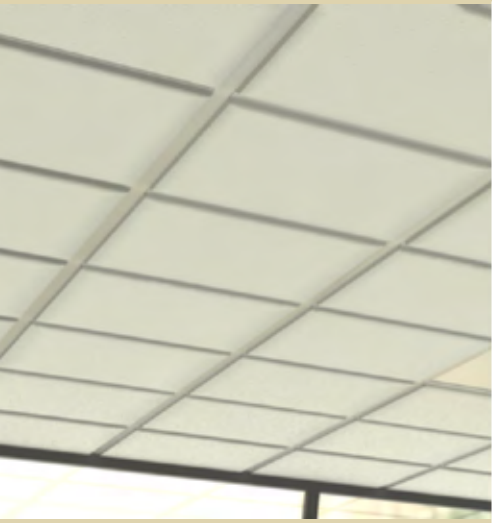
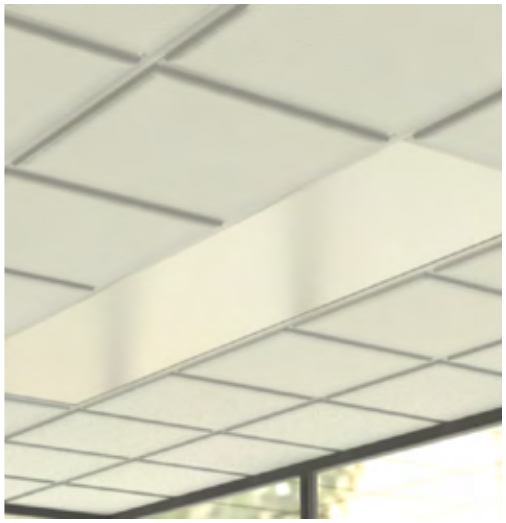
*the future of space conditioning*

# Modula High Performance

## heating panel





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

**Installation**
Ceiling integrated
Free hanging

**Capacity**
618 W/m² @ 55 dtK.

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

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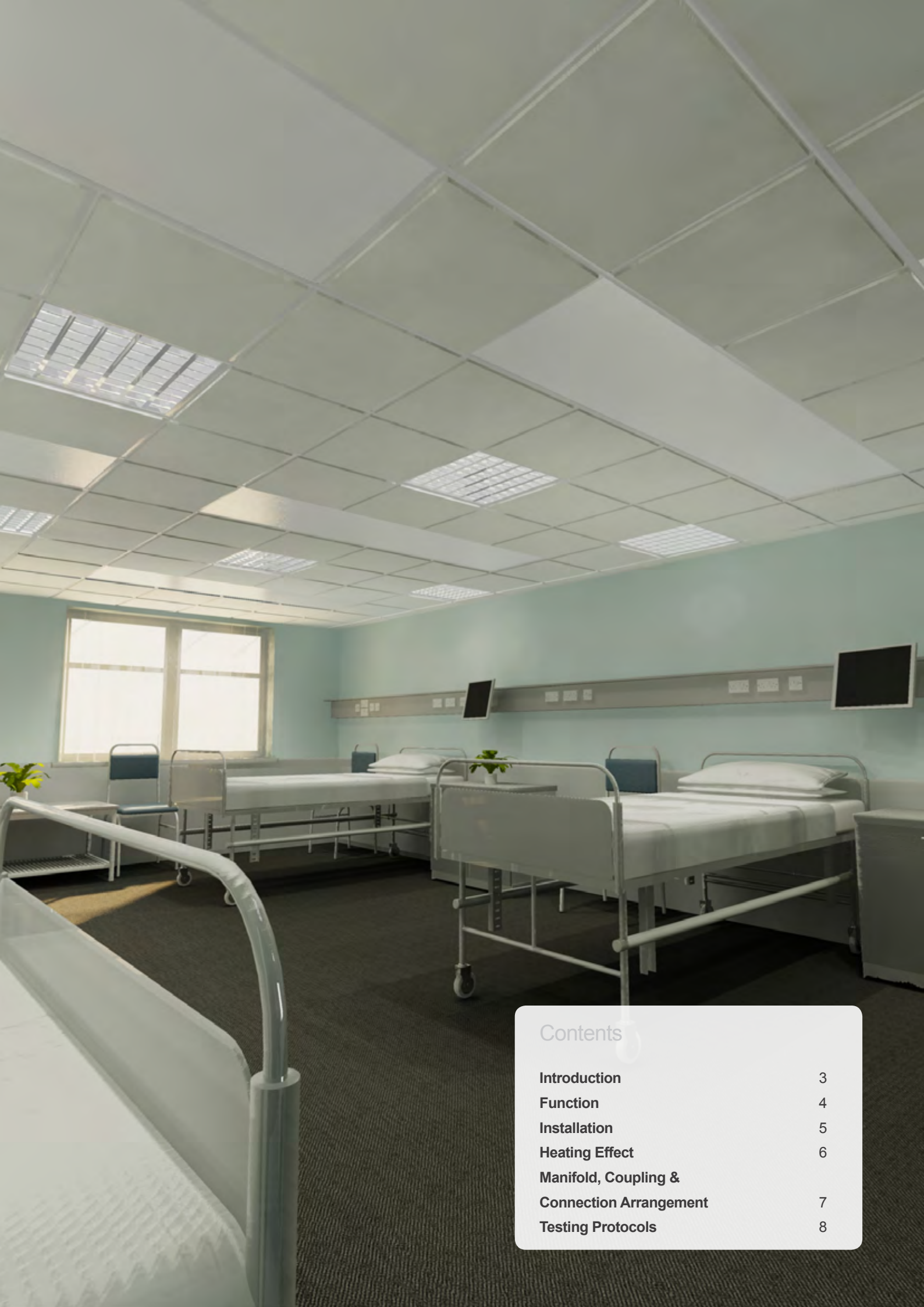


## Contents

# 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 utilizing 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 heating cassette. The cassettes are manufactured from 1.0mm gauge smooth-faced steel panels 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 then 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 wrapped mineral wool insulation 45 kg/m³ density. The technology employed in the construction of the cassette 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.
- 618 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.

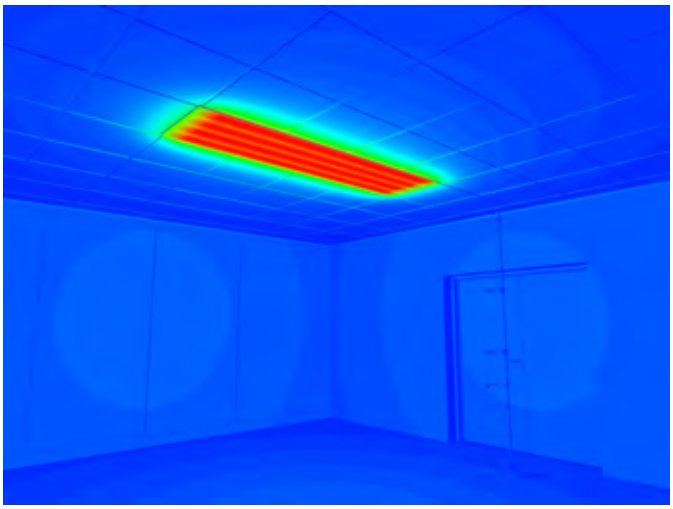
# Function

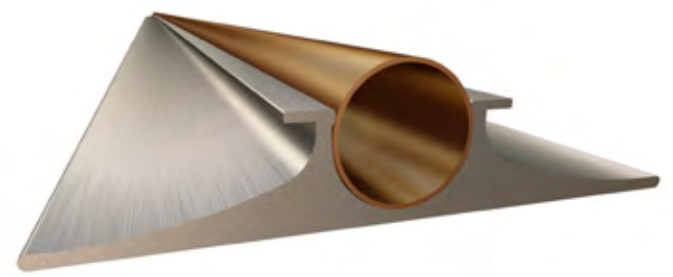
With an output of 618 W/m² at 55 dtK. Modula is one of the most efficient smooth-faced radiant heating panels currently available.

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 aluminium 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

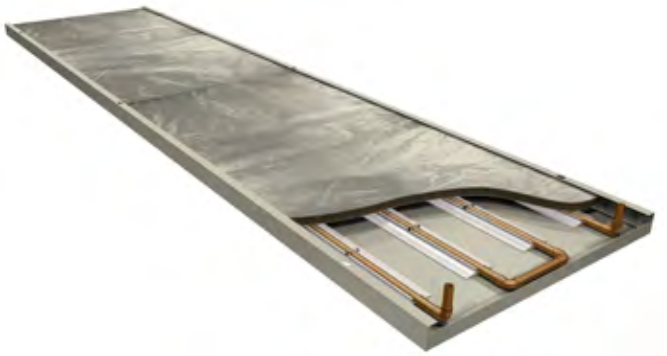
*Dimensions:* Modula is available in two widths, as standard - 0.6m and 0.3m. The dimensions are reduced (minus 8mm on length and width) so that panels can be integrated within a traditional suspended ceiling using exposed T-bars (24mm wide) on a 600 x 600mm grid module. The depth of the Modula panel 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 wrapped mineral wool insulation within the panels returned flanges.



## Application

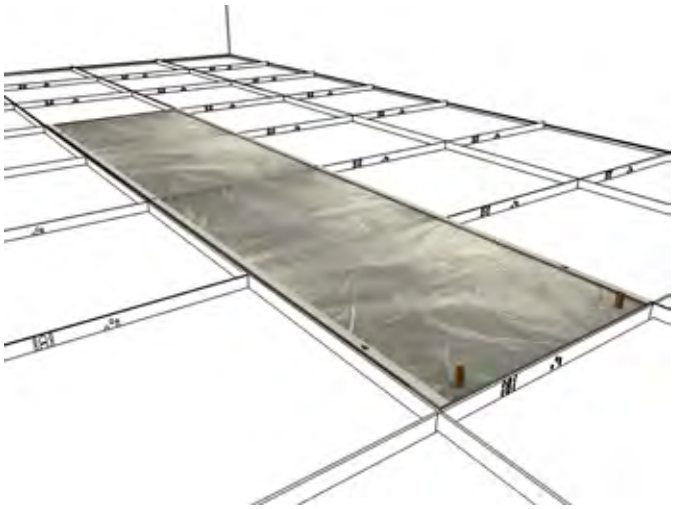
Modula is particularly suited for use in hospitals, schools, shops and offices; in fact wherever there is a need for a high-output radiant heating panel which is simple to install, easy to keep clean and comes at a very competitive price. Modula is the perfect solution for integration with an exposed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

# 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 2.4m long, each positioned no more than 200mm in from each end . Panels 2.4m long or over require 6 No. fixings.

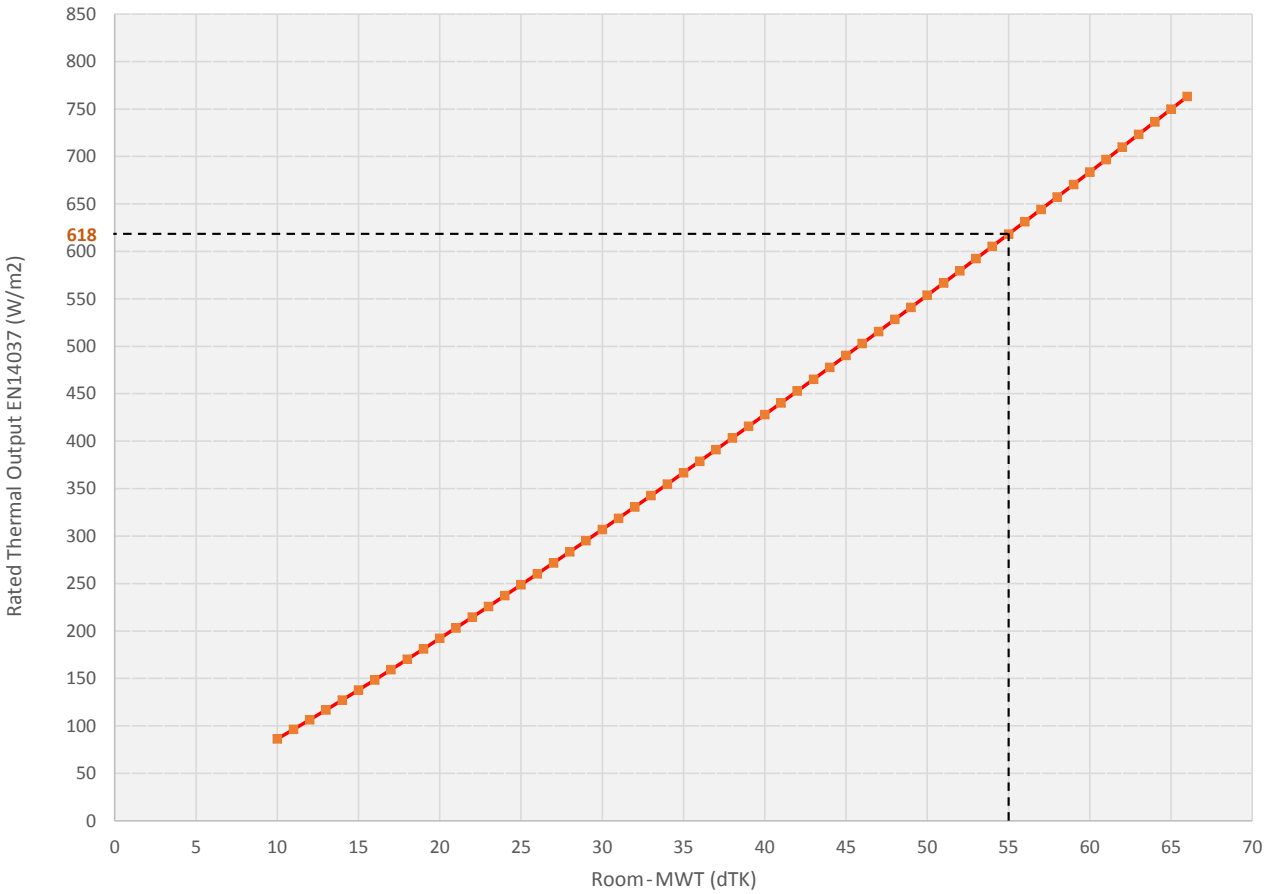
It should be remembered that the ceiling system “main runners” must be designed to run either side of the Modula panel and parallel to its long sides. Ceiling system “cross noggin” bayonets must be capable of being bent back so as not to clash with the Modula panel.

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



# Heating Effect

| Heating effect per panel (w) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Mean water temperature - room temperature (°C) | | | | | | | | |
| Width 0.6m | | | | | | | | |
| Length (m) | 48 | 50 | 52 | 54 | 56 | 58 | 60 | 62 |
| 0.6 | 190 | 199 | 209 | 218 | 227 | 237 | 246 | 256 |
| 1.2 | 380 | 399 | 417 | 436 | 454 | 473 | 492 | 511 |
| 1.8 | 571 | 598 | 626 | 654 | 682 | 710 | 738 | 767 |
| 2.4 | 761 | 797 | 834 | 872 | 909 | 947 | 984 | 1022 |
| 3.0 | 951 | 997 | 1043 | 1089 | 1136 | 1183 | 1230 | 1278 |
| Width 0.9m | | | | | | | | |
| Length (m) | 48 | 50 | 52 | 54 | 56 | 58 | 60 | 62 |
| 0.6 | 285 | 299 | 313 | 327 | 341 | 355 | 369 | 383 |
| 1.2 | 571 | 598 | 626 | 654 | 682 | 710 | 738 | 767 |
| 1.8 | 856 | 897 | 939 | 981 | 1023 | 1065 | 1107 | 1150 |
| 2.4 | 1141 | 1196 | 1252 | 1307 | 1363 | 1420 | 1477 | 1534 |
| 3.0 | 1426 | 1495 | 1565 | 1634 | 1704 | 1775 | 1846 | 1917 |



# Manifold, Coupling & Connection Arrangement

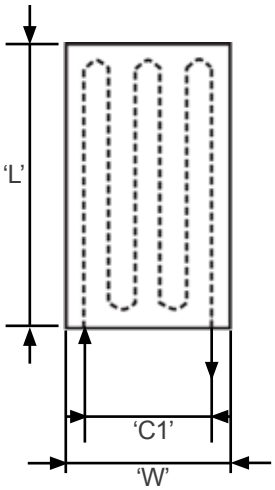


*FIG 1.*

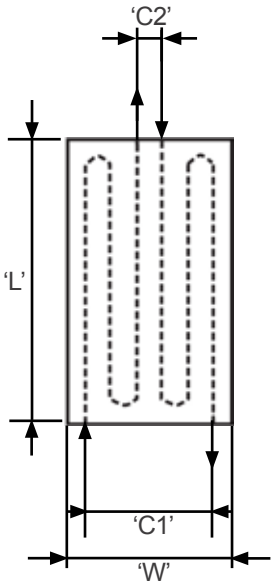
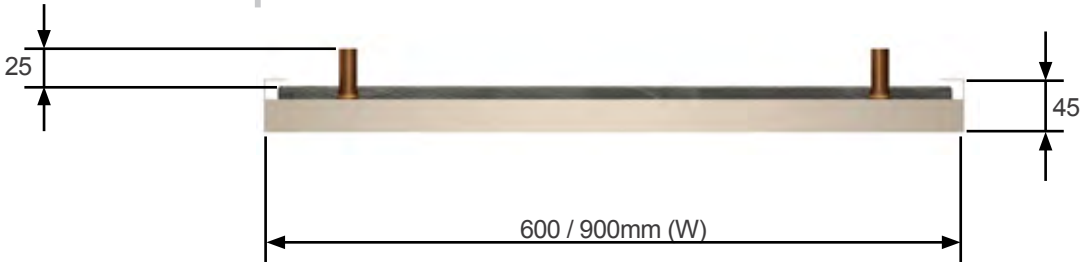


*FIG 2.*

| 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** | 0.11 kg/s | 0.11 kg/s |
| Thermal Expansion*** | 1.6 mm/m | |

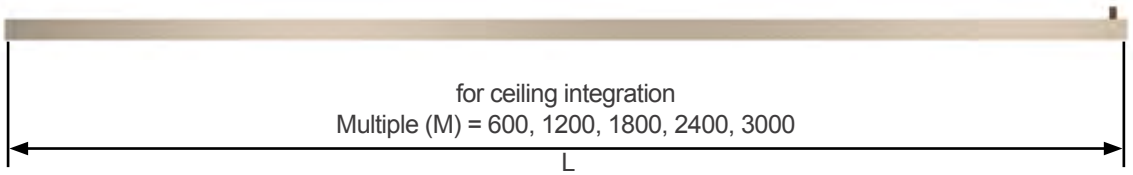
**Note:** All flow and return connections manifolds are 15mm OD vertical.
* @ 76°C MWT
** (1.0 m/s) with ΔP = 13.7 kPa (3.0m long panel)
*** @ 55°C Above Ambient

## 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 ±1mm.

## 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 ±1mm.

# Testing Protocols

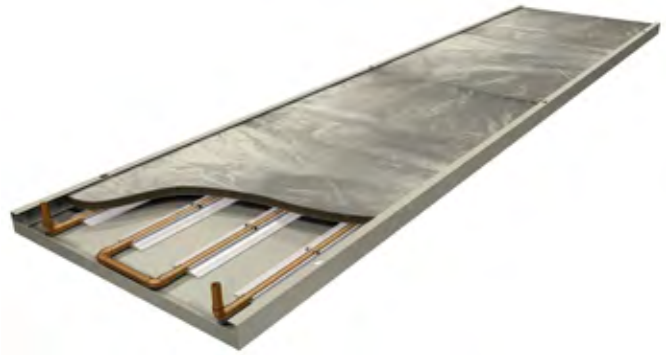
| | |
|---|---|
| Maximum working pressure | 8.7 Bar (g) |
| Maximum test pressure | 13.0 Bar (g) |
| Classification category | SEP |
| Pressure equipment directive 97 / 23 / EC | |

## Extrusion Specification

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

## Thermal Insulation

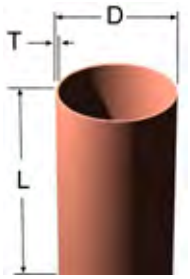
Modula panels are supplied with integrated 25mm thick 45 kg/m³ class 'O' foil wrapped mineral wool insulation within the panels returned flanges.



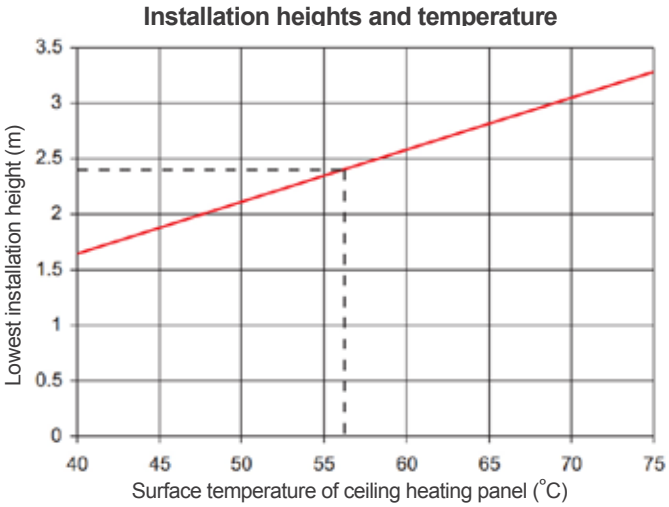
## Copper Pipe Specification

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;

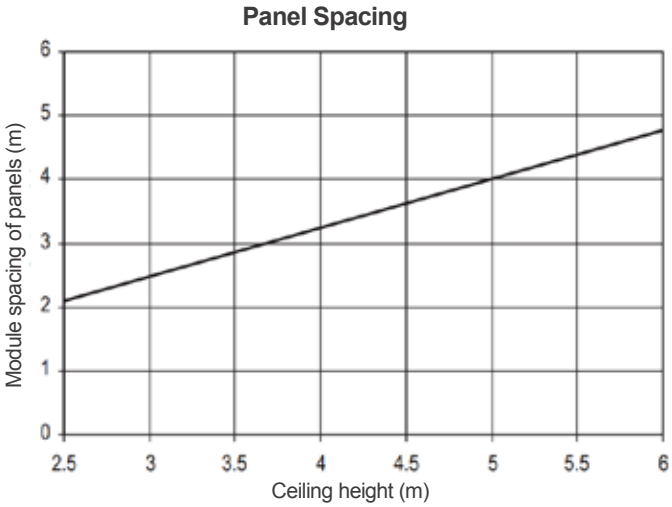
Outside Diameter (D): 15mm
Wall Thickness (T): 0.38mm
Minimum Straight Length (L): 35mm




## Modula Dimension Guidelines




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




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

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systems

## UK Head Office

Frenger System Ltd
Riverside Road
Pride Park
Derby
DE24 8HY

tel: +44 0 1332 295 678
fax: +44 0 1332 381 054
sales@frenger.co.uk
www.frenger.co.uk

## Australian Office

Frenger
Level 20
Tower 2
201 Sussex Street
Sydney
NSW 2000
Australia

tel: +61 2 9006 1147
fax: +61 2 9006 1010
sales@frenger.org.au
www.frenger.org.au

## American Office

FTF Group Climate
1501 Broadway, Times Square
12th Floor
New York
NY 10036
United States of America

tel: +00 1 646 571 2151
fax: +00 1 646 571 2001
sales@ftfgroup.us
www.ftfgroup.us

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