THERMAL OUTPUT

UG19D634

COMISA QUALITY COMES FIRST

50 COMISA 1969/2019

TYPE SLIM GRAPHITE
Test report

TEST REPORT FOR SPECIFIC THERMAL OUTPUT
OF FLOOR HEATING CONSTRUCTION IN ACC. TO EN 1264

EN

IGE
Institüt für
GebäudenEnergetik

Universität Stuttgart

Lehrstuhl für
Heiz-und
Raumlufttechnik

Deutscher Akkreditierungs Rat
DAR

SPECIFIC THERMAL OUTPUT TESTING IN ACC. TO EN 1264 PART. 2, FLOOR HEATING SYSTEM

1. TEST METHOD

Initial test of floor heating system

2. INSTITUT:

Institüt für GebäudeEnergetik Lehrstuhl für Heiz - und Raumlufttechnik der Universität Stuttgard
Pfaffenwaldring 35 - D-70569 Stuttgard-Vaihingen

3. CLIENT:

COMISA S.p.A. - Via Neziole, 27 - 25055 - Pisogne (Bs) - ITALY

4. MANUFACTURER:

The Client

5. SYSTEM DESCRIPTION

trademark:	SISTEMA SLIM GRAFITE					
construction:	Type A					
spacing in m:	0,050	0,100	0,150	0,200	0,250	0,300

Pipe:

material:	PE-RT / Al / PE/RT (diffusiondicht)
diameter:	0,016 m
thickness:	0,022 m
eff. heat conductivity:	0,387 W/mK

Systeme layer plate:	plate with nubs of polystyrol					
volume of nubs in %:	7,69	7,43	7,34	7,30	7,28	7,26
heat conductivity of nubs:	0,4 W/m K					

Load distribution layer:

material:	Concrete floor
thickness:	0,045 m
heat conductivity:	1,20 W/m K

6. TEST RESULTS:

Limit specific thermal output in W/m2	100,0	98,5	96,0	62,6	86,6	84,5
Limit temperature difference in K:	13,3	15,5	17,5	19,4	21,0	22,4

7. PROCEDURE OF TESTING:

The system was tested by calculation method.
An additional experimentell testing is not necessary.

8. CALCULATION RESULTS:

Characteristic curves: $q = k_H * \Delta\theta_H$

ADD. FLOOR COVERING	0,00	0,05	0,10	0,15	m² K/W
Spacing T	Equivalent coefficient for heat transfer kH				
0,050 m	7,534	5,372	4,167	3,403	W/m² K
0,100 m	6,342	4,670	3,708	3,082	W/m² K
0,150 m	5,482	4,137	3,350	2,822	W/m² K
0,200 m	4,756	3,673	3,028	2,583	W/m² K
0,250 m	4,128	3,261	2,738	2,366	W/m² K
0,300 m	3,592	2,900	2,479	2,170	W/m2 K

Prof. Dr.-Ing. M. Schmidt

Universität Stuttgart
Institut für GebäudeEnergetik
Pfaffenwaldring 35 · 70569 Stuttgart
Tel.: (+49)711 / 685 620 85
Fax: (+49)711 / 685 620 96
www.ige.uni-stuttgart.de

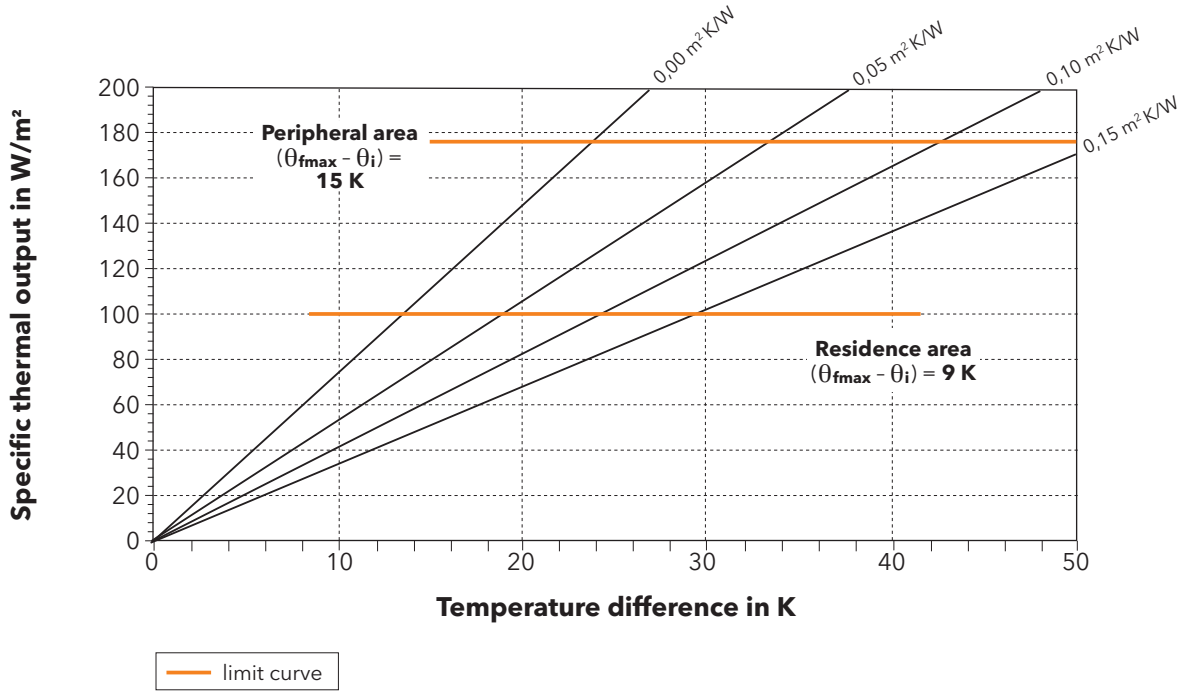
Dr.-Ing. Chr. Beck

SPECIFIC THERMAL OUTPUT TESTING IN ACC. TO EN 1264 PART. 2, FLOOR HEATING SYSTEM

LIMIT CURVES **Spacing T = 0,050 m**

$\Delta\theta_{fmax}$	FLOOR COVERING	0,00	0,05	0,10	0,15	m² K / W
9	Limit temperature difference	**13,3**	18,6	24,0	29,4	K
K	Limit specific thermal output	**100,0**	100,0	100,0	100,0	W / m²
15	Limit temperature difference	23,2	32,6	42,0	51,4	K
K	Limit temperature difference	175,0	175,0	175,0	175,0	

Spacing T = 0,050 m

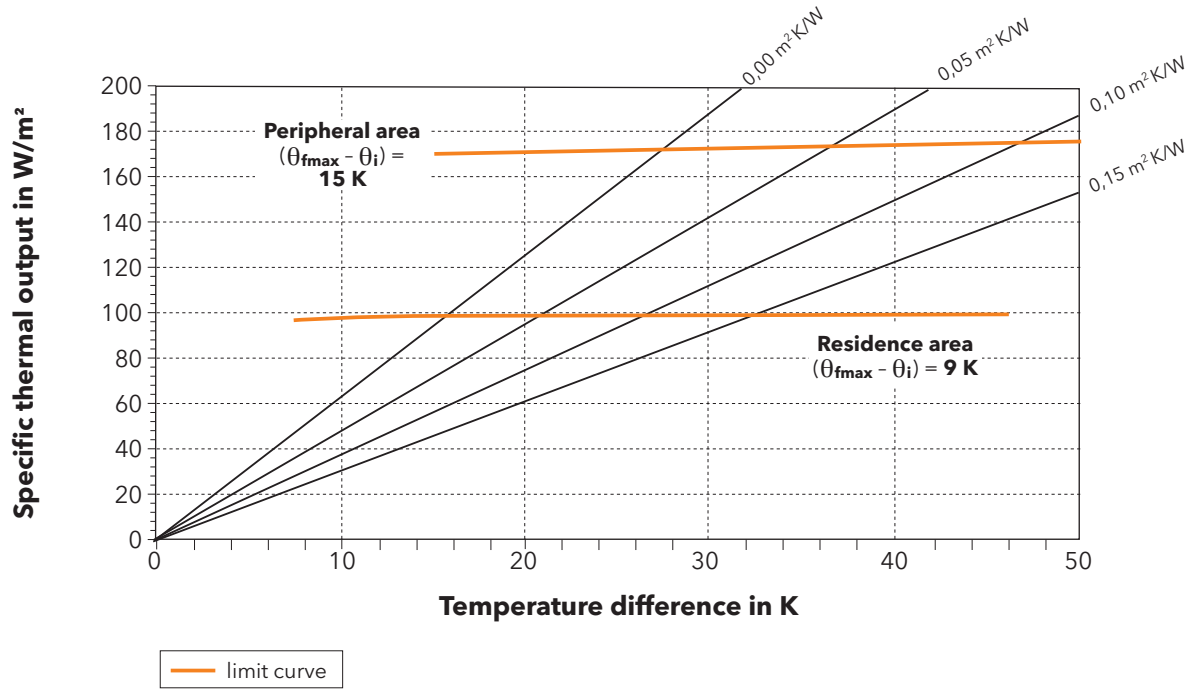


CALCULATION FACTORS	Spacing T = 0,050 m				
Resistance of floor covering	0,000	0,050	0,100	0,150	m² K / M
Factor B	6,735	6,725	6,719	6,716	W / m² K
Factor a_B	1,058	0,764	0,598	0,491	
Spacing factor a_T	1,230	1,188	1,156	1,134	
Spacing exponent m_T			0,333		
Covering factor $a_Ü$	1,069	1,056	1,043	1,037	
Covering exponent $m_Ü$			0,000		
Pipe factor A_D	1,013	1,013	1,012	1,011	
Pipe exponent m_D			-1,000		
Limit curve coefficient B_G			100,000		
Limit curve exponent n_G			0,000		

LIMIT CURVES **Spacing T = 0,100 m**

$\Delta\theta_{fmax}$	FLOOR COVERING	0,00	0,05	0,10	0,15	m² K / W
9	Limit temperature difference	**15,5**	21,3	27,0	32,4	K
K	Limit specific thermal output	**98,5**	99,4	100,0	100,5	W / m²
15	Limit temperature difference	27,2	37,3	47,2	56,8	K
K	Limit temperature difference	172,8	174,3	175,0	175,0	W / m2

Spacing T = 0,100 m

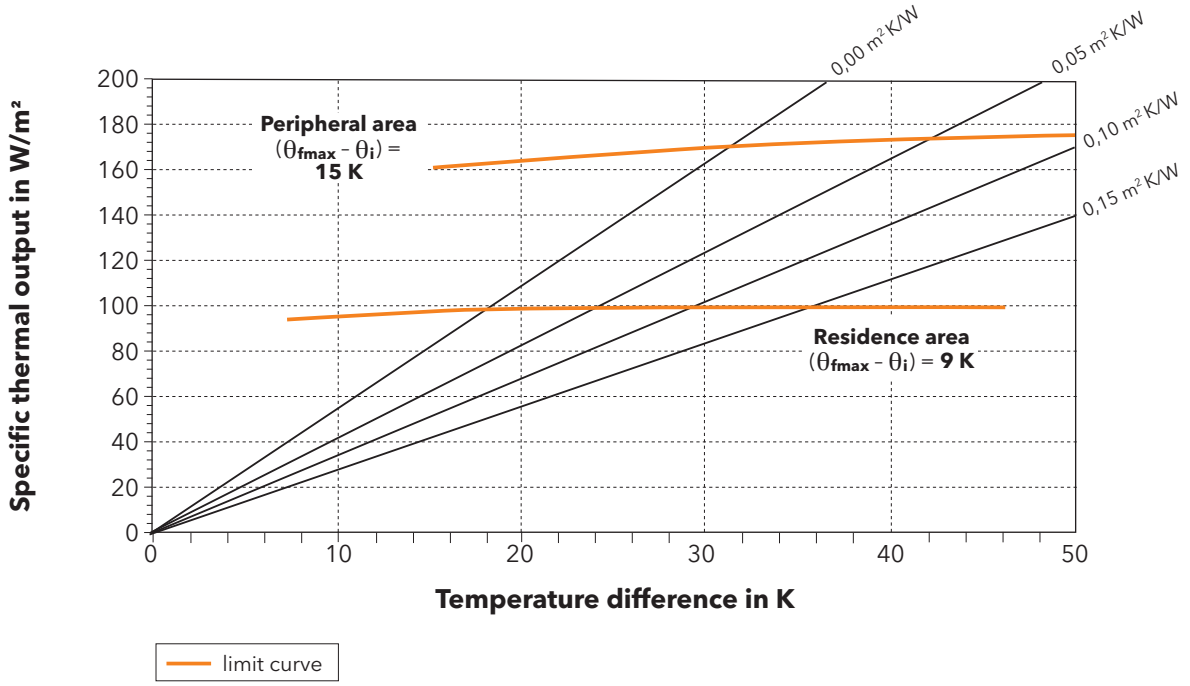


CALCULATION FACTORS	Spacing T = 0,100 m				
Resistance of floor covering	0,000	0,050	0,100	0,150	m² K / M
Factor B	6,758	6,743	6,734	6,728	W / m² K
Factor a_B	1,035	0,752	0,591	0,486	
Spacing factor a_T	1,230	1,188	1,156	1,134	
Spacing exponent m_T			– 0,333		
Covering factor $a_Ü$	1,063	1,050	1,039	1,034	
Covering exponent $m_Ü$			0,000		
Pipe factor A_D	1,013	1,013	1,012	1,011	
Pipe exponent m_D			-1,000		
Limit curve coefficient B_G			91,607		
Limit curve exponent n_G			0,027		

LIMIT CURVES **Spacing T = 0,150 m**

$\Delta\theta_{fmax}$	FLOOR COVERING	0,00	0,05	0,10	0,15	m² K / W
9	Limit temperature difference	**17,5**	23,7	29,7	35,4	K
K	Limit specific thermal output	**96,0**	98,1	99,6	100,9	W / m²
15	Limit temperature difference	30,7	41,5	52,1	62,0	K
K	Limit temperature difference	168,4	172,0	174,7	175,0	W / m²

Spacing T = 0,150 m

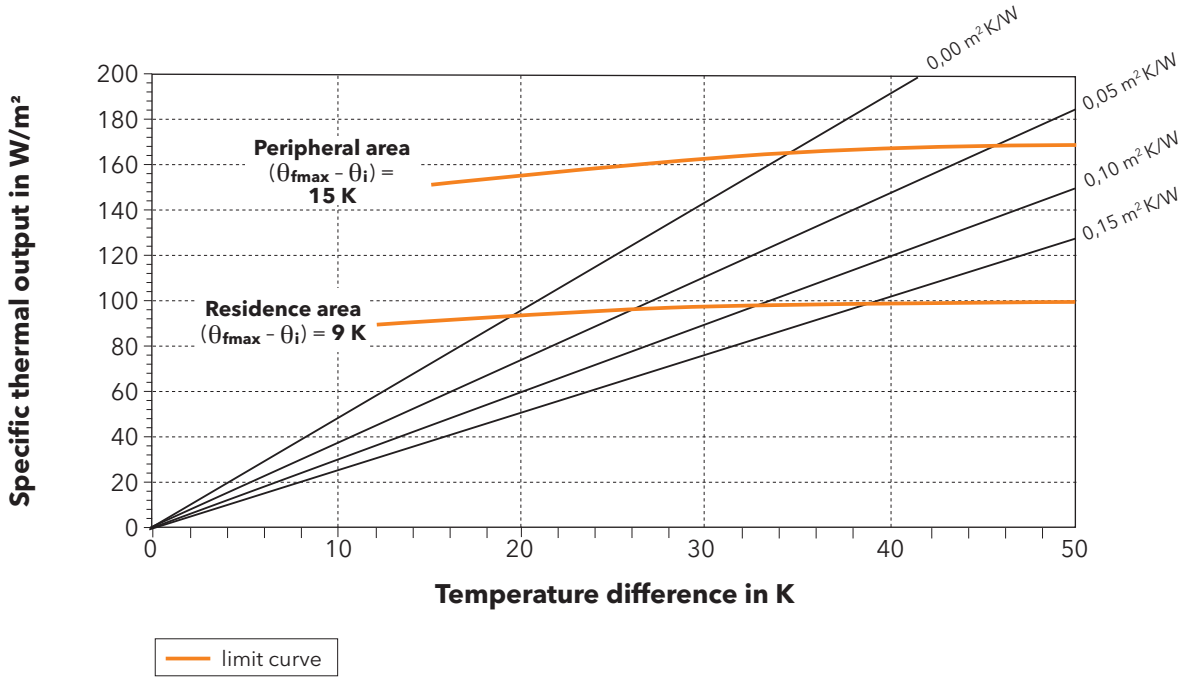


CALCULATION FACTORS	Spacing T = 0,150 m				
Resistance of floor covering	0,000	0,050	0,100	0,150	m² K / M
Factor B	6,776	6,757	6,746	6,739	W / m² K
Factor a_B	1,035	0,752	0,591	0,486	
Spacing factor a_T	1,230	1,188	1,156	1,134	
Spacing exponent m_T			-1,000		
Covering factor $a_Ü$	1,057	1,046	1,035	1,031	
Covering exponent $m_Ü$			0,000		
Pipe factor A_D	1,040	1,034	1,029	1,024	
Pipe exponent m_D			-1,000		
Limit curve coefficient B_G			78,641		
Limit curve exponent n_G			0,070		

LIMIT CURVES **Spacing T = 0,200 m**

$\Delta\theta_{fmax}$	FLOOR COVERING	0,00	0,05	0,10	0,15	m² K / W
9	Limit temperature difference	**19,5**	26,1	32,5	38,7	K
K	Limit specific thermal output	**92,6**	95,9	98,4	100,5	W / m²
15	Limit temperature difference	34,2	45,8	57,0	67,7	K
K	Limit temperature difference	162,5	168,2	172,6	175,0	W / m²

Spacing T = 0,200 m



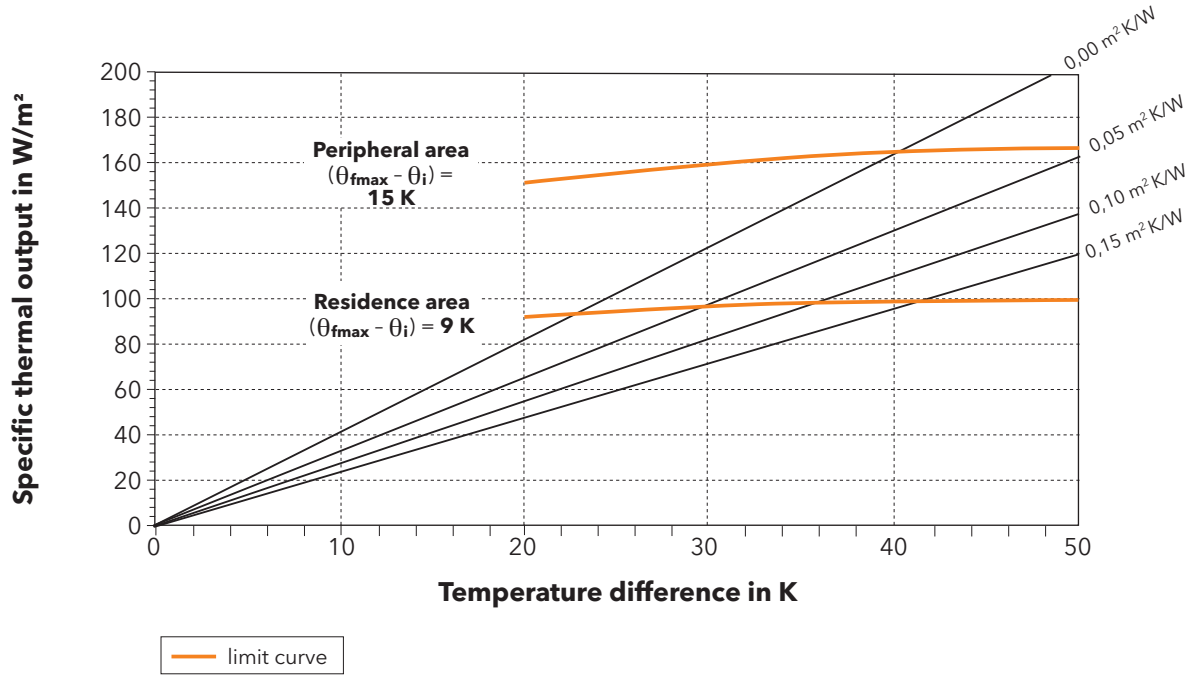
CALCULATION FACTORS	Spacing T = 0,200 m				
Resistance of floor covering	0,000	0,050	0,100	0,150	m² K / M
Factor B	6,788	6,768	6,756	6,748	W / m² K
Factor a_B	1,035	0,752	0,591	0,486	
Spacing factor a_T	1,230	1,188	1,156	1,134	
Spacing exponent m_T			– 1,667		
Covering factor $a_Ü$	1,051	1,041	1,032	1,028	
Covering exponent $m_Ü$			0,000		
Pipe factor A_D	1,046	1,040	1,035	1,030	
Pipe exponent m_D			-1,000		
Limit curve coefficient B_G			65,277		
Limit curve exponent n_G			0,118		

LIMIT CURVES **Spacing T = 0,250 m**

$\Delta\theta_{fmax}$	FLOOR COVERING	0,00	0,05	0,10	0,15	m² K / W
9	Limit temperature difference	**21,0**	27,9	34,4	41,0	K
K	Limit specific thermal output	**86,6**	90,9	94,2	97,0	W / m²
15	Limit temperature difference	36,8	48,9	60,3	70,0 *	K
K	Limit temperature difference	152,0	159,4	165,2	165,6 **	W / m²

* Specific thermal output with the limits of max temperature difference | ** Max temperature difference for the pipe in K

Spacing T = 0,250 m



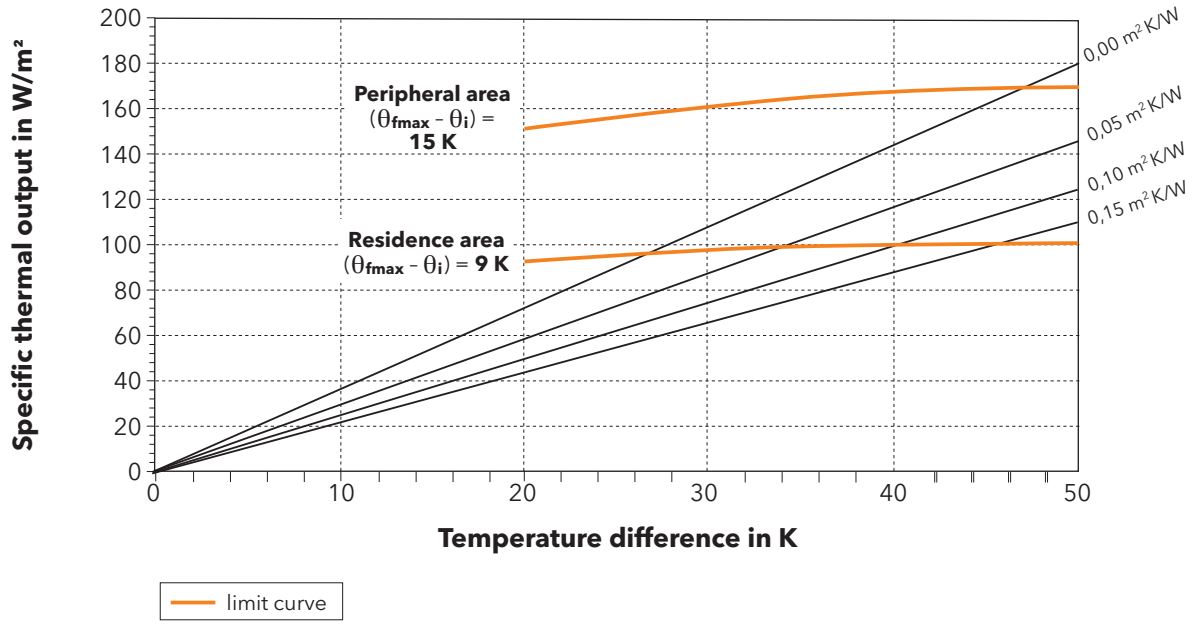
CALCULATION FACTORS	Spacing T = 0,250 m				
Resistance of floor covering	0,000	0,050	0,100	0,150	m² K / M
Factor B	6,795	6,775	6,763	6,755	W / m² K
Factor a_B	1,035	0,752	0,591	0,486	
Spacing factor a_T	1,230	1,188	1,156	1,134	
Spacing exponent m_T			-2,333		
Covering factor $a_Ü$	1,045	1,035	1,028	1,024	
Covering exponent $m_Ü$			0,000		
Pipe factor A_D	1,051	1,046	1,041	1,035	
Pipe exponent m_D			-1,000		
Limit curve coefficient B_G			51,819		
Limit curve exponent n_G			0,169		

LIMIT CURVES **Spacing T = 0,300 m**

$\Delta\theta_{fmax}$	FLOOR COVERING	0,00	0,05	0,10	0,15	m² K / W
9	Limit temperature difference	**22,4**	29,7	36,5	43,5	K
K	Limit specific thermal output	**80,5**	86,2	90,6	94,5	W / m²
15	Limit temperature difference	39,3	52,1	64,1	70,0 *	K
K	Limit temperature difference	141,3	151,2	158,8	151,9 **	W / m²

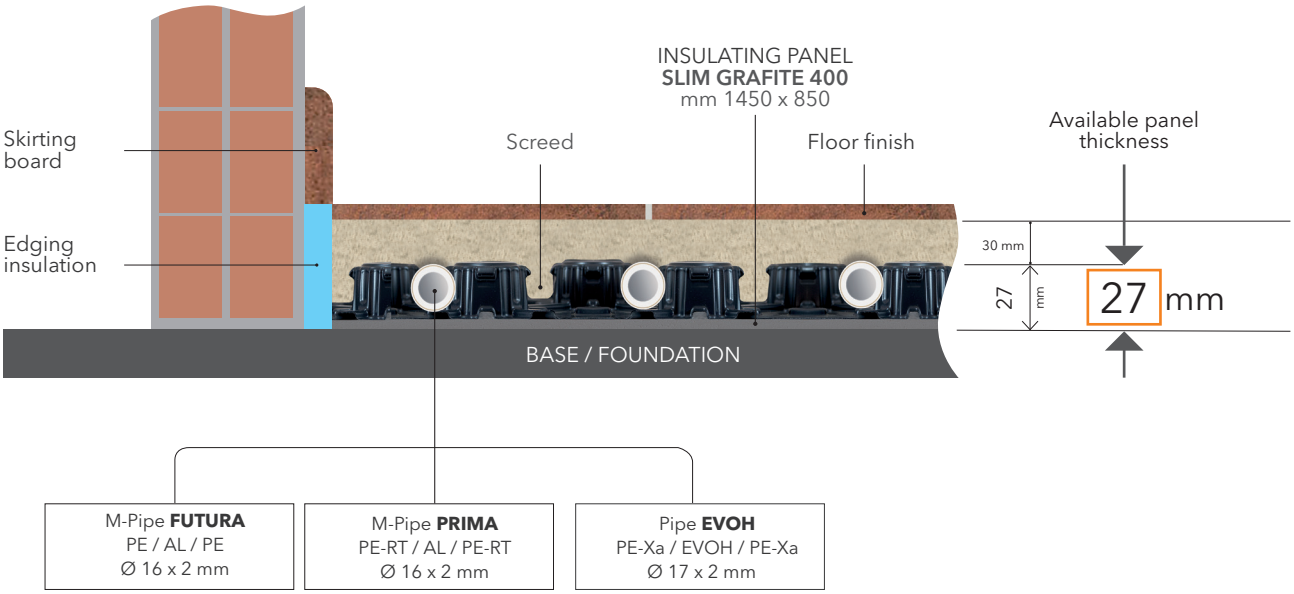
* Specific thermal output with the limits of max temperature difference | ** Max temperature difference for the pipe in K

Spacing T = 0,300 m



CALCULATION FACTORS	Spacing T = 0,300 m				
Resistance of floor covering	0,000	0,050	0,100	0,150	m² K / M
Factor B	6,799	6,780	6,769	6,760	W / m² K
Factor a_B	1,035	0,752	0,591	0,486	
Spacing factor a_T	1,230	1,188	1,156	1,134	
Spacing exponent m_T			-3,000		
Covering factor $a_Ü$	1,040	1,031	1,024	1,021	
Covering exponent $m_Ü$			0,000		
Pipe factor A_D	1,053	1,049	1,044	1,039	
Pipe exponent m_D			-1,000		
Limit curve coefficient B_G			38,140		
Limit curve exponent n_G			0,240		

9. CONSTRUCTION DRAWING OF TEST SAMPLE:



10. CONFORMITY OF THE TECHNICAL DOCUMENTS

The system is type A of DIN 18560 part. 2.
The sketch on the tecnical documents are in acc. to EN 1264 part. 4.
The official technical documents should be sended to the Institut within 6 months.

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SPECIFIC THERMAL OUTPUT TESTING IN ACC. TO EN 1264 PART. 2, FLOOR HEATING SYSTEM

1. DECRIPTION OF THE TEST METHOD:

The heating output of the looked floor system can be determined to EN 1264 part. 2.
In part. 5 of EN 1264 instructions are given which changes are to be expcted in the output (heating case and chilled case), if the arrangement of the space surfaces is changed. Thus the arrangement on the ground is, e.g., in the chilled case the case with the lowest output values, while in the heating case the arrangement on the ground proves the highest values.

2. TEST RESULTS:

2.1 PROCEDURE OF TESTING:
The standard specific thermal output the heating case is calculated to EN 1264 for 4 standard layers (R_1 to R_4):

$R_\lambda = 0{,}0;\ 0{,}05;\ 0{,}1$ and $0{,}15\ m^2 K/W$

These theoretical values of the resistance cover the really seeming floor covering to a great extent, so that for the laters use with these values or interpolations the system can be laid out.

2.2 RESULTS OF HEATING CASE IN ACC. TO EN 1264 PART. 2:
Characteristic curves: $q = k_H * \Delta\theta_H$

ADD. FLOOR COVERING	0,00	0,05	0,10	0,15	m^2 K/W
Spacing T	Equivalent coefficient for heat transfer k_H				
0,050 m	7,534	5,372	4,167	3,403	W/m² K
0,100 m	6,342	4,670	3,708	3,082	W/m² K
0,150 m	5,482	4,137	3,350	2,822	W/m² K
0,200 m	4,756	3,673	3,028	2,583	W/m² K
0,250 m	4,128	3,261	2,738	2,366	W/m² K
0,300 m	3,592	2,900	2,479	2,170	W/m2 K

2.3 RESULTS OF CHILLED CASE IN ACC. TO EN 1264 PART. 5:

The results for the floor heating system in acc. to EN 1264 part. 2 has to be transmitted by calculation method in acc. to EN 1264 part. 5

ADD. FLOOR COVERING	α (W/m2 K)	$\Delta R_\mu = 1/\alpha - 1/10{,}8$ (m^2 K/W)
Spacing T	Equivalent coefficient for heat transfer k_H	
Floor	10,8	0,0000
Floor	6,5	0,0613
Wall	8,0	0,0324
Wall	8,0	0,0324
Ceiling	6,5	0,0613
Ceiling	10,8	0,0000

3 CHARACTERISTIC CURVES FOR THE CASE OF CHILLED FLOOR

The cooling output of a floor system is reduced with the otherwise same conditions compared with the output of an under-floor heating system. A cause for this are the changed conditions on the heat transfer by convection on the surface of the floor. From part 5 on EN 1264 the respective heat transfer coefficients are known.

For the looked floor type THERMOCONCEPT STANDARD the following output values arise.

$q = k_H * \Delta\theta_H$ with $\Delta\theta$ Temperature difference

RA	0,05	0,10	0,15	0,20	0,25	030
K_{H1}	5,036	4,428	3,957	3,540	3,165	2,833
K_{H2}	3,964	3,553	3,226	2,929	2,658	2,417
K_{H3}	3,268	2,967	2,722	2,497	2,292	2,107
K_{H4}	2,780	2,547	2,355	2,177	2,014	1,868

Coefficient s of the characteristic curves for the different standard layers as a function of the pipe distance RA

Prof. Dr.-Ing. M. Schmidt

Universität Stuttgart
Institut für GebäudeEnergetik
Pfaffenwaldring 35 · 70569 Stuttgart
Tel.: (+49)711 / 685 620 85
Fax: (+49)711 / 685 620 96
www.ige.uni-stuttgart.de

Dr.-Ing. Chr. Beck

The figures 1 to 6 show this connection again in graphic form.

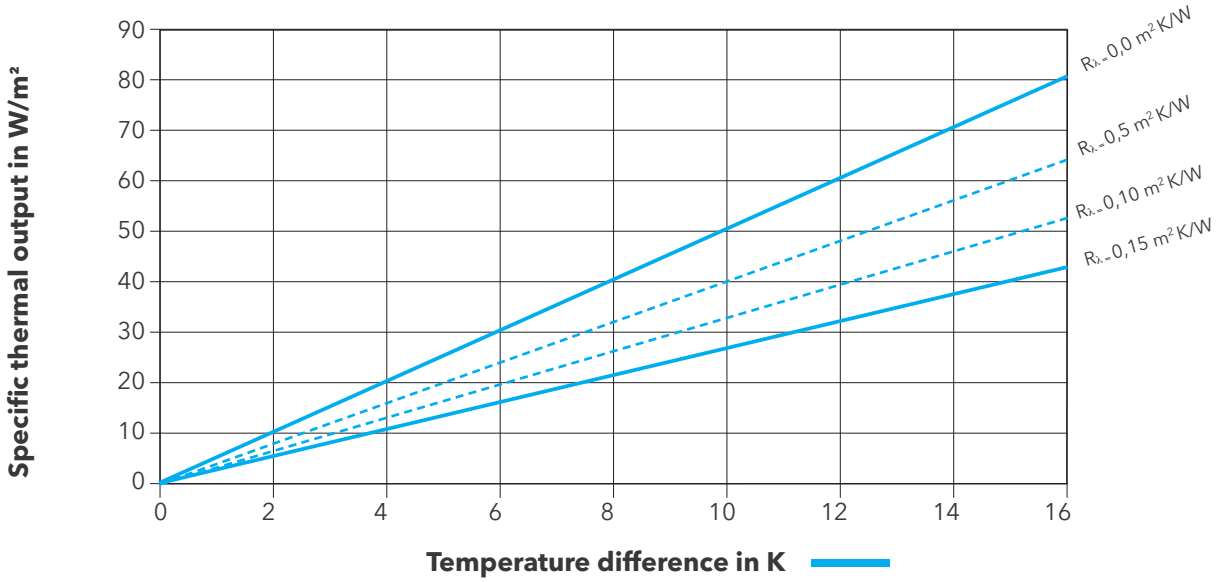

Figure 1: cooling output in dependence of the temperature distance room - water for pipe distance RA **50 mm**

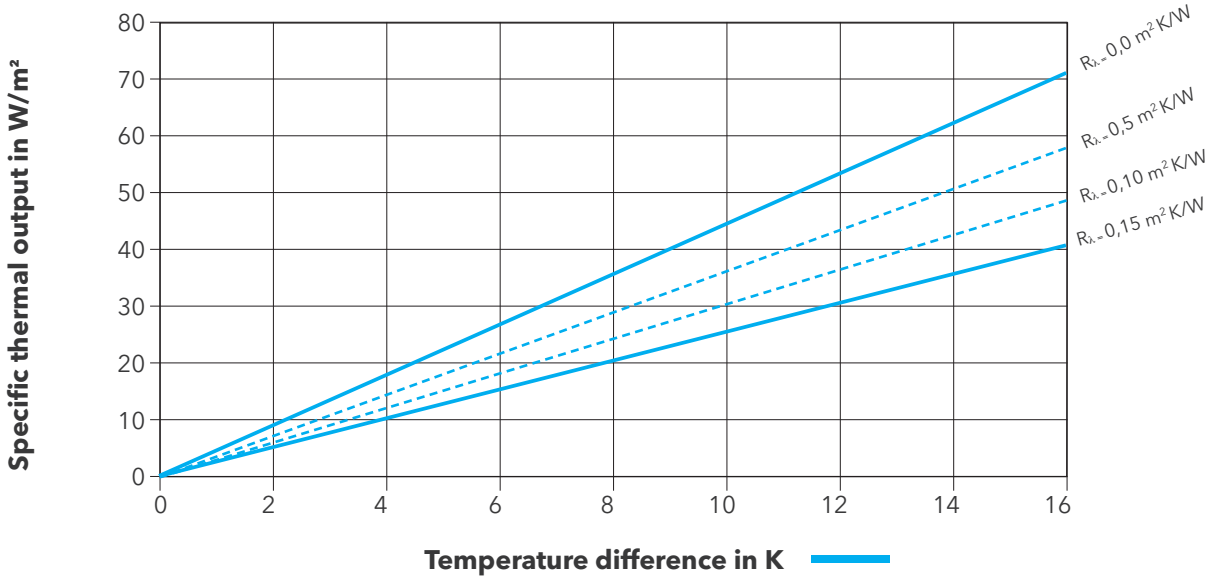

Figure 2: cooling output in dependence of the temperature distance room - water for pipe distance RA **100 mm**

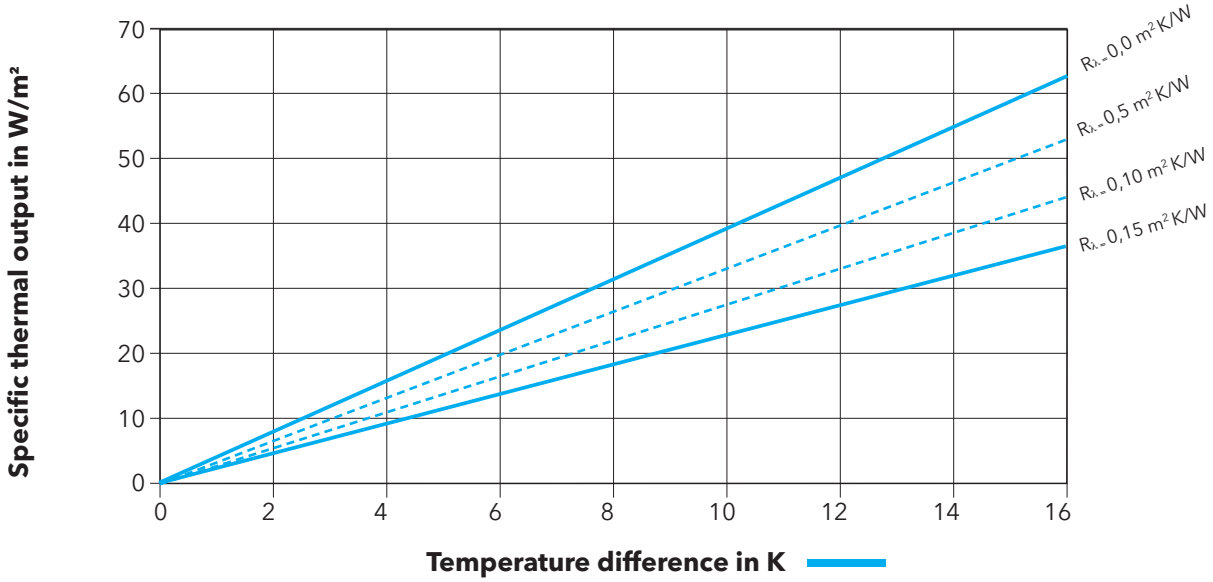

Figure 3: cooling output in dependence of the temperature distance room - water for pipe distance RA **150 mm**

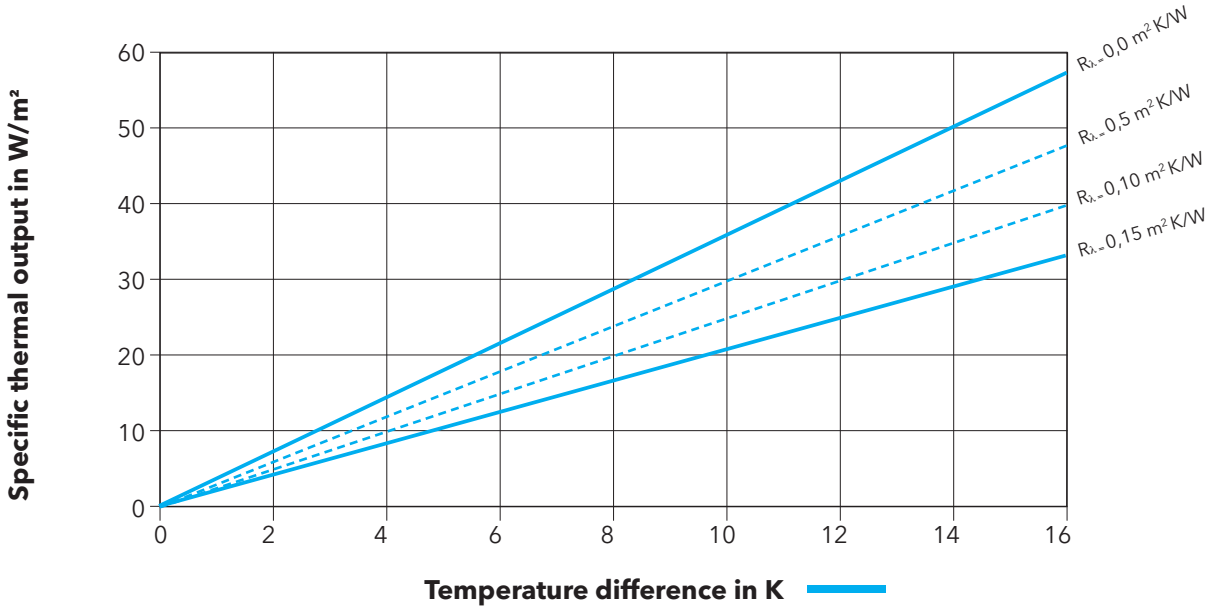

Figure 4: cooling output in dependence of the temperature distance room - water for pipe distance RA **200 mm**

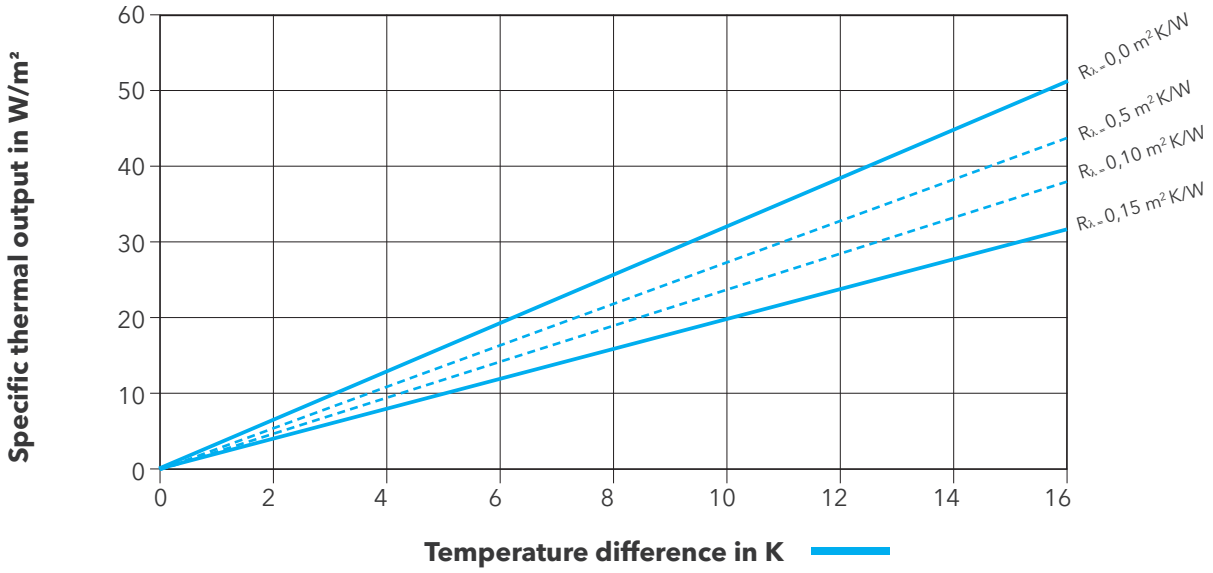

Figure 5: cooling output in dependence of the temperature distance room - water for pipe distance RA **250 mm**

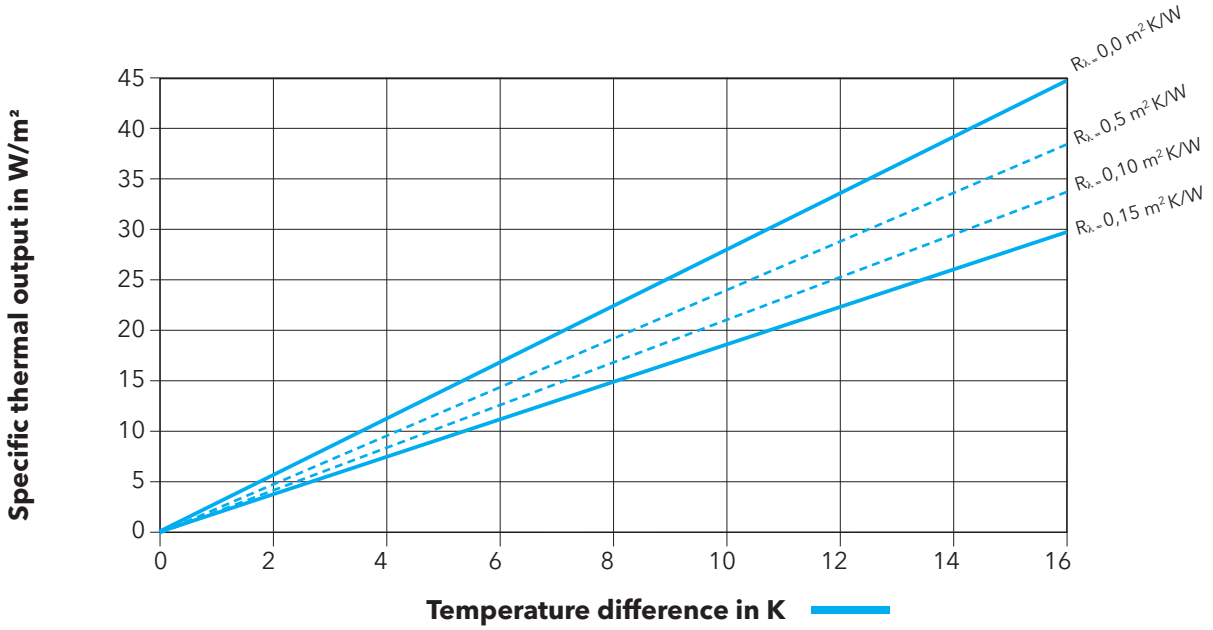

Figure 6: cooling output in dependence of the temperature distance room - water for pipe distance RA **300 mm**