

EFFI

FERRUM



"We check the usage regularly. Normally there is a number of heat coils fans in these shops and the savings in hot water by using EFFI FERRUM climate panels instead of fan coils is 50-54%.

It gives good indications of savings. Very good. We also have to consider the savings in no maintenance of fan coils, low noise level, less wiring and so on."

Thor Einarsson
chief operating engineer
Bonus supermarkets chain

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EFFI FERRUM climate panels are a versatile system for creating thermal comfort indoors. In addition to high efficiency heating panels also can be used for cooling. The climate panels can work all year round, in any season, creating the necessary comfort at the right time.

Human thermal comfort depends on the method of obtaining the heat. For example, basking in the sun, a person feels comfortable and natural. EFFI FERRUM climate panels way of work is based on the natural effect of the spread of solar heat. Solar rays passing through the air without losing the heat, but then they come to a contact with solid body, they heat it .

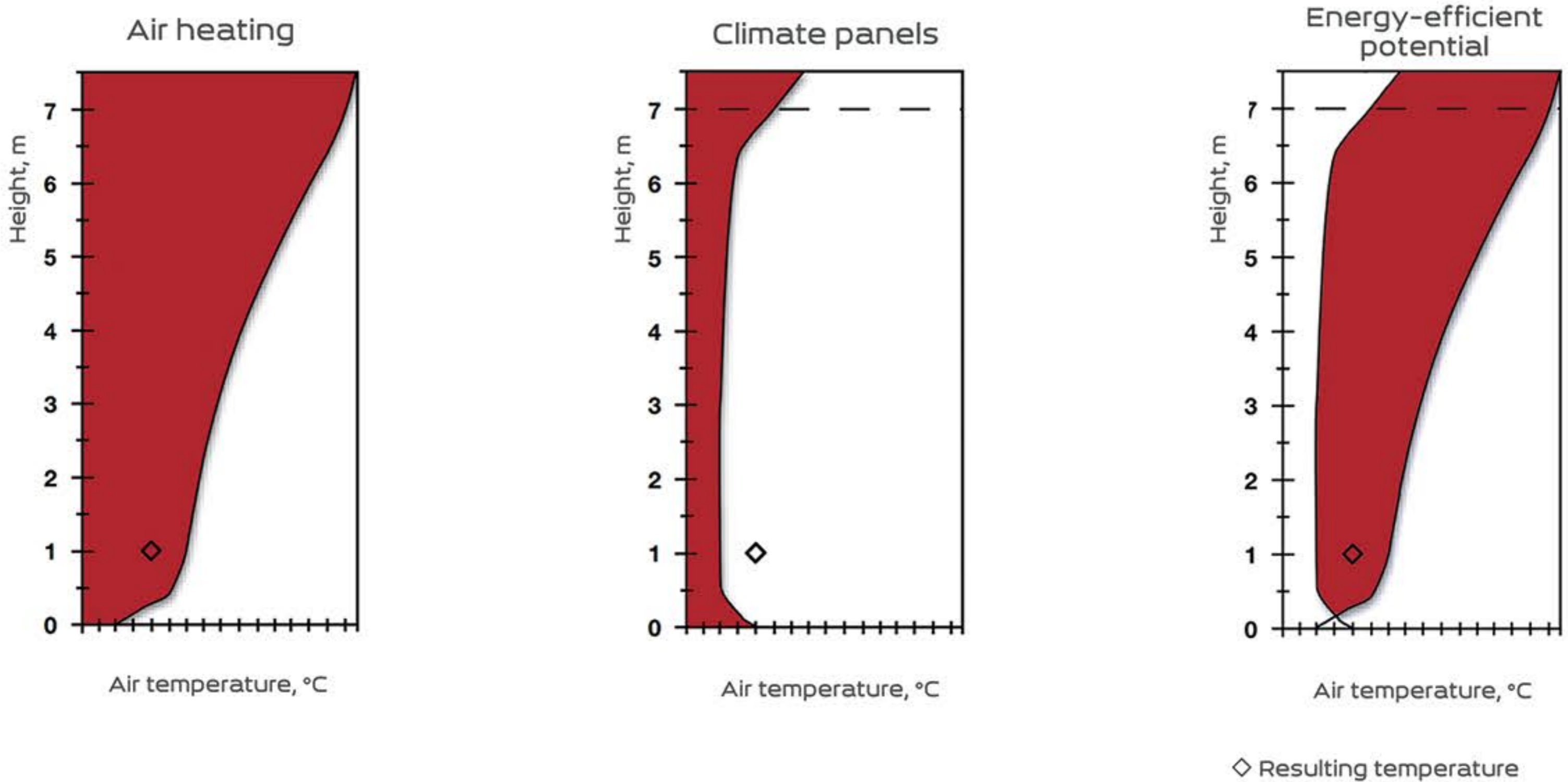
An important advantage of the climate panels is the ability to work with absolutely any source of heat: gas or electric boiler, solid-fuel system or heat pump, with a centralized heating network. There is no dependence of a particular energy source price, it is possible to choose the most profitable option.

The climate panels are especially effective in high buildings: production halls, warehouses, sports and concert venues, shopping and exhibition spaces, at the service stations. Safe climate panels can be applied in areas with high fire and explosion categories of fire hazard, they are ideal solution for hospitals, kindergartens and schools.

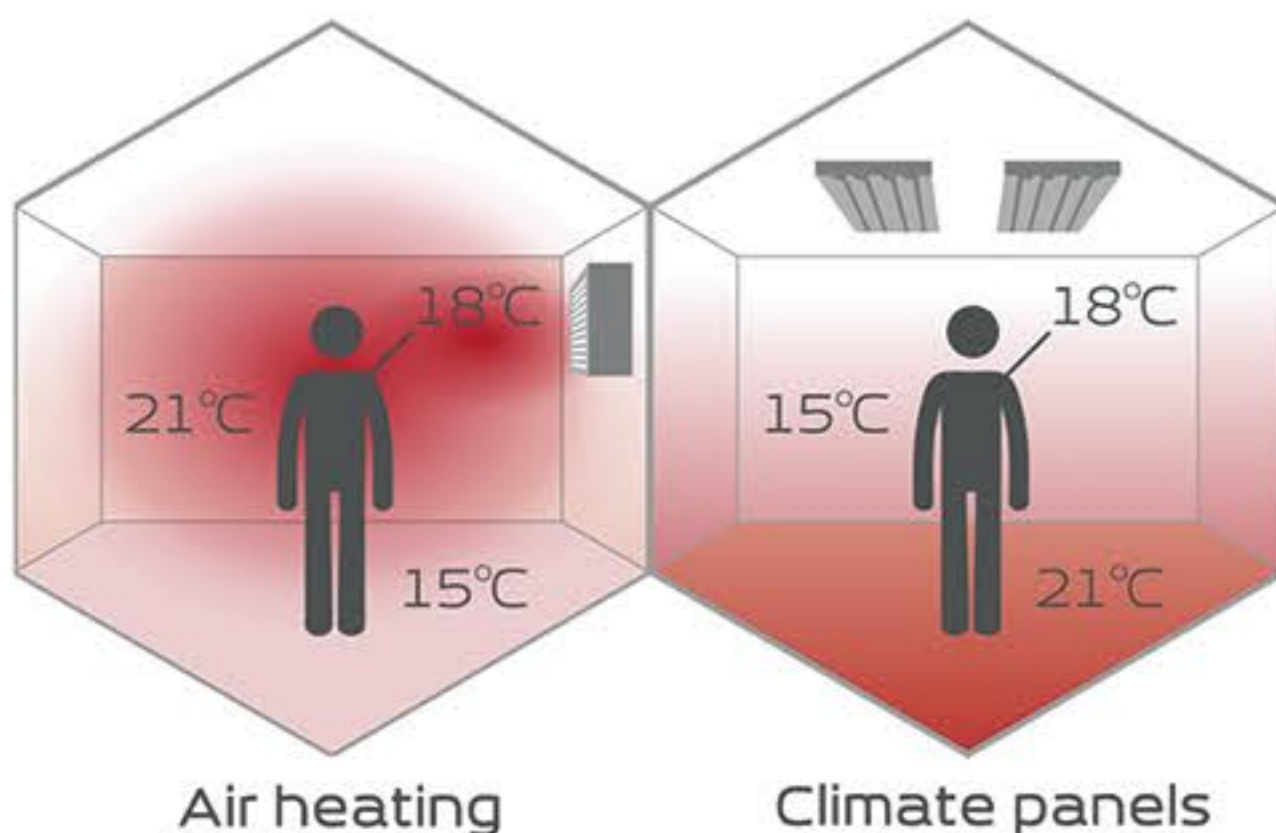
For heat transfer EFFI FERRUM climate panels use sunlike infrared rays. Best of all, this effect is noticeable in winter, when, in the freeze, you can warm up in the sun rays. The air around you has a negative temperature, but the sun is still warms your body.



EFFI FERRUM climate panels energy-efficient potential:



Heating systems comparison:



EFFI FERRUM climate panels way of work is to transfer energy by infrared radiation. Air for such radiation is a transparent body, which allows heating the solid bodies in a room directly. This way of work improves a comfortable temperature for a person and allows to lower the air temperature in the room, significantly reducing the energy consumption.

SUCH A DECREASE IN THE AVERAGE AIR TEMPERATURE REDUCES THE CONSUMPTION OF ENERGY RESOURCES UP TO 50%.

Advantages



Short terms

Terms of manufacturing and delivery of EFFI climate panels are reduced as much as possible.



Low temperature

Climate panels may operate with a relatively low water temperature, from 35 °C.



Complete silence

EFFI climate panels are a completely silent system for heating and cooling.



Convenient location

Due to the location on the ceiling, climate panels does not occupy the usable area in the room.

Flexible adjustment

Ability to create individual temperature regimes within the same rooms.



No maintenance

The system does not require any maintenance. The climate panels are easy to assemble.



Warranty

We provide a broad and flexible warranty program on the climate panels.



No dust

EFFI climate panels eliminate the parasitic airflow, reducing dust.



The main advantage of EFFI FERRUM eco-friendly climate panels – more efficient energy consumption compared to other climatic systems. By investing in energy-efficient climate system, you reduce your costs, increasing the efficiency of the enterprise.

Comparison of heating and cooling costs*:



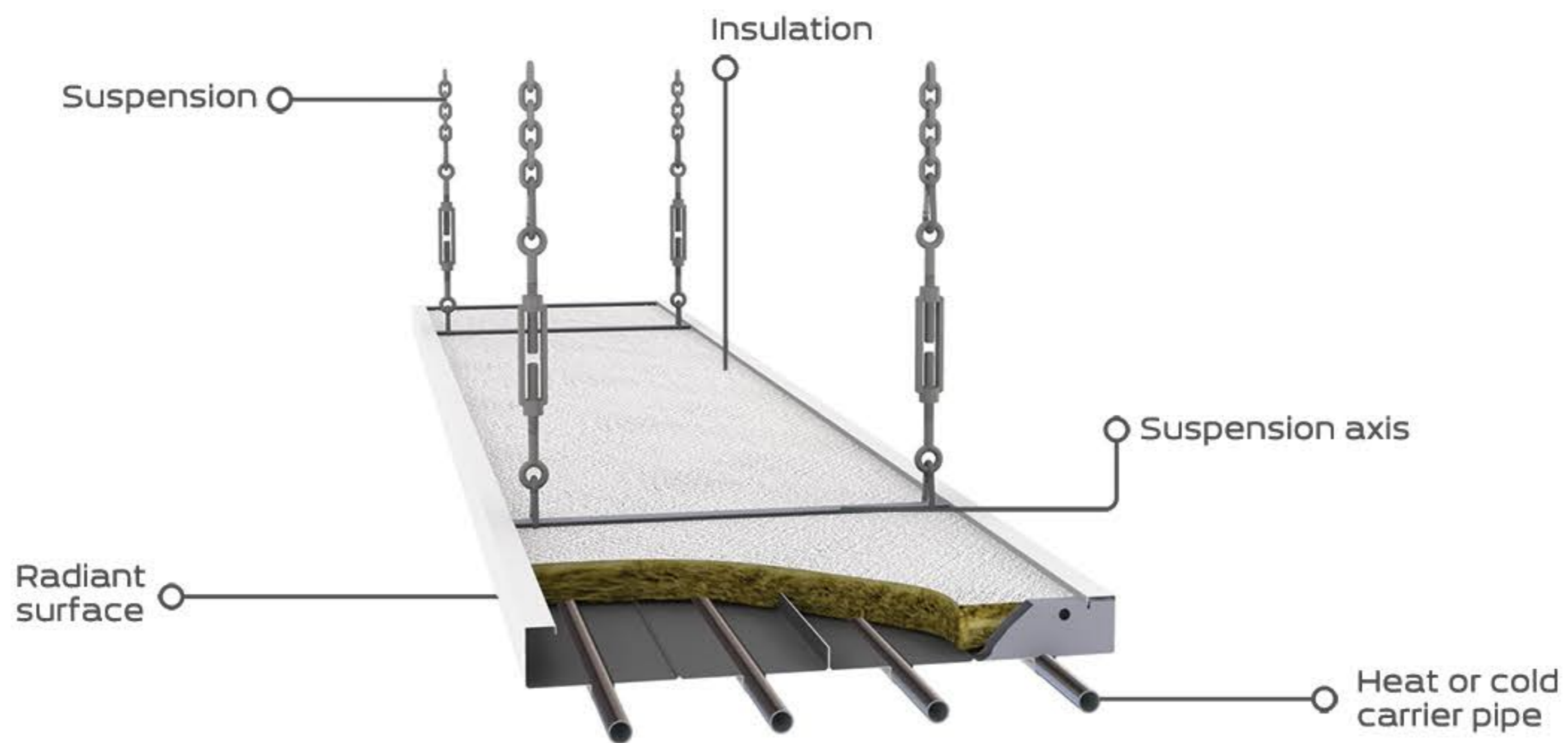
* according to EN 15316-2-1:2011



EFFI

Sport arenas

EFFI FERRUM climate panel scheme:



EFFI FERRUM climate panel is a shaped steel sheet, which has 4 galvanized steel pipes inside. Over it there is a layer of insulation: mineral wool or special thermal insulation for wet areas. Mounting axis are inside the panel, with integrated mounting holes. To mount the panels to each other, as well as for connecting the collector, press fittings are used .



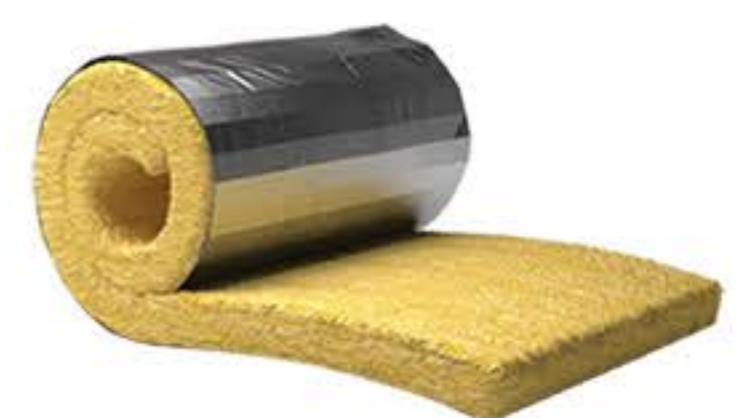
Press fitting.

Used to connect the collector and the climate panels between themselves.



Collector.

Used to connect the climate panels to the pipelines system.



Insulation.

Directs all heat in the area where it is needed.



Joint covering plate.

Used in places where panels modules are connecting together and in the collector connection.



Anti-ball protective grid.

Prevents sports equipment from getting stuck and protects the climate panels from damage.



U-shaped fitting.

Allows you to abandon the use of collectors and place the return and feed on one side.



Specifications

Possible combinations



For more flexibility and efficiency of heating and cooling, EFFI FERRUM climate panels can be installed in single lines or in parallel lines, at a distance of 70 mm between the lines. The maximum length of a climate panels line must not exceed 50 m.



Standart module length



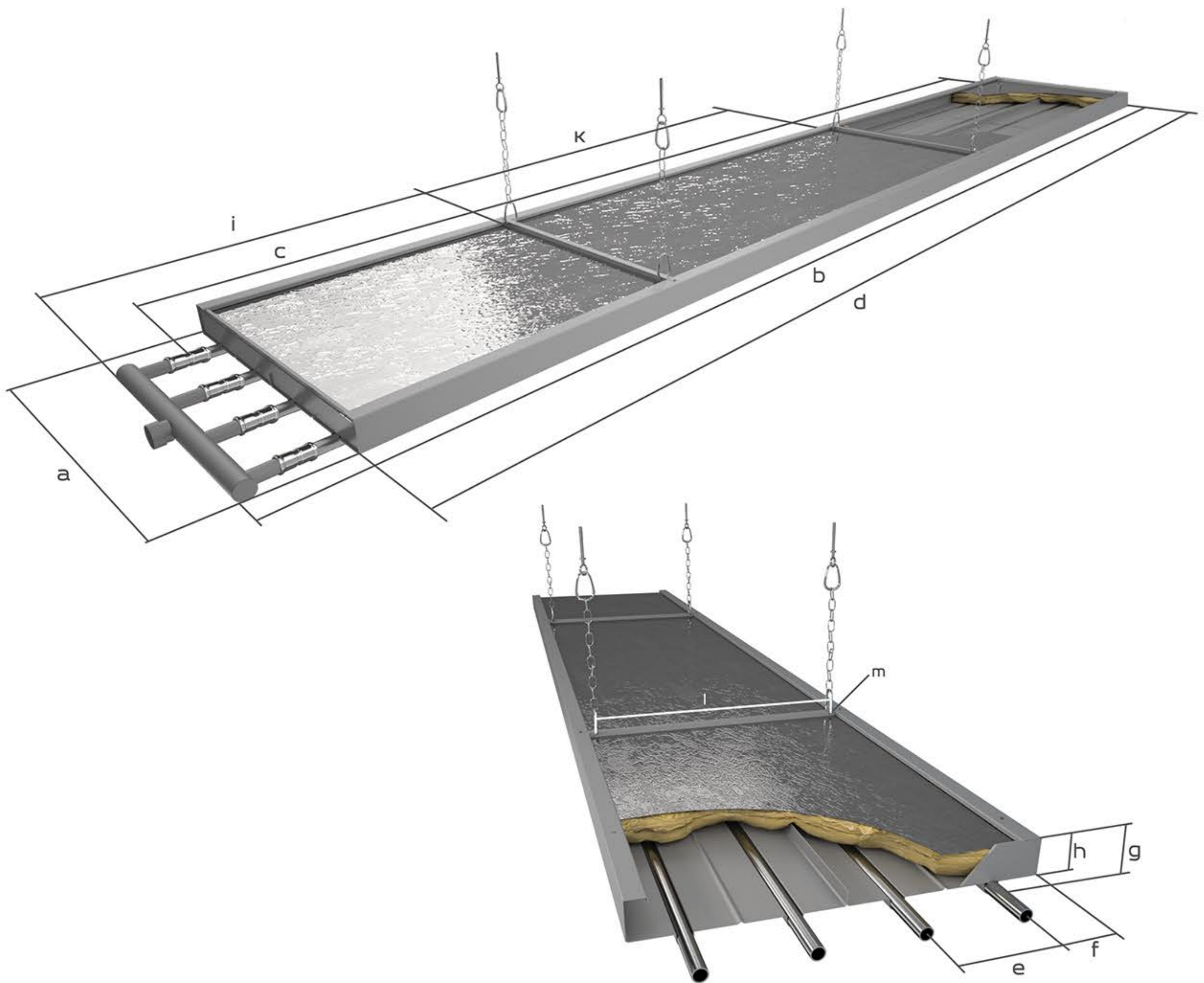
EFFI FERRUM climate panels are available in five standard lengths: from 2 to 6 meters. By additional request it is possible to produce non-standard length of the climate panels.

Specifications

Installation width	MM	396
Number of pipes	pc	4
Pipe sizes	MM	15 x 1.2
Climate panel and pipe material		Steel
Distance between the pipes	MM	99
Distance between the climate panels lines	MM	70
Minimum installation length of the climate panel	MM	2000
Maximum installation length of the climate panel	MM	6000
Number of suspension points on the axis		2
Distance between the points of suspension	MM	323
Maximum operating temperature	°C	120
Maximum operating pressure	bar	10
Weight without water, with insulation	kg/m	3,9
Insulation weight	kg/m	0,28
Water content	l/m	0,53
Operating weight with water and insulation	kg/m	4,7
Heating power at $\Delta t = 55 \text{ K}$	W/m	208
Cooling power at $\Delta t = 10 \text{ K}$	W/m	37

THE RESISTANCE TO PRESSURE AND HEATING POWER OF EFFI CLIMATE PANELS ARE TESTED ACCORDING TO EN 14037-1:2016 AND EN 14037-2:2016 BY EU NOTIFIED BODY LABORATORY WSP LAB AT STUTTGART, GERMANY.

Sizes



Description	Size, mm
a Total width	396
b Total length	2170
c Pipes length	2000
d Radiation surface length	1840
e Distance between pipes centers	99
f Distance from pipe center to the skirting	49,5
g Total height	53,3
h Skirting height	40
i Collector- suspension axis	570
k Suspension axis - suspension axis	1200
l Distance between suspension points	323
m Mounting holes diameter	9

Collector sizes	Size, mm
Total length	400
Total width	160
Total height	110
Inlet diameter	1"
Nozzles diameter	15
Nozzles length	80

Fitting sizes	Size, mm
Total length	53
Maximum diameter	22
Distance between pipes inside fitting	10



EFFI FERRUM climate panels heating power

$\Delta t_{\text{heat}}(\text{K})$	W/rm	W/coll. pair	$\Delta t_{\text{heat}}(\text{K})$	W/rm	W/coll. pair
80	321	92	48	178	46
78	311	89	46	170	44
76	302	86	44	161	41
74	293	83	42	153	39
72	284	80	40	145	36
70	275	77	38	136	34
68	266	74	36	128	31
66	257	71	34	120	29
64	248	68	32	112	27
62	239	65	30	104	24
60	230	62	28	96	22
58	222	60	26	88	20
56	213	57	24	80	18
55	208	55	22	73	16
54	204	54	20	65	14
52	195	51	18	58	12
50	187	49	16	51	10

Calculation of the temperature difference in heating and cooling:

$$t_R = \frac{(t_E + t_A)}{2}$$

$$\Delta t_{\text{heat}} = \frac{(t_F + t_{Re})}{2} - t_R$$

$$\Delta t_{\text{cool}} = t_R - \frac{(t_F + t_{Re})}{2}$$

THE HEATING POWER OF EFFI CLIMATE PANELS IS TESTED ACCORDING TO EN 14037-2:2016 BY EU NOTIFIED BODY LABORATORY WSP LAB AT STUTT GART, GERMANY.

EFFI FERRUM cooling power

With insulation		W/o insulation	
$\Delta t_{\text{cool}}(\text{K})$	W/rm	$\Delta t_{\text{cool}}(\text{K})$	W/rm
15	60	15	71
14	56	14	65
13	52	13	61
12	48	12	57
11	43	11	51
10	40	10	47
9	36	9	42
8	31	8	37
7	28	7	32
6	23	6	28
5	19	5	23

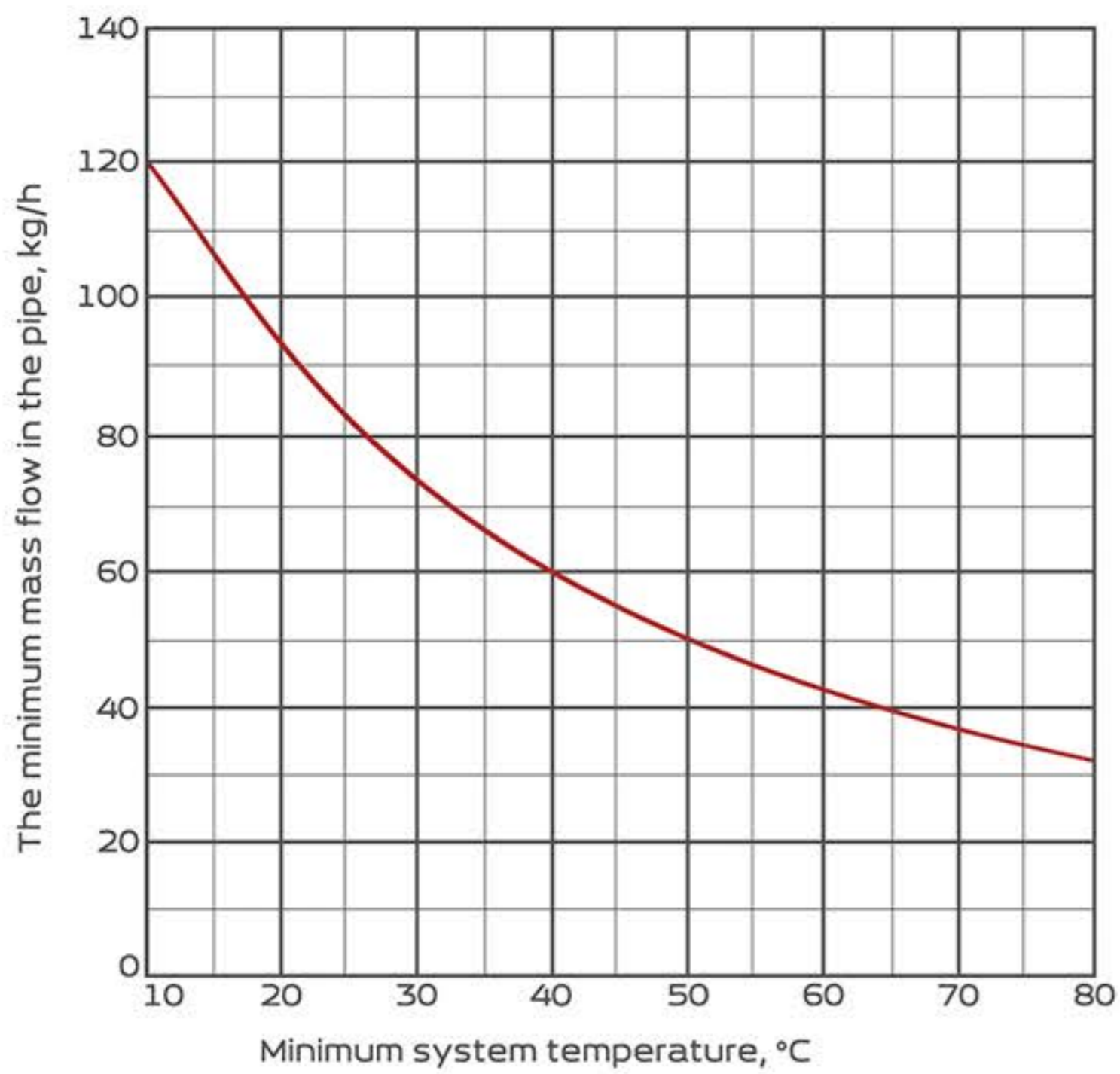
Heating and cooling power are shown as a function of temperature difference. Cooling capacity is increased without insulation, but in this case free air circulation around the panels is necessary.

Legend:

- t_A - air temperature (°C)
- t_E - average temperature of the radiation, average temperature of surrounding surfaces (°C)
- t_R - resulting temperature (°C)
- t_F - temperature in the supply pipeline (°C)
- t_{Re} - temperature in the return pipeline (°C)
- Δt_{heat} - heating temperature difference (K)
- Δt_{cool} - cooling temperature difference (K)



Minimum mass flow



To provide indicated power the turbulent flow must be created in the pipes the climate panel. This minimum water flow rate depends on the minimum system temperature. If there is no turbulent flow in each of the tubes of the climate panels, the total system power is reduced by approximately 15%.

Temperature limits

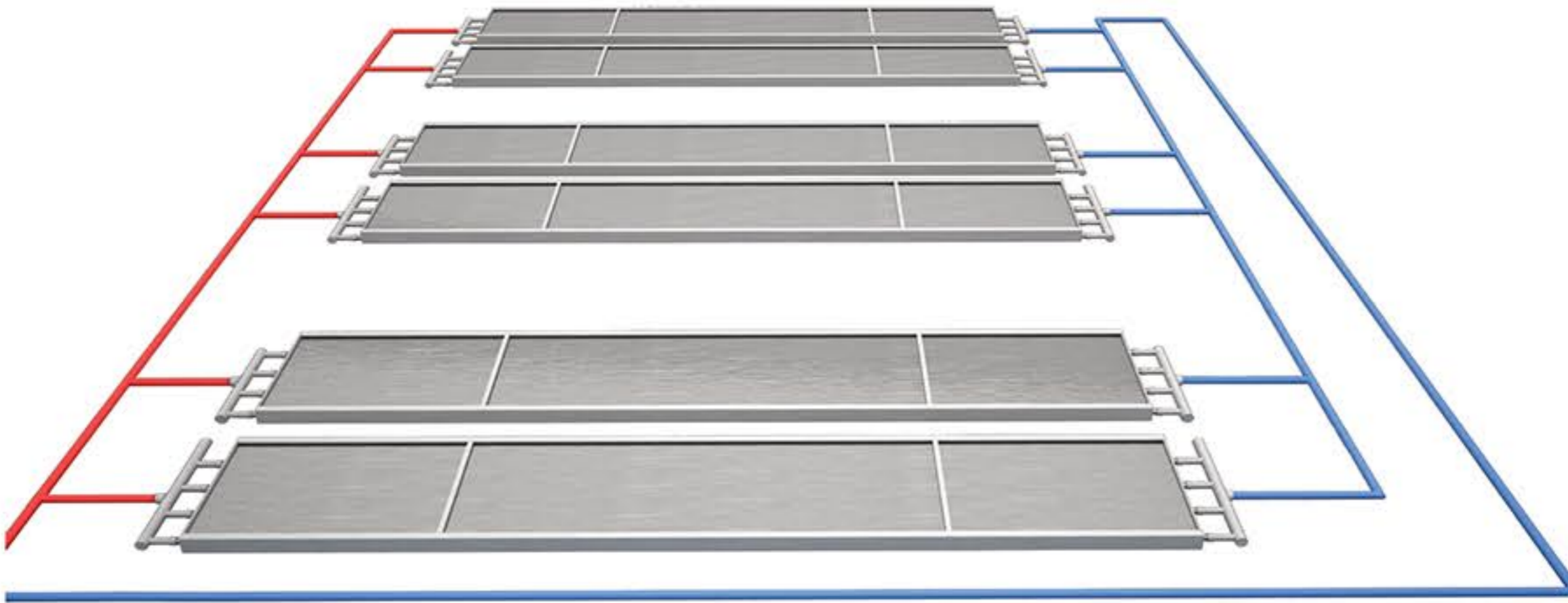
Height	Ceiling share covered with climate panels					
	10%	15%	20%	25%	30%	35%
Average temperature of the heating carrier, °C						
≤3	73	71	68	64	58	56
4			91	78	67	60
5				83	71	64
6				87	75	69
7				91	80	74
8					86	80
9						87
10						94

In operation of the climate panels, temperatures should be less than the limit temperatures, indicated in the table.

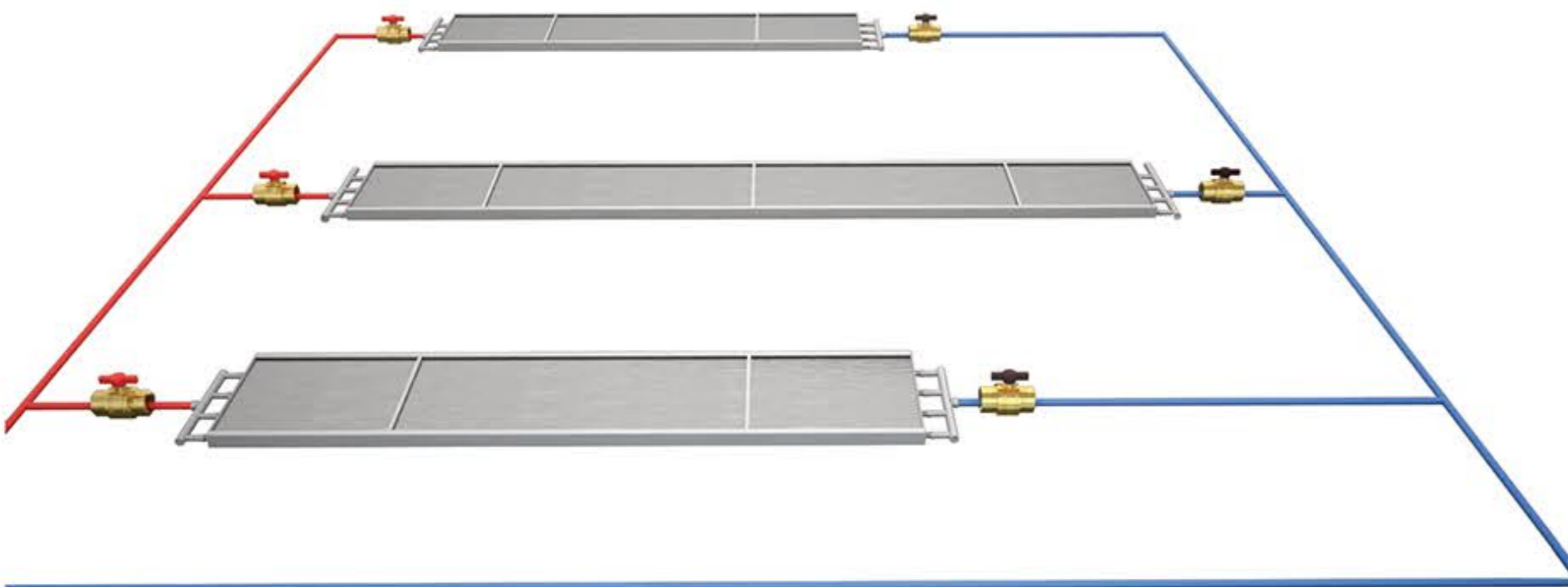


Balancing

Heat or cold carrier proper distribution must be created for effectively functioning climate panels system. When installing the panels of the same length it's recommended to use the Tichelmann system of the pipelines:



When using the climate panels of different lengths and power, there is a need for a hydraulic balancing with the help of balancing valves:



Automatics

For automatic control of climate panels system following items can be used:

Spherical thermometer



Three-way valve



Controller

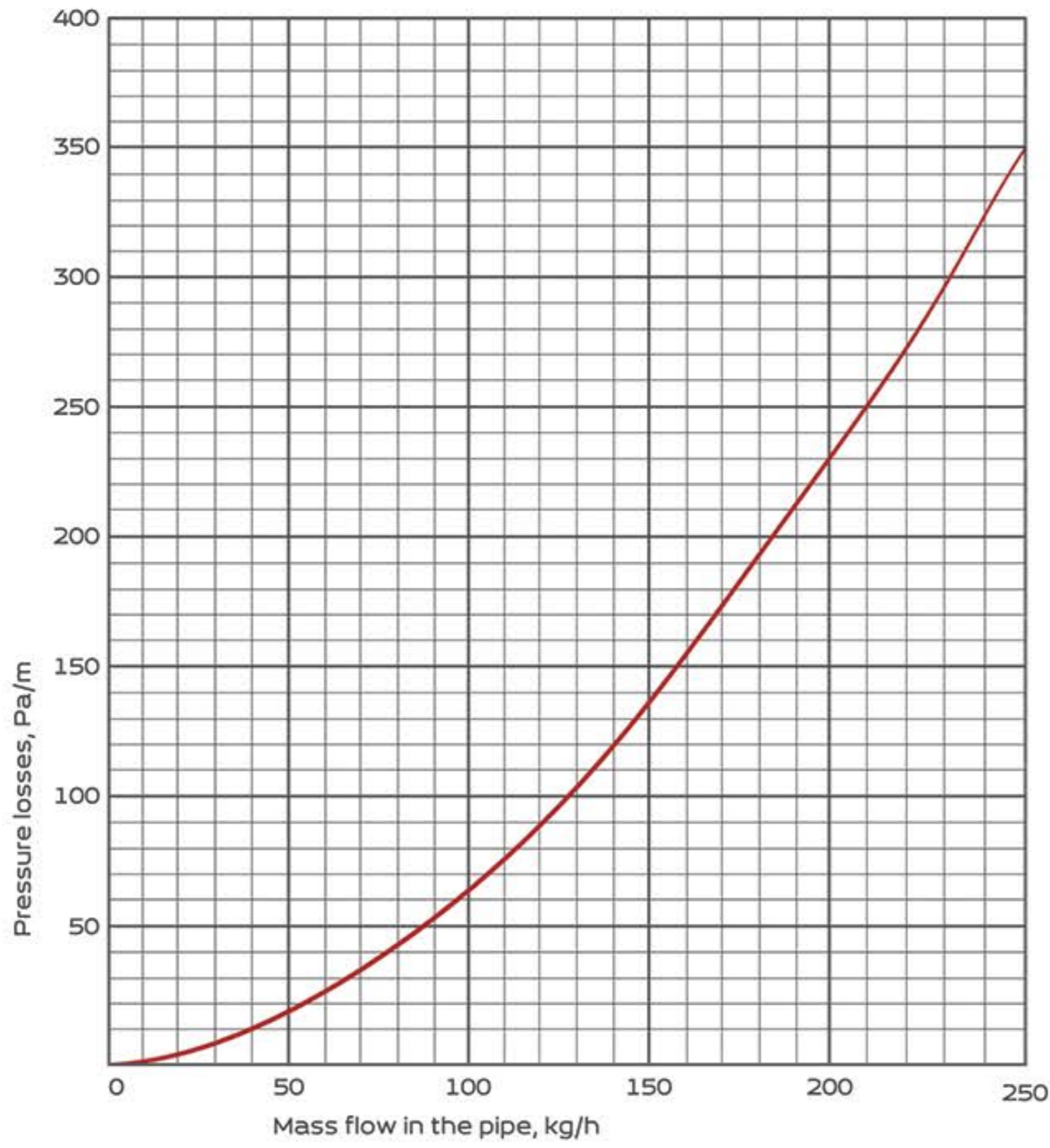




MAN trucks dealer

EFFI

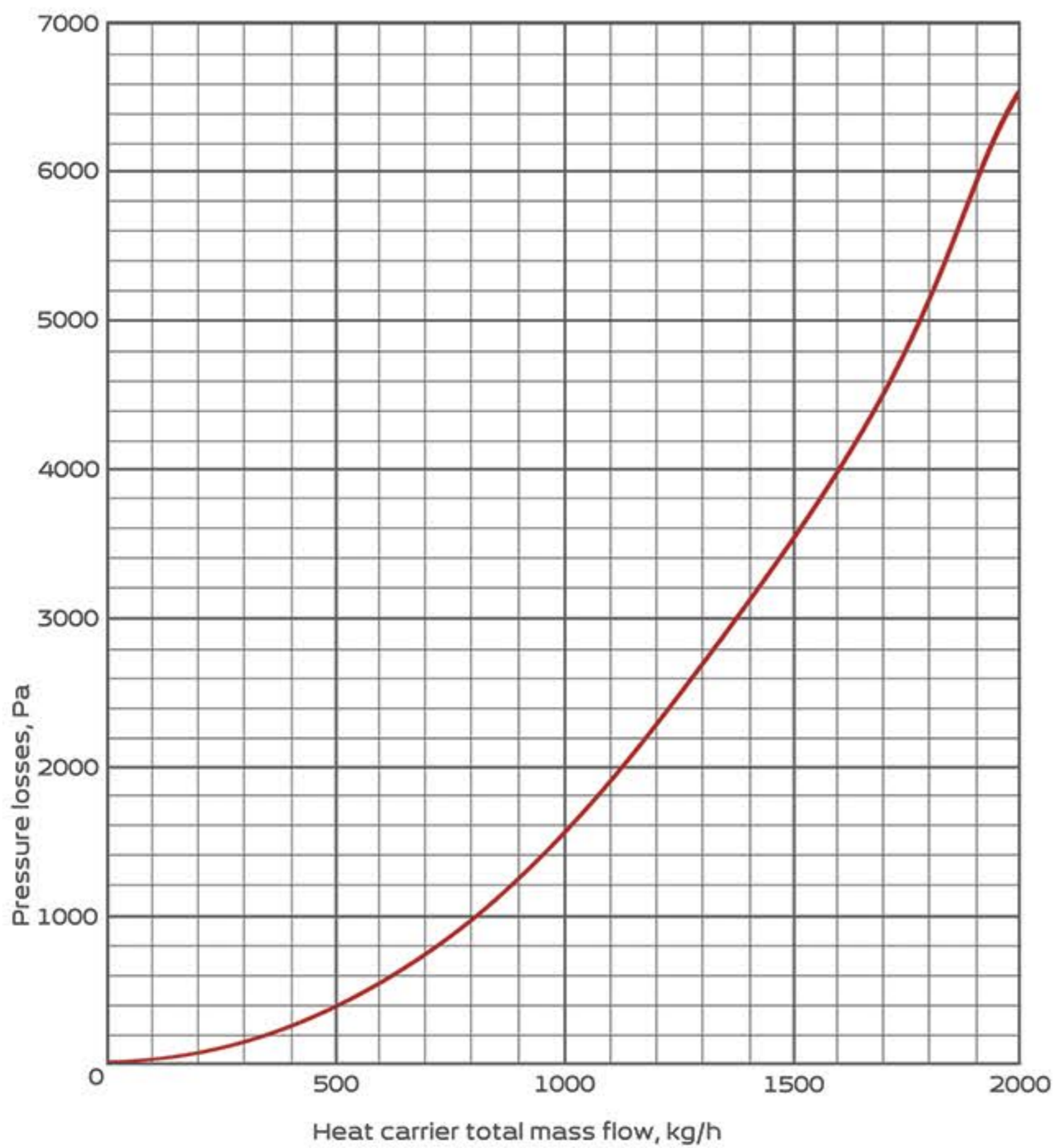
Pressure losses in each tube



Pressure losses calculation

EFFI FERRUM climate panels pressure losses equals the sum of the pressure losses in the pipes and the pressure losses in the collector pair. When using balancing valves their pressure losses are also taken into account.

Pressure losses in the collector pair





Calculation example

The heat load of the room is calculated according to the existing norms. With increased air exchange in the room, supply air must be preheated. Climate panels can't be used as air curtains at gates or doors in the room.

EFFI FERRUM climate panels calculation example

This example shows the climate panel calculation for pavilion type room. The task is to obtain internal temperature of 20 °C in the whole building.

Separate building has the following parameters:

Length: 40 meters

Width: 15 meters

Height: 7 meters

Outdoor air temperature: -22 °C

General normalized heat loss: 63985 W

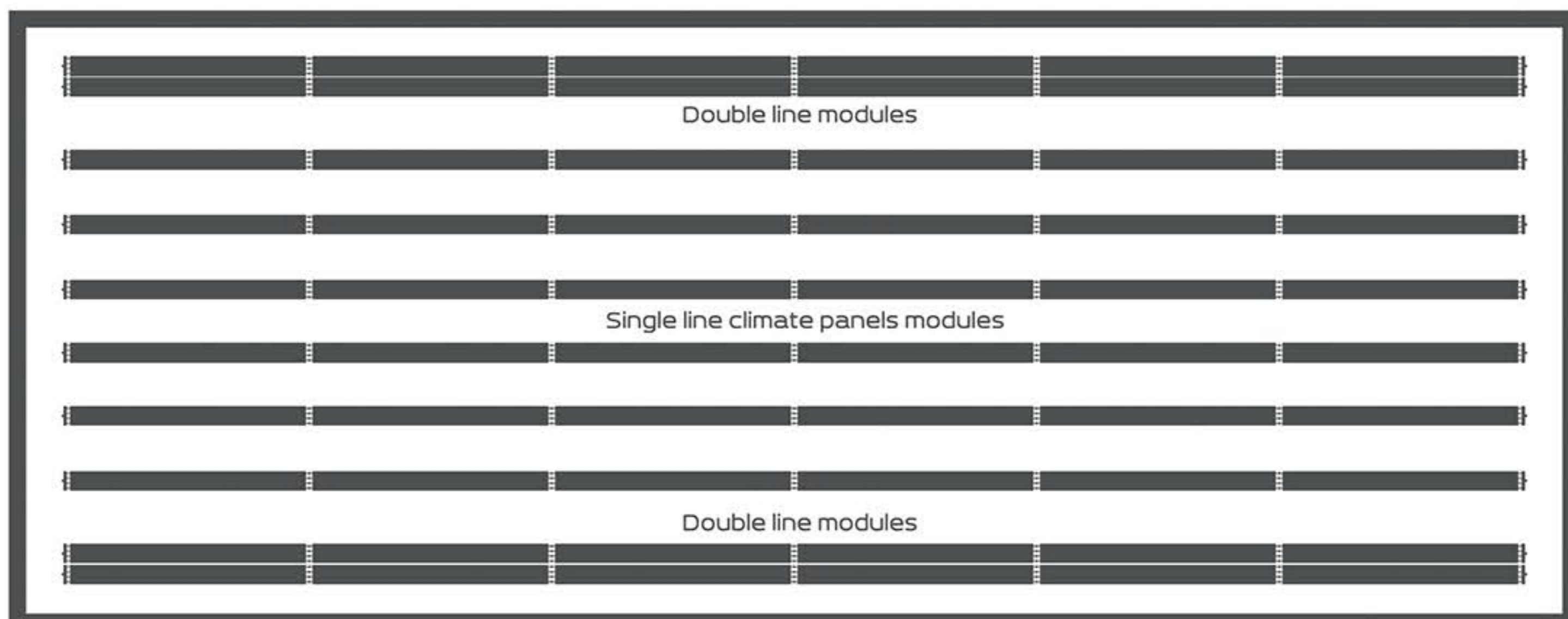
Flow temperature: 80 °C

Return temperature: 60 °C

Using page 9 of this document we can find the value of the temperature difference for our environment - $\Delta t = 50 \text{ K}$, and the heating power of the climate panels at such temperature difference - 187 watts and the heating power of collector pair - 49 watts.

Based on the total length of the room, we create one line of panels 36 meters long, calculating its power in our circumstances, not forgetting to add a pair of collectors $(36 \times 187) + 49 = 6781$ watts. To find the total number of lines required, we divide the existing general heat loss to the power of our created one line: $63985 \text{ W} / 6781 \text{ W} = 9.43$ lines.

The calculation shows that we need 10 lines of climate panels, plus a small reserve of power. Each line consists of 6 modules of 6 meters long and two collectors. 4 has a double line modules and 6 lines a single ones. The total length of the climate panel system is 360 meters, the number of collectors - 20 pieces, the total heating power of the system - 67810 watts.



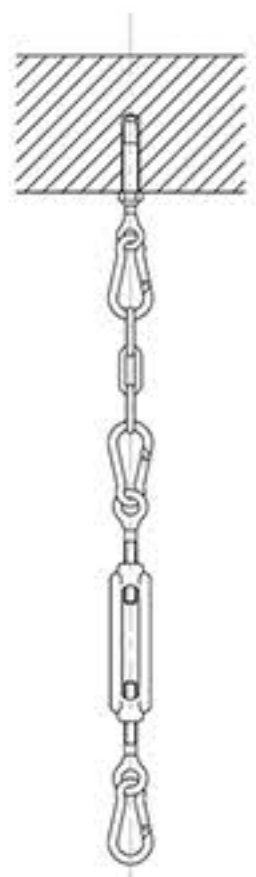


Production facility, Thorup, Denmark

EFFI

Mounting and standard sizes

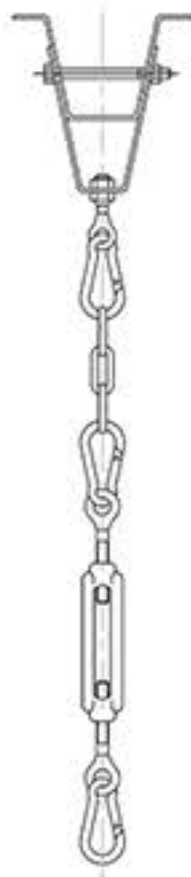
EFFI FERRUM climate panels mounting options:



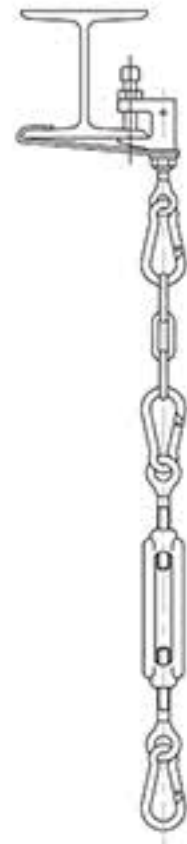
To the concrete ceiling



To the steel profile



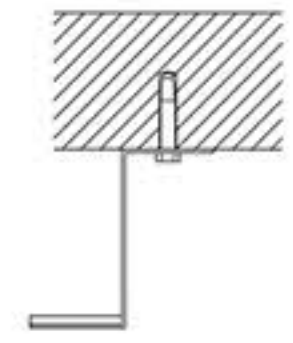
To the steel profiled sheet



To the steel beam

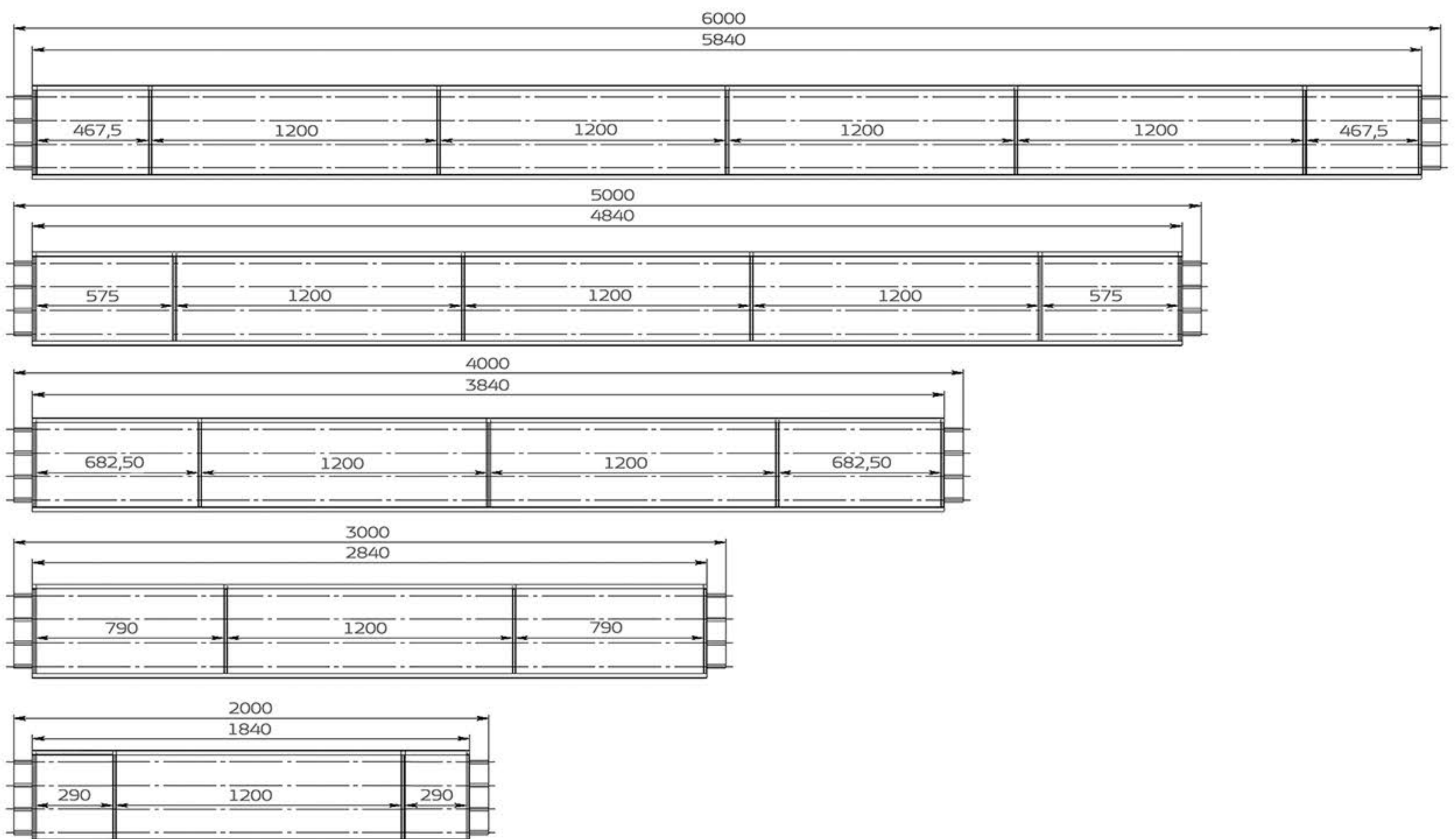


To the inclined steel beam



Directly to the ceiling

Standard sizes of EFFI FERRUM climate panels:





CP006

Classic EFFI climate panel, suitable for most rooms.



CP006W

For rooms with high humidity (car washes, swimming pools, water parks). Special thermal insulation.



CP006G

A special "anti-ball" grid prevents sports equipment from getting stuck in the climate panels. For sport gyms, arenas, etc.



CP006S

EFFI FERRUM climate panel with thermal insulation, closed from above by a metal screen. The metal shield protects thermal insulation from external influences.



CP006HC

The model that allows you to hide the collector. For rooms with high design requirements.



CP006AGRO

The model is protected by vinyl fabric. Provides the possibility of wet washing of the climate panel. For agricultural facilities.



PF15S

Steel galvanized type M press fitting. It is used for connecting panels among themselves and connection of collectors.



CR41SS

Stainless steel connecting collector. Used to connect climate panels to pipelines.



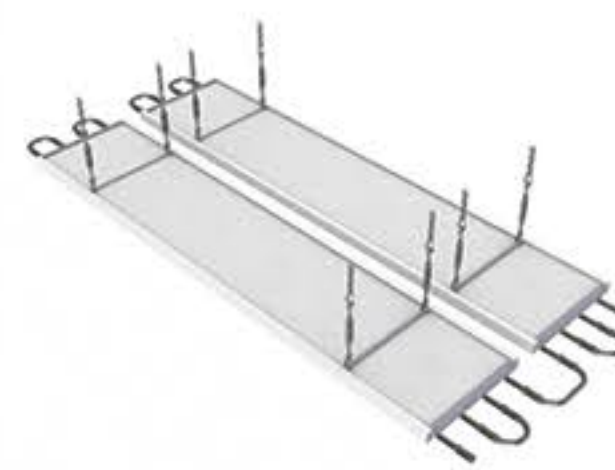
JC170

Cover for connections. Closes the joints of panels with each other and the connection of collectors. With thermal insulation.



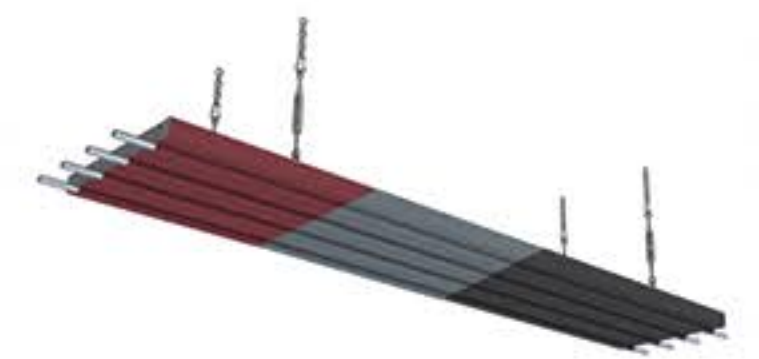
MSB2

Aluminum multi-axis for parallel mounting of several panels. Helps to save on mounting and labor.



UB100, UB170

U-shaped connecting elements, which allow you to abandon the use of collectors, create a connection scheme similar to a "snake", and place the return and feed on one side.



CP006- (*color code)**

EFFI climate panels can be painted in any RAL color.

More information:
www.effipanel.com

