



Lindab **Plana Matrix**

Radiant cooling panels for
Ecophon Solo Matrix Celsius system



Cooling and heating panels

Plana Matrix



Use

Plana Matrix cooling panels are developed together with Ecophon to be an important part of the Solo Matrix Celsius ceiling system. The radiation share for the panels exceeds 50% to 60%, compared to approx. 5% for conventional fin coil products. Since the air velocities can be kept low, the result is a draught-free environment.

Installation

Plana Matrix is customised to be installed in Ecophon Solo Matrix Celsius ceiling system only.

Worth noting

The low weight ensures quick and effortless installation.

Plana Matrix panels are tested according to EN-14240: 2003, EN-14037-2: 2016 and EN-14037-5: 2016 at accredited to EN ISO/ IEC 17025 notified body by DIBt according to (EU) No. 305/2011 NB 1428, WSPlab, Stuttgart, Germany and are CE-marked.

Key figures

Length:	1200, 2400 mm
Width:	600, 1040, 1200 mm
Height:	40 mm
Max. Capacity:	Cooling: 126 W/m ² at ($\Delta t_{rw} = 10$ K)
	Heating: 194 W/m ² at ($\Delta t_{rw} = 15$ K)

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The Plana Matrix is a simple yet powerful radiant panel, based on well known Atrium Plana, customized to fit into the Ecophon Solo Matrix Celsius ceiling system.

The panel is made out of painted aluminium and the water pipes are made of copper.

Plana Matrix C, Cooling

When cold water passes through the panel, the heat of the aluminium plate, absorbed from the hot room air, is transferred to the cold water, with very little temperature loss. The panel partly chills the warm room air on its cold surfaces and, partly absorbs heat from the room via low-temperature radiation. In this way, the room is chilled via both radiation (approx. 50%) and convection. The absorption of low-temperature radiation means that the surfaces of the room, and above all the floor, walls, furniture and fittings have a lower temperature than if then cooling was only convective. This means that storage of "cooling energy" is greater. The Plana Matrix C is not equipped with insulation but is colored on the top also to enable best emission of radiation towards the ceiling.

Plana Matrix C, Heating

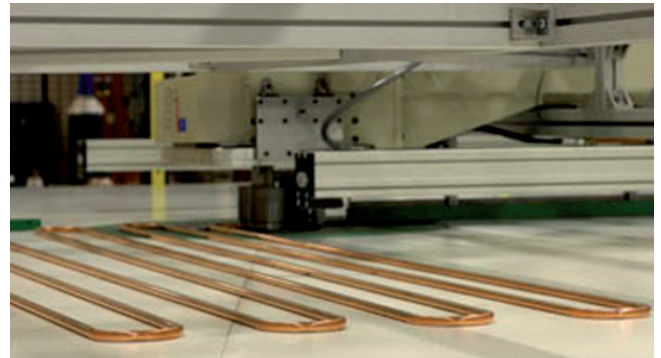
When warm water passes through the copper pipe, heat is transferred to the aluminium plate, with very little temperature loss thanks to the unique welding technique. The panel is warmed and it then radiates the heat into the room. The thermal radiation travels through the air without any loss of energy on its way to the floor, walls and room objects. In this way, you avoid heating a large air mass that, when warm, sticks to the ceiling. Instead, the heat goes where it is needed the most. It is mainly the floor, walls, furniture and fittings in the room that are heated. The temperature of the room surfaces becomes higher than that of the room air and thus transfers its heat to the air. By heating primarily the room surfaces instead of the air, you can save a lot of energy. The Plana Matrix C is not equipped with any insulation on the top and therefore also radiates heat towards the concrete ceiling. A more detailed description of how ceiling heating works is available in Lindab's Ceiling Heating Guide.

Design

The design of the panels is based on a unique manufacturing process. Optimal energy transfer is secured by a high precision laser welding and offers near-to-lossless transfer of heat energy between the copper piping and the aluminium distribution plate. Lindab delivers the lightest and most effective radiant panel on the market.

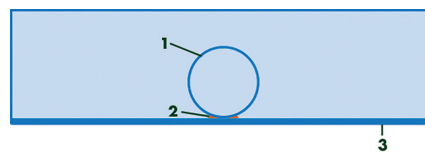


Picture 1: Plana Matrix unique manufacturing process.



Picture 2: Plana Matrix high precision laser welding.

Plana Matrix C is a flat cooling panel with a sleek and soft design. It is made out of a thin aluminium plate with laser welded copper pipes on top. Plana Matrix C is available as standard traffic white RAL 9016 gloss 5, installed exposed in a Ecophon Solo Matrix ceiling system. Because of the minimum distance given by the system of 40 mm it can be considered as exposed free-hanging. Plana Matrix C can be installed in an 2-pipe "Change-Over"-system used for both cooling and heating. When heating is of minor importance.



Picture 3: Plana Matrix panel - Copper pipe [1] laser welded [2] on aluminium front plate [3]

Cooling and heating panels

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Data

Variants

Width: The panels are available in three different nominal widths for cooling (C-), 60 (560 mm), 104 (1000 mm) and 120 (1160 mm).

Lengths: The panels are available in nominal lengths: 1,2 m (1160 mm) and 2,4 m (2360 mm).

Height: The height of all panels is 40 mm.

Water connection: Available with bended DN10 connection, with 2-Pipe connection.

Surface treatment: The panels are made out of aluminium and are powder-coated.

Design: Plana Matrix is supplied as standard with a plane, closed surface.

Colour

The product is available as standard, traffic white RAL 9016 gloss value 5 ± 1 .

Accessories

Lindab offers different control, piping and regulation accessories. Please contact Lindab Technical support.

Dimensioning of heating panels

Radiant heating is an excellent heating system with lots of advantages such as lower energy consumption, quick response and more uniform room temperature compared to other heating systems. Placement in the ceiling also means that the radiant heat directly affects all underlying exposed surfaces visible from the panel. Walls are free from radiators and allow a more flexible use of the room's surfaces. Lindab has produced a "[Ceiling heating guide](#)", with advice on how to achieve the best possible indoor climate and what to think about in connection with dimensioning and placement.

The capacity output from the radiant panels depends on the temperature difference between the panel surface and the surfaces to be heated. The water flow and the turbulence of the water also affect the power output. For a correct dimensioning for your particular operating case, please contact Lindab Technical support.

Dimensioning

For the individual dimensioning of your Plana Matrix in your Ecophon Solo Matrix Celsius system, please contact Lindab Technical support.

Definitions:

P_w = Cooling capacity water [W]

P_{wnom} = Nominal capacity water [W/m²]

q_w = Water flow rate [l/s]

t_r = Room air temperature [°C]

Δt_{rw} = Temp. diff., room air and mean water temp. [K]

Δt_w = Temp. diff. water circuit [K]

Cooling and heating panels

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Plana Matrix C 60 - Nominal cooling capacity P_{wnom} [W/m²]

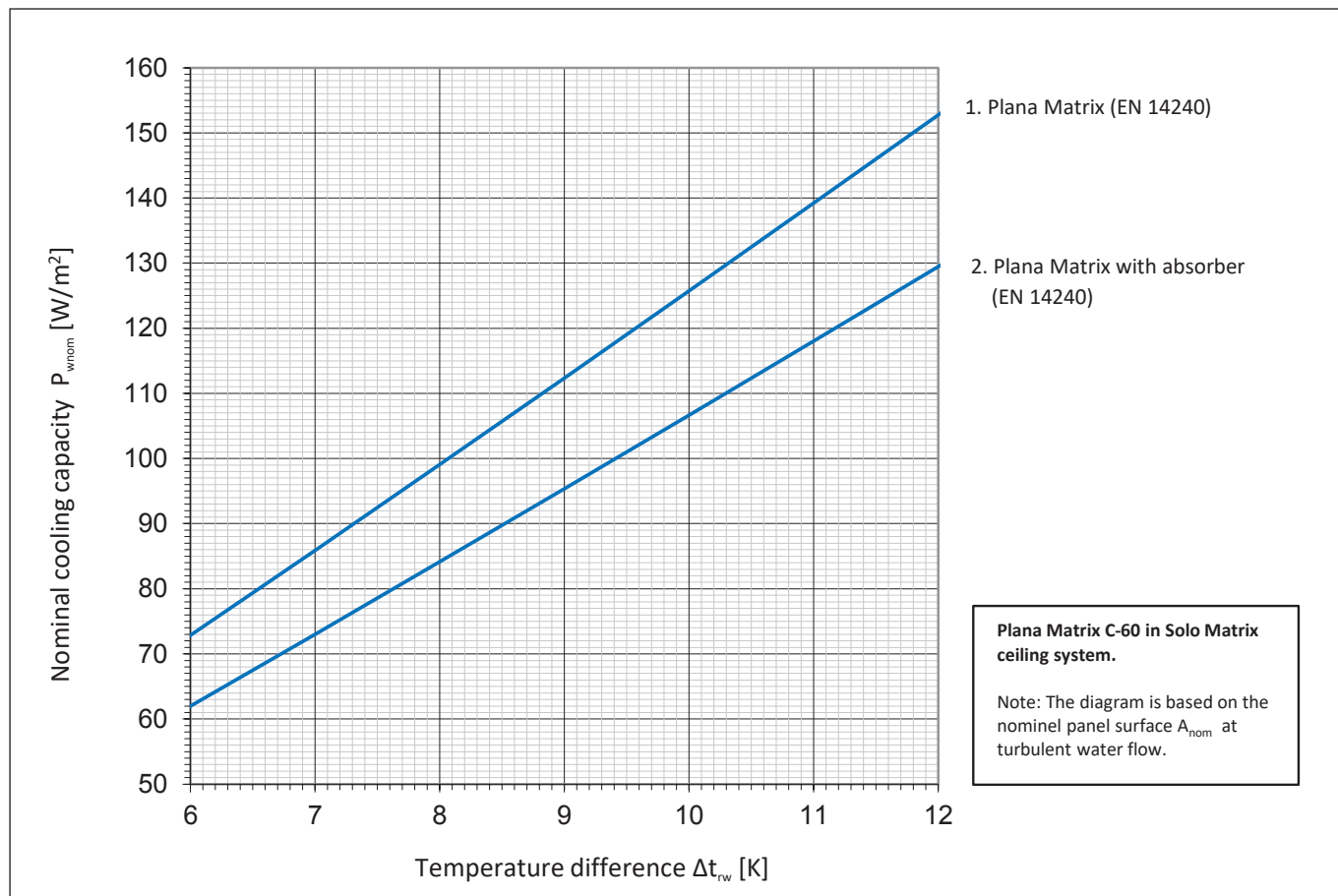
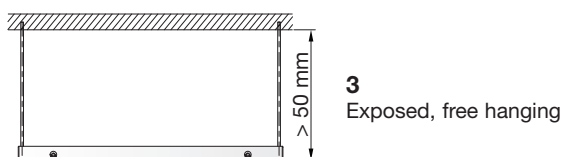


Diagram 1: Nominal cooling capacity P_{wnom} for Plana Matrix C-60

Curve	Installation type	Insulation type	Related to	P_{wnom} @10 K [W/m ²]	P_{wnom} @10 K* [W/m ²]
1	Exposed (free hanging > 50mm)	None	EN 14240: 2004	125,7	128,3
2	Exposed (free hanging > 50mm)	Absorber	EN 14240: 2004	106,7	106,5

Table 1: Curves legend diagram 1 (*related to WSP test acc. to related EN-norm)

Installation types



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For a quick calculation if the required specific cooling capacity in a room/building can be supplied by the Solo Matrix Celsius system. The diagram shows the nominal cooling capacity P_{wnom} related to the occupied ceiling surface for different temperature differences room air to mean water temperature. The full ceiling surface has to be splitted between both radiant- and accoustic panels in Ecophon Solo Matrix Celsius system (area or linear) to achieve a perfect indoor climate.

Nominal cooling capacity P_{wnom} for Plana Matrix C-60 related to occupied ceiling surface

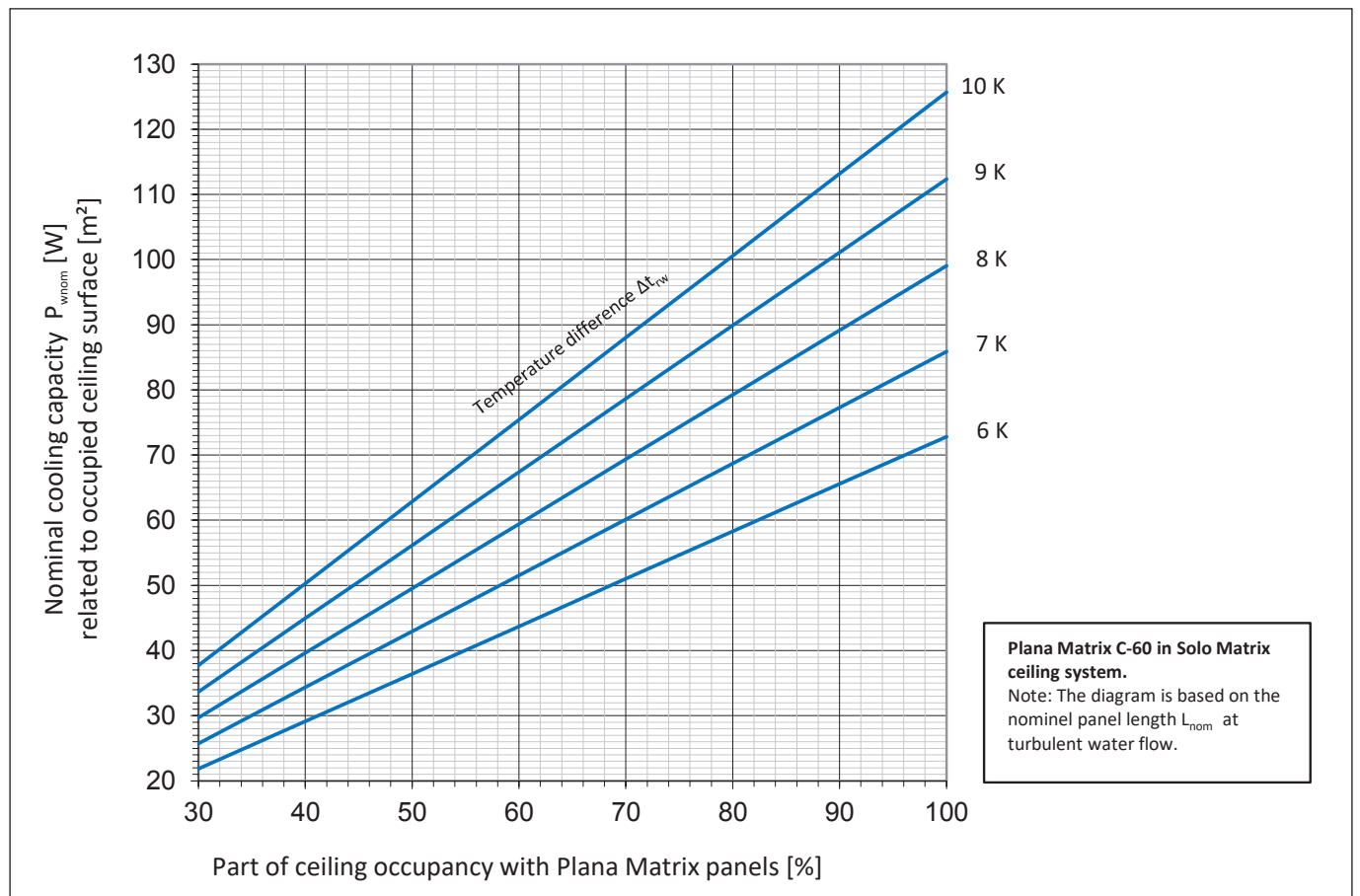


Diagram 2: Nominal cooling capacity P_{wnom} for Plana Matrix C-60 related to occupied ceiling surface

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Plana Matrix C-60 - Nominal heating capacity P_{wnom} [W/m²]

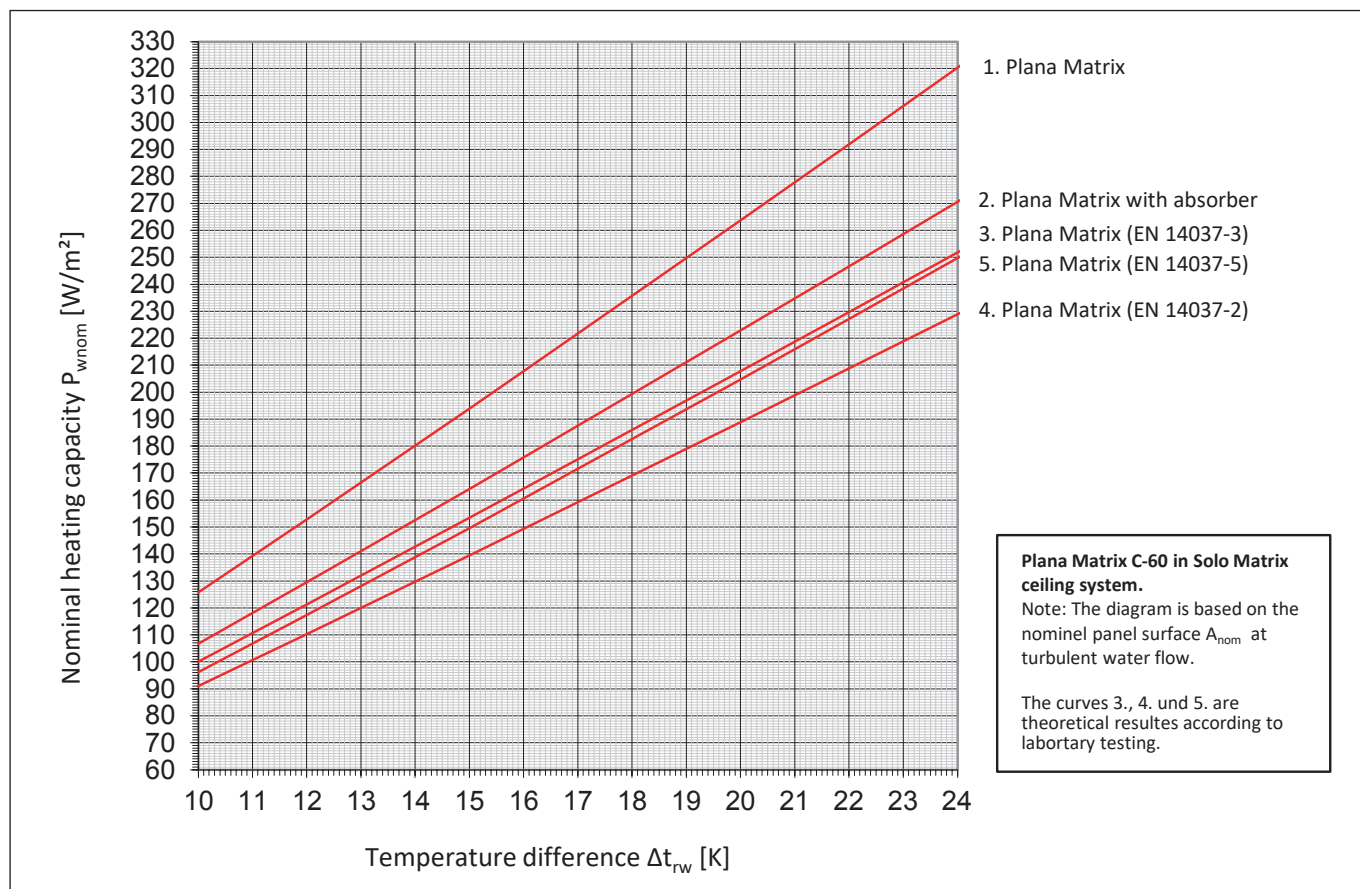
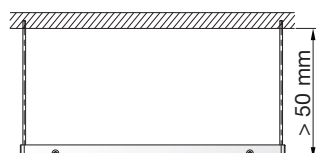


Diagram 3: Nominal heating capacity P_{wnom} Plana Matrix C-60

Curve	Installation type	Insulation type	Related to	P_{wnom} @15 K [W/m ²]	P_{wnom} @15 K** [W/m ²]
1	Exposed free hanging > 50mm	None	N/A	193,9	N/A
2	Exposed free hanging > 50mm	Absorber	N/A	164,1	N/A
3*	Exposed free hanging > 50mm	Layer of 40 mm mineral wool with vertical fibre	EN 14037-3:2016	153,4	170,3
4*	Exposed free hanging > 50mm	Layer of 40 mm mineral wool with vertical fibre	EN 14037-2:2016	149,6	137,8
5	Exposed free hanging > 50mm	None	EN 14037-5: 2016	139,5	125,3

Table 2: Curves legend diagram 3 (*The panels are not offered with mineral wool layer, ** related to WSP test acc. to related EN-norm)

Installation types



3
Exposed, free hanging

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Pressure drop in water circuit, width 60

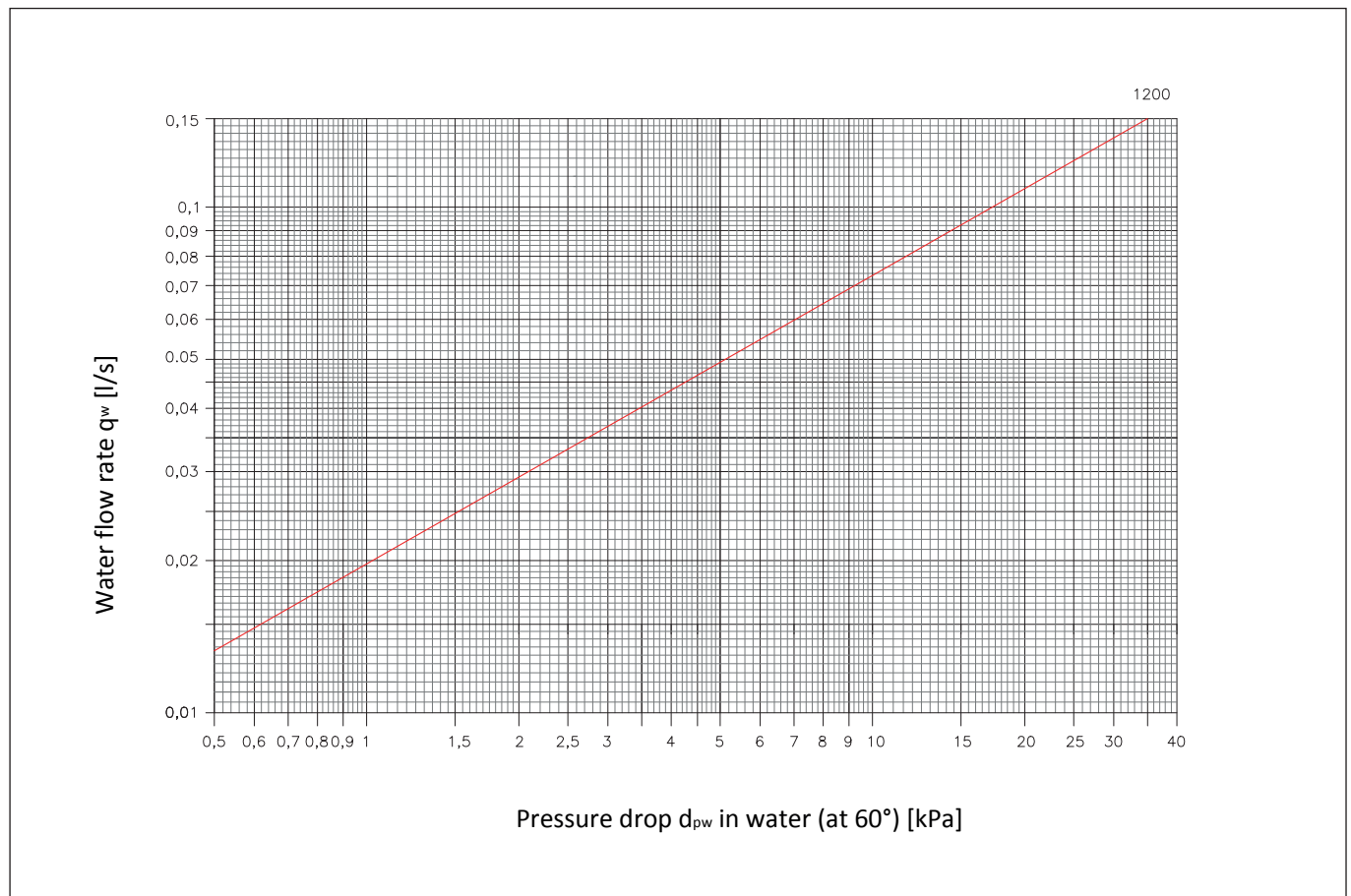


Diagram 4: Plana Matrix C-60, pressure drop at 60 °C. For pressure drops at temperatures other than 60°C, the pressure drop is multiplied by the pressure drop factor (see table 3).

Pressure drop	
Plana Matrix-C-60-10-7	Multiplication factor
-104	1
-120	1
-240	2
Plana Matrix-C-104-10-7	
-120	2
-240	4
Plana Matrix-C-120-10-7	
-120	2
-240	4

Table 3: Multiplication factor pressure drop for others that C-60-10-7-120

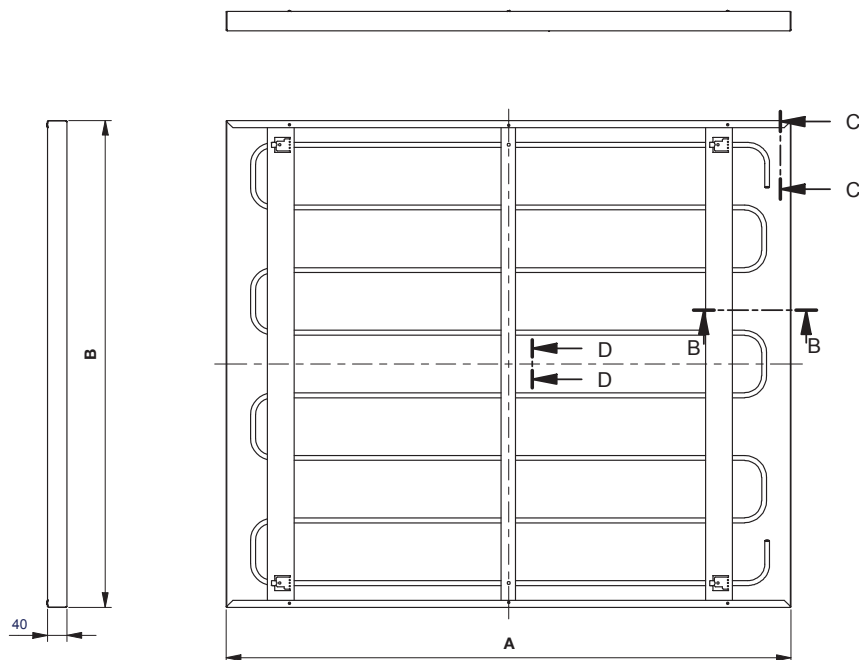
NB! Please use the multiplication factor from table 6 to calculate the pressure drop when using other than Plana Matrix C-60-10-7-120.

For the individual dimensioning of your Plana Matrix panels in your Ecophon Solo Matrix Celsius system, please contact Lindab Technical support.

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Dimensions



Picture 4: Dimensions of Plana Matrix C panel

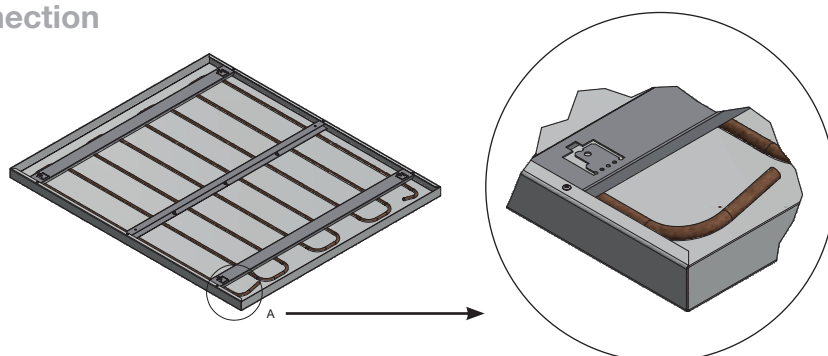
Type	B _{nom} [mm]	L _{nom} [mm]	B Width [mm]	A Length [mm]	Dry weight [kg]	Water content [kg]
C-60-10-7-120-0	600	1200	560	1160	4,1	0,3
C-60-10-7-240-0	600	2400	560	2360	8,2	0,6
C-120-10-7-120-0	1200	1200	1160	1160	8,6	0,6
C-120-10-7-240-0	1200	2400	1160	2360	17,2	1,2
C-60-10-7-104-0	600	1040	560	1000	3,6	0,3
C-104-10-7-120-0	1040	1200	1000	1160	7,5	0,6
C-104-10-7-240-0	1040	2400	1000	2360	14,9	1,2

Table 4: Plana Matrix, specific measures

Ceiling installation and water connection

The Plana Matrix C panel is prepared for bending up 4 to 8 means with than fit perfectly into the Ecophon Solo Matrix system under construction (picture 5; check Solo Matrix Celsius Installation Instruction at Ecophon for further details).

The water connection is bended 15° (connection type 7) in dimension CU-Ø10x0.5 mm for direct connection with push fittings (picture 5; please contact Lindab Technical support)



Picture 5: Connection type 7, CU-Ø10x0.5 mm, 15° bend

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Specific data

Recommended water temperature cooling [°C]	15-17 (avoid condensation)
Recommended water temperature heating [°C]	35-40
Max. water temperature [°C]	50
Copper pipes quality	EN 12735-2 CU-DHP
Copper pipe dimension [mm]	∅10x0,5
Pressure class	PN 10
Max. pressure drop in serial connection of panels/circuit [kPa]	25
Expansion at HW*: +55/45°C	0,7 mm/m
Expansion at HW*: +80/60°C	1,2 mm/m
Min. number of fixing points	Acc. to panel construction and Ecophon Solo Matrix Celsius
Suspension traverse	Customized for simple installation in Ecophon Solo Matrix Celsius
Max. distance between the axes of fixing points	Acc. to panel construction and Ecophon Solo Matrix Celsius
Upper insulation	No insulation on upper side
Standard colour	RAL 9016 +/- 5%
Emissivity	0,94-0,97

Table 5: Plana Matrix-C, specific data



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Control

Lindab offers control equipment that is very simple to use. To avoid heating and cooling being activated at the same time, the systems are controlled sequentially (Regula Combi). For the technical data, refer to a separate brochure, Regula.



Plana Matrix – Ceiling Panel with Cooling and Heating Function

Supply and installation of a ceiling panel type Plana Matrix in combination with an acoustic ceiling system type Solo Matrix Celsius.

Plana Matrix is a cooling and heating panel as a radiant ceiling element. Due to a high radiation component, the ceiling panel offers excellent cooling and heating performance. When combined with acoustically effective ceiling panels of the type Ecophon Solo Matrix Celsius, an excellent indoor climate is achieved, combined with a high level of acoustic comfort. The proportion of cooling/ heating panels in relation to acoustic panels is calculated and optimally matched depending on the object.

Plana Matrix is made of powder-coated aluminium and is manufactured using a high-tech laser welding process. This process provides an excellent connection between the aluminium panel and the water-bearing copper meander, thereby establishing optimum heat transfer. The flat and smooth surface of Plana Matrix Celsius can be perfectly integrated into the ceiling.

It is installed in conjunction with the substructure of Ecophon's Solo Matrix Celsius ceiling system and is hooked into the appropriate brackets.

Plana Matrix are tested according to EN-14240: 2004, EN-14037-2: 2016 and EN-14037-5: 2016.

Plana Matrix is powder coated as standard in white to match the Solo Matrix Celsius ceiling system.

A connection set for the water-side connections as well as valves and actuators are available as a plug-in system for easy and quick hydraulic connection.

Make: Ecophon
Type: Plana Matrix Celsius

Technical Data:

Panel length:	2400 mm
Panel width:	1200 mm
Panel height:	40 mm
Water connection:	10 mm

Cooling capacity according to EN 14240 (10K)

Cooling capacity in the design case

Flow temperature:	15° C
Return temperature:	17° C
Room temperature:	26° C

Order code

Product **Plana Matrix C - 120 - 10 - 7 - 240 - 0**

Type: C

Width: 60, 104 and 120 cm

Water connection: 10 mm

Connection type: 7

Length: 120 cm and 240 cm

Perforation:

0 = no (std.)



Most of us spend the majority of our time indoors. Indoor climate is crucial to how we feel, how productive we are and if we stay healthy.

We at Lindab have therefore made it our most important objective to contribute to an indoor climate that improves people's lives. We do this by developing energy-efficient ventilation solutions and durable building products. We also aim to contribute to a better climate for our planet by working in a way that is sustainable for both people and the environment.

[Lindab](#) | For a better climate