

EFFI
climate panels



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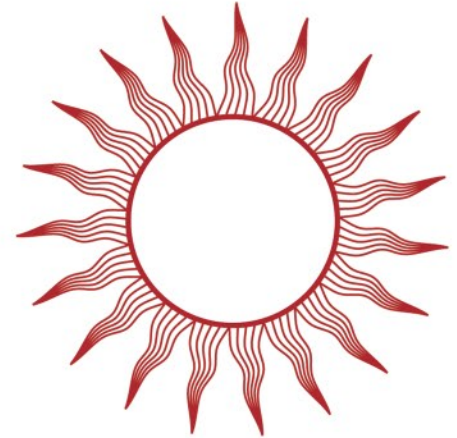
EFFI climate panels are a versatile system for creating thermal comfort indoors. In addition to high efficiency heating panels also can be used for cooling. The climate panels can work all year round, in any season, creating the necessary comfort at the right time.

Human thermal comfort depends on the method of obtaining the heat. For example, basking in the sun, a person feels comfortable and natural. EFFI 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 .

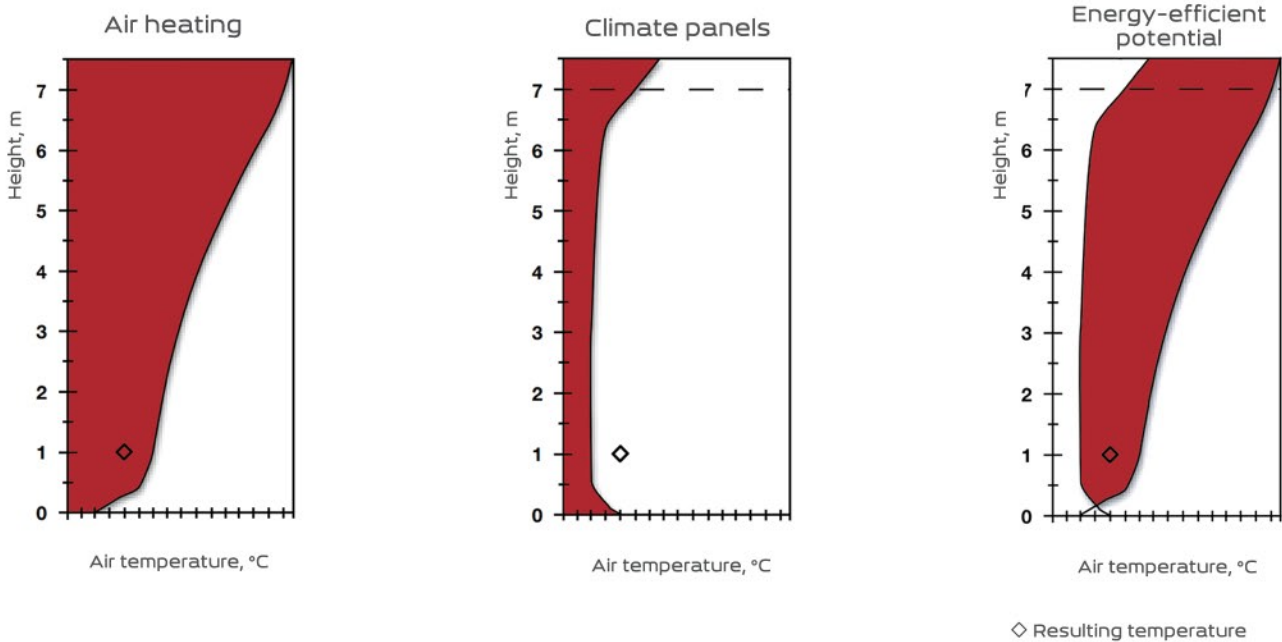
An important advantage of the climate panels is the ability to work with absolutely any source of heat: gas or electric boiler, solid-fuel system or heat pump, with a centralized heating network. There is no dependence of a particular energy source price , it is possible to choose the most profitable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

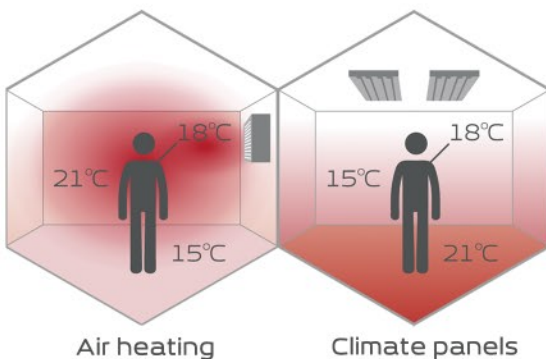
For heat transfer climate panels use sunlike infrared rays. Best of all, this effect is noticeable in winter, when, in the freeze, you can warm up in the sun rays. The air around you has a negative temperature, but the sun is still warms your body.



EFFI climate panels energy-efficient potential:



Heating systems comparison:



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



Term of manufacturing and delivery of EFFI climate panels is reduced as much as possible.

Ability to create individual temperature regimes within the same rooms.



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

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



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

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



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

EFFI climate panels eliminate the parasitic airflow, reducing dust.



The main advantage of EFFI eco-friendly climate panels - more efficient energy consumption compared to other climatic systems.

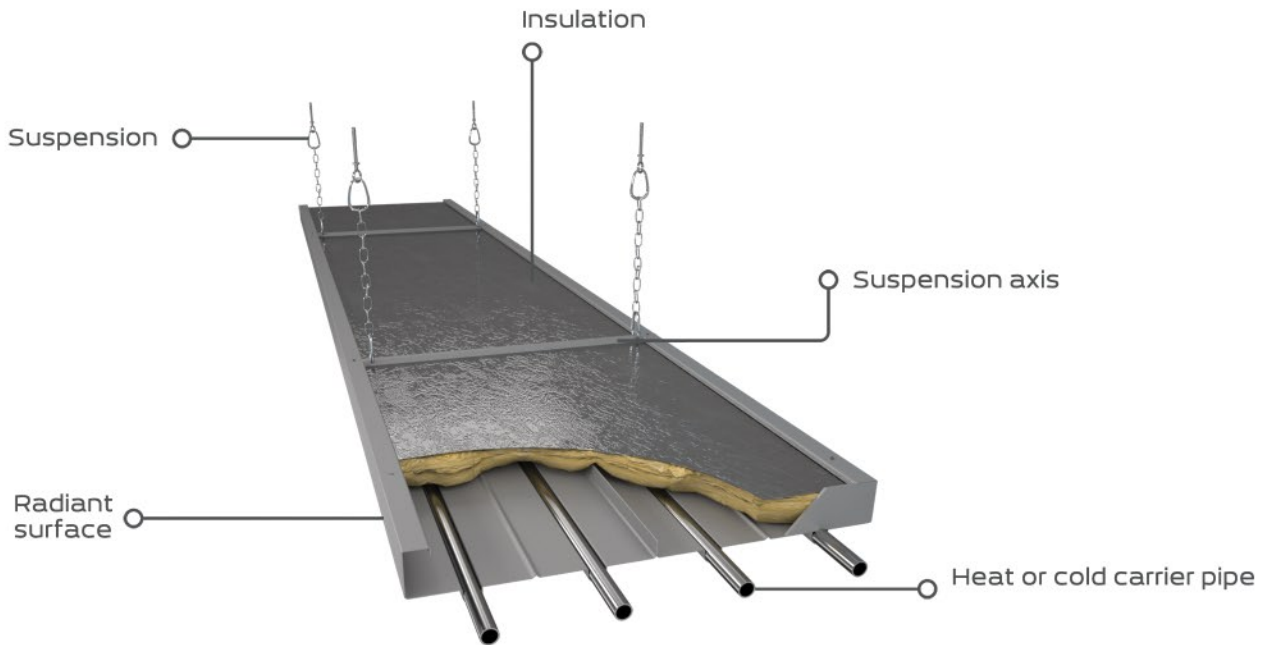
By investing in energy-efficient climate system, you reduce your costs, increasing the efficiency of the enterprise.

Comparison of heating and cooling costs*:



* according to EN 15316-2-1:2011

EFFI climate panel scheme:



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.



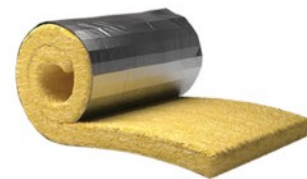
Press fitting.

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.



Possible combinations



For more flexibility and efficiency of heating and cooling, 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 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

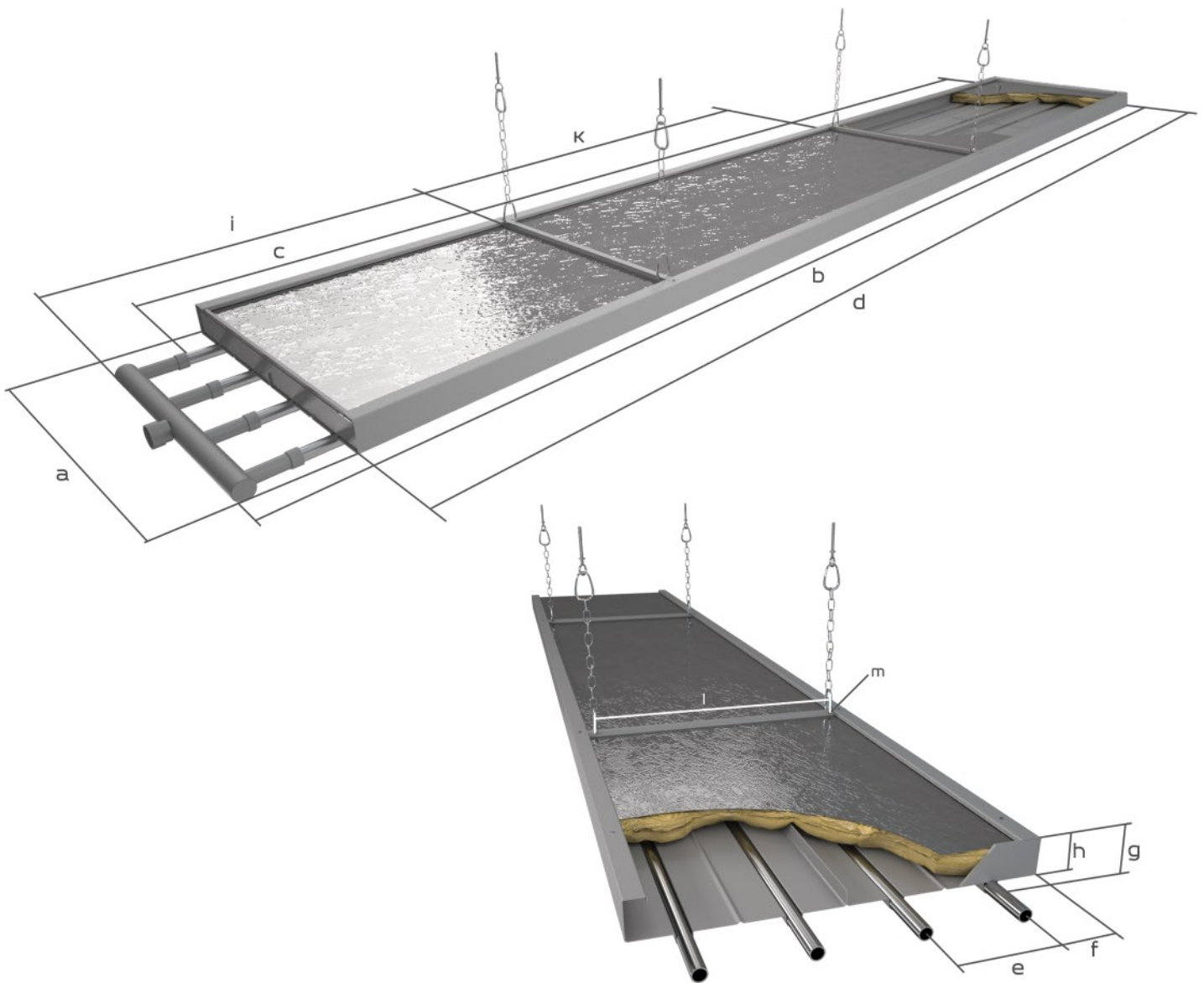
Installation width	MM	396
Number of pipes	pc	4
Pipe sizes	MM	15 x 1,2
Climate panel and pipe material		Steel
Distance between the pipes	MM	99
Distance between the climate panels lines	MM	70
Minimum installation length of the climate panel	MM	2000
Maximum installation length of the climate panel	MM	6000
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

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)

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 wigth	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



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EFFI 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 Stuttgart, Germany.

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

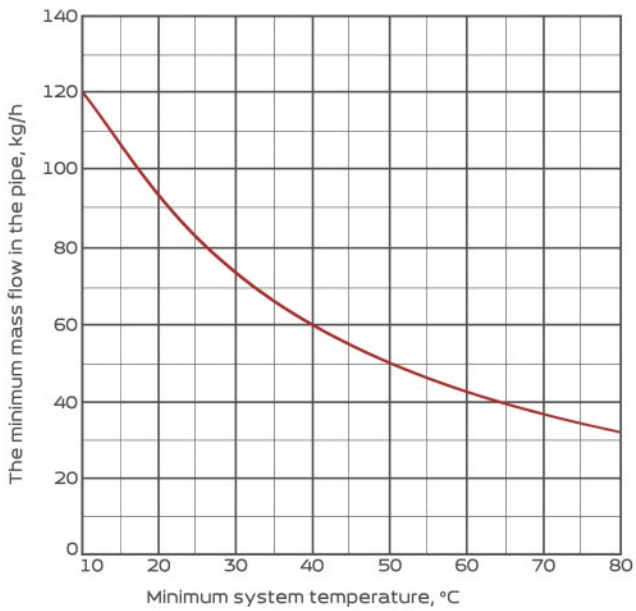
Heating and cooling power are shown as a function of temperature difference. Cooling capacity is increased without insulation, but in this case free air circulation around the panels is necessary.

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)
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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%
M						
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

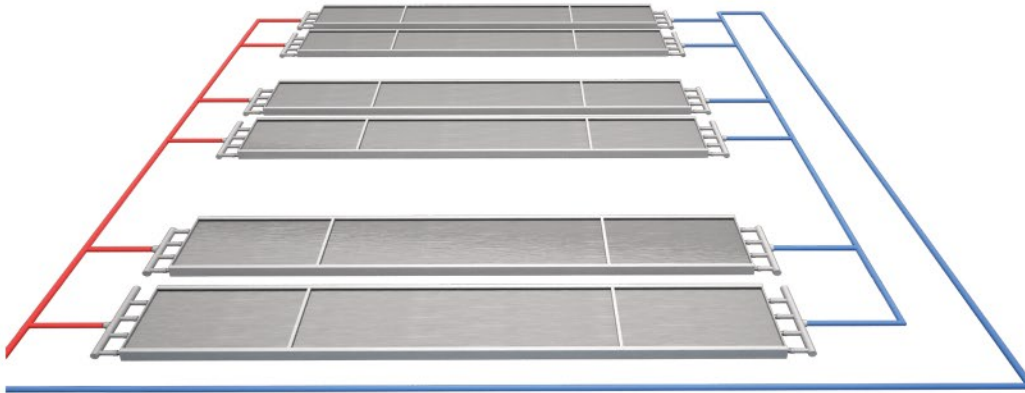
In operation of the climate panels, temperatures should be less than the limit temperatures, indicated in the table.



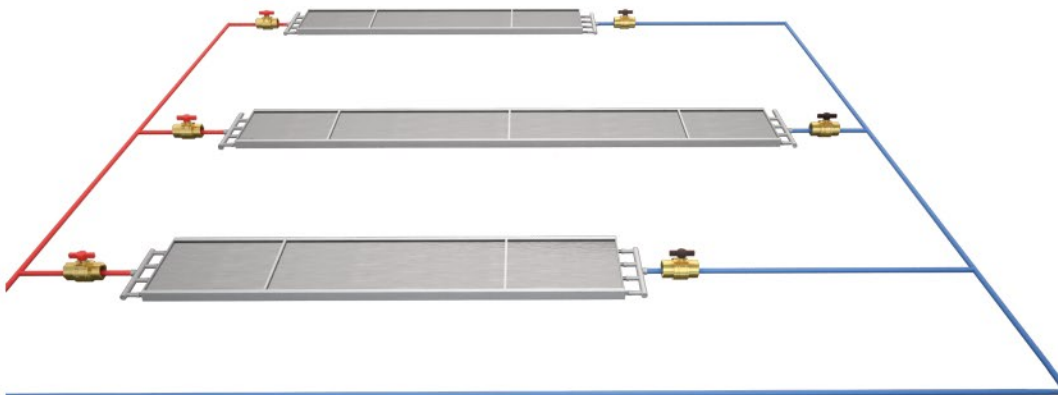
Hydraulic balancing

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 length and power, there is a need for a hydraulic balancing with the help of balancing valves.



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

Spherical thermometer



Three-way valve

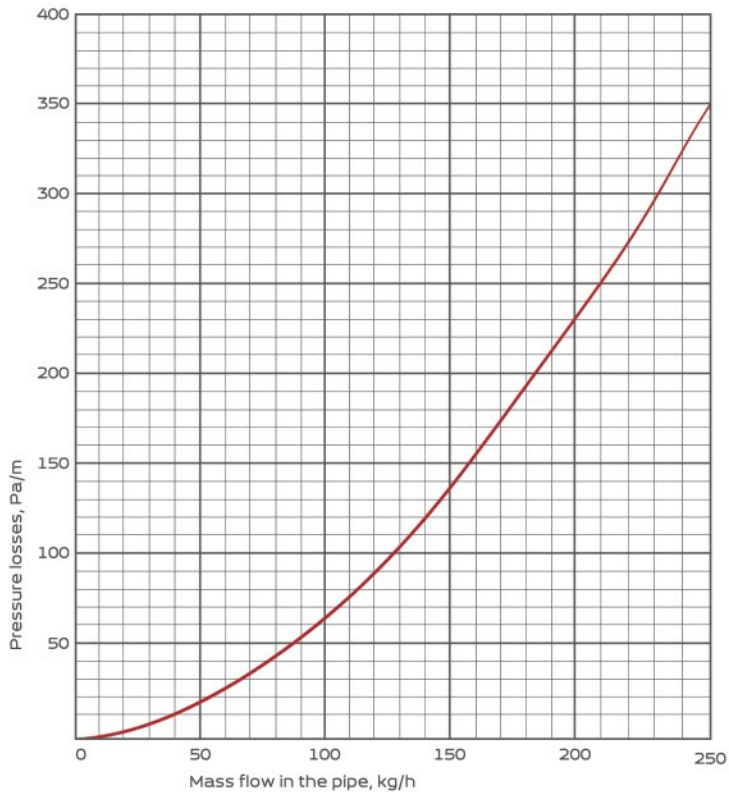


Controller





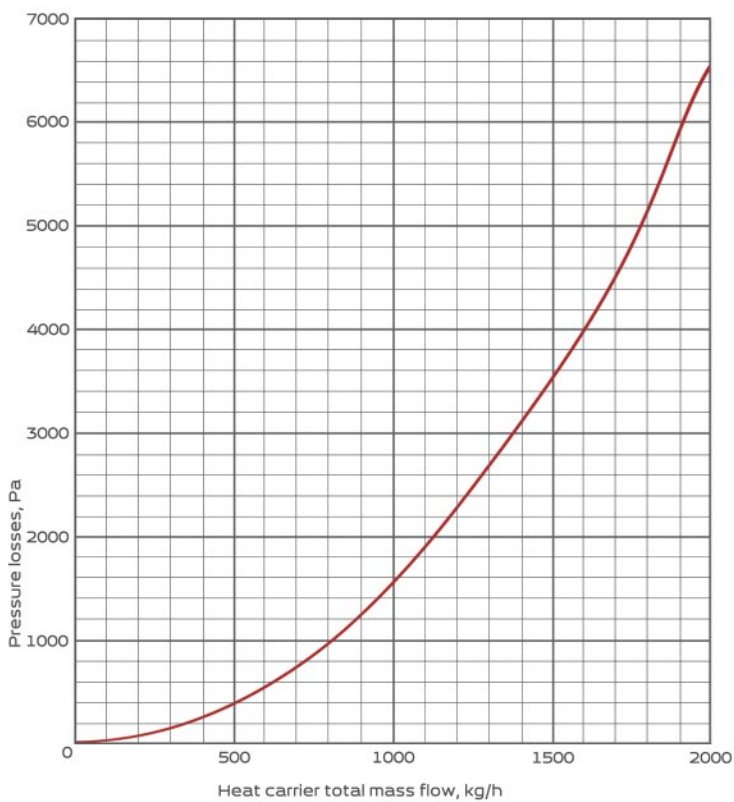
Pressure losses in each tube



Pressure losses calculation

EFFI climate panels pressure losses equal the sum of the pressure losses in the pipes and the pressure losses in the collector pair. When using balancing valves their pressure losses is 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 climate panels calculation example

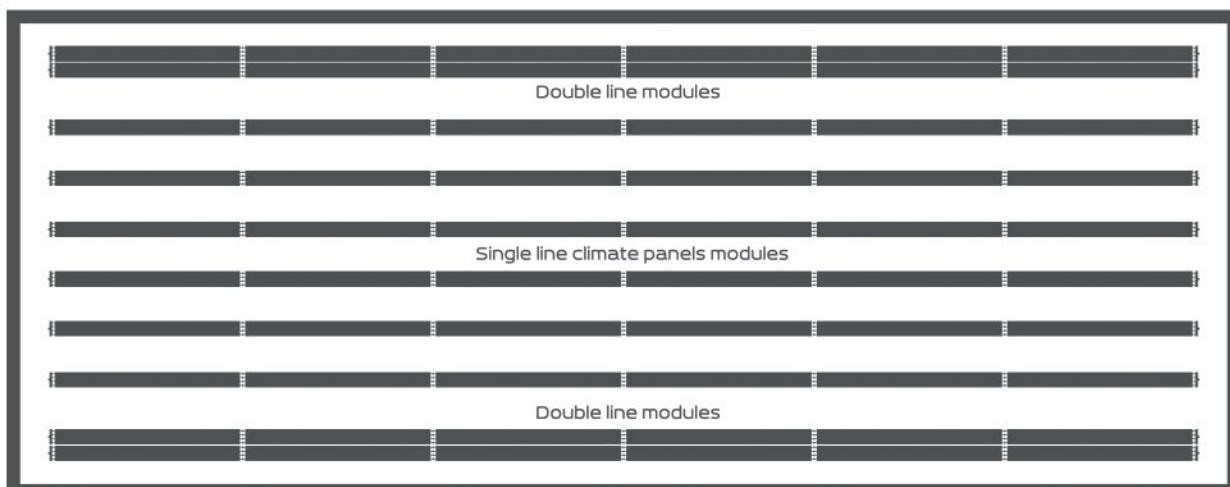
This example shows the climate panel calculation for pavilion type room. The task is to obtain internal temperature of 20 °C in the whole building.

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 - $\Delta t = 50$ 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.





Fitness centers

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Why should I use EFFI climate panels?

EFFI climate panels is the most energy-efficient system for creating a climate of high spaces. By using it, you will reduce heating costs up to 50%.

The reason of the saving?

Energy-saving potential of the climate panels consists of several parts. Climate panels eliminate indoor temperature drop height, so you do not overpay for the overheating of non-working areas. In addition, the system requires no maintenance and repair, replacement of filters or periodic preventive maintenance. The main reason for the efficiency is simple: you do not need to heat the entire volume of air in the room, the climate panels heat all surfaces directly, thus reducing the room temperature without compromising comfort.

What serves as a heat carrier and a source of energy?

Climate panels use water as heat or cold carrier. The source of heat or cold may be any: gas or electric boiler, solid-fuel system, heat pump, centralized heating systems, industrial waste heat and so on.

Where the climate panels can be used?

Climate panels can be used in any building. However, the high rate of efficiency is achieved at the suspension height from 4 meters. At lower heights climate panels show the efficiency level of other climate systems, while retaining it's other advantages.

Can I use the climate panels in wet areas?

Yes, by using a special thermal insulation, which effectively works in a wet environment: at car washes, aquaparks, swimming pools and so on.

Is the infrared radiation from the climate panels harmful?

Low-temperature EFFI climate panels are absolutely safe. Moreover, they are ideal solution for rooms with high demands on sanitation: hospitals, schools and kindergartens.

How to mount the climate panels?

Climate panels can be mounted parallel to the floor, with the suspension system, or directly on the ceiling, at any height. Thanks to a modular design local zones of heating or cooling can be created.



More information:
effi.com.ua/en.html

