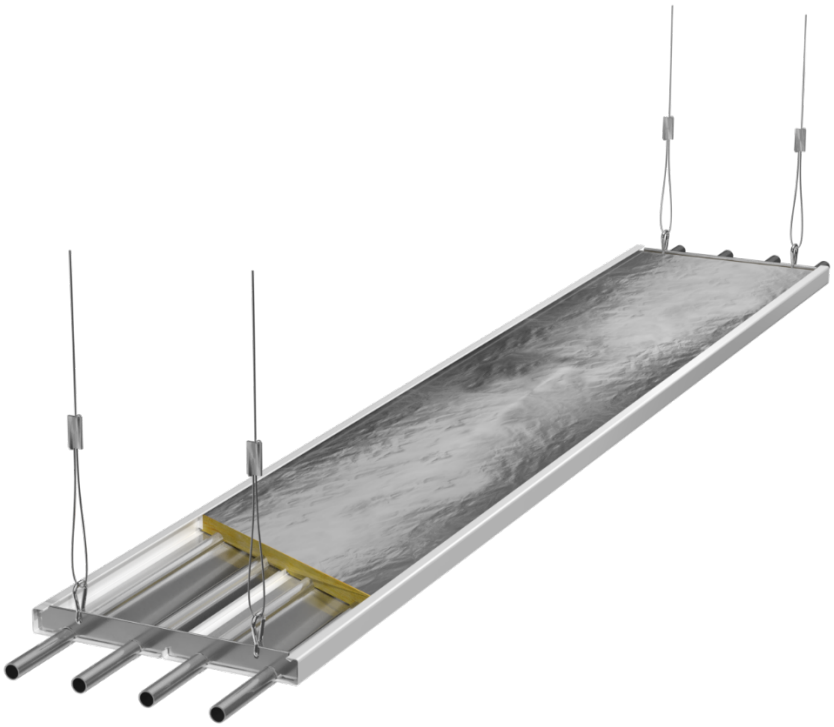
KOTRBATÝ

Ceiling water radiant panel (EN 14037-1:2016)

KOTRBATÝ „KIT“



Registernummer: 011-8D005

Technical Conditions

CE 1015

17, certificate: E-30-00064-17

Safety instructions
Construction
Technical specification
Connecting
Suspension

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1. Characteristics

In principle, radiant heating is more economical than warm-air systems and at the same time, it provides for better micro-climatic conditions.
Water radiant panels enable significant reductions of heat consumption in combination with suitable ventilation systems that bring air directly to the occupied areas at low speeds and with a lower temperature of released air than it would have in case or warm air heating. **The achieved savings can be up to 40 %.** Radiant heating ensures convenience. A great benefit of the water radiant panels is zero requirement for maintenance. A modular radiant heating system allows you to create any radiant surface suspended under the roof shell, both longitudinally and transversely. Panels that are pressed together in bands serve as a heating surface as well as a distribution pipeline.
The radiant surface is made of aluminum sheet, which has high heat conductivity and ensures the high average mean temperature of the surface. The quality of the surface coating is very high and the color shade does not change or the surface does not become damaged even under extreme temperatures.

2. Symbols

This symbol draws your attention to the careful observance of the instructions in the text.

CAUTION! This symbol refers to important instructions or to the possible consequences of the non-observance of these instructions.

3. Safety instructions

This documentation contains basic instructions for the installation of the **KOTRBATÝ KIT** radiant panels.

CAUTION! Before installation and the commissioning of the system, it is absolutely necessary for the installation technicians to read this documentation thoroughly.

Besides the instructions mentioned here, it is naturally necessary to observe the valid regulations, directives and local standards. The system may only be put into operation after the completion of all the prescribed tests for systems of warm / hot water heating.

4. General regulations

1. The design and installation of central heating systems that use water or steam as the heating medium is subject to the valid standards e.g EN 12828.

2. The design, implementation and operation of the safety equipment for systems of central heating and the heating of hot water is subject to the EN 12828 standard. A central heating or hot-water heating system **must not** be put into operation without this safety equipment.

3. All the commissioning shall follow the process described in EN 14336.

4. Installation may only be carried out by qualified technicians. During the installation, the technicians are obliged to observe work safety rules and to proceed in such a way as to not damage the equipment. The guarantee terms do not cover damages caused in this way. The installation must be carried out in accordance with the design documentation as well as the valid regulations, standards and directives.

5. The radiant panels must be stored in such a way as to be protected from climatic influences, chemical substances, mechanical damage or unauthorized handling (they should be stored in roofed, lockable and dry spaces).

6. The radiant heating system may only be connected if the parameters of the heating water (pressure, temperature) correspond to the technical data mentioned in the documentation and it may only be operated in accordance with the valid standards, regulations and directives! The connection must be established in accordance with the design documentation. The whole heating system must not be put into operation without safety equipment.

5. Type, description

The radiant panels are made of shaped aluminum lamellas with inserted steel pipes and they are connected with crossbars. The system consists of panels made of modules with a width of 330 mm that are on site connected together to the required width with the use of top consoles. The basic element of the radiant panel is a 18 x 1.0 mm precise steel pipe (EN 10305-3) that leads the heating medium and is connected to the 0,8 mm thick aluminum sheet (in various colors) of the lower part of the panel. The standard color is RAL 9016. The design of the panels makes it possible to supply panels of different colors with regard to architects' ideas. The heating media are: hot water up to the temperature of 120 °C and a pressure of 0.6 MPa.

6. Purpose of use

The system is used for the heating of large indoor spaces such as industrial halls, gymnasiums, sports halls, shops, marketplaces, warehouse buildings, etc. The temperature under the roof shell, which is generally the largest cooled area of the heated space, has the decisive influence on the economy of operation.
The curve of air temperature related to the height of the building heated with radiant panels is shown in fig. 1. Over the panel level, there is a warm air cushion (3) the temperature of which depends on the quality of roof insulation. If the insulation is good, the temperature of the contact point (1) is higher (t_s^1 = 21 °C); if the insulation is poor (2), it is lower (t_s^2 = 17 °C). In the case of warm-air heating with wall air heaters, these values are significantly different (fig. 2: t_s^1 = 26 °C, t_s^2 = 23 °C). This temperature difference has a considerable impact on the heat consumption in the heated building, to say nothing of the consumption of electricity for the operation of hot-air heating.

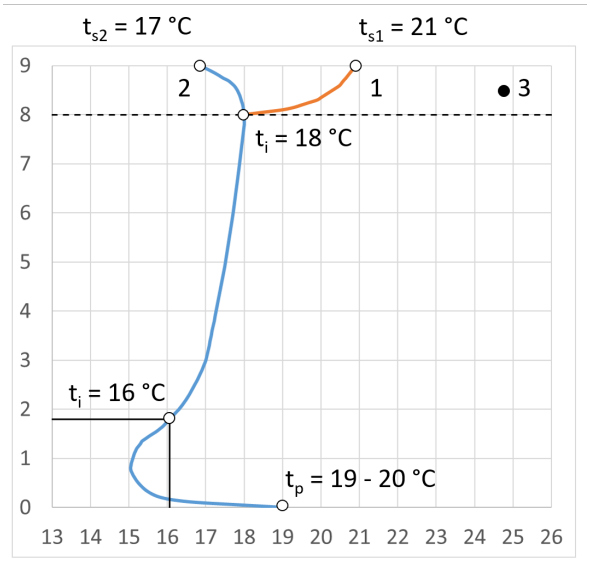


Fig. 1

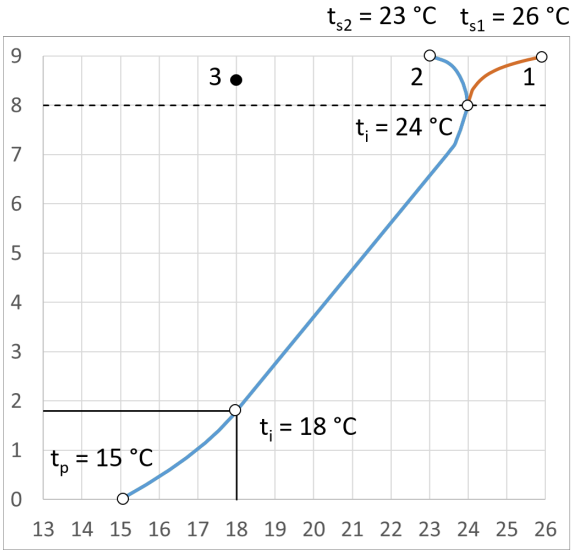


Fig. 2

7. Panel construction

Fig. 3 shows a complete radiant panel of the width 330 mm. Panels are equipped with crossbars used for panels' suspension. It is possible to suspend these panels next to another (up to 4 pieces) with distance of 60 mm by modular way to create a heating surface of demanded thermal output. To ensure better radiant efficiency, 30 mm thick insulation with aluminum coating is fixed to the upper side of the panel. This insulation is covered with side wings at the side.

CAUTION! The individual panels are suspended with the use of chains with the corresponding load-bearing capacity and they are aligned to the horizontal position with tensioning screws or other suspension system.

Nomenclature:

Radiant panel – a heating element transmitting heat energy to the working space by radiation.

Radiant strip – a series of radiant panels connected together to one band by press-fittings.

Heat insulation - Mineral wool insulation with a thickness of 3 cm with top covering aluminum foil that is put on the upper part of a radiant panel. The joints between the boards are covered with an aluminum self-adhesive tape. **INSULATION IS ASSEMBLED ALREADY IN MANUFACTURE**.

Bottom connection cover - a profiled aluminum sheet used to cover the joints of the panels in the strip.

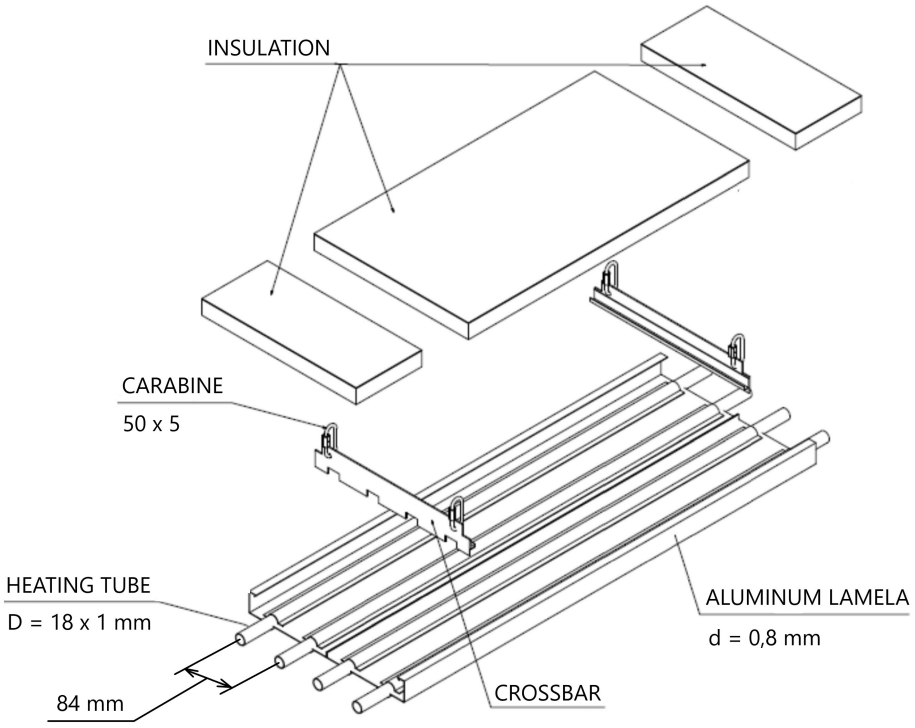


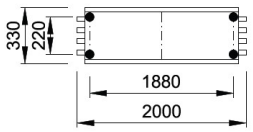
Fig. 3

8. Dimensions

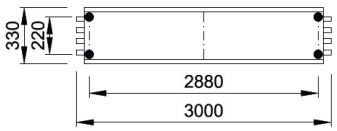
Figures 4 and 5 shows basic dimensions of the individual types of produced radiant panels.

Figure 6 shows cross-section of radiant panel KIT I.

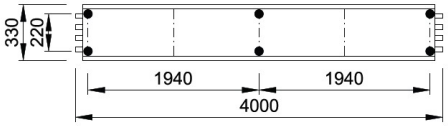
KIT I – Length **2000 mm**



KIT I – Length **3000 mm**



KIT I – Length **4000 mm**



KIT I – Length **6000 mm**

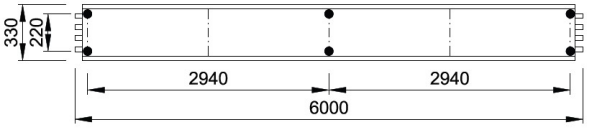
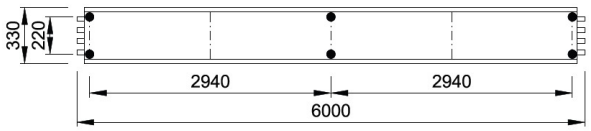
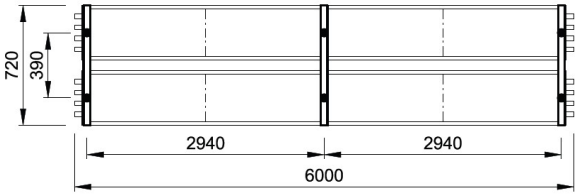


Fig. 4

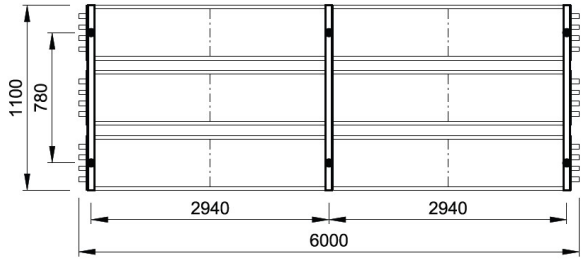
KIT I – Length **6000 mm**



KIT II – Length **6000 mm**



KIT III – Length **6000 mm**



KIT IV – Length **6000 mm**

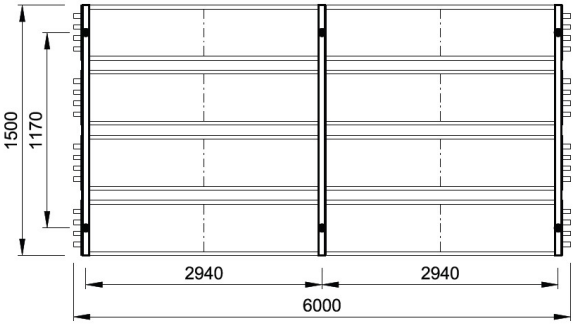


Fig. 5

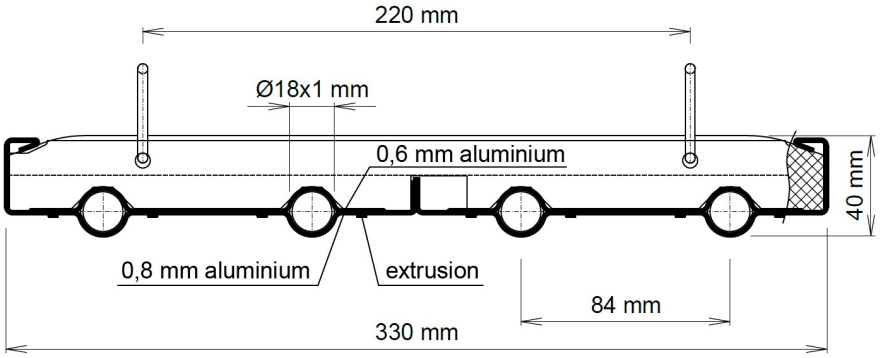


Fig. 6

9. Technical data

Radiant panels are designed on the basis of a calculation of heat losses while respecting the specifics of radiant heating. The calculation method is presented in the book "Energy efficient Heating and Ventilation of Large Halls" REHVA guidebook No. 15. (Kabele, Hojer, Kotrbatý, Petráš, Sommer)

Max. operation water overpressure **6 bar**

Max. operation temperature **120 °C**

Table 1 shows assembly and operation panels' weights. In the table 2 there are thermal outputs for heating with insulation

Tab. 1 – Weights (incl. Pressfittings, Insulation) and Water Volume

Type	Total width [mm]	Weight 2m [kg]		Weight 3m [kg]		Weight 4m [kg]		Weight 6m [kg]		**MAX. kg/SP***	Water Volume [l/m]
		operat.	assembly	operat.	assembly	operat.	assembly	operat.	assembly		
KIT I	330	9,3	7,7	13,7	11,3	18,3	15,1	27,2	22,4	**6,7**	0,8
KIT II	720	19,9	15,3	28,7	22,5	38,6	30,2	56,7	44,8	**13,8**	1,6
KIT III	1110	29,9	23,0	43,1	33,8	57,9	45,2	84,6	67,1	**20,7**	2,4
KIT IV	1500	39,8	30,6	57,4	45,0	77,3	60,3	112,9	89,5	**27,6**	3,2

* It shows maximal weight Load per suspension Point, incl. Watter (6 m panel, middle susp. axis)

Δt [K]	Thermal output of continuous panel [W/m] / header couple [W]								For precise calculation of specific thermal output use following: $q\ [W/m] = K * \Delta t^{n}$
	Panel type								
	KIT I [W/m]	2x Header [W]	KIT II [W/m]	2x Header [W]	KIT III [W/m]	2x Header [W]	KIT IV [W/m]	2x Header [W]	
K	1,9187	0,2511	3,8374	0,5022	5,7561	0,7533	7,6748	1,0044	
n	1,1967	1,2676	1,1967	1,2676	1,1967	1,2676	1,1967	1,2676	
20	69	11	138	22	208	34	277	45	
25	90	15	181	30	271	45	361	59	
30	112	19	225	37	337	56	450	75	
35	135	23	270	46	405	68	541	91	
40	159	27	317	54	476	81	634	108	
45	183	31	365	63	548	94	730	125	
50	207	36	414	72	621	107	828	143	
55	232	40	464	81	696	121	928	161	
60	258	45	515	90	773	135	1030	180	
65	283	50	567	100	850	150	1134	200	
70	310	55	620	110	929	164	1239	219	
75	336	60	673	120	1009	179	1346	239	
80	363	65	727	130	1090	195	1454	260	
85	391	70	782	140	1172	210	1563	280	
90	418	75	837	151	1255	226	1674	301	

Tab. 2 – Rated thermal outputs ϕ_{act} * 1,1 of radiant panel KOTRBATÝ KIT (EN 14037:2016)

Nomenclature in table 2:
$\Delta t = ((t_{m1} + t_{m2}) / 2) - t_i$ [K]
t_{m1} [°C] water temperature – inlet
t_{m2} [°C] water temperature – outlet
t_i [°C] internal design temperature

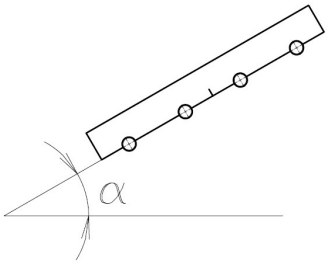


Fig. 7

The minimum heating water amount through one pipe of one module: **100 kg/h**, w = 0,15 m/s.

Thermal outputs specified in tab. 2 are valid for panels positioned horizontally. When the panels are tilted (fig. 7), designed heating output shall be increased by:

Angle α = 30° - increase factor by 10 %
α = 45° - increase factor by 15 %

Hygienic limitations

For comfort operation the maximum irradiation intensity on the top of a person's head should not exceed $I_s = 200\ W/m^2$.

$I_s = Q_p \cdot \eta_{rad} / S_1\ [W/m^2]$,

where:
Q_p [W] panels' thermal output
S_1 [m^2] irradiated floor surface
η_{rad} [-] percentage of panel's radiant thermal output (for this evaluation consider 0,70)

10. Radiant panels´ thermal output control

The advantage of water suspendable radiant panels is the possibility to control precisely the thermal output according to actual demand without cycling. Among recommended control schemes one can consider classical setup with three-way valve and circulation pump (fig. 8a), alternative setup with two-way valve, shortcut and circulation pump (fig. 8b) and in heating systems with sufficient disposition pressure on the primary side setup with controllable jet pump (fig. 8c). The fig. 8c setup eliminates the demand on the secondary circulation pump while maintaining all the advantages of qualitative control.

On the other hand, to the non-recommended setups belong quantitative control with two-way valve with on/off actuators. At this setup high temperature shocks appears in the system which may cause unwanted noise specifically in acoustically sensitive premises.

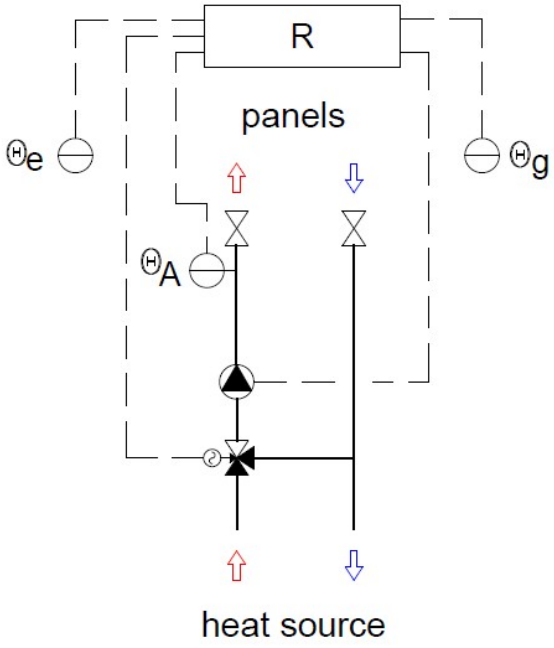


Fig. 8a

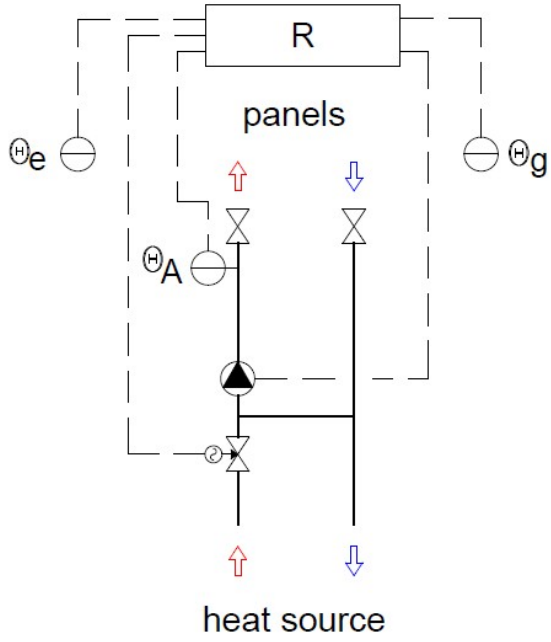


Fig. 8b

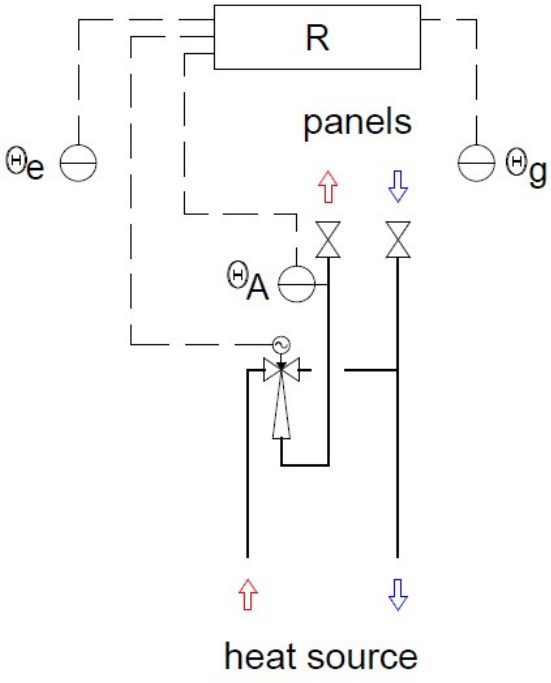


Fig. 8c

11. Design of a heating surface

The heating system containing **KOTRBATÝ KIT** radiant panels system is based on the principle wherein the heating surface serves also as the distribution pipeline of the

heating medium at the same time. The connection piping is hence very short with minimized acquisition costs.

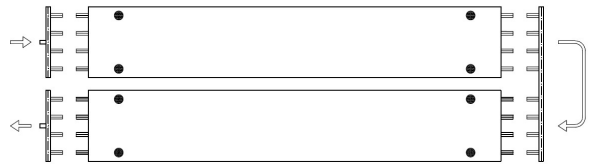
The method of connection is influenced by the parameters of the heating medium. Basic requirement: a minimum flow speed in the heating pipe 18 / 1,0 mm – w_{min} = 0,15 m/s. The higher the speed is, the better. With this speed you can suspend the panels horizontally, without an inclination. It is recommended to install the supply line for the panels below the level of suspension. Both of the main distribution systems should be inclined against the flow direction of the medium. In this case, the whole system can be vented at one point of the return pipeline. To achieve hydraulic balance in the whole system, it is recommended to consider Tichelmann connection when possible.

There are recommended connection schemes on fig. 9. Different connections on request! At **KIT I - R2** connection **should never be** on one band **temperature drop** (inlet - outlet) **higher than 20 K.** Recommended maximum length of the band is 60 m. Optimal uniformity of the heating can be achieved by appropriate choice of bands connection into heating circuits. Average temperature in hall cross section should be ideally the same. Bands with higher temperature should be located at external walls where there is higher heat demand.

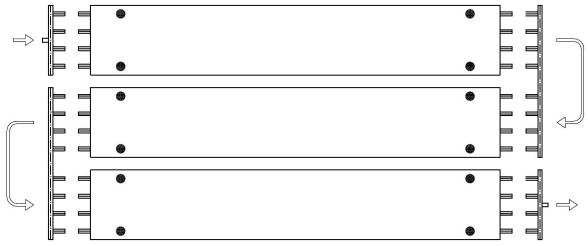
KIT I + Connection R1

KIT I + Connection R2

KIT II + Connection R1



KIT III + Connection R1



KIT IV + Connection R1

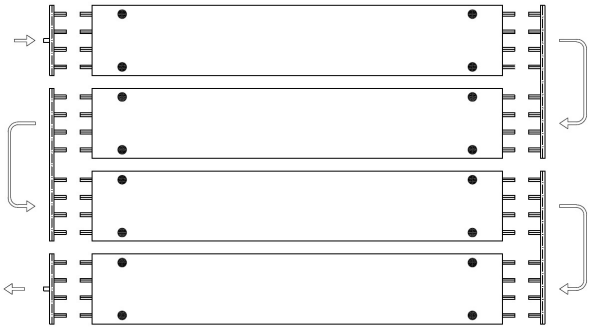


Fig. 9

CAUTION! In both cases the flow velocity higher than w_{min} = 0,15 m/s must be maintained.

Air venting and draining

The kit system of panels allows also different ways of heating surfaces creation enabling reaction to specific local condition given by building technology. When it is not possible to air-vent / drain just from one point it is recommended rather than using automating

air-venting valve to use cup at the highest place with small piping leading to the hand reachable level from the floor where a cock valve can be located. The air-venting is then done simply by opening of this cock valve and waiting before all the air will be removed from the system. When just water without bubbles is leaving the system, it is safe to consider system vented. When it is necessary to use automatic air-venting valve it is recommended to place a cock valve below this valve to allow replacement without necessity of draining the system.

12. Pressure drop

Total pressure drop of radiant panels **KOTRBATÝ KIT** is given by sum of friction pressure losses in heating tubes and local pressure drop at headers. It is important first to choose the optimal connection type (fig. 9) and based on the resulting mass flow rate read from fig. 10 appropriate data:

1) specific panels pressure loss R[Pa/m] – left y-axis;
2) header pressure loss Δp [Pa] – right y-axis.

Resulting pressure drop is after given by multiplication of specific pressure drop R by total length and addition of two headers' pressure drop.

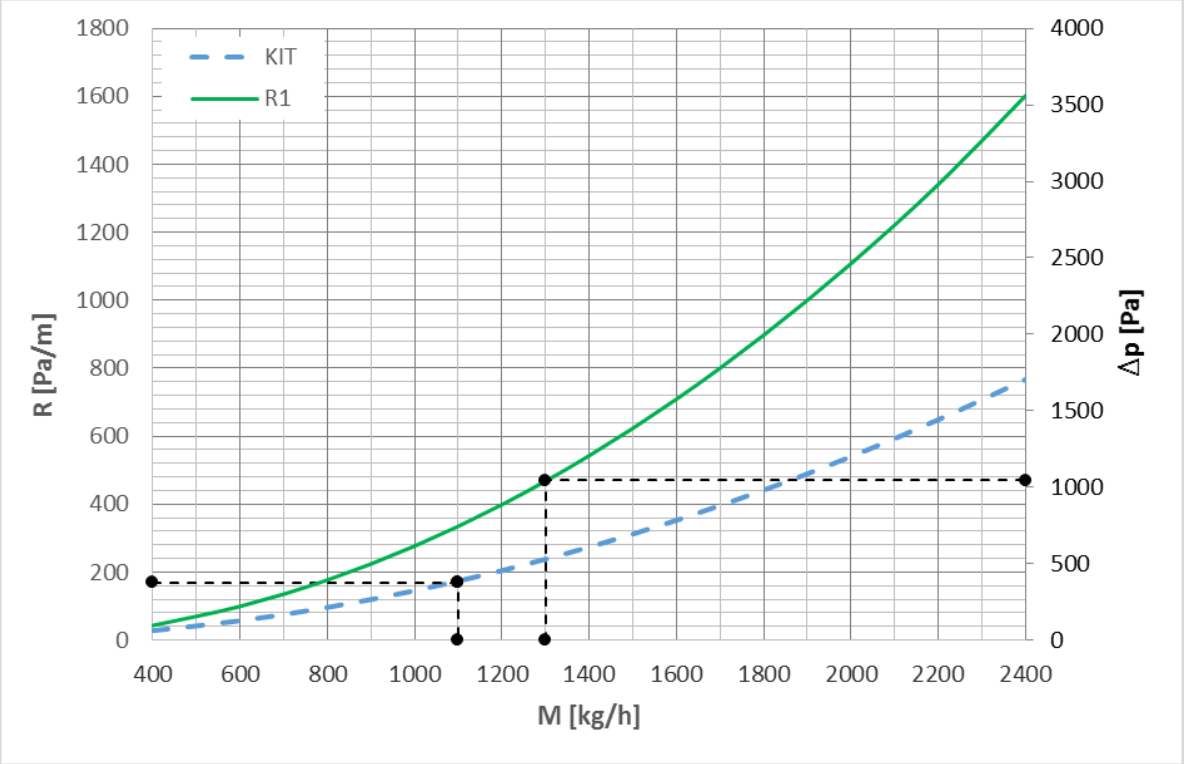


Fig. 10 – Pressure losses of radiant panel and header for R1 connection

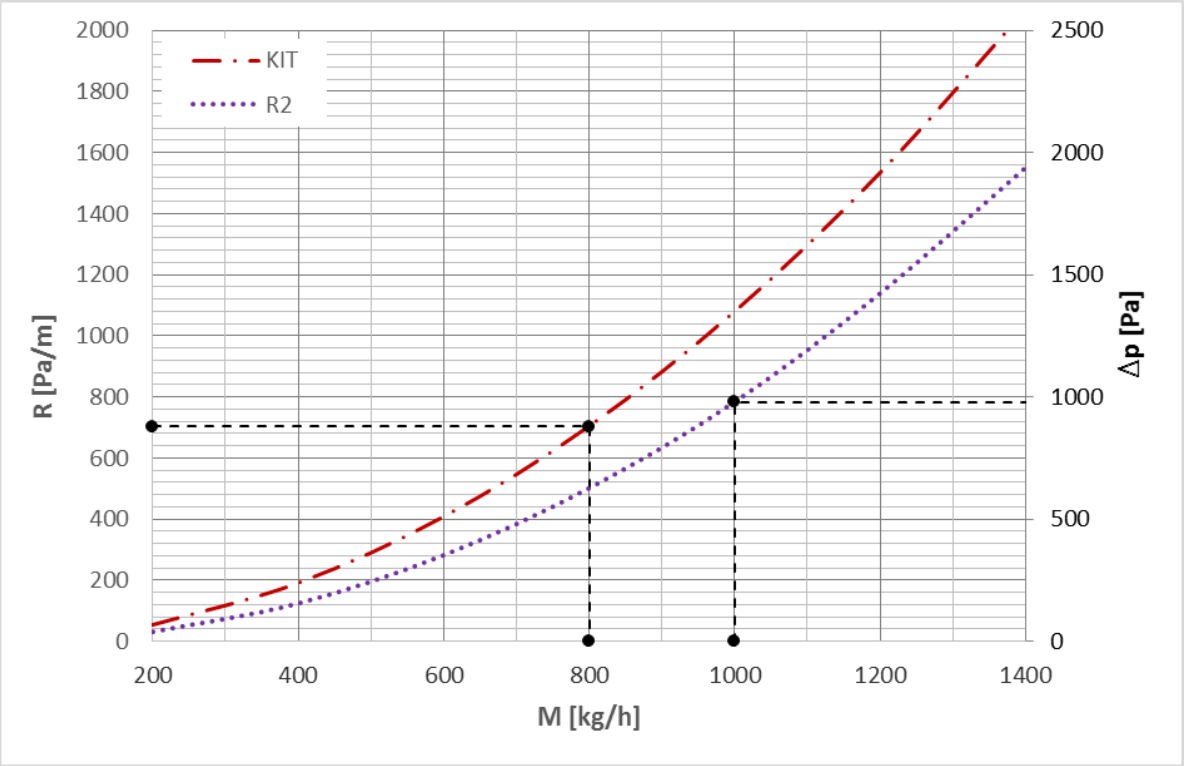


Fig 11 – Pressure losses of radiant panel and header for R2 connection

13. Assembly instructions

Radiant panels KIT are produced in lengths 2000, 3000, 4000, 6000 mm and widths 330, 720, 1110, 1500 mm. Panels are produced continuous and just on site they are connected together to bands by press-fittings. Created strips are connected to heating system by supplied pressable headers (distributors).

CAUTION!

Assembly work can be done just by qualified workers of assembly company.

During assembly it is important to follow technical and safety rules and regulations. Assembly has to be done according to project documentation.

During panels' installation the assembly organisation is obliged to fully ensure safety of all the assembly personnel and also occupants nearby. **The organisation shall perform all the safety measures to avoid any damage or an injury!**

This document doesn't specify comprehensive method of assembly works. These shall be specified by assembly organisation based on particular project conditions, situation on site, own possibilities etc.

How to suspend the panels

1. Before start it is necessary to check if the project documentation is clear, if the dimensions of the space are in accordance with design layout and cross section and all details known. If not, we recommend to contact responsible designer.
2. The realisation documentation shall specify detailed positions and way of suspension of the panels to the roof.

3. First step is to prepare, measure and mark on the ceiling positions of suspension points and attach designed end piece to the marked points. At long strips do not forget than the fitting has some internal space where there is no pipe so the pipes are not facing precisely one another. At fittings DN 18 is this space about 10 mm / fitting. It is recommended to control dimensions by diagonal measurements if not any laser system is used.

RECOMMENDATION!

Do not underestimate this step, take your time and measure precisely. this is the most important point of the whole process!

Keep the suspensions to the roof always vertical (without inclination) or tilted outwards! Do not use suspension to one point (A – type of suspension)! It makes the assembly very difficult. The only exception might be KIT I.

CAUTION!

Chosen suspension system shall withstand maximum designed load / suspension point (table 1) with high enough safety factor. The system shall have some **surface treatment against corrosion**!

4. After assembly of the end points some wire or nodal chain shall be attached (if a wire system doesn't already contain the end point). Always consider some small length reserve for the water level corrections.

5. Panels are equipped with up to 5 crossbars but not all has to be used for suspension. Following rules should be followed:

Panel length	**Number of panels' crossbars / top profiles Min. used / Total**
6 m	**3** (ends + middle) / **5**
4 m	**3** (ends + middle) / **5**
3 m	**2** (ends) / **3**
2 m	**2** (ends) / **3**

Tab. 3 – Minimum number of used crossbars for suspension

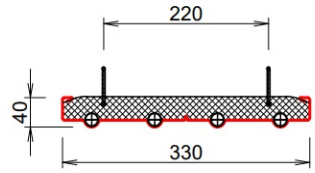
If a panel crossbar is not utilized for suspension, both neighbour ones shall be used!

6. When wires or nodal chains are in place, the next step is to assemble radiant panel (**KIT I**) or common top profile (**KIT II, III, IV**) (fig. 12).

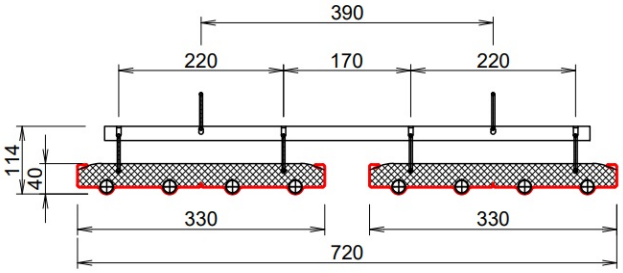
CAUTION!

The assembly platform determined for panels lifting to the roof level we recommend to equip it in the places of touch between the panel and the platform with some soft clean material (textile, cardboard paper, insulation) to avoid scratches.

KIT I



KIT II



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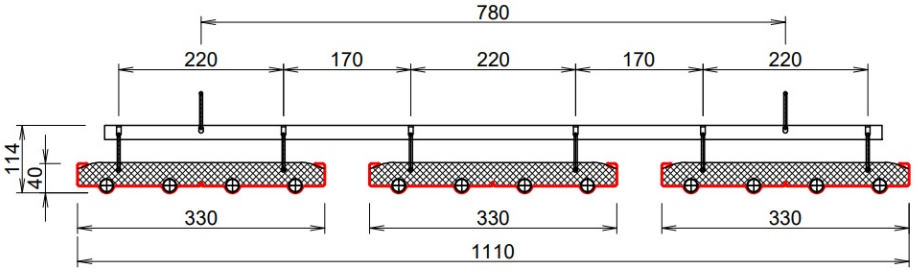

KIT IV

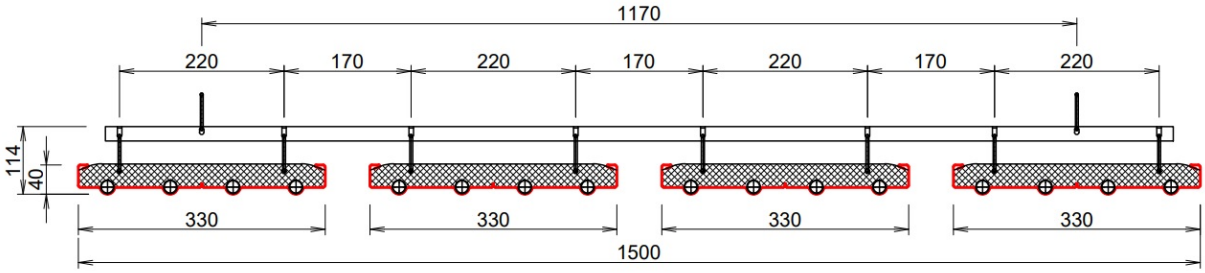

Fig. 12

7. It is recommended to insert between panels (common top profiles) and suspension system stretching screw or other system allowing adjusting of the water level of the panels both in longitudinal and transverse direction

CAUTION! It is important to ensure axis concentricity, **flatness in water level** and length alignment of panels connected in bands.

8. Panels are gradually lifted and suspended by delivered carabines 50x5 to the prepared suspension system (KIT I) or common top profiles (KIT II, KIT III, KIT IV).

9. After suspension and alignment of all the panels which are considered to create one band the connection by press-fittings shall be performed.

10. One should start with pressing of the headers to the end panels of the band according to the design documentation. Press-fittings are inserted by turning on each pipe till the end towards panels and then header is aligned and with slight pressure and by gradual turning of fittings the header is pushed to the panel again until the end. **BEWARE**, it is important to control header type and position twice as **pressing is irreversible operation!** For header pushing to the panel neither big force nor any tools should be used as there is a risk of damaging the O-rings. If it is not possible to attach the header smoothly, it is possible to use soapy water and wet tubes slightly. It might be also possible to use assembly clamps equipped with soft material on the touching surface

11. Press-fittings should be aligned and both panel with panel or panel with header should be fixed and maintained together for example by assembly clamps. Pressing should be done from one end of the bend on. **Never start at the same time from both sides of one band!** When 2 and more panels are already pressed together it becomes difficult or even impossible to move so the later connection together will become impossible. Before final pressing check the last time the straightness of the whole band.

12. The pressing process should be performed so: the first the very side tube, continue with the fitting on the complete opposite side and the middle fitting leave for the last. All the suspensions should be evenly loaded.

13. For the connection shall be used **just the fittings designed for this purpose**, water temperatures and material of piping – steel. The pressing tools shall be used accordingly to chosen fittings. Whatever uncertainty shall be discussed with technical office of KOTRBATÝ company.

14. At the end the headers' outlets are pressed to the piping of a heating system. **The outlet is standardized 28 x 1.5 precise tube**. After connection the water can be slowly filled.

15. The commissioning process now begins with flushing (EN 14336).

16. The second step is tightness test (EN 14336) connected with air-venting.

17. **For nonproblematic operation, declared performance and guaranteed warranty it is IMPORTANT to AIRVENT the whole system fully!!!**

18. The third step is overpressure test (EN 14336).

19. Just after successful overpressure test the connections between panels can be equipped with connection covers and top insulation. One can be sure there is

nowhere water leakage and all the press connections are done well. **Do not fix the connection covers firmly to both panels!** The construction is done so, that the cover cannot fall even when riveted or screwed just on one side. The reason is not creating longer aluminium dilatation length then 6 m.

20. Last point is a heating test. Before official heating test we recommend to run the heating system minimal one week on demanded values so as there is a need of dry out the possible after pressing ıd floor and also get to the state with normally accumulated structures and material.

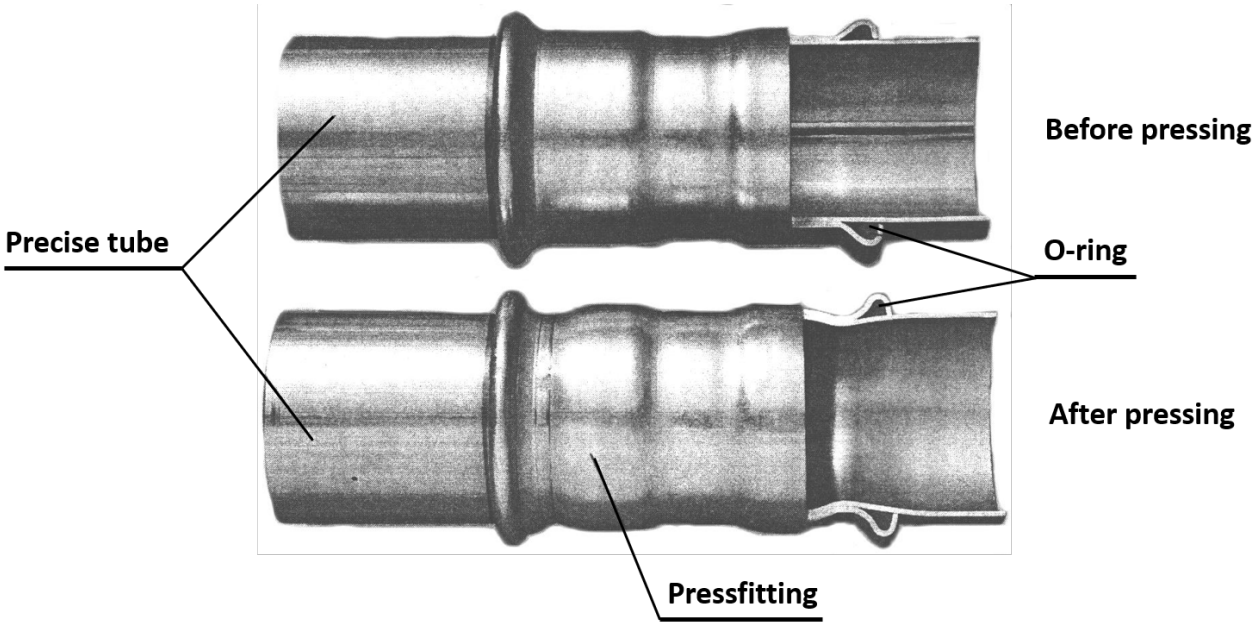

Fig. 13

All the chosen accessories and valves shall have sufficient temperature and pressure parameters.

Lengths of suspension

With regard to the expansion of the panels, you must select the corresponding length of the suspensions. The length of a suspension depends on the length of the radiation band made of individual panels and the maximum temperature of the heating medium. The minimum lengths of suspensions are specified in table 4.

Tab. 4 minimum suspension length

Suspension length	Max. temp.	Strip length
[m]	[°C]	[m]
0,30	120	< 40 m
0,40	120	> 40 m and < 60 m

Dilatation of the radiant strip at max. operation temperature

As the materials are changing its shape with temperature dilatation of strip length shall be considered / checked. As aluminium pieces are not connected in longer pieces than 6 m,

important material is steel and particularly tubes connected by fittings. Here is the calculation procedure:

$\Delta l = L_p / 2 . \Delta t . \alpha_1 . 1000$ [mm] (1)

$\Delta t = t_m - t_i$ [K] (2)

where:

Δl [mm]	Prolongation of half of strip length (if there is fixed point in the middle) at Δt
L_p [m]	Length of the strip
Δt [K]	difference between maximum t_m and assembly air temperature t_i
α_1 [1/K]	Coefficient of thermal expansion 12,0 . 10^{-6} - steel at 0-100 °C
t_m [°C]	Maximal operation water temperature in the strip
t_i [°C]	Ait temperature in hall during assembly

In the equation (1) there is considered the dilatation just of one half of the radiant strip. Imaginary fixed point (PB) is located in the middle of the band (if not designed somewhere else) (fig. 14), D*l* is value that should be considered during design of the last suspension. If it is designed vertical at cold state (*1* on fig. 15), when heated the suspension will tilt to one side and will have tendency to bend the radiant panels upwards (2 on fig. 14). When the suspensions are short (table 4) it is recommended to consider the dilatation already at suspension points' measuring phase and prolong the distances between suspensions by few mm. This way at cold stage the suspensions will be a little tilted but after heating up it will become vertical.

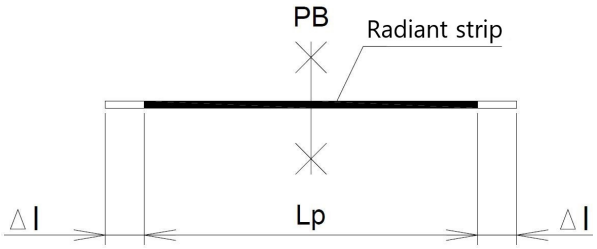

fig. 14

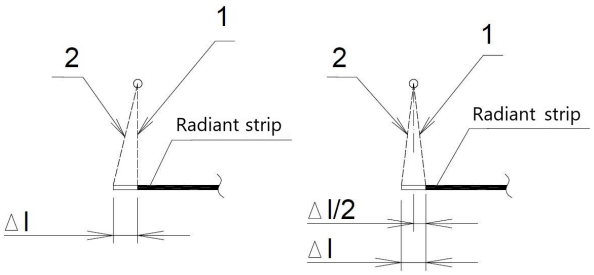

fig. 15

Dilatation Compensation

At short panels the length difference will be just few mm and there will not be any problem in longer bands there should be designed some compensation, either on tubes (not to suspend it firmly) or by for example flexible hoses for connections of each strip. One rule shall be followed at these hoses: **the hoses shall not be stressed on tension** at any operation state – operation manual of producer shall be followed!

14. Safety distances

At higher temperature heating systems (above 100 °C) also fire safety measures shall be followed. The feeding and return piping insulated by adequate material and some minimal distances to burnable surfaces maintained. Local fire safety standards shall be followed. Radiant panels are produced with reaction to fire grade A1. It is strictly forbidden to lay anything extra on the radiant panels!

15. Packing

The radiant panels are supplied on **pallets** with the length of 6 m supported with square logs and packed in shrinkage foil.

16. Disposal of the package and product after the end of their useful life

Waste must be sorted and handed over to an organization involved in waste collection and disposal. After the end of the life of the panel, it must be dis-assembled and handed over for recycling, while:

- the panel is made of steel pipes,
- the heating surface is made of aluminum sheet.

Used packing	**Catalogue no.**
Layered paper	15 01 01
Polyethylene foil	15 01 02

17. Transport

CAUTION! The panels are transported on stiff wooden pallets with maximum length 6 m.

During the transport, you must take measures to prevent the panels from being damaged. The manufacturer accepts no liability for damages caused during transport, handling and assembly.

18. Contacts

KOTRBATÝ V.M.Z. spol. s r.o.
VAT nr.: CZ49645955
www.kotrbaty.cz

Design and sales:
Polivkova 583/30
158 00 Prague 5
Czech Republic
email.: design@kotrbaty.cz
tel.: +420 245 005 921

Manufacture:
Sdruzena 1788
393 01 Pelhrimov
Czech Republic
email.: vyroba@kotrbaty.cz
tel.: +420 564 571 520

Declaration of Performance

No. : P-CE-01-2020

According to Regulation (EU) No. 305/2011 "laying down harmonized conditions for the marketing of construction products and repealing Council Directive 98/106/EEC"

1. Product Identification: *Ceiling water radiant panel*

2. Type / Market name: ***KIT***

Specification of Types and Variants:

	Width (mm)	*Length (mm)*
KIT I	*330*	*2000, 3000, 4000, 6000*
KIT II	*720*	*2000, 3000, 4000, 6000*
KIT III	*1110*	*2000, 3000, 4000, 6000*
KIT IV	*1500*	*2000, 3000, 4000, 6000*

3. Intended use: *Heating of buildings with heating medium water*

4. Identification of manufacturer: *KOTRBATÝ V.M.Z. spol. s r.o.*
Sdruzena 1788
393 01 Pelhrimov
Czech Republic
VAT no.: CZ49615955

5. Authorized representative: *not relevant*

6. System of assessment and verification of performance consistency: *System 3*

7. Harmonized Standard: *EN 14037-1, 2, 3: 2016*

8. Notified body: ***A.*** *Strojirensky zkusebni ustav s.p. - NB 1015*
Hudcova 56 b
621 00 Brno
Czech Republic
VAT no.: CZ00001490

N.B. A) performed the initial Type Test and issued the Report No. E-30-00064-17 dated 23.1.2017.

B. *Universität Stuttgart*
Institut für Gebäudeenergetik - NB 0626
Pfaffenwaldring 35
70569 Stuttgart
Germany

Test Reports:
DF20 D12.5171 dated 10.3.2020

9. Declared Performance:

Essential characteristics	*Performance*	*Harmonized technical specification*
Surface temperature	max. 120 °C	EN 14037-1:2016
Surface protection	passed	EN 14037-1:2016, Par. 5.2
Materials	www.kotrbaty.cz	EN 14037-1:2016, Par. 5.3
Emissivity	>0,8	EN 14037-1:2016, Par. 5.4
Mechanical steadiness	Horizontal curve < 10 mm Vertical deflection < 10 mm	EN 14037-1:2016, Par. 5.5
Fixing points	passed	EN 14037-1:2016, Par. 5.6
Pressure tightness	0,78 MPa (1,30x)	EN 14037-1:2016, Par. 5.7
Resistance to pressure	10,14 MPa (1,69x)	EN 14037-1:2016, Par. 5.8
Dimension tolerances	passed	EN 14037-1:2016, Par. 5.9
Top insulation	passed	EN 14037-1:2016, Par. 5.10
Pressure losses	www.kotrbaty.cz	EN 14037-1:2016, Par. 5.11
Release of dangerous substances	passed	EN 14037-1:2016, Par. 5.12
Reaction to fire	A1	EN 14037-1:2016, Par. 5.13
Rated thermal output	passed www.kotrbaty.cz	EN 14037-1:2016, Par. 5.14

10. Manufacturer Declaration:

We declare that the Performance of Products listed in Paragraphs 1 and 2 refers to declared Performance in Paragraph 9. Responsible for this declaration is Manufacturer listed in paragraph 4.

Signed on behalf of Manufacturer:

Ing. Libor Tousek, Manufacture director Kotrbatý V.M.Z. spol s r.o.
(Name and Function)

KOTRBATÝ
V.M.Z. spol. s r.o.
Sdružená 1788
393 01 Pelhřimov

In Pelhrimov 01.07.2020

(Place and issuing Date) *(Signature)*