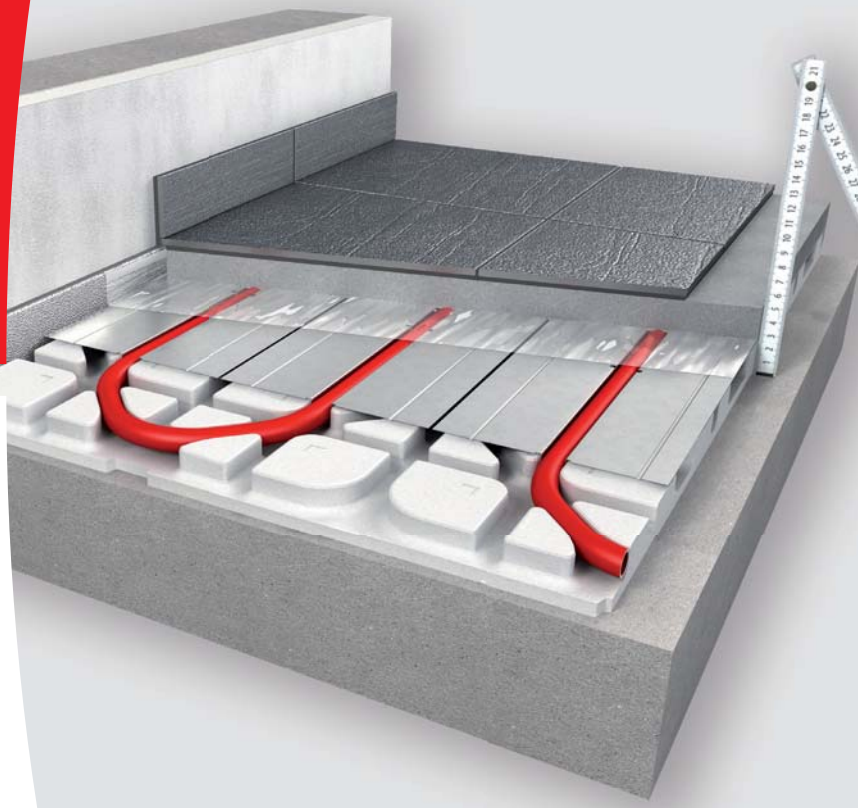
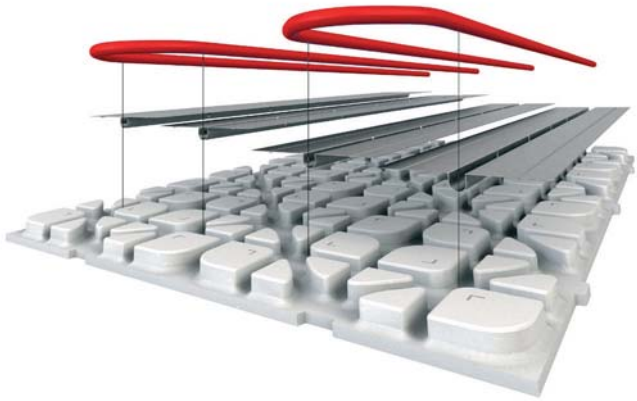
Energy Systems

ClimaComfort® TBS

Technical information and assembly instructions





Living full of energy

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System description

System description

The Roth ClimaComfort® TBS dry construction system is a hot water floor heating system acc. to DIN EN 1264 designed for dry installation. The low installation height and the low mass per unit area make the Roth ClimaComfort® TBS dry construction system ideal for use in buildings undergoing renovation. It is ideally suited for floor heating and cooling systems below dry screed panels or similar load distribution layers. Given certain installation conditions it can also be used for underneath wet screed.

The aluminium heat-conducting lamellae (width 150 mm) ensure uniform distribution of the heating/cooling output. When combined with the diffusion-resistant and dimensionally stable Roth System Pipe Alu-Laserflex ø 14 mm and 16 mm, the result is a perfectly coordinated system for renovation projects or dry construction applications. Pipes can be laid on the Roth ClimaComfort® dry construction system panels in a coiled or a meandering pattern at an installation spacing of 15 cm, 22,5 cm and 30 cm.

System benefits

The Roth ClimaComfort® TBS is suitable for use in new or existing property as well as all building types specified in DIN EN 1264, such as residential, office and commercial buildings or other buildings used for comparable purposes. The maximum permissible imposed loads specified for the approved load distribution layers must be taken into account here.
Roth ClimaComfort® TBS is especially suitable for renovations or building projects in which wet screed should not be used, e.g. in listed (historical) buildings. Drying times as in the case of screeds need not be observed. Given the low installation height and low mass per unit area, Roth ClimaComfort® TBS is also ideal when fitting out attics or for wooden beam ceilings. Thanks to the installation structure of the system panel there is no problem in adapting the radiant heating to complicated room geometries. The installation grid can be used horizontally, vertically and even diagonally if wished. The system is registered with and monitored by DIN CERTCO. It is characterised by its low installation height and mass per unit area, short commissioning procedure and fast reaction time.

DIN CERTCO
Gesellschaft für Konformitätsbewertung mbH

ZERTIFIKAT

Zertifikatinhaber	Roth Werke GmbH Am Seerain 35232 Dautphetal
Produkt	Raumflächenintegrierte Heiz- und Kühlsysteme mit Wasserdurchströmung in Fußböden, Decken und Wänden
Typ, Modell	ClimaComfort TBS
Prüfgrundlage(n)	DIN EN 1264-2:2009-01 DIN EN 1264-4:2009-11 Zertifizierungsprogramm Raumflächenintegrierte Heiz- und Kühlsysteme mit Wasserdurchströmung (2009-11)
Konformitätszeichen	DIN Geprüft
Registernummer	7F402-F
Gültig bis	2018-03-31
Nutzungsrecht	Dieses Zertifikat berechtigt zum Führen des oben stehenden Konformitätszeichens in Verbindung mit der genannten Registernummer. Weitere Angaben siehe Anhang.

DAkkS Deutsche Akkreditierungsstelle D-ZE-11125-01-00

2013-04-10
Dipl.-Ing P. Suxdorf
Geschäftsführer

DIN CERTCO

DIN

DIN CERTCO Gesellschaft für Konformitätsbewertung mbH - Alboinstraße 56 - D-12103 Berlin - www.dincertco.de

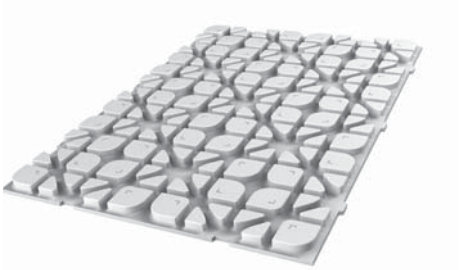
System description

Thermal comfort

The heating and cooling modes of Roth ClimaComfort® TBS allow thermal comfort to be achieved for each room – not just in new constructions, but also in existing buildings. According to DIN EN ISO 7730 perceived temperatures of between 20 °C and 24 °C are permissible for heated rooms, with a value of 22 °C deemed optimum.

In summer, perceived temperatures of 20 °C to 27 °C are permitted in day rooms. In terms of thermal comfort, a value of between 23,5 °C and 25,5 °C is considered to be ideal for sedentary activities.

System components



Roth ClimaComfort® dry construction system panels

Technical data	
Material	EPS DEO WLG 033
Thermal conductivity category (WLG)	033
Thermal resistance R_A [m²K/W]	0,75
Dimensions [mm]	900 x 600 x 25
Effective installation area [m²]	0,54
Pipe dimension [mm]	Ø 14 and Ø 16 Alu-Laserflex system pipe
Installation spacing [cm]	15/22,5/30/diagonal: 20
Maximum system temperature [°C]	50
Load distribution layer of floor	Dry screed panels
Permissible long-term compressive strain [kN/m²]	≤60
Building material class	B2 DIN EN 13501-1 Class E
Weight [kg]	0,27
Mass/m² without load distribution layer [kg/m²] (including lamella, water and system pipe)	3,2 (with installation spacing of 15 cm)

System description

Roth heat-conducting lamella Ø 14 mm and 16 mm, AL

Technical data		
Pipe dimension [mm]	Ø 14	Ø 16
Material	Aluminium	
Predetermined breaking point [mm]	in grid 150, 300, 450	
Dimensions [mm]	900 x 150 x 0,5	
Thermal conductivity [W/(mK)]	235	
Weight/unit [g]	200	

Roth System Pipe Alu-Laserflex Ø 14 mm and 16 mm

Technical data		
Pipe dimension	Ø 14 mm/100 m/11 kg, 240 m/26 kg, 600 m/66 kg	ø 16 mm/200 m/20 kg, 600 m/59 kg
Properties	Excellent dimensional stability	
Colour	red	
Pipe layers	5-layer pipe	
Thermal conductivity [W/(mK)]	0,35	
Linear elongation coefficient [1/K]	$0,3 \times 10^{-4}$	
Building material class	B2	
Min. bending radius	5 x da (bending spring can be used)	
Pipe roughness	0,007	
Water capacity [l/m²]	Ø 14: 0,079	Ø 16: 0,11
Max. temperature over long term [°C]	70	
Max. temperature over short term [°C]	95	
Max. pressure [bar]	6	
Testing and certification basis	DIN 4726, DIN ISO 22391	
Approval number	DIN CERTCO 3V332	
Connection technology	Roth PPSU PressCheck®, Roth MS PressCheck®, Roth MS screw connector	
Optimal installation temperature [°C]	-20 °C to +40 °C	
Permissible water additives	Roth antifreeze FKN 28	

System description

Roth PE Cover Film

Technical data	
Material	PE film
Dimensions	50 m x 1,5 m x 0,2 mm (75 m²)

Roth CC Connection Panel

Technical data	
Material	EPS DEO WLG 035
Dimensions [mm]	1000 x 500 x 25
Thermal conductivity category (WLG)	035
Thermal resistance R [m² K/W]	0.71
Permissible long-term compressive strain [kN/m²]	≤45

Roth CC pipe guide panel, ø 14 and 16 mm

Technical data	
Material	EPS DEO WLG 031
Dimensions [mm]	1200 x 625 x 25 (provides 10 segments)
Thermal conductivity category (WLG)	031
Thermal resistance R [m² K/W]	0,75
Permissible long-term compressive strain [kN/m²]	≤35
Area of application	Optional for installing inlet lines and connections in area of manifold connection or as edge support

System description

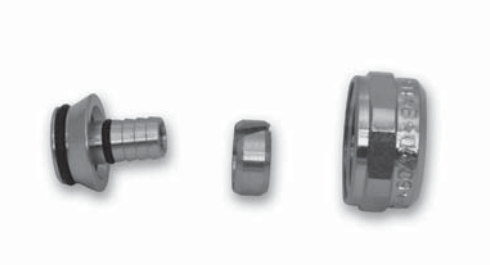
Roth PE foam for impact sound insulation

Technical data	
Material	Permanently elastic, extruded PE foam
Dimensions	50 m x 1 m x 6 mm (50 m²)
Improved impact sound insulation	ΔL_{WP} = 19 dB

Roth edge insulating strip 130 mm

Technical data	
Material	PE foam, blue with PE film
Dimensions	Foam: 25 m x 8 mm x 130 mm Film: 180 mm x 0,035 mm

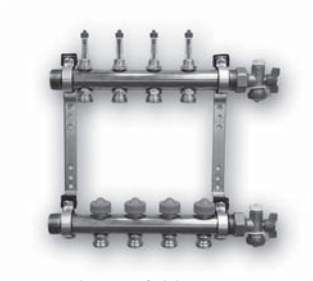
System description



Roth universal screw connection Ø 14, Ø 16 mm

Roth Pipefix Ø 14 and 16 (for e.g. connection pipes)

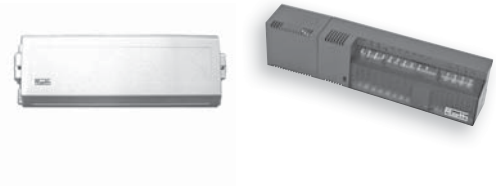
Roth room thermostats (radio and cable version)



Roth manifold

Roth actuators

Roth manifold cabinets



Roth connection modules
(heating/cooling, radio and cable version)

Please note that functionality and the validity of Roth's guarantee can only be guaranteed if compatible system components are used.

Set-up and configuration

Design criteria

Room temperatures for underfloor heating
According to DIN EN 12831, the following room temperatures for heated rooms form the basis of the underfloor heating calculation:

Room type	Standard indoor temperature ϑi [°C]
Living rooms and bedrooms	+20
Offices, meeting rooms, exhibition rooms	+20
Hotel rooms	+20
Sales rooms, shops (general)	+20
Classrooms (general)	+20
Theatre, concert and event rooms	+20
Bath and shower rooms, swimming pools, changing rooms, any use in undressed area	+24
WC rooms	+20
Heated side rooms (corridors, stairwells)	+15

Different temperature requirements must already be provided when calculating the performance data.

Maximum temperature in the screed

The manufacturer's instructions for the dry screed panels must be followed.

Surface temperature with underfloor heating

For well-being, the maximum temperature difference between room temperature and surface temperature of the floor in areas where people spend time and also around the edges is limited to 9 °C and a maximum of 15 °C.

The power output is therefore limited by the limit curves for 9 K and 15 K.

Space (room temperature) [°C]	Maximum surface temperature [°C]
Living rooms, bedrooms and offices (20)	29 (ΔT: 9 K)
Bath, shower (24)	33 (ΔT: 9 K)
Edge areas (20)	35 (ΔT: 15 K)

Dew-point monitoring during cooling

In "Cooling" mode, it must be ensured that the dew-point temperature is not undercut. The cooling water inlet temperature may not be less than 16 °C. Condensation may form at temperatures below 16 °C.

The temperature is prevented from dropping below the dew point by appropriate control systems with dew-point monitoring.

Set-up and configuration

Floor coverings

The floor covering can also be considered in the planning phase. So that an optimum set-up and use of the radiant heating is achieved, the thermal resistance of the desired floor covering ($R_{\lambda B}$) must be applied in the calculation.

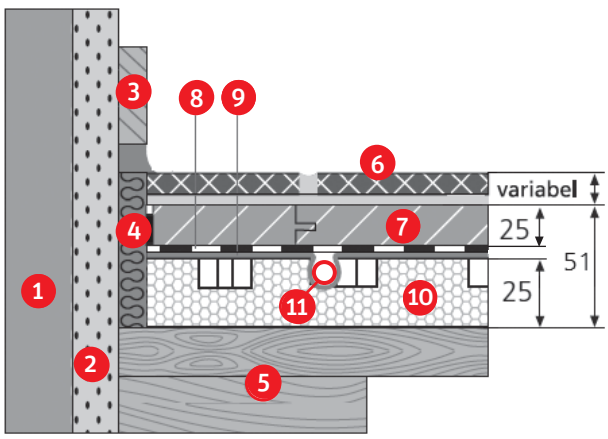
If the value is not known, the value of **$R_{\lambda B}$ = 0,10 m²K/W** is used in the calculation.
Values of **$R_{\lambda B}$ > 0,15 m²K/W** for the floor covering can be agreed in writing if the maximum temperatures for inlet, floor surface and screed are not exceeded.

Planning guidelines for fully adhesive floor coverings on floor heating and cooling systems

Floor covering (Examples)	Thickness [mm]	Thermal conductivity λ [W/mK]	Thermal resistance $R_{\lambda B}$ [m²K/W]
Ceramic tiles	13	1,05	0,012
Marble	12	2,1	0,0057
Quarry tiles	12	1,2	0,010
Precast stone	12	2,1	0,0057
Carpets	variable	variable	0,07 – 0,17
Tufted floor coverings	6,5	0,54	0,12
Linoleum	2,5	0,17	0,015
Plastic covering	3,0	0,23	0,011
PVC covering without support	2,0	0,20	0,01
Mosaic parquet (oak)	8	0,21	0,038
Strip parquet (oak)	16	0,21	0,09
Multiple layer parquet	11 – 14	0,09 – 0,12	0,055 – 0,076

All floor coverings, as well as the adhesive used, must be suitable for floor heating and cooling systems.
The technical documents of the respective manufacturer apply to the use and processing.

Installation layout



1 Wall
2 Internal plaster
3 Skirting board
4 Roth edge insulating strip 130 mm
5 Subsurface (e.g. wooden beam ceilings)
6 Surface covering (e.g. tiles)
7 Dry screed panel
8 Roth PE Cover Film
9 Roth heat-conducting lamella 150 mm (alum.)
10 Roth ClimaComfort® dry construction system panels 600 x 900 mm
11 Roth System Pipe Alu-Laserflex Ø 14 and 16 mm

Set-up and configuration

Interfaces

The planning and creation of floor heating and cooling systems calls for thorough coordination between the different trades, e.g. construction planner, heating engineer, dry construction builder and the screed and floor installers.

When installing floor heating and cooling systems in new buildings, or when renovating existing buildings, the quality of the final result is, to a large extent, dependent on the level of coordination between the different trades during the planning phase and the execution of the project.
Timely coordination avoids mistakes, and with it the extra effort and cost they involve.

Planning requirements

It must be basically established which measures are necessary before installation of Roth ClimaComfort® TBS starts. In the case of a renovation project, planning of the heating and cooling surfaces is a complex process. A guide for performing the as-built survey and planning the works is available in the form of checklists from the brochures of Germany's Federal Association of Surface Heating and Surface Cooling (BVF). They can help with the planning, execution and commissioning of retrofitted embedded radiant heating and cooling systems (http://www.flaechenheizung.de).

An as-built survey of the building structure must be carried out, whereby the structure of the floors, walls or ceilings is assessed by the planner or architect. An energy consultant can also be engaged when planning the heating or cooling performance.

- Determination of the type and thickness of the substructure to calculate the heat transfer coefficients, identify the insulation thicknesses and materials and to establish the heating/cooling output.
- Check calculations to demonstrate that the structural requirements on floor, wall or ceiling structures are satisfied. The deviations in terms of evenness and angles according to DIN 18202 must be observed.
- Existing or planned installation lines (electrical, sanitary, ventilation, chimney, service shaft) must be recorded or provided for.
- as regards maximum loads and additional insulation, the data sheets and specifications of the manufacturers of the load distribution layer selected apply.

Load distribution layers

The manufacturer instructions provided here were correct as at December 2014. In the event of any discrepancies, the latest versions issued by the relevant manufacturers apply.

fermacell

Description	Intended use according to DIN 1055-3*	Load capacity [kN/m²] acc. to DIN 1055-3	Single load [kN]	Dimensions [mm]	Mass per unit area [kg/m²] Dead load [kN/m²]	Thermal conductivity [W/mK]	Building material class
fermacell screed element 2E11	A2, A3, B1, D1	2,0	2,0	1500 x 500 x 20	23 0,23	λ_R = 0,32	A2
fermacell screed element 2E22	A2, A3, B1, B2, D1	4,0	3,0	1500 x 500 x 25	29 0,29	λ_R = 0,32	A2
fermacell Powerpanel TE	A2, A3, B1, B2, D1	4,0	3,0	1250 x 500 x 25	25 0,25	λ_R = 0,173	A1

* See table of intended uses and building types

Set-up and configuration

Maximum tile sizes, fermacell

Screed element layers with hot water underfloor heating	Intended use*	Screed element 2E11	Screed element 2E22	Powerpanel TE
Permissible edge lengths [mm] of porcelain stoneware tiles ≥9 mm thickness	A2, A3, B1, D1	330	600	600
Permissible edge lengths [mm] of porcelain stoneware tiles ≥15 mm thickness	A2, A3, B1, D1	330	450	450
Height of additional insulation, maximum 1 layer				
EPS DEO 150 kPa [mm]		40	60	60
EPS DEO 200 kPa or XPS DEO 300 kPa [mm]		70	90	90
XPS DEO 500 kPa [mm]		110	130	130

* See table of intended uses and building types

Fermacell guidelines for tile sizes >330 mm

Fermacell guidelines for tile sizes >330 mm	
Laying template	Lay tiles only with joints running straight (continuous joints); do not offset joints
Laying techniques	Lay tiles using thin-bed or medium-bed method (except on gypsum screed elements)
Tile geometry	Side ratio 1:1 to 3:1
Levelling beneath the above screed layers (without reducing tile edge length)	10 to 30 mm fermacell levelling filler with cover panel made from 10 mm fermacell gypsum board or
	fermacell ground levelling compound or
	fermacell bonded filler
Covering	Sufficiently bend-resistant solid covering or stacked timber planks or
	Sufficiently bend-resistant wooden-beam covering, sagging of cover beams and planking limited to max. 1/500
Intended use*	These installation layout recommendations apply only to intended use 1 (e.g. rooms and hallways in residential buildings) Per. single load 1,0 kN; per. load capacity 1,5 (2,0) kN/m², A2, A3
Only use system-compatible products (primers, tile adhesives etc.) that have been approved by the manufacturer for the appropriate intended use, tile sizes and surfaces. The joint is created only once the tile adhesive is completely dry (follow manufacturer's instructions!). These installation layout recommendations are based on internal testing; all installation work must be executed by professionals in order to achieve these results. Follow the latest application instructions published by fermacell GmbH and Roth Werke GmbH! The current version applies. The current terms and conditions of fermacell GmbH apply; see http://www.fermacell.de/de/content/geschaeftsbedingungen.php	

* See table of intended uses and building types

You can find further information at www.fermacell.de.

Set-up and configuration

Rigips

Description	Intended use according to DIN 1055-3*	Load capacity [kN/m²] acc. to DIN 1055-3	Single load kN	Dimensions [mm]	Mass per unit area [kg/m²] Dead load [kN/m²]	Thermal conductivity [W/mK]	Material class
Rigips Rigidur screed element 20	A2, A3, B1, B2, D1	3	3	500 x 1500 x 20	24,1 0,241	λ_R = 0,2	A2
Rigips Rigidur screed element 25	A2, A3, B1, B2, D1	3	3	500 x 1500 x 25	30,1 0,301	λ_R = 0,2	A2

* See table of intended uses and building types

The non-clad screed elements have been specially designed for the installation of underfloor heating. The hard foam layer surrounding the pipes must meet the quality standards of EPS DEO 150 kPa as a minimum. This also applies to additional heat insulation layers.

If the underfloor heating system is to be built on a concrete panel or cover, the concrete surface must be covered with a 0,2-mm PE film. The inlet temperature of the underfloor heating system is limited to 50 °C.

Tiling and natural stone panels
When laying using the thin-bed method, compatible tiles can be laid on any Rigidur screed element.

- The maximum edge length for ceramics and natural stones should not exceed 330 mm. Due to the manufacturing methods used, larger tile sizes cannot deliver the level finish that is required for the thin-bed method. This approach would result in hollow gaps under the tiles, which increases the risk of cracking.
- The tile adhesives and mortars used must be explicitly labelled as suitable for use with gypsum dry screeds. If the tile adhesive manufacturer indicates that a specific system primer is required, this primer should be applied, in spite of the fact that the screed elements have already been primed ex-works.
- Any expansion joints in the dry screed and subsurface must be taken into account when laying the tiles. Expansion joints must be sealed using a suitable, permanently elastic joint sealant.

The current versions of the manufacturer's product documentation apply. You can find further information at www.rigips.de.

Norit

Description	Intended use according to DIN 1055-3*	Load capacity [kN/m²] acc.to DIN 1055-3	Single load [kN]	Dimensions [mm]	Mass per unit area [kg/m²] Dead load [kN/m²]	Thermal conductivity [W/mK]	Building material class
Dry screed Norit-TE 20	A2, A3	2	1	1200 x 600 x 20	25 0,25	λ_R = 0,4	A2
Dry screed Norit-TE 25	A2, A3, B1, B2, D1	3	3	500 x 1500 x 25	31 0,31	λ_R = 0,4	A2

* See table of intended uses and building types

Permissible tile sizes:
Tiles measuring up to 330 x 330 mm can be laid as standard without any additional measures being required. If larger tiles are used, decoupling layers are required. The addition of further layers may reduce the heating or cooling performance.

The current versions of the manufacturer's product documentation apply. You can find further information at www.lindner-norit.com.

Set-up and configuration

Creaton clay tile

Description	Intended use according to DIN 1055-3*	Load capacity [kN/m²] acc.to DIN 1055-3	Single load [kN]	Dimensions [mm]	Mass per unit area [kg/m²] Dead load [kN/m²]	Thermal conductivity [W/mK]
CREAPUR	without filler: A2, A3, B1, B2, B3, C1, C2, C3, D1, D2	5	4	400 x 180 x 20	38,25 0,38	λ_R = 0,41
KERATOP	without filler: A2, A3, B1, B2, B3, C1, C2, C3, D1, D2	5	4	500 x 250 x 20	40 0,40	λ_R = 0,41

* See table of intended uses and building types

- "Creaton clay tile"
- Roth ClimaComfort® TBS
- Levelling filler

Installation height
45 mm

- "Creaton clay tile"
- Roth ClimaComfort® TBS
- Styropor EPS 035 DEO (200 kPa) (max. 2 layers)
- Levelling filler

Installation height
to 110 mm

- "Creaton clay tile"
- Roth ClimaComfort® TBS
- Styrodur XPS 500 kPa (max. 3 layers)
- Levelling filler

Installation height
up to 60 mm (1 layer XPS 500)
up to 190 mm (up to 3 layers XPS 500)

The current versions of the manufacturer's product documentation apply.
You can find further information at www.creaton.de.

Knauf

Description	Intended use according to DIN 1055-3*	Load capacity [kN/m²] acc. to DIN 1055-3	Single load [kN]	Dimensions [mm]	Mass per unit area [kg/m²] Dead load [kN/m²]	Thermal conductivity [W/mK]	Fire classification
Knauf Brio 18	without filler: A2, A3, B1	2	1	1200 x 600 x 18	23	λ_R = 0,30	A2-s1, d0
Knauf Brio 23	without filler: A2, A3, B1	2	2	1200 x 600 x 23	28,6	λ_R = 0,30	A1
Knauf TUB panels	without filler: A2, A3, B1, D1	2	2	1250 x 900 x 25	26	λ_R = 0,21	A2-s1, d0

* See table of intended uses and building types

Set-up and configuration

Heating screed
Knauf Brio elements and TUB panels can be laid on top of underfloor heating systems. We recommend that expansion joints are used across door thresholds and from edge lengths of approx. 20 m upwards. The inlet temperature must not exceed 55 °C. Heat congestion (e.g. under cabinets or carpets) must be prevented. The temperature in the screed element must not exceed 45 °C at any point.

Ceramic tiles and natural stone
Use flexible adhesive systems that are compatible with underfloor heating. Follow the application instructions provided by the manufacturer of the adhesive system for the relevant cover sizes; the indicated minimum adhesive bed thicknesses must also be complied with. Lay porcelain stoneware tiles using the buttering-floating method, sliding the tiles into the adhesive bed from the side and pressing them down.The maximum edge length for tiles laid using the thin-bed method is 330 mm.

Larger floor tiles with an edge length of up to max. 1200 mm may be laid on Knauf Brio, in combination with a rigid floor leveller and a thicker base layer. Do not use non-bonded filler. Only use wood fibre insulation (e.g. Knauf wood fibre insulation boards WF) as impact sound insulation.
When applying adhesive to large non-absorbent tiles (e.g. natural stone), we recommend that you apply a sealing primer (2-layer epoxy resin, e.g. Knauf FE impregnation, sanded down) or suitable adhesives.

The current versions of the manufacturer's product documentation apply. You can find further information at www.knauf.de.

CompactFloor®

Description	Intended use in according to DIN 1055*	Load capacity [kN/m²] acc. to DIN 1055	Single load [kN]	Dimensions [mm]	Mass per unit area [kg/m²] Dead load [kN/m²]	Thermal conductivity [W/mK]	Building material class
CompactFloor® EXPERT	A1, A2, A3, B1, D1	3	2	600 x 400 x 20	42 0,42	1,2	A1
CompactFloor® PRO	A1, A2, A3	2	1	1220 x 725 x 10	19 0,19	0,50	A2

* See table of intended uses and building types

Tile size

		CompactFloor® EXPERT	CompactFloor® PRO
Ceramic tiles/porcelain stoneware	Tile size [cm]	120 x 120	60 x 60
	Edge ratio	-	1:1 to 3:1
	Minimum thickness [mm]	9	9
	techn. Joint width [mm]	3	3
Natural stone	Tile size [cm]	120 x 120	60 x 60
	Edge ratio	-	1:1 to 3:1
	Minimum thickness [mm]	15	15
	techn. Joint width [mm]	3	3

Additional insulation

	CompactFloor® EXPERT	CompactFloor® PRO
EPS DEO 200 kPA	Max. 70 mm (2 layers)	Max. 20 mm (1 layer)
XPS DEO 300 kPa	Max. 70 mm (2 layers)	Max. 40 mm (1 layer)
XPS DEO 500 kPa	Max. 100 mm (2 layers)	Max. 60 mm (1 layer)

The current versions of the manufacturer's product documentation apply.
You can find further information at www.compact-floor.de.

Set-up and configuration

Intended uses and building types

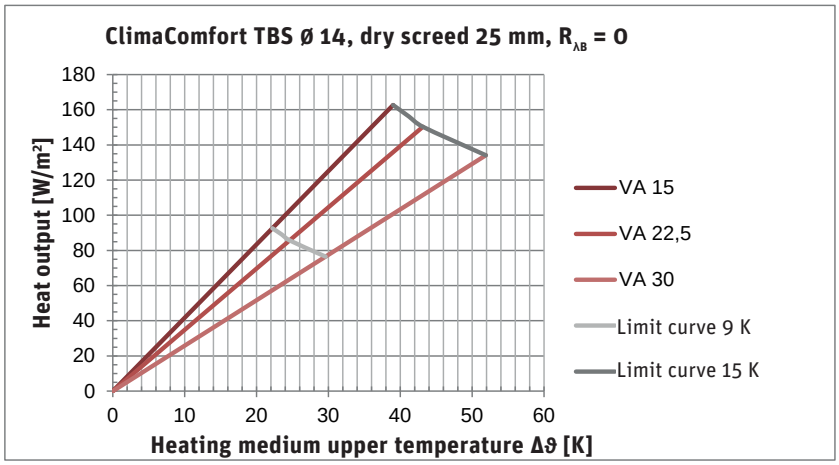
Category	Intended use	Use	Examples	Load capacity [kN/m²]	Single load [kN]
A	A2	Residential and lounge areas	Rooms and hallways in residential buildings, hospital wards, hotel rooms and hotel room kitchens/bathrooms	1,5	-
	A3		as for A2 without sufficient lateral load distribution	2	1
B	B1	Office and working areas, halls	Hallways in office buildings, office space, doctors' surgeries, day rooms and lounge areas, including halls	2	2
	B2		Hallways in hospitals, hotels, care homes etc., kitchens and treatment rooms and operating theatres without heavy equipment	3	3
	B3		as for B2 with heavy equipment	5	4
C	C1	Rooms, meeting rooms and areas used for gatherings of people (with the exception of A, B, D and E)	Areas containing tables, e.g. classrooms, cafes, restaurants, dining rooms, reading rooms, reception rooms	3	4
	C2		Areas containing fixed seating, e.g. churches, theatres, cinemas, conference rooms, lecture theatres, meeting rooms, waiting rooms	4	4
	C3		Freely accessible areas, e.g. museums, exhibition spaces, entrance areas in public buildings and hotels, basement ceilings not subjected to road traffic loads	5	4
	C4		Sports and play areas, e.g. dance halls, sports halls, gymnastics and athletic sports areas, stages	5	7
D	D1	Sales areas	Sales areas up to 50 m² in residential, office or similar buildings	2	2
	D2		Areas in retail shops and warehouses	5	4
	D3		Areas as for D2, but with increased single loads due to presence of tall storage racks	5	7
E	E1	Factories and workshops, stables, storage areas and entry/exit areas, areas in which large groups of people gather	Low-duty areas in factories and workshops; areas in large livestock facilities	5	4
	E2		Storage areas and libraries	6	7
	E3		Medium to heavy-duty use areas in factories and workshops, areas in which large groups of people regularly gather, grandstands without fixed seating	7,5	10

In accordance with DIN 1055

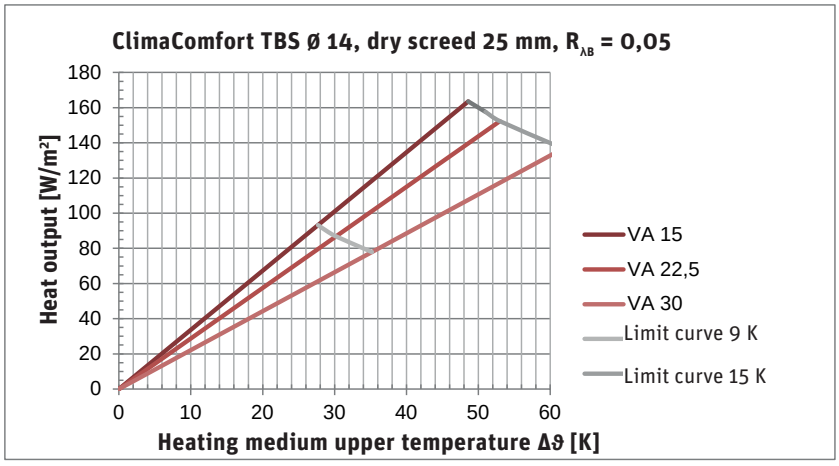
Performance data

Performance data for Roth ClimaComfort® TBS Ø 14 mm, heating

$R_{\lambda B}$ = 0 m²K/W Ø 14	Heating	Occupied area, Ø 14 [ΔT 9 K]		Boundary zone, Ø 14 [ΔT 15 K]	
Installation spacing T [mm]	Offset coefficient K_H [W/(m²K)]	Standard thermal output q_N [W/m²]	Standard heating medium upper temperat. $\Delta\vartheta_N$ [K]	Standard thermal output q_N [W/m²]	Standard heating medium upper temperat. $\Delta\vartheta_N$ [K]
VA 15	4,17	92,6	22,2	162,5	39,0
VA 22,5	3,48	85,7	24,6	150,3	43,1
VA 30	2,5	76,5	29,6	134,2	51,9

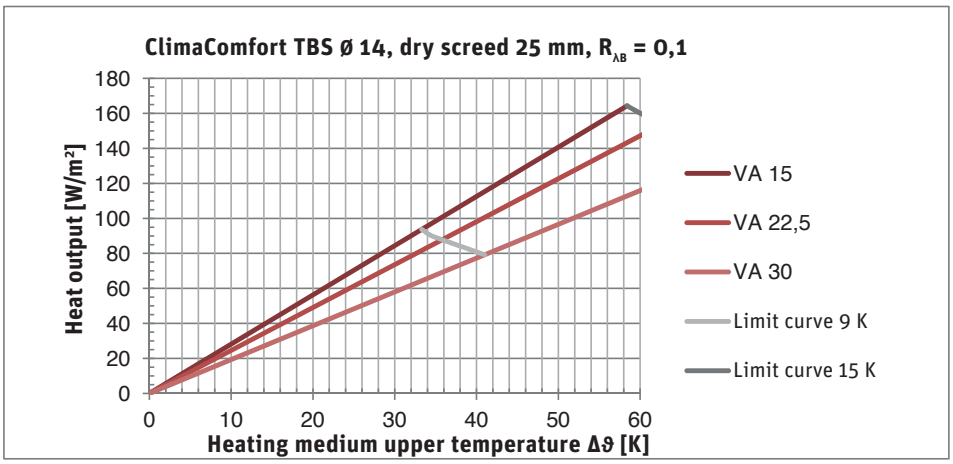


$R_{\lambda B}$ = 0,05 m²K/W Ø 14	Heating	Occupied area, Ø 14 [ΔT 9 K]		Boundary zone, Ø 14 [ΔT 15 K]	
Installation spacing T [mm]	Offset coefficient K_H [W/(m²K)]	Standard thermal output q_N [W/m²]	Standard heating medium upper temp. $\Delta\vartheta_N$ [K]	Standard thermal output q_N [W/m²]	Standard heating medium upper temp. $\Delta\vartheta_N$ [K]
VA 15	3,37	93,2	27,7	163,5	48,6
VA 22,5	2,87	86,8	30,2	152,3	53,0
VA 30	2,2	77,9	35,2	136,7	61,8

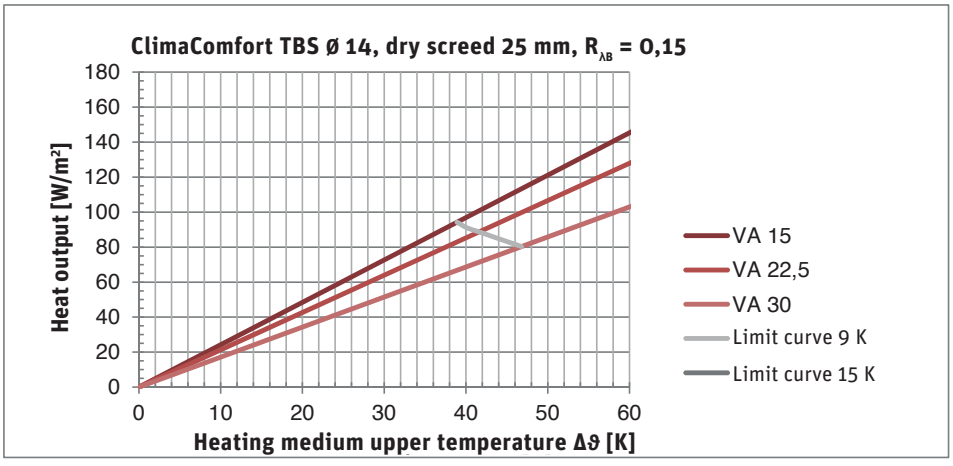


Performance data

$R_{\lambda B}$ = 0,1 m²K/W Ø 14	Heating	Occupied area, Ø 14 [ΔT 9 K]		Boundary zone, Ø 14 [ΔT 15 K]	
Installation spacing T [mm]	Offset coefficient K_H [W/(m²K)]	Standard thermal output q_N [W/m²]	Standard heating medium upper temp. $\Delta\vartheta_N$ [K]	Standard thermal output q_N [W/m²]	Standard heating medium upper temp. $\Delta\vartheta_N$ [K]
VA 15	2,81	93,7	33,3	164,4	58,4
VA 22,5	2,45	87,8	35,8	154,0	62,8
VA 30	1,93	79,2	41,0	138,9	71,9



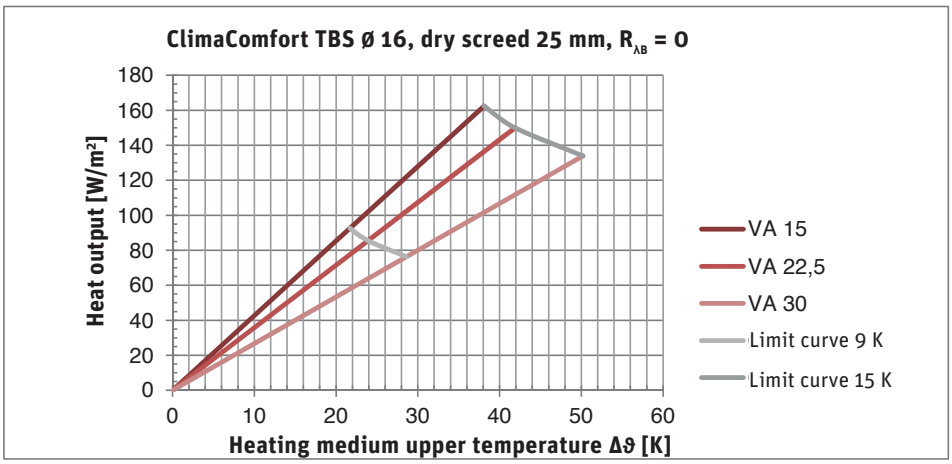
$R_{\lambda B}$ = 0,15 m²K/W Ø 14	Heating	Occupied area, Ø 14 [ΔT 9 K]		Boundary zone, Ø 14 [ΔT 15 K]	
Installation spacing T [mm]	Offset coefficient K_H [W/(m²K)]	Standard thermal output q_N [W/m²]	Standard heating medium upper temp. $\Delta\vartheta_N$ [K]	Standard thermal output q_N [W/m²]	Standard heating medium upper temp. $\Delta\vartheta_N$ [K]
VA 15	2,42	94,2	38,9	165,2	68,2
VA 22,5	2,45	87,8	35,8	154,0	62,8
VA 30	1,72	80,3	46,8	140,8	82,1



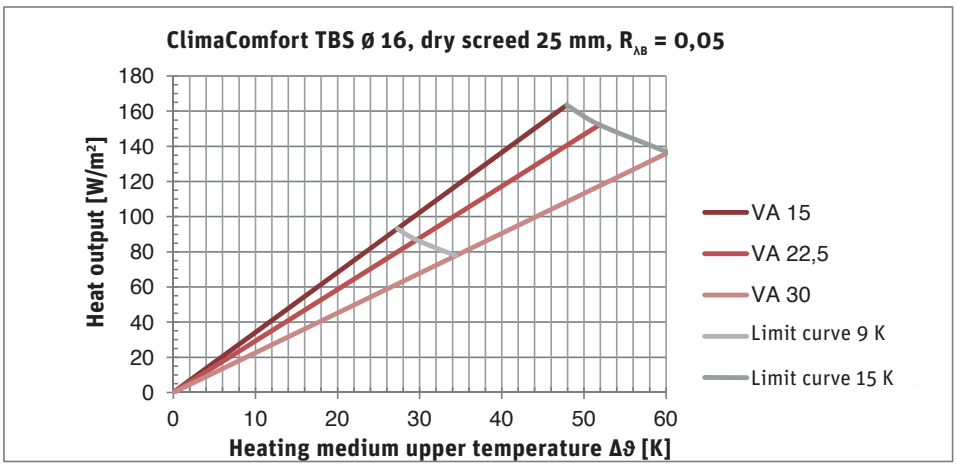
Performance data

Performance data for Roth ClimaComfort® TBS Ø 16 mm, heating

$R_{\lambda B}$ = 0 m²K/W Ø 16	Heating	Occupied area, Ø 16 [ΔT 9 K]		Boundary zone, Ø 16 [ΔT 15 K]	
Installation spacing T [mm]	Offset coefficient K_H [W/(m²K)]	Standard thermal output q_N [W/m²]	Standard heating medium upper temp. $\Delta\vartheta_N$ [K]	Standard thermal output q_N [W/m²]	Standard heating medium upper temp. $\Delta\vartheta_N$ [K]
VA 15	4,27	92,6	21,7	162,4	38,1
VA 22,5	3,58	85,5	23,9	150,0	41,9
VA 30	2,67	76,3	28,6	133,9	50,2

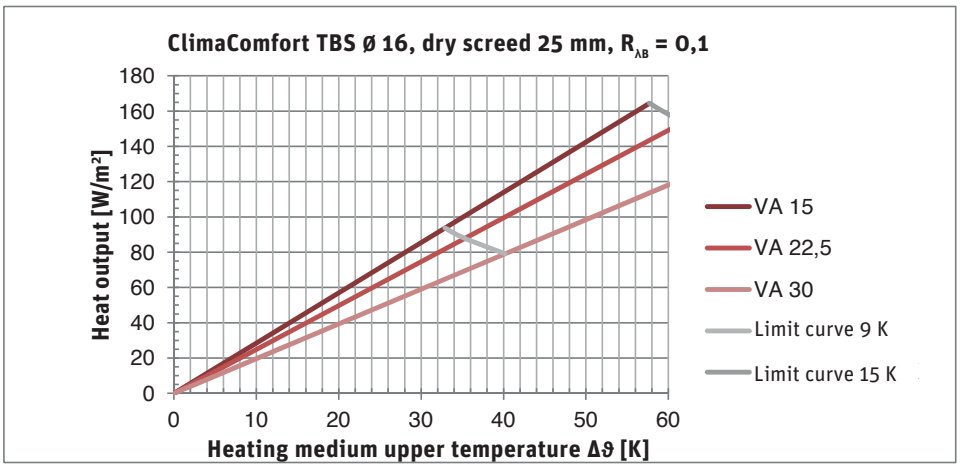


$R_{\lambda B}$ = 0,05 m²K/W Ø 16	Heating	Occupied area, Ø 16 [ΔT 9 K]		Boundary zone, Ø 16 [ΔT 15 K]	
Installation spacing T [mm]	Offset coefficient K_H [W/(m²K)]	Standard thermal output q_N [W/m²]	Standard heating medium upper temp. $\Delta\vartheta_N$ [K]	Standard thermal output q_N [W/m²]	Standard heating medium upper temp. $\Delta\vartheta_N$ [K]
VA 15	3,41	93,2	27,3	163,5	47,9
VA 22,5	2,93	86,7	29,6	152,2	51,9
VA 30	2,26	77,8	34,4	136,5	60,3

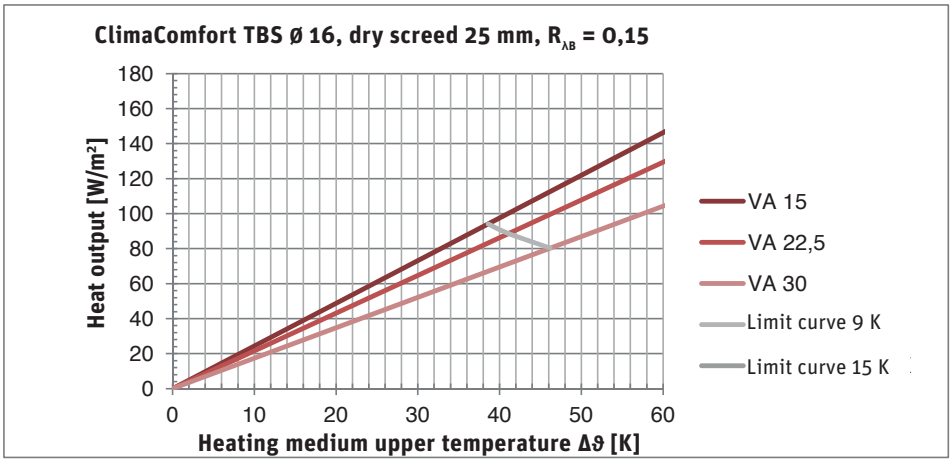


Performance data

$R_{\lambda B}$ = 0,1 m²K/W Ø 16	Heating	Occupied area, Ø 16 [ΔT 9 K]		Boundary zone, Ø 16 [ΔT 15 K]	
Installation spacing T [mm]	Offset coefficient K_H [W/(m²K)]	Standard thermal output q_N [W/m²]	Standard heating medium upper temp. $\Delta\vartheta_N$ [K]	Standard thermal output q_N [W/m²]	Standard heating medium upper temp. $\Delta\vartheta_N$ [K]
VA 15	2,85	93,7	32,9	164,4	57,7
VA 22,5	2,49	87,8	35,3	153,9	61,9
VA 30	1,97	79,1	40,2	138,8	70,5



$R_{\lambda B}$ = 0,15 m²K/W Ø 16	Heating	Occupied area, Ø 16 [ΔT 9 K]		Boundary zone, Ø 16 [ΔT 15 K]	
Installation spacing T [mm]	Offset coefficient K_H [W/(m²K)]	Standard thermal output q_N [W/m²]	Standard heating medium upper temp. $\Delta\vartheta_N$ [K]	Standard thermal output q_N [W/m²]	Standard heating medium upper temp. $\Delta\vartheta_N$ [K]
VA 15	2,44	94,1	38,6	165,1	67,7
VA 22,5	2,16	88,6	41,1	155,5	72,1
VA 30	1,74	80,3	46,2	140,8	81,0



Performance data

Determining the performance data

The performance data for the heating and cooling surfaces on the floor has been calculated according to DIN EN 1264 and registered and monitored by DIN CERTCO.

DIN CERTCO registration numbers: 7F402-F

Heating:

Thermal output (q) = Heating medium upper temperature ($\Delta\vartheta_H$) * offset coefficient (K_H)

q: Thermal output of floor heating systems divided by effective surface

$\Delta\vartheta_H$: Logarithmic mean difference between heating medium temperature and inside temperature (temperature difference between heating medium and room)

K_H: Increase in characteristic curve (equivalent thermal transmission coefficient)

Heating medium or coolant: Water

Heating medium upper temperature

Logarithmically determined (precisely):

$$\Delta\vartheta_H = \frac{\vartheta_V - \vartheta_R}{\ln \frac{\vartheta_V - \vartheta_i}{\vartheta_R - \vartheta_i}}$$

simplified:

$$\Delta\vartheta_H = \frac{\vartheta_V + \vartheta_R}{2} - \vartheta_i$$

ϑ_V: Inlet temperature

ϑ_R: Return temperature

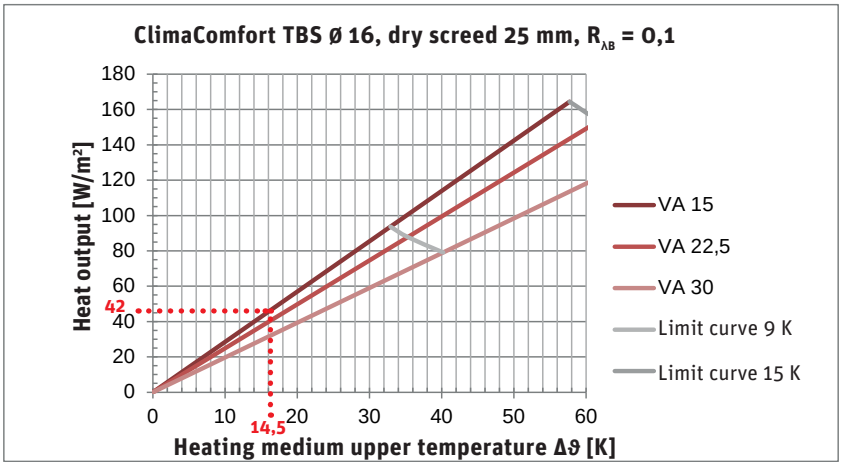
ϑ_i: Room temperature

Performance data

Example – Performance calculation, heating

Example, heating – Performance calculation with diagram:

ϑ_V:	Inlet temperature	35 °C [K]
ϑ_R:	Return temperature	30 °C [K]
ϑ_i:	Bedroom room temperature	18 °C [K]
$R_{\lambda B}$:	Thermal resistance	0,1 m²K/W
VA:	Planned installation spacing	15 cm
$\Delta\vartheta_H$:	Heating medium upper temperature	Calculated from formula (precisely): 14,36 K, simplified: 14,5 K
q:	Power output	42 W/m² (read)



Same example, heating – performance calculation with formula:
Thermal output (q) = Heating medium upper temperature ($\Delta\vartheta_H$) * offset coefficient (K_H)

ϑ_V:	Inlet temperature	35 °C [K]
ϑ_R:	Return temperature	30 °C [K]
ϑ_i:	Bedroom room temperature	18 °C
$R_{\lambda B}$:	Thermal resistance	0,1 m² K/W
VA:	Planned installation spacing	15 cm
$\Delta\vartheta_H$:	Heating medium upper temperature	Calculated from formula (precisely): 14,36 K, simplified: 14,5 K
K_H:	Offset coefficient	2,85 (from table)
q:	Power output	14,36 x 2,85 = 40,93 W/m², simplified: **41,33 W/m²**

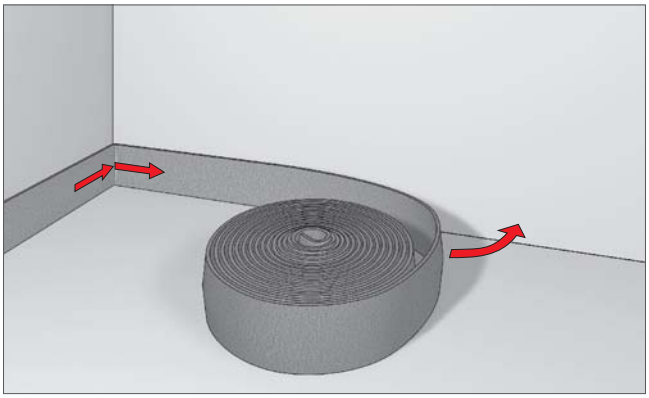
$R_{\lambda B}$ = 0,1 m²K/W Ø 16	Heating
Installation spacing T [mm]	Offset coefficient K_H [W/(m²K)]
VA 15	2,85
VA 22,5	2,49

Installation requirements

- The supporting subsurface must satisfy the structural requirements for bearing the flooring construction and the intended traffic load.
- The height and evenness of the surface of the supporting subsurface must correspond to the requirements of DIN 18202 “Tolerances in building construction” Table 3 line 3.
- Commercially available floor smoothing agents can be used to level out any uneven subsurfaces. **Grainy, loose materials are not suitable.**
- The load-bearing capacity of the entire floor structure on solid slabs and wooden beam ceilings depends on the point and area loads guaranteed by the manufacturers of the dry screed panels.
- Roth ClimaComfort® TBS is not suitable for use without a load distribution layer.
- The supporting subsurface must be dry and swept clean before installing Roth ClimaComfort® TBS.
- Construction joints from the supporting subsurface must be adopted in the flooring design.
- In the case of flooring or areas in contact with the ground or areas where rising damp is anticipated, sealants against ground moisture and non-pressing water in accordance with DIN 18195 are provided for. The specifications of the construction planner apply here. If sealants made of PVC or bitumen are laid on the unfinished floor, they are covered with PE film.
- **Additional measures for heat or impact sound insulation must comply with the specifications given by the manufacturers of the load distribution layers.**

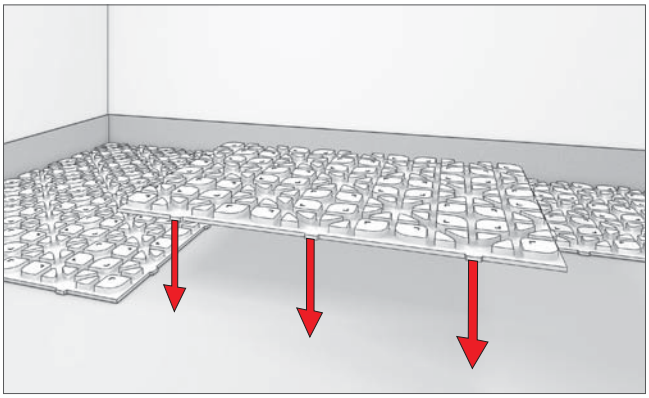
Ideal room conditions for installation are 15 to 25 °C and a humidity of 50 to 60%. A relative humidity of 80% should not be exceeded in the long term.

Assembly Instructions

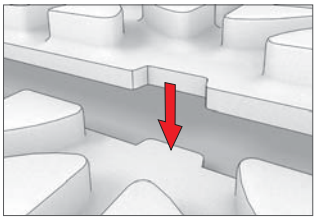


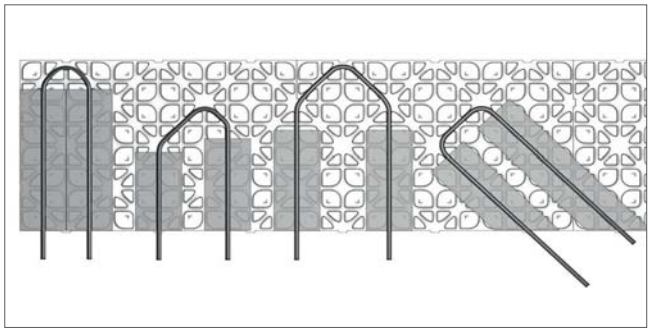
The subsurface must be clean, even and capable of bearing loads so it is in full contact with the system panels.

1. The edge insulating strip is fitted around all walls.

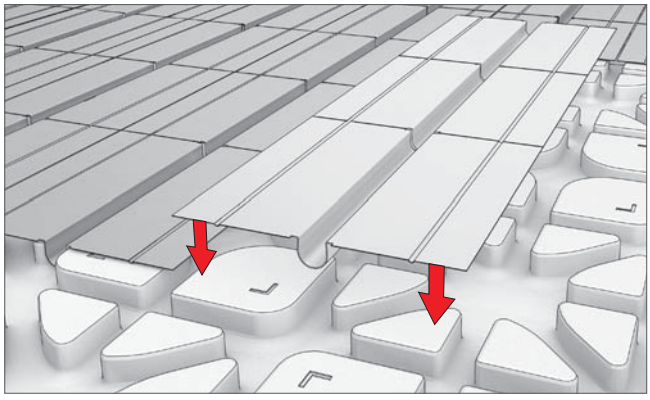


2. The system panels are laid in the room starting from one corner.



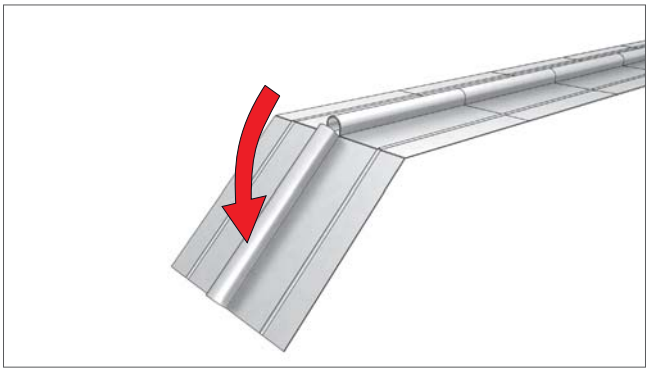


3. The system panels can be cut to size in any way required and so adapted to the individual room. The installation grid offers a range of different installation options.

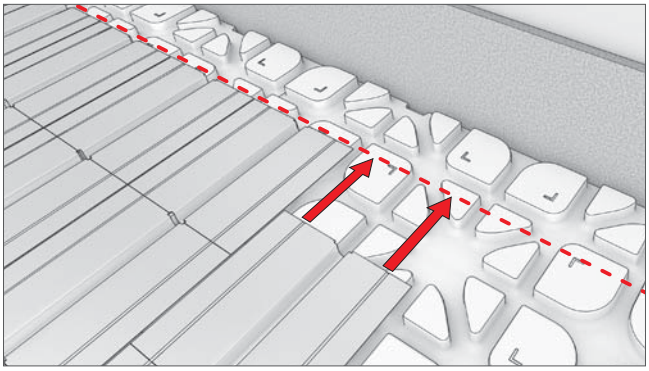


4. Insert the AL heat-conductive lamellae fitted in the Roth ClimaComfort® dry construction system panels, following the required installation spacing.

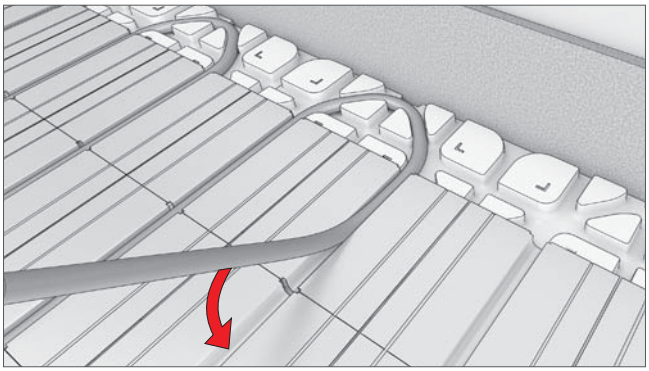
Assembly Instructions



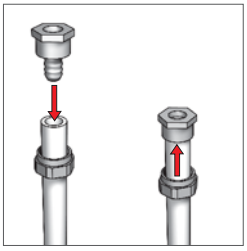
5. The heat-conducting lamellae are provided with predetermined breaking points and can be shortened to the required length if necessary.

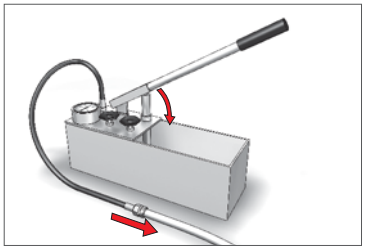


6. The L marking on the supporting panel indicates the position to which the heat-conducting lamella should extend. This means that the lamella and pipe are perfectly aligned in relation to each other on installation.



7. Lay the system pipe Alu-Laserflex in the heat-conducting lamella or in the bend sections in the ClimaComfort® dry construction system panel.



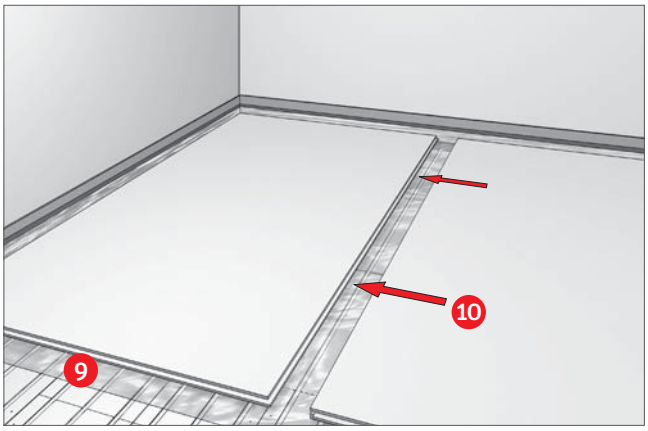


8. Pressure test for conducting a leak test on radiant heating and cooling systems in accordance with DIN EN 1264, Part 4.

   Procedure:
   Check the heating or cooling circuits within Roth ClimaComfort® TBS for leaks by performing a water pressure test before covering with dry construction panels. Tightness against leaks must be ensured immediately before and during installation of the dry construction panels.

See leak test protocol

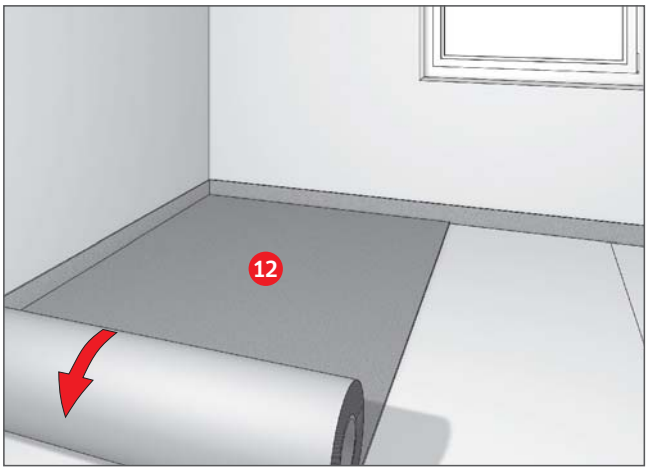
Assembly Instructions



9. Fit PE protective film between Roth ClimaComfort® dry construction system panels and load distribution layer.

10. Install the load distribution layer according to the manufacturer's instructions.

11. Functional heating/cooling (see heating protocol)



12. Install the surface covering, e.g. tiles, carpeting, laminate, parquet etc

Leak test protocol

for performing a leak test on floor heating and cooling systems

according to DIN EN 1264, Part 4

Building project: _____

Client: _____

Contractor: _____

The following Roth floor heating and cooling system has been installed as part of the above-mentioned building project:

System

- ☐ Roth Original Tacker® System
- ☐ Roth Knob System
- ☐ Roth ClimaComfort® Dry Construction System
- ☐ Roth Pipefix System
- ☐ Roth ClimaComfort® Panel System
- ☐ Roth ClimaComfort® Compact System
- ☐ Roth industrial radiant heating/ non-residential property
- ☐ Roth sport and sprung floor heating
- ☐ Roth structural temperature control
- ☐ Roth outdoor panel heating
- ☐ Roth Flipfix® Tacker System
- ☐ Roth Quick-Energy® Tacker System

Pipe type

- ☐ Roth DUOPEX S5®
  - ☐ ø 14
  - ☐ ø 17
  - ☐ ø 20
  - ☐ ø 25
  - ☐ ø 32
- ☐ Roth X-PERT S5®+
  - ☐ ø 14
  - ☐ ø 16
  - ☐ ø 17
  - ☐ ø 20
- ☐ Roth Alu-Laserflex
  - ☐ ø 14
  - ☐ ø 16
- ☐ Roth ClimaComfort® S5
  - ☐ ø 11
- ☐ Roth PERTEX® S5
  - ☐ ø 17

The leak test can be performed using water, compressed air or inert gas.

The heating circuits were checked for leaks before fitting the load distribution layer.

All pipelines have been sealed with metal plugs, caps, etc. Any apparatus, pressure containers or fittings not suitable for the pressure test have been removed.

Ambient temperature: _____ °C

Temp. of testing medium: _____ °C

Leak test protocol

Testing medium – compressed air or inert gas

☐ Oil-free compressed air ☐ Nitrogen ☐ Carbon dioxide

☐ _____

☐ All pipe connections have been visually inspected to check they have been properly executed

Test pressure: _____ 150 mbar

Test period (up to pipework volume of 100 l) 120 min
for every additional 100 l _____ + 20 min

The test period commences once temperatures have been calibrated
and a steady state attained for plastic materials.

Pipework volume: _____ l Test period: _____ min

☐ No drop in pressure was detected during the test period
☐ There is no evidence of leaks.
☐ The test criteria have been satisfied

Load testing at increased pressure

Test pressure ø ≤63 mm: _____ bar (max. 3 bar)
Test period: _____ min (min. 10 min)
for every additional 100 l _____ + 10 min

The test period commences once temperatures have been calibrated
and a steady state attained for plastic materials.

☐ No drop in pressure was detected during the test period
☐ There is no evidence of leaks.
☐ The test criteria have been satisfied

Town/City: _____ Date: _____

Developer/Client Stamp/Signature	Construction Manager/Architect Stamp/Signature	Heating engineering company/Installer Stamp/Signature

Leak test protocol

Testing medium – water

The test pressure must not be less than 4 bar and not more than 6 bar.

☐ The fill-up water has been adjusted and filtered according to VDI 2035-2. Heating circuits are fully vented.
☐ The temperature difference between the fill-up water and the environment does not exceed 10 °C

Main test for smaller installations (e.g. on each floor) or preliminary test for large systems
Test period: 60 min

1. Permissible test pressure

P_{test} = 1,5 x $P_{operation}$ P_{test} Test pressure applied: _____bar

2 x P_{test} in 30 min Test pressure generated twice within 30 min.
Time intervals between tests 10 min

2. Permissible pressure drop in 30 min

Max. 0,6 bar (0,1 bar/5 min)

P_{min} = P_{test} - 0,6 bar P_{actual} ≥ P_{min} (after 30 min): _____bar

☐ There is no evidence of leaks.
☐ The test criteria have been satisfied

Main test for large systems (if required)
Test period 120 min

Permissible pressure drop: max 0,2 bar

P_{min} = P_{test} - 0,2 bar P_{actual} ≥ P_{min} (after 120 min): _____ bar

☐ There is no evidence of leaks.
☐ The test criteria have been satisfied

Suitable measures need to be taken if there is a risk of frost. These include using antifreeze and temperature equalisation of the building. When the system starts normal operation, any antifreeze can be drained and disposed of in accordance with national occupational health and safety requirements. The system then needs to be rinsed out 3 times with clean water.

Town/City: _____ Date: _____

Developer/Client Stamp/Signature	Construction Manager/Architect Stamp/Signature	Heating engineering company/Installer Stamp/Signature

Functional heating/cooling protocol

for floor heating and cooling systems, Roth ClimaComfort® TBS

Building project: _____

Client: _____

Construction stage: _____

Component: _____

Requirements

Functional heating should be performed to test whether the heated or cooled floor, wall, or ceiling structures are working properly.
With dry systems, functional heating should only be performed once any smoothing over or adhesive work is complete. The smoothing agent or adhesive must be allowed to harden over. Any manufacturer's instructions must be followed.
The maximum specified inlet temperature (usually up to 45 °C) must be observed for 1 day.
If there is a risk of frost, the installation should then be left running accordingly. Any manufacturer specifications which deviate from the standard or this protocol should be observed and logged as well.

☐ Floor ☐ Ø 14 ☐ Ø 16 ☐ Ø 20 ☐ Ø 25

Documentation

Type of heat distribution layer (if necessary, the actual product): _____

End of work on heat distribution layer (date): _____

Start of functional heating (date): _____

At constant max. specified inlet temperature t_v= _____ °C (if necessary, using manual control)

End of functional heating (date): _____

Suitable protective measures need to be adopted if there is a risk of frost (e.g. frost protection mode).

The rooms were ventilated without draughts and all windows and outer doors closed after the radiant heating and cooling system was switched off.

☐ yes ☐ no

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

☐ The installation was not in use at the time.

☐ The heat distribution layer was heated to an inlet temperature of _____ °C.

Caution: When switching off the radiant heating after the heating up period, the heating surface needs to be protected from draughts and from cooling down too quickly until it is completely cold.

Confirmation:

Developer/Client Stamp/Signature	Construction Manager/Architect Stamp/Signature	Heating engineering company/Installer Stamp/Signature

Standards and directives

The following laws, directives, guidelines and standards need to be taken into account when planning and creating a heating installation:

- German Energy Conservation Act (Energieeinsparungsgesetz - EnEG)
- German Energy Saving Directive (Energieeinsparverordnung - EnEV)
- German Heating Costs Directive (Heizkostenverordnung - HeizkostenV)
- The individual administrative instructions from the various German states regarding the EnEG

Standards, guidelines and German Contract Procedures for Building Works (Verdingungsordnung für Bauleistungen – VOB)

- DIN 1168 Building plasters
- DIN 4108 Thermal insulation in buildings
- DIN 4109 Sound insulation in buildings
- DIN 4701 Part 10 Energy Efficiency of Heating and Ventilation Systems in Buildings
- DIN 4726 Warm water underfloor heating systems and radiator connecting systems – Plastics piping systems and multilayer piping systems
- DIN 18195 Water-proofing of buildings
- DIN 18202 Tolerances in building construction - Structures
- DIN 18336 VOB, Part C: Waterproofing
- DIN 18340 VOB, Part C: Dry lining and partitioning work
- DIN 18350 VOB, Part C: Plastering and rendering
- DIN 18352 VOB, Part C: Wall and floor tiling
- DIN 18380 VOB, Part C: Installation of central heating systems and hot water supply systems
- DIN 18382 electrical cable and wiring system in buildings
- DIN 18560 Floor screeds in building construction
- DIN V 18599 Energy efficiency of buildings – Calculation of the net, final and primary energy demand for heating, cooling, ventilation, domestic hot water and lighting
- DIN EN 1264 Water-based surface-embedded heating and cooling systems
- DIN EN 1991-1-1 Actions on structures
- DIN EN 12831 Heating systems in buildings - Method for calculation of the design heat load
- DIN EN 13162 – DIN EN 13171 Thermal insulation products for buildings
- DIN EN 13501 Fire classification of construction products and building elements
- DIN EN 13813 Screed material and floor screeds - Screed materials - Properties and requirements
- DIN EN 13914 Design, preparation and application of external rendering and internal plastering
- VDI 2035 Part 2 Prevention of damage in water heating installations - Water-side corrosion

Guarantee

The guarantees and warranty conditions apply to the Roth ClimaComfort® TBS in accordance with the warranty certificates enclosed with the products.

CERTIFICATE OF GUARANTEE

Roth Floor Heating and Cooling Systems
Roth Pipe Installation Systems

1. Within a 10 years following installation, although no longer than 10 1/2 years following delivery of the system components, we will provide, in accordance with our preference, either free-of-charge product replacement or repair and damage replacement in the event that damage appears in the system components which we have supplied which were caused by faults in materials or production.

   Excluded from this are mechanical moving parts and products as well as electrical and electrically-powered parts and products for which we have provided the guarantee services in the event of faults in materials or production listed above within a time period of 12 months following installation.

2. Prerequisites for this guarantee are:
   a. exclusive use and installation of all system components belonging to the respective Roth Floor Heating System/Pipe Installation System,
   b. documented adherence to the planning, installation and operating instructions respectively valid at the time of the installation,
   c. adherence to the standards and regulations valid for this work type and for the relevant adjacent work types in connection with the respective Roth Floor Heating System/Roth Pipe Installation System,
   d. that the installation company and the companies carrying out the construction/finishing work types are respectively recognised and authorised specialist companies and that these companies have verified their confirmations with names and signatures on this certification document,
   e. that a completely filled out copy of this guarantee certificate is sent back to us without delay,
   f. that damages are immediately reported to us with simultaneous forwarding of the guarantee certificate,
   g. that claims are made within the guarantee period.

We are insured against claims made in this agreement under an extended company and product liability insurance policy with a coverage amount of **5.000.000 Euros** per occurrence for personal and property injuries.
The stipulations contained in consumer protection laws are unaffected by this guarantee.
This guarantee is subject to the material laws of Germany.
The preceding guarantee bond affects the following:

Object of construction: _____

Building contractor: _____

Radiant Heating and Cooling Systems:

☐ Roth Original Tacker® System
☐ Roth Flipfix Tacker® System
☐ Roth Quick-Energy® Tacker System
☐ Roth Knob System
☐ Roth ClimaComfort® dry Construction System
☐ Roth ClimaComfort® Panel System
☐ Roth ClimaComfort® Compact System
☐ Roth Pipe Fixing System
☐ Roth Industrial Radiant Heating System
☐ Roth Outdoor Area Heating System
☐ Roth Sport Floor Heating System
☐ Roth Isocore Concrete Core Temperature Control

Roth Pipe installation systems:

☐ Roth Radiator Connection System
☐ Roth Domestic Hot Water System

The system components belonging to the respective Roth Floor Heating System and/or the respective Roth Pipe Installation System were delivered and installed completely on the respective date of installation.

Floor Heating System: Area laid _____ m²
Radiator Connection System: Number of radiator connections _____ pieces
Domestic Hot Water System: Number of borrow area connections _____ pieces

Specialist heating company:

Signature	Stamp	Date of installation

Construction/ finishing work types:

Signature	Stamp	Date of completion

Commissioning:

Signature	Stamp	Date of completion

Signature	Stamp	Date of the commissioning

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09/17 B Subject to technical modifications.

Notes

Notes

Our strengths
Your benefits

Innovation

- Early identification of market requirements
- In-house materials research and development
- In-house engineering
- The company is certified in accordance with DIN EN ISO 9001

Service

- Extensive field network of qualified sales professionals
- Hotline and project planning service
- Factory training courses, planning and product seminars
- Fast availability of all Roth brand product ranges throughout Europe
- Comprehensive guarantee and extended liability agreements

Products

- Complete range of easy-to-install product systems
- Manufacturing expertise for the complete product range within the Roth Industries group of companies

Roth Energy and Sanitary Systems

Generation
- Solar systems
- Heat pump systems
- Solar heat pump systems

Storage
Storage systems for
- Domestic and heating water
- Combustibles and biofuels
- Rainwater and waste water

Application
- Floor heating and cooling systems
- Pipe installation systems
- Shower systems

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