TECHNICAL SHEET

PANEL APA R20/22

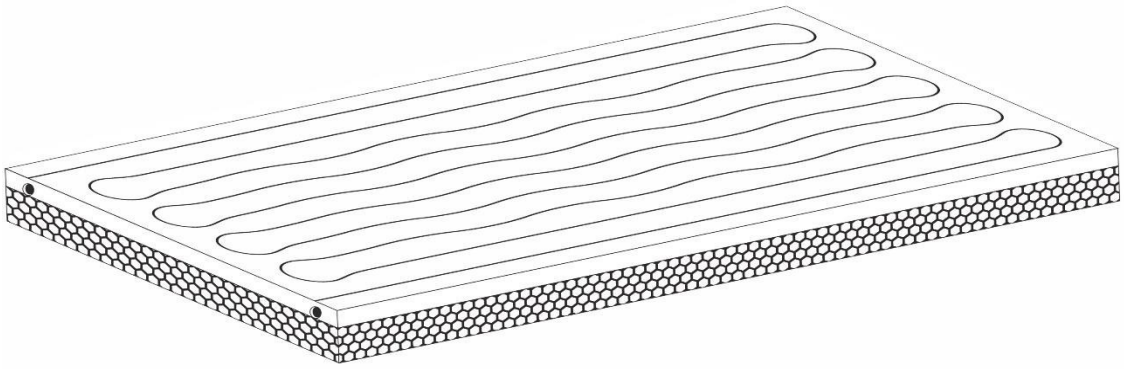
RADIANT PANEL

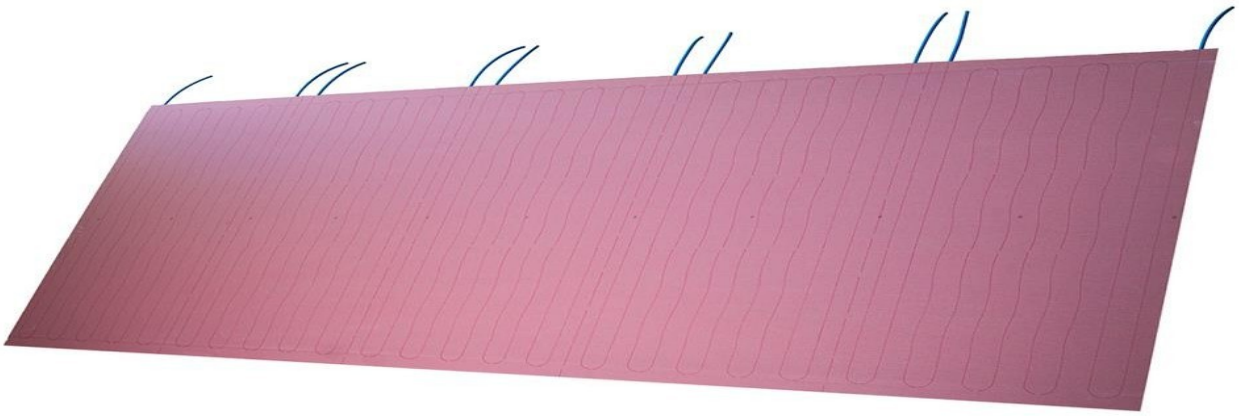
10 YEAR WARRANTY
10
10 YEAR WARRANTY

PREFABRICATED WATER RADIANT PANEL FROM FIREPROOF GYPSUM-BOARD FOR RADIANT HEATING/COOLING THROUGH THE CEILING AND THROUGH THE WALL

PANEL APA R20/22

The prefabricated radiant panel made of a 15 mm thick fireproof plasterboard board, which contains a spiral type circuit with a PE-XC Ø 8*1 pipe (with an oxygen barrier positioned at 50 mm distance from each other) and a 27 mm thick polystyrene board with a density of 26 kg/m ^{3}. The surface of the radiant panel has good mechanical resistance, moisture resistance and fire resistance.

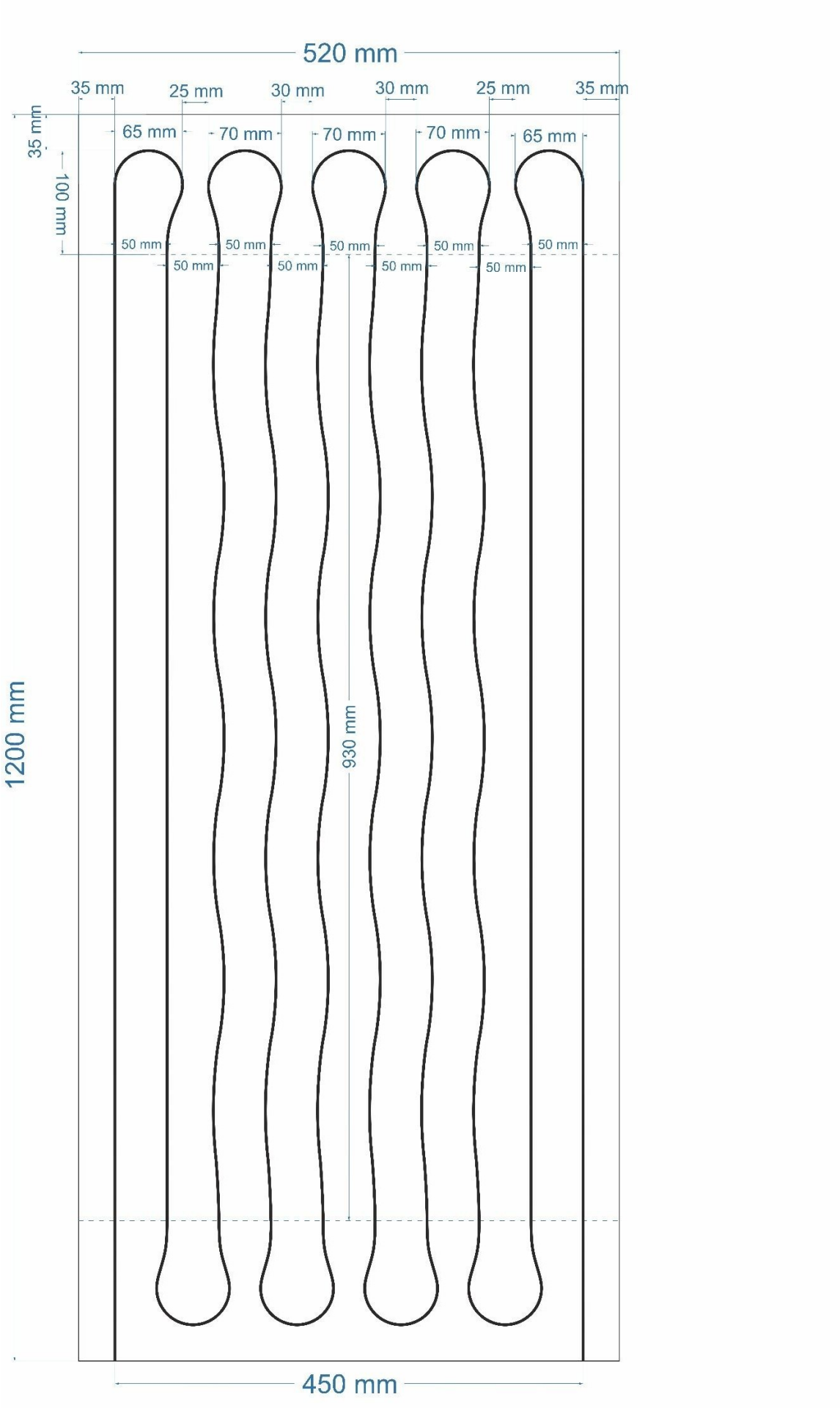




FIELD OF APPLICATION	
RESIDENTIAL AND NON-RESIDENTIAL	TYPE OF ASSEMBLY
New houses and under renovation	Ceiling
Wooden houses	Wall
Passive houses	
Houses on metal structure	
New apartments and under renovation	
Offices	
Schools	
Hospitals	

PANEL APA R20/22 radiant panel	
EXTERNAL DIMENSIONS	2600X1200X42
TOTAL THICKNESS	42 mm
PLASTER-BOARD THICKNESS	15 mm
POLYSTYRENE BOARD THICKNESS	27 mm ESP200
THERMAL CONDUCTIVITY OF PLASTER-BOARD	W/MK 0,3
INSULATION THERMAL CONDUCTIVITY	W/MK 0.33
FIRE REACTION CLASS	A1
PIPE DIAMETER	8*1 mm
PIPE MATERIAL	PE-XC with oxygen barrier
ASSEMBLY DISTANCE	50mm
CIRCUIT TYPE	Serpentine
TOLERANCE	± 0,5
OPERATING TEMPERATURE	Heating 25-32 °C Cooling 14-20 °C

Length (mm)	Width (mm)	Thickness (mm)	Weight (kg)	Circuit length (mt)	Water content (ml)	Surface (mP)
1200	2600	42	41	60	1,90	3.12
1200	2080	42	32.80	48	1,52	2.49
1200	1650	42	24.60	36	1,14	1.87
1200	1040	42	16.4	24	0,76	1.24
1200	520	42	8.20	12	0,38	0.62


520 mm
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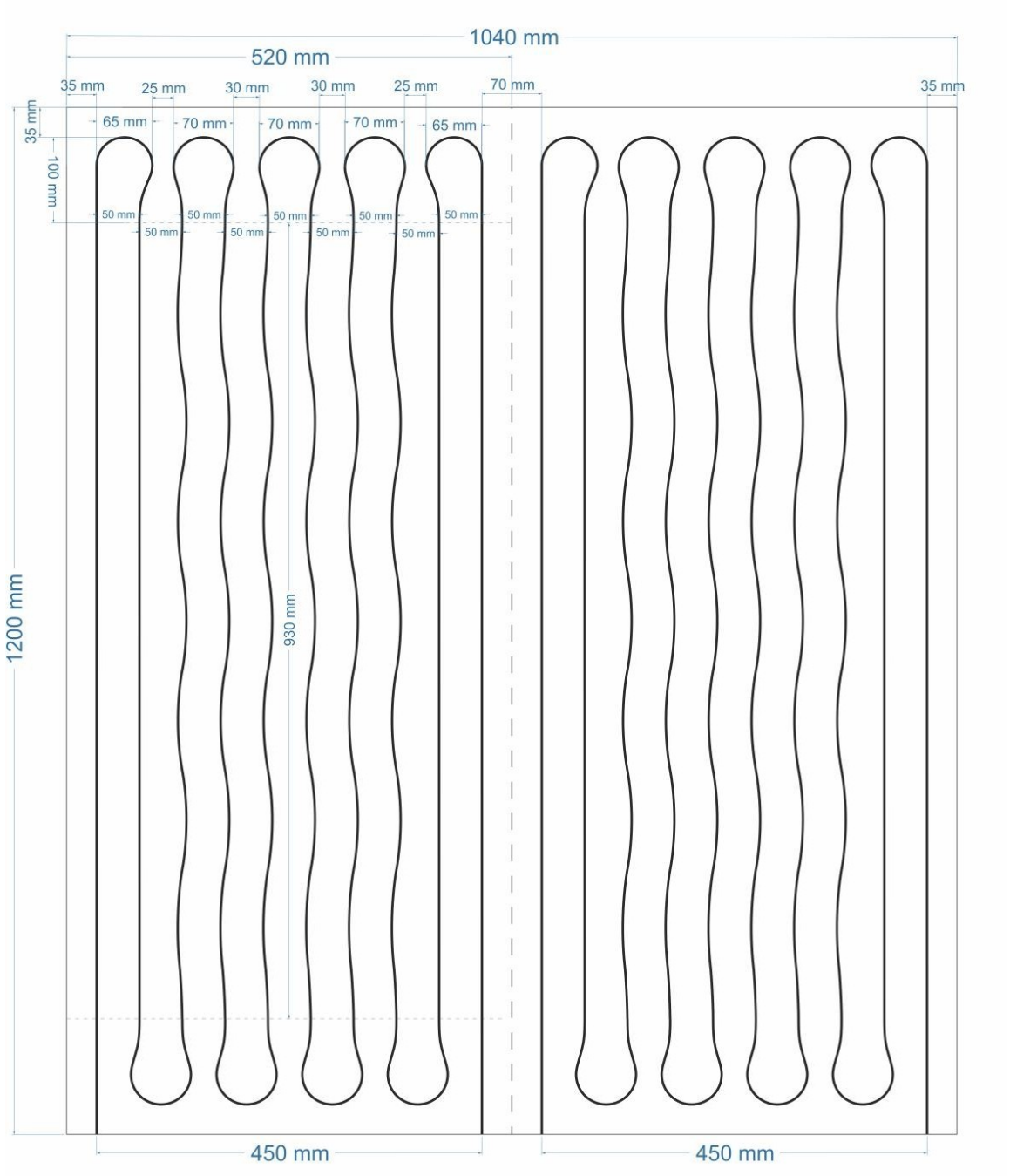
1200 mm
930 mm
450 mm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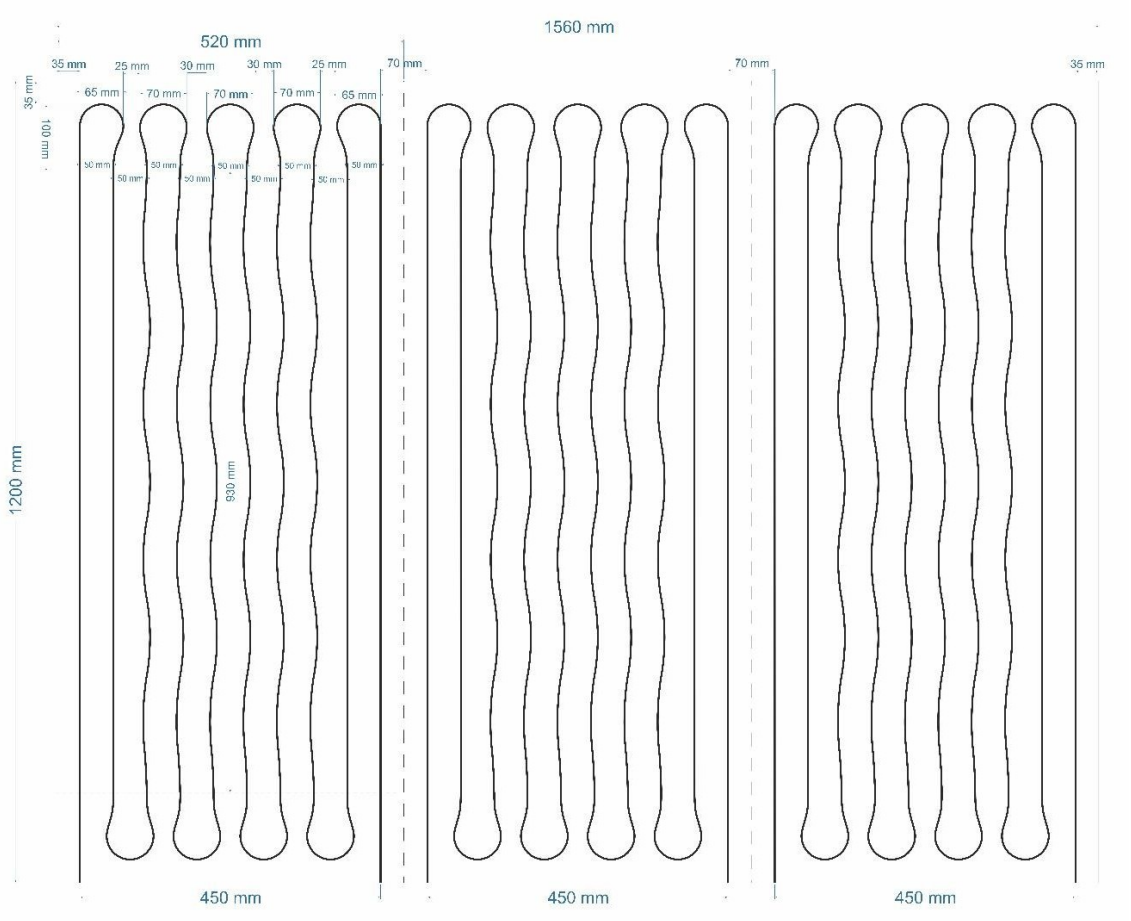
1200 mm
930 mm
450 mm
450 mm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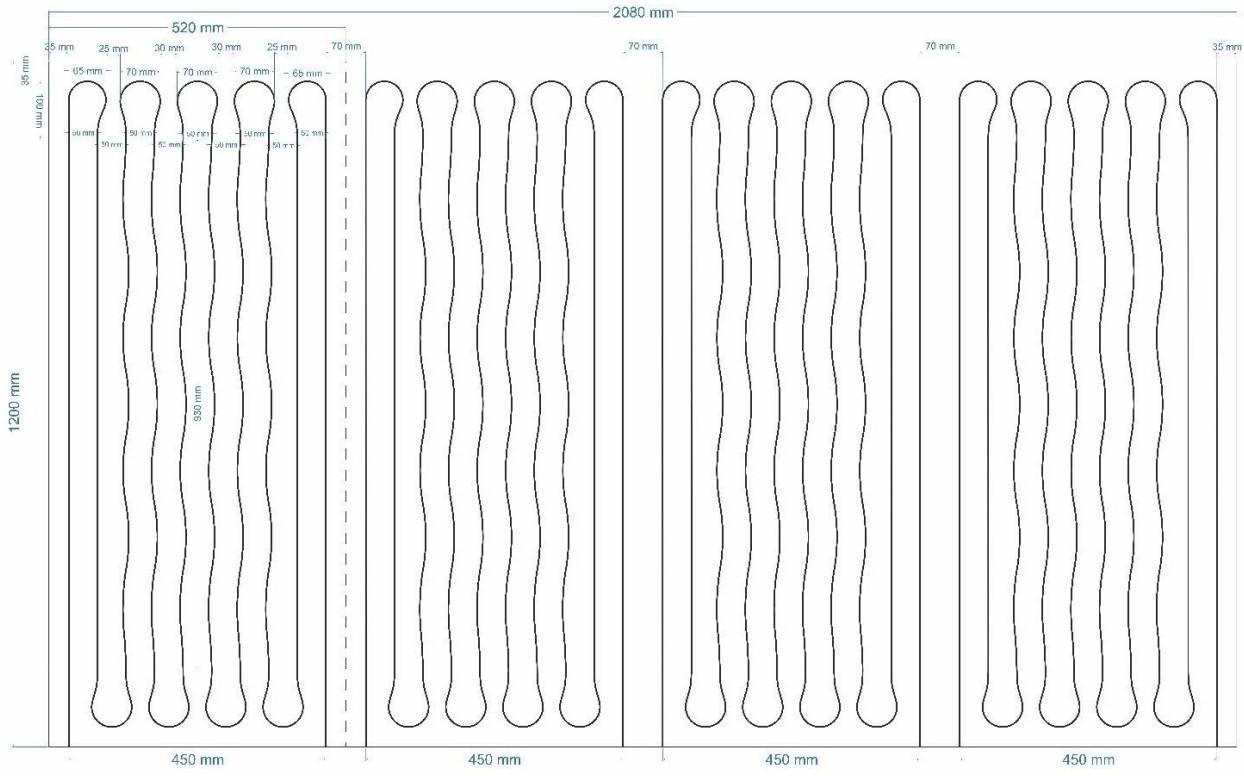
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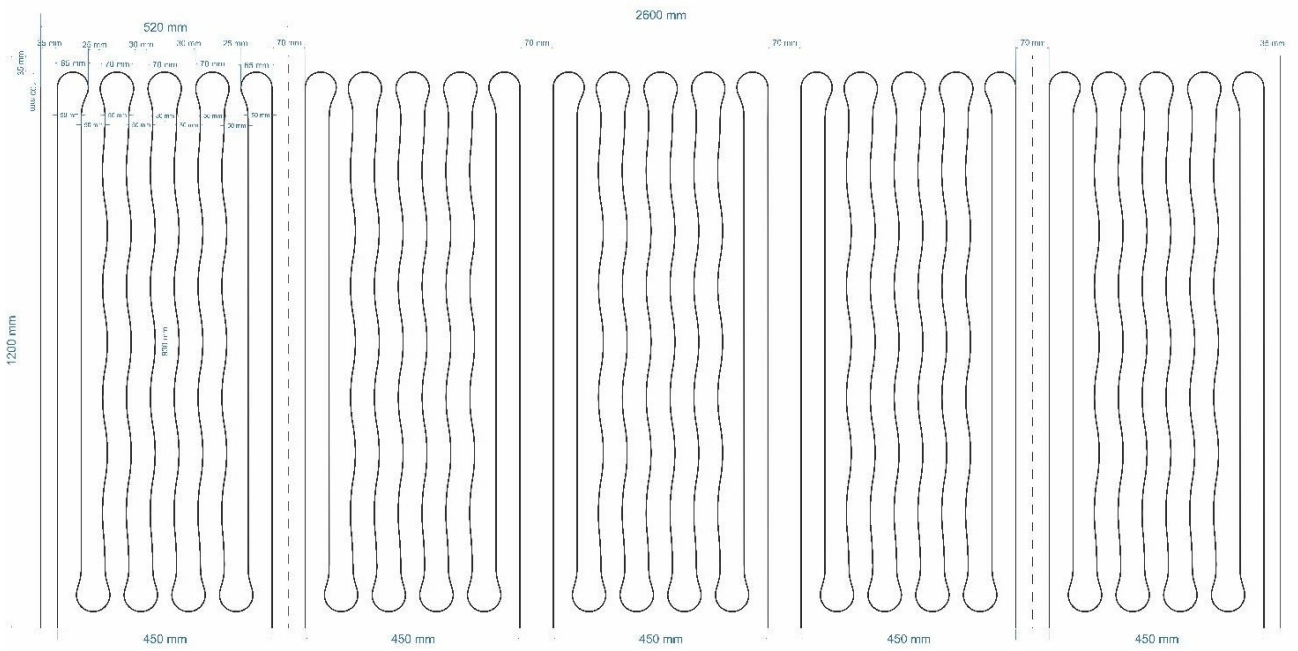
520 mm
2600 mm
1200 mm
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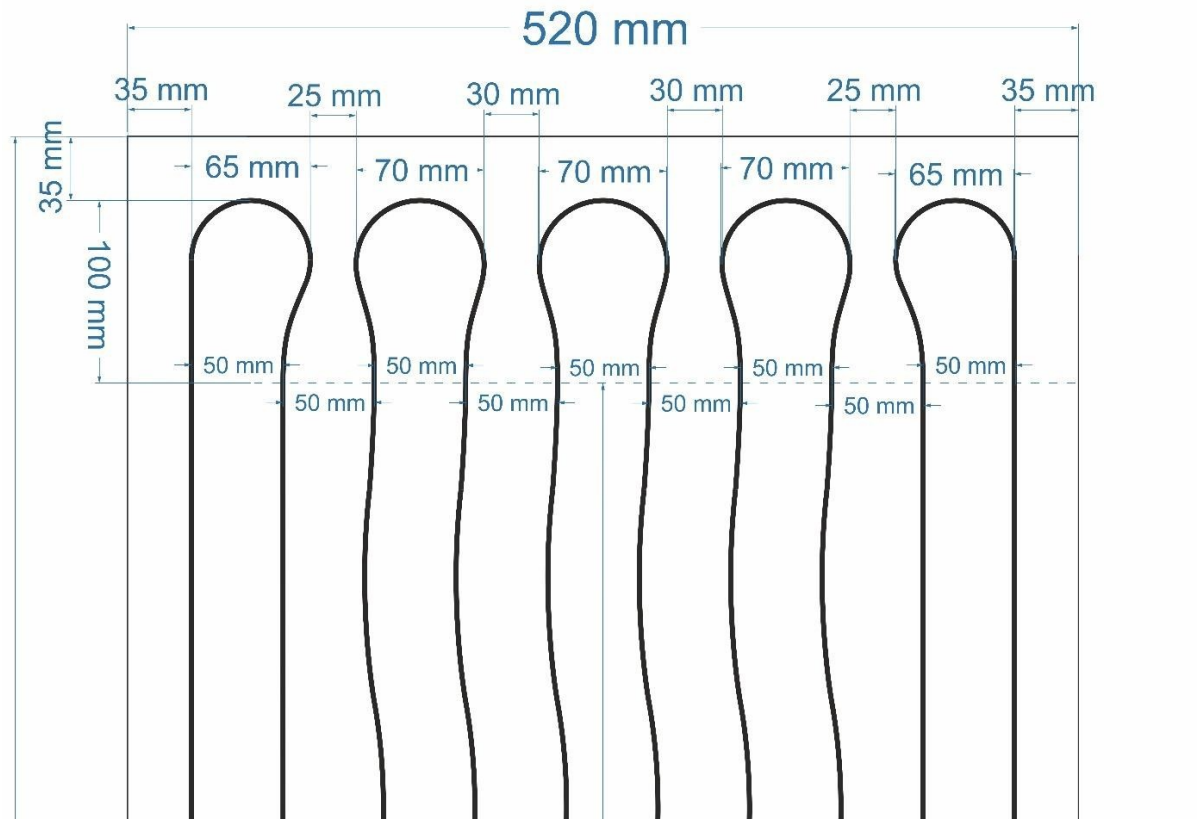
450 mm
450 mm
450 mm
450 mm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7. Test results

The values presented in this test report are rounding values based on exact measured values. Hence, in case of any recalculation using these values, the results can differ from the data given in this test report.

All test results relate only to the items tested.

Graphic characteristics are located on pages 6 and 7, the measurement protocol is shown on page 8.

Characteristic equation of thermal output related to active area:

$\Phi_L = k \cdot \Delta T^n$ [W/m²] Coefficient k = 3,591

Exponent n = 1,067

Standard thermal output related to active area at ΔT = 15 K:

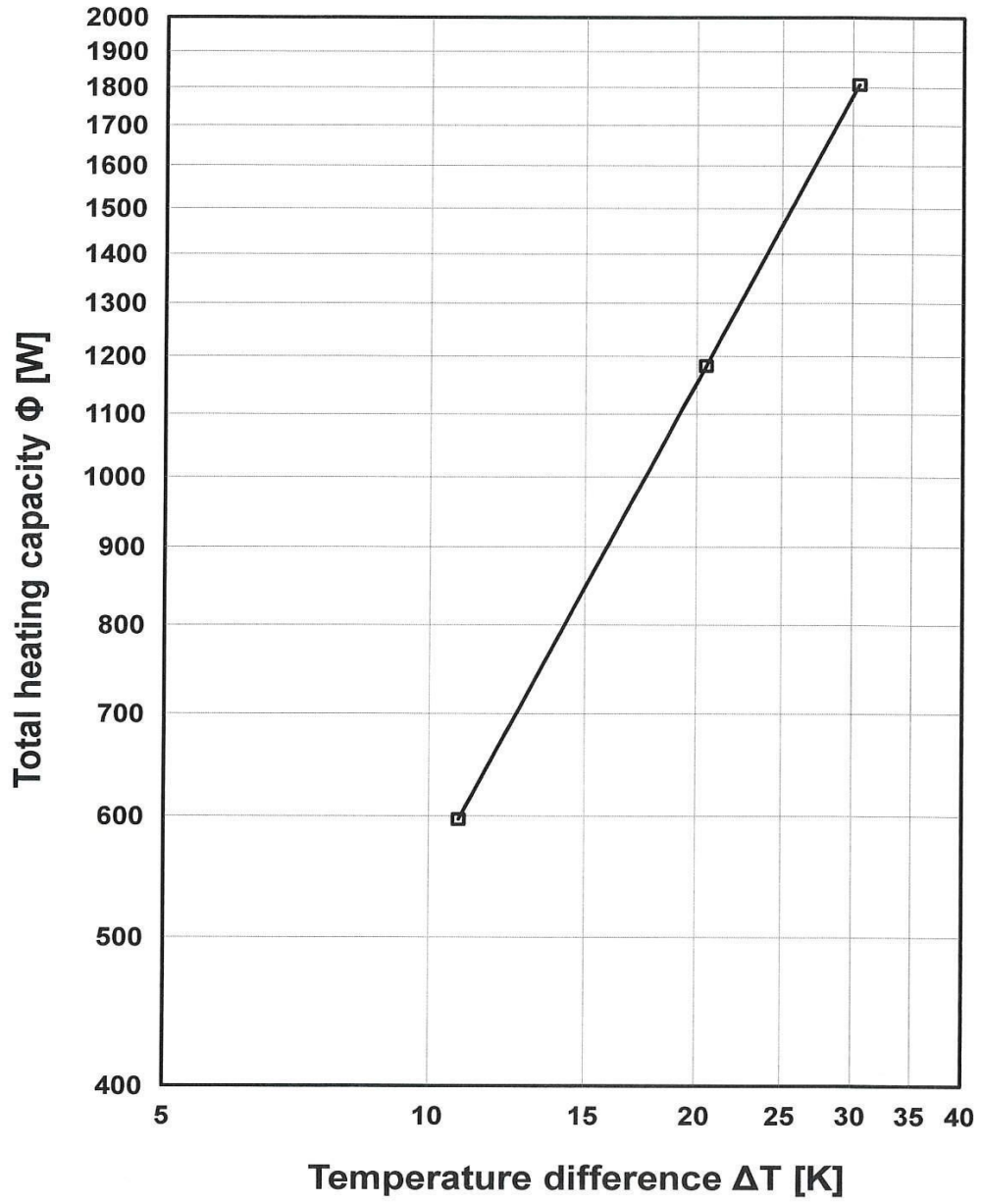
Φ_L = 64,6 W/m²

Stuttgart, 08.02.2022

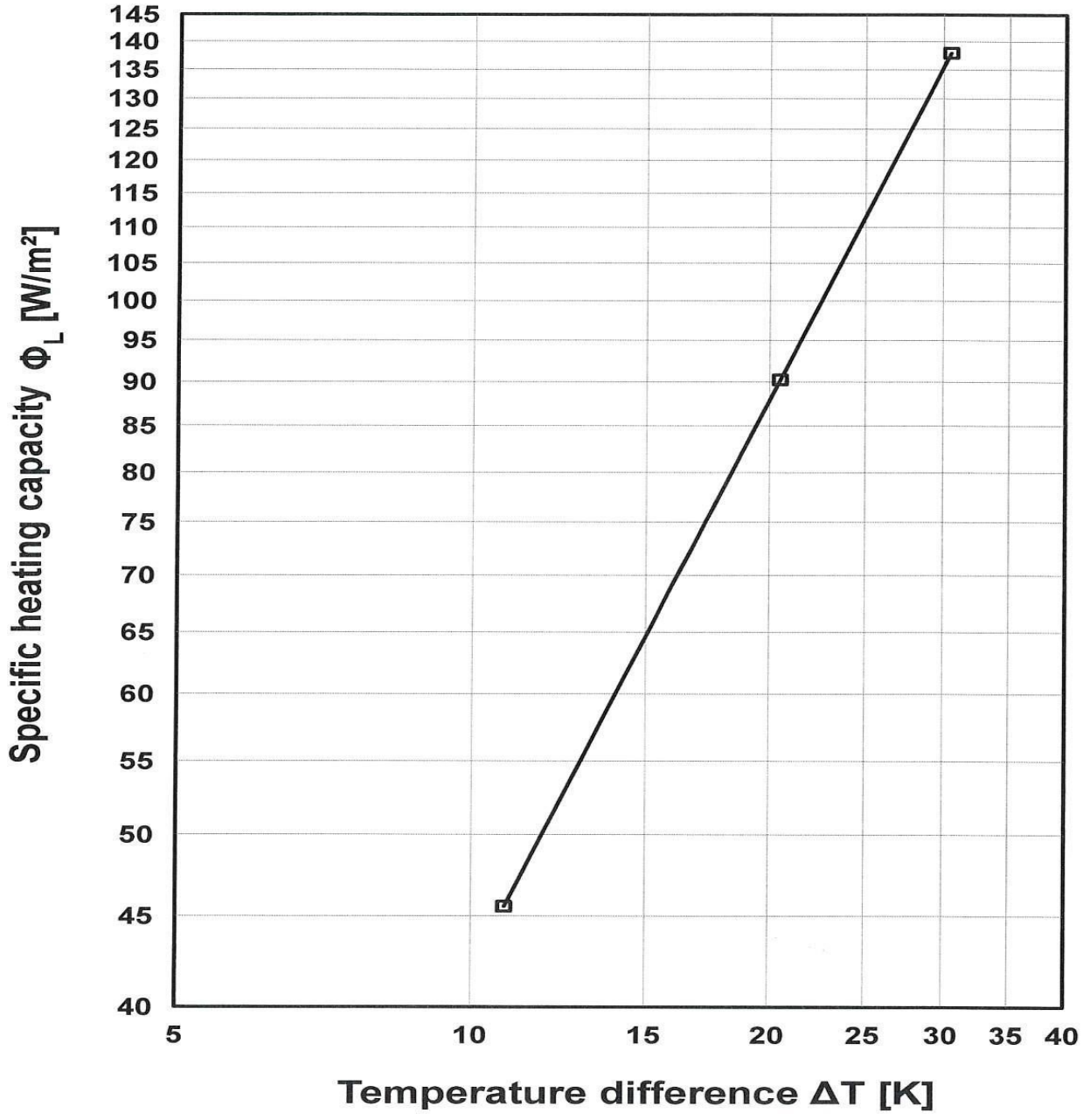
Dipl.-Ing. (BA) Thomas Haase
(Technical Manager of the Laboratory)

M. Sc. Andrea Heindl
(Test Manager)

Characteristic equation of thermal output:



Characteristic equation of specific thermal output, related to active area:



8. Measurement protocol

Results of test					
	Symbol	Unit	Measuring point		
			1	2	3
Date of measurement			24.11.2021	24.11.2021	25.11.2021
Air pressure	p	kPa	98,60	98,31	97,83
Reference room temperature	t_{ref}	°C	20,01	20,01	19,99
Inlet water temperature	t_1	°C	42,48	31,81	53,52
Outlet water temperature	t_2	°C	38,55	29,83	47,52
Water temperature drop	$t_1 - t_2$	K	3,93	1,98	6,00
Inlet water enthalpy	h_1	kJ/kg	177,85	133,26	224,01
Outlet water enthalpy	h_2	kJ/kg	161,42	124,97	198,93
Enthalpy difference	$h_1 - h_2$	kJ/kg	16,43	8,29	25,08
Mean water temperature	t_m	°C	40,51	30,82	50,52
Temperature difference	ΔT	K	20,51	10,81	30,53
Water flow rate	q_m	kg/h	258,1	258,1	258,2
Measured thermal output	Φ_{me}	W	1178,0	594,5	1798,8
Output corrected for barometric pressure*	Φ	W	1182,5	597,0	1807,7
Thermal output related to active surface	Φ_L	W/m²	90,2	45,6	138,0

Control temperatures				
	Unit	Measuring point		
		1	2	3
Air temperature 0,25 m above floor	°C	19,1	19,5	18,6
Air temperature 0,75 m above floor	°C	19,3	19,6	19,0
Air temperature 1,7 m above floor	°C	20,2	20,1	20,2
Air temperature in the void	°C	32,2	26,5	38,3
Surface temperature wall 1	°C	18,3	19,1	17,6
Surface temperature wall 2	°C	18,3	19,1	17,6
Surface temperature wall 3	°C	18,4	19,1	17,7
Surface temperature wall 4	°C	18,3	19,1	17,6
Surface temperature wall 5 (floor)	°C	18,5	19,1	17,8
Surface temperature wall 6 (ceiling)	°C	18,2	19,0	17,5

* $\Phi = \Phi_{me} \cdot (0{,}65 + 0{,}35 \cdot (101{,}325/p)^{0{,}4})$

7. Test results

The values presented in this test report are rounding values based on exact measured values. Hence, in case of any recalculation using these values, the results can differ from the data given in this test report.

All test results relate only to the items tested.

Graphic characteristics are located on pages 6 and 7, the measurement protocol is shown on page 8.

Characteristic equation of cooling capacity related to active area at nominal cooling water flow rate:

$P_a = k \cdot \Delta\theta^n$ [W/m²] Coefficient k = 5,381

Exponent n = 1,029

Nominal cooling capacity related to active area at $\Delta\theta_N$ = 8 K and nominal cooling water flow rate:

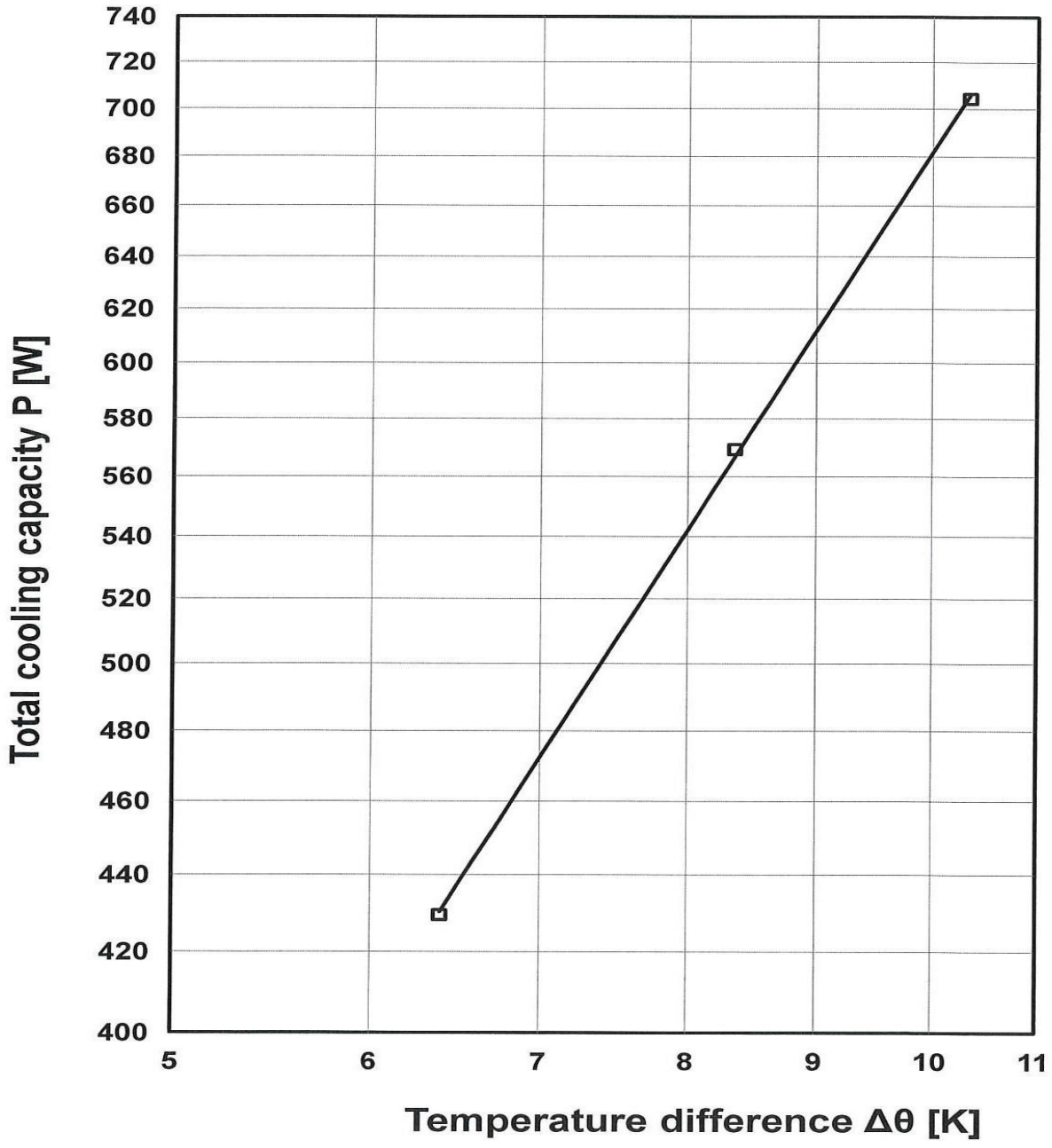
P_a = 45,7 W/m²

Stuttgart, 06.12.2021

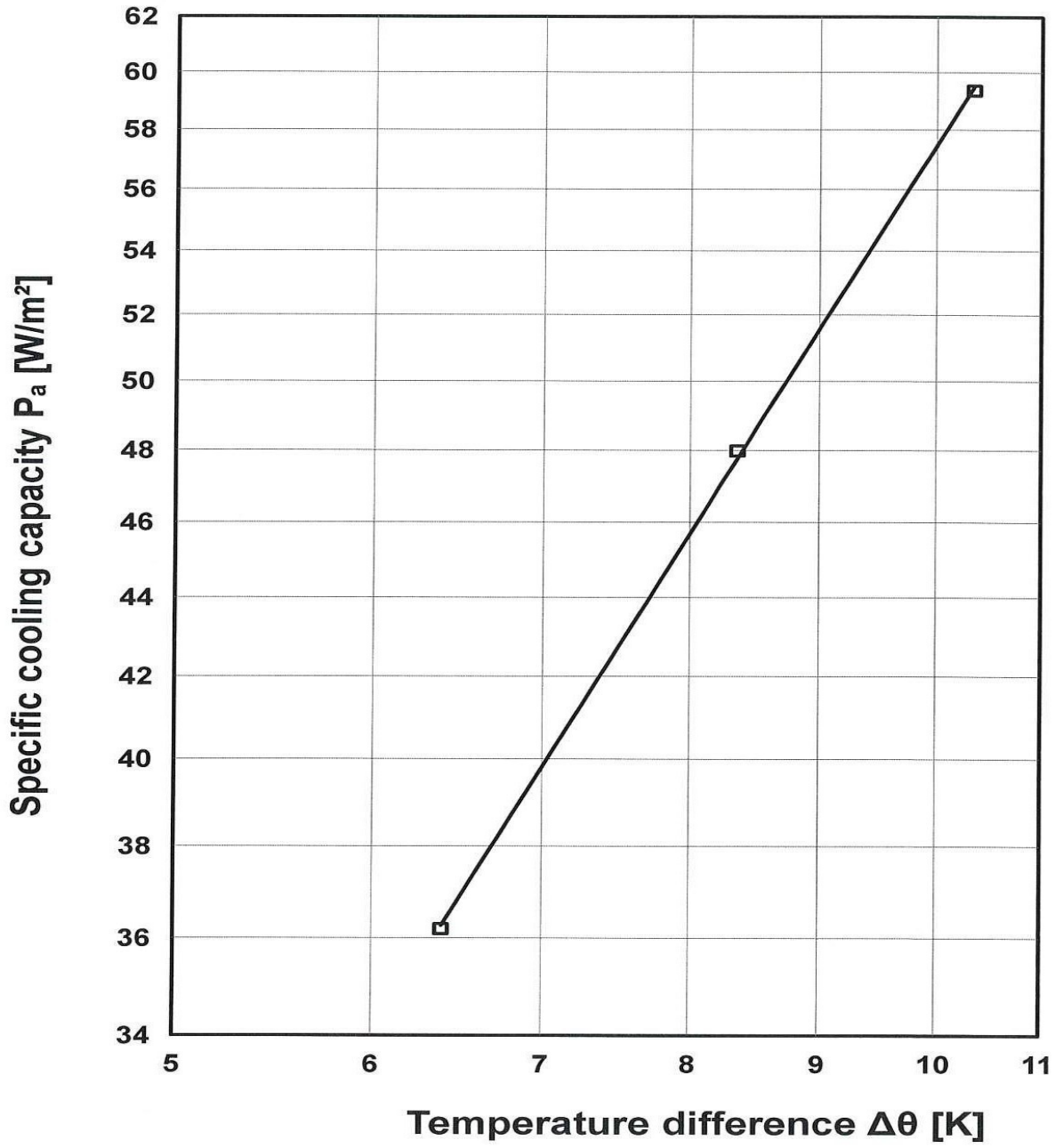
Dipl.-Ing. (BA) Thomas Haase
(Technical Manager of the Laboratory)

M. Sc. Andrea Heindl
(Test Manager)

Characteristic equation of cooling capacity:



Characteristic equation of specific cooling capacity, related to active area:



8. Measurement protocol

Results of measurements					
Number of measuring point			1	2	3
Date of measurement			23.11.2021	23.11.2021	24.11.2021
Cooling water flow rate [kg/h]		q_w	233,6	233,5	233,4
Temperatures [°C]	Water inlet	θ_{w1}	16,66	18,92	14,45
	Water outlet	θ_{w2}	18,76	20,50	17,04
	Globe	θ_g	26,07	26,10	26,09
	Air - 1,7 m	$\theta_{a1,7}$	26,3	26,3	26,3
	Air - 1,1 m	$\theta_{a1,1}$	26,4	26,3	26,4
	Air - 0,1 m	$\theta_{a0,1}$	26,3	26,3	26,4
	Surface wall 1	θ_{sw1}	26,2	26,2	26,1
	Surface wall 2	θ_{sw2}	26,2	26,2	26,2
	Surface wall 3	θ_{sw3}	26,2	26,2	26,2
	Surface wall 4	θ_{sw4}	26,2	26,2	26,2
	Surface inside floor	θ_{floor}	26,1	26,1	26,1
	Surface inside ceiling	$\theta_{ceiling}$	26,1	26,1	26,1
	Air - void	$\theta_{a\text{-}void}$	21,7	22,6	20,8
Heating capacity - dummies [W]		P_s	554,0	411,0	687,0

Calculations from measurements					
Number of measuring point			1	2	3
Reference temperature [°C]		θ_{ref}	26,07	26,10	26,09
Δθ [K]	Water temperature rise	$\Delta\theta_w$	2,10	1,58	2,59
	Reference mean water	$\Delta\theta$	8,35	6,39	10,34
Cooling capacity	Specific - test room area [W/m²]	P_t	38,7	29,2	47,9
	Specific - installation area [W/m²]	P_i	40,6	30,6	50,3
	Specific - active area [W/m²]	P_a	48,0	36,2	59,4
	Total [W]	P	569,2	429,4	704,2
Heat transfer/ test room periphery [W]		P_B	22,2	17,3	25,2
Heat balance [W]		ΔQ	6,9	-1,2	7,9
Heat balance maximum value [W]		0,05 · P	+/- 28,5	+/- 21,5	+/- 35,2

TEST REPORT for determining the heating/cooling capacity of hot/cold surfaces in accordance with EN 14240

Heating/cooling through the ceiling
Plasterboard water radiant panel

Plasterboard water radiant panel, PE-XC Ø 8*1 mm pipe, installation distance between pipes: 50 mm.

Test report

No: 21.58.CIO.002/A02 - HEATING

Thermal performance - heating

Temperature in the flow of the radiant panel	W/m²	
8k (28˚C)	33,02	
9K (29˚C)	37,44	
10K (30°C)	41,90	
11K (31°C)	46,38	
12K (32°C)	50,89	
13K (33°C)	55,43	
14K (34°C)	59,99	
15K (35°C)	64,50	
16K (36°C)	69,18	
17K (37°C)	73,80	
18K (38°C)	78,44	
19K (39°C)	83,10	
20K (40°C)	87,78	
21K (41°C)	92,47	
22K (42°C)	97,18	
23K (43°C)	101,90	
24K (44°C)	106,63	

Nominal capacity: 64,6 W/m^2 (Δt: 15K)

(active surface ratio: 100%; active surface: 14,01m^2)

Test report

No: 21.58.CIO.001/A01 - COOLING

Thermal performance – cooling

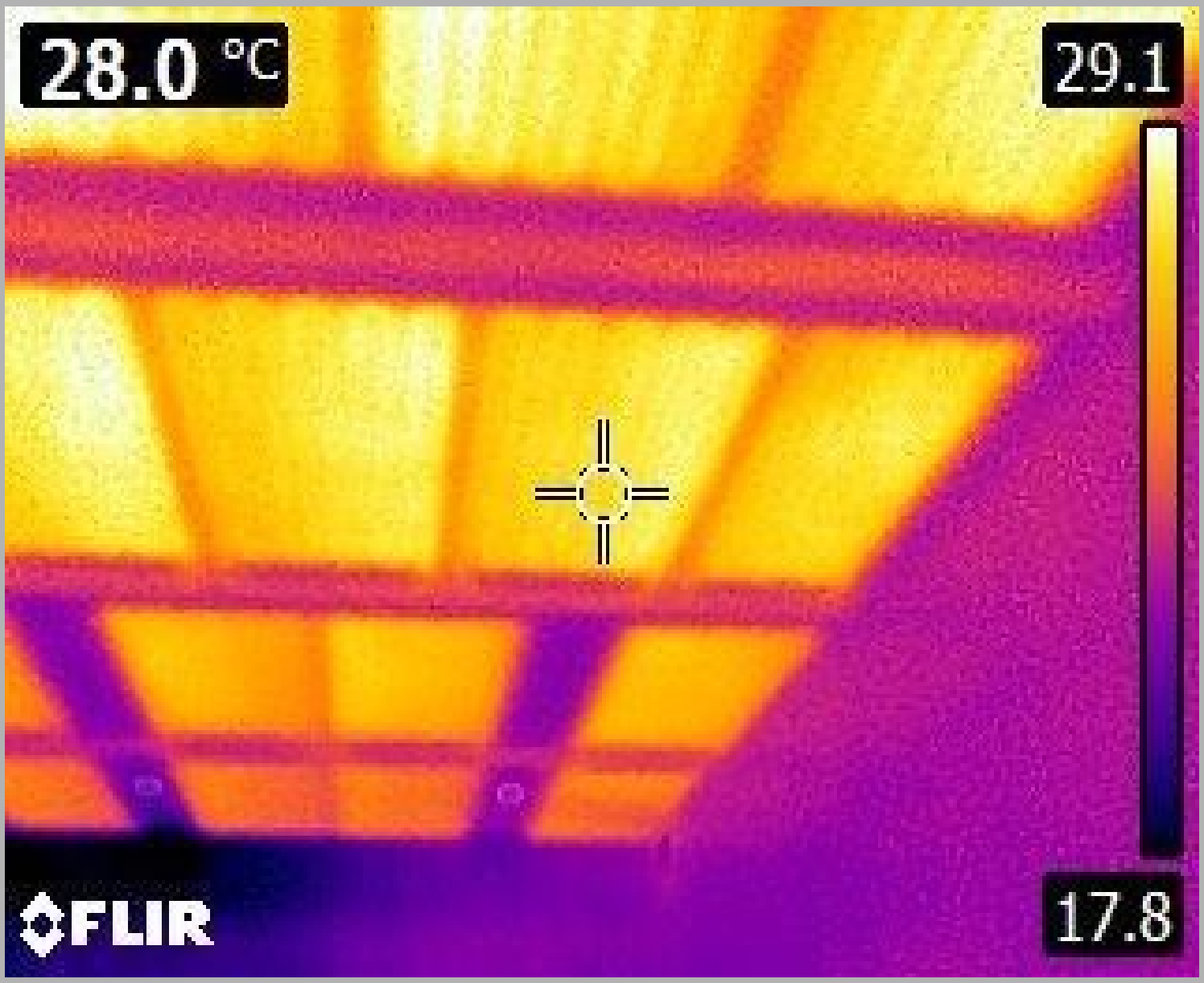
Temperature in return of the radiant panel	W/m²	
12k (14˚C)	69,39	
11K (15˚C)	63,45	
10K (16˚C)	57,52	
9K (17˚C)	51,61	
8K (18˚C)	45,72	
7K (19˚C)	39,85	
6K (20˚C)	34	
5K (21°C)	28,19	
4K (22°C)	22,40	

Nominal capacity: 45,7 W/m^2 (Δt: 8K)

(active surface ratio: 100%; active surface: 14,01m^2)

Panelradiant S.R.L.

ORADEA (BH)



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PANELRADIANT

10 YEAR WARRANTY 10 YEAR WARRANTY 10