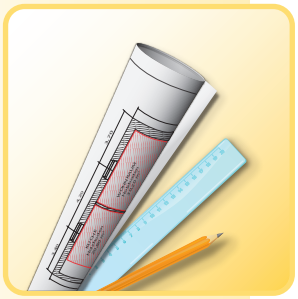
www.variotherm.at

DRYWALL FLOOR HEATING

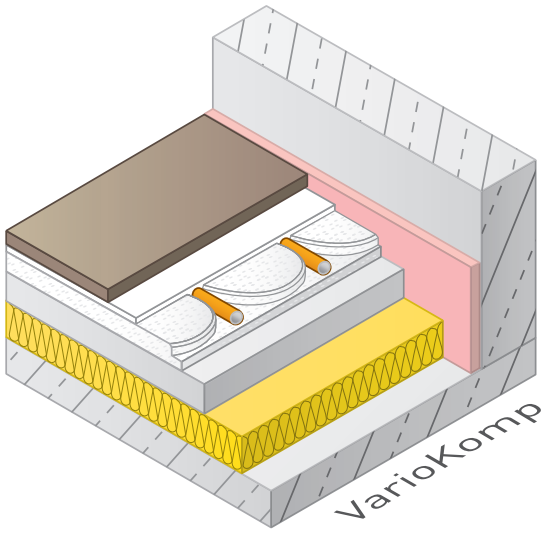
VarioComp.



Design

VARIOTHERM

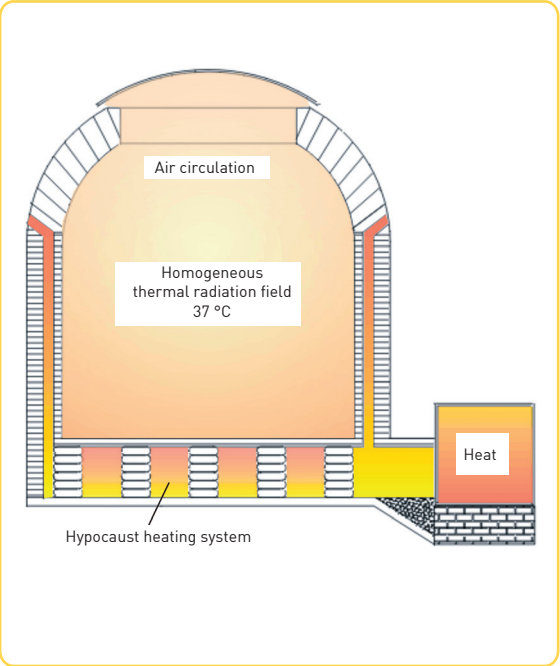
HEATING. COOLING. COMFORT.



Design manual

e80311

1. Principles



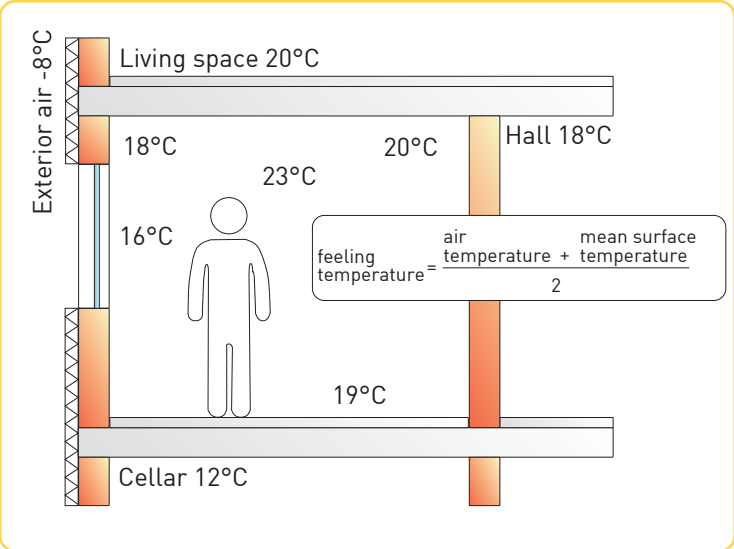
Hypocaust heating system as used by the Romans (antiquity)

That the ancient Romans already appreciated the qualities of floor and wall heating systems is proven by extensive finds and reconstructions of Roman thermal baths from the 1st century BC.

In the last 20 years, the popularity of floor heating systems has seen a substantial revival. The Variotherm floor heating system gives off radiant, long-wavelength infrared heat. Consistent with the body's own heat, similar to the heat of the sun, this type of heat is experienced as particularly pleasant.

The Variotherm floor heating system is ideal for all 'cold' floor coverings. It is an optimum temperature regulator, creating a pleasant atmosphere. Naturally, it can be used with all other floor coverings suitable for floor heating systems.

1.1 Comfort



Impact of the room on felt temperature

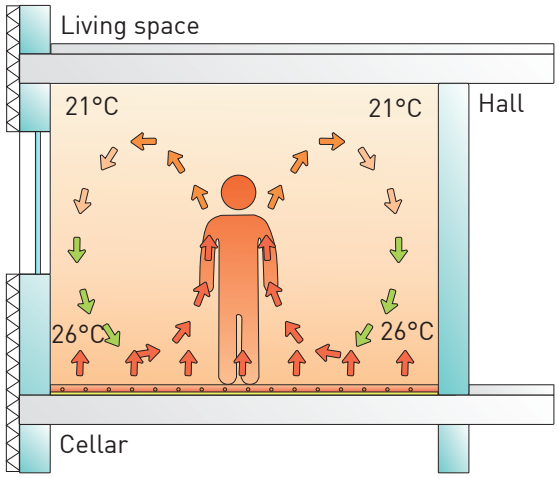
Comfort is not only created through a certain air temperature in the room. The temperature of the surfaces enclosing the room is of equal importance. The felt temperature is roughly consistent with the arithmetic mean of both temperatures.

What makes people feel comfortable?

People feel comfortable when the following basic 'thermal comfort' equation holds:

Heat production = heat loss

In this context, it is important that the heat loss from the human body is as evenly distributed in all directions as possible. We feel uncomfortable if too much heat is lost in one particular direction (cold surfaces, droughts) or heat loss is prevented in one direction (hot surfaces or steam-tight, thick clothing). In many cases it is therefore recommendable to install a combination involving the Variotherm wall heating system. Consistent heat transfer ensures that temperature layering in the room is kept at a minimum, promoting the general spreading of a pleasant temperature. In the case of floor heating, the floor is indeed warmer than the air at head-level. Indeed, according to popular wisdom, people 'stay healthy with a cool head and warm feet'. The room temperature can be set lower than with conventional heating systems. Radiant heat raises the felt air temperature without affecting your comfort.



Floor heating

Since the heat is transferred invisibly via the floor, no visible components have to be planned for, such as recesses for heating devices, radiators and pipes.

These almost unavoidable 'subtenants' in expensive living space require a lot of room and are not pleasing to the eye. They restrict both the wall and window design and the space where furniture can be positioned.

Combined floor heating and wall heating systems complement each other perfectly in living spaces. They allow for tailor-made heat supply in every room.

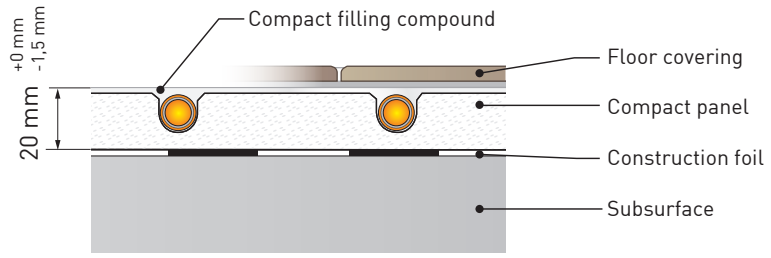
1.2 Energy savings

The right floor heating system not only gives you optimum comfort, it also saves energy and money. The cost of operating a floor heating system can be reduced due to low surface temperatures and hence low heating water temperatures. Floor heating is therefore ideal where low-temperature energy sources are used, such as condensing boilers, heat pumps and solar collectors.

The approximate cost savings per 1 K (°C) lower room air temperature are 6%. Low room air temperature also has the great physiological advantage of significantly increasing the absorption of oxygen.

2. System

2.1 Description and advantages of the Compact floor heating

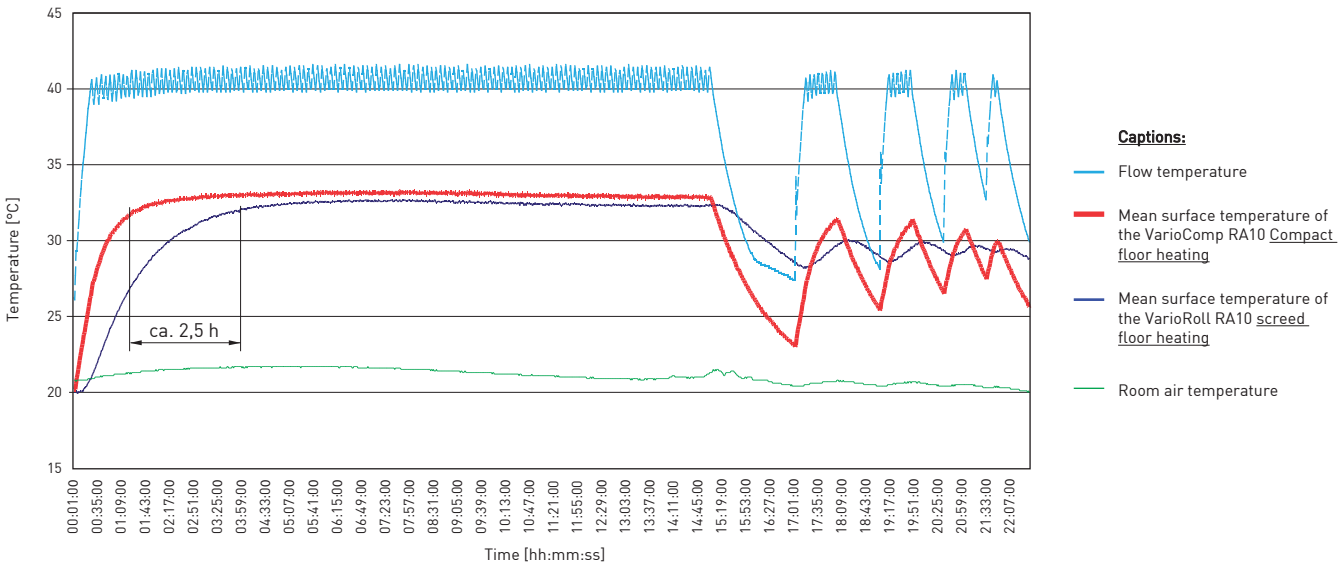


The Compact floor heating is ideally suited for retrofitting a floor heating system. It can be easily installed on drywall floor structures without screed. The fast reaction time allows good control of the room temperature even in sunny rooms.

The advantages:

- System is only 20 mm high (+ 0 mm; -1.5 mm)
- Low weight of only 25 kg/m²
- Surface ready for laying the floor covering
- Fast installation, e.g. tiles can be laid after only 24 hours
- Ideal for renovations
- Continuous nap system allows free laying of pipes
- Fast reaction times:

The Compact floor heating was subjected to comparison measurements with a screed floor heating system (VarioRoll, pipe spacing 100 mm, screed covering of the VarioProFile pipe: 40 mm) for 24 hours.

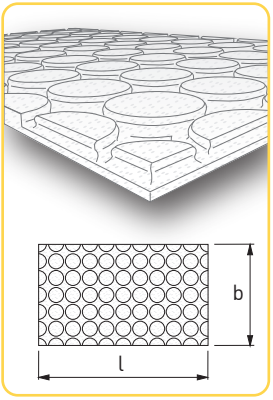


The faster heating of the surface of the Compact floor heating compared to the screed floor heating system can be clearly seen. The reaction time of the surface temperatures to reduced flow temperature is shorter. This results in:

- Better control of the Compact floor heating. The surface temperature during heating is greater than that of the screed floor heating system.
- More efficient layout of the heating surfaces because lower flow temperatures than those used for other floor heating systems are possible.

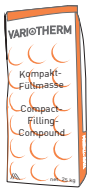
2.2 Components

Variomodular pipe 11.6x1.5/Alu0.20 (multi-layer composite pipe).
For details, see page 7.



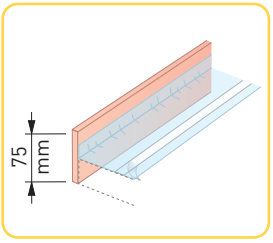
The Compact panel is an 18 mm thick FERMACELL® gypsum fibreboard. It serves as a pipe bracket and heat conducting panel for pipe spacings of 100 mm and 200 mm. It has pre-cut grooves that make it easy to lay the pipe.

Panel dimensions (w x l): 600 x 1000 mm = 0.60 m²



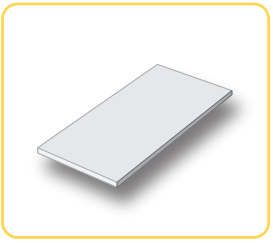
The Compact filling compound is a special filling compound for filling the pre-laid Compact panels with inserted Variomodular pipe 11.6x1.5/Alu0.20.
The completed surface corresponds to a gypsum structure surface as per ÖN B 2207 or EN12004.

The product range is rounded off by the edge insulation strip, the polyethylene construction foil, the blank panel for unheated areas and the heating distribution manifold with matching room thermostats.

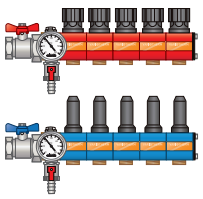


Edge insulation strip as per EN 1264-4

PE construction foil



Blank floor panel FBHK 1000 x 600 mm



Distribution manifold

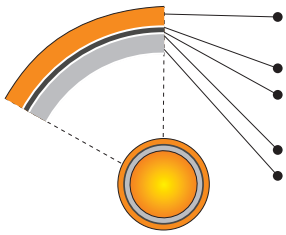
Room thermostat

„DISTRIBUTION and CONTROL“

Details regarding the system and heating circuit pipes and the room temperature control are provided in the „DISTRIBUTION and CONTROL“ planning and installation manual.

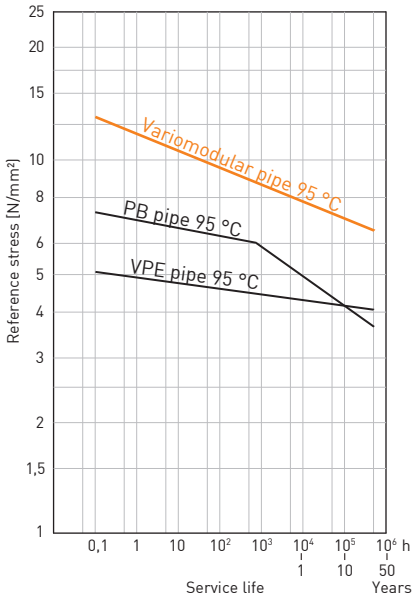
3. Variomodular pipe 11,6x1,5/Alu0,20

3.1 Properties



- Raised-temperature-resistance, polymer outside pipe, orange
- Adhesive layer
- Homogeneous longitudinal butt-welded, absolutely round, solid aluminium pipe (0.20 mm)
- Adhesive layer
- Raised-temperature-resistance polyethylene (PE-RT)

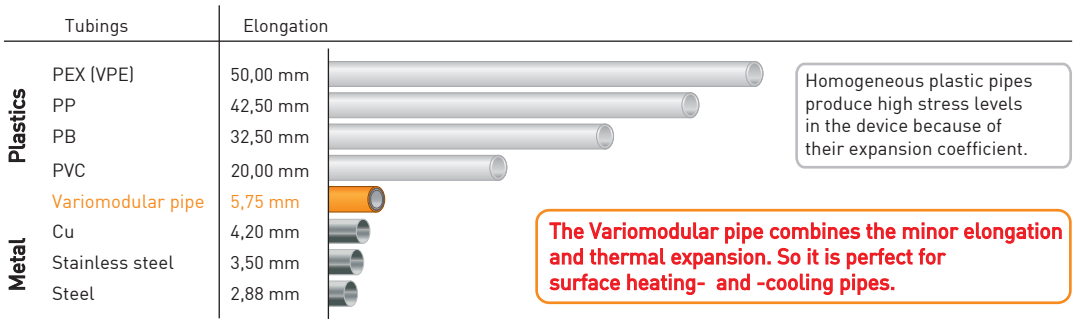
Creep behaviour



Advantages

- Can be located in plaster with a pipe locator for wall heating
- Fully corrosion-free
- Resistant to hot water additives (inhibitors, antifreeze)
- Optimum behaviour under long-term stress
- Mirror-smooth inner surface – less pressure loss – no encrustation
- Lower linear coefficient of expansion, lower heat expansion forces
- High pressure and temperature resistance (12 bar, +95°C)
- 100% oxygen and steam diffusion-tight
- Flexible, easy to bend, extremely good hydrostatic stability
- As light as a plastic pipe
- Sound-insulating properties similar to all-plastic pipes
- 10-year guarantee with certificate

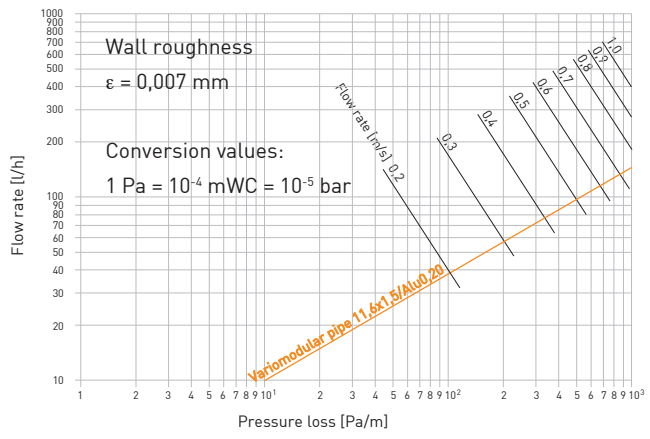
Elongation of different tubings with
10 m and temperature difference Δt 25 °C (e.g. 20 °C to 45 °C)



Homogeneous plastic pipes produce high stress levels in the device because of their expansion coefficient.

The Variomodular pipe combines the minor elongation and thermal expansion. So it is perfect for surface heating- and -cooling pipes.

Pressure loss



Technical data

Pipe diameter:	11,6 mm
Pipe wall thickness:	1,5 mm
Aluminium pipe thickness:	0,20 mm
Roll length:	250 m
Water content:	0,058 l/m
Special narrow bending radius:	37 mm
Max. operating temperature:	95 °C
Can be exposed for short periods to:	110 °C
Max. operating surface:	12 bar
Linear expansion coefficient:	$2{,}3 \times 10^{-5}$ [K^{-1}]
Mean heat conduction coefficient λ:	0,43 W/mK
Heat transmission resistance:	R_λ=0,0033 m^2K/W

3.2 Pipe spacing and pipe requirement

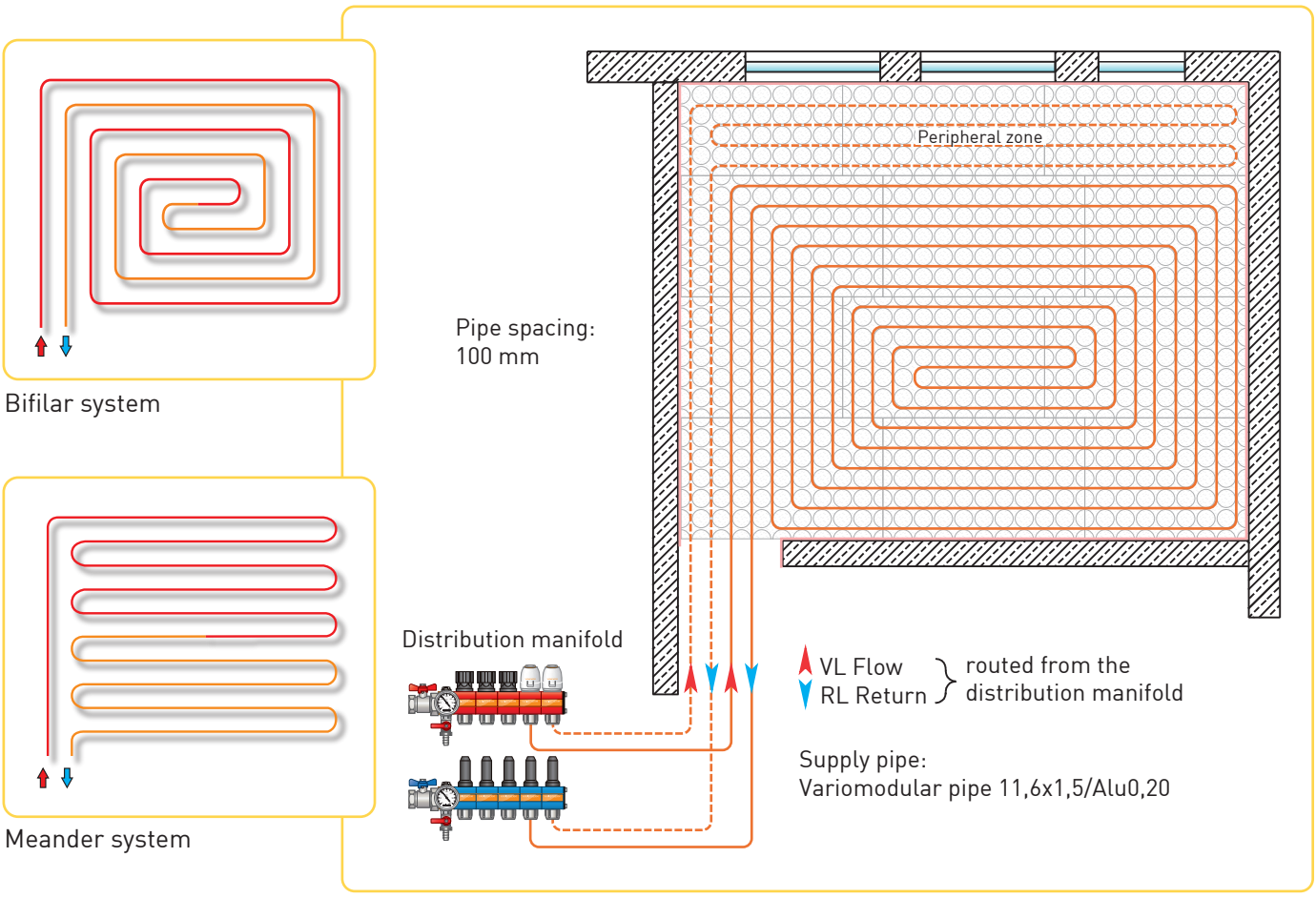
The required thermal output of the individual room determines the spacing between the pipes. In living rooms and barefoot areas the pipes are spaced at 100 mm intervals to create a pleasant room atmosphere. In other rooms (halls, laboratories, etc.) the pipes can also be laid using 200 mm spacing.

Pipe spacing	Pipe requirement
100 mm	10,0 m / m²
200 mm	5,0 m / m²

3.3 Pipe laying

Bifilar system: Even distribution of surface temperature because the flow is positioned next to the return.

Meander system: Less even distribution of surface temperature for small and ancillary rooms and peripheral zones.



Example layout

4. Properties of the subsurface

The Compact panel is purely a pipe bracket and thermal conduction element. The necessary static support, heat and impact sound insulation and protection against moisture diffusion must already be provided by the construction underneath the Compact panel. The rooms must be cleared out, clean, grease-free, dust-free and dry. Residual plaster and mortar must be removed. All professional installers carrying out subsequent work must be informed of the floor heating installation in order to avoid damage. You can hang an information sign at an appropriate place in the construction site – available from www.variotherm.at (Service/Info centre).

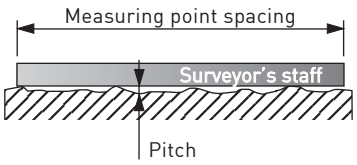
Information sign

4.1 Dryness of the subsurface

The subsurface must be dry, dust-free and grease-free. The residual moisture may not exceed max. 1.0% CM.

4.2 Evenness of the subsurface

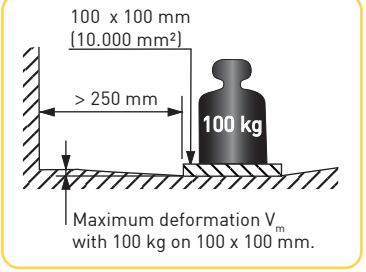
The required evenness is as follows (ÖNORM DIN 18202):



Measuring point spacing	0,1 m	1 m	4 m	10 m
Pitch max.	1 mm	3 mm	9 mm	12 mm

4.3 Load-bearing capacity of the subsurface

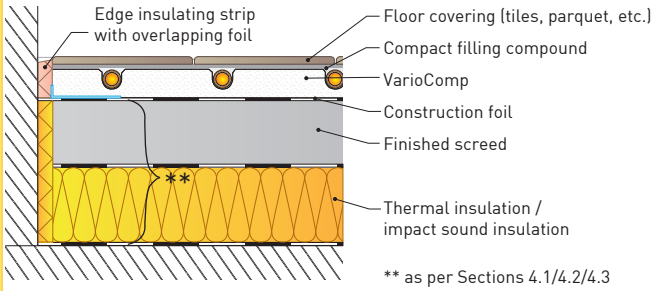
The load-bearing capacity specified in the table below must be provided.
If there are several concentrated loads, these must be at least 500 mm apart.
Caution! The sum of the concentrated loads must not exceed the maximum permissible floor load capacity. Particularly heavy objects (pianos, aquariums, bathtubs) must be given special consideration!



Room usage as per DIN 1055-3	Max. concentrated load [kN]	Max. service load [kN/m²]	Max. deformation V_m [mm]
Rooms and corridors in residential buildings, hospital bedrooms, hotel rooms including corresponding kitchens and bathrooms **Category A2/A3**	1,0	1,5	1,5
Corridors in office buildings, office spaces, medical practices, station rooms, waiting rooms, including the corridors **Category B1**	2,0	2,0	1,0
Corridors in hospitals, hotels, senior residences, boarding schools, etc., kitchens and treatment rooms including operating theatres without heavy machinery **Category B2**	3,0	3,0	1,0
Areas with fixed seating; e.g. areas in churches, theatres or cinemas, congress halls, lecture halls, meeting rooms, waiting areas **Category C2**	4,0	4,0	- (floor structure on request)

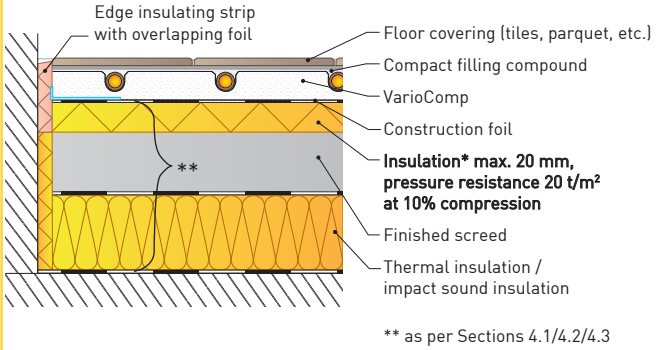
4.4 Examples of floor structures

Compact floor heating on an existing subsurface



Room usage A2/A3 + B1/B2 + C2

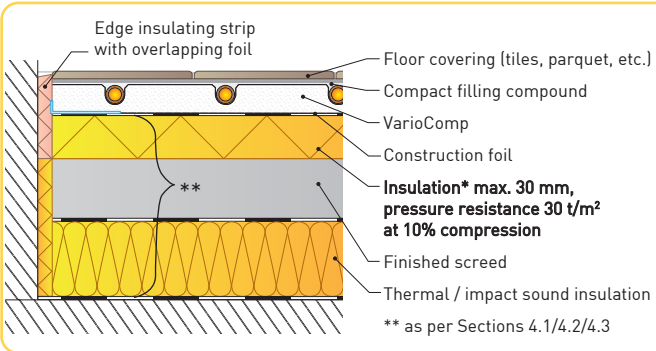
Compact floor heating directly on thermal insulation



Room usage A2/A3

*Insulation max. 20 mm,
pressure resistance 20 t/m² at 10% compression:

e.g. Styrodur 2800C, Austrotherm Universalplatte, Kingspan Styrozone, Austrotherm Uniplatte, Jackon Jackodur CFR 300, DOW Floormate 200-A, Wedi Bauplatte, Jackon Jackoboard, PCI Pecidur, Steico Universal, Steico Underfloor, Pavatex Isolair L22, Ceresit/Cimsec CL58 Mutiverlegeplatte, PCI Polysilent, Ardex DS 40



Room usage A2/A3 + B1/B2

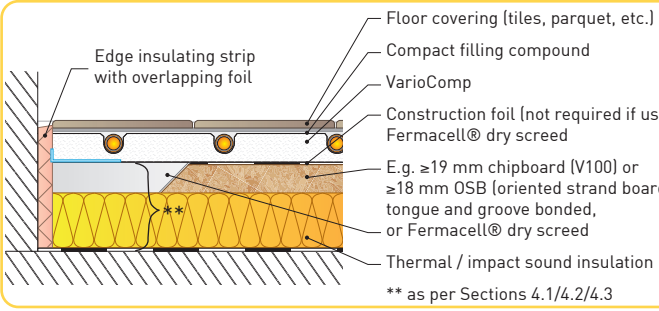
*Insulation max. 30 mm,
pressure resistance 30 t/m² at 10% compression:

e.g. Styrodur 3035CS, Austrotherm XPS Top 30GK, Kingspan Styrozone H350, DOW Floormate 500-A, Jackon Jackodur CFR 300, PCI Pecidur, Jackon Jackoboard, Wedi Bauplatte, PCI Polysilent, Ceresit/Cimsec CL58 Multiverlegeplatte

Note: Black = XPS panel, Blue = XPS panel with plastered weave on both sides, Red = wood fibreboard, Green = impact-sound insulation panel

Compact floor heating on a load distribution layer

A load distribution layer is necessary for insulation thicknesses > 30 mm or when using thermal insulation with a pressure resistance of < 20 t/m² at 10% compression.



Room usage A2/A3 + B1/B2

5. Specification

5.1 Note on standards

Please observe the regulations, provisions and standards applicable to the calculation of floor heating systems. The respective information is provided in the individual sections.

5.2 Guidelines for the thermal resistance R [m²K/W] of various floor coverings

Recommendation: Use floors having a maximum thermal resistance of 0.15 m²K/W.

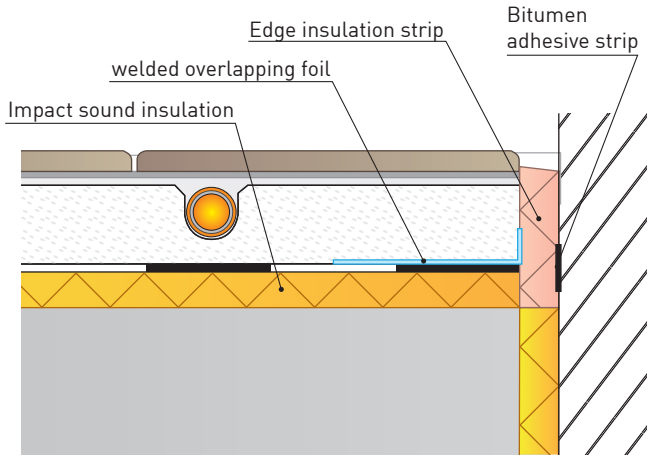
Floor covering	Thickness	Thermal resistance R = d/λ [m²K/W]
Tiles	8 mm	0,01
Clinker slabs	11 mm	0,01 - 0.02
Marble	10 mm	0,01
Natural stone slab	12 mm	0,01
Linoleum	2,5 mm	0,015
PVC coverings	2,5 mm	0,01 - 0,02
Adhesive cork	5 mm	0,01
Prefinished parquet f. (2 lay.)	10 mm	0,05 - 0,07
Prefinished parquet f. (3 lay.)	14 mm	0,07 - 0,10
Laminate	9 mm	0,05
Thin carpet	6 mm	0,07 - 0,11
Medium-thick carpet	9 mm	0,11 - 0,15
Thick carpet	13 mm	0,15 - 0,24

5.3 Impact sound insulation

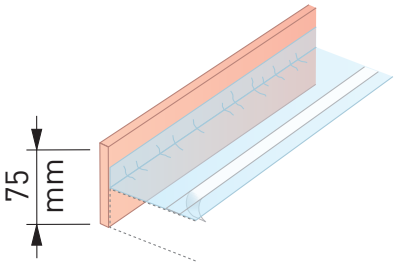
Particular attention should be paid to impact sound insulation. The impact sound improvement values should be determined by the planner or architect. The impact sound insulation must be matched to the corresponding floor structure as per Section 4.

Materials that may be laid directly underneath the Compact floor heating to improve the impact sound insulation:

- Ceresit/Cimsec CL58 Mutiverlegeplatte
- PCI Polysilent
- Ardex DS 40



Edge insulating strips are to be applied along the exterior walls, including columns, steps, door frames, pillars and shafts. They prevent sound and thermal bridges and allow the Compact floor heating to expand.



5.4 Heat requirement calculation

VARIOTHERM VARIOTHERM HEIZSYSTEME GMBH | A-2544 LEOBERSDORF | GÜNSELSDORFER STRASSE 3a
T: +43 (0) 22 56 - 648 70-0 | F: +43 (0) 22 56 - 648 70-9 | office@variotherm.at | www.variotherm.at

Norm-Heizlast nach ÖN EN 12831 (ausführliches Verfahren) Datum:
Nationaler Anhang: ÖN EN 12831 / Beiblatt 1 Seite: 1

Projekt:

Übersicht der Bauteile

Code	Bezeichnung	U-Wert W/m²K	Rges m²K/W	Rsi m²K/W	Rse m²K/W	R-Baut m²K/W
AF01	Außenfenster	1.200	0.833	0.130	0.040	0.663
AT01	Außentür	1.200	0.833	0.130	0.040	0.663
AT02	Eingangstür	1.800	0.556	0.130	0.040	0.386

Zusammenstellung der Räume Formblatt G - 2

Raum		Θ_{int}	A_R	Φ_{Te}	Φ_T	$\Phi_{V,min}$	$\Phi_{V,inf}$	$\Phi_{V,su}$	$\Phi_{V,mj,inf}$	Φ_{Netto}	Φ_{RH}	Φ_{HL}
Nr.	Bezeichnung	°C	m²	W	W	W	W	W	W	W	W	W
Haus, KG			64.30	1757		872	0	0	0		0	
00.001.001	Keller 5,48m²	20.0	5.48	149	149	74				224	0	224
00.001.002	Keller 9,3 m²	20.0	9.30	194	194	126				320	0	320
00.001.003	Keller 17,10 m²	20.0	17.10	180	180	232				412	0	412
00.001.004	Keller 22,05 m² inkl. Stie	20.0	27.90	929	929	379				1308	0	1308
00.001.005	Keller 2,34 m² + 2,18 m²	20.0	4.52	305	305	61				366	0	366
Haus, EG			113.97	3590		1705	0	0	0		0	
00.002.001	Schrankraum 5,48 m²	20.0	5.48	196	196	79				275	0	275
00.002.002	Bad 9,3 m²	24.0	9.30	306	306	150				456	0	456
00.002.003	Zimmer 10,22 m²	20.0	10.22	393	393	148				541	0	541
00.002.004	Zimmer 10,24 m²	20.0	10.24	308	308	148				456	0	456
00.002.005	Flur 4,94 m² + Diele 10...	20.0	15.88	407	407	229				637	0	637
00.002.006	WC 1,65 m²	20.0	1.65	81	81	48				129	0	129
00.002.007	Küche 22,05 m²	20.0	22.05	833	833	319				1152	0	1152
00.002.008	Wohnzimmer 22,05 m²	22.0	22.05	758	758	337				1096	0	1096
00.002.009	Zimmer 17,1 m²	20.0	17.10	308	308	247				555	0	555

Extract from EDP heat load calculation for a single family house

The EN 12831 standard with the respective national annex applies to the heat requirement calculation in heated rooms.

5.5 Variotherm dimensioning software

Individual floor heating circuits can be calculated swiftly and easily with Variotherm's dimensioning software – available at www.variotherm.at (Service/Professional area).

Dimensioning of Variotherm Heating Systems

Building project: _____ Postal Code: _____ City: _____ Date: _____ Processed by: _____

No	Room Name	Floor space A [m²]	Maximum Length of circuit at RH L [m]	Heating Load Q [W]	Supplement heating load Up [%]	Heating Load incl. Supplement Q+Up [W]	Room temp. ti [°C]	Heat transfer system	Floor covering RH [d²λ]	Dimensioning temp. tv/tr [°C]	Mathematical Dim.	Unit	Type	Practical No of circuits	Dim.	Unit	Typ	Residual performance	FH To (Ti=20) [°C]	Supply pipe	Supply line length per circuit [m]	Pressure loss per circuit [mWC]	Flow quantity per circuit [kg/h]	Distribution manifold number
1	Vjetrobran 1.	2,80		842		842	20	Modular WH MWHK-F		40/30	7,59	m²	MWHKF	1	2,5	m²	MWHKF	-565	-			0,26	24	1
2	Čekaona 2.	35,60		2408		2.408	20	Modular WH MWHK-F		40/30	21,69	m²	MWHKF	6	4,63	m²	MWHKF	676	-			1,02	45	1
3	Ordinacija 3.	12,48		1003		1.003	20	Modular WH MWHK-F		40/30	9,04	m²	MWHKF	2	5,4	m²	MWHKF	1.198	-			1,50	52	2
4	Sterilizacija 4.	6,40		650		650	20	Modular WH MWHK-F		40/30	5,86	m²	MWHKF	3	5,08	m²	MWHKF	689	-			1,28	49	1
5	Ordinacija 5.	12,48		1003		1.003	20	Modular WH MWHK-F		40/30	9,04	m²	MWHKF	3	4,6	m²	MWHKF	882	-			1,01	45	1
6	Kabinet 6.	7,36		913		913	20	Modular WH MWHK-F		40/30	8,23	m²	MWHKF	2	4,09	m²	MWHKF	-95	-			0,83	40	2
7	Administracija 7.	5,56		889		889	20	Modular WH MWHK-F		40/30	8,01	m²	MWHKF	2	5,03	m²	MWHKF	204	-			1,27	49	2
8	Soba za osobje 8.	8,82		1148		1.148	20	Modular WH MWHK-F		40/30	10,34	m²	MWHKF	2	3,43	m²	MWHKF	-128	-			0,53	33	2
9	Toalet 9.	5,90		345		345	20	Compact floor heating	0,010	40/30	5,50	m²	K RA20	2	5,9	m²	MWHKF	162	-			1,91	57	2
10	Boiler room 10.	2,20		244		244	20	Compact floor heating	0,010	40/30	2,20	m²	K RA10	1	5,9	m²	RA10	145	27			0,65	43	2
														1	2,2	m²	RA10	-61	27			0,06	16	2

Total Q: 9.446

Summary of the heating systems

Amount	Unit	Heating system	Typ	Pipe / heating element
	m²	System wall heating	SWHK1	
	m²	System wall heating	SWHK2	
	m²	System wall heating	SWHK3	
107,0	m²	Modular wall heating	MWHK-F	1.498,3 lfm
	m²	EasyFlex wall heating	EWH77F	
	m²	EasyFlex wall heating	EWHK77	
	m²	EasyFlex wall heating	EWHK115	
	m²	Modular ceiling heating	MDKH-F	
	m²	Screed floor heating	RA10	
	m²	Screed floor heating	RA15	
	m²	Screed floor heating	RA20	
	m²	Screed floor heating	RA25	
	m²	Screed floor heating	RA30	
8,1	m²	Compact floor heating	RA10	81,0 lfm
	m²	Compact floor heating	RA20	
	m	Skirting heating	Hmini	
	m	Skirting heating	HLIa	
	m	Skirting heating	HLIIa	
	m	Skirting heating	HLIIIa	
	m	Ducted channel heating	BKH1mini	
	m	Ducted channel heating	BKH1	
	m	Ducted channel heating	BKH2mini	
	m	Ducted channel heating	BKH2	
	m	Supply pipe	16x2	
	m	Supply pipe	11,6x2	
		Total filling water		91,6 Liters

Summary of pipe length by line

Line	Room	m ∅ 16	m ∅ 11,6
1	Vjetrobran 1.		35,0
2			
3	Čekaona 2.		388,9
4			151,2
5	Ordinacija 3.		213,4
6			
7	Sterilizacija 4.		193,2
8			
9	Ordinacija 5.		114,5
10			
11	Kabinet 6.		140,8
12			
13	Administracija 7		96,0

Line	Room	m ∅ 16	m ∅ 11,6
14			
15	Soba za osobje 8.		165,2
16			
17	Toalet 9.		59,0
18			
19	Boiler room 10.		22,0
20			
21			
22			
23			
24			
25			
TOTAL			1.579,3

	tv/tr	Number of heating circuits	Flow quantity manifold [kg/h]	Max. pressure loss +0,1 mWC for manifold [mWC]
Distribution manifold 1	35/30	13	576	1,38
Distribution manifold 2	35/30	12	521	2,01
Distribution manifold 3				
Distribution manifold 4				
Distribution manifold 5				

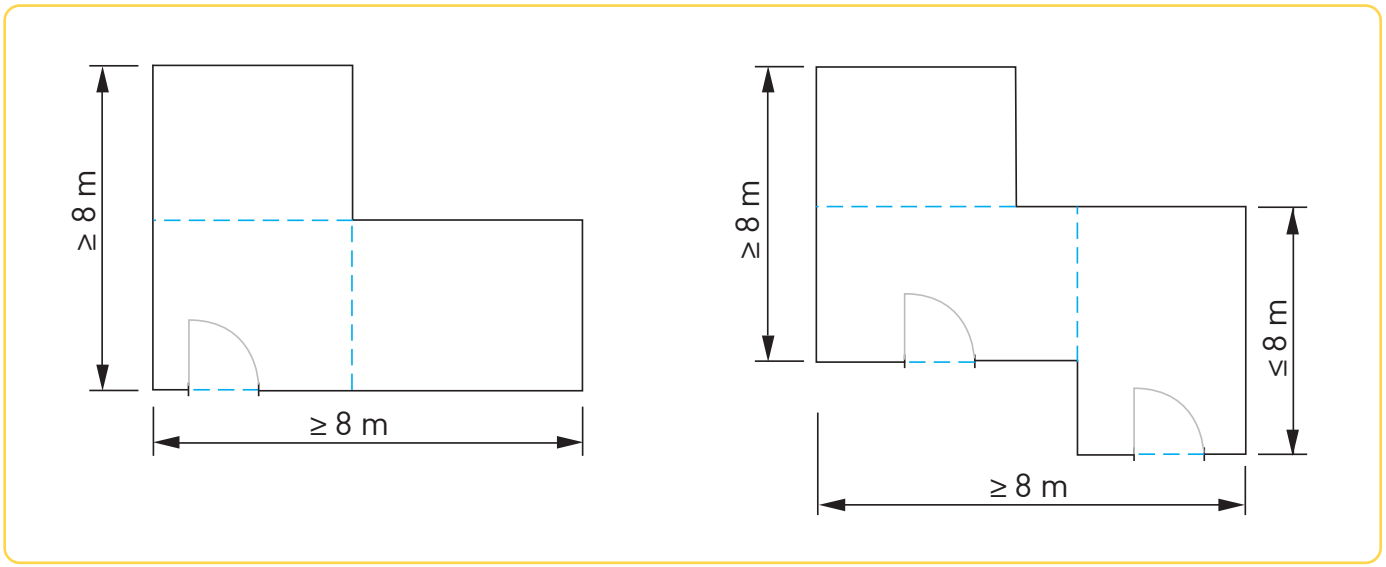
When all distribution manifolds are fed via one pump, the following applies:

Total flow quantity:	1097	kg/h
Maximum pressure loss from distribution manifold incl. 0,1mWC for max. opended valve	2,01	mWC

Example

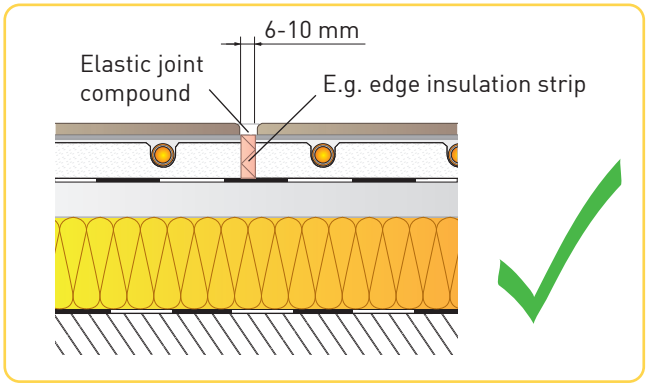
3.2 Movement joints

Movement joints (e.g. with edge insulation strips) are attached to provide tension-free accommodation of length alterations. These are to be defined by the architect or planner.

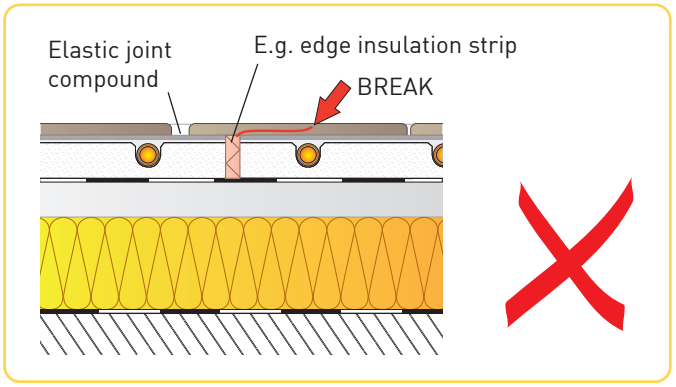


- Edge ratio max. 1:2
- Max. section size 40 m², max. edge length 8 m
- Keep the number of pipe feed-throughs through the movement joints as small as possible

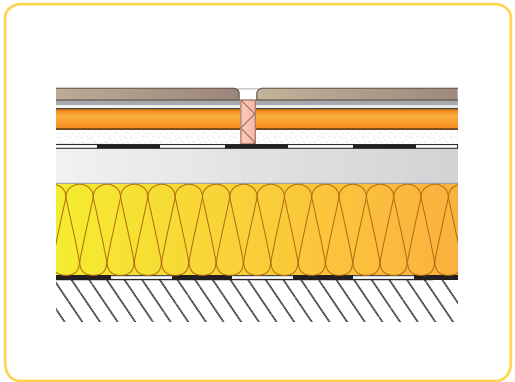
The movement joints are particularly significant in the case of ceramic coverings. It is crucial that the movement joints run congruently in all layers (compact floor heating and floor covering).



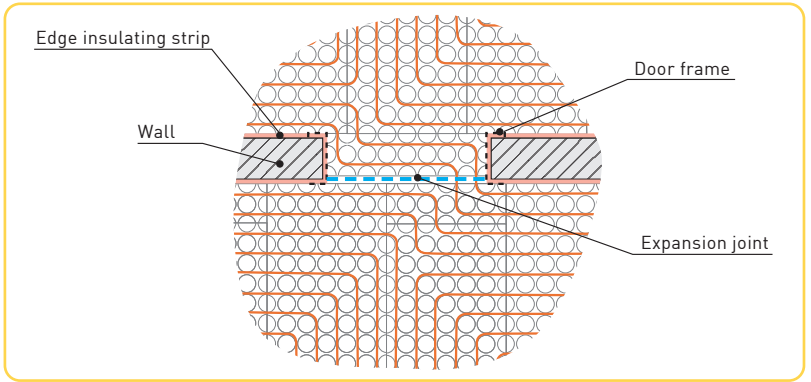
Correct movement joint



Incorrect movement joint

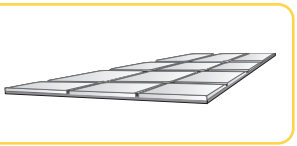


Pipe feed-through through the movement joint (no sleeve tube required)



In the vicinity of the door, the expansion joint is fed through under the door leaf.

5.7 Heat output table: tiles, ceramic and natural stone coverings



Heat output in W/m²

Thermal resistance d/λ: 0.01 – 0.02 m²K/W

Heat output in W/m² **for 100 mm pipe spacing**

t_f/t_r	t_{mH}	Room temperature T_r = 15 °C	T_r = 18 °C	T_r = 20 °C	T_r = 22 °C	T_r = 24 °C	T_0 at T_r=20°C
30/20	25	53	38	27	16	-	23
30/25	27,5	67	51	40	29	18	24
35/25	30	82	65	53	43	32	25
35/30	32,5	95	79	68	57	47	26
37,5/32,5	35	109	93	83	70	60	27
40/30	35	109	93	83	70	60	27
40/35	37,5	124	108	97	85	74	29
45/35	40	138	122	110	99	88	29
45/40	42,5	153	137	126	114	102	31
50/40	45	168	152	140	129	117	32
50/45	47,5	183	165	154	143	132	33

Heat output in W/m² **for 200 mm pipe spacing**

Not suitable for living rooms or bare-foot areas!

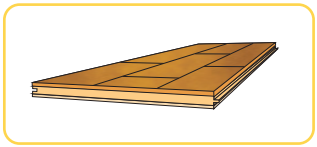
t_f/t_r	t_{mH}	Room temperature T_r = 15 °C	T_r = 18 °C	T_r = 20 °C	T_r = 22 °C	T_r = 24 °C	T_0 at T_r=20°C
30/20	25	40	28	20	12	-	22
30/25	27,5	51	38	30	22	14	23
35/25	30	62	50	41	33	24	24
35/30	32,5	73	60	52	44	35	25
37,5/32,5	35	84	71	63	54	46	26
40/30	35	84	71	63	54	46	26
40/35	37,5	94	82	72	65	57	26
45/35	40	105	93	84	75	67	27
45/40	42,5	117	105	95	87	78	29
50/40	45	128	116	106	98	89	29
50/45	47,5	139	126	118	110	100	31

Caution! The flow temperature must never exceed 50 °C.

t_{mH} = mean hot water temperature $\frac{t_f+t_r}{2}$ t_f/t_r = flow/return temperature T_0 = mean surface temperature T_r = room temperature

All temperatures in °C

5.8 Heat output table: thin parquet floors, laminates and carpets



Heat output in W/m²

Wärmedurchlasswiderstand d/λ: 0,075 m²K/W

Heat output in W/m² **for 100 mm pipe spacing**

t_f/t_r	t_{mH}	Room temperature T_r = 15 °C	T_r = 18 °C	T_r = 20 °C	T_r = 22 °C	T_r = 24 °C	T_0 at T_r=20°C
30/20	25	41	29	21	12	-	22
30/25	27,5	53	40	32	24	15	23
35/25	30	65	52	43	35	26	24
35/30	32,5	77	62	53	45	37	25
37,5/32,5	35	87	74	66	56	48	26
40/30	35	87	74	66	56	48	26
40/35	37,5	98	86	77	67	59	27
45/35	40	111	98	88	80	70	28
45/40	42,5	121	108	99	91	81	29
50/40	45	134	122	112	102	93	30
50/45	47,5	145	131	122	113	103	31

Heat output in W/m² **for 200 mm pipe spacing**

Not suitable for living rooms or bare-foot areas!

t_f/t_r	t_{mH}	Room temperature T_r = 15 °C	T_r = 18 °C	T_r = 20 °C	T_r = 22 °C	T_r = 24 °C	T_0 at T_r=20°C
30/20	25	32	23	17	10	-	22
30/25	27,5	42	32	26	19	13	23
35/25	30	51	40	34	28	20	23
35/30	32,5	60	49	42	35	29	24
37,5/32,5	35	69	59	52	44	38	25
40/30	35	69	59	52	44	38	25
40/35	37,5	78	68	60	53	47	25
45/35	40	87	77	70	64	56	26
45/40	42,5	95	85	78	71	65	27
50/40	45	106	96	88	81	73	28
50/45	47,5	115	104	96	89	82	29

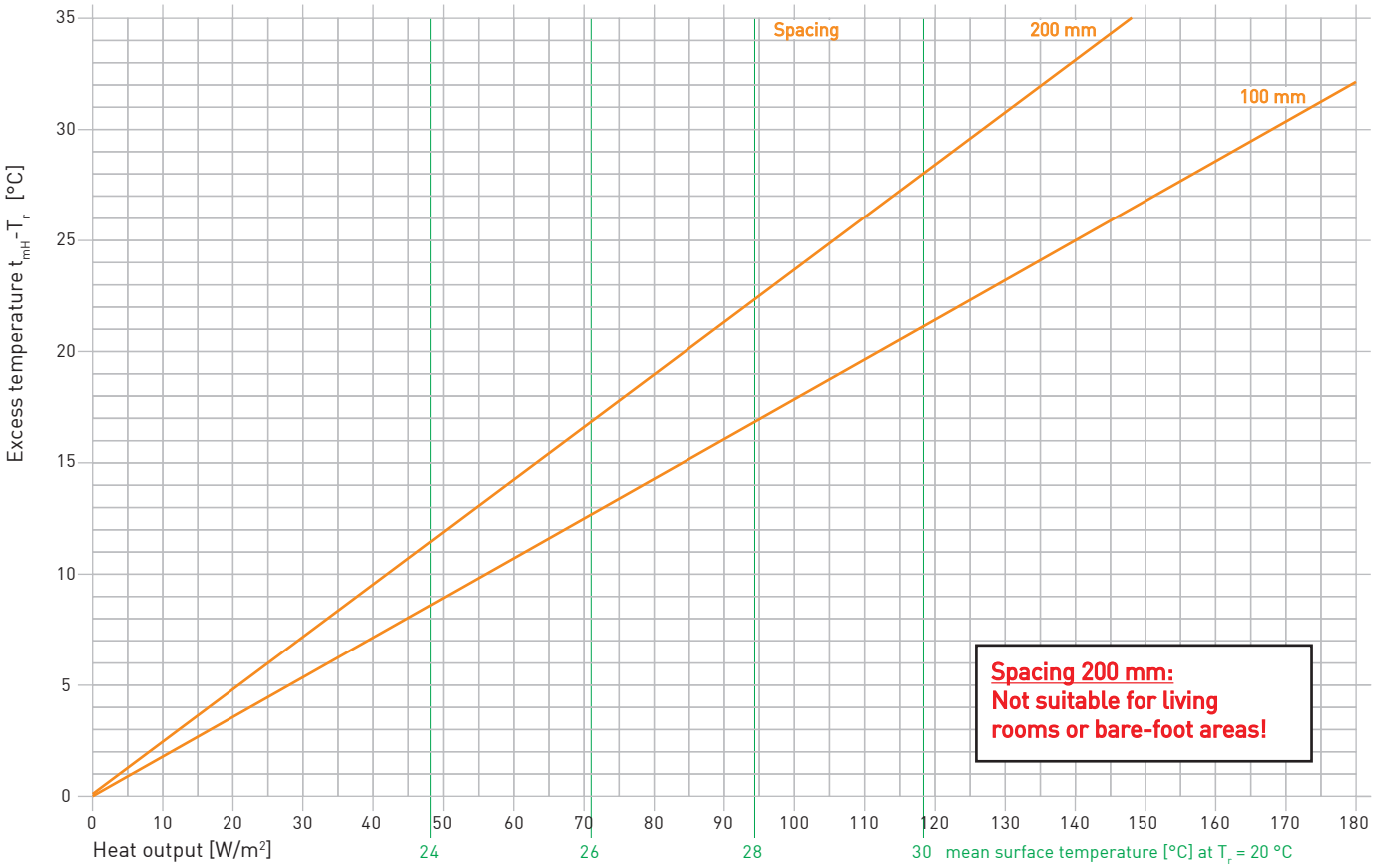
Caution! The flow temperature must never exceed 50 °C.

t_{mH} = mean hot water temperature $\frac{t_f+t_r}{2}$ t_f/t_r = flow/return temperature T_0 = mean surface temperature T_r = room temperature

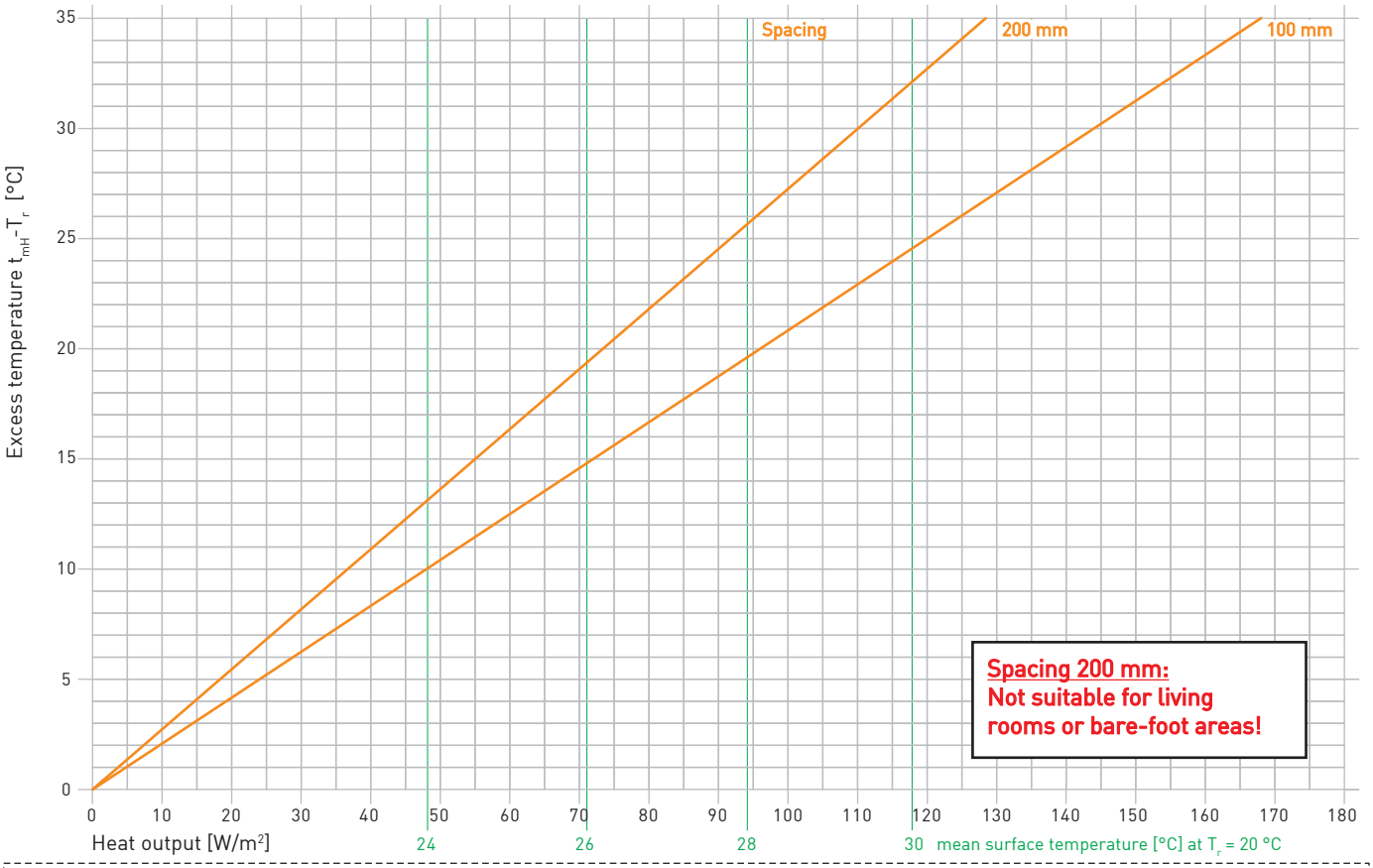
All temperatures in °C

5.9 Heat output diagrams

HEAT OUTPUT for a floor covering with a thermal resistance of d/λ = 0,01 [m²K/W]

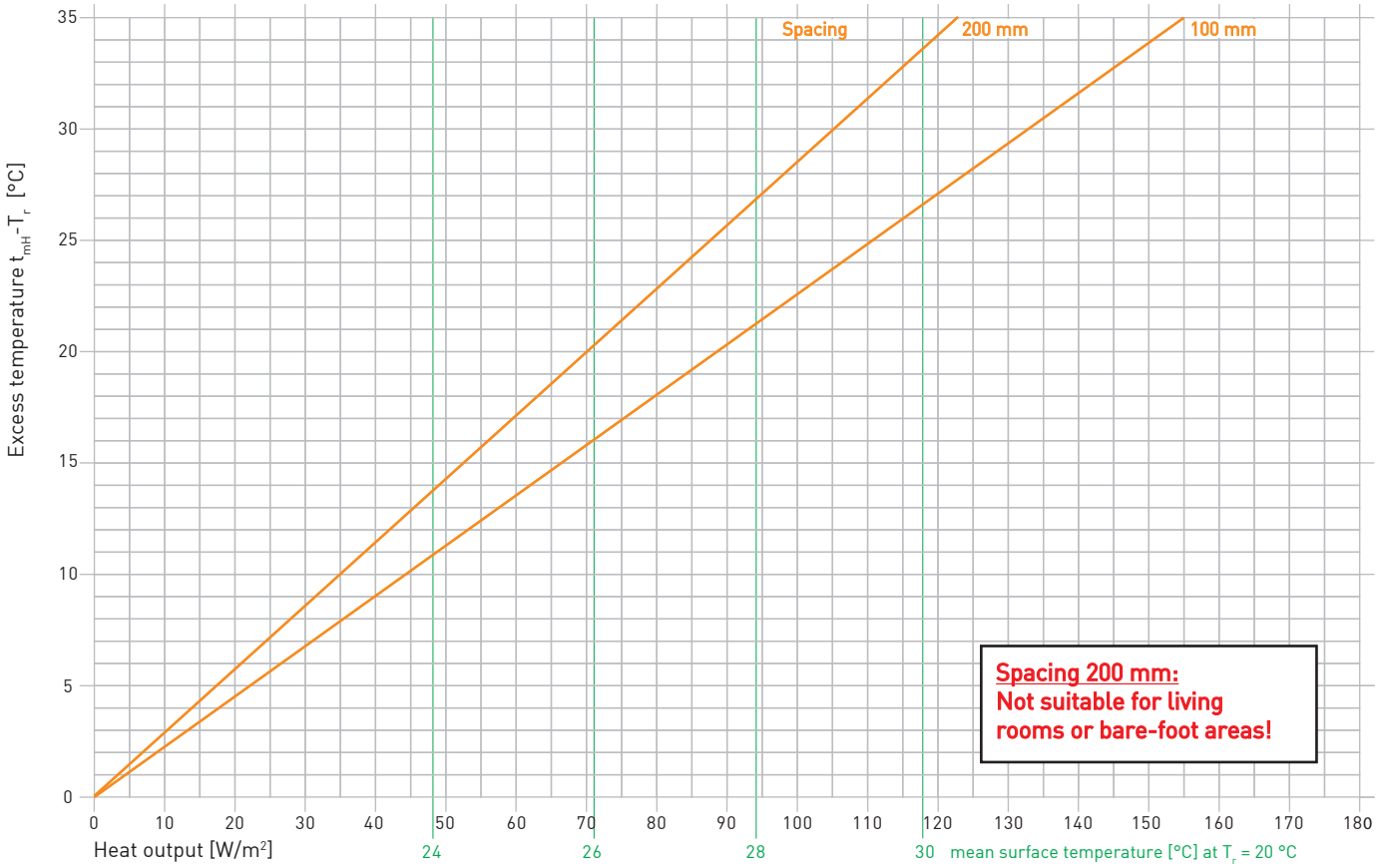


HEAT OUTPUT for a floor covering with a thermal resistance of d/λ = 0,05 [m²K/W]

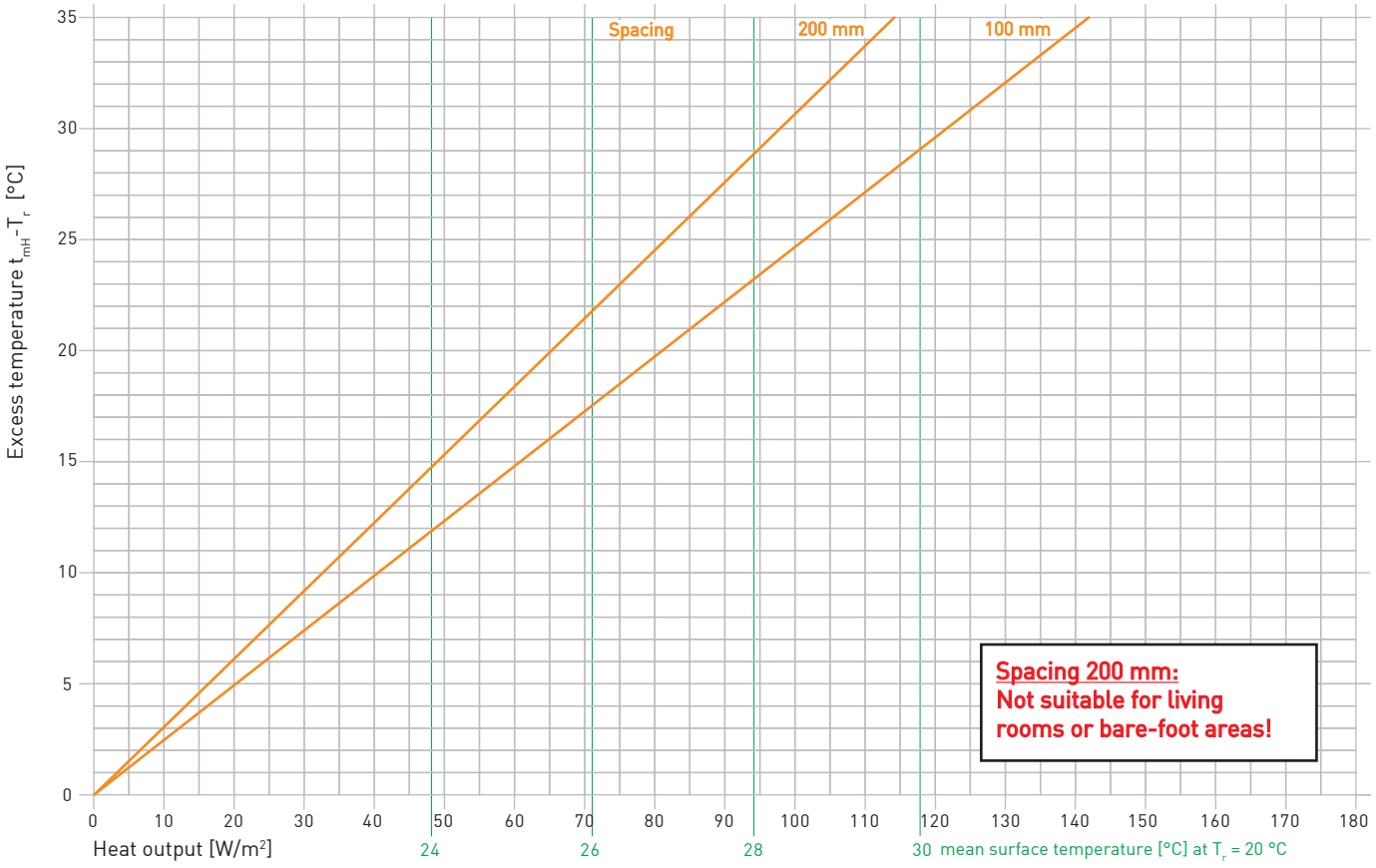


t_{mH} = mean hot water temperature = $\frac{t_f+t_r}{2}$ [°C] t_f/t_r = flow/return temperature [°C] T_r = room temperature [°C]

HEAT OUTPUT for a floor covering with a thermal resistance of d/λ = 0,075 [m²K/W]

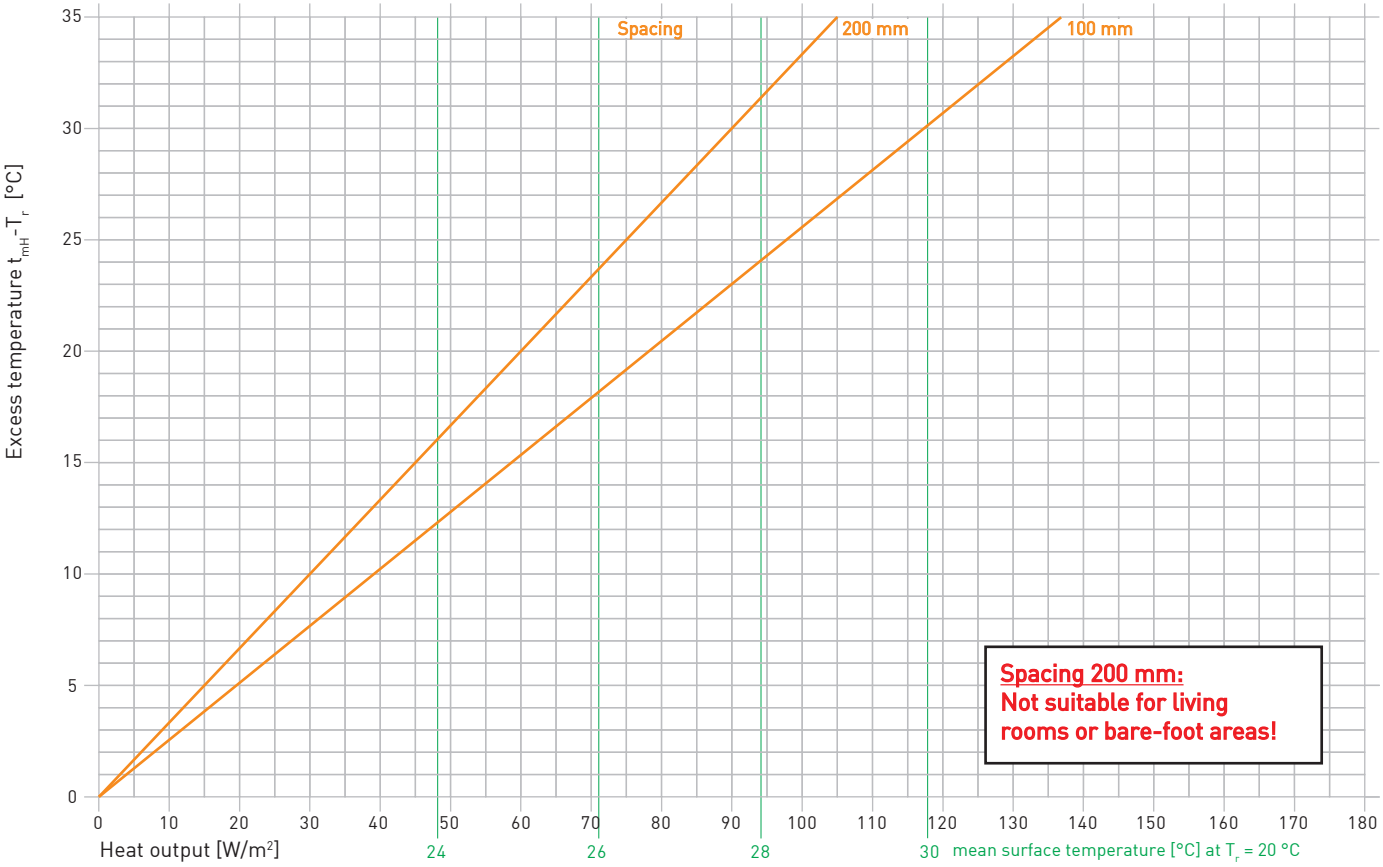


HEAT OUTPUT for a floor covering with a thermal resistance of d/λ = 0,10 [m²K/W]

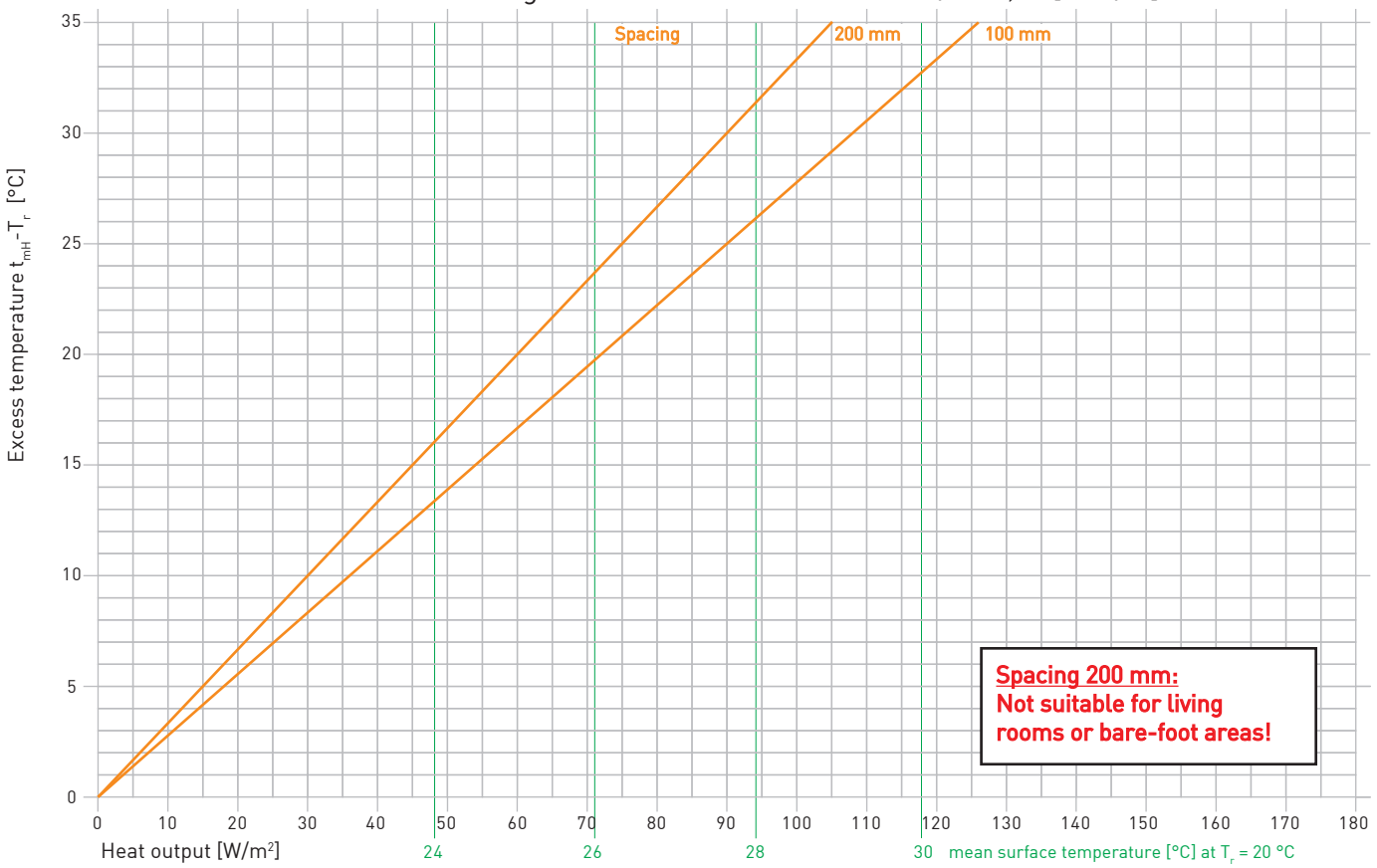


t_{mH} = mean hot water temperature = $\frac{t_i+t_w+t_r}{2}$ [°C] t_v/t_r = flow/return temperature [°C] T_r = room temperature [°C]

HEAT OUTPUT for a floor covering with a thermal resistance of d/λ = 0,12 [m²K/W]

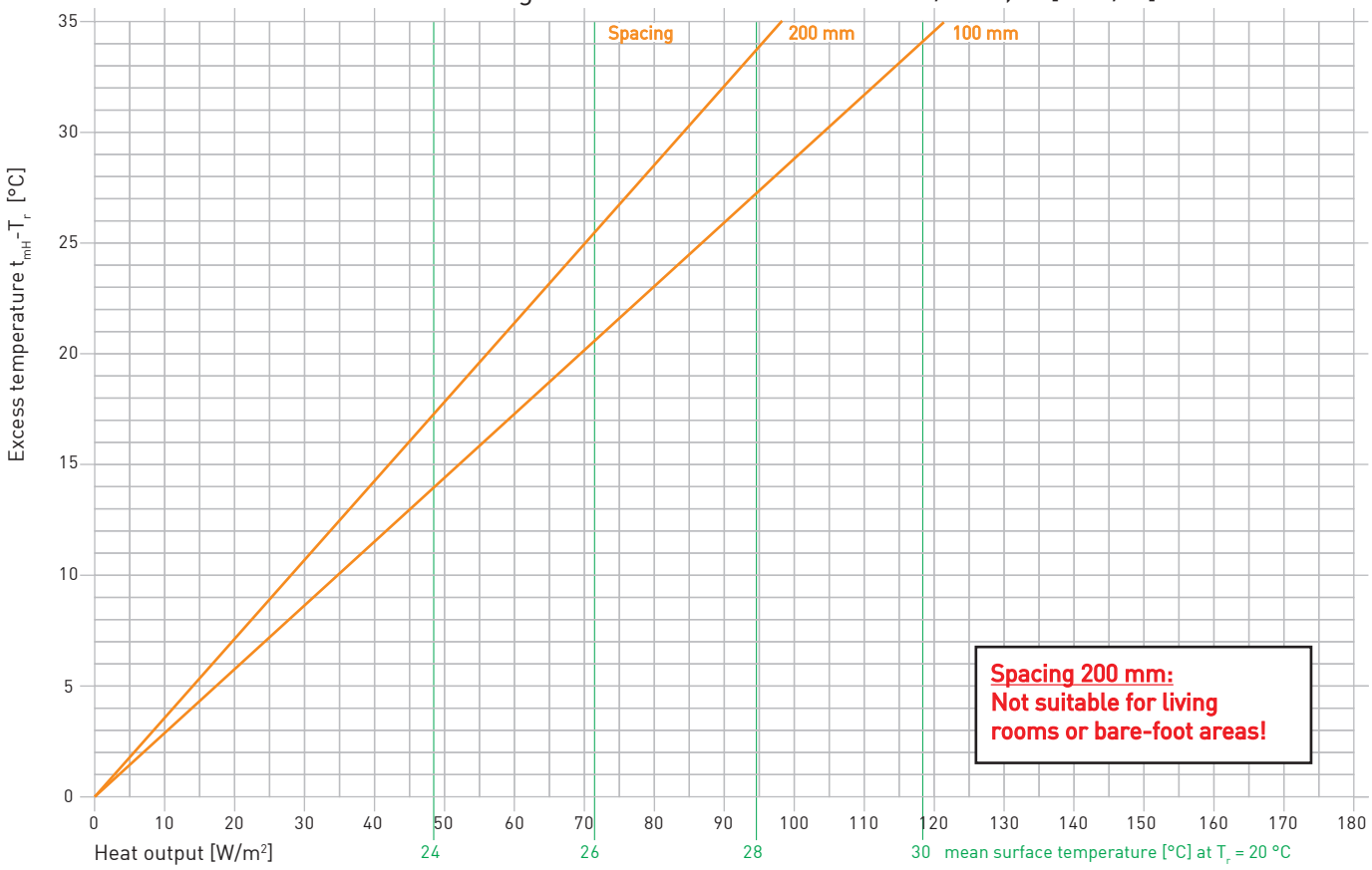


HEAT OUTPUT for a floor covering with a thermal resistance of d/λ = 0,14 [m²K/W]

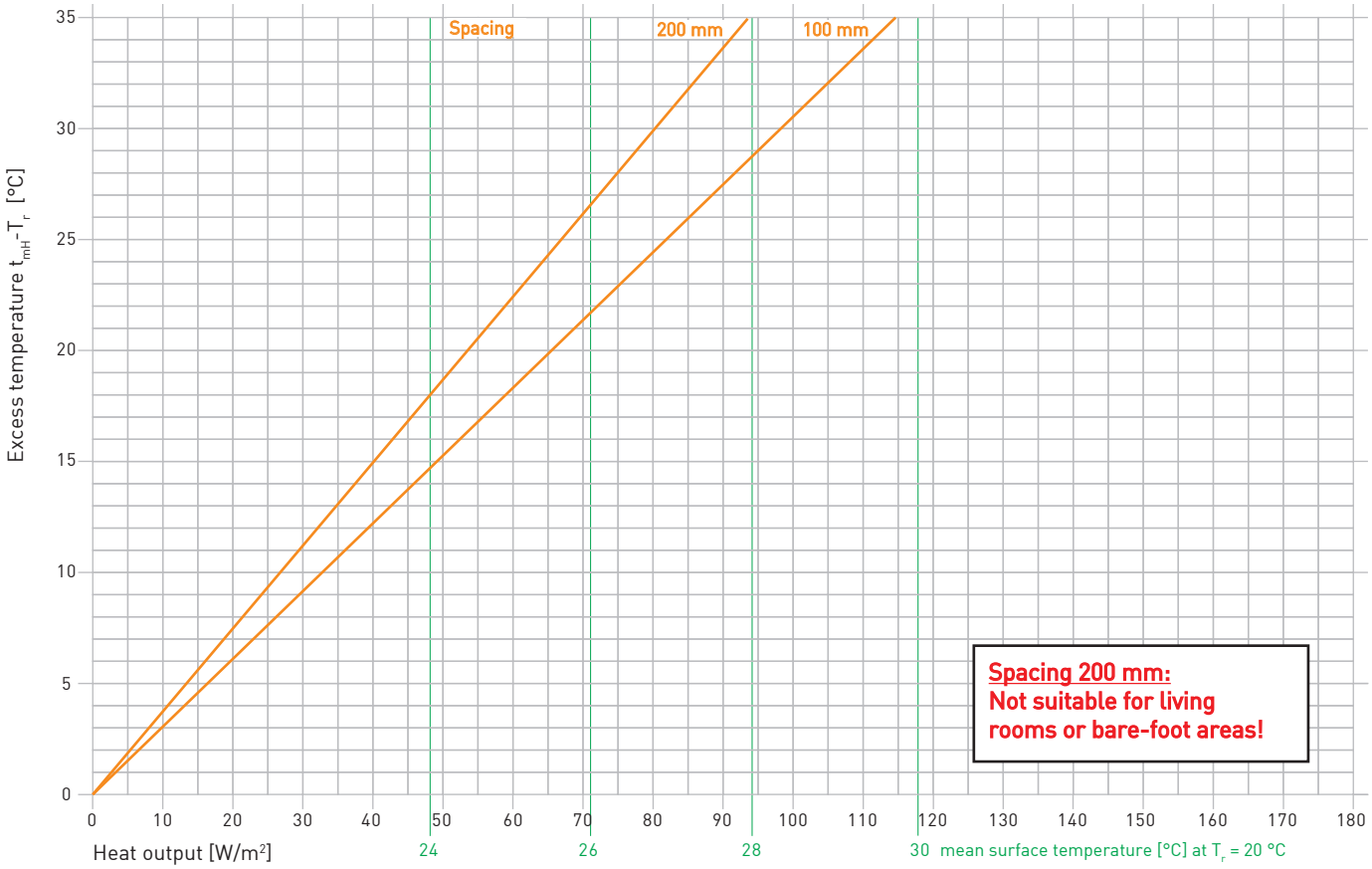


t_{mH} = mean hot water temperature = $\frac{t_f+t_r}{2}$ [°C] t_f/t_r = flow/return temperature [°C] T_r = room temperature [°C]

HEAT OUTPUT for a floor covering with a thermal resistance of d/λ = 0,16 [m²K/W]



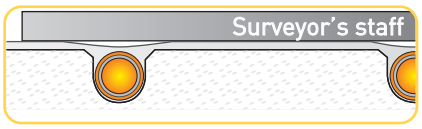
HEAT OUTPUT for a floor covering with a thermal resistance of d/λ = 0,18 [m²K/W]



t_{mH} = mean hot water temperature = $\frac{t_f+t_r}{2}$ [°C] t_f/t_r = flow/return temperature [°C] T_r = room temperature [°C]

6. Floor covering

The floor covering used must be suitable for floor heating systems (observe the manufacturer's instructions). The surface of the VarioComp complies with DIN 18202, Limits for evenness deviations under higher requirements, Table 3, Row 4.

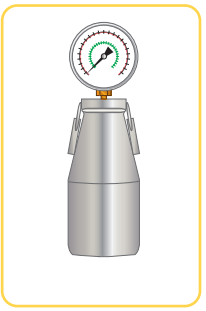


Measuring point spacing	0,1 m	1 m	4 m	10 m
Pitch max.	1 mm	3 mm	9 mm	12 mm

Before laying the floor covering, the Compact floor heating must be dried as per the following table:

Floor covering (observe the manufacturer's instructions!)	Drying time without baking out at t_i = 20 °C		Drying time with baking out* at t_f = 40 °C, t_i = 20 °C	
	Time	CM value	Time	CM value
Stone and ceramic coverings (thin-bed)	144 h	1,3 %	24 h	1,3 %
Wood covering, parquet	192 h	0,3 %	36 h	0,3 %

*At 20 °C, you must wait at least 3 hours after finishing applying the filling compound before beginning the baking out process.



CM moisture meter

Application in wet rooms:

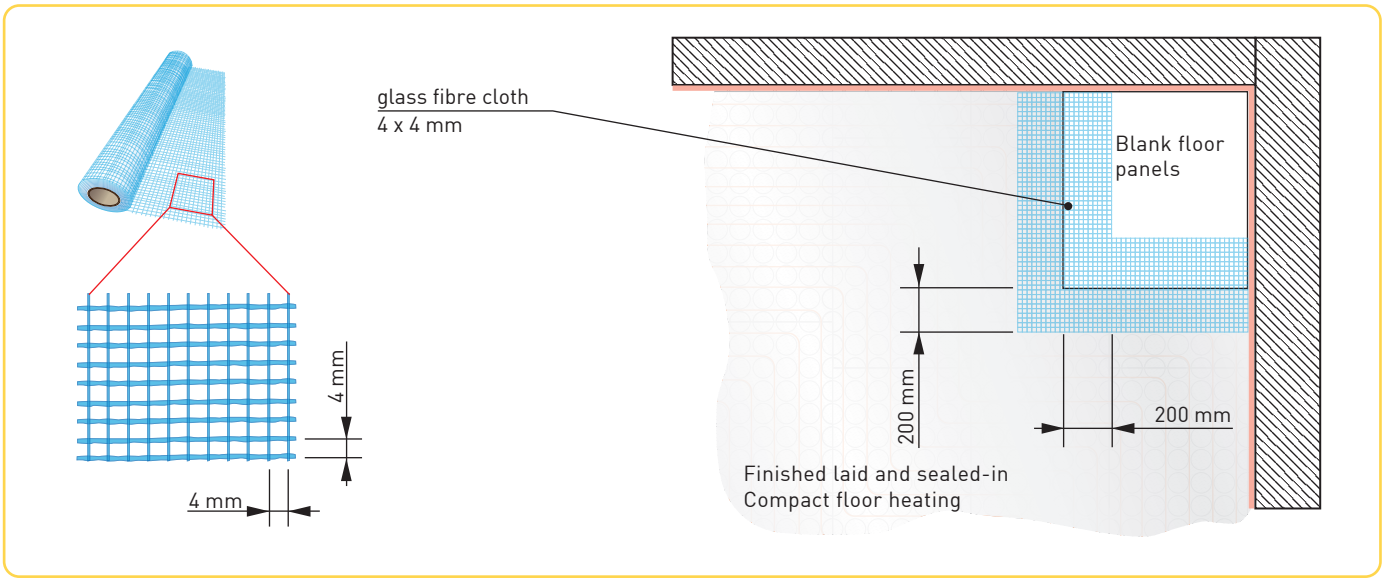
Operational demands group (ÖN B 2207)	Which room?	Adhesive mortar with tile coverings	Sealing system	Primer
W1	Residential sector: toilets, corridors, staircases	Anhydrite flexible adhesive mortar	Not required	Not required
		cement flexible adhesive mortar	Not required	Required
W2	Residential sector: kitchen Commercial sector: toilet systems	Only cement flexible adhesive mortar	Recommended	In addition to the sealing system, when recommended by the manufacturer
W3	Residential sector: spray water areas In showers and bathrooms	Only cement flexible adhesive mortar	Recommended	In addition to the sealing system, when recommended by the manufacturer
W4	Commercial sector: kitchens, shower systems	No Compact floor heating possible		

Product examples for primer or sealing system:

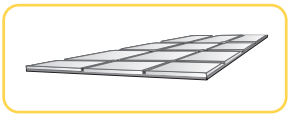
Manufacturer / Brand	Primer	Sealing system
Ardex	Ardex P51	Ardex 8 + 9
Murexin	Tiefengrund LF	Duschdicht / Flüssigfolie
Cimsec	Gipsgrundierung	Dichtflex
PCI	Gisogrund	Lastogum
Schönox	Schönox KH	Schönox HA oder 1K-DS
Mapei	Primer G	Mapegum WPS
Weber	weber.prim 801	weber.sys 822
Ceresit	Lösungsmittelfreier Tiefengrund	Ceresit Dusch- und Badabdichtung

Borders between Compact panels and blank panels:

Cover the borders using glass fibre cloth (4 x 4 mm) at an overlap of 200 mm (bond using tile adhesive).



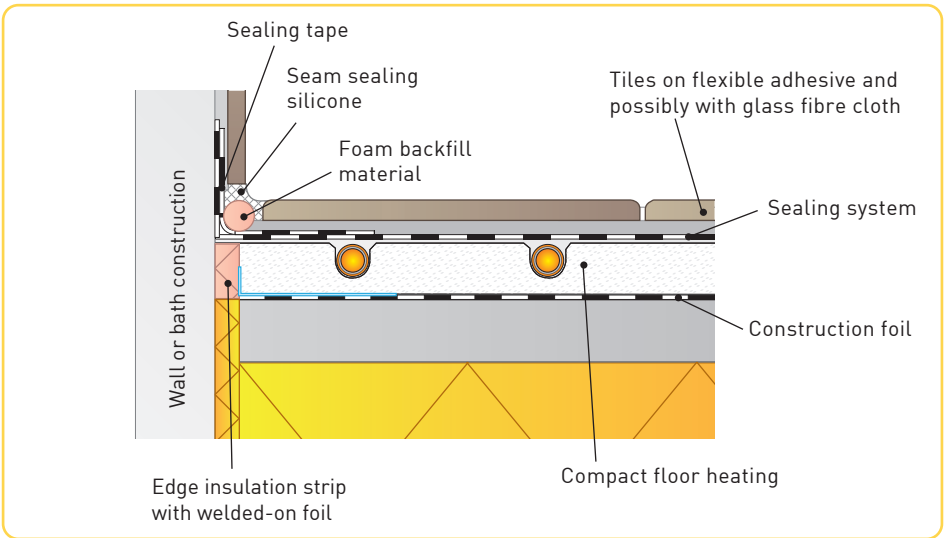
6.1 Tiles



See also the appropriate standards for laying tiles, panels and mosaics.

Points to be observed:

- The surface must be dust-free.
- Sealing systems must be used on surfaces subject to the effects of moisture (see page 20). The wall boundaries must be sealed using appropriate sealing tape.



Example:
Tiled floor covering subject to the effects of moisture (W2/W3)

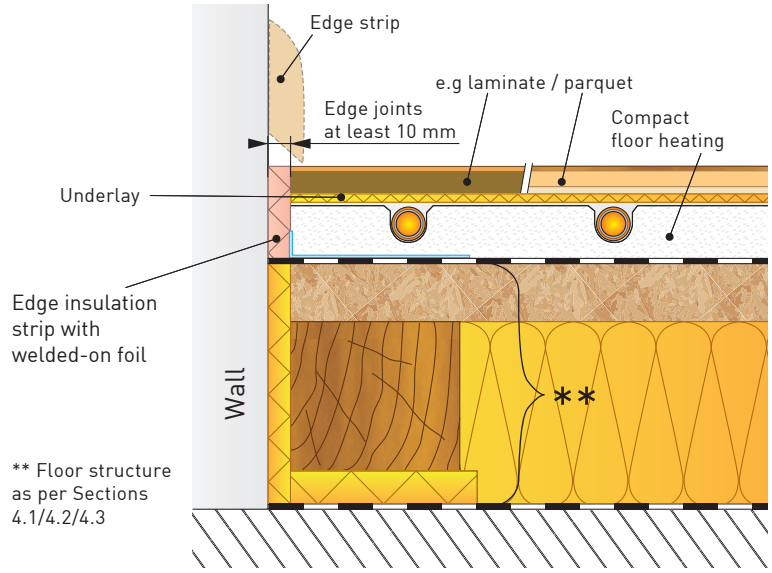
- A flexible adhesive is used to bond the tiles. A primer must be applied if required by the adhesive manufacturer. This is particularly the case for flexible cement adhesives.
- Flexible grouting mortar must be used for grouting.
- After laying the tiles, boundaries with the walls are additionally sealed with silicone.

For critical floor structures, we recommend integrating a 4 x 4 mm fibre glass cloth into the flexible adhesive.

6.2 Wood covering, parquet and laminate

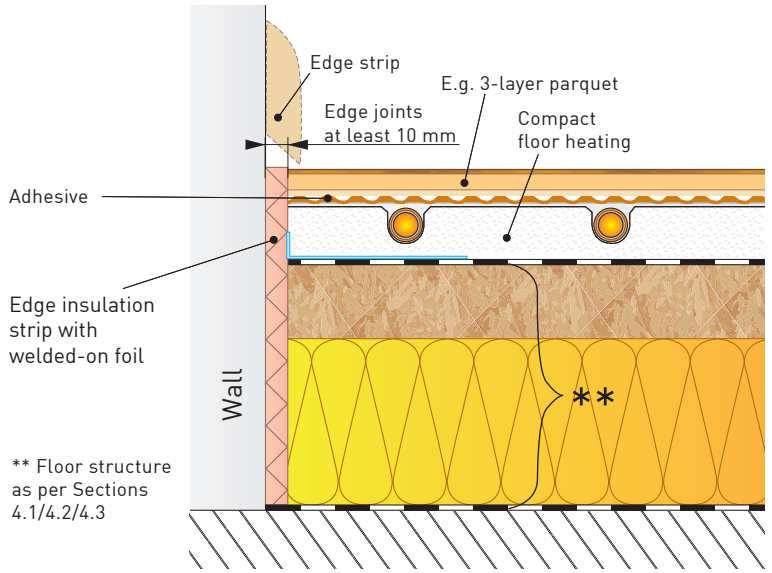
Lay only floor coverings that are approved by the manufacturer for use with floor heating systems. Observe the laying instructions of the manufacturer.

Floating application:



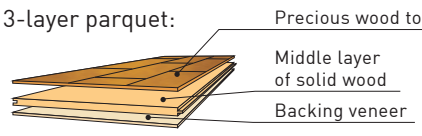
The laminate/parquet covering is laid floating on a floor heating underlay (max. 2 mm). Please remember to leave ample edge joints both to the wall and to all other fixed components in the room. The edge joints should be of at least 10 mm.

Adhesive parquet:



Parquet can be glued onto the Compact floor heating under the following conditions:

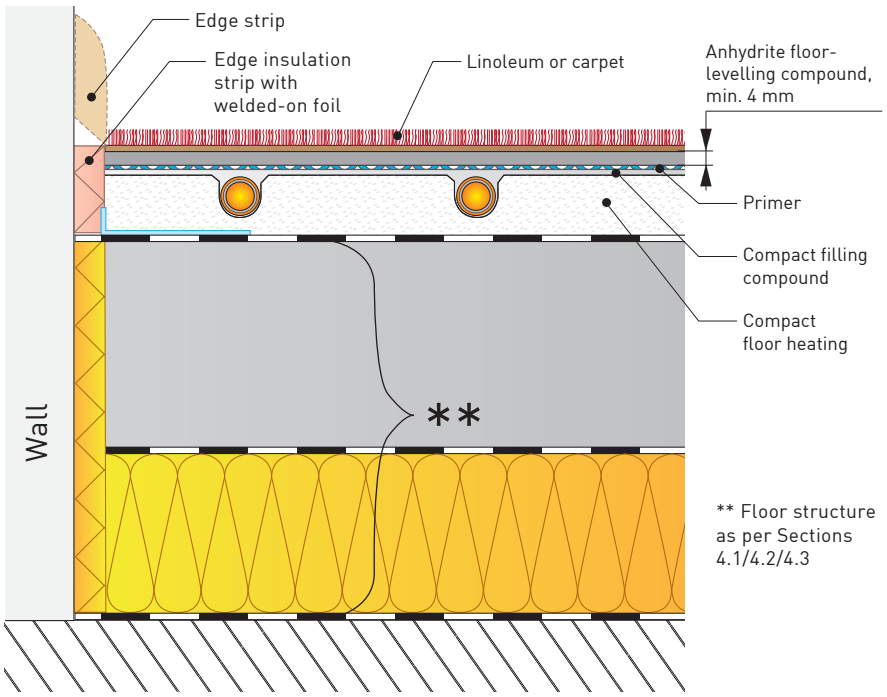
- Maximum flow temperature of 40 °C (Maximum temperature limiter required!)
- Bonding using e.g. Mapei Ultrabond P990 1K (without primer) or equivalent adhesive (primer as per adhesive manufacturer's specifications)
- 2 or 3-layer parquet, approved for use with floor heating systems (also stick parquet) without bonding in the tongue and grooves, parquet thickness: 9 to max. 15 mm

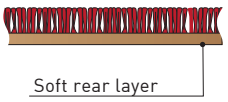


- The parquet is glued directly onto the VarioComp system. We recommend not using additional decoupling material.

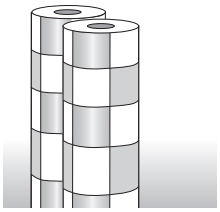
6.3 Linoleum or carpet

For soft floor coverings, an anhydrite-based floor-levelling compound at least 4 mm thick is laid over the completed VarioComp.





Carpet

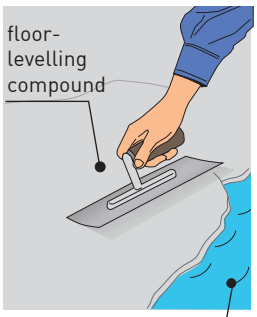


Linoleum

Please observe the relevant manufacturer's instructions for the required primer or sealant of the VarioComp surface and of the planned floor-levelling compound.

Product examples for primer and anhydrite floor-levelling compound:

Manufacturer / Brand	Primer	Anhydrite floor-levelling compound
Mapei	Primer G	Planitex D10
Schönox	Schönox VD, PG	Schönox AP
Maxit	maxit floor 4716	maxit floor 4095
Fermacell	Tiefengrund	Boden-Nivelliermasse
Thomsit	R776, R777	AS1 Rapid
Stauf	IBOLA D54	IBOLA GS



Finished VarioComp surface, primed

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GÜNSELSDORFER STRASSE 3A
2544 LEOBERSDORF
AUSTRIA

T: +43 22 56 - 648 70-0
F: +43 22 56 - 648 70-9

office@variotherm.at www.variotherm.at