
EFFI
hydronic ceiling climate panels

CONTENTS

OVERVIEW

EFFI CUPRUM climate panels offer a versatile way to keep indoor spaces comfortable. They provide efficient heating and cooling, making them a great year-round solution for any season.

Human comfort depends on how heat or cold is received. Basking in the sun during winter or stepping into a cool cave on a hot day feels natural. EFFI CUPRUM climate panels recreate these effects, delivering thermal energy the same way.

Thermal radiation spreads through the air without losing energy, heating only the surfaces it touches or absorbing heat from warmer objects in cooling mode.

OVERVIEW

A key benefit of the climate panels is their ability to work with any heat or cold water source—heat pump, gas, electric boiler, solid fuel, or centralized heating. There's no need to rely on a single energy source, allowing you to choose the most cost-effective option.

Climate panels are especially effective in high-ceiling spaces starting at 3m, including lobbies, medical facilities, educational buildings, offices, shopping centers, exhibition halls, indoor sports arenas, and concert venues.

Safe and reliable, they can be used in areas with high fire and explosion risks, yet they are also suitable for hospitals, schools, and daycare centers.

OPERATING PRINCIPLES

EFFI CUPRUM climate panels use a hydronic system to transfer energy from any heating or cooling source, such as a heat pump or any type of boiler.

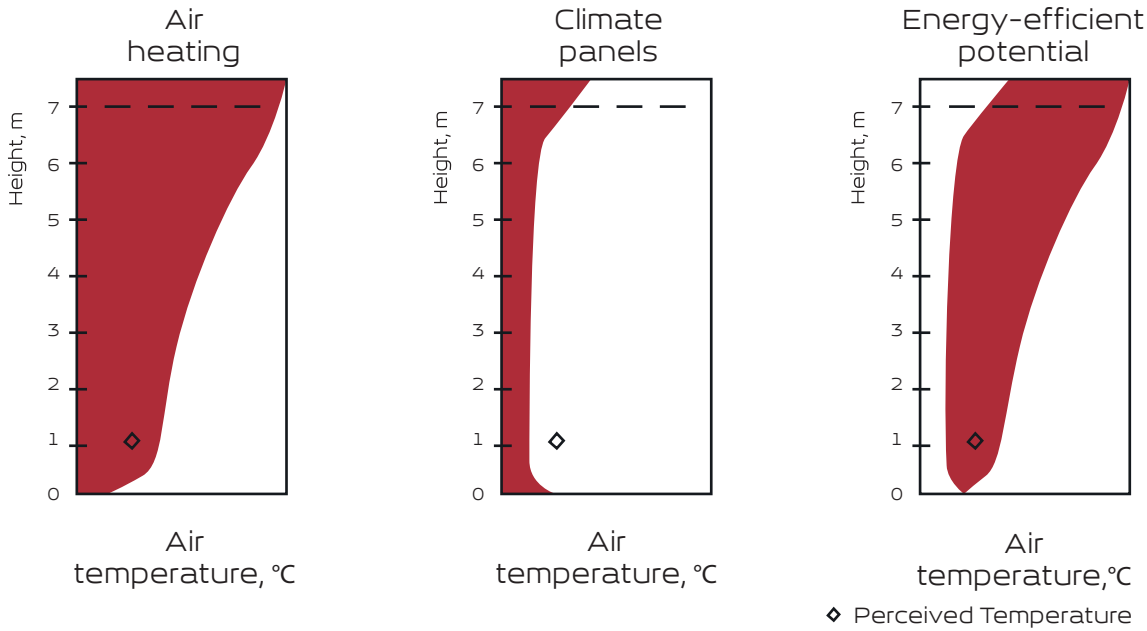
The panels then distribute thermal energy throughout the space, radiating it efficiently and warming or cooling the surfaces and objects they meet, with minimal energy loss.

A key benefit of EFFI CUPRUM climate panels is that they primarily affect objects, surfaces, and bodies rather than directly heating or cooling the air.

They function similarly to how the sun's direct thermal radiation provides warmth even on a cold, clear day. This is the most natural way for humans to receive warmth.

Just as objects absorb infrared radiation, they also emit it toward cooler surfaces. Chilled ceiling panels absorb infrared radiation from warmer objects and people in the room, effectively cooling them down.

ENERGY SAVING POTENTIAL



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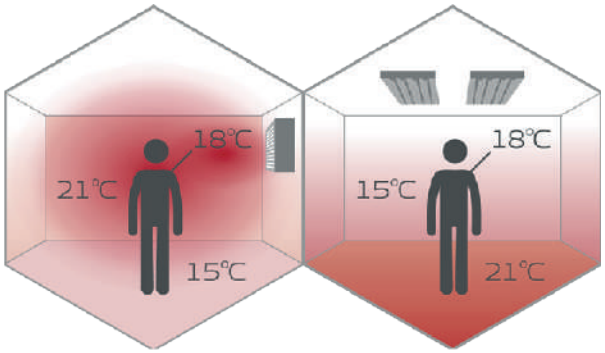
ENERGY SAVING POTENTIAL

Heating systems comparison:

Air heating



Climate panels

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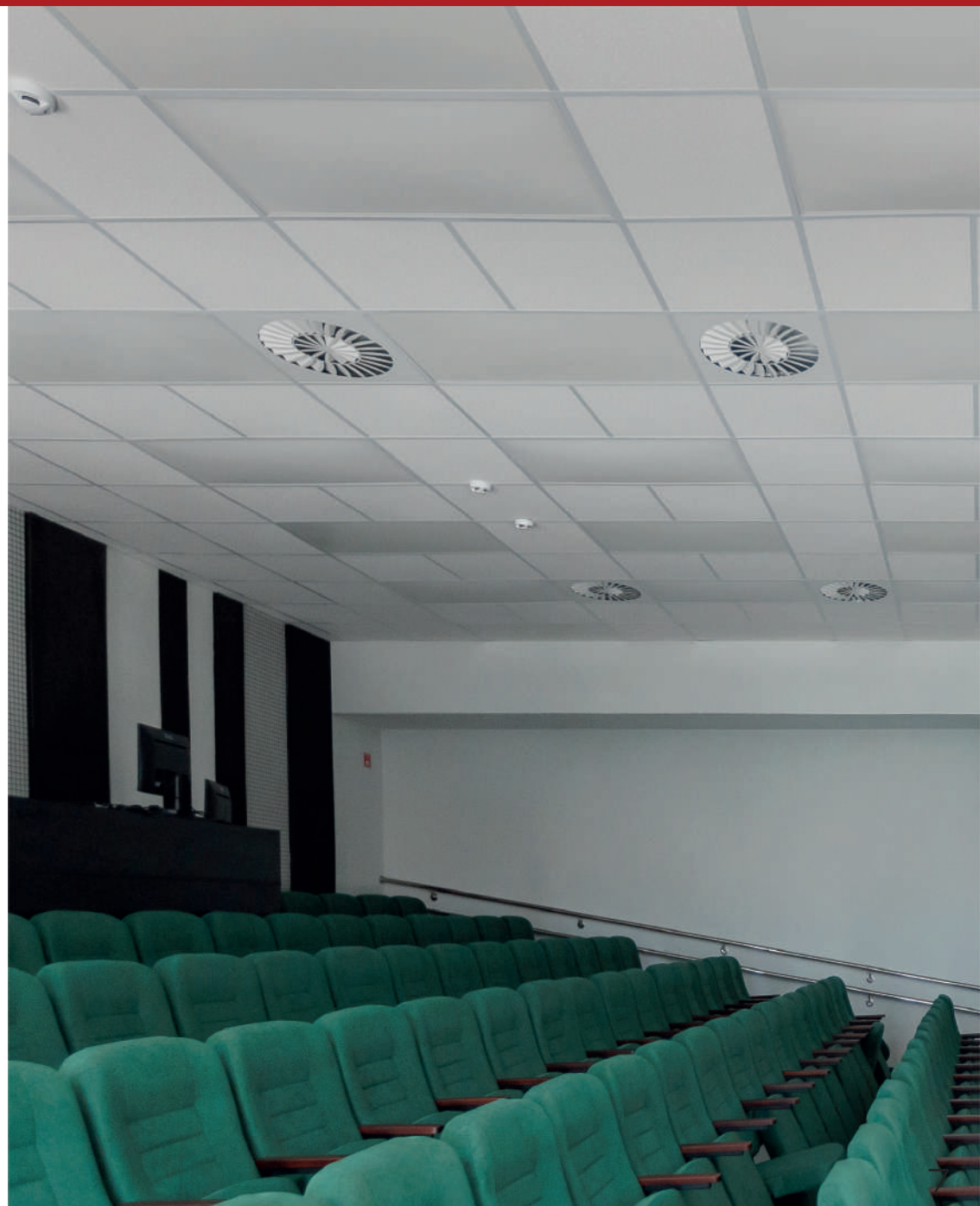


BENEFITS

EFFI CUPRUM ceilings provide a universal HVAC solution for heating and cooling indoor spaces.

3-in-1

EFFI CUPRUM combines a heating system, a cooling system, and the ceiling itself. The modules can be integrated into any suspended ceiling or placed freely in the room, eliminating the need for three separate systems.

Year-round comfort

Compatible with all common heating and cooling sources, the system creates a comfortable temperature in both heating and cooling modes.

Design flexibility

The module sizes match standard suspended ceiling dimensions. The system can be used in any room with a drop ceiling and remains completely invisible. EFFI CUPRUM ceilings can be finished in any RAL color.

BENEFITS

Superior comfort

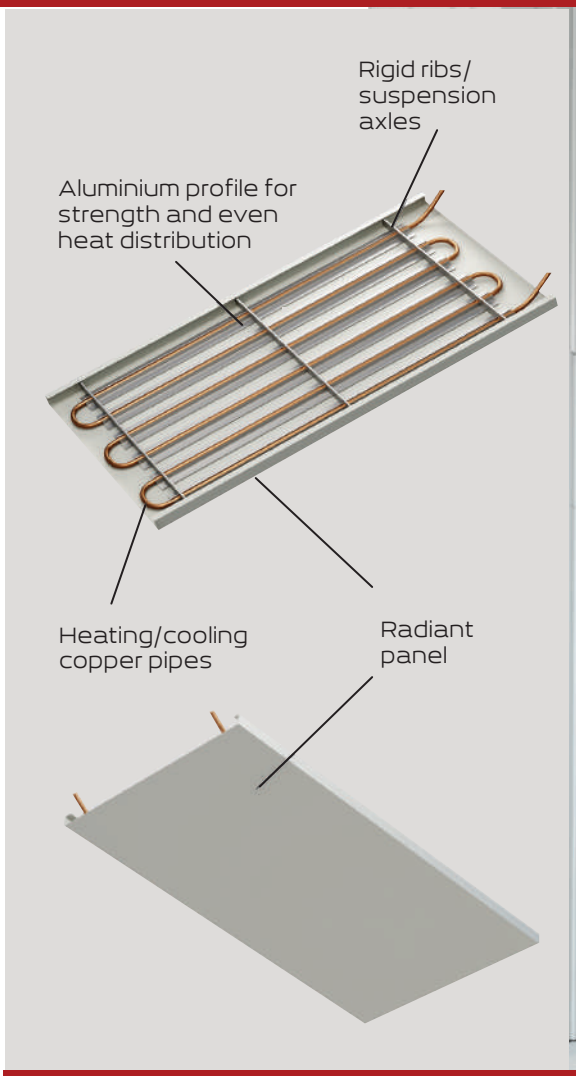
EFFI CUPRUM ceilings provide a silent system that doesn't create drafts or move dust, ensuring a comfortable and uniform temperature. Moreover, there is no need for maintenance.

Energy efficiency

EFFI CUPRUM reduces costs for achieving the desired temperature by an average of 30% compared to traditional air heating and air conditioning systems.

Operation with heat pumps

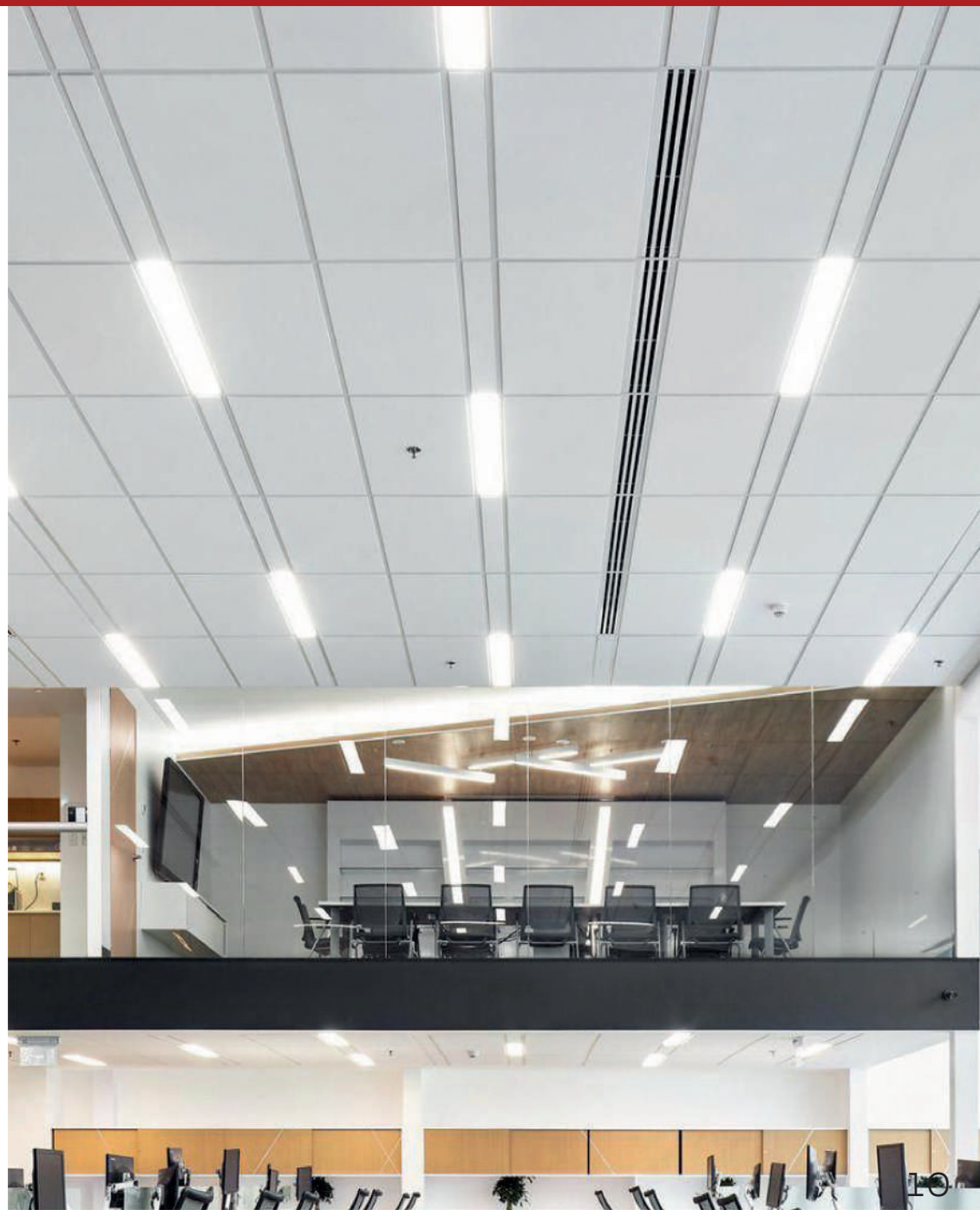
In heating mode, the system operates starting at 35°C, ideal for efficient heat pump operation. In cooling mode, the coolant temperature is not lower than 60°F to prevent condensation, enhancing the efficiency of heat pumps or chillers.



Only high-quality materials are used in the production. Copper pipes with a diameter of 12 mm.
Special aluminum profiles transfer heat or cold from the pipes to the metal surface. 0.8 mm in thick steel sheet with powder coating.

MODEL RANGE

Model		CUPRUM4	CUPRUM6
Number of pipes		4	6
Distance between pipes	mm	150	100
Suspension points per axle	-	2	2
Maximum water temperature	°C	85	85
Maximum working pressure	mPa (bar)	1,0(10)	1,0(10)
Panel weight	Kg/m²	11.1	13.4



SPECIFICATIONS

Depending on room requirements, the modules include either 4 or 6 copper pipes, CUPRUM4 and CUPRUM6 models, respectively.

In basic cooling operation, the modules are not insulated. For primary heating use, insulation is applied on top of the modules.

The metal can be perforated for aesthetic purposes and to improve room acoustics; the thermal insulation serves as a sound absorber in this case.

Panels are available in four lengths: 1200 mm, 1800 mm, 2400 mm, and 3000 mm with a standard width of 596 mm. Custom sizes are also available upon request.

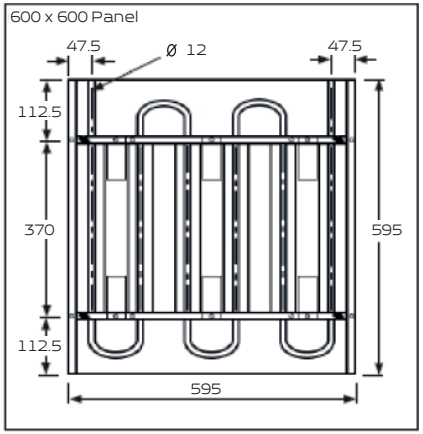
The standard panels are finished in clean white (RAL 9003). Custom RAL colors are available upon request as well.

Individual panels should be connected into groups until the recommended maximum pressure drop of approximately 27 kPa is reached.

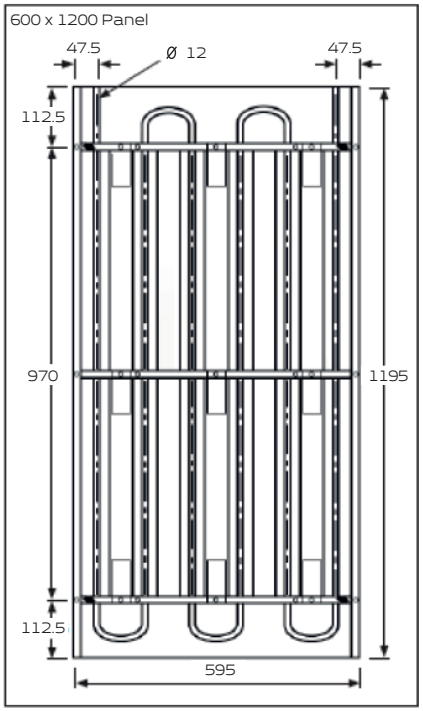
DIMENSIONS AND SUSPENSION POINTS

CUPRUM 6

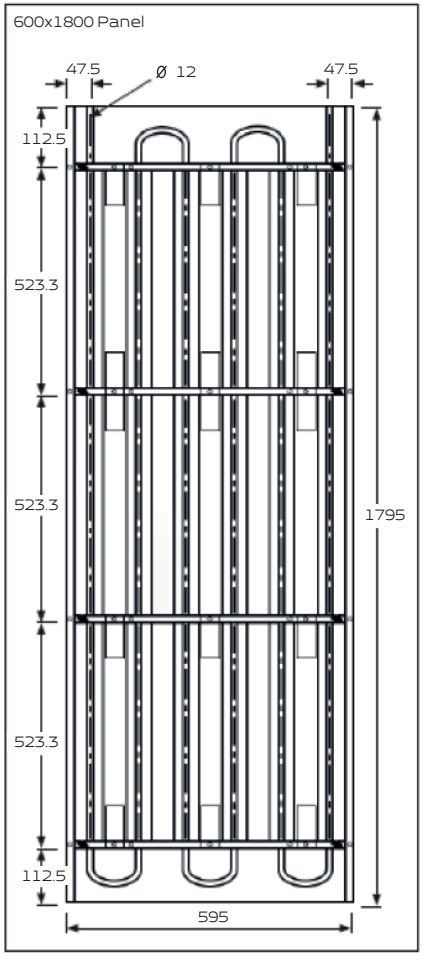
600 x 600 Panel



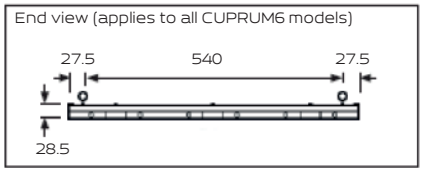
600 x 1200 Panel



600x1800 Panel



End view (applies to all CUPRUM6 models)



POWER CALCULATION

Heating and cooling power is shown as a function of temperature differential.

Removing insulation enhances cooling capacity; however, for optimal performance, free air circulation around the panels is essential in this case.

Legend:

t_A - air temperature (°C)
t_E - average surrounding surface temperature (°C)
t_R - resulting temperature (°C)
t_F - supply pipeline temperature(°C)
t_{Re} - return pipeline temperature (°C)
ΔT_{heat} - heating temperature differential(°C)
ΔT_{cool} - cooling temperature differential (°C)

Calculation of the Temperature Differential in Heating and Cooling:

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

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

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

CUPRUM4 HEATING POWER

Without insulation

Dimensions	600x600	600x1200	600x1800	600x2400	600x3000
Δt(K)	W	W	W	W	W
50	209	418	627	837	1046
48	200	400	599	799	999
46	190	381	571	762	952
44	181	363	544	726	907
42	172	344	516	688	860
40	163	326	489	652	815
38	154	307	461	615	769
36	145	289	434	579	724
34	136	271	407	543	679
32	127	253	380	507	634
30	118	236	354	472	590
28	109	218	327	436	545
26	100	201	301	402	502
24	92	184	275	367	459
22	83	166	249	333	416
20	75	150	225	300	374
18	67	133	200	266	333
16	58	117	175	233	292
14	50	100	150	200	250
12	42	84	126	168	211
10	35	69	104	138	173

With insulation

Dimensions	600x600	600x1200	600x1800	600x2400	600x3000
Δt(K)	W	W	W	W	W
50	157	314	471	628	785
48	150	300	450	600	751
46	143	287	430	573	716
44	136	273	409	546	682
42	130	259	389	518	648
40	123	246	368	491	614
38	116	232	348	464	580
36	109	219	328	438	547
34	103	205	308	410	513
32	96	192	288	384	481
30	90	179	269	359	448
28	83	166	249	333	416
26	77	153	230	307	383
24	70	140	211	281	351
22	64	127	191	255	319
20	57	114	172	229	286
18	51	102	153	204	256
16	45	90	135	180	225
14	39	78	117	156	194
12	33	66	98	131	164
10	27	53	80	107	133

Notes:
- Panels without insulation should be used only when cooling is the primary operating mode of the system.
- It is recommended to group panels to achieve turbulent coolant flow. If the Reynolds number (Re) does not exceed 2300, thermal output may be reduced by up to 15%, and air removal from the system becomes more difficult.

CUPRUM4 COOLING POWER

Without Insulation					
Dimensions	600x600	600x1200	600x1800	600x2400	600x3000
Δt(K)	W	W	W	W	W
15	66	131	197	262	328
14	61	122	183	243	304
13	56	112	168	225	281
12	51	102	153	204	256
11	46	93	139	186	232
10	42	84	126	168	211
9	37	75	112	150	187
8	33	66	98	131	164
7	28	57	85	114	142
6	24	48	72	96	121
5	19	39	58	78	97
4	15	31	46	62	77
3	11	22	33	45	56
2	7	14	22	29	36
1	3	6	10	13	16

With Insulation					
Dimensions	600x600	600x1200	600x1800	600x2400	600x3000
Δt(K)	W	W	W	W	W
15	57	114	171	228	284
14	53	105	158	210	263
13	49	97	146	194	243
12	44	89	133	177	221
11	40	81	121	161	202
10	36	73	109	145	182
9	32	64	96	128	160
8	28	56	84	112	140
7	24	49	73	98	122
6	21	41	62	82	103
5	17	33	50	66	83
4	13	26	39	52	65
3	9	19	29	37	47
2	6	12	18	24	31
1	3	6	9	12	14

Notes:
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CUPRUM6 HEATING POWER

Without insulation

Dimensions	600x600	600x1200	600x1800	600x2400	600x3000
Δt(K)	W	W	W	W	W
50	235	471	706	942	1177
48	225	450	675	900	1125
46	214	428	643	857	1071
44	204	408	611	815	1019
42	193	387	580	773	967
40	183	366	549	732	914
38	172	345	517	690	862
36	162	325	487	649	812
34	152	305	457	609	761
32	142	284	427	569	711
30	132	264	396	528	661
28	122	244	366	488	610
26	112	225	337	449	562
24	103	205	308	410	513
22	93	186	279	372	464
20	84	167	251	334	418
18	74	148	222	297	371
16	65	130	194	259	324
14	56	112	167	223	279
12	47	94	140	187	234
10	38	76	114	153	191

With Insulation

Dimensions	600x600	600x1200	600x1800	600x2400	600x3000
Δt(K)	W	W	W	W	W
50	597	1198	1795	2393	2993
48	570	1143	1713	2287	2857
46	543	1089	1631	2178	2720
44	519	1038	1556	2075	2594
42	144	289	433	577	722
40	137	274	410	547	684
38	129	258	388	517	646
36	122	243	365	487	608
34	114	228	342	456	571
32	107	213	320	426	533
30	99	199	298	397	497
28	92	184	275	367	459
26	85	169	254	338	423
24	77	155	232	310	387
22	70	140	211	281	351
20	63	127	190	253	317
18	56	112	168	225	281
16	49	99	148	197	247
14	42	85	127	170	212
12	36	72	108	144	180
10	29	58	87	117	146

Notes:
- Panels without insulation should be used only when cooling is the primary operating mode of the system.
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CUPRUM6 COOLING POWER

Without insulation

Dimensions	600x600	600x1200	600x1800	600x2400	600x3000
Δt(K)	W	W	W	W	W
15	72	144	216	288	360
14	67	133	200	266	333
13	62	123	185	246	308
12	56	112	168	225	281
11	51	102	153	204	256
10	46	91	137	183	229
9	41	81	122	163	203
8	36	71	107	143	178
7	31	62	93	124	155
6	26	52	78	104	130
5	21	42	64	85	106
4	17	33	50	66	83
3	12	24	36	48	59
2	8	15	23	30	38
1	4	7	11	14	18

With Insulation

Розміри	600x600	600x1200	600x1800	600x2400	600x3000
Δt(K)	W	W	W	W	W
15	64	129	193	258	322
14	60	120	179	239	299
13	55	109	164	219	274
12	50	100	150	200	250
11	45	91	136	181	227
10	41	81	122	163	203
9	36	73	109	145	182
8	32	63	95	127	158
7	27	55	82	109	137
6	23	46	69	92	115
5	19	37	56	75	94
4	14	29	43	58	72
3	10	21	31	42	52
2	7	14	21	27	34
1	3	6	10	13	16

Notes:
- Panels without insulation should be used only when cooling is the primary operating mode of the system.
- It is recommended to group panels to achieve turbulent coolant flow. If the Reynolds number (Re) does not exceed 2300, thermal output may be reduced by up to 15%, and air removal from the system becomes more difficult.

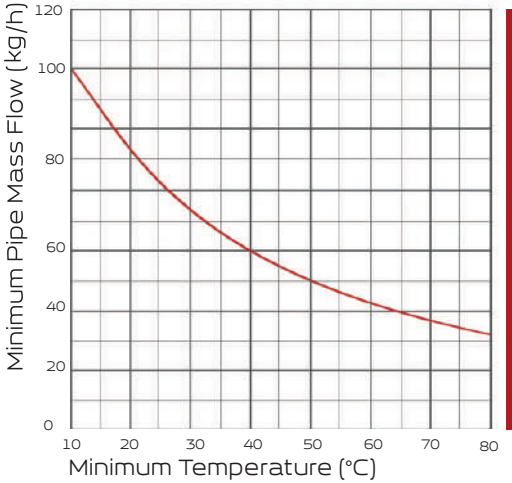
MINIMUM MASS FLOW AND TEMPERATURE LIMITS

To achieve the required power, turbulent flow must be maintained in the pipes of the climate panels.

The minimum water flow rate is determined by the lowest temperature in the system. In heating mode, this corresponds to the return water temperature. In cooling or combined heating/cooling applications, it corresponds to the cold water supply temperature.

If turbulence is not achieved in each pipe, the total system power may decrease by approximately 15%.

Minimum mass flow



Notes:
It is recommended that the distance between the centers of the CUPRUM climate panel modules not exceed the installation height of the panels.
This ensures uniform system operation and enables timely entry into operating mode.

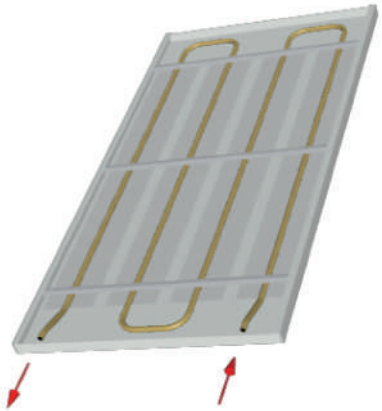
Temperature Limits

Height	Ceiling area covered with climate panels					
m	10%	15%	20%	25%	30%	35%
	Average coolant temperature, °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

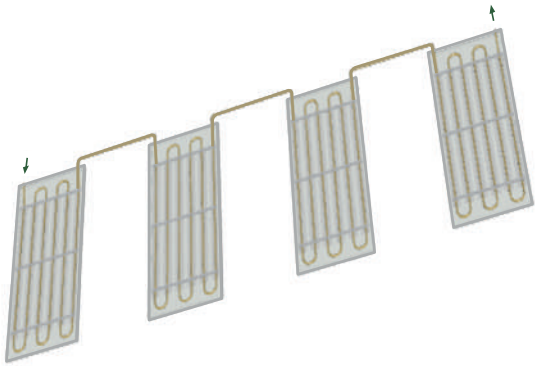
During operation, the heating carrier temperature must stay below the limits listed in the table.
In unoccupied areas or spaces with short-term occupancy, a small exceedance of the temperature limits is acceptable.

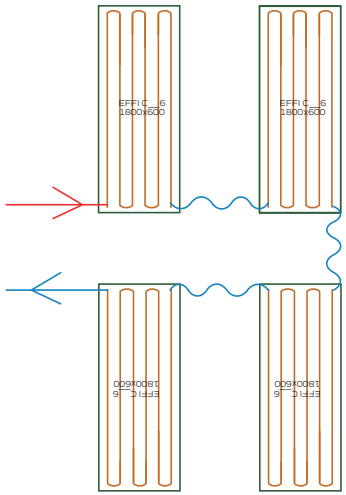
TYPES OF HYDRONIC CIRCUITS

Single Panel



Group of Panels





To ensure the climate panel system operates efficiently, the heat or cold carrier must be properly distributed.

To achieve hydraulic balancing and enable zone-based temperature control, it is essential to install an automatic combined PICV (Pressure Independent Control Valve) – with a=const=1, such as the Danfoss AB-QM or a similar model – at the return outlet of the panel or panel group. The valve should be set according to the required flow rate of the heating or cooling source.

AUTOMATIC CONTROLS

Automatic Control Components

The following items can be used for the automatic control of the climate panel system:

Thermostat

Temperature Controller

Communication Module

Pressure Independent Control Valve (PICV)

Operating Principle

To automatically maintain the desired room temperature, it is recommended to use a controller or a set of controllers with an integrated temperature and humidity sensor placed within the space.

Humidity control is required during cooling mode operation.

All control components of the system are connected via low voltage wiring.

A central thermostat can manage up to 192 individual temperature zones within the space.

Target temperatures are maintained automatically.

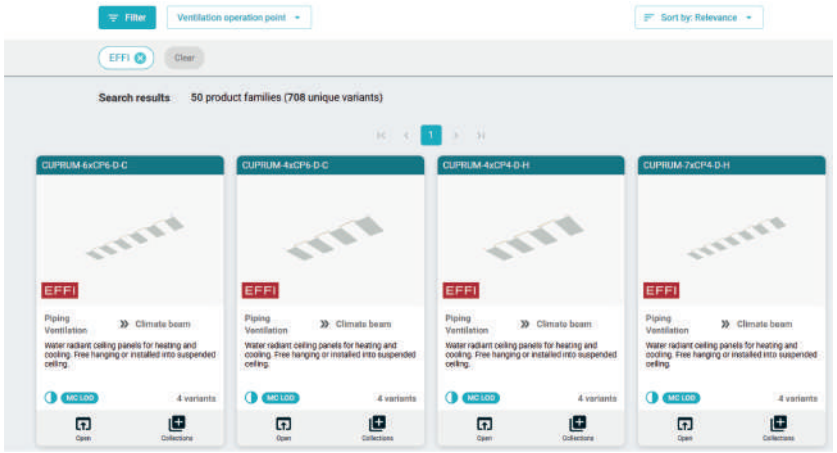
The system can be easily integrated with a BMS (Building Management System) or BOS (Building Operating System), if required.

HYDRONIC PERFORMANCE

1. Follow the link

https://www.magicad.cloud

2. Choose the required configuration for grouping CUPRUM4 or CUPRUM6 panels.



3. Select the appropriate module

4. Determine the pressure loss through a single panel or group of panels using the reference chart.

CALCULATION EXAMPLE

This example focuses on a single room. The objective is to determine the required number of EFFI CUPRUM4 climate panels with insulation to meet the calculated heat load.

Input Data:
Room area: 80 m²
Heat load: 3200 W/h
Room height: 3.5 m
Temperature curve (supply/return):
55 °C / 45 °C

Step 1:
Determine Δt
We calculate the temperature differential (Δt) between the average panel temperature and the indoor temperature:
$\Delta t = ((55 + 45) \div 2) - 20 = 30\ °C$

Step 2:
Determine Panel Power
Using the heating power performance table for CUPRUM4 climate panels at $\Delta t = 30°C$, the output of one panel (600 mm × 1800 mm) is 269 W/h.

Step 3:
Calculate the Required Number of Panels
Divide the total heat load by the output of one panel:
3200 (W) /269 (W/m²) ≈ 12 panels
CUPRUM 4 (600 mm × 1800 mm).

CALCULATION EXAMPLE

Step 4:
Panel Grouping. Panels are grouped to meet hydraulic and layout requirements.
In this case: 3 groups of 4 panels each.

Step 5:
Determine Pressure Loss and Flow
Using the pressure loss vs. flow chart for the panel type CUPRUM4 x CP4-D-H at 55/45 °C:
- Group output:
269 W/h x 4 panels = 1076 W/h.
- Flow rate per group:
93 l/h = 1.5 l/min = 0.026 l/sec
- Pressure loss per group: 6 kPa (Page 21)

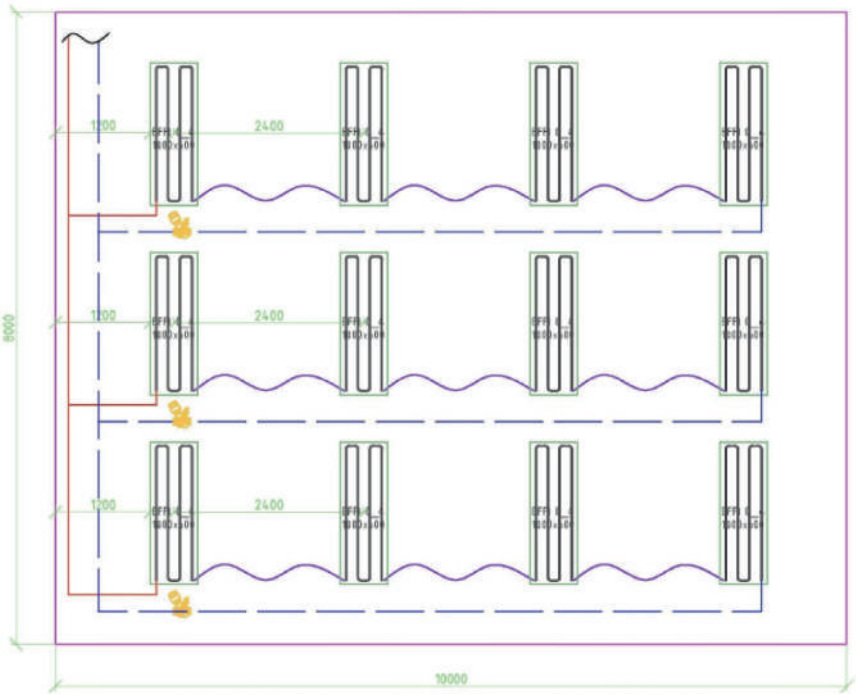
Step 6:
Validate Hydraulic and Thermal Criteria
The system meets the following criteria:
- Pressure loss per group: 6 kPa < 30 kPa
- Reynolds number for turbulent flow:
Re = 6000 > 2300
- Total panel output:
12 x 269 W = 3228W > 3200 W.

Conclusion:

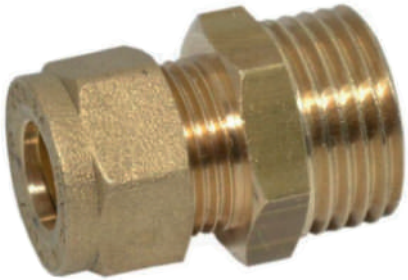
To meet the heat load of 3200 W, you need 12 EFFI CUPRUM4 insulated panels, arranged in 3 groups of 4 modules each.

SYSTEM FINALIZING

The next step is to select PICV, automatic control components, and the ceiling mounting system.



Accessories



Fittings for 12 mm copper pipe – 2 pieces per climate panel.

Stainless steel braided faucet hoses – 2 pieces per climate panel (length selected individually).

More information

effipanels.com