1.0 Description

Modula is an unobtrusive modular heating panel. The panels are manufactured from 1.0mm thick 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 foil encapsulated mineral wool insulation. 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 a smooth faced simple-to-install panel with high heating capacity is the preferred solution.

Fig 1. Modula Radiant Panel

1.1 Product Specification

With an output of **588 w/m²** (Modula HP) 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.

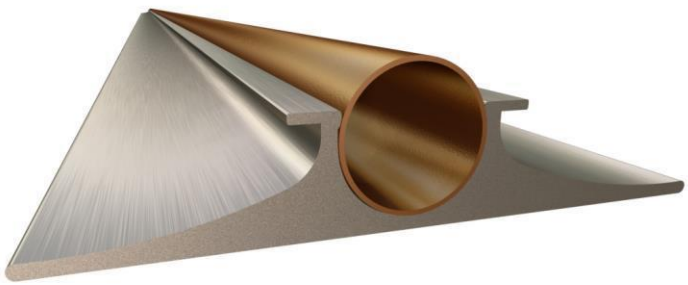


Fig 2. Modula copper pipe and extruded pipe seat

1.2 System Operation

The Modula heating panel warms the room by both radiation and by convection. The radiation is to the surrounding colder surfaces and the convection to passing room air.

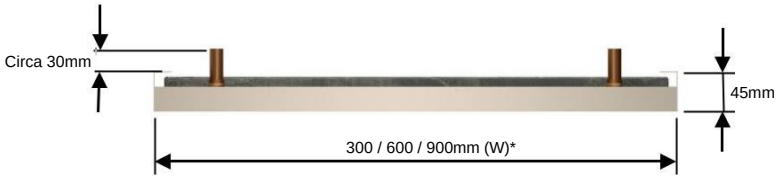
Modula is comprised of copper tube pathways mechanically fixed within formed Aluminium pipe seats, bonded to a smooth steel faceplate.

Warm water is passed through the copper tube pathways at a sufficient turbulent flow rate ensuring heat transfer that warms the steel faceplate, so creating radiant and convective heat output.

2.0 Product Details

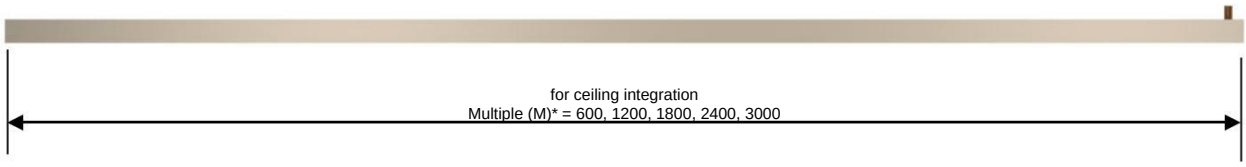
2.1 Dimension

2.1.1 Width & Depth, mm



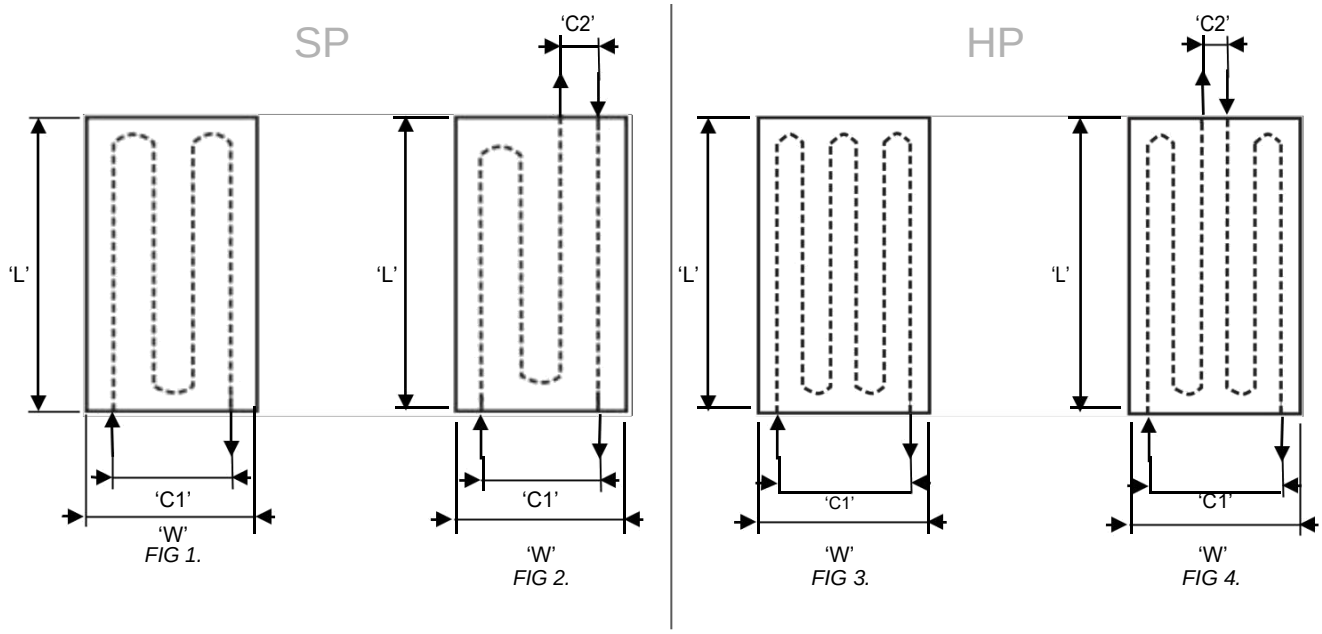
Modula is manufactured in standard module widths (W) from 0.3m, 0.6m to 0.9m.
*Actual dimensions are less 8mm to fit into standard T-bars. All panels manufactured to a dimensional tolerance of +/- 1mm.

2.1.2 Length, mm



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

2.2 Manifold, Coupling & Connection Arrangement



Coupling Type	C4	D4/D4-O	C6	D6
Pipe Configuration	Fig 1.	FIG 2.	FIG 3.	FIG 4.
Length 'L'	-8mm	-8mm	-8mm	-8mm
Width 'W'	592mm	592mm	592mm	592mm
Con. Centre 1 'C1'	450mm	450mm	500mm	500mm
Con. Centre 2 'C2'	N/A	150mm	N/A	100mm
Water Content (per tube)	0.15 l/m	0.15 l/m	0.15 l/m	0.15 l/m
Panel Weight (dry)	10.0 kg/m	10.0 kg/m	11.5 kg/m	11.5 kg/m
Minimum Flow Rate*	0.012 kg/s	0.012 kg/s	0.012 kg/s	0.012 kg/s
Maximum Flow Rate**	0.105 kg/s	0.105 kg/s	0.105 kg/s	0.105 kg/s
Thermal Expansion***	1.6mm/m			

Note: All flow and return connections are 15mm OD vertical
*@ 76°C MWT
** (1.0 m/s) with ΔP = 13.4 kPa (3.0m long panel)
*** @ 55°C Above Ambient

2.3 Thermal Insulation

Modula panels are supplied with integrated thermal insulation; 25mm thick 45kg/m³ class 'O' foil encapsulate mineral wool insulation.

3.0 Product Performance

Modula SP

		ΔtK (Mean water Temperature less room temperature (°C))								
Panel Dimensions		48	50	52	54	55	56	58	60	62
Width (m)	Length (m)	Q̇ (W)	Q̇ (W)	Q̇ (W)	Q̇ (W)	Q̇ (W)	Q̇ (W)	Q̇ (W)	Q̇ (W)	Q̇ (W)
0.3	0.6	81	85	89	93	95	97	101	105	109
0.3	1.2	161	169	177	186	190	194	202	210	218
0.3	1.8	242	254	266	278	284	291	303	315	328
0.3	2.4	323	339	355	371	379	387	404	420	437
0.3	3.0	404	424	444	464	474	484	505	525	546
0.6	0.6	161	169	177	186	190	194	202	210	218
0.6	1.2	323	339	355	371	379	387	404	420	437
0.6	1.8	484	508	532	557	569	581	606	630	655
0.6	2.4	646	678	710	742	758	775	808	840	874
0.6	3.0	807	847	887	928	948	968	1009	1051	1092
0.9	0.6	242	254	266	278	284	291	303	315	328
0.9	1.2	484	508	532	557	569	581	606	630	655
0.9	1.8	727	763	799	835	853	872	908	946	983
0.9	2.4	969	1017	1065	1113	1138	1162	1211	1261	1310
0.9	3.0	1211	1271	1331	1392	1422	1453	1514	1576	1638
Above stated radiant outputs based on 82°C Flow and 72°C return with a room temperature of 21.5°C.										

Modula HP

		ΔtK (Mean water Temperature less room temperature (°C))								
Panel Dimensions		48	50	52	54	55	56	58	60	62
Width (m)	Length (m)	Q̇ (W)	Q̇ (W)	Q̇ (W)	Q̇ (W)	Q̇ (W)	Q̇ (W)	Q̇ (W)	Q̇ (W)	Q̇ (W)
0.6	0.6	180	189	198	207	212	216	226	235	244
0.6	1.2	360	378	396	414	423	433	451	470	489
0.6	1.8	540	567	594	621	635	649	677	705	733
0.6	2.4	720	756	792	829	847	865	902	940	977
0.6	3.0	900	945	990	1036	1059	1082	1128	1175	1222
0.9	0.6	270	283	297	311	318	325	338	352	366
0.9	1.2	540	567	594	621	635	649	677	705	733
0.9	1.8	810	850	891	932	953	974	1015	1057	1099
0.9	2.4	1080	1134	1188	1243	1270	1298	1354	1410	1466
0.9	3.0	1350	1417	1485	1554	1588	1623	1692	1762	1832
Above stated radiant outputs based on 82°C Flow and 72°C return with a room temperature of 21.5°C.										

4.0 Suspension / Installation

Important!
Installation and maintenance is to be performed by properly trained personnel only!
Wear eye protection and cut resistant / proof gloves.
Product includes sharp edges and burrs!

The Modula panels are designed to be fixed directly back to the structural soffit. Panels are supplied with pre-punched holes which are suitable for suspension using rigid threaded rod hanging systems (by others). Four holes are required for each heating panel section up to 1.8m long; each positioned no more than ¼ panel lengths in from each end (e.g. maximum 0.3m from each end on a 1.2m panel). 2.4m/3m panel sections require 6 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 panels.

5.0 Coupling & Connection

Water connections should be either Solder or Compression fittings; do not twist the copper pipes.

Note: Copper inserts should be fitted into the flow and return tails before connecting the connection fittings.

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

5.2 Connection

Each flow and return tail will arrive with a protective cap that should be removed at time of installation

The supplied copper inserts should be used when making connection to prevent the possibility of pipe crushing. Always support the copper pipe coil whilst inserting the copper inserts into position.

Do not use excessive force when inserting the copper inserts into position, as this may cause deformation of the panel face.

5.3 Copper Pipe Specification

The copper pipe used to manufacture the Modula Heating Connections is compatible with the European Standard for Copper tubes EN12735-2; the dimensional specification is as follows:

Outside Diameter (D): 15 mm ± 0,04 mm.
Wall Thickness (T): 0.38 mm.
Minimum Straight Length (L): 35 mm

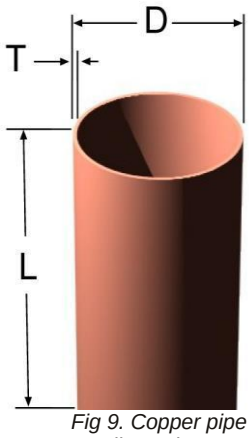


Fig 9. Copper pipe dimensions

6.0 Maintenance

The Modula panel should be cleaned periodically. The frequency of cleaning depends on the indoor climate of the environment which the panel is installed.

Dust and marks are best removed from the surface of the panel with a damp cloth. More stubborn stains can be removed with a mild detergent.

7.0 Water and Air Quality

A specialist water treatment contractor should carry out water preparation and maintenance.

The water system must be air tight to prevent oxygen entering the pipe work. The pipe work must also be equipped with automatic air vents to remove any air in the system. The LTHW system should be filled using potable water which compliesctivewith… 98/83/the“**EC** ”Dire.In addition:

- The water quality must have a pH-value of approximately 6-9.
- The water velocities should not exceed 1 m/s.
- Oxygen in the water must not exceed 1 ml/l.
- In-line strainers are to be used to remove particles from the water.
- Any additive inhibitors must be appropriate to use with copper and solder.

8.0 System Working Pressure

Modula radiant heating panels have been designed and manufactured in accordance with the Pressure Equipment Directive 97/23/EC. The units are classified as SEP – Sound Engineering Practice and are manufactured and tested to the following pressures:

Maximum working pressure	8.7 bar (g)
Maximum test pressure	13 bar (g)

9.0 Product Labelling

Project: Contract name
Contract No.: Order identification number.
Length (m): *0.6m, 1.2m, 1.8m, 2.4m, 3.0m*
Width (m): *0.3m, 0.6m, 0.9m*
Manifold: C2, D2, C4, D4, D4-O, C6, D6, C8, D8, D8-O
Product Code: The product's type ID number.

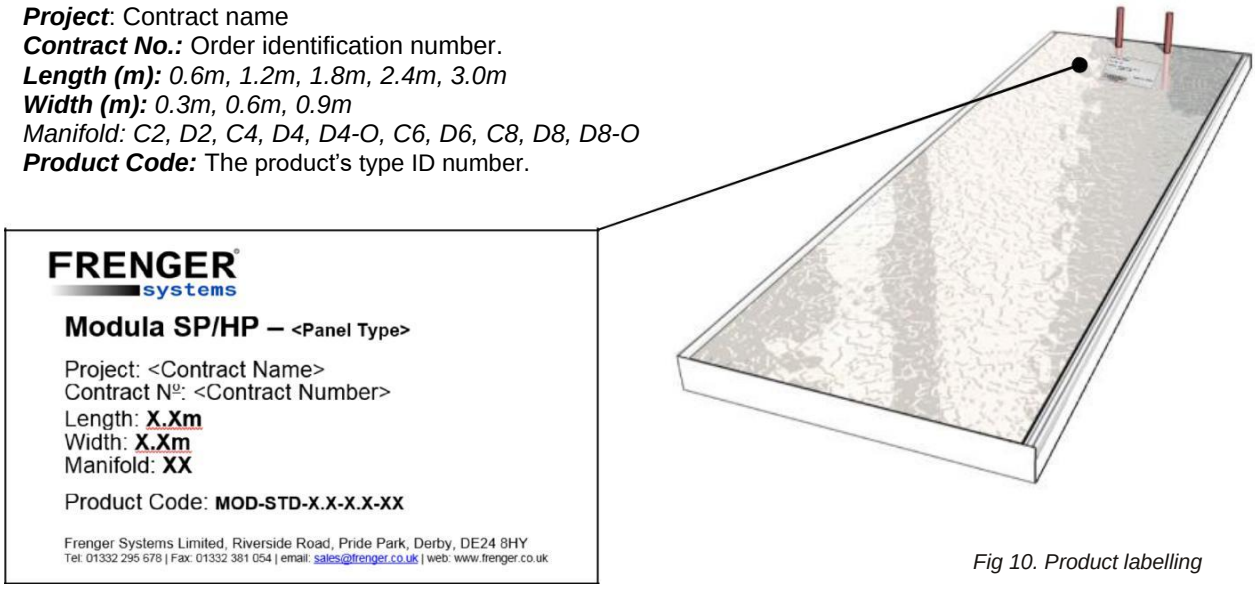


Fig 10. Product labelling

10.0 Delivery & Handling

Panels are supplied within purpose made pallets each panel has a protected low-tac film covering the panel face to protect it from damage. Panels will be spaced using polystyrene sheets and Frenger's specially designed cardboard end caps.