Universität Stuttgart

IGE
Institut für
GebäudeEnergetik

Lehrstuhl für
Heiz- und
Raumlufttechnik

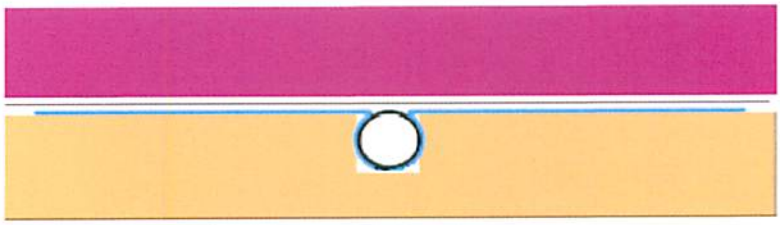
test report for specific thermal output
of floor heating construction
in acc. to EN 1264

Freeheat SAS

Thermio+

Prüfbericht

HB15 P415



This report consits of 4 pages and 1 page appendix.

The test results relate only to the items tested.

The test laboratory is accredit in acc. to ISO/IEC 17025 by DAkkS.
Acceptances from certification bodies:
DINCERTCO / RAL / AFNOR / BSI / AENOR

DAkkS
Deutsche
Akkreditierungsstelle
D-PL-11027-01-00
D-IS-11027-01-00

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specific thermal output, floor heating system in acc. to DIN EN 1264-2 and DIN EN 1264-4

1. **test method:** intial test of floor heating system

2. **Institut:**
Institut für GebäudeEnergetik
Lehrstuhl für Heiz- und Raumlufttechnik
der Universität Stuttgart
Pfaffenwaldring 35
70550 Stuttgart

3. **client:**
Freeheat SAS
6, route des boutonnière
41000 St. Denis sur Loire (France)

4. **manufacturer:** the client

5. **system description:**

trademark:	**Thermio+**		
construction:	dry system (Option)		(construction tye B in acc. to DIN 18560 T.2)
spacing in m:	0,100	**0,200**	
test sample:			
pipe:	GIACOMIN PE-RT/EVOH/PE-RT 16x1.5mm (sauerstoffdicht)		
material:	PE-RT		
diameter:	0,016	m	
thickness:	0,0015	m	
eff. heat conductivity:	0,400	W/m K	(--> data sheet of manufacturer / Giacomini France)
covering:	-		
diffuser plates:	diffuser plates of aluminium		
thickness:	0,50	mm	
heat conductivity:	200	W/m K	
width:	0,090 (Option)	m resp.	**0,190 m (act. product)**
covering / load distribution layer:			
material:	screed (Fabr. Anhydritec Ltd., type Gyvlon THERMIO+)		
thickness:	0,025	m	
heat conductivity:	2,50	W/m K	(--> data sheet of manufacturer / Anhydritec Ltd)

Documents for examination: The basis for the testing and certification are the following documents in their current version.

DIN EN 1264-2 version: Mrz 13	Raumflächenintegrierte Heiz- und Kühlsysteme mit Wasserdurchströmung – Teil 2: Fußbodenheizung: Prüfverfahren für die Bestimmung der Wärmeleistung unter Benutzung von Berechnungsmethoden und experimentellen Methoden.
DIN EN 1264-4 Nov 09	Raumflächenintegrierte Heiz- und Kühlsysteme mit Wasserdurchströmung – Teil 4: Installation
DIN CERCTO	Zertifizierungsprogramm Stand November 2009 "Raumflächenintegrierte Heiz- und Kühlsysteme mit Wasserdurchströmung"

6. **Information about test methods**

The system has been tested with calcualtion method (version HB15 P415.xls).
An additional experimental testing is not required.

7. **test results:**

	(Option)	
Limit specific thermal output in W/m²:	100,0	**91,4**
Limit temperature difference in K:	11,4	**12,4**

Stuttgart, 1.07.2015

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8. calculation results:

parameter data: appendix A

characteristic curves:

$$q = k_H * \Delta\vartheta_H$$

	add. floor covering	0,00	0,05	0,10	0,15	m² K/W
	spacing T	equivalent coefficient for heat transfer k_H				
(Option)	0,100 m	8,756	5,843	4,384	3,508	W/m² K
	0,200 m	7,395	5,127	3,923	3,177	W/m² K

limit curves:

Option: This spacing is not in the actual product offer

		spacing T =			0,100	m
$\Delta\vartheta_{Hmax}$	floor covering	0,00	0,05	0,10	0,15	m² K/W
9	Limit temperature difference.	11,4	17,1	22,8	28,5	K
K	Limit specific thermal output	100,0	100,0	100,0	100,0	W/m²
15	Limit temperature difference.	20,0	30,0	39,9	49,9	K
K	Limit specific thermal output	175,0	175,0	175,0	175,0	W/m²

This spacing is the actual product offer

		spacing T =			0,200	m
$\Delta\vartheta_{Hmax}$	floor covering	0,00	0,05	0,10	0,15	m² K/W
9	Limit temperature difference.	12,4	18,1	23,9	29,8	K
K	Limit specific thermal output	91,4	92,8	93,9	94,7	W/m²
15	Limit temperature difference.	21,8	32,0	42,5	53,1	K
K	Limit specific thermal output	161,6	164,1	166,7	168,6	W/m²

diagrams:

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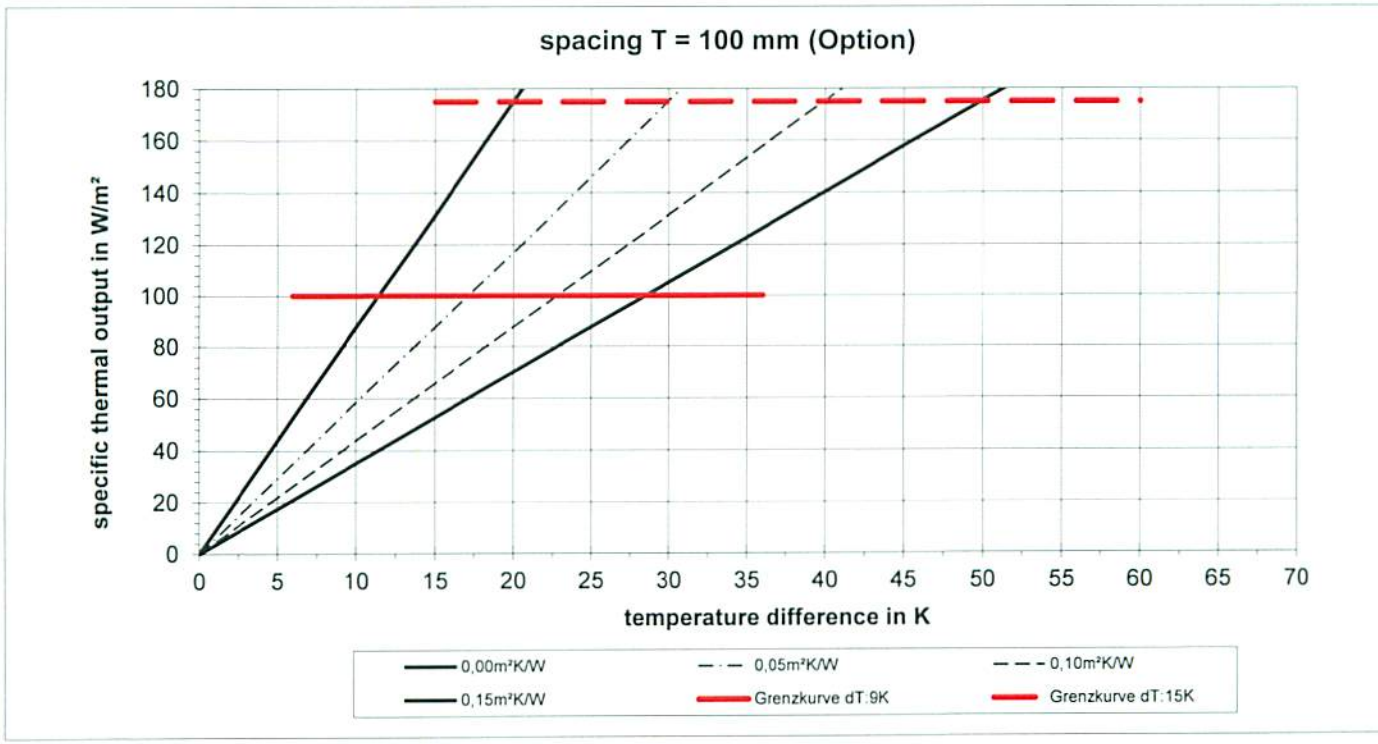

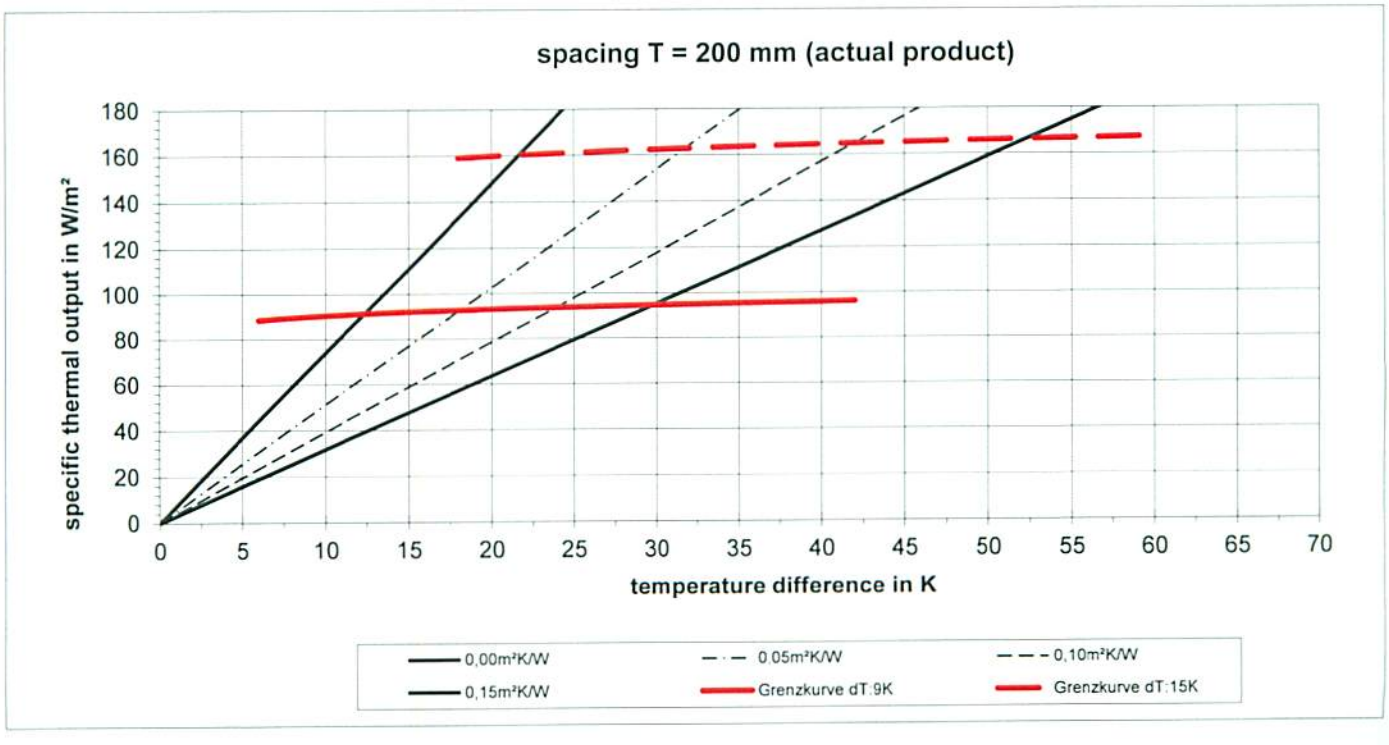

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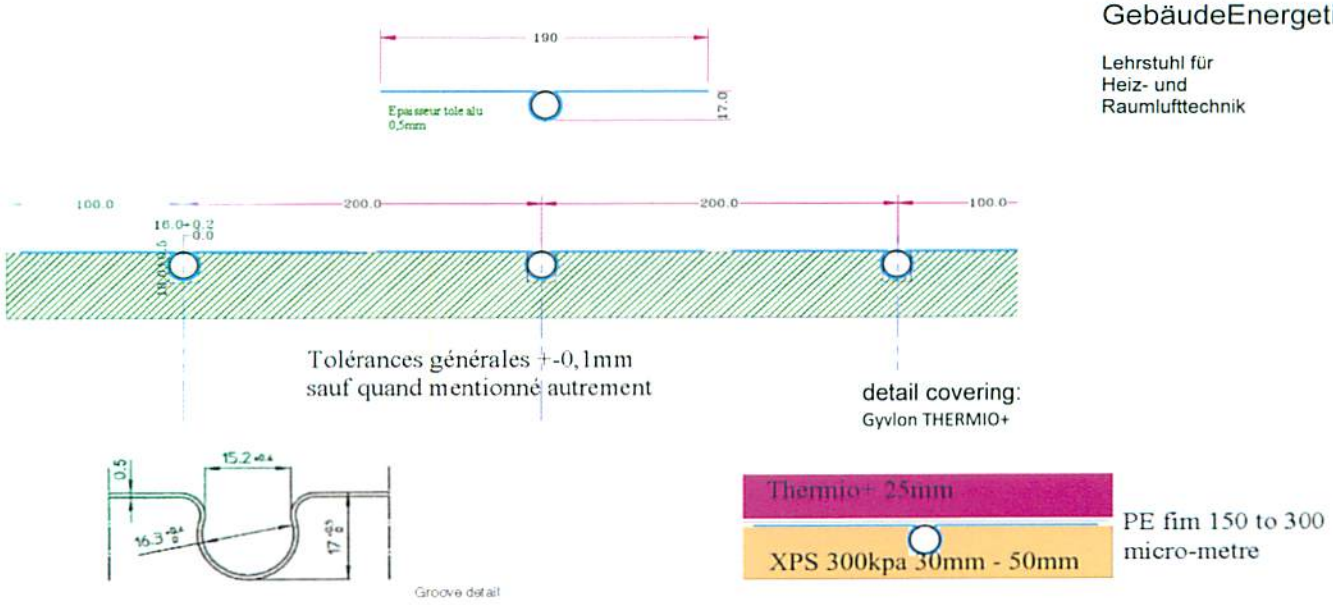
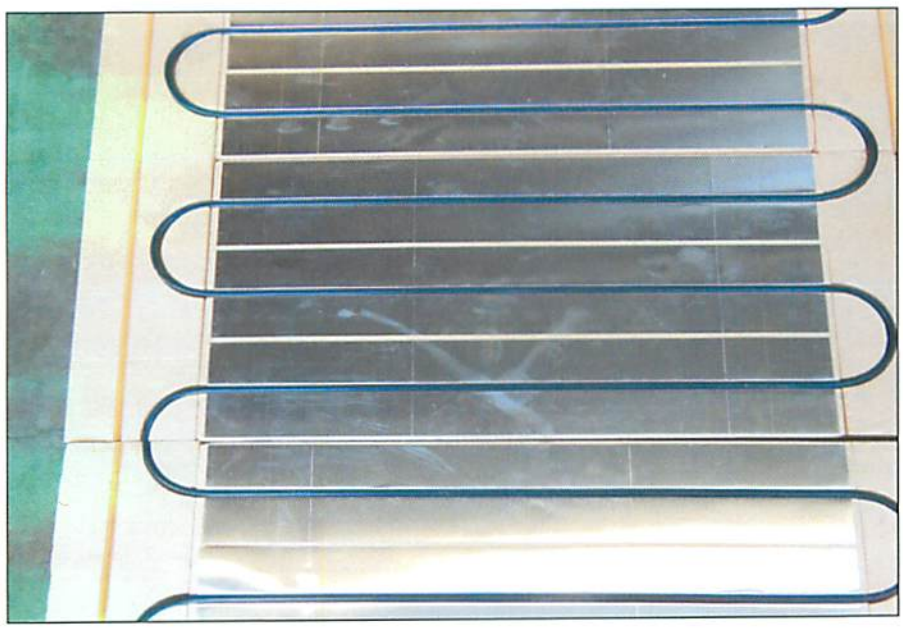
9. construction drawing of test sample:



10. Picture of test area:

The test area was built on 25.6.2015 in the Institut. The used material was sended directly by the client. The construction is equal to the nominal construction of the drawing and the technical documents.



11. conformity of the technical documents

The system is type B of DIN 18560 part 2.

The sketch of the technical 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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APPENDIX

A calculation factors:

Option: This spacing is not in the actual product offer

	spacing T =	0,100	m	
resistance of floor covering:	0,000	0,050	0,100	0,150	m² K/W
factor B:	6,802	6,701	6,651	6,621	W/m² K
factor a_B:	1,000	0,677	0,512	0,412	
spacing factor a_T:	1,103				
spacing exponent m_T:	-0,333				
covering factor $a_Ü$:	1,341				
factor $b_Ü$:	1,000				
value k_{wl}:	1,302				
factor a_{wl}:	1,012				
factor a_K:	0,980				
limit curve coefficient B_G:	99,314				
limit curve exponent n_G:	0,004				

This spacing is the actual product offer

	Rohrabstand T =	**0,200**	**m**	
resistance of floor covering:	0,000	0,050	0,100	0,150	m² K/W
factor B:	7,010	6,853	6,770	6,719	W/m² K
factor aB:	1,000	0,709	0,549	0,448	
spacing factor aT:	1,103				
spacing exponent mT:	-1,667				
covering factor aÜ:	1,341				
factor bÜ:	0,500				
value kwl:	1,051				
factor awl:	1,007				
factor aK:	0,920				
limit curve coefficient B_G:	82,407				
limit curve exponent n_G:	0,041				