Building type A

Key
① Screed
② Heating element
③ Cover
④ Insulation layer
⑤ Load-bearing underground

Comply with the following installation instructions:
If the surface of the floating screed, or screed installed on separation layer, is in an incline, a similar incline must already be provided in the load-bearing underground to ensure even thickness of the screed layer.

With hot water underfloor heating system, a mean temperature of 55 °C must not be permanently exceeded in the cement screed in the area of the heating elements.

Surface temperatures
DIN EN 1264-2 defines the maximum permissible surface temperatures with heated floor surfaces:
- 29 °C in living areas
- 35 °C in border zones
- 33 °C in bathrooms

Joints

Arrangement and formation

A joint plan must be generated which shows the type and arrangement of the joints.
Movement joints must be provided in the screed above the building joints. Furthermore, joints (edge joints) must be provided to separate the screed from upright building parts. Any additional joints required must be arranged in such a way that compact fields are created.

Depending on their function, the following joint types are differentiated according to DIN 18560 "Floor screeds in building construction":

- Movement joints
- Edge joints
- Concealed joints

Movement joints

Movement joints absorb movements of the screed in all directions. They completely separate the screed right up to the system panel or the heat and footfall sound insulation. If connection lines cross a movement joint, joint protection must be provided over a length of 300 mm for joints installed at the crossover point.
These movement joints must be provided along the same lines in the floor covering.

Edge joints

Edge joints separate the screed from all enclosing surfaces, but also from building parts in the room such as columns, stairs, or room partition elements. Edge insulation strips 90/10 provide for the 5 mm minimum movement clearance specified in the DIN standard.
Do not trim off the movement and edge joint insulation strips before completion of the floor covering work respectively joint filling for hard floors. Finally, they must be permanently sealed when the tile surface is laid.

Concealed joints

Concealed joints, also called trowel grooves, can additionally relieve the tension in screed fields already separated by movement joints.
They can for example be made in door passages where real movement joints are not mandatory. A trowel groove must cut off max. the top third (10 mm) of the screed panel. Take care not to damage the pipes. After hardening, the groove is sealed e.g. with synthetic resin; it must not be superimposed as a joint in the tile surface or similar.

Only supply lines (e.g. to the manifold) may be guided through the joints.

Screed fields of 40 m² and more and a side ratio of max. 2:1 or screed fields of 60 m² and more and a side ratio of max. 3:2 as well as side lengths of more than 8 m must be separated by movement joints.
Generally, a side ratio of a/b < 1/2 must not be exceeded. According to DIN EN 1264-4, any irregularly formed areas must be separated off with joints; the aim is to have only rectangular areas with the above-specified dimensions.

For T- or L-shaped rooms, Viega recommends to create rectangular or square screed fields.
Floating heating screed or screed on separating layer is subject to length expansion. For cement screed, the heat expansion coefficient is 0.012 mm/m K.

Supply lines through movement joints

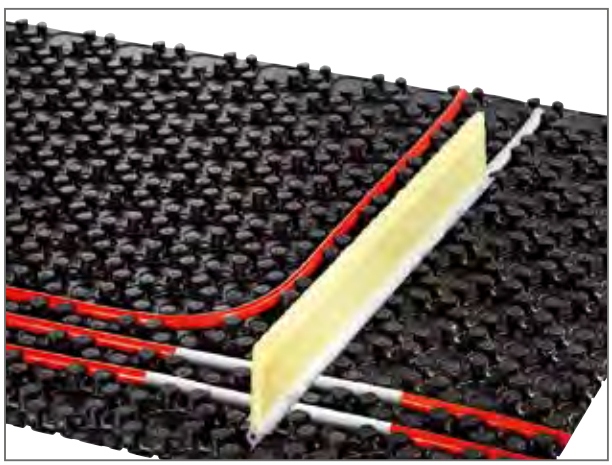


Fig. 39: Supply lines through movement joints

If movement joints are guided through supply lines, the joints must be protected. This is done by means of a slit joint protection. Next, the round profile is pushed between the pipes or over the entire length of the expansion joint into the snap plate.
Finally, the expansion joint profile is placed over the round profile and glued to the system surface. The round profile separates the screed in the required form in the snap plate area, the expansion joint profile separates it in the coverage area.
To achieve a proper formation of the expansion joint, apply the screed evenly into the room, starting from both sides of the expansion joint profile.

Functional heating

With cement screed with Fonterra Base screed additive, functional heating can already be carried out after five days (or after seven days with a room temperature of < 15 °C) in accordance with DIN EN 1264-4.

Functional heating starts with a supply temperature of 25 °C which must be maintained for at least two days; after that, the temperature must be increased to 35 °C for two days. Next, the maximum design supply temperature must be set and maintained for at least three days. Functional heating must be documented. For documentation, the sample in the appendix to this brochure (Functional heating) can be used.

Any shrinkage cracks must be force-fit sealed, e.g. with synthetic resin. Before the floor covering is installed, another course of heating according to CM log is recommended, the 'readiness-for-covering heating'.

The floor layer must ascertain the residual moisture of the screed in at least three measuring points per 200 m² heating area, or per apartment. He decides when the screed is ready for floor laying.

Note on CM measurement

With the system Fonterra Base **Flat 12, using the special screed additive Base Flat reduces the value from the conversion table of the manufacturer of the CM device as follows:**

- 0.8 CM % up to day 14
- 0.3 CM % up to week 5

The following limit values are specified for the screed curing process of heated cement screeds:

- Textile/elastic coatings, parquet, laminate 1.8CM %
- Ceramic tiles or natural/artificial stones 2.0CM %

Coordination between the heating installers, screed installers and floor layers is necessary. For information, refer to the brochure "Schnittstellenkoordination bei beheizten Fußbodenkonstruktionen" (Interface coordination with floor constructions) of BVF Hagen or on the Internet at: www.flaechenheizung.de.

Assembly steps

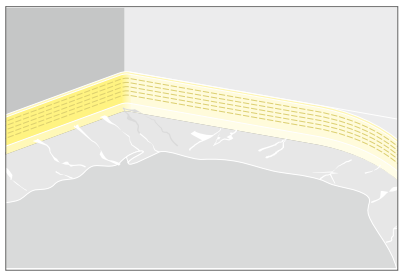


Fig. 40: Lay and fasten the edge insulation strips.

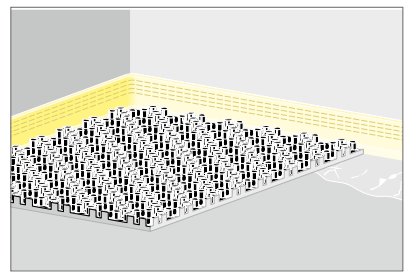


Fig. 41: Lay the Fonterra Base snap plates from left to right. Arrange the film flaps under the snap plate.

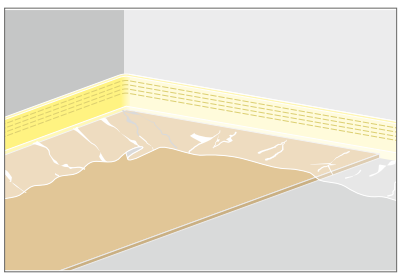


Fig. 42: Lay footfall sound insulation if applicable. Arrange the film flaps on the insulation.

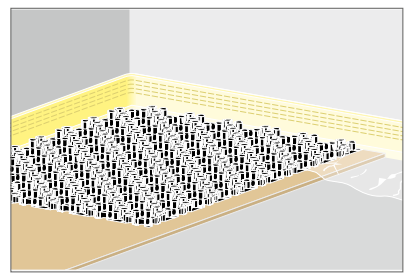


Fig. 43: Laying the Fonterra Base snap plates free of hollow spaces over the entire surface. Arrange the film flaps under the snap plate.

Fig. 44: Lay the pipes in accordance with the calculated data.

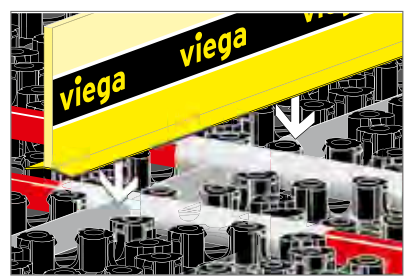


Fig. 45: Provide the expansion joints.

Floor coverings

General

Floor coverings installed in connection with underfloor heating must be approved for this use and have a thermal resistivity ≤ 0.15 m² K/W. The installation work must be carried out properly; it starts as soon as the readiness for covering has been ascertained. This is done by measuring the residual moisture of the screed in the places where Viega measuring point sets have been installed. The measurement is done by means of a CM instrument.

Before the floor covering is installed, the floor layer must establish the suitability of the covering for installation on the screed, as specified in DIN EN 1264-4.

According to DIN EN 14259, adhesives must be suitable for creating a solid and permanent connection. They must have no negative effects on the floor covering or the underground and must not emit any disagreeable smell after application.
The floor temperature should be between 18 °C and 22 °C, the relative humidity between 40 and 65%.
For edge and expansion joints, only permanently elastic filling is permitted, or they must be covered with a joint profile.

The installation instructions for floor covering and their processing in this document apply generally. For detailed information on suitability and installation, refer to the applicable standards and regulations and the information by the respective associations. The relevant processing guidelines of the individual system providers must be observed as well.

In respect of any further work steps such as
- flooring work
- working with scaffolding
- heavy equipment set up on the heating screed
- storage of tiles,

make sure that the max. payload of 2 kN/m² in this area is not exceeded. This can be achieved for example by using on-site load distribution layers.

Natural or artificial stone coverings

Natural or artificial stone coverings are very popular; thanks to their small thermal resistivity of 0.012 m^2K/W for ceramic tiles and 0.010 m^2K/W for natural stone coverings, they are particularly well suited for surface heating systems. Tiles and panels must have been approved by the manufacturer for thin bed laying; they must have a max. edge length of 35 x 35 cm for natural stone and 40 x 40 cm for terracotta.
Get technical advice if you wish to use tiles of greater edge lengths or lay them onto an approved additional insulation layer.

Natural or artificial stone coverings as floor covering

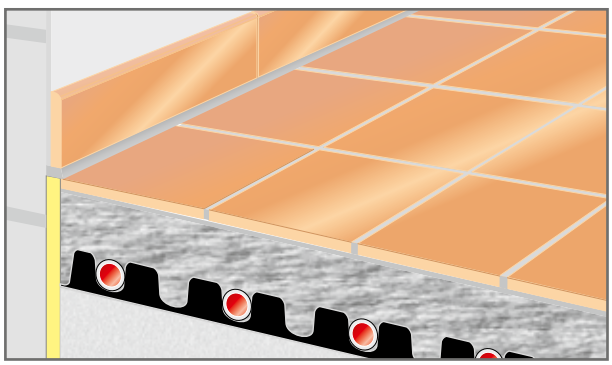


Fig. 46: Natural or artificial stone coverings as floor covering

Textile / elastic floor coverings

Textile / elastic floor coverings are suitable for use with underfloor heating systems if marked accordingly.
Due to their higher thermal resistivity, they need a higher supply temperature than ceramic coverings, but they show better results than stone floor coverings in terms of compensation for the ripple of the floor temperature profile.
Elastic or textile floor coverings must be glued over the entire surface.
The installation work must be done according to the regulations of DIN 18365 and the manufacturers' instructions.

Textile / elastic floor coverings

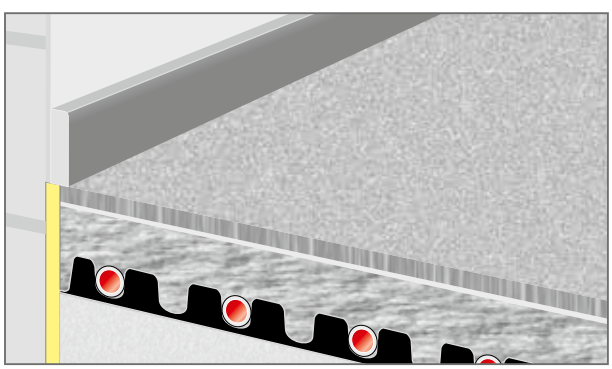


Fig. 47: Textile/elastic floor coverings

Parquet, laminate

Parquet coverings must be laid in compliance with the manufacturers' installation instructions.
The moisture content for multi-layer parquet must be noted; it can be found in the respective standards.
Three-layer parquet can be laid without ("floating") or with adhesive (note manufacturer's information). Use adhesive which is shear-resistant and described by the manufacturer as "suitable for underfloor heating" and "heat ageing resistant".
Due to their marked swelling and shrinking behaviour, solid one-layer parquets are not suitable for laying on Fonterra Base Flat 12 system surfaces.

Parquet or laminate as floor covering

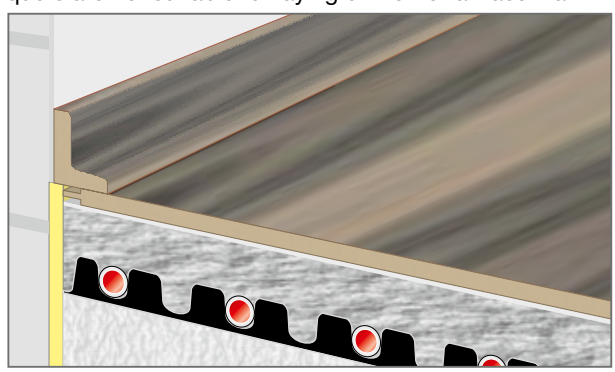


Fig. 48: Parquet or laminate as floor covering

Timber floors on underfloor heating systems tend to show increased swelling and shrinking movements. Thus, widening of the joints must be expected during the heating season. This is not a quality defect. Keeping a constant climate of approx. 20 °C and 50% relative humidity helps to reduce this joint formation.
Also note the parquet manufacturer's recommendations.

Functional heating

We recommend to retain the document.

Building project		Date	
Building owner's address			
Address of the qualified installation company			

Heating of cement-bonded heating screed must be carried out according to EN 1264-4 – Hot water underfloor heating systems and interface coordination with heated underfloor structures.
– The other regulations must be observed as well –

If cement screeds are prepared with Fonterra screed additive Base Flat, functional heating can take place sooner:

- ☐ with a room temperature of > 15 °C, after five days
- ☐ with a room temperature of 5 to 15 °C, after seven days

This deviation from the standard is a piece of manufacturer's information which has proven its worth in practical application for years, and thus must be considered as state-of-the-art.

General notes

- ☐ The heating process must be slow and continuous.
- ☐ The rooms must be ventilated but air draughts must be avoided.
- ☐ After functional heating, the screed must be protected from air draughts and excessively fast cooling.
- ☐ The heated floor surface must be free of building material and other covers/weight placed upon it.
- ☐ Heat for two days at 25 °C supply temperature, then for two days at 35 °C supply temperature, next three days at a maximum design supply temperature (max. 55 °C).

Materials used	Pipes:	☐ 12 x 1.3 mm
	Screed type:	
	Screed additive:	

Functional heating log

with supply temperature 25 °C	Start:		End:
with supply temperature 35 °C	Start:		End:
with maximum design supply temperature in the supply line	Start:		End:
Interruptions:	☐ yes	from: to:	☐ no

The system was approved for further building work at an outside temperature of °C.

- ☐ At this point, the system was out of operation.
- ☐ At this point, the floor was heated at a supply temperature of °C.
- ☐ All windows and external doors were closed.

The moisture content of the screed must be determined before starting the tiling, floor covering, or parquet laying work by measurement at the screed panel after it has cooled down (1 to 2 days after the end of functional heating).

Comments

Building owner	**Site management**	**Qualified installation company**
Date/signature/stamp		

Pressure test

After completion of the installation work and execution of the pressure test, this document must be handed over to the planner/building owner. We recommend to retain the document.

Building project		Date	
Building owner's address			
Address of the qualified installation company			

Before applying the screed, do a leakage test of the heating circuits using water; as an alternative, compressed air can be used according to DIN EN 1264-4. The leakage test is carried out at the finished but not yet covered pipelines.

Notes on the test procedure

- Fill the system with filtered water and vent it completely.
- In case of major differences (~10 K) between the ambient temperature and the filling water temperature, wait for 30 minutes after filling the system for the temperatures to adjust.
- Carry out the leakage test at a pressure of 0.4 MPa (4 bar), max. 0.6 MPa (6 bar).
- System units not designed for these pressure levels (e.g. safety valves, expansion vessels etc.) must be exempted from the test.
- Visual inspection of the piping system/check per manometer*.
- The pressure must be kept constant during the application of the screed.
- Take suitable measures to exclude freezing, for example room heating or addition of anti-freeze to the heating water.
- If the anti-freeze is not required for normal operation, the system must be cleaned by emptying and flushing with at least three water exchanges.
- The water temperature must be kept constant during the test.

* Pressure gauges must be used which clearly indicate pressure changes of 0.01 MPa.

Materials used	Pipes:	☐ 12 x 1.3 mm
	Pipe connectors:	

Log of the pressure test		
Start of the pressure test:	Start pressure:	Water temperature [°C]:
End of the pressure test:	Final pressure:	Water temperature [°C]:

Visual inspection of pipe connectors carried out?	☐ yes	☐ no
Position of couplings marked in the installation plan?	☐ yes	☐ no
Leak tightness was established, no permanent form changes identified in any component?	☐ yes	☐ no
Has the operating pressure been set on system handover?	☐ yes	☐ no

Comments

Building owner	**Site management**	**Qualified installation company**
Date/signature/stamp		

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