

25 Year Guarantee

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Independently tested
to EN 14037:2015 at
HLK Stuttgart

the future of space conditioning

Modula High Performance

radiant heating panel



Application

Commercial, hospitals, hotels, schools, shops, sports halls,
offices, laboratories, food industry etc.

Installation

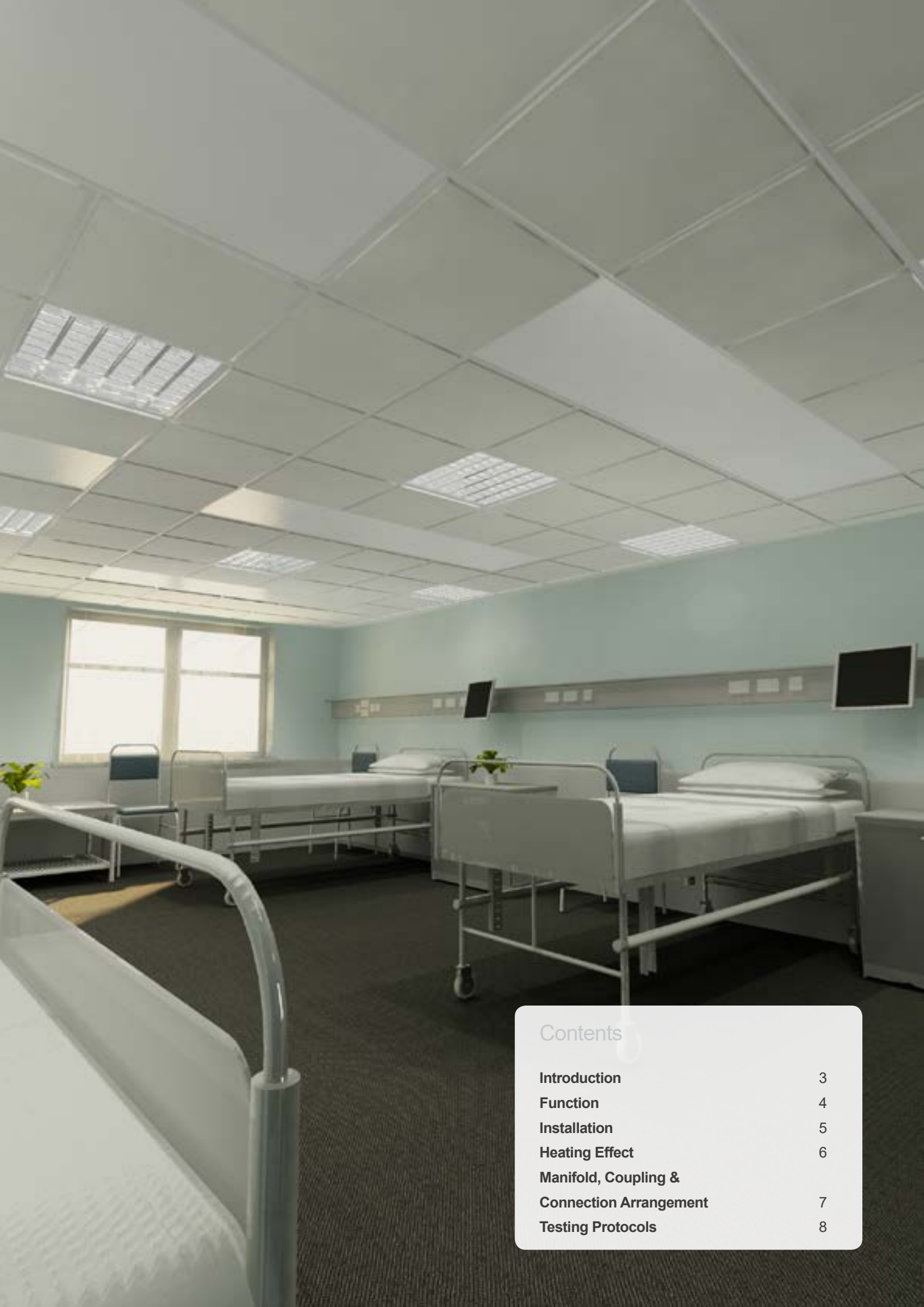
Ceiling integrated
Free hanging
Surface mounted
Flanged recessed

Capacity

588 W/m² @ 55 dtK.

Features

Smooth finish
Technology proven over 50 years
Low construction depth
High capacity
Cost effective
Simple to install



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Introduction

How does ceiling heating work?

If hot air rises, why and how can a 'Radiator' on the ceiling be effective? - This is most people's reaction to the idea of utilising a radiant ceiling heating panel system.

The basic way to explain on how such a system works is to compare the principle of our own 'Sun' - when you stand in direct sunlight you feel and almost immediate increase in temperature, this is due to the radiant energy that is transferred direct from the 'Suns' rays warming your skin.

A radiant ceiling heating panel system works on the same principle - it transfers a large proportion of its heating energy via radiation (typically up to 60% of a panels overall heat output) direct to all and any of an areas surfaces it 'sees', travelling in much the same way as light is distributed and reflected in an area.

It is due to this 'reflection' and the constant radiation exchange between all room surfaces continuously striving to level out that ensures a very even temperature spread throughout an area.

Additionally this same radiant effect ensures that all room surfaces are heated to a higher temperature when compared to a conventional heating system. This means that a comfortable indoor climate temperature can be achieved with lower air temperatures than realized with a convective heating system - potentially up to 3 degrees lower. The net result of this is a reduction in the heat loads and energy consumption in any area that utilizes a radiant ceiling heating panel system.

Modula HP Heating Panel



Description

Modula is an unobtrusive modular radiant heating panel. The panels are manufactured from 1.0mm thick smooth-faced steel and are designed to be integrated within a standard 24mm exposed grid ceiling system. Copper pipes are expanded under pressure into extruded aluminium pipe seats to give high metal-to-metal contact and the pipe seats are securely fixed to the rear of the steel panels. Consequently, the arrangement delivers excellent heat transfer characteristics. Panels are insulated with 25mm thick class 'O' foil encapsulated mineral wool insulation 45 kg/m³ density. The technology employed in the construction of the panel results in very high heating capacity at low water mass flow rates.

Modula has been specifically developed for use in schools and healthcare environments, where smooth faced simple-to-install panel with high heating capacity is the preferred solution.

Standard Features

- Modular system to fit into 600mm exposed grid ceiling.
- Modular lengths; 0.6m, 1.2m, 1.8m, 2.4m, 3.0m.
- Panel depth 45mm.
- Smooth faced, unobtrusive design.
- 588 W/m² @ 55 dtK room (mwt - room temp).
- Standard polyester finish RAL 9010 (25% gloss).

water connections: 15mm OD Copper, to EN12449 / EN127352

weight: less than 21 kg/m²

Connection Possibilities

water; vertical, same end for flow and return.
Alternative options available upon request.

Maintenance

The unit has no moving parts, and therefore maintenance requirement is limited to periodic cleaning of the surface of the panel with a soapy sponge and drying with a cotton towel.

Installation

Standard fixing arrangement from the structural soffit using rigid or flexible wire hangers (supplied by others), suspended via pre punched keyhole slots.

For simplicity and flexibility we recommend that flexible stainless steel braided EPDM hoses are used to connect the Modula panel.

Function

With an output of 588 W/m² at 55 dtK. Modula HP is one of the most efficient smooth-faced radiant heating panels currently available.

The secret to Modula's outstanding performance lies in its unique method of expanding the water-carrying copper pipes within the heat radiating aluminium extrusions. The extrusions are then mechanically bonded to the zintec steel panel face using a heat transfer adhesive. Due to the high metal - to - metal contact between the copper waterways and extrusions and the fact that the aluminium pipe seats are fully bonded to the panel face, the energy transport between the pipe and panel face is extremely efficient.

The manufacture of Modula is semi-automated in our purpose-built facility; consequently panels can be produced to very high tolerances. Furthermore, the processes employed and the standardised design means that the cost of Modula remains highly competitive.

Modula is so simple to install that it is most often fitted by the ceiling installer. Frenger can offer an installation service using our own engineers or on-site training to ensure that the installation is carried out to the very highest standard.

Design

Dimensions: Modula HP is available in two widths, as standard - 0.6m and 0.9m. The dimensions are reduced (minus 8mm on length and width) so that panels can be integrated within a traditional suspended ceiling using exposed T-bars (24mm wide) on a 600 x 600mm grid module. The depth of the Modula panel is just 45mm.

Lengths: Modula is produced in module lengths of 0.6m, 1.2m, 1.8m, 2.4m and 3.0m as standard; non-standard lengths are available upon request.

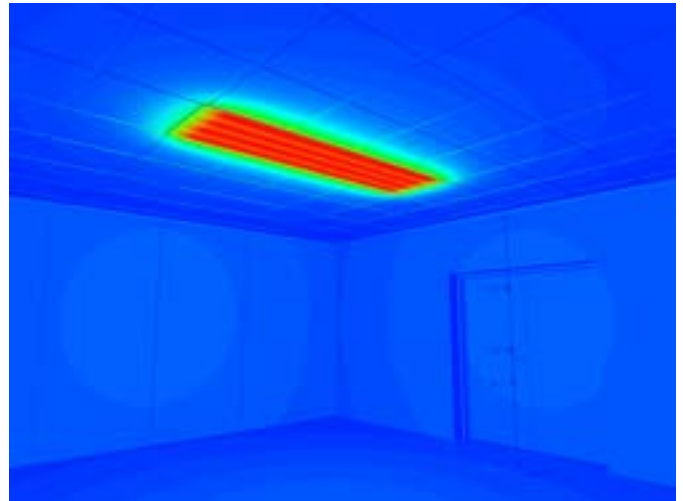
Water connection: Modula is available with two different connection configurations (C and D) please see page 7 for further details.

Surface finish: Modula is polyester coated as standard in RAL 9010, gloss value 25%, emissivity 0.94.

Insulation: Modula is supplied with integrated 25mm thick 45 kg/m³ class 'O' foil encapsulated mineral wool insulation within the panels returned flanges.

Application

Modula is particularly suited for use in hospitals, schools, shops and offices; in fact wherever there is a need for a high-output radiant heating panel which is simple to install, easy to keep clean and comes at a very competitive price. Modula is the perfect solution for integration with an exposed grid ceiling system, but is equally suited to free hanging applications. The panel can also be adapted to suit surface mounted applications or recessed into a plasterboard ceiling.



Installation

The Modula panels are designed to be fixed directly back to the structural soffit. Panels are supplied with pre-punched keyhole slots which are suitable for suspension using rigid or flexible wire hanging systems (by others). Four holes are required for each heating panel up to 1.8m long, each positioned no more than 200mm in from each end. Panels 2.4m long or over require 6 No. fixings.

It should be remembered that the ceiling system "main runners" must be designed to run either side of the Modula panel and parallel to its long sides. Ceiling system "cross noggin" bayonets must be capable of being bent back so as not to clash with the Modula panel.

For simplicity and flexibility we recommend that flexible stainless steel braided EPDM hoses are used to connect the Modula panel.



Installation Examples



Surface mounted

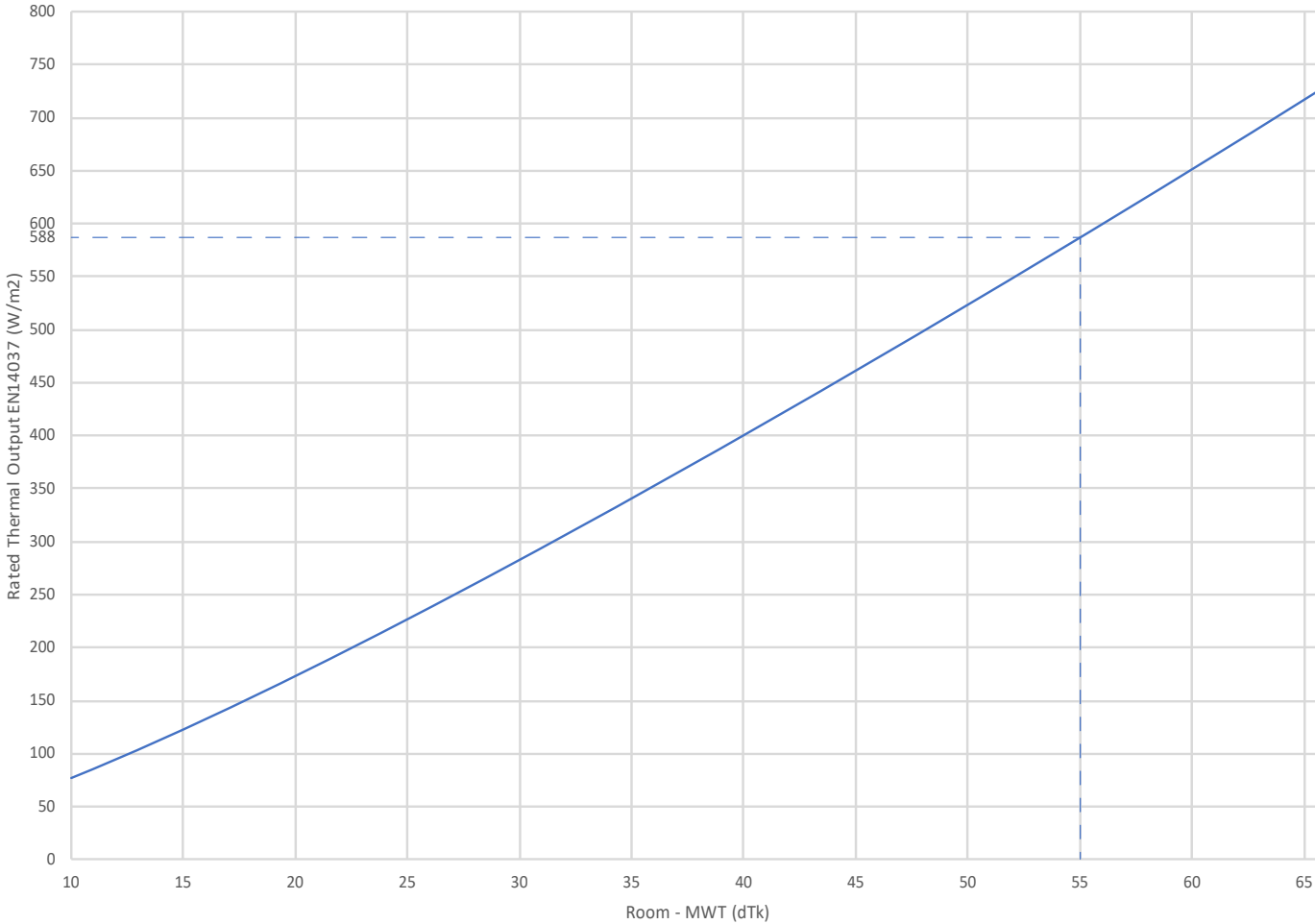


Recessed into plasterboard ceiling

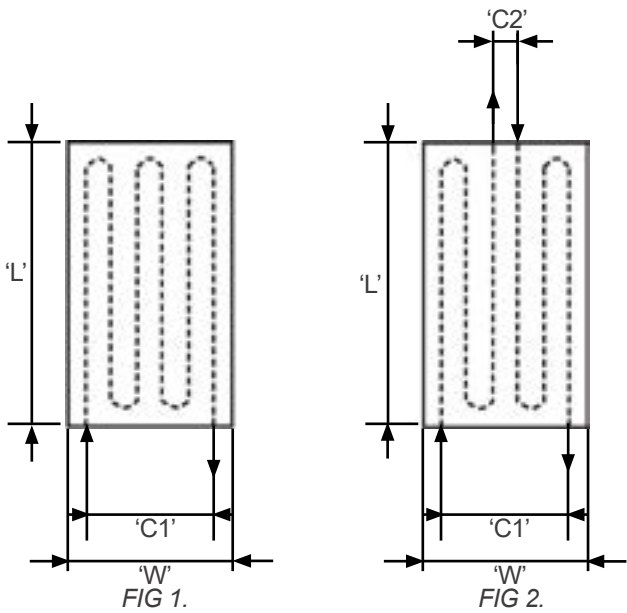
Heating Effect

Panel Dimensions		ΔtK (Mean water Temperature less room temperature (°C))																	
		48		50		52		54		55		56		58		60		62	
Width (m)	Length (m)	Q̇(w)	ṁ (l/s)	Q̇(w)	ṁ (l/s)	Q̇(w)	ṁ (l/s)	Q̇(w)	ṁ (l/s)	Q̇(w)	ṁ (l/s)	Q̇(w)	ṁ (l/s)	Q̇(w)	ṁ (l/s)	Q̇(w)	ṁ (l/s)	Q̇(w)	ṁ (l/s)
0.6	0.6	180	0.012	189	0.012	198	0.012	207	0.012	212	0.012	216	0.012	226	0.012	235	0.012	244	0.012
	1.2	360	0.012	378	0.012	396	0.012	414	0.012	423	0.012	433	0.012	451	0.012	470	0.012	489	0.012
	1.8	540	0.012	567	0.012	594	0.013	621	0.014	635	0.014	649	0.014	677	0.015	705	0.015	733	0.016
	2.4	720	0.016	756	0.016	792	0.017	829	0.018	847	0.018	865	0.019	902	0.020	940	0.020	977	0.021
	3.0	900	0.020	945	0.021	990	0.022	1036	0.023	1059	0.023	1082	0.024	1128	0.025	1175	0.026	1222	0.027
0.9	0.6	270	0.012	283	0.012	297	0.012	311	0.012	318	0.012	325	0.012	338	0.012	352	0.012	366	0.012
	1.2	540	0.012	567	0.012	594	0.013	621	0.014	635	0.014	649	0.014	677	0.015	705	0.015	733	0.016
	1.8	810	0.018	850	0.019	891	0.019	932	0.020	953	0.021	974	0.021	1015	0.022	1057	0.023	1099	0.024
	2.4	1080	0.024	1134	0.025	1188	0.026	1243	0.027	1270	0.028	1298	0.028	1354	0.029	1410	0.031	1466	0.032
	3.0	1350	0.029	1417	0.031	1485	0.032	1554	0.034	1588	0.035	1623	0.035	1692	0.037	1762	0.038	1832	0.040

Above stated radiant flow rates based on 82°C Flow and 72°C return with a room temperature of 21.5°C.
 For red values the flow rate has been adjusted to the recommended minimum flow of 0.012 kg/s.



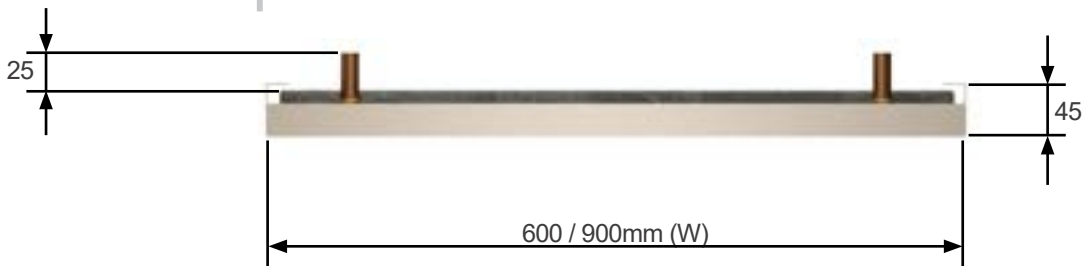
Manifold, Coupling & Connection Arrangement



Coupling Type	C6	D6
Pipe Configuration	FIG 1.	FIG 2.
Length 'L'	M -8mm	M -8mm
Width 'W'	592mm	592mm
Con. Centre 1 'C1'	500mm	500mm
Con. Centre 2 'C2'	N/A	100mm
Water Content (per tube)	0.15 l/m	0.15 l/m
Panel Weight (Dry)	11.5 kg/m	11.5 kg/m
Minimum Flow Rate*	0.012 kg/s	0.012 kg/s
Maximum Flow Rate**	0.105 kg/s	0.105 kg/s
Thermal Expansion***	1.6 mm/m	

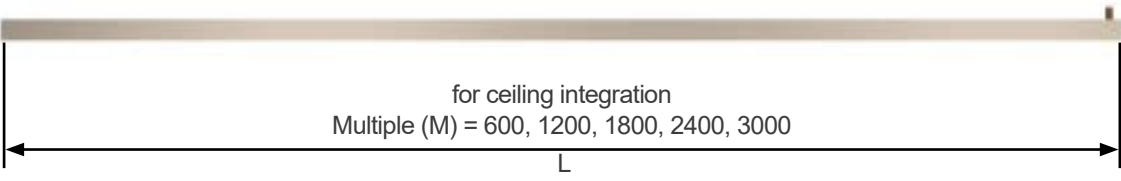
Note: All flow and return connections manifolds are 15mm OD vertical.
 * @ 76°C MWT
 ** (1.0 m/s) with $\Delta P = 13.7$ kPa (3.0m long panel)
 *** @ 55°C Above Ambient

Width & Depth mm



Modula is manufactured in standard module lengths (L) from 0.6m, up to 3.0m. Actual dimensions are less 8mm to fit into standard T-bars. All panels are manufactured to a dimensional tolerance of ± 1 mm.

Length mm



Modula is manufactured in standard module lengths (L) from 0.6m, up to 3.0m. Actual dimensions are less 8mm to fit into standard T-bars. All panels are manufactured to a dimensional tolerance of ± 1 mm.

Testing Protocols

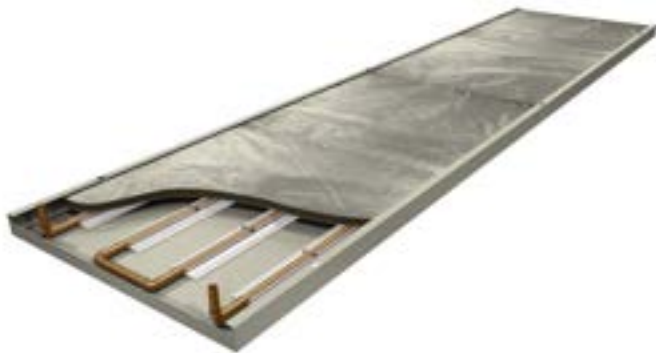
Maximum working pressure	8.7 Bar (g)
Maximum test pressure	13.0 Bar (g)
Classification category	SEP
Pressure equipment directive 97 / 23 / EC	

Extrusion Specification

Section tolerances	BS 1474
Chemical properties	BS 1472
Heat treatment	BS 1490

Thermal Insulation

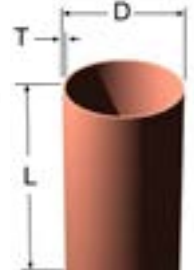
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Copper Pipe Specification

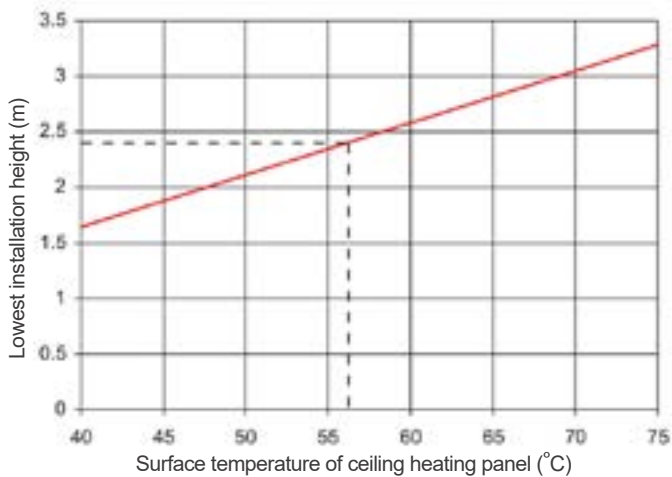
The copper pipe used in the manufacture of the Modula heating panel is compatible with the European Standard for Copper Tubes EN12449 / EN12735-2. The dimensional specification are as follows;

Outside Diameter (D): 15mm
 Wall Thickness (T): 0.38mm
 Minimum Straight Length (L): 35mm



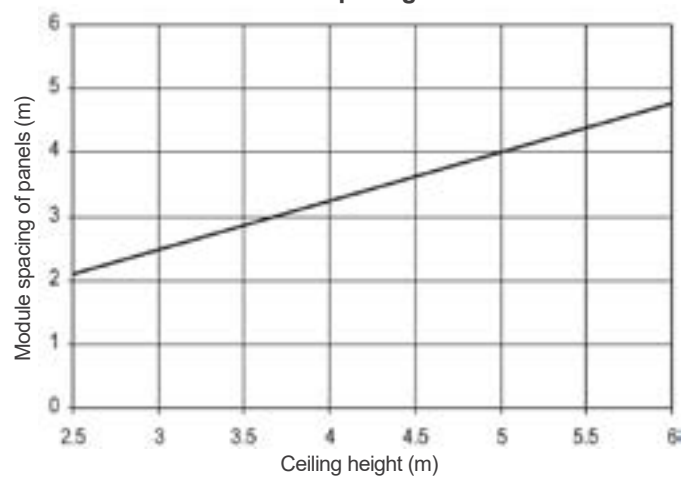
Modula Dimension Guidelines

Installation heights and temperature



Guide to lowest installation height for the ceiling heater with radiant temperature asymmetry of 5°C. Assumes panel installation adjacent to cold wall / window.

Panel Spacing



Recommended spacings between heating panels (centre-to-centre).





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