

Heating and cooling system on the ceiling and on the walls

Test Report

21.58.CIO.002/A1

on the conformity of a heated ceiling surface
according to EN 14037-5:2016

This report replaces report no. 21.58.CIO.002 and consists of 14 pages

This report shall not be reproduced except in full without the written approval of the test laboratory.

- 0. Modification of report** Name and address of customer and manufacturer
- 1. Test laboratory and location of test**
- WSPLab**
Dr.-Ing. Frank Bitter
Kapuzinerweg 7
70374 Stuttgart
Germany
- Phone: +49 711 953922-0
Fax: +49 711 953922-66
- Test laboratory recognized by DIN CERTCO
and accredited to EN ISO/ IEC 17025
- 2. Customer**
- PANELRADIANT S.R.L
Jud. BH Mun. Oradea
Str. Principatele Unite nr. 18, et 1, ap. 8
Romania
- 3. Manufacturer**
- PANELRADIANT S.R.L
Jud. BH Mun. Oradea
Str. Principatele Unite nr. 18, et 1, ap. 8
Romania
- 4. Identification of test item**
- 4.1 Receipt of test item 22.11.2021
- 4.2 Date of test 24.11.2021
- 4.3 Manufacturer's designation Heating and cooling system on the ceiling and on the walls
- 4.4 Details of test item Closed heated ceiling consisting of 21 panels. Each panel consists of a plasterboard (1200 mm x 520 mm x 15 mm) with integrated plastic pipes laid in meandering pattern (8 mm x 1 mm; pipe spacing 50 mm) and an insulation layer (expanded polystyrene plate, thickness 27 mm) on the top side. All panels are hydraulically connected in parallel, details see drawings in chapter 9.

- 4.5 Nominal dimensions of test item
- Active area:
 $A_a = (1,2 \text{ m} \times 0,52 \text{ m}) \times 21 = 13,10 \text{ m}^2$
- Installation area:
 $A_i = (3 \times 1,2 \text{ m} + 1 \times 0,25 \text{ m}) \times (7 \times 0,52 \text{ m}) = 14,01 \text{ m}^2$
- Active area ratio:
 $R_a = A_a / A_i = 0,94$
- 4.6 Hydraulic connection of test item
- Number of elements connected in series: -
 Number of units connected in parallel: 21
- 4.7 Insulation
- Top of elements: Yes (integral part of the system)
 Connecting pipelines: Yes
 Collectors and distributors: Yes
 Connections between elements: -

5. Test room information and test set up

- 5.1 Type of test facility
- tightly closed controlled and water-flowing enclosing surfaces
- 5.2 Test specification
- EN 14037-5:2016
- 5.3 Inside dimensions of partly insulated test room
- Length = 4100 mm
 Width = 4000 mm
 Height = 2875 mm
- 5.4 Distance between test item bottom edge and floor
- 2575 mm
- 5.5 Measuring point of reference temperature (Globe temperature)
- At a height of 0,75 m above the floor in the centre of the test room

6. Measurement method and instruments

The determination of the thermal output is based on the measurement of the water flow rate and the enthalpy difference between water inlet and outlet.

6.1	Heating water flow rate	Electromagnetic flow meter, calibrated with weighing method
6.2	Heating water temperatures (inlet and outlet)	PT 100 sensors
6.3	Globe temperature	PT 100 sensor with blackened light metal sphere (diameter 150 mm, emissivity 0,9)
6.4	Air temperatures	Radiation shielded thermo couples NiCr-Ni

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:

$$\Phi_L = k \cdot \Delta T^n \text{ [W/m}^2\text{]}$$

Coefficient $k = 3,591$

Exponent $n = 1,067$

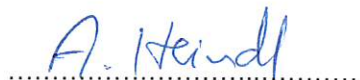
Standard thermal output related to active area at $\Delta T = 15 \text{ K}$:

$$\Phi_L = 64,6 \text{ W/m}^2$$

Stuttgart, 08.02.2022

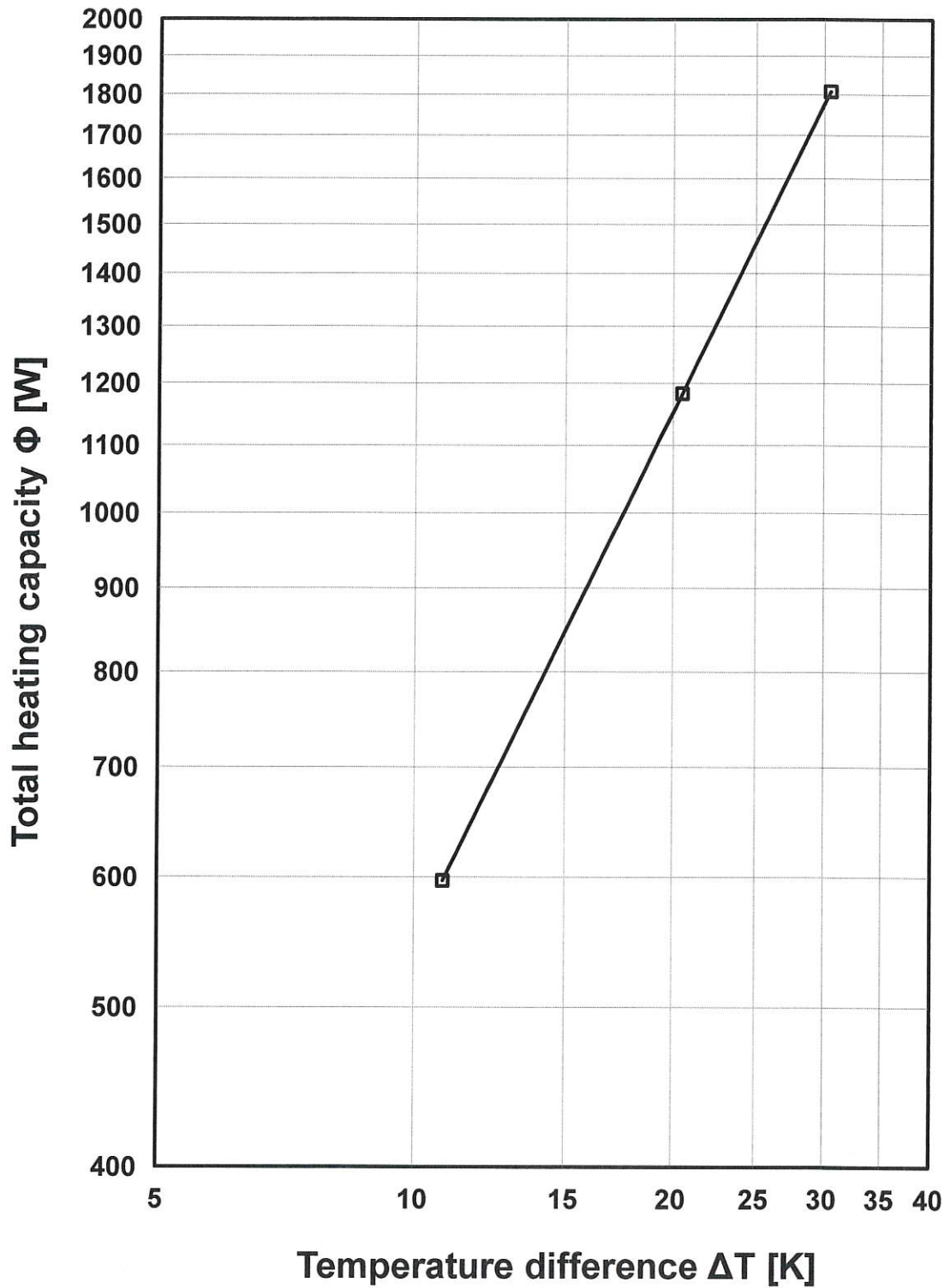


Dipl.-Ing. (BA) Thomas Haase
(Technical Manager of the Laboratory)

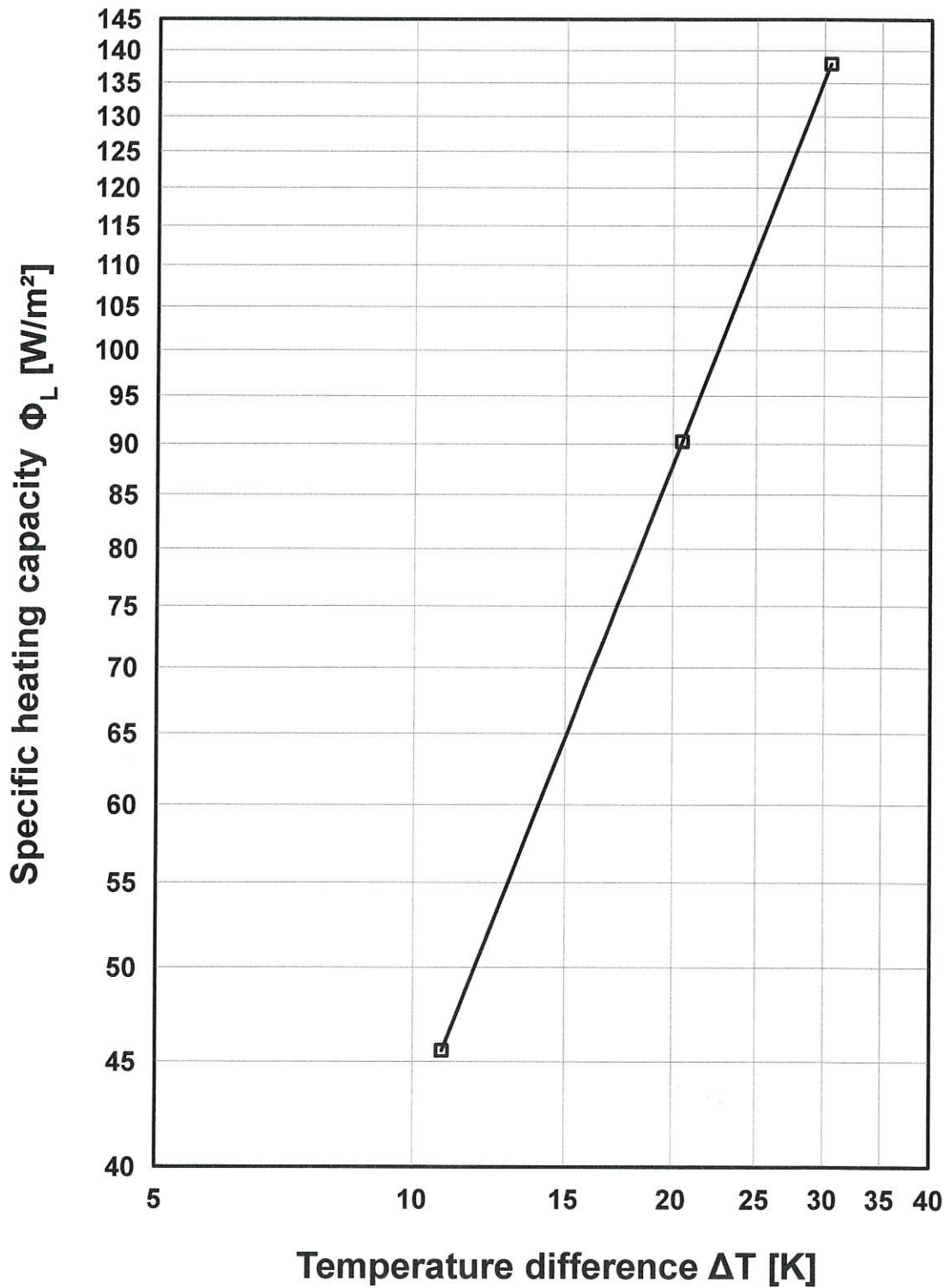


M. Sc. Andrea Heindl
(Test Manager)

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/m ²	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	

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

9. Drawings of the test item

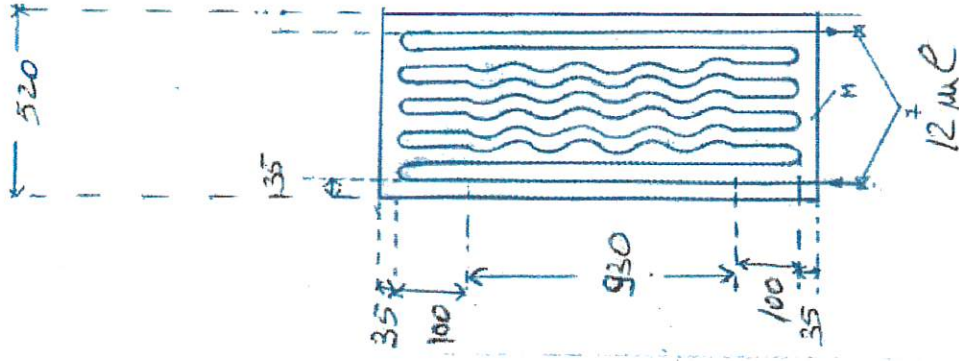
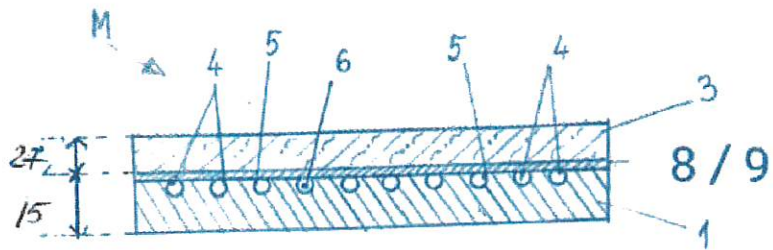
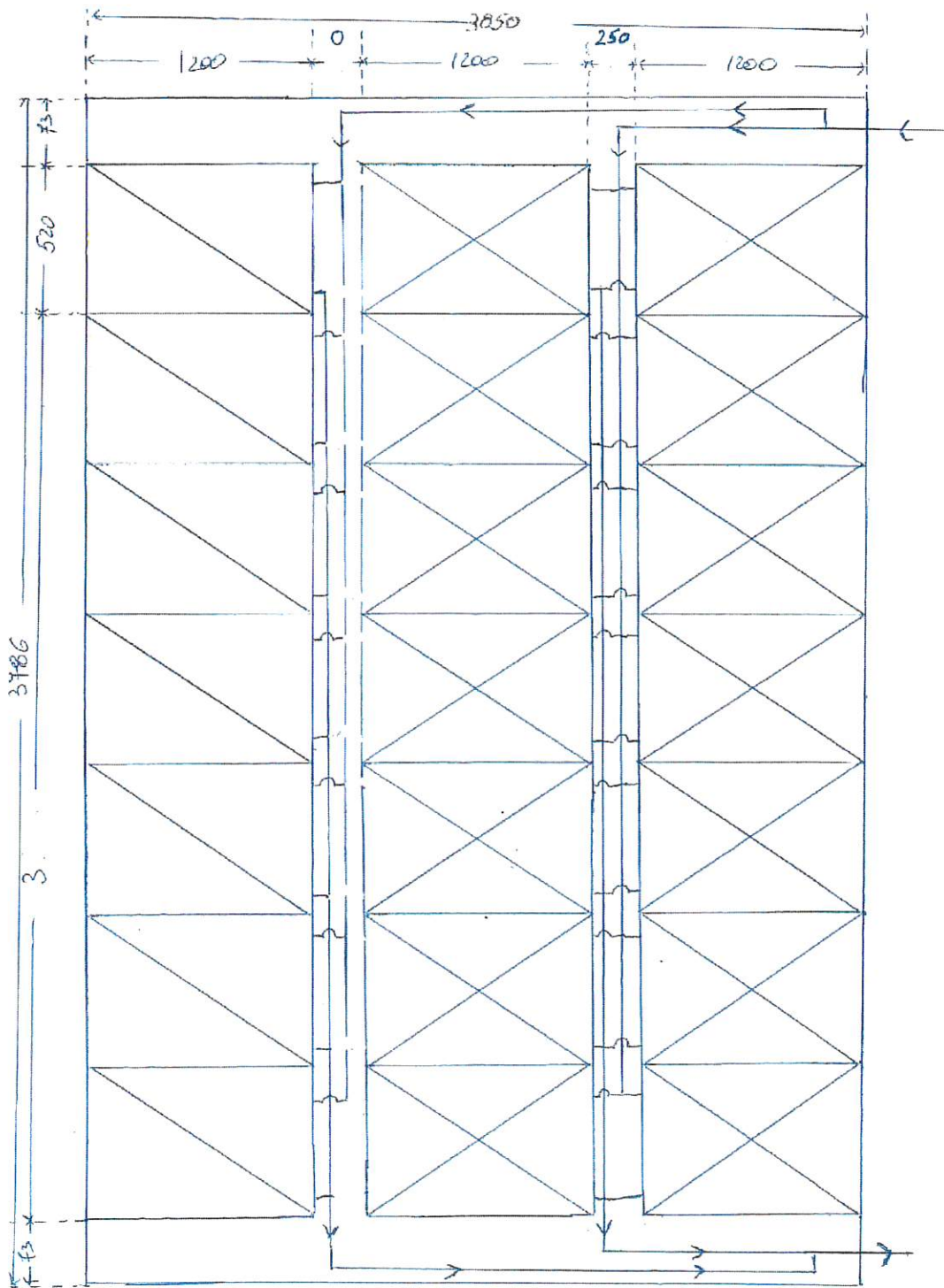


Figura 2





10. Photographs of the test item

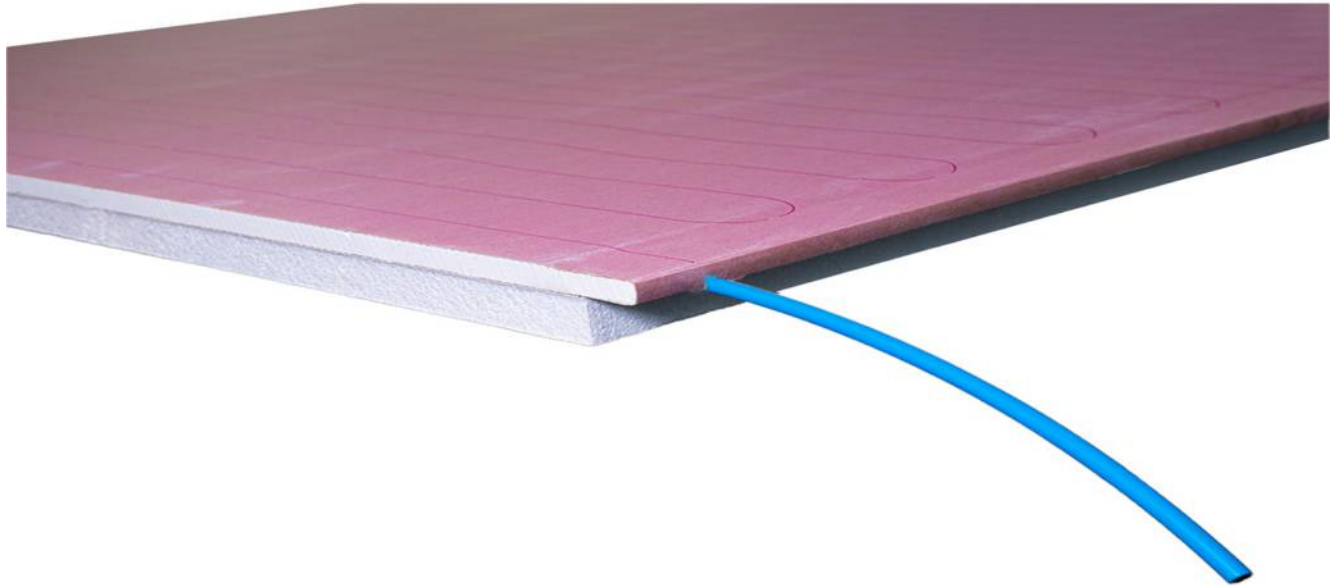
Lower side of an element:



Upper side of an element:



Setup of an element:



Complete test setup:

