

Test report
for the determination of the cooling capacity
of cooling surfaces for rooms according to EN 14240

closed ceiling

Type: Pannello Radiante in Cartongesso
soffitto / parete: PRC 5.0

plasterboard panel, PEx - tubes (8 x1 mm),
distance between the tubes: 50mm

proterclima s.r.l.
I – 70024 Gravina in Puglia (BA).

Test report

No.: VF10 K26.2855

nominal capacity: 316 W resp. 44 W/m² (Δt : 8K)

(active area ratio: 100%; active area: 7,20m²)

capacity in acc. to DIN 4715 - old: 56 W/m² (Δt : 10K)

(active area: 7,20m²)



This test report consists of 9 pages and it may be reproduced only in its integral form.
The results of the test refer only to the test samples.

The HVAC Institute, Lehrstuhl für Heiz- und Raumlufttechnik (LHR), is from DAR accredited according to ISO/IEC 17025 and is from DINCERTCO recognised as an independent test laboratory. Further on the Institute is also an accredited inspection body according to EN 45004.

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1. Edition

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test report A
for the determination of the capacity of cooling surfaces for rooms in acc. to EN 14240
- initial testing -

1 Test laboratory: Prüfstelle Heizung-Lüftung-Klimatechnik Stuttgart
Pfaffenwaldring 6A
70569 Stuttgart



2 Applicant: proterclima s.r.l.
Via B. Croce, 14
I - 70024 Gravina in Puglia (BA)



3 Manufacturer: The applicant

4 Data of tested cooling surface: gypsum panels, 15mm, with insulation.
(drawing and photo: pages 8,9) active ceiling area: **7,20m²**
Type: Pannello Radiante in Cartongesso total ceiling area: **7,20m²**
soffitto/parete: PRC 5.0 PEx-tubes (8x1mm), circle flow,
distance between tubes: 50mm

Date of entry of the test samples: 02.01.2008 perforation: -

Date of entry of the technical data: - acoustical fleece: no

Sampling: Delivery by the applicant Distance between the tubes: **50mm**

5 Test results: closed ceiling

Measurement report see pages 3 to 6 Characteristics see page 7

Characteristic equation: $P_a = k \cdot \Delta \theta^n$ [W/m²]

exponent n = **1,0781** constant k = **4,6815**

cooling capacity $\Delta t=8K$: 316 W resp. **44 W/m²** referring to the active area

Note: The results of this testing refer only to the test samples.

Calculated mass flow rate at 2K temperature difference (inlet - outlet)

at 8K temperature difference between room and water: 19 kg/(h*m²)

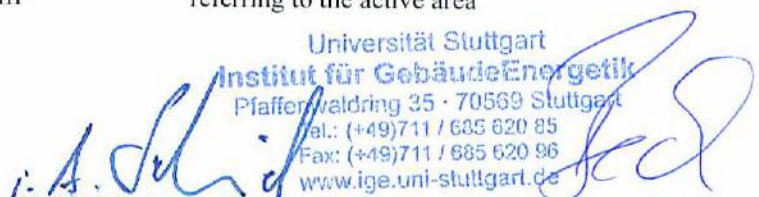
Characteristic equation for half mass flow rate: $P_a = c \cdot \Delta \theta^m$ [W/m²]

exponent m = 1,0946 constante c = 4,5253

cooling capacity $\Delta t=8K$: 44 W/m² referring to the active area

Stuttgart, the 18. Jan 10

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(Stamp and signature of the test laboratory)

Prof. Dr.-Ing. M. Schmidt

Dr.-Ing. Chr. Beck

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test report A

for the determination of the capacity of cooling surfaces for rooms in acc. to EN 14240

6 Data to the test booth:

Type of the test booth: closed, tempered by water, in acc. to DIN 4715 (old)
 Dimension test booth L / W / H: 4,0m / 4,0m / 3,0m
 Distance of the sample from the floor: 2,50m
 Installation of the sample: by test laboratory
 Data of installation: 21.01.2008
 Connection: the 6 elements (3 panels) are connected in parallel serie,
 two elements (1 panel) in circuit.

test room area	A _t :	14,44m ²	installation area ratio	Ri:	0,50
installation area	A _i :	7,20m ²	active area ratio	Ra:	1,00
active area	A _a :	7,20m ²			

7 Design of the tested cooling surface: closed ceiling

Material of the cooling surface: plasterboard panel, 15mm
 Material of the cooling pipes: pipes of plastic (PE-Xc, 8 x 1mm)
 Distance between the pipes: 50mm
 Surface coating: without coating
 Amount of pipes per cooling circuit: 1
 Connection between cooling surface and pipes: PE pipes integrated in the plasterboard panel.
 -
 -
 Thermal insulation, above: with insulation on backside (thickness: 25mm), EPS.

8 Correction due to the pressure: horicontal, closed ceiling without forced air movement

In EN 14240 no information is given how to chanche the results of measurement to nominal standard air pressure of p_s=1013mbar. Therefore the equations of EN 442 or EN 14037 are used:

$$\dot{Q}_{korrr} = \dot{Q}_{gem} \left(s_p + (1 - s_p) \left(\frac{P_s}{P_{gem}} \right)^{n_p} \right)$$

radiation ratio:	0,70	exponent for correction n _p :	0,50
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9 Data of humidity

humidity in test room: 35 % rel. Humidity
 humidity test sample: <2 % of weight

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Test results

1.1 Measured values for the determination of the capacity at nominal mass flow rate

Test no.:		1	2	3
Date:		21. Jan	21. Jan	21. Jan
Air pressure	kPa	96,51	96,45	96,33
Water mass flow rate	kg/h	299,62	299,74	299,33
Reference air temperature (Globe 1,1 m)	°C	26,01	26,02	26,03
Water inlet temperature	°C	13,95	15,92	18,89
Water outlet temperature	°C	15,27	17,01	19,65
Temperature difference	K	1,32	1,10	0,75

1.2 Additional values

Mean insufficient temperature arithmetic	K	11,39	9,55	6,75
Measured cooling capacity	W	461	382	262
Corrected capacity, 1013 mbar	W	465	385	264
Cooling capacity per m ² active area	W/m ²	64,5	53,4	36,7

1.3 Control temperatures

Mean floor temperature	°C	26,0	26,1	26,0
Mean wall temperature East:	°C	26,0	26,0	26,0
South:	°C	26,1	25,9	26,0
West:	°C	25,9	26,0	26,1
North:	°C	26,0	26,0	26,1
Mean ceiling temperature	°C	26,0	26,1	26,1

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Test results

test no.:	1	2	3
date:	21. Jan	21. Jan	21. Jan

1.4 calculations:

reference temperature	°C	26,01	26,02	26,03
mean temp. of surroundings	°C	26,0	26,0	26,1
temperature near to the ceiling	°C	21,4	22,0	23,0
temperatur of ceiling of test room	°C	26,0	26,1	26,1
capacity per m ² test room area	W/m ²	32,2	26,6	18,3
capacity per m ² installation area	W/m ²	64,5	53,4	36,7

1.5 heating bilance

heat transfer test surroundings	W	35	30	24
heating output of dummies	W	448	368	251
heating bilance	W	21,7	16,1	12,7
max. value of heating bilance	W	23,1	19,1	13,1

1.6 air temperatures in test room

hight over floor	0,1 m	°C	28,8	25,9	25,9
	1,1m	°C	26,2	26,2	26,1
	1,7m	°C	26,2	26,2	26,1
	2,6m	°C	26,3	26,3	26,2
temperature above the ceiling:		°C	21,4	22,0	23,0

1.7 calculated surface temperatures

mean temp. of chilled surfaces	°C	20,0	20,9	22,4
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Test results

2.1 Measured values for the determination of the capacity at half mass flow rate

Test no.:		4	5	6
Date:		21. Jan	21. Jan	21. Jan
Air pressure	kPa	96,20	96,13	96,00
Water mass flow rate	kg/h	149,52	149,69	149,75
Reference air temperature (Globe 1,1 m)	°C	25,98	26,01	26,03
Water inlet temperature	°C	13,46	15,43	18,39
Water outlet temperature	°C	16,09	17,61	19,93
Temperature difference	K	2,62	2,18	1,53

2.2 Additional values

Mean insufficient temperature arithmetic	K	11,15	9,46	6,84
Measured cooling capacity	W	456	379	267
Corrected capacity, 1013 mbar	W	459	382	269
Cooling capacity per m ² active area	W/m ²	63,8	53,1	37,3

2.3 Control temperatures

Mean floor temperature	°C	26,0	26,0	26,0	
Mean wall temperature	East:	°C	25,9	26,0	25,9
	South:	°C	26,0	26,0	26,0
	West:	°C	26,0	26,0	25,9
	North:	°C	26,0	25,9	25,9
Mean ceiling temperature	°C	26,0	26,0	26,0	

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Test results

test no.:	4	5	6
date:	21. Jan	21. Jan	21. Jan

2.4 calculations:

reference temperature	°C	25,98	26,01	26,03
mean temp. of surroundings	°C	26,0	26,0	25,9
temperature near to the ceiling	°C	21,7	22,1	23,0
temperatur of ceiling of test room	°C	26,0	26,0	26,0
capacity per m ² test room area	W/m ²	31,8	26,5	18,6
capacity per m ² installation area	W/m ²	63,8	53,1	37,3

2.5 heating bilance

heat transfer test surroundings	W	33	28	21
heating output of dummies	W	445	365	252
heating bilance	W	21,6	14,3	5,9
max. value of heating bilance	W	22,8	19,0	13,3

2.6 air temperatures in test room

hight over floor	0,1 m	°C	25,8	25,8	25,9
	1,1m	°C	26,2	26,2	26,1
	1,7m	°C	26,2	26,2	26,1
	2,6m	°C	26,3	26,3	26,2
temperature above the ceiling:		°C	21,7	22,1	23,0

2.7 calculated surface temperatures

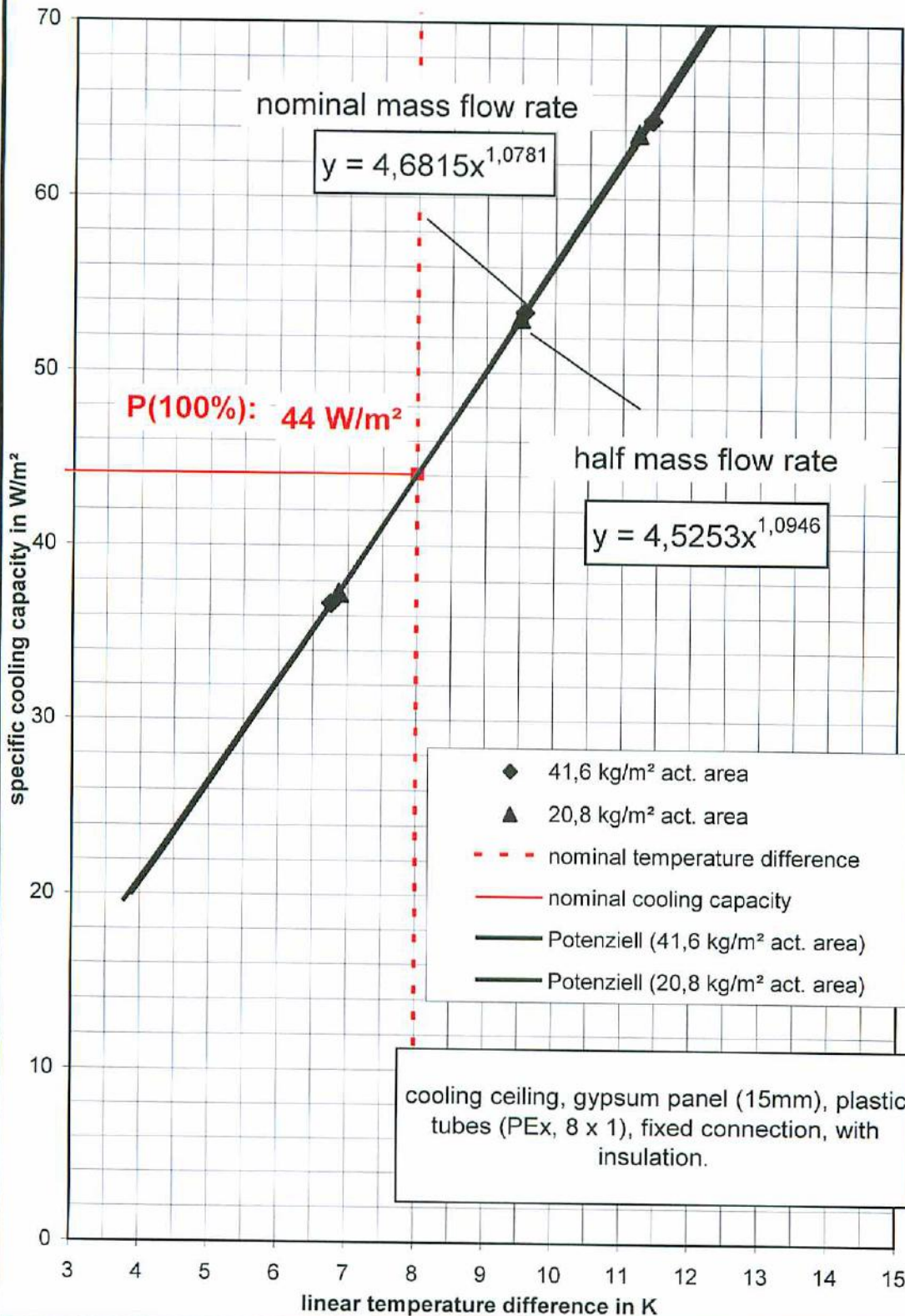
mean temp. of chilled surfaces	°C	20,0	20,9	22,4
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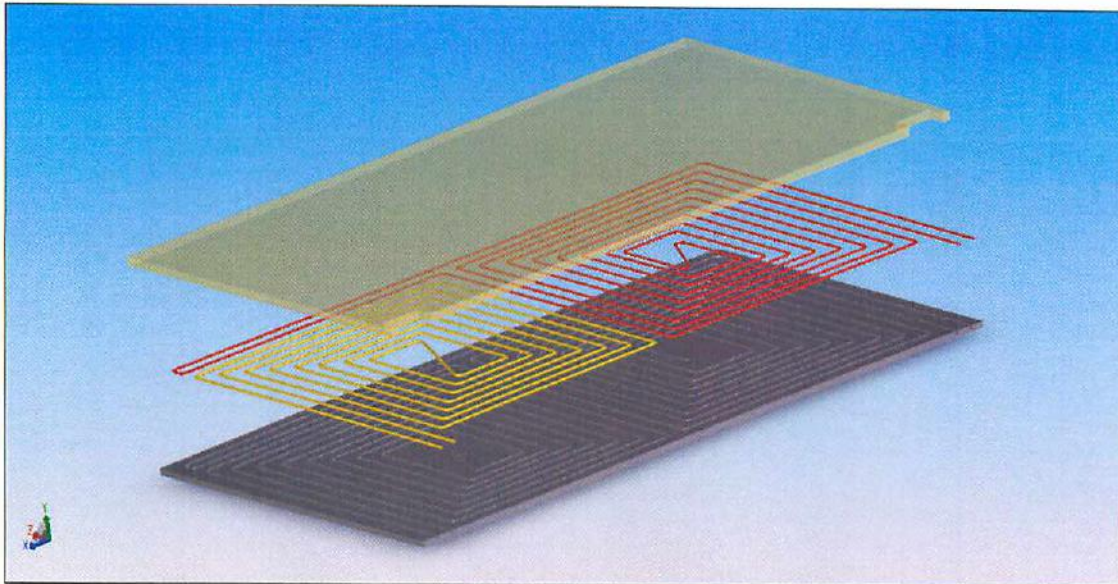
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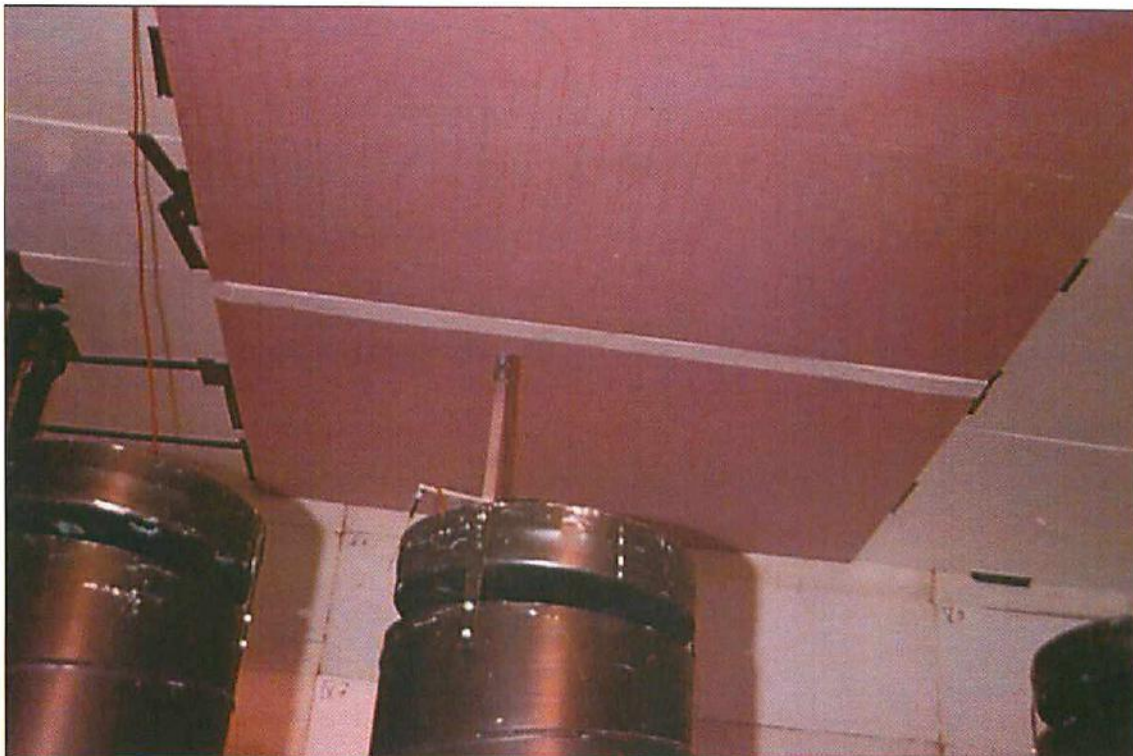
applicant: **proterclima s.r.l.**

type: Pannello Radiante in Cartongesso

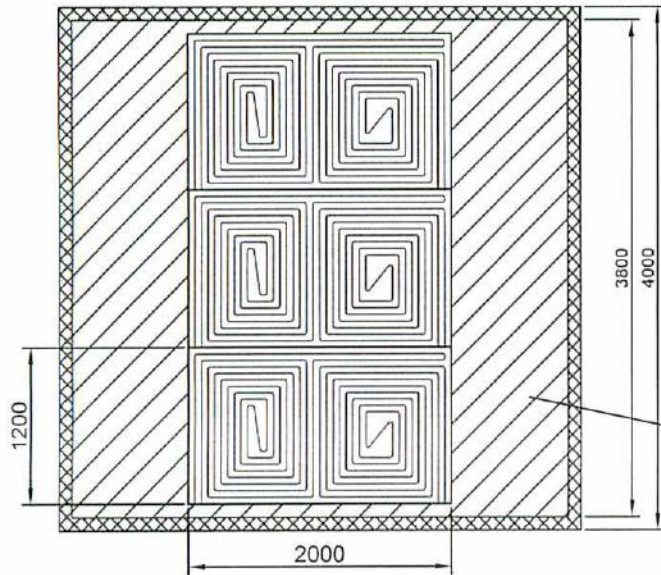




Cooling surface element 1200mm x 2000mm, distance between pipes: 50mm
proterclima s.r.l., PE-Xc - pipe 8mm x 1mm, plasterboard panel: 15mm
Pipes integrated in panels, with insulation above: 25mm



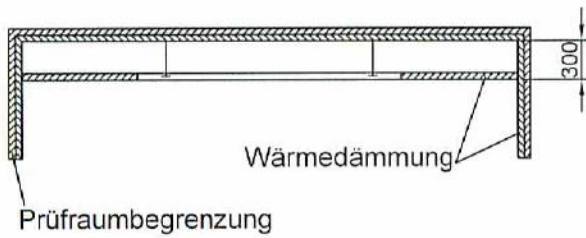
Installation in the test booth according to EN 14240,
designed as closed cooling surface



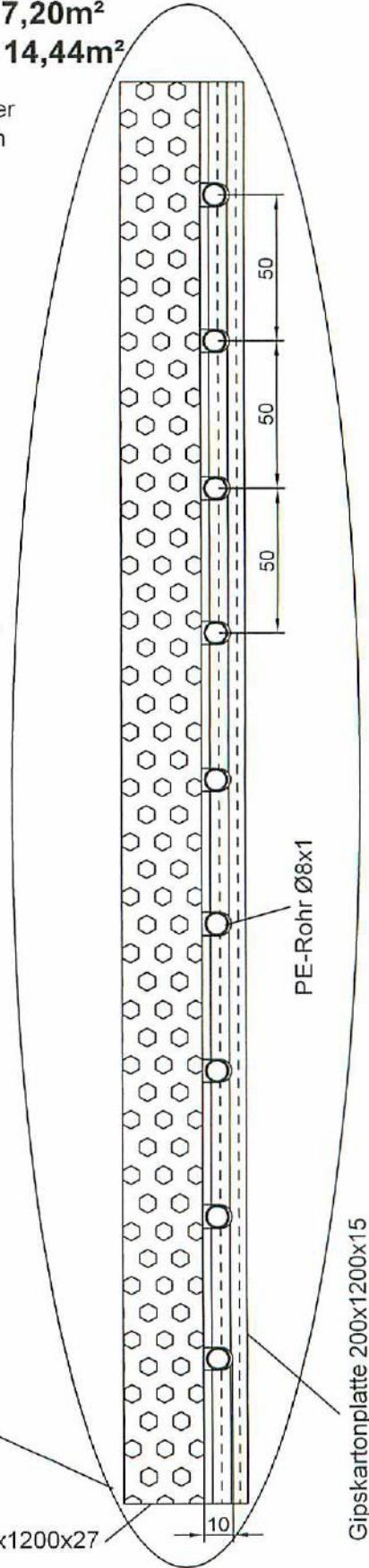
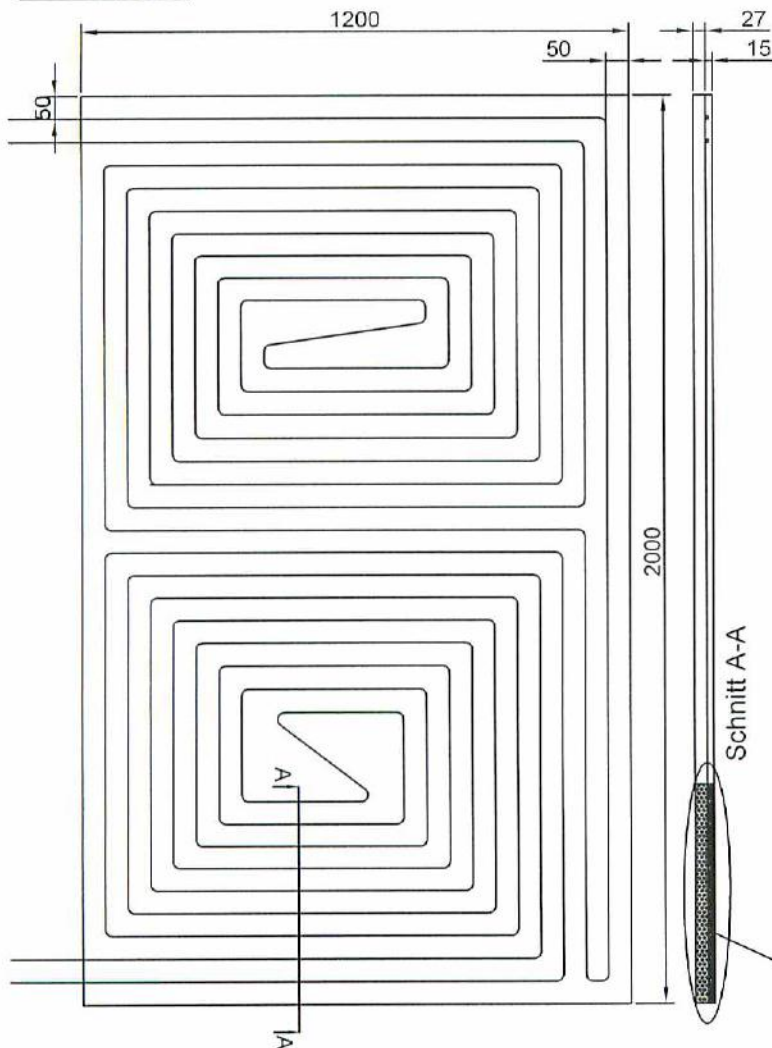
Leistungsprüfung:
Kühldecke nach
DIN EN 14240

Parallel-Schaltung
mit 3 Kühlgruppen

Aa = 7,20m²
Ap = 7,20m²
Ai = 7,20m²
At = 14,44m²

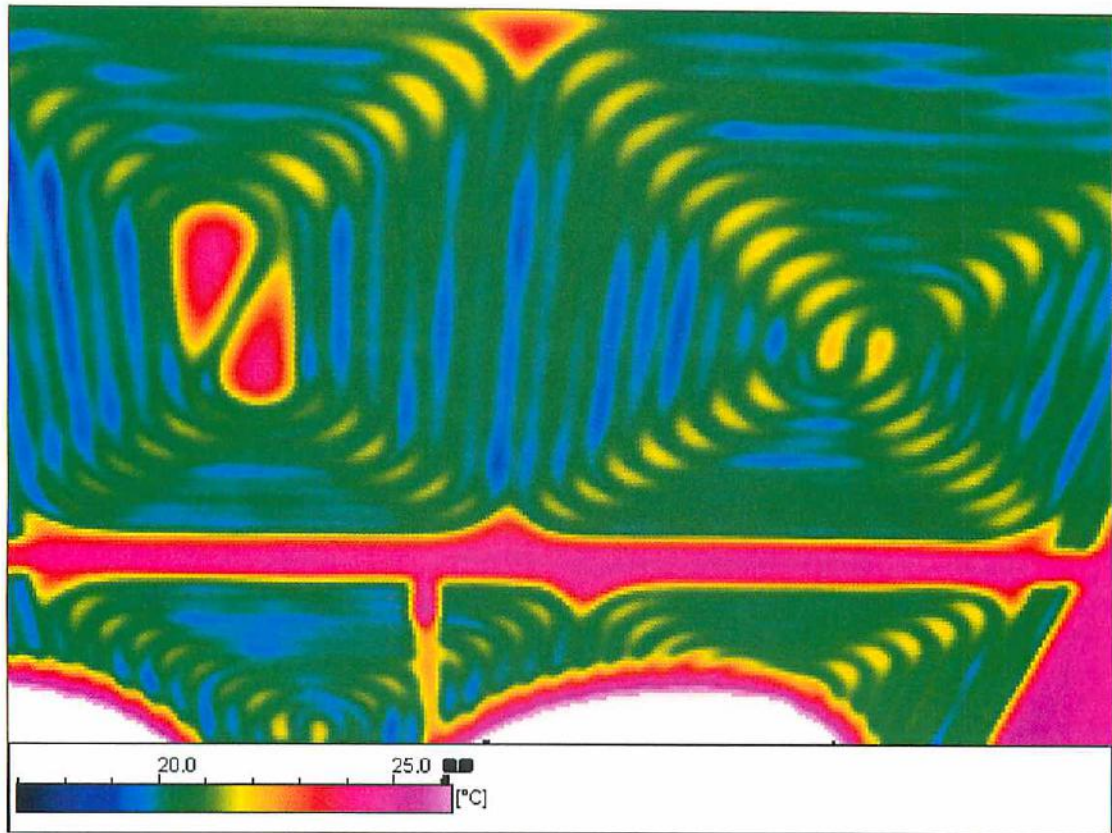


Kühlmodul

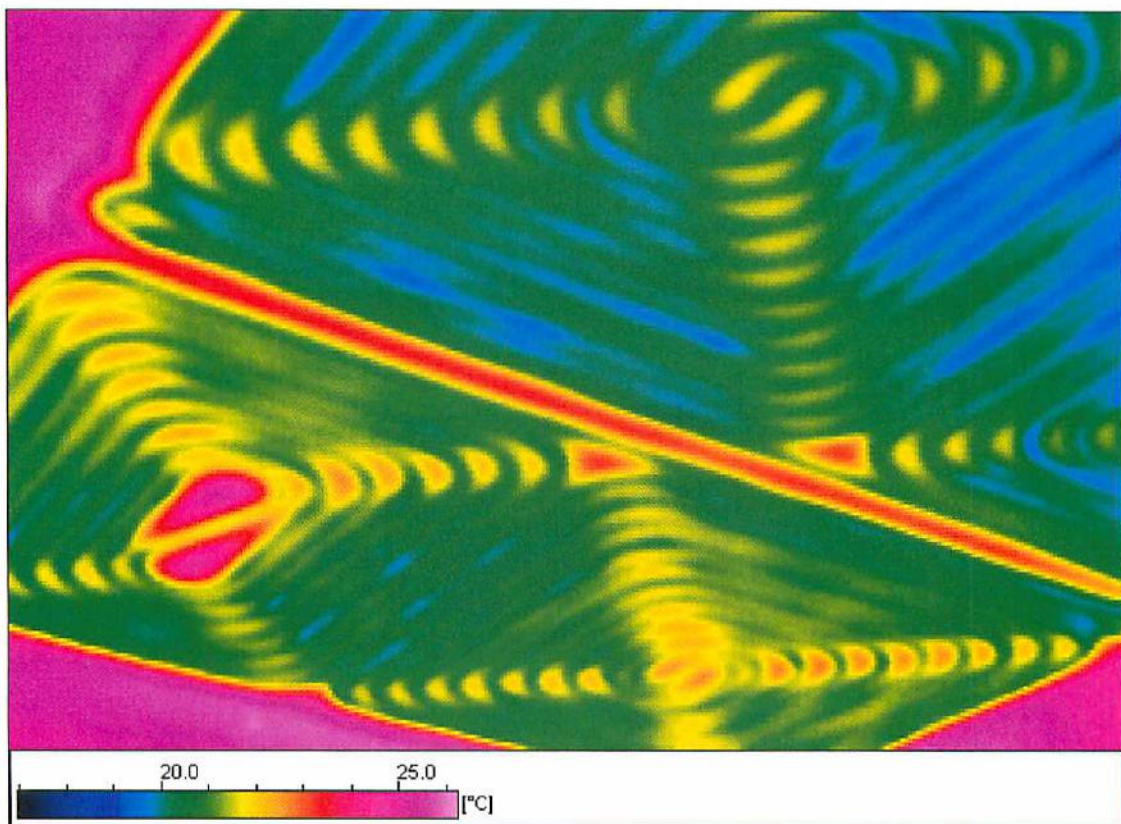


Dämmung EPS 200x1200x27

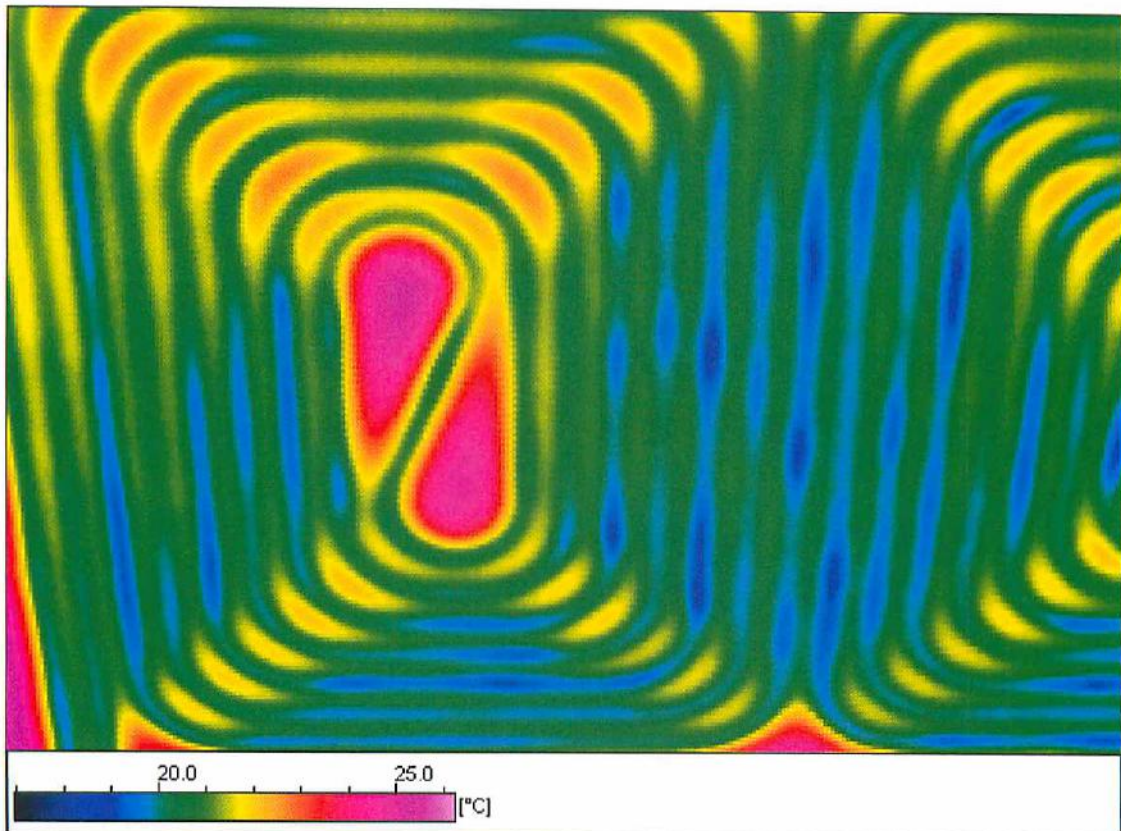
Gipskartonplatte 200x1200x15



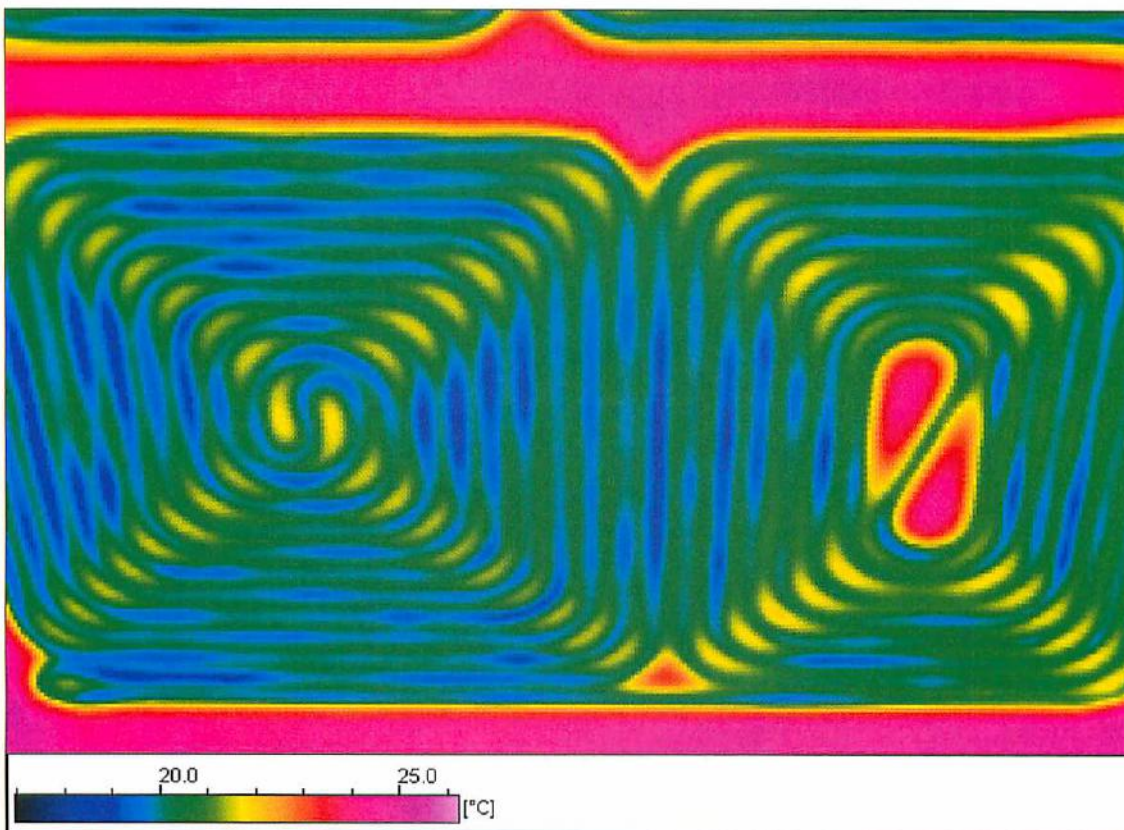
measuring point 1: mean water temperature: 14,6°C, room temperature: 26,0°C,
right side of the ceiling



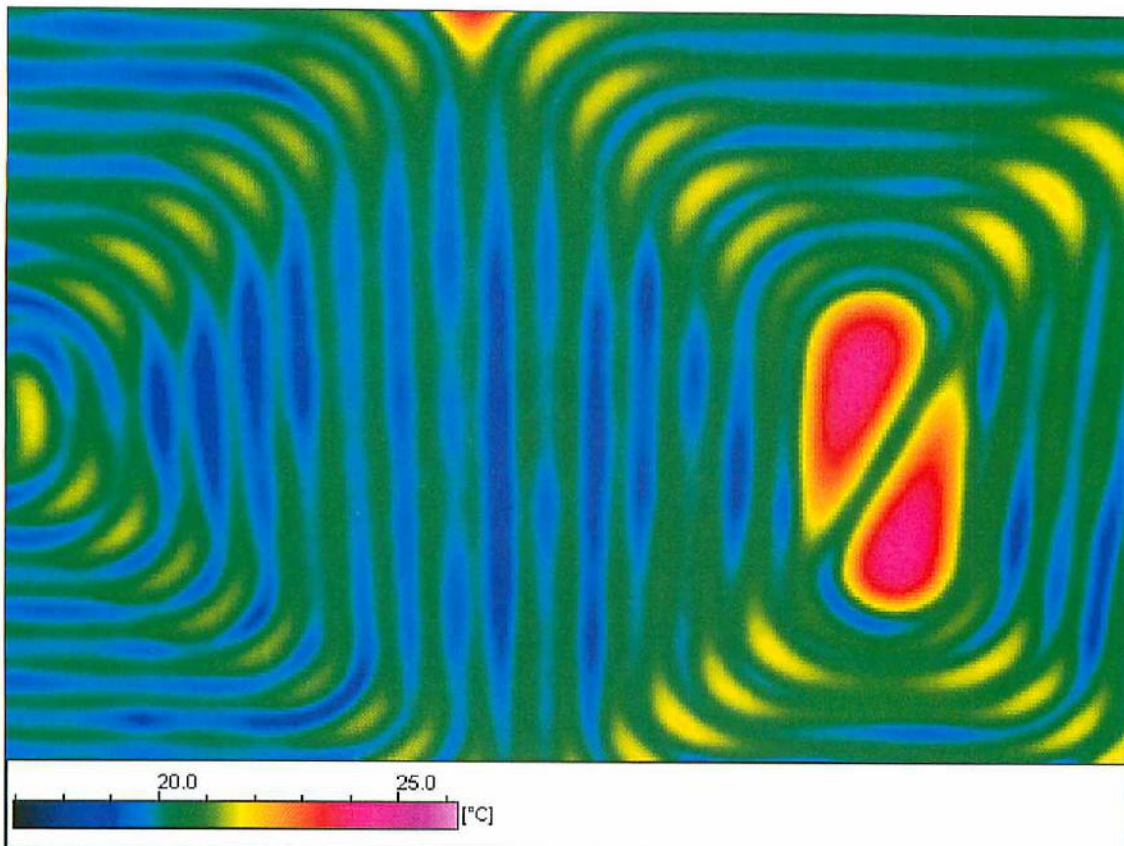
measuring point 1: left side of the ceiling



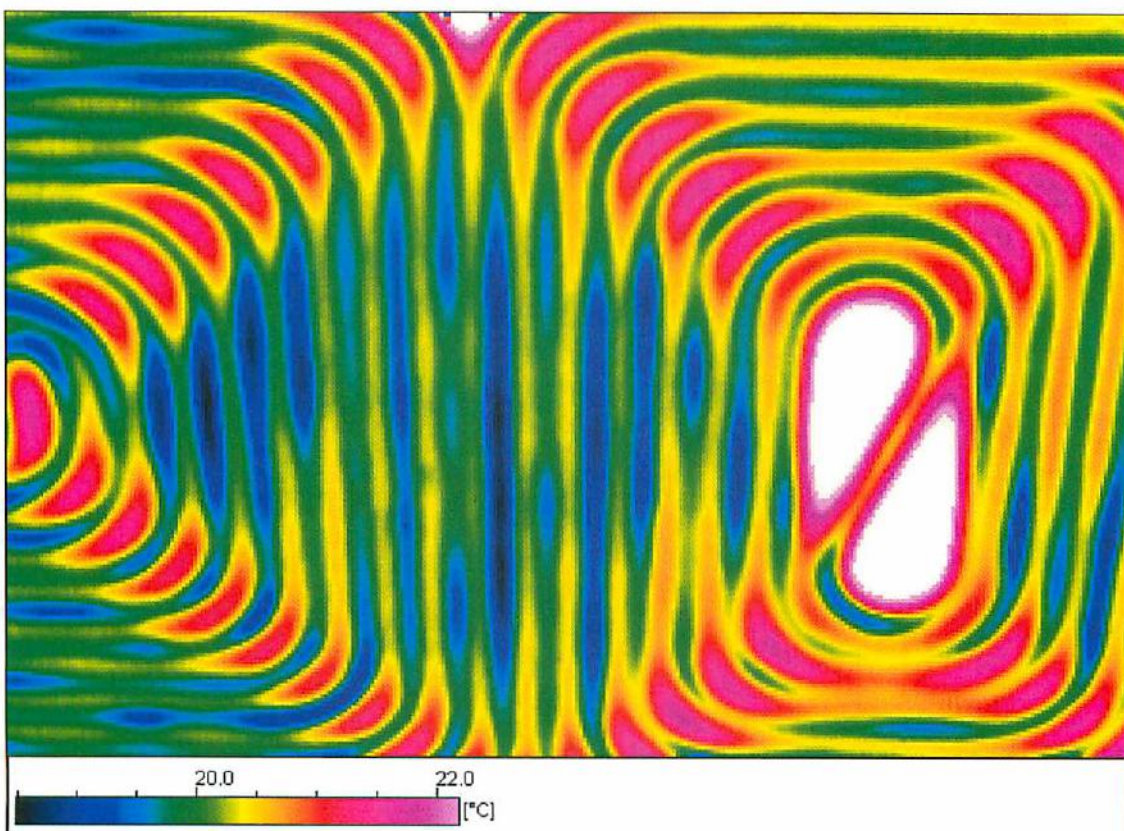
measuring point 1: mean water temperature: 14,6°C, room temperature: 26,0°C



as above, some more other panels



measuring point 1: mean water temperature: 14,6°C, room temperature: 26,0°C



as above, more details in temperatures