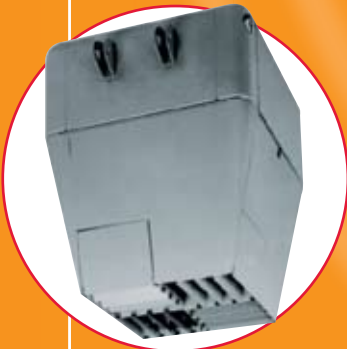




# Copperad Heat Emitters



## Introduction

### Introduction to Heat Emitters

This catalogue features the range of Copperad heat emitters available through your local BSS branch. Full specification data is included together with dimensional details and other necessary information. Our technical specialists are pleased to visit clients and advise on the most suitable equipment for a proposed application.

Products supplied by BSS are generally in accordance with British or other international Standard Specifications where applicable and as interpreted by the manufacturers, and present no hazard to health or safety if properly installed. There are however, many occasions when goods are ordered from us without any reference being made to the intended use, in which case, the company must assume that the users will take all necessary steps to ensure that the products purchased are suitable for the conditions in which they are intended to operate.

Our current catalogues generally indicate the Standards and Classes with which the products comply, but if in doubt, please consult your nearest BSS branch. This equipment complements our existing range of heating products, which include our well known range of boilers, heat exchangers, flue and chimney equipment and a comprehensive package of heating and ventilating controls all of which are exstock from our central warehouse and readily available to all our depots.

### Copperad – A Brief History

Copperad originated in 1932 as the British Unit Heater Company, founded by Mr. S. J. Holmes and a Mr. R. F. Jarratt. The name “Copperad” first appeared in 1939 when the company moved to St. Pancras Place, London, as the brand name for the unit heaters. In 1945 a second piece of apparatus was designed, to replace radiators, and the fan convector was born. In 1946 Copperad Limited became the company name.

Although there have been many changes of ownership, and indeed design, in the intervening years, Copperad has maintained a high level of respect as a brand throughout this period. The most significant change has been the decision to sell all Copperad products into the UK exclusively through nationwide distributor BSS (UK). This decision was not surprising as BSS has been one of Copperad’s major accounts since the early days of the 1930’s and continues to offer major benefits to designers and contractors from its network of local branches.

The BSS Group plc and its subsidiary companies assume that the user will take all necessary steps to ensure that all products purchased are suitable for the conditions in which they were intended to operate.

Every effort has been made to ensure that the information contained in this publication is accurate at the time of publishing but all illustrations and descriptions are intended to provide an approximation only and are not subject to contractual liability.

The BSS Group plc and its subsidiary companies expressly exclude all liability for typographical errors or omissions or for any misinterpretation of the information provided in this publication. All products are subject to alteration without notice.

The Copperad fan convector is the latest, stylish range offered with the flexibility to meet the wide variety of site applications encountered by designers, specifiers and installers for varied applications including schools, colleges, offices and public buildings. A full range of casing styles is available to cover all applications, available in four major types:

- Floor mounted
- Concealed
- Horizontal
- Hideaway

The free-standing floor mounted and concealed types are supplied in two heights, low level (600mm), ideal for under sill or under worktop applications and extended (2100mm). The Horizontal and Hideaway styles are 600mm high and 340mm high respectively. A style selection chart is given on pages 10 and 11.

Single sloping units can be floor or wall mounted, whilst the double sloping unit is designed for ceiling mounting, but could be used on a wall.

For safety, and aesthetics, all low level units feature curved top and bottom front edges, and pencil proof grilles prevent the ingress of any unwanted items into the casing, making them particularly suitable for use in buildings where children or elderly people are accommodated. Grilles, where fitted, are finished in dark grey RAL 7000 which complements the casing finish of light grey RAL 9002 chosen to look attractive in a variety of surroundings.

The style selection chart shows certain installation suggestions, where the unit is completely enclosed behind builders work panels, e.g. styles 50 or 83. It is important that when using this method, the builders work panelling has an easily removable section, at least corresponding to the front access panel of the unit this is necessary to achieve access for filter cleaning etc.

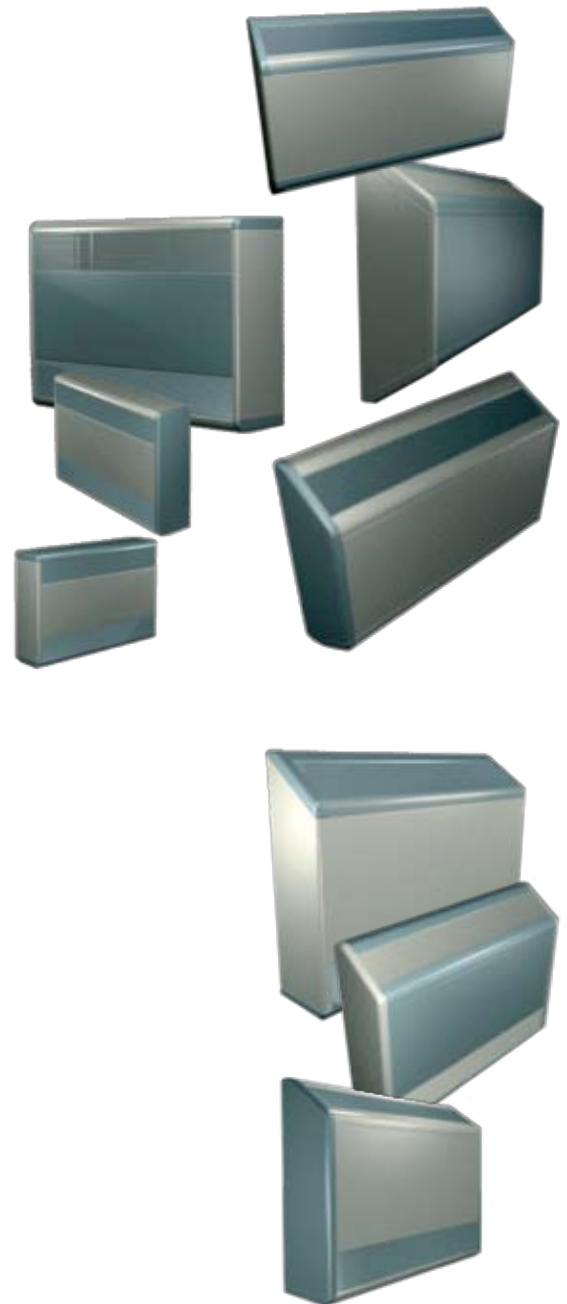
The hideaway units style 90 are designed to be entirely hidden behind builders work. The heat exchanger is enclosed but no spigot is provided for air inlet. The fan tray is removable, and contains the filter. These units can be mounted either vertically or horizontally and a builders work access panel must be provided, large enough to remove the fan tray.

### Ease of Access

Access to all units is via the front panel; and this is easily removed by undoing two screws which retain the front panel to the case, unlocking the key locks if fitted, allowing access to the heat exchanger, pipe and connections and fan tray. The fan tray is disconnected from the main electrical supply (and all ancillary equipment) at the terminal block thus making it safe to handle. The fan tray slides out to reveal the washable filter, on the rear inlet and hideaway models. For front and bottom inlet units, the filter is located across the inlet grill or opening, with extended units the filter is positioned in the top half of the unit directly below the fan tray assembly.

### Slideaway Fan Tray

This is fitted immediately below the heat exchanger and is a self-contained unit carrying the fans, motor, terminal block and the optional speed control switch and thermostats.



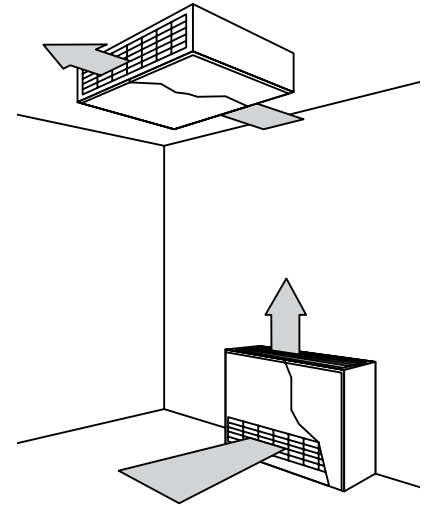
## Fan Convectors

### Connections

All heat exchanger connections are screwed 3/4" BSP female. Flow and return connections are always together at the same end of the unit, at the opposite end to the electrical connections. The required pipe connection end (i.e. left or right hand) should always be specified when ordering. Please note that the handing is determined when facing the access panel. When conditions demand a change in handing, this can easily be accommodated on site (see instructions in IOM). The heat exchanger can also be inverted on site to bring the pipework in from above.

**Note:** Right hand connections will be supplied if handing is not stated.

Both units right handed as viewed on front access panel



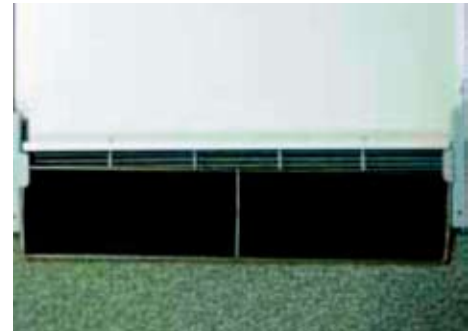
### Heat Exchanger

Heat exchangers are available for use on low and medium temperature hot water. These are made in either a one, two or three row configuration to give the emission required, and include a low temperature cut out thermostat as standard. Also available are heat exchangers suitable for use with steam.



### Filters

Air filters made from washable flame retardant bonded polyester material are fitted as standard. They are situated in the top of the fan tray and can be removed after only partially sliding out the tray on rear inlet and hideaway units. Front and bottom inlet units have the filter located across the grille or opening. Extended casings have the filter positioned in the top half of the units below the fan tray assembly.



### Concealed Valves

All units have been designed to accommodate isolating valves within the casing, access being available only after removing the front panel. Screw operated straight type Ballofix type valves can be supplied in 3/4" BSP sizes on both flow and return pipework.



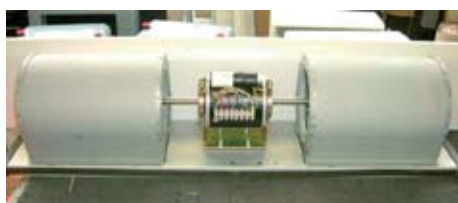


### Air Vents

All heat exchangers, except those intended for use in steam systems, are fitted with air vents as standard. As an optional extra these can be replaced with either automatic air vents or extended air vents accessible from the front without removing the front panel.

### Multi-Speed Motors

Capacitor start motors giving the choice of three operating speeds are fitted as standard. They are totally enclosed frames with super silent, oiled for life, factory sealed bearings that require no maintenance. Twin shaft motors are fitted to the 900mm and 1200mm long units with a single shaft on the 600mm long units.



### Voltage

All units are suitable for use on a 240V 50Hz single phase supply. As an option, motors can be supplied to operate on a 220V supply. 3 AMP fuse protection is provided.

### Overheat Cut-Out

Motors will have built in Standard Thermal Overload Protection (S.T.O.P) with automatic reset.



### Speed Control Switch

This can be built into all floor/wall mounted and concealed styles. The switch is a rocker type with three positions; low, medium and high speed. The switch is concealed behind a plain front access panel. A separate on/off rocker switch is provided. The switch can also be supplied fitted into a wall mounted switch box suitable for the remote control of all styles. A standard electrical back box is used, suitable for either surface or flush mounting, which is fitted with a white plastic switch plate. A remote summer/winter rocker switch can be fitted if required, either mounted on the plate internally or into the external remote switch box.



### Full Range of Controls

As optional extras, inbuilt thermostats may be fitted to automatically switch the unit on/off (T1) or to provide speed change (med/low (T2) or medium/high (T3).

However with inverted, horizontal, hideaway and those floor/wall mounted and concealed styles fitted with fresh air inlets, inbuilt thermostats are not recommended. For such applications a remote wall mounted thermostat should be used. Access to inbuilt thermostats is via the front panel. Details of automatic thermostatic control are given on page 15.

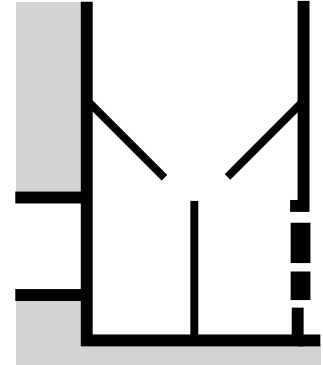
### Terminal Block

The terminal block is a combined three section plug and socket, allowing the fan tray, with all controls and wiring, to be removed to a convenient and safe position for maintenance purposes. It can be replaced without having to refer to a wiring diagram.

## Fan Convectors

### Dampers

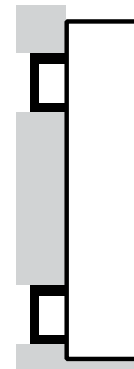
Where a mixture of fresh air and recirculated air is required, a manually operated damper mechanism is available, this allows the fresh air inlet spigot to be closed off when required. The damper is fitted to the lower rear panel without incurring any increase in height of the units. Unauthorised adjustment of the damper is prevented, by making it accessible only after removing the front panel. Motorised versions of the damper mechanism are available to order (factory fitted only), further details upon application.



Damper

### Recessed Installation

All styles having front outlet can if required be partly or fully recessed into a wall, cupboard or shelf unit, resulting in a very slim and unobtrusive installation. These units are supplied with factory fitted spigots (20mm) to allow for site connection of duct section / plenums (by others).



Recessed with spigots

### Separate Grilles

For all styles having a spigotted inlet and/or outlet, separate loose grilles of a similar style to those fitted to units, but mounted in a slim attractive architrave frame, can be provided as optional extras. These are finished in light grey with a mid grey grille. Screw holes are provided for easy fixing. Please note that these grilles are not weatherproof and therefore are unsuitable for external use.

### Key Operation

Locks which can only be operated by a special key, can be fitted to the front panel as an option. (Standard on style 21, SS and DS models). Units without key locks have screws in the top grille which fix the panel to the case.

### Sound Insulation

All units are quiet in operation, with the moving parts isolated from the structure and internal surfaces lined, where applicable, with sound absorbing material.



Loose grilles

### Fuse Protection

Overload protection is not normally required. The circuit should be fused in the normal way. 3 amp fuse rating is recommended. A switched fuse box can be supplied as an optional extra (SF).

### Automatic Control

By fully using all the optional control equipment, the unit can operate completely automatically under normal ambient conditions. They can be built in and hidden out of sight if required. The motor can be controlled from an inbuilt switch mounted on the fan tray or from a remote control box. The two lower speeds (low and medium) are used for the majority of applications whilst the high speed is kept for occasions such as rapid warm - up prior to occupancy. The lowest speed is recommended where low noise transmission is essential, such as churches and libraries. A full range of thermostats is also available.



Key lock access panel



### Fitted as standard Low Water Temperature Cut-out (LTC)

Fitted as standard is a fixed setting thermostat attached to the heat exchanger and easily detachable from the fan tray wiring by the plug and socket provided. This avoids cold draughts being circulated, by switching off the fans when the hot water temperature drops below 35°C (95°F). The fans are automatically switched on again when the water temperature rises to 43°C (110°F). An adjustable stat is also available if required (ALTC).

### Optional Controls

#### 1. On/Off control Thermostat (T1)

An adjustable thermostat with its control knob calibrated in degrees Celsius provides On/Off control for the motor in response to changes in ambient air temperature. It is of the liquid expansion type with a sensing bulb located on a bracket attached to the fan scroll on the incoming airstream.

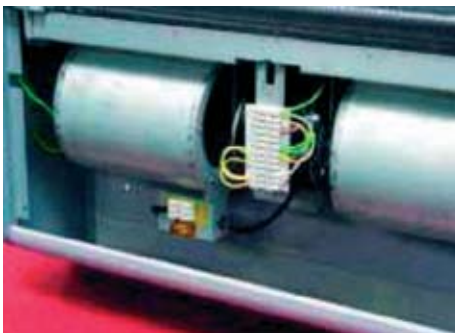
#### 2. Automatic Speed Change Thermostats (T2 and T3)

The same specification as the T1 used by itself or in a pair. Speed can automatically be changed from high to medium (T3) and/or then from medium to low (T2) at any predetermined temperature setting. Normally a temperature difference of between 3°C and 6°C is used between the T1 and T2 and between the T2 and T3. Preset at the time of installation, these thermostats can simply provide a rapid warm-up on high speed which is automatically switched to medium and then low speed when the room is occupied. A constant temperature control is then achieved by the On/Off thermostat (T1). More accurate and sensitive room control may be obtained by using a remote wall mounted T1 thermostat, which must always be used when combining a T2 and T3 together. Remote mounted T1, T2 and T3 thermostats should always be used on horizontal or inverted units or those having fresh air inlets. If a concealed switch is fitted this must be set at a high speed for a T3 or medium speed for a T2.

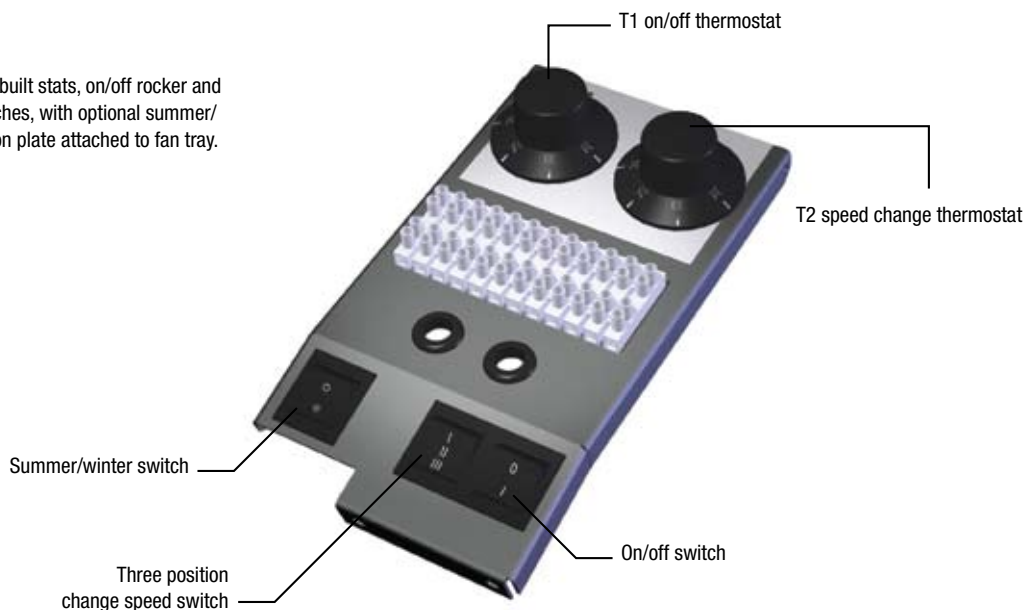
A combined electronic two-stage thermostat has been introduced to provide T1 and T2 functions from one control. Details on application.

#### 3. Special Controls Fan Enable Relay

A 24 AC relay can be fitted, to allow a heater to be switched on/off remotely by a controlled 24 A.C. supply.



Bracket showing two in-built stats, on/off rocker and three speed rocker switches, with optional summer/winter switch mounted on plate attached to fan tray.



## Fan Convectors

### Model Reference and Accessories

The complete model reference is made up of a number of sections. This is an example of how a typical reference should be presented.

- Basic Referencea
- LTC and filter fitted as standard

eg 21 09 R / CS /LTC/T1/T2	
21	Style of fan convector (21 bottom inlet, top outlet, with grilles)
09	Size of coil (to suit 600/900/1200mm wide unit)
(S)	Signifies steam coil where used
R	R = right hand pipe connections (std) , L = left hand pipe connections )
CS	Separate On/off and 3 speed switches mounted internally on a carrier plate
LTC	Low temperature cut out to prevent fans running when water below pre-set temperature (appx 45°C)
T1	Inbuilt on/off thermostat
T2	Inbuilt speed change thermostat, medium to low
T3	Inbuilt speed change thermostat, high to medium <i>NB Only two inbuilt stats can be accommodated, if all three stats selected one (usually on/off) must be remote</i>

Suffix	Description	Available with styles
T1	Thermostat on/off control	All except hideaway, horizontal and inverted units and those with fresh air inlets. Fitted individually or in pairs of T1 and T2 or T2 and T3 or T1 and T3
T2	Thermostat speed control med/low	
T3	Thermostat speed control med/high	
CS	Concealed speed control/on off switches	Standard on 21, DS and SS units
K	Key locks on access panel	11,13,15,23,24,25,27,30,31,32,33 & 40
VE	Extended air vent	All except units with steam coils
VA	Automatic air vent	All except units with steam coils and where operating horizontally
ALTC	Adjustable low temperature cut out	All styles
FER	Fan enable relay 24 VAC	All styles
V075	Factory fitted valves, pair ¾"	All styles. Screw operated type, straight pattern, threaded. Restricted for use with temps up to 120°C (250°F) max
EX	Extension height other than standard 2100mm ( overall height in mm)	30,31,32,33,50,51,& 52. Height to be stated from floor to top of unit, and to be within 1300mm min and 2300mm max
SF	Switched fuse (supplied loose)	All styles
LG600	Loose grille in support frame 600mm	All spigotted units, not suitable as external air inlet grilles. Not included as standard with spigotted units
LG900	Loose grille in support frame 900mm	
LG1200	Loose grille in support frame 1200mm	
RS 1, 2, 3, R	Remote switch box (loose)	All styles: RS1 = on/off, RS2 = speed med/low, RS3 = High/low. Box 1 for single switch or Box 2 for multi switches required (surface (S) or flush mount (F) available)
WMT	Wall mounting thermostat (loose)	
PL600	Plinth 600mm	Supplied loose for low level floor standing units only
PL900	Plinth 900mm	
PL1200	Plinth 1200mm	
INV	Inverted case	Outlet at bottom of case instead of top
RAF	Reversed air flow	Air in at top, out at bottom. Recommended where case inverted
SPF	Special paint finish (Specify RAL)	Standard colour light grey case RAL 9002 with mid grey grilles RAL 7000, CT unit all white RAL 9010

### Style number

Indicates the arrangement of the air inlet and outlet positions on each unit and whether it is a low-level, extended, hideaway or ceiling mounted unit.

### Type

This indicates the heat exchanger for the operating conditions and also defines the unit length (S indicates a steam coil). The type number defines the nominal emission (kW) when operating on hot water or steam at medium speed . (03 and 04 are 600mm units, 05,06 and 08 are 900mm units and 09,12 and 15 are 1200mm units.

### Handing

Left or right handing is determined when facing the access panel – right hand will be supplied unless specifically otherwise stated.

### Options

There are options which can be added to the above basic units to suit individual circumstances, identified below with their suffices, which should be separated by oblique strokes as in the above example



### Selection Criteria

- **Quantity Required?** – and full reference number)
- **Heat Output Required** – kW or Btu/hr
- **Which Model?** – Floor mounting (most popular), Ceiling mounting, Concealed, Extended model, Chassis model
- **Which Medium?**  
LPHW 82°C flow, 71°C return  
MPHW 110°C flow, 90°C return  
Steam (Maximum 8.5 bar)
- **Heat Output?** – kW or Btu/hr
- **Electrical Supply?** – 200/240 Volt, single phase only
- **Mounting Height?** – If ceiling mounted only LPHW/high level, max. 3m
- **Options Required?** – Inbuilt ON/OFF thermostat (T1), speed change thermostat (T2) takes the fan speed from medium to low when temperature is reached, speed change thermostat (T3) takes the fan speed from high to medium when temperature is reached.

#### Note

Only two combinations of thermostat can be used on a single unit, i.e. T1/T3 or T2/T3, etc. Wall mounted thermostat (WMT) can replace inbuilt (T1) thermostat if required. Recommended applications for ceiling mounted unit.

### Selection Guide

Knowing the application required for the unit, the style necessary to suit that application can easily be chosen. The tabulated data of thermal duties is then referred to. As the emission required and operating speed is usually known, together with the flow and return temperatures and ambient conditions, the overall length required can be found from the tables. Factors may have to be used where mean water temperatures differ, etc. The full model reference for ordering can then be built up quite easily.

#### Note

It is recommended that wherever possible units are sized for normal usage on low or medium speed conditions, leaving the higher speed available for quick warm-up situations, units should not be sized on the high speed outputs. If higher water temperatures or low pressure steam are required, then within the limitations mentioned above, the following control systems can be used provided that the water flow temperature does not exceed 115°C (240°F) or the steam pressure exceed 0.7 bar gauge (10lb/in<sup>2</sup> gauge).

1. Operate the fan continuously at one speed or use a remote changeover thermostat(s) and modulate by switching fan speeds (the fan must still run continuously) or
2. Ensure the heating medium is shut off prior to switching the motor off; an automatic valve controlled by a remote thermostat will provide this facility for up to say four fan convectors. Note that these comments apply equally to inverted wall mounted convectors, but if mounted low down, higher leaving air temperatures could be used.

When connecting duct work to concealed / hideaway units, the external static should not exceed 24pa (max.). Care should be taken on mounting heights with ceiling mounted units.

As a rough guide:

**Model 03, 05 & 09 units up to 3.08 metres (10 feet) from floor level.**

**Model 06 & 12 units up to 2.77 metres (9 feet) from floor level.**

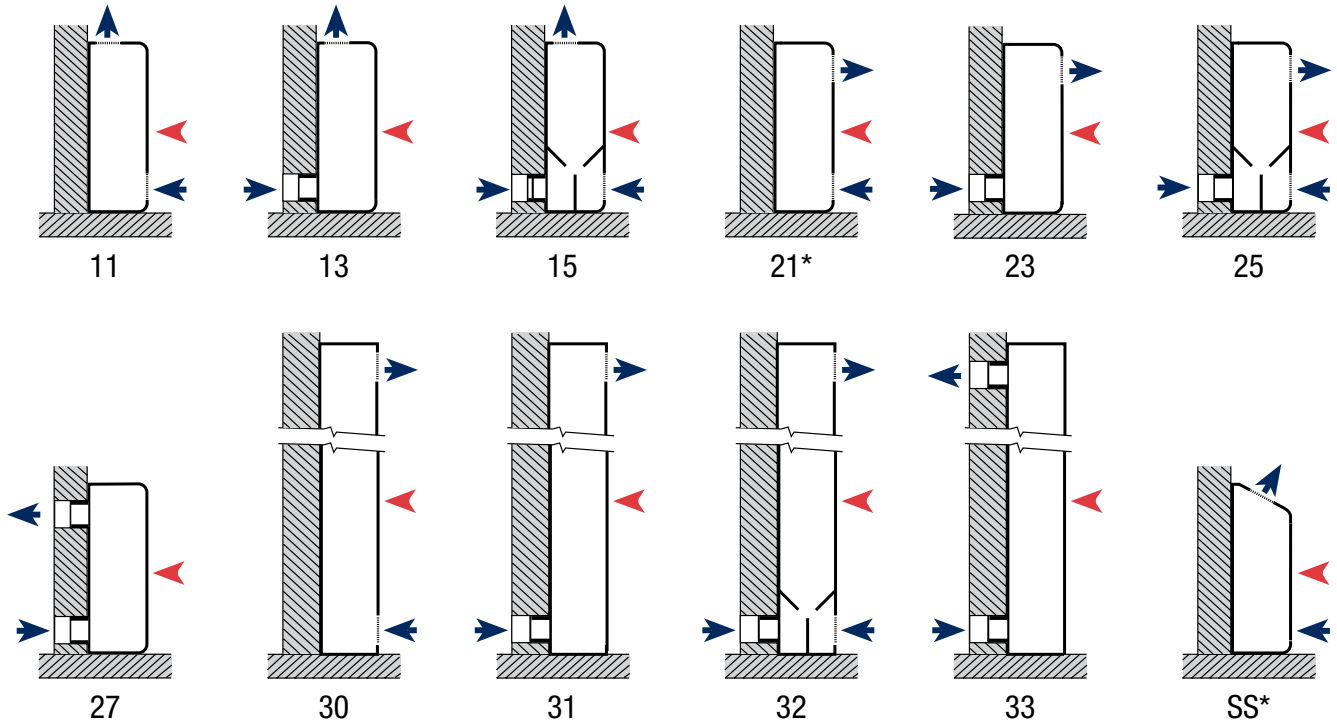
**Model 04, 08 & 15 units up to 2.45 metres (8 feet) from floor level.**

(Based on LPHW system 75°C mean, 10°C drop). A higher leaving air temperature obtained with deeper batteries reduces the mounting height. Avoid using low speed on horizontal applications.

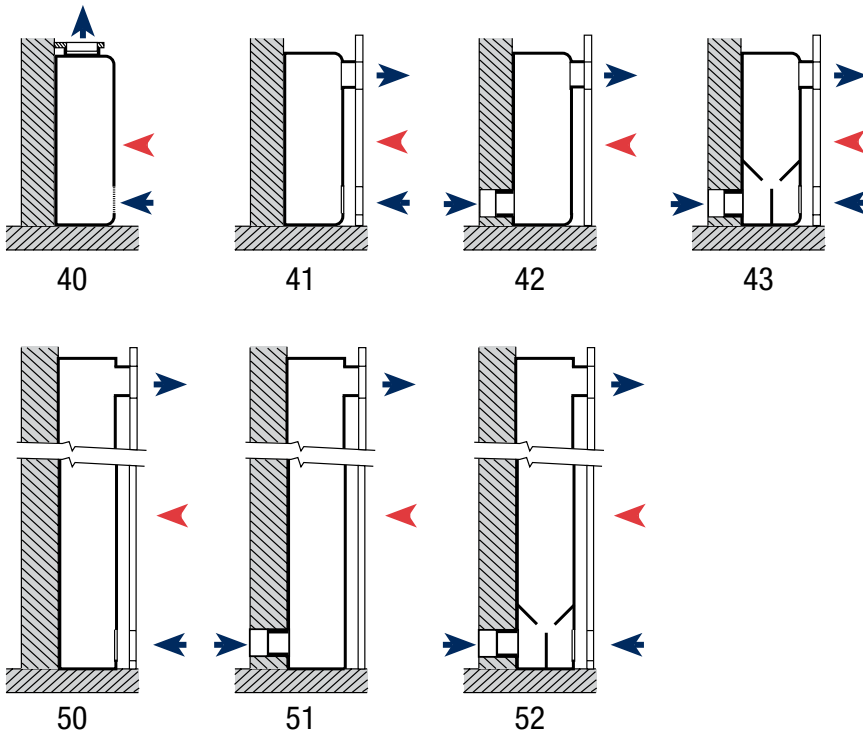
## Fan Convectors

### Style Selection

#### Free Standing Styles



#### Concealed Styles

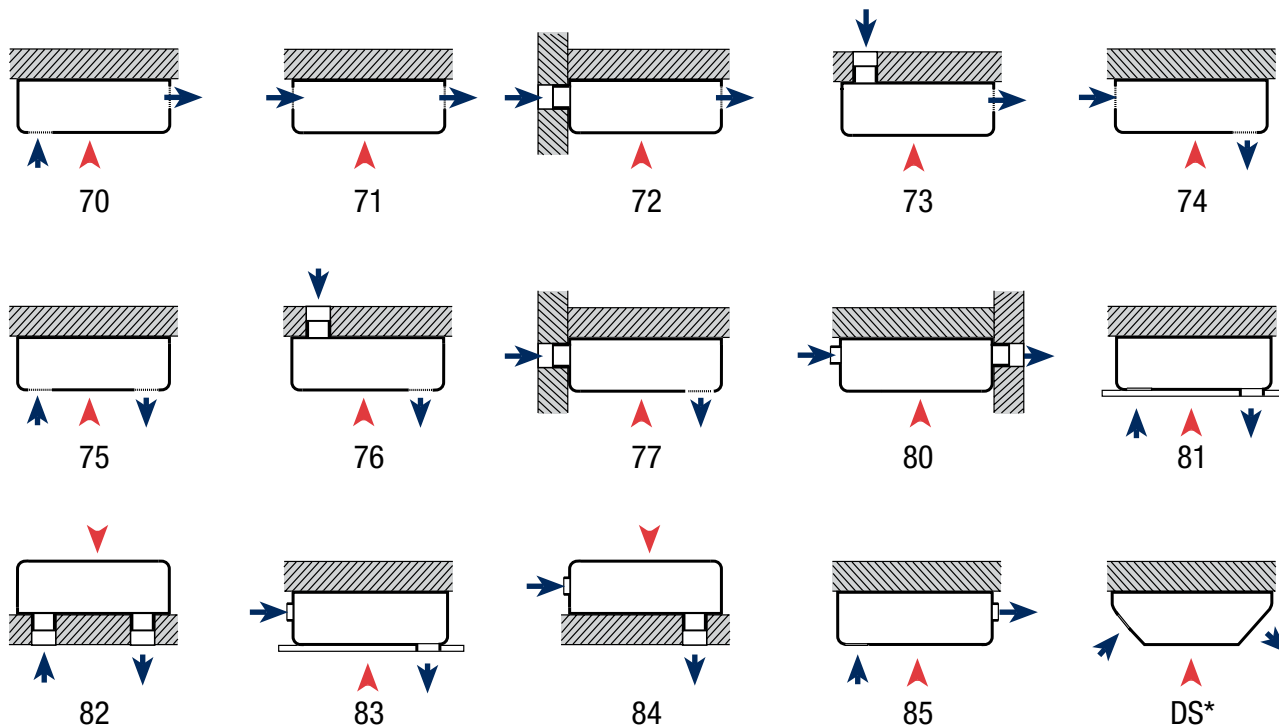


**\* Stocked Units**

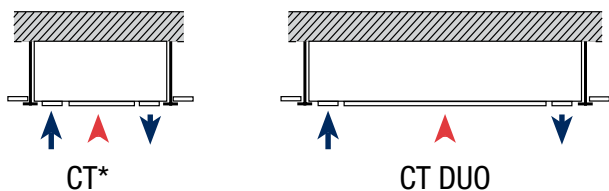
Stocked models SS, DS & 21 have fitted T1 Thermostats and LTC as standard.

All stock fan convectors have RHS connections as standard. However, if LHS connections are required this can be changed quite simply on site – see IOM for details.

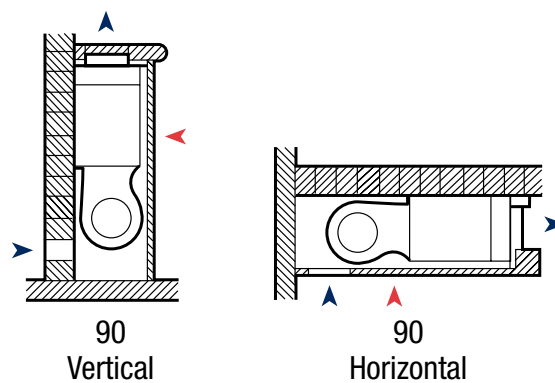
## Horizontal Styles



## CT2007 Styles



## Hideaway Styles



\* Stocked units

### Notes on Style Selection

Inbuilt concealed switch (CS) fitted as accessory.	11, 13, 15, 21, 23, 25, 27, 30, 31, 32, 33 and 40 (Stocked model 21 and SS fitted as standard)
Designed for remote control, No inbuilt switch	41, 42, 43, 50, 51, 52, 70, 71, 72 73, 74, 75, 76, 77, 80, 81, 82, 83, 84, 85, 90, DS, CT
Intended for floor or wall mounting	11, 13, 15, 21, 22, 23, 25, 27, 40, 41, 42, 43, SS
Intended for floor mounting only	30, 31, 32, 33, 50, 51 and 52
Standard for ceiling mounting. Not generally suitable for medium and high temperature hot water or steam unless certain precautions are taken.	70, 71, 72, 73, 74, 75, 76, 77, 80, 81, 82, 83, 84 85, DS and 90 (horizontal version)

## Fan Convectors

### Performance Data – Fan Convectors

Length mm	Coil Type	EAT °C	Low temperature hot water 75°C, 10°C drop														
			High Speed					Medium Speed					Low Speed				
			Duty kW	Mean basic rating	Air volume M³/s	NR Guide	LAT °C	Duty kW	Mean basic rating	Air volume M³/s	NR Guide	LAT °C	Duty kW	Mean basic rating	Air volume M³/s	NR Guide	LAT °C
600	03	15	3.15				47.8	2.95				48.7	2.5				49.2
		18	2.98	0.052	0.080	37	49.0	2.78	0.049	0.073	39	49.7	2.35	0.041	0.061	37	50.1
		21	2.80				50.2	2.61				50.8	2.22				51.3
	04	15	4.32				63.6	4.07				67.2	3.49				68.9
		18	4.08	0.072	0.074	37	63.9	3.85	0.068	0.065	39	67.4	3.28	0.058	0.054	37	68.6
		21	3.84				64.2	3.62				67.4	3.09				68.7
900	05	15	6.34				48.7	5.56				48.8	4.97				51.0
		18	5.99	0.105	0.165	33	49.8	5.26	0.092	0.144	37	50.0	4.69	0.082	0.121	33	52.0
		21	5.60				50.7	5.00				51.4	4.42				53.0
	06	15	7.00				52.2	6.56				54.9	5.92				57.9
		18	6.59	0.116	0.157	33	53.0	6.18	0.108	0.137	37	55.6	5.57	0.098	0.115	33	58.4
		21	6.20				53.9	5.80				56.3	5.2				58.7
	08	15	8.42				61.5	7.48				60.5	6.82				64.4
		18	7.88	0.138	0.151	39	61.5	7.06	0.124	0.132	37	60.9	6.45	0.113	0.108	33	64.7
		21	7.46				62.2	6.63				61.3	6.05				64.8
1200	09	15	11.52				53.4	10.38				52.6	9.07				54.6
		18	10.9	0.191	0.250	38	54.3	9.8	0.172	0.230	35	53.5	8.56	0.150	0.191	31	55.3
		21	10.27				55.2	9.2				54.3	8.06				56.2
	12	15	13.17				61.1	11.58				59.1	9.95				61.1
		18	12.42	0.218	0.238	38	61.5	10.92	0.192	0.219	35	59.6	9.42	0.165	0.180	31	61.6
		21	11.71				62.0	10.3				60.2	8.84				61.9
	15	15	14.59				68.6	13.04				67.2	10.81				68.0
		18	13.81	0.242	0.227	38	68.7	12.38	0.217	0.208	35	67.6	10.23	0.179	0.170	31	68.1
		21	13.15				69.3	11.66				67.7	9.6				68.1

To calculate duties for units operating on conditions different to the above. We recommend you use the “mean basic rating” data.

Calculate the temperature difference (TD) between the heating medium (Mean Water Temp.) and the Entering Air temp.  $MWT - EAT (60 - 18 = TD 42°C)$

Select an appropriate size unit from the catalogue and note its Mean Basic Rating (BR). The basic rating is then multiplied by the TD to equal the unit output.

(E.g.: 08 fan convector at medium speed on 18°C EAT and 60 mean water temp.

$BR = 0.124$ ;  $TD = 42$  Therefore:  $0.124 \times 42 = 5.21kW$  output)

For Temperature Drops other than 10°C – apply the following factors to the kilowatt duty:

5°C=1.04 10°C=1.00 15°C=0.94 20°C=0.87 25°C=0.81 30°C=0.75 40°C=0.68

### Copperad Fan Convectors

Length mm	Coil Type	EAT °C	Steam Temperature – 0.5 bar gauge (111°C)															Product Code
			High Speed					Medium Speed					Low Speed					
			Duty kW	Mean basic rating	Air volume M³/s	NR Guide	LAT °C	Duty kW	Mean basic rating	Air volume M³/s	NR Guide	LAT °C	Duty kW	Mean basic rating	Air volume M³/s	NR Guide	LAT °C	
600	05(S)	15	5.45				71.8	5.08				73	4.29				73.6	
		18	5.26	0.057	0.08	41	72.8	4.91	0.053	0.073	39	74.1	4.15	0.045	0.061	37	74.7	
		21	5.08				73.9	4.73				75	4				75.6	
900	09(S)	15	11.56				76.4	9.61				73.5	8.57				77.1	
		18	11.16	0.12	0.157	39	77.2	9.28	0.1	0.137	37	74.4	8.28	0.089	0.115	33	78	
		21	10.77				78.2	8.95				75.4	7.98				78.8	
1200	16(S)	15	18.8				77.7	16.77				75.8	13.88				75.6	
		18	18.11	0.195	0.25	38	78.4	16.19	0.174	0.23	35	76.7	13.41	0.144	0.191	31	76.5	
		21	17.47				79.2	15.6				77.5	12.92				77.4	

To obtain duties at steam pressures other than those in the above table, multiply the kW duty by the factors in the table right.

Factors for EAT °C	Steam Pressure (bar gauge)				
	0.5	1	2	4	6
	Steam Temperature °C				
	111	120	134	152	165
15	1	1.1	1.27	1.48	1.63
18	0.96	1.07	1.23	1.44	1.6
21	0.92	1.04	1.2	1.41	1.56

## Performance Data

### External Ducting Resistance Factors

The data given in both the Hot Water and steam emission table is based on an external static resistance of nil.

Multiply the following factors by the Duties, Basic Ratings (BR) and Air Volumes given in the tables to obtain the duties of units fitted with external ducting when operating at the following resistances. (Max. 24Pa)

Resistance Pa	High Speed		Medium Speed		Low Speed	
	Air volume factor	Duty and BR factor	Air volume factor	Duty and BR factor	Air volume factor	Duty and BR factor
0	1	1	1	1	1	1
12	0.87	0.92	0.84	0.9	0.82	0.89
18	0.81	0.88	0.78	0.86	0.75	0.85
24	0.74	0.84	0.71	0.82	0.69	0.81

### Engineering Data – Copperad Fan Convectors

Minimum flow rate								
Kg/s	Coil type							
	03	04	05	06	08	09	12	15
	0.009	0.018	0.026	0.018	0.018	0.03	0.03	0.042

Hydraulic resistance in kPa											
MWT °C	EAT °C	Drop °C	Coil Type								
			03	04	05	06	08	09	12	15	
75	15	10	6.6	3.8	2.8	11.8	14.2	11.9	14.1	7.0	

Electrical characteristics of fan convector motors				
Length mm	Speed	Unit Power Rating W	Running Current A	Starting Current A
600	High	52	0.23	0.33
	Medium	49	0.21	0.26
	Low	46	0.20	0.22
900	High	90	0.38	0.48
	Medium	76	0.34	0.38
	Low	65	0.28	0.31
1200	High	116	0.50	0.84
	Medium	104	0.44	0.64
	Low	96	0.41	0.59

The data given is for motors operating on the standard 240V 50HZ single phase supply.

Length mm	Type	Water content kg	Styles – weights in kg				
			11, 13, 21, 23, 27, 40, 41, 42, 70, 71, 72, 73, 74, 75, 76, 77, 80, 81, 82, 83, 84, 85, SS, CT	24, 25, 43, DS	30, 31, 33, 50, 51	32, 52	90
600	03	0.40	22	25	44	46	12
	04	0.61	23	26	45	47	13
900	05	0.55	30	34	60	64	16
	06	0.86	31	35	61	65	17
	08	0.86	32	36	62	66	18
1200	09	1.15	37	41	76	81	19
	12	1.15	38	42	77	82	20
	15	1.73	39	44	79	83	21

Net weights are listed, for shipping weights add 20%.

## Fan Convectors

### Engineering Specification

#### Heat Exchanger

- (a) The primary tubes shall be of solid drawn copper. Arrangements shall be made to permit free and unrestricted expansion of each tube.
- (b) The headers shall be of formed steel construction, the primary tubes being securely fixed thereto by brazing.
- (c) The secondary surface shall comprise continuous "plate-type" non-ferrous fins having accurately formed collars held in close metallic contact with the primary tubes.

#### Casing

The casing shall be adequately stiffened to prevent distortion, and shall have curved top and bottom front edges on low level units, using castings. All casings shall be constructed from heavy gauge steel, degreased, pretreated and finished with a high grade low gloss polyester powder paint to RAL 9002, with grilles RAL 7000. Alternatively, units can be finished in any BS colour in eggshell, semi gloss or full gloss at extra cost. A separate plinth may also be specified.

#### Insulation

Internal parts of the unit shall, where necessary, be insulated with suitable material to restrict the transmission of sound. All metallic parts in contact shall be securely fixed to prevent chatter.

#### Grilles – Material & Construction

Pencil proof extruded aluminium grilles shall be provided as standard equipment for the air inlet and outlet apertures except for styles having spigotted inlets/outlets when they shall be supplied loose if specified. Grilles shall be of the extruded aluminium type of construction. Loose grilles for use with spigotted units shall be contained within a frame. All grilles will be finished dark grey to RAL 7000 with a light grey frame to RAL 9002.

#### Motors

The motors shall be permanent split-capacitor totally enclosed type. The bearings shall be of the sleeve type for quiet running, sealed-in and factory lubricated. No re-oiling shall be necessary during the life of the motor. All motors shall have the choice of three operating speeds and overload protection is not required. Motors are tested to relevant sections of BS5000 part II. An overheat cut-out is inbuilt as standard.

#### Fans

The fans shall be double inlet width centrifugal type with curved forward blades. They shall be statically and dynamically balanced, and the fans shall be directly mounted and secured onto the motor shaft. (single on 600mm wide and double on 900 and 1200mm wide units)

#### Access Panel

The access panel shall be removable within the height of the casing, and be fixed by two screws through the grille. Key locks may also be specified, standard on styles 21, SS and DS.

#### Motor/Fan Tray Assembly

The motor shall be resiliently mounted to the fan tray or scrolls. The motor/fan tray assembly itself shall be also resiliently mounted to the casing structure. The tray shall be easily withdrawable for inspection and cleaning after disconnection from the mains supply and ancillaries with the plugs and sockets provided.

#### Control Gear

A three position manual control switch shall be provided where specified, enabling low, medium and boost speed to be selected. A separate on/off switch can also be provided.

#### Low water temperature cut-out

Suffix LTC (fitted as standard) to prevent fans running if water temperature falls below preset value. Not fitted to coils on steam duty.

#### Automatic Control

Where specified, each unit shall have automatic control gear comprising one or more of the following:

- Thermostatic On/Off control – Suffix T1.
- Thermostatic speed control Medium/Low – Suffix T2.
- Thermostatic speed control High/Medium – Suffix T3.
- Adjustable water temperature cut-out – Suffix ALTC.

#### Filters

Filters, which shall be provided as standard, shall be of washable flame retardant bonded polyester material.

#### Connections

They shall be either left or right hand as specified (right-hand unless specified). Connections shall be screwed female 3/4" BSP. Manual air vents shall be provided as standard, except on heat exchangers for use with steam. Automatic or extended air vent options are available. Local isolating valves are recommended.

#### Pressure Test

The heat exchanger shall be tested to 21.25 BAR G (350 PSI). Air under water.

#### Maximum Working Pressure

All heat exchangers shall be suitable for maximum permitted working pressure of 8.5 bar gauge (125 PSI).

#### Performance

The fan convector shall be tested and rated in accordance with BS. 4856 Part 1 – 1972. (1983).

## Packaging

Each fan convector shall be packed, together with full installation instructions, in a purpose made carton on which shall be clearly marked the model number and such reference as may be called for in the schedule.

## Installation

All units are supplied with an installation, operating and maintenance manual

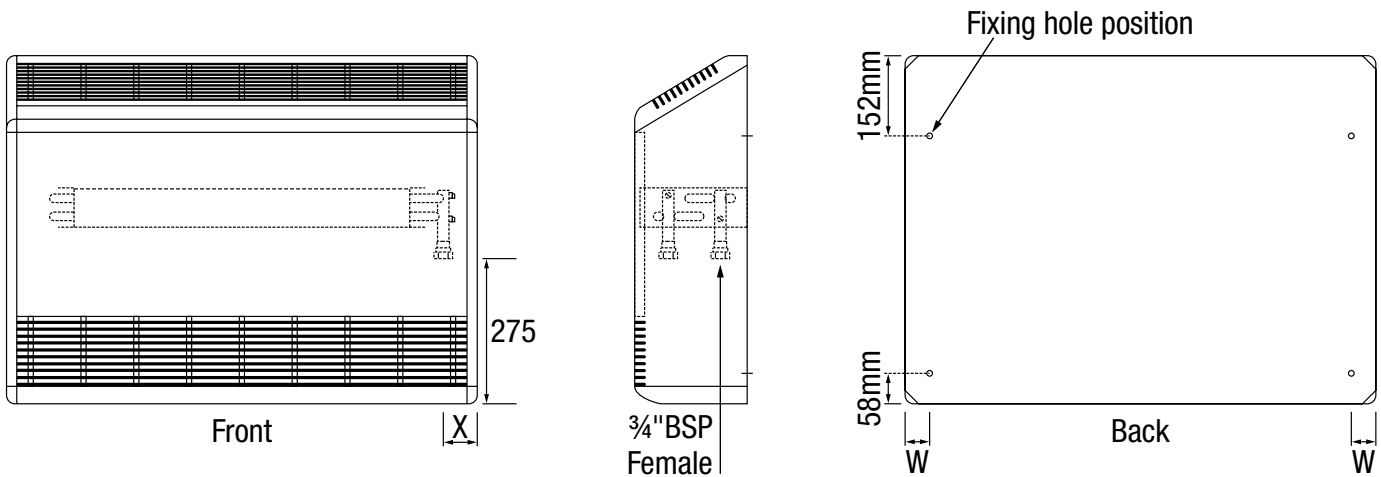
## Quality Assurance

The manufacturer of Copperad products has been inspected and holds manufacturing systems controlled to ISO9001 standards, and all products conform to the latest CE requirements.

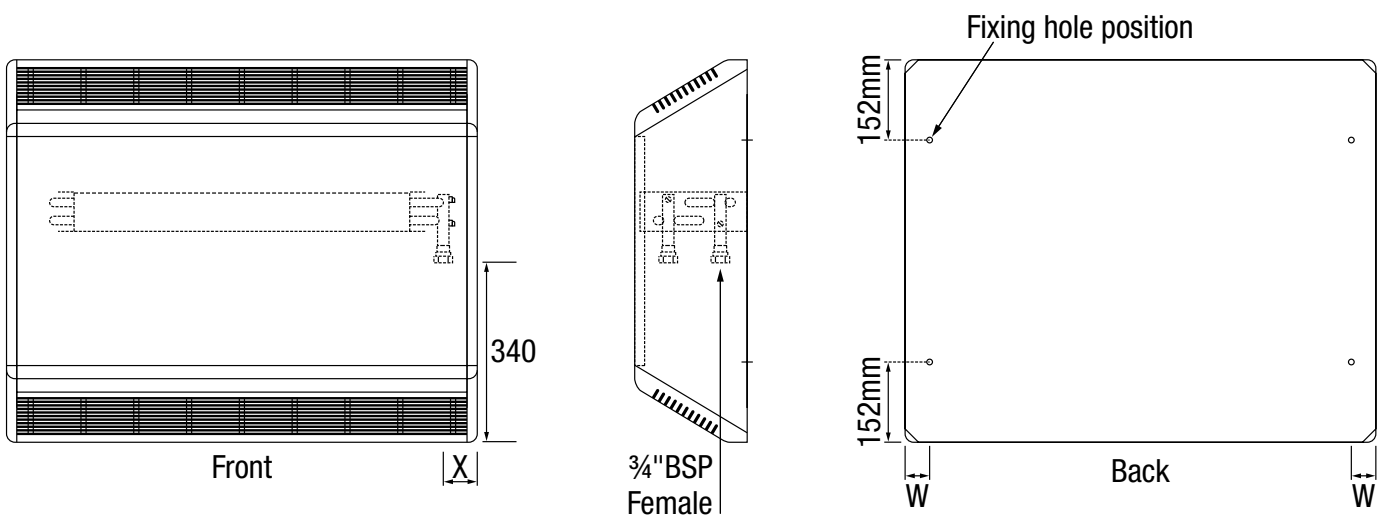
## Dimensions

### Sloping Top Units Style SS & DS

#### Style SS



#### Style DS



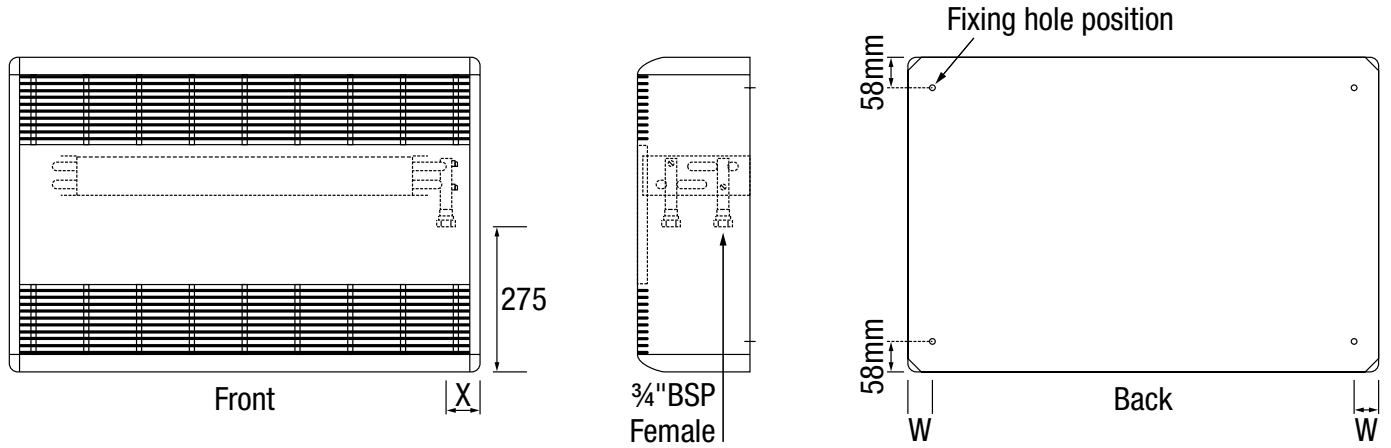
Dimensions	Unit length mm		
	600	900	1200
Overall unit length	592	892	1192
Overall unit height SS	660	660	660
DS	720	720	720
Overall case depth	212	212	212
Access panel width	554	854	1154
W Fixing hole	46	46	46
X Heat exchanger connection	64	64	64

	Style Number	
	SS	DS
Access Panel Height	482	430

## Fan Convectors

### Dimensions

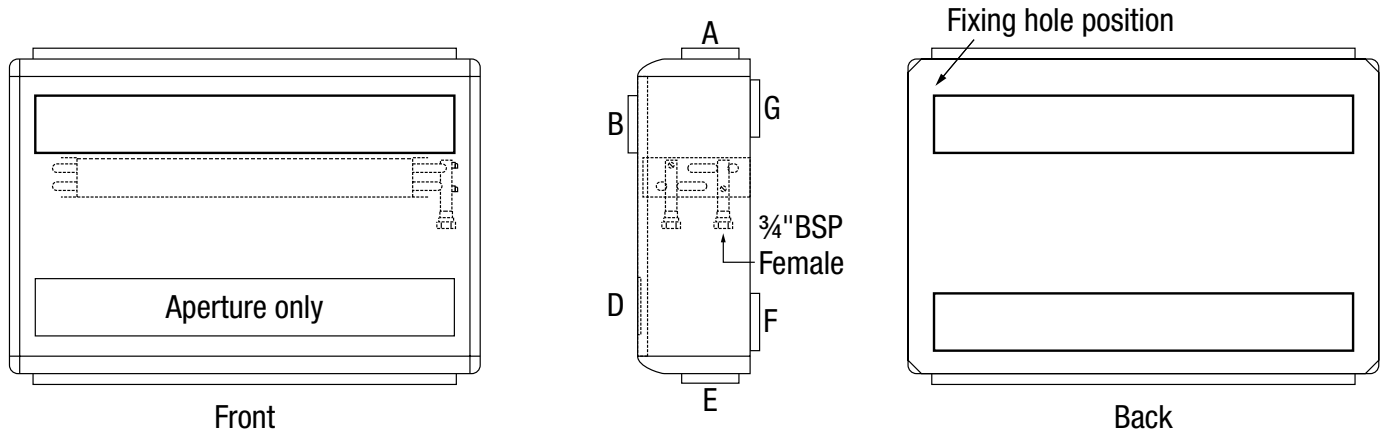
Low Level Units Style Numbers 11 to 27, 40 to 43 and High Level Style Numbers 70 to 85 & CT



**Note 1:** CT as 600 size unit but with square edges

**Note 2:** These basic dimensions apply to all low level units irrespective of whether they are grilled or spigotted and vertical or horizontally mounted. Although style 21 grille positions are shown, any other combination of grille positions selected from the Style Selection Chart does not affect these dimensions. Heat exchanger connections – screwed 3/4" BSP female.

### Spigot dimensions and location



	Style Number										
	13, 15, 23, 25, 73, 76	27, 28	40	41, 81	42	43	72, 77	80	83	84	85
Spigot Location	F	FG	A	BD	BF	BDF	E	AE	BE	EG	AD

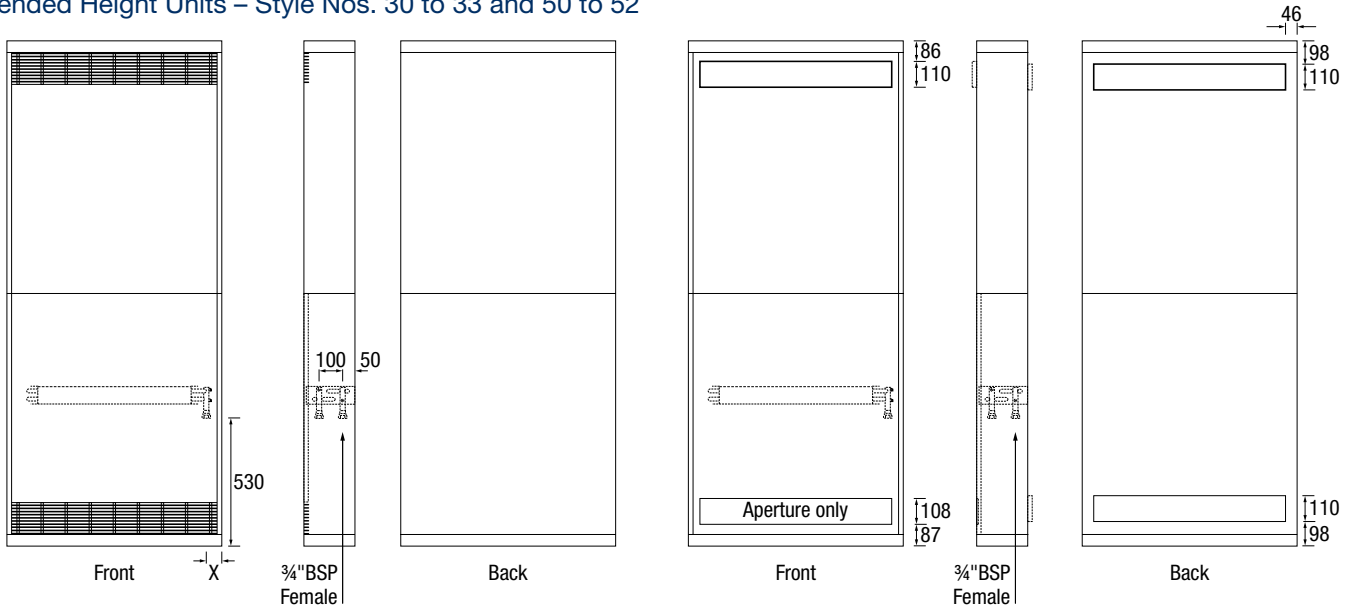
Dimensions	Unit length mm		
	600	900	1200
Overall unit length	592	892	1192
Access panel length	554	854	1154
Spigot length	500	800	1100
W Fixing hole	46	46	46
X Heat exchanger connection	64	64	64

	Style Number	
Access Panel Height	11, 15	13, 21, 23, 25, 27, 41, 42, 43, 71, 72, 73
	40, 70, & 85	74, 75, 76, 77, 80, 81, 82, 83 & 84
	401	515



## Dimensions

### Extended Height Units – Style Nos. 30 to 33 and 50 to 52

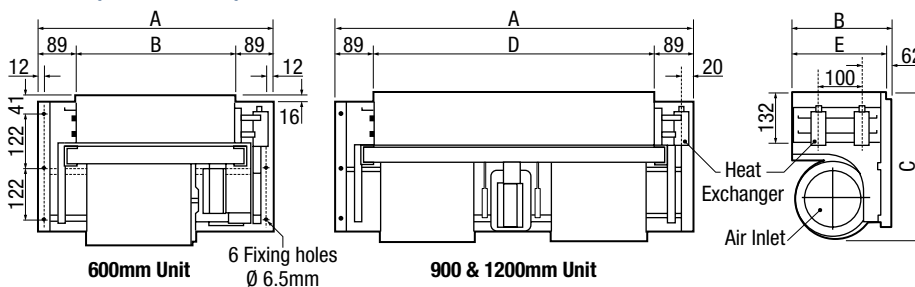


Standard extended case height is 2100mm and standard case depth is 215mm

Dimensions	Nominal mm		
	600	900	1200
Overall unit length	592	892	1192
Access panel length	554	854	1154
Spigot length	500	600	1100
X Heat exchanger connection	64	64	64

## Dimensions

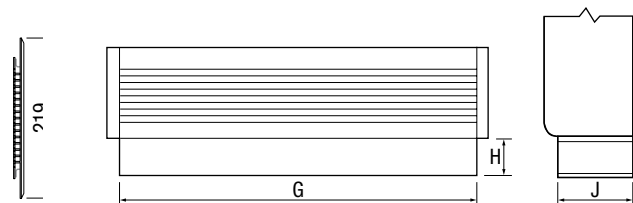
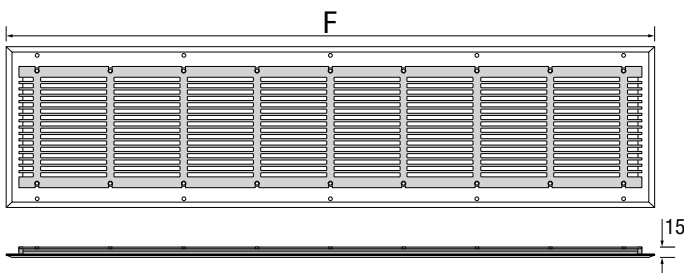
### Hideaway Units – Style Number 90



Dimensions	Unit length (mm)		
	600	900	1200
Overall	545	820	1145
A			
B		210	
C		340	
Spigot			
D	367	642	967
E		198	
Loose Grille			
F	586	886	1186
Plinth			
G	561	861	1161
H		100	
J		176	

## Loose Grilles

## Plinth



Use Number 8 countersunk screws. Typical loose grille arrangement.

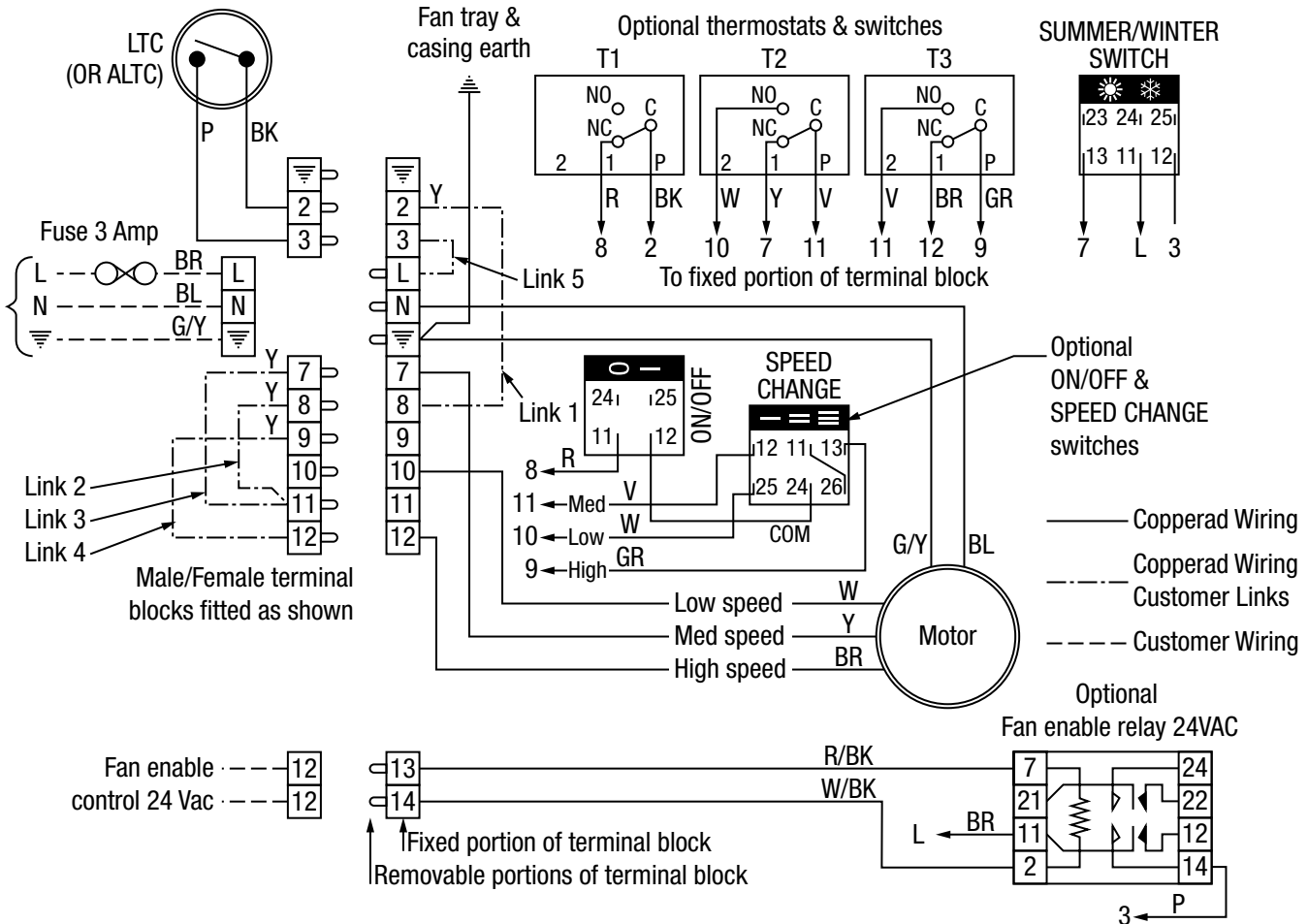
**Note 1:** Dimensions are to the outside of the spigot. The optional loose grille can be used with these units by fitting a change section duct or butting the spigot up to the underside of a builders work sealing panel, thus forming a plenum chamber between the spigot and the grille. Builders work access panel size to be overall length less 50mm by 300mm high. Heat exchanger connections – screwed 3/4" BSP Female.

**Note 2:** Aperture for spigot to be spigot size + 10mm.

## Fan Convectors

### Electrical diagram

Diagram 1: Internal control wiring



The basic wiring is shown above for a unit without optional control equipment fitted – as such it is set to run continuously at the medium speed setting. The optional switch and thermostats which can be inbuilt are also shown together with the arrows and numbers indicating the connecting wire and terminal block positions that they would occupy if fitted. If any of these options are inbuilt, then some of the dotted Links shown numbered 1 to 4 are removed, as follows:

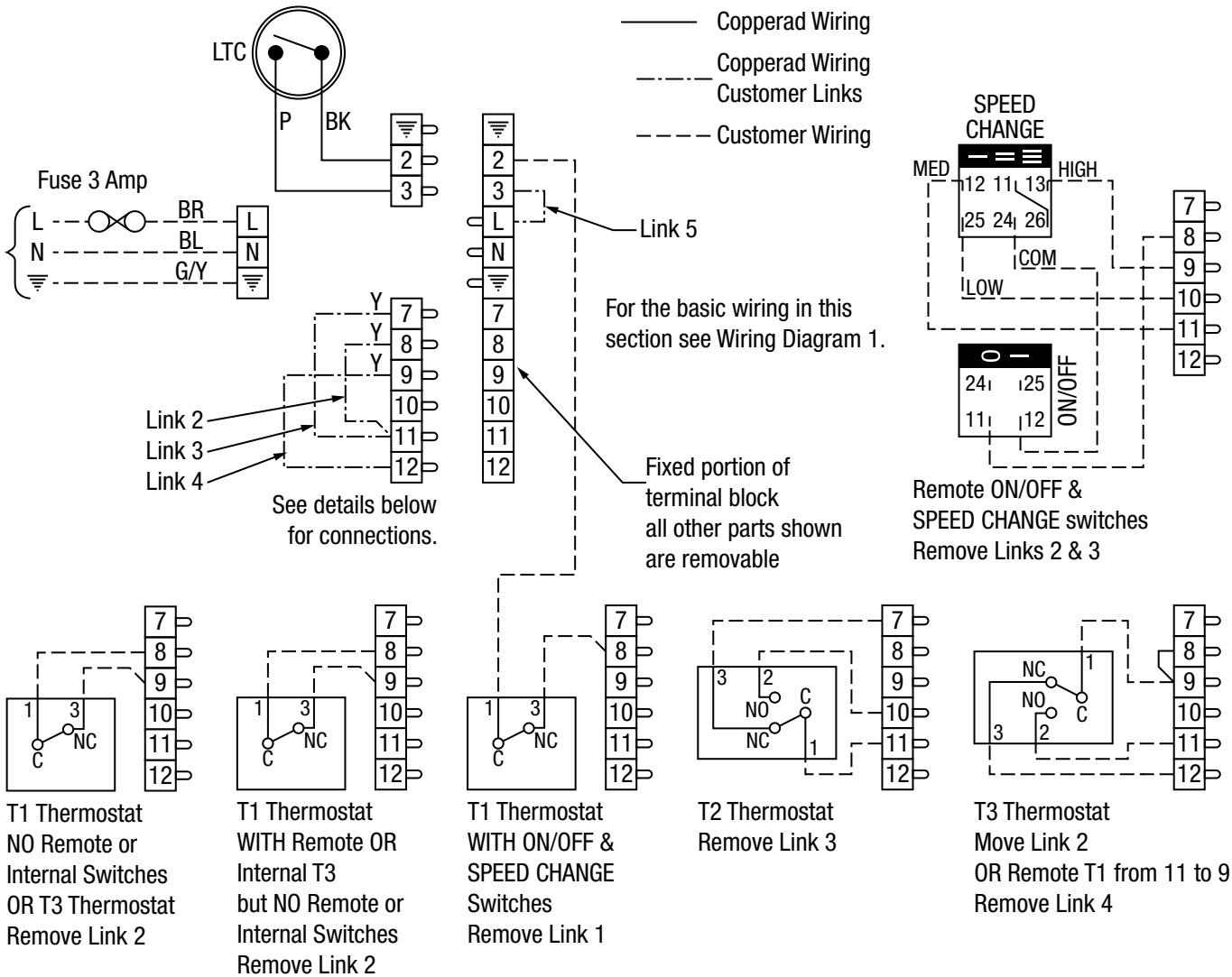
- If on/off thermostat T1 is required, then Link 1 would not be fitted
- If speed control switch is required, then Link 2 would not be fitted
- If speed change thermostat medium to low (T2) is required then Link 3 would not be fitted
- If speed change thermostat high to medium (T3) is required then Link 4 would not be fitted and Link 2 must be fitted between 8 and 9.

#### Notes

1. The LTC is factory fitted as shown in diagram No 1.
2. T1, T2 and T3 cannot all be inbuilt and wired in together as indicated in the diagram. They must be fitted in combinations of T1 and T2, T1 and T3 or T2 and T3. If, however, a control system involving all three is required. Then it is recommended that the T1 thermostat must be remotely mounted.
3. If T3 or T2 and T3 are required to operate without a switch, then Link 2 will be fitted between positions 8 and 9 on the terminal block.
4. If a unit basically wired for single speed running is required to operate at low speed, then alter Link 2 to connect between positions 8 and 10 on the terminal block. Similarly, for high speed re-connect Link 2 between positions 8 and 12.

## Site wiring - remote options

Diagram 2: Remote control wiring



Thermostat terminal numbers refer to Copperad supply only.  
For thermostats by others, refer to manufacturer's own literature.

When required to operate with remotely mounted controls, units will be supplied basically wired for medium speed running as shown in diagram no 1.  
For all units, we recommend a 3 amp fuse is fitted.

The remote switch and thermostats required should be fitted to the removable sections of the terminal block as shown.

1. To fit a on/off speed change switch combination, remove Link 2 between terminals 8 and 11.
2. To fit a remote on/off thermostat (T1) remove Link 1 between terminals 2 and 8 on the fixed section of the terminal block.
3. To fit a remote speed change thermostat – medium to low (T2) remove Link 3 between terminals 7 and 11.
4. To fit a remote speed change thermostat – high to medium (T3) remove Link 4 between terminals 9 and 12.
5. To fit a summer/winter switch, connect the two switch terminals to 8 and 3 in parallel with the LTC.

### Electrical wiring colours

BK	BR	R	Y	BL	V	GR	W	P	G/Y
BLACK	BROWN	RED	YELLOW	BLUE	VIOLET	GREY	WHITE	PINK	GREEN/YELLOW

## Natural Convectors

The Copperad Natural Convector range is the latest generation of stylish convector heaters for homes, offices, shops, hotels and hospitals. Wherever comfortable heating and space saving is important. Available in a choice of models ranging from 0.63 to 2.36 kW on Low Temperature Hot Water, or 1.37 to 5.4 kW on steam applications. For ease of installation and accessibility the heat exchanger is screwed to the wall and the casing held by a top retaining strip and side keyhole slots. The casing can easily be removed for cleaning or decorating. The Natural Convector has been designed to look good in any modern setting. The softly rounded edges and sloping top front to the casing provide added strength as well as a high degree of safety – an important feature when installed in areas used by children and older people. The smooth contoured design also makes cleaning easy, and the anodised aluminium pencil proof grille with the polyester powder coated casing provides a functional, elegant finish.

### Features and Benefits

- Sloping top for Safety and Aesthetics.
- Continuous aluminium linear grilles, ideal if installed in schools.
- Compact and space saving.
- Simple wall mounted and easy to remove for decorating.
- Clean and silent in operation.
- Low Surface Temperature, meets DSS DN4 specification (When used on LTHW).
- Inlet Grille model available for safety, and to conceal low level pipework.
- 2 standard casing styles available. Stocked with damper fitted
- Lengths available 600mm, 900mm, 1200mm and 1500mm
- 2 Battery styles available – 1 row steam or water and 2 row water.
- Maximum Working Pressure – 10.5 Bar g. water.
- Ex-stock standard models.



### Model Reference

The model reference is made up of a number of sections. This is an example of how a unit is identified.

CVD	1	6	06
Code	Heat exchanger	Casing height	Casing length

Code	Description	Remarks
CV	Casing with sloping top, no inlet	
CVI	Casing with sloping top and inlet grille	
CVD**	Casing as CV but with damper	BSS stocked item
CVDI	Casing as CVI but with damper	
1	One row steam/water heat exchanger	3/4" BSP F connectors
2	Two row heat exchanger (water only)	15mm plain tail connections
6	Casing height	600mm casing height standard
06	600mm case length	
09	900mm case length	
12	1200mm case length	
15	1500mm case length	

The units are supplied with a light grey case to RAL 9002 and mid-grey grilles to RAL 7000 as standard. All white units can be provided at no additional cost. Other RAL colours are available at additional cost.

The heat exchanger is mounted on to a bracket type back panel, and can be mounted behind builder's work if required. Any such application must ensure that a sufficiently large access panel is made available for maintenance purposes and a separate outlet grille must be purchased for this application.

One and two row LPHW coil options as standard with 15mm plain tails on 2-row water, 3/4" BSP on steam/water 1-row coil.

## Natural Convectors

Unit size	600 (1606)	900 (1609)	1200 (1612)	1500 (1615)	600 (2606)	900 (2609)	1200 (2612)	1500 (2615)
No of rows	1	1	1	1	2	2	2	2
Output kW 80/70 LPHW	0.63	1.06	1.48	1.9	0.79	1.31	1.83	2.36
Output kW 65/55 LPHW	0.4	0.68	0.95	1.22	0.51	0.84	1.17	1.51
Output kW Steam 0.5 barg	1.46	2.63	3.24	3.98	n/a	n/a	n/a	n/a
Unit weight	9.8	12.5	17.2	20.1	10.0	12.8	17.5	20.4

The above is based on 20°C entering air temperature. To obtain duties under other conditions than the above, multiply the emissions from that table by the factors given below.

LST Units operating on 75°C mean will have a casing temperature lower than 40°C, but the grille temperature will be up to 50°C. However units operating on 60°C mean will maintain a casing and grille temperature below 43°C.

### Steam Systems

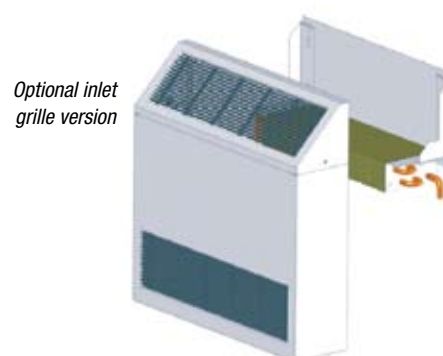
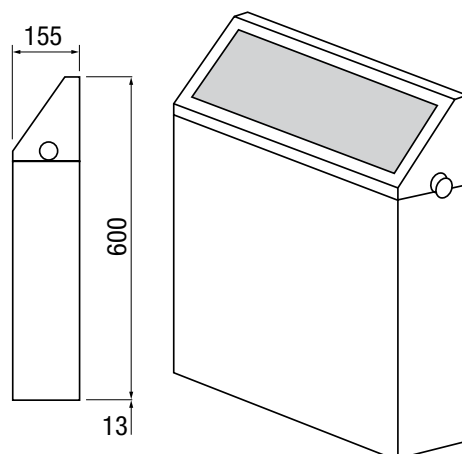
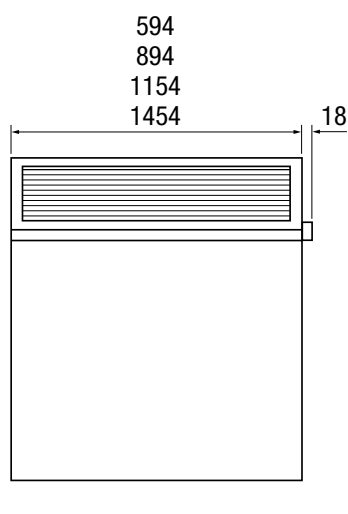
Units offered are suitable for maximum safe working pressure of 2.0 barg (30 psig), we generally recommend that natural convectors are operated on low steam pressures, up to 1.5 barg (20 psig) – convectors can be operated at higher pressures, but leaving air temperatures tend to be excessive and dehumidify the air of the heated area.

Emission factors for hot water		Mean water temperature °C									
		60	65	70	75	80	85	90	85	100	110
EAT°C	15	0.75	0.87	1	1.13	1.27	1.42	1.56	1.72	1.87	2.20
	18	0.68	0.8	0.92	1.05	1.19	1.33	1.47	1.62	1.78	2.1
	20	0.63	0.75	0.87	1	1.13	1.27	1.42	1.56	1.72	2.03

	Temperature drop °C							
	5	10	15	20	25	30	35	40
1 row unit	1.06	1	0.94	0.89	0.83	0.78	0.73	0.68
2 row units	1.09	1	0.92	0.85	0.78	0.72	0.67	0.52

Emission factors for steam		Mean water temperature °C									
		0.05	0.5	1	1.5	2	2.5	4	5	8	
EAT°C	15	0.94	1.06	1.19	1.28	1.39	1.44	1.60	1.72	1.95	
	18	0.90	1.02	1.15	1.24	1.35	1.41	1.58	1.68	1.91	
	20	0.87	1	1.12	1.21	1.31	1.39	1.56	1.65	1.88	

## Dimensions



### Quality Assurance

The manufacturer of Copperad products has been inspected and holds manufacturing systems controlled to ISO9001 standards, and all products conform to the latest CE requirements.

## Unit Heaters



Unit heater with wire guard fitted

Unit heater with D2 downstream diffuser fitted



Copperad unit heaters have been manufactured for over 50 years, and in that time the range has gained a reputation for unrivalled quality and reliability. The components are pre manufactured to ISO9001 standards, and final assembly and test is by BSS.

With over 200 variations available from two styles and six model sizes with coils for steam or water there is a Copperad unit heater for practically all commercial and industrial applications.

Five types of heat exchanger allow for different heating media, either steam or hot water can be used. Each unit can handle water pressures up to 10 bar. Water connections are supplied threaded to BSP.

- Two styles and six model sizes
- Over 200 model variations
- Five types of heat exchanger for steam and hot water
- Choice of motor speeds 700, 940, 1400 RPM – three and single phase – 1P44 rating
- Pressure tested for 10 bar water operation

### Unit Heater with Fan Guard

This unit with its superior appearance provides a generally horizontal discharge and is ideal for most space heating applications. The wire fan guard is fitted to provide protection against motor and moving parts, and complies with Health and Safety regulations. Spigots for ducting and outlet are available. Body paint finish – mid grey (RAL 7000).

### Downstream Unit Heaters D2

These units provide a generally downward discharge and are particularly recommended for application demanding greater mounting heights. The diffusers and submounted motors enable the units to cover a wide range of applications, and spigots for ductwork are available. The diffuser provides a choice between a single downward air stream and four individual air streams depending on the setting of the vanes. The D2 style diffuser is hinged to allow easy access to the motor and fan for maintenance. The selection of the style of diffuser will depend on the temperature of the heating medium.

### Application

Unit Heaters can be connected to fresh air inlet ducts. For this application the units can be supplied with the necessary spigots. However, spigots can be added later to units originally installed for air recirculation in order to accept a fresh air intake.

### Control

Unit Heaters should be provided with individual overload protection. It is advisable to use a separate starter, with its own overload cut-out for each unit heater. An isolating switch should also be fitted, but this may be used to isolate a group of unit heaters. With regard to temperature control within a space, switching of fan motors is achieved most economically by the use of room thermostats.

## Model Reference

The complete model reference is made up of a number of sections. This is an example of how a typical reference should be presented:

B	W	2	9 /	WG
Case	Water	Heat exchanger	Motor speed	Wire guard

Basic Reference Code	Description	Remarks
A, B, C, D, E, F	Unit size	Must be stated in all cases
W	Hot water systems only	No reference required for steam systems
1, 2 or 3	Heat exchanger coil (battery)	Number of rows of tubes (3 row is water only)
4, 9 or 7	Motor speed	1400 rpm, 940 rpm or 700 rpm

Style and/or accessories Code	Description	Remarks
WG	Wire guard for motor	Fitted as standard except where D2 diffuser fitted
D2	Downstream diffuser	Sub mounted motor when D2 fitted
A0	Air outlet spigots	Used as air inlet for D2 units
AI	Air inlet spigots	

### Sound Levels

Sound Code	Sound Power Level dB Re 10 <sub>12</sub> W	Suggested Application
VQ	56-60	Laboratories
Q	61-65	Gymnasias, Sports Halls
FQ	66-70	Assembly Workshops
I	71-75	Light Engineering Workshops
FN	76-80	Engineering Machine Shops
N	81-85	Heavy Engineering Workshops

The environment of the installation will often limit the choice of unit heaters to those with acceptable sound levels.

A sound code is quoted throughout the tables to assist in the selection of unit heaters. The code is based on the sound power output of the unit and is set out alongside:

Note that Downstream unit heaters are inherently noisier and should not be used where Q or VQ conditions are required. Single phase motors are generally noisier than three-phase motors. Unit heaters operating against ductwork resistance will be somewhat noisier. In buildings where there is no moving machinery units having codes FN and N are not recommended. The table on this page gives the code for each model, together with the corresponding NC and dBA values. The sound code table on this page applies to all models fitted with three-phase motors operating with free inlet and discharge (FID).

Sound levels								
Unit Size	Motor Speed	Nominal RPM	Code	Basic Units		Downstream Units		
				NC	dBA	Code	NC	dBA
A4	Normal	1400	I	55	60	I	57	62
A9	Slow	940	Q	43	48	FQ	46	51
B4	Normal	1400	FN	59	64	FN	60	65
B9	Slow	940	FQ	47	52	FQ	49	54
B7	Extra Slow	700	Q	43	48	FQ	44	49
C4	Normal	1400	N	60	65	N	61	66
C9	Slow	940	I	49	54	I	51	56
C7	Extra Slow	700	Q	44	49	FQ	46	51
D4	Normal	1400	N	64	69	N	65	70
D9	Slow	940	FN	53	58	FN	55	60
D7	Extra Slow	700	I	49	54	I	50	55
E4	Normal	1400	N	64	69	N	65	70
E9	Slow	940	FN	52	57	FN	54	59
E7	Extra Slow	700	I	48	53	I	49	54
F9	Normal	1400	FN	55	60	FN	56	61
F7	Slow	940	I	50	55	I	50	55

### Basic Type

The figures for NC and dBA are quoted for a position 2m (7ft) from the heater or 1.5m (5ft) above the floor level and 45° to unit heater position when this is mounted at the normally recommended average mounting height corresponding to 45°C (110°F) LAT, which ever is the greater.

### Downstream Type

The figures for NC and dBA are quoted for a position 1.5m (5ft) above the floor level or 2m (7ft) below the heater (and directly under a unit heater) mounted at the normally recommended average mounting height corresponding to 45°C (110°F) LAT, which ever is the greater.

### Notes

The environment in all cases is assumed to have a mean absorption coefficient of 0.12 and the space associated with the heater for these acoustic assessments is that for which such a heater would be suitable. The sound pressure reference level in all cases is dB re 2 x 10<sup>-5</sup> N/m<sup>2</sup>.



## Unit Heaters

### Using Emission Tables

The tables of emissions given can be used for both Listed' and Unlisted' conditions and apply to BASIC UNITS. A correction factor is required with DOWNSTREAM STYLE D2 as detailed below.

### With Listed Conditions

The emission tables can be simply used to select unit heaters on projectors having the heating conditions shown at the top of each emission table.

#### Method

Listed conditions

##### Step 1

Using the relevant table select the thermal emission that is nearest to the design requirements.

##### Step 2

Check the leaving air temperature and sound code to see if they are within suitable limits for the specification.

##### Step 3

Should the temperature drop differ from that listed, an adjustment to the emission can be made using the factor tables at the foot of each page.

##### Step 4

If the unit required is Downstream and the heating medium temperature is high enough to warrant a D2 style with sub-mounted motor, both thermal and volumetric emissions are reduced by a percentage which is tabulated under each emission table. Details concerning Downstream selection are provided.

##### Step 5

The model satisfying the design criteria is shown under the model reference listed in the first column of each emission table. Finally, check the model reference against its equivalent in the mounting height table to determine the coverage conditions.

### With unlisted conditions

The following is a guide to calculation of outputs from a unit which is operating under conditions not fully covered by the tables. Factors which are involved are defined as follows.

#### Basic Rating (BR)

The basic rating is the thermal output in kW or Btu/h divided by the temperature difference in °C or °F, between entering air temperature and the mean heating medium temperature. For steam application use the dry saturated steam temperature at the stipulated pressure

#### Temperature difference (TD)

TD = Mean Water Temp (MWT) - Entering Air Temperature (EAT)

#### Thermal output (kW or Btu/h)

Thermal output = Basic rating x Temperature Difference

#### Z factor

This varies with Entering Air Temperature – see table (right).

#### Temperature Rise (TR)

$$TR = \frac{\text{Thermal Output}}{\text{Air Volume} \times Z}$$

Where air volume is in m<sup>3</sup>/s or ft<sup>3</sup>/min (see emission tables).

#### Leaving Air Temperature (LAT)

LAT = Entering Air Temperature (EAT) + Temperature Rise (TR)

#### Flow Rate

$$SI = \frac{\text{Thermal output (kW)}}{\text{Water Temperature drop (°C)} \times 4.2} = \text{kg/s}$$

$$Imp = \frac{\text{Thermal output (Btu/h)}}{\text{Water Temperature drop (°F)}} = \text{lb/hr}$$

Temperature of Incoming Air		Z Factor for Temperature in	
°C	°F	°C	°F
-1	30	1.30	1.16
10	40	1.25	1.14
15	50	1.22	1.12
20	60	1.20	1.09
30	70	1.16	1.07
40	80	1.13	1.05

### Method Unlisted Conditions

#### Step 1

Determine basic rating required =  $\frac{\text{Thermal Output}}{\text{Temperature Difference}}$

#### Step 2

From given emission tables find the basic rating nearest to required basic rating with regard to the following factors:

1. Leaving Air Temperature
2. Mounting Height
3. Throw/Coverage
4. Sound Code.

#### Step 3

Apply to the basic rating and influencing factors, i.e. unlisted temperature drop.

#### Step 4

Calculate Thermal Output.

#### Step 5

Calculate Leaving Air Temperature.



## Example

(SI units used, Imperial similar)

Duty required 19kW downstream D2 model  
 Heating conditions 105°C MWT, 30° drop  
 Entering Air temperature 20°C

**From above, basic rating (BR) required**

$$BR = \frac{19}{85} = 0.224$$

From tables, model CW29 is selected having Basic Rating 0.262 or whichever is nearer to that required and having acceptable sound and mounting height/coverage performance.

**From table**

$$\text{Initial temperature rise} = \frac{23.6}{0.59 \times 1.20} = 33^\circ\text{C}$$

Factor for 30°C Drop = 0.94

Factors for D2 Diffuser (at 33°C temperature rise) = 0.92 for reduction in thermal output and 0.88 for reduction in volumetric output

New Basic Rating = 0.92 x 0.94 x 0.262 = 0.227

Thermal Output = 0.227 x 85 = 19.30kW

Air Volume = 0.59 x 0.88 = 0.52m<sup>3</sup>/s

$$\text{Actual temperature rise} = \frac{19.3}{0.52 \times 1.20} = 30.9^\circ\text{C}$$

**Thus:**

Leaving Air Temperature = 30.9 + 20 = 50.9°C

## Mounting Height

Size	Speed	Effective Throw	Basic Units					Downstream Units							
			Mounting Height with Air Temperature as shown							Mounting Height with Air Temperature as shown					
			Up to 40°C		Over 40 to 50°C		Coverage at Min Mounting	Up to 40°C		Over 40 to 50°C		Over 50 to 60°C			
Min	Max	Min	Max	Min	Max	Min		Max	Min	Max					
A	N	9.1	2.4	3.4	2.1	3.1	7.3 x 7.3	2.7	4.6	2.4	4.3	2.1	3.4		
	S	6.1	2.4	3.1	2.1	2.7	4.9 x 4.9	2.7	4.3	2.1	3.7	1.8	3		
B	N	10.7	3.4	4.3	3.1	4	8.5 x 8.5	3.4	5.2	3.1	4.9	2.4	4.3		
	S	9.1	2.7	3.4	2.4	3.1	7.3 x 7.3	3.1	4.6	2.4	4	2.1	3.7		
	ES	6.1	2.4	3.4	2.4	2.7	4.9 x 4.9	2.7	4.3	2.1	3.7	2.1	3.4		
C	N	13.7	4	5.2	3.7	4.9	11.0 x 11.0	4.3	7.6	3.4	6.7	3.1	5.2		
	S	10.7	3.4	4.6	3.1	4.3	8.5 x 8.5	3.7	5.5	3.1	4.9	2.7	4.3		
	ES	7.6	3.1	4	2.4	3.4	6.1 x 6.1	3.4	4.9	2.7	4.3	2.4	4		
D	N	16.8	4.6	5.8	4.3	5.5	13.4 x 13.4	4.3	8.8	3.4	7.9	3.1	6.1		
	S	13.7	3.4	5.2	3.1	4.6	11.0 x 11.0	3.7	6.4	3.1	5.2	2.7	4.6		
	ES	10	3	4.5	3	4	8.0 x 8.0	3.3	5.5	2.9	4.7	2.5	4.1		
E	N	19.8	5.2	6.4	4.9	5.8	15.9 x 15.9	4.6	8.8	4	7.9	3.4	6.4		
	S	16.8	4	5.2	3.7	4.8	13.4 x 13.4	4	6.1	3.1	5.2	2.7	4.9		
	ES	12.2	3	4.5	3	4	9.8 x 9.8	3.6	5.4	2.9	4.7	2.5	4.4		
F	N	22.9	5.2	6.7	4.9	6.1	18.3 x 18.3	5.2	10.4	4.3	9.8	4	7.6		
	S	16.8	3.7	5.8	3.4	5.5	13.4 x 13.4	4.6	6.4	3.7	6.1	3.4	5.5		

N = Normal Speed: 1400 rpm on A-E Units.  
 S = Slow Speed: 940 rpm on A-F Units.  
 ES = Extra Slow Speed: 700 rpm on B-F Units.

Not applicable to F. unit  
 Not Applicable to A unit

## Unit Heaters

### Emissions – LTHW 75°C Mean 10°C Drop

Model	EAT -1°C		EAT 15°C		EAT 20°C		Air Volume m³/s	Mean Basic Rating	Sound Code	Mounting height range (m)				
	Emission kW	LAT °C	Emission kW	LAT °C	Emission kW	LAT °C				LAT up to 40°C		LAT 41° to 50°C		
										Min	Max	Min	Max	
AW24	10.5	26	8.3	36	7.6	39	0.33	0.14	I	2.4	3.4	2.1	3.1	NORMAL SPEED
AW34	13.2	36	10.4	44	9.6	47	0.30	0.17	I	2.4	3.4	2.1	3.1	
BW24	16.5	21	13.1	32	12.0	36	0.64	0.22	FN	3.4	4.3	3.1	4.0	
BW34	22.4	31	17.7	40	16.2	43	0.59	0.30	FN	3.4	4.3	3.1	4.0	
CW24	19.8	18	15.7	30	14.4	34	0.87	0.26	N	4.0	5.2	3.7	4.9	
CW34	28.0	28	22.1	38	20.2	41	0.80	0.37	N	4.0	5.2	3.7	4.9	
DW24	37.9	17	29.9	29	27.4	33	1.78	0.50	N	4.6	5.8	4.3	5.5	
DW34	51.7	26	40.8	36	37.4	39	1.62	0.68	N	4.6	5.8	4.3	5.5	
EW24	49.9	19	39.4	31	36.1	35	2.05	0.66	N	5.2	6.4	4.9	5.8	
EW34	67.1	28	53.0	38	48.6	41	1.92	0.88	N	5.2	6.4	4.9	5.8	
AW29	8.7	31	6.9	40	6.3	43	0.23	0.12	Q	2.4	3.1	2.1	2.7	SLOW SPEED
AW39	10.6	43	8.4	50	7.7	52	0.20	0.14	Q	2.4	3.1	2.1	2.7	
BW29	13.7	26	10.8	36	9.9	39	0.43	0.18	FQ	2.7	3.4	2.4	3.1	
BW39	17.8	37	14.0	45	12.9	48	0.39	0.23	FQ	2.7	3.4	2.4	3.1	
CW29	17.0	23	13.5	34	12.3	37	0.59	0.22	I	3.4	4.6	3.1	4.3	
CW39	22.6	34	17.8	43	16.3	46	0.53	0.30	I	3.4	4.6	3.1	4.3	
DW29	30.1	22	23.8	33	21.8	37	1.10	0.40	FN	3.4	5.2	3.1	4.6	
DW39	38.6	33	30.5	42	27.9	45	0.94	0.51	FN	3.4	5.2	3.1	4.6	
EW29	39.5	24	31.2	35	28.6	38	1.30	0.52	FN	4.0	5.2	3.7	4.8	
EW39	51.5	37	40.7	45	37.3	48	1.13	0.68	FN	4.0	5.2	3.7	4.8	
FW29	59.2	23	46.7	34	42.8	37	2.05	0.78	FN	5.2	6.7	4.9	6.1	
FW39	80.4	34	63.5	43	58.2	46	1.89	1.06	FN	5.2	6.7	4.9	6.1	
BW27	11.9	32	9.4	41	8.6	44	0.30	0.16	Q	2.4	3.4	2.4	2.7	EXTRA SLOW SPEED
BW37	14.4	43	11.3	50	10.4	52	0.27	0.19	Q	2.4	3.4	2.4	2.7	
CW27	14.3	28	11.3	38	10.4	41	0.41	0.19	Q	3.1	4.0	2.4	3.4	
CW37	17.5	40	13.8	47	12.7	49	0.36	0.23	Q	3.1	4.0	2.4	3.4	
DW27	26.8	27	21.1	37	19.4	40	0.80	0.35	I	3.0	4.5	3.0	4.0	
DW37	33.5	38	26.4	46	24.2	48	0.71	0.44	I	3.0	4.5	3.0	4.0	
EW27	32.8	29	25.9	39	23.8	42	0.90	0.43	I	3.0	4.5	3.0	4.0	
EW37	42.9	42	33.9	49	31.0	51	0.83	0.56	I	3.0	4.5	3.0	4.0	
FW27	50.3	28	39.7	38	36.4	41	1.44	0.66	I	3.7	5.8	3.4	5.5	
FW37	67.2	42	53.0	49	48.6	51	1.30	0.88	I	3.7	5.8	3.4	5.5	

The above sound codes are applicable to basic units only.

See separate data on sound codes and mounting heights for downstream D2 units.

### Emission Factors

The figures above apply to the water temperature drops of 10°C only. For other temperature drops, multiply the given factors. Top line indicates water temperature drop in deg C.

Unit	Water Temperature Drop in °C		
	5	15	20
2 row	1.04	0.94	0.88
3 row	1.03	0.96	0.92

	Air Temperature Rise in °C		
	15-30	30-50	50-70
Unit heater with D2	0.92	0.88	0.84
Air Volume Factors	0.95	0.92	0.90

## Emissions – MTHW 110°C Mean 20°C Drop

Model	EAT -1°C		EAT 15°C		EAT 20°C		Air Volume m³/s	Mean Basic Rating	Sound Code	Mounting height range (m)				
	Emission kW	LAT °C	Emission kW	LAT °C	Emission kW	LAT °C				LAT up to 40°C		LAT 41° to 50°C		
										Min	Max	Min	Max	
AW14	8.1	15	6.9	29	6.6	34	0.41	0.073	I	2.4	3.4	2.1	3.1	NORMAL SPEED
AW24	15.2	35	13	48	12.3	52	0.33	0.137	I	2.4	3.4	2.1	3.1	
AW34	19.5	50	16.7	62	15.8	65	0.3	0.176	I	2.4	3.4	2.1	3.1	
BW14	13.8	13	11.8	28	11.2	33	0.75	0.124	FN	3.4	4.3	3.1	4	
BW24	26.3	31	22.5	44	21.3	48	0.64	0.237	FN	3.4	4.3	3.1	4	
BW34	34.6	45	29.6	57	28.1	61	0.59	0.312	FN	3.4	4.3	3.1	4	
CW14	19.6	14	16.8	28	15.9	33	1.06	0.177	N	4	5.2	3.7	4.9	
CW24	35.9	32	30.7	45	29.1	48	0.87	0.323	N	4	5.2	3.7	4.9	
CW34	47.8	46	40.9	58	38.8	61	0.8	0.431	N	4	5.2	3.7	4.9	
DW14	30.6	11	26.2	26	24.8	31	2	0.276	N	4.6	5.8	4.3	5.5	
DW24	61.9	26	53	40	50.2	44	1.78	0.558	N	4.6	5.8	4.3	5.5	
DW34	79.4	38	67.9	50	64.4	54	1.92	0.276	N	4.6	5.8	4.3	5.5	
EW14	43.1	15	36.9	29	34.9	34	2.15	0.388	N	5.2	6.4	4.9	5.8	
EW24	81.6	30	69.8	44	66.2	47	2.05	0.735	N	5.2	6.4	4.9	5.8	
EW34	105.5	42	90.3	54	85.5	58	1.92	0.95	N	5.2	6.4	4.9	5.8	
AW19	6.5	20	5.6	34	5.3	38	0.25	0.059	Q	2.4	3.1	2.1	2.7	SLOW SPEED
AW29	11.7	39	10	51	9.5	55	0.23	0.105	Q	2.4	3.1	2.1	2.7	
AW39	14.9	58	12.7	68	12.1	71	0.2	0.134	Q	2.4	3.1	2.1	2.7	
BW19	12.1	19	10.4	33	9.8	37	0.49	0.109	FQ	2.7	3.4	2.4	3.1	
BW29	21	38	18	50	17	54	0.43	0.189	FQ	2.7	3.4	2.4	3.1	
BW39	26.3	52	22.5	63	21.3	67	0.39	0.237	FQ	2.7	3.4	2.4	3.1	
CW19	17	18	14.5	32	13.8	37	0.7	0.153	I	3.4	4.6	3.1	4.3	
CW29	29.1	38	24.9	50	23.6	54	0.59	0.262	I	3.4	4.6	3.1	4.3	
CW39	36.4	53	31.2	64	29.5	67	0.53	0.328	I	3.4	4.6	3.1	4.3	
DW19	27	15	23.1	30	21.9	34	1.1	0.243	FN	3.4	5.2	3.1	4.6	
DW29	48.1	34	41.1	46	39	50	0.94	0.433	FN	3.4	5.2	3.1	4.6	
DW39	59.8	49	51.2	61	48.5	64	1.4	0.539	FN	3.4	5.2	3.1	4.6	
EW19	35.6	19	30.5	33	28.9	38	1.3	0.321	FN	4	5.2	3.7	4.8	
EW29	63	37	54	50	51.1	53	0.94	0.568	FN	4	5.2	3.7	4.8	
EW39	78.4	54	67.1	65	63.5	68	1.4	0.706	FN	4	5.2	3.7	4.8	
FW19	55.4	18	47.4	33	44.9	37	2.26	0.499	FN	5.2	6.7	4.9	6.1	
FW29	95.7	36	81.9	48	77.6	52	2.05	0.862	FN	5.2	6.7	4.9	6.1	
FW39	120.8	49	103.4	61	97.9	64	1.89	1.088	FN	5.2	6.7	4.9	6.1	
BW17	10.4	22	8.9	36	8.5	40	0.36	0.094	Q	2.4	3.4	2.4	2.7	EXTRA SLOW SPEED
BW27	16.5	43	14.2	54	13.4	58	0.3	0.149	Q	2.4	3.4	2.4	2.7	
BW37	20.6	59	17.7	70	16.7	72	0.27	0.186	Q	2.4	3.4	2.4	2.7	
CW17	14.7	22	12.5	36	11.9	40	0.5	0.132	Q	3.1	4	2.4	3.4	
CW27	22.9	43	19.6	55	18.5	58	0.41	0.206	Q	3.1	4	2.4	3.4	
CW37	28.6	62	24.5	72	23.2	75	0.36	0.258	Q	3.1	4	2.4	3.4	
DW17	24.5	19	21	33	19.9	37	0.97	0.221	I	3	4.5	3	4	
DW27	40.8	39	35	52	33.1	55	0.8	0.368	I	3	4.5	3	4	
DW37	49.8	54	42.7	65	40.4	68	0.71	0.449	I	3	4.5	3	4	
EW17	31.3	22	26.8	36	25.4	40	1.06	0.282	I	3	4.5	3	4	
EW27	52.5	45	44.9	57	42.6	60	0.9	0.473	I	3	4.5	3	4	
EW37	63	59	54	69	51.1	72	0.83	0.568	I	3	4.5	3	4	
FW17	46.1	21	39.4	35	37.4	40	1.13	0.415	I	3.7	5.8	3.4	5.5	
FW27	78.4	42	67.1	54	63.5	58	1.63	0.706	I	3.7	5.8	3.4	5.5	
FW37	95.7	57	81.9	68	77.6	71	1.44	0.862	I	3.7	5.8	3.4	5.5	

## Unit Heaters

### Emission Factors

The figures above apply to the water temperature drops of 20°C only. For other temperature drops, multiply the given factors. Top line indicates water temperature drop in deg C.

Unit	Water Temperature Drop in °C		
	10	30	40
1 Row	1.09	0.89	0.79
2 Row	1.05	0.94	0.89
3 Row	1.03	0.96	0.92

Unit heater with D2	Air Temperature Rise in °C		
	15-30	30-50	50-70
Air Volume Factors	0.92	0.88	0.84
Emission Factors	0.95	0.92	0.90

### Emissions – Steam 1.0 Bar Gauge (120°C)

Model	EAT -1°C		EAT 15°C		EAT 20°C		Air Volume m³/s	Mean Basic Rating	Sound Code	Mounting height range (m)				
	Emission kW	LAT °C	Emission kW	LAT °C	Emission kW	LAT °C				LAT up to 40°C		LAT 41° to 50°C		
										Min	Max	Min	Max	
A14	11.0	20	9.5	34	9.1	39	0.41	0.091	I	2.4	3.4	2.1	3.1	NORMAL SPEED
A24	17.7	41	15.4	54	14.7	58	0.33	0.147	I	2.4	3.4	2.1	3.1	
B14	17.5	17	15.2	31	14.5	36	0.75	0.145	FN	3.4	4.3	3.1	4.0	
B24	30.2	37	26.2	50	25.0	54	0.64	0.250	FN	3.4	4.3	3.1	4.0	
C14	24.2	17	21.0	31	20.0	36	1.06	0.200	N	4.0	5.2	3.7	4.9	
C24	41.5	37	36.2	50	34.5	54	0.80	0.345	N	4.0	5.2	3.7	4.9	
D14	40.0	15	34.6	29	33.0	34	2.00	0.330	N	4.6	5.8	4.3	5.5	
D24	69.0	30	60.0	43	57.0	47	1.78	0.574	N	4.6	5.8	4.3	5.5	
E14	49.5	17	43.0	31	41.0	36	2.15	0.410	N	5.2	6.4	4.9	5.8	
E24	90.0	34	78.0	47	74.5	51	2.05	0.745	N	5.2	6.4	4.9	5.8	
A19	8.9	28	7.7	42	7.4	46	0.25	0.074	Q	2.4	3.1	2.1	2.7	SLOW SPEED
A29	15.0	50	13.0	62	12.4	66	0.23	0.124	Q	2.4	3.1	2.1	2.7	
B19	15.1	22	13.1	37	12.5	41	0.49	0.125	FQ	2.7	3.4	2.4	3.1	
B29	25.0	45	21.7	57	20.7	61	0.43	0.207	FQ	2.7	3.4	2.4	3.1	
C19	20.6	21	17.9	35	17.0	40	0.70	0.107	I	3.4	4.6	3.1	4.3	
C29	33.8	45	29.4	57	28.0	61	0.59	0.28	I	3.4	4.6	3.1	4.3	
D19	33.1	19	28.8	33	27.4	38	1.30	0.274	FN	3.4	5.2	3.1	4.6	
D29	57.5	39	50.0	52	47.5	56	1.10	0.475	FN	3.4	5.2	3.1	4.6	
E19	42.3	22	36.8	37	35.0	41	1.40	0.35	FN	4.0	5.2	3.7	4.8	
E29	72.5	44	63.0	56	60.0	60	1.30	0.6	FN	4.0	5.2	3.7	4.8	
F19	62.0	21	54.0	35	51.5	40	2.26	0.515	FN	5.2	6.7	4.9	6.1	
F29	106.0	40	92.0	53	88.0	57	2.05	0.880	FN	5.2	6.7	4.9	6.1	
B17	12.8	27	11.1	41	10.6	45	0.36	0.106	Q	2.4	3.4	2.4	2.7	EXTRA SLOW SPEED
B27	20.3	53	17.6	64	16.8	68	0.30	0.168	Q	2.4	3.4	2.4	2.7	
C17	17.4	27	15.1	41	14.4	45	0.50	0.144	Q	3.1	4.0	2.4	3.4	
C27	27.5	52	23.8	63	22.7	67	0.41	0.227	Q	3.1	4.0	2.4	3.4	
D17	29.5	24	25.6	38	24.4	42	0.97	0.244	I	3.0	4.5	3.0	4.0	
D27	47.5	46	41.2	58	39.3	62	0.80	0.393	I	3.0	4.5	3.0	4.0	
E17	36.7	26	31.8	40	30.3	44	1.06	0.303	I	3.0	4.5	3.0	4.0	
E27	60.0	53	52.5	64	50.0	68	0.90	0.500	I	3.0	4.5	3.0	4.0	
F17	53.0	25	46.0	39	44.0	43	1.63	0.44	I	3.7	5.8	3.4	5.5	
F27	87.0	46	75.5	58	72.0	62	1.44	0.72	I	3.7	5.8	3.4	5.5	

### Emission Factors

The figures above apply to louvred models only – for models with D2 downstream diffuser adjust as indicated below. Sound codes applicable to basic units only – check figures for D2.

Unit heater with D2	Air Temperature Rise in °C		
	15-30	30-50	50-70
Air Volume Factors	0.92	0.88	0.84
Emission Factors	0.95	0.92	0.90

## Emissions – Steam 4.0 Bar Gauge (152°C)

Model	EAT -1°C		EAT 15°C		EAT 20°C		Air Volume m³/s	Mean Basic Rating	Sound Code	Mounting height range (m)				
	Emission kW	LAT °C	Emission kW	LAT °C	Emission kW	LAT °C				LAT up to 40°C		LAT 41° to 50°C		
										Min	Max	Min	Max	
A14	13.9	26	12.5	41	12	45	0.41	0.91	I	2.4	3.4	2.1	3.1	NORMAL SPEED
A24	22.5	53	20.1	66	19.4	70	0.33	0.147	I	2.4	3.4	2.1	3.1	
B14	22.2	22	19.9	37	19.1	41	0.75	0.145	FN	3.4	4.3	3.1	4	
B24	38.2	47	34.2	61	33	65	0.64	0.25	FN	3.4	4.3	3.1	4	
C14	30.6	22	27.4	37	26.4	41	1.06	0.2	N	4	5.2	3.7	4.9	
C24	52.7	47	47.3	61	45.5	65	0.8	0.345	N	4	5.2	3.7	4.9	
D14	50.5	19	45.2	34	43.5	38	2	0.33	N	4.6	5.8	4.3	5.5	
D24	88	38	79	52	76	56	1.78	0.574	N	4.6	5.8	4.3	5.5	
E14	62.7	22	56	37	54	41	2.15	0.41	N	5.2	6.4	4.9	5.8	
E24	114	43	102	57	98	61	2.05	0.745	N	5.2	6.4	4.9	5.8	
A19	11.3	36	10.1	50	9.8	54	0.25	0.074	Q	2.4	3.1	2.1	2.7	SLOW SPEED
A29	19	64	17	78	16.4	81	0.23	0.124	Q	2.4	3.1	2.1	2.7	
B19	19.1	29	17.1	44	16.5	48	0.49	0.125	FQ	2.7	3.4	2.4	3.1	
B29	31.5	57	28.4	71	27.4	74	0.43	0.207	FQ	2.7	3.4	2.4	3.1	
C19	26	27	23.5	44	22.5	48	0.7	0.17	I	3.4	4.6	3.1	4.3	
C29	43	57	38.5	71	37	74	0.59	0.28	I	3.4	4.6	3.1	4.3	
D19	42	24	37.5	40	36	44	1.3	0.274	FN	3.4	5.2	3.1	4.6	
D29	73	50	65	64	63	67	1.1	0.475	FN	3.4	5.2	3.1	4.6	
E19	53.5	29	48	44	46	48	1.4	0.35	FN	4	5.2	3.7	4.8	
E29	92	56	82	70	79	73	1.3	0.6	FN	4	5.2	3.7	4.8	
F19	79	27	70	42	68	46	2.26	0.515	FN	5.2	6.7	4.9	6.1	
F29	135	52	121	65	116	69	2.05	0.88	FN	5.2	6.7	4.9	6.1	
B17	16.2	34	14.5	49	14	53	0.36	0.106	Q	2.4	3.4	2.4	2.7	EXTRA SLOW SPEED
B27	25.5	67	23	80	22	83	0.3	0.168	Q	2.4	3.4	2.4	2.7	
C17	22	34	19.5	49	19	53	0.5	0.144	Q	3.1	4	2.4	3.4	
C27	34.5	66	31	79	30	82	0.41	0.227	Q	3.1	4	2.4	3.4	
D17	37	30	33.4	45	32	49	0.97	0.244	I	3	4.5	3	4	
D27	60	59	54	71	52	75	0.8	0.393	I	3	4.5	3	4	
E17	46.5	33	41.5	48	40	52	1.06	0.303	I	3	4.5	3	4	
E27	76	67	68	80	66	83	0.9	0.5	I	3	4.5	3	4	
F17	67	32	60	46	58	50	1.63	0.44	I	3.7	5.8	3.4	5.5	
F27	111	59	99	72	95	75	1.44	7.2	I	3.7	5.8	3.4	5.5	

### Emission Factors

The figures above apply to louvred models only – for models with D2 downstream diffuser adjust as indicated below. Sound codes applicable to basic units only – check figures for D2,

Unit heater with D2	Air Temperature Rise in °C		
	15-30	30-50	50-70
Air Volume Factors	0.92	0.88	0.84
Emission Factors	0.95	0.92	0.9

## Unit Heaters

### Emissions – Steam 8.0 Bar Gauge (175°C)

Model	EAT -1°C		EAT 15°C		EAT 20°C		Air Volume m³/s	Mean Basic Rating	Sound Code	Mounting height range (m)				
	Emission kW	LAT °C	Emission kW	LAT °C	Emission kW	LAT °C				LAT up to 40°C		LAT 41° to 50°C		
										Min	Max	Min	Max	
A14	16	30	14.5	45	14.1	49	0.41	0.091	I	2.4	3.4	2.1	3.1	NORMAL SPEED
A24	26	61	23.5	75	22.8	79	0.33	0.147	I	2.4	3.4	2.1	3.1	
B14	25.5	25	23.2	40	22.5	45	0.75	0.145	FN	3.4	4.3	3.1	4	
B24	44	54	40	68	39	73	0.64	0.25	FN	3.4	4.3	3.1	4	
C14	35	25	32	40	31	45	1.06	0.2	N	4	5.2	3.7	4.9	
C24	61	54	55	68	53.5	73	0.8	0.345	N	4	5.2	3.7	4.9	
D14	58	22	53	37	51	42	2	0.33	N	4.6	5.8	4.3	5.5	
D24	101	44	92	57	89	62	1.78	0.574	N	4.6	5.8	4.3	5.5	
E14	72	25	66	40	64	45	2.15	0.41	N	5.2	6.4	4.9	5.8	
E24	131	50	115	63	116	68	2.05	0.745	N	5.2	6.4	4.9	5.8	
A19	13	41	11.8	56	11.5	60	0.25	0.074	Q	2.4	3.1	2.1	2.7	SLOW SPEED
A29	21.8	74	19.9	87	19.2	91	0.23	0.124	Q	2.4	3.1	2.1	2.7	
B19	22	33	20	48	19.4	52	0.49	0.125	FQ	2.7	3.4	2.4	3.1	
B29	36.5	66	33	79	32	83	0.43	0.207	FQ	2.7	3.4	2.4	3.1	
C19	30	32	27	46	26.5	51	0.7	0.17	I	3.4	4.6	3.1	4.3	
C29	49	66	45	79	43	83	0.59	0.28	I	3.4	4.6	3.1	4.3	
D19	18	28	44	43	42.5	48	1.3	0.274	FN	3.4	5.2	3.1	4.6	
D29	84	58	76	71	74	76	1.1	0.475	FN	3.4	5.2	3.1	4.6	
E19	61.5	33	56	48	54	52	1.4	0.35	FN	4	5.2	3.7	4.8	
E29	106	64	96	78	93	82	1.3	0.6	FN	4	5.2	3.7	4.8	
F19	91	32	83	46	80	51	2.26	0.515	FN	5.2	6.7	4.9	6.1	
F29	155	59	141	52	136	57	2.05	0.88	FN	5.2	6.7	4.9	6.1	
B17	18.6	40	17	54	16.4	59	0.36	0.106	Q	2.4	3.4	2.4	2.7	EXTRA SLOW SPEED
B27	29.5	77	27	90	26	95	0.3	0.168	Q	2.4	3.4	2.4	2.7	
C17	25.3	40	23	54	22.5	59	0.5	0.144	Q	3.1	4	2.4	3.4	
C27	40	76	36.4	89	35	93	0.41	0.227	Q	3.1	4	2.4	3.4	
D17	43	35	39	50	38	54	0.97	0.244	I	3	4.5	3	4	
D27	69	67	63	81	61	85	0.8	0.393	I	3	4.5	3	4	
E17	53	38	48.5	53	47	57	1.06	0.303	I	3	4.5	3	4	
E27	88	77	80	90	78	94	0.9	0.5	I	3	4.5	3	4	
F17	78	36	71	51	68	56	1.63	0.44	I	3.7	5.8	3.4	5.5	
F27	127	67	115	81	112	85	1.44	0.72	I	3.7	5.8	3.4	5.5	

#### Emission Factors

The figures above apply to louvred models only - for models with D2 downstream diffuser adjust as indicated below. Sound codes applicable to basic units only - check figures for D2,

Unit heater with D2	Air Temperature Rise in °C		
	15-30	30-50	50-70
Air Volume Factors	0.92	0.88	0.84
Emission Factors	0.95	0.92	0.90

## Operating Conditions

Whereas the heat exchangers fitted with screwed connections are suitable for pressures up to 10 bar gauge (145 psig), limitations at pressures below this can be incurred on units fitted with standard motors due to the effect of temperature on the motor windings. Current standard motors are supplied with Class 'B' insulation and as such the following working temperature limits must be observed.

Style	Limitations of heating media
Basic	Saturated steam at 10 barg (145 psig) and water at 120°C (248°F)

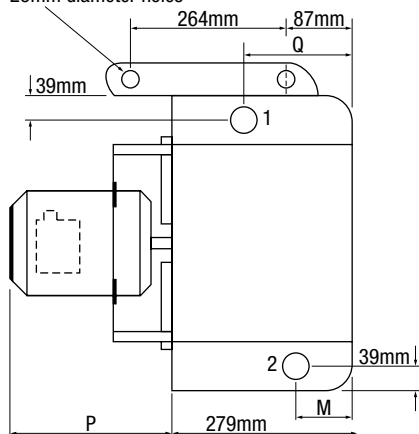
The Downstream D2 unit limitations are not specifically caused by the media being used, as the sub-mounted motor precludes that, however the leaving air temperature must be controlled and held to a maximum of 63°C (145°F)

Properties of Saturated Steam – SI Units			
Gauge Pressure (Bar)	Temperature (°C)	Latent Heat (KJ/Kg)	Volume (m <sup>3</sup> /Kg)
0.05	101	2253	1.57
0.1	102.3	2250	1.53
0.2	105	2242	1.4
0.5	115	2226	1.15
1	120.9	2202	0.88
2	134	2163	0.6
4	152.8	2106	0.37
5	159.6	2086	0.31
6	165	2066	0.27
7	171	2048	0.24
8	176.1	2030	0.21
10	184.1	2001	0.18

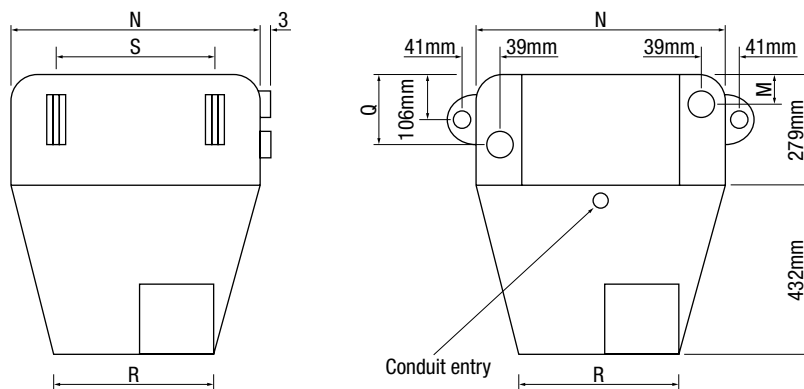
## Dimensions

### Basic WG

Support cleats have 25mm diameter holes



### Downstream Types



## Unit Heaters

Size and number of rows	Connections inch (mm)		Dimensions mm						Weights, Water & Shipping Space				
	Inlet BSP Female	Outlet BSP Female	M	N	P	Q	R	S	Basic units		Units with D2 diffusers		Water content Kgs
									Nett wt Kgs	M <sup>3</sup>	Nett wt Kgs	M <sup>3</sup>	
A1	1 (25)	1 (25)	140	505	248	65	301	178	30	0.23	34	0.28	0.7
A2	1¼ (32)	1¼ (32)	140	505	248	65	301	178	32	0.23	37	0.28	1.2
AW1	1 (25)	1 (25)	140	505	248	65	301	178	30	0.23	34	0.28	0.7
AW2	1 (25)	1 (25)	65	505	248	140	301	178	32	0.23	37	0.28	1.2
AW3	1 (25)	1 (25)	65	505	248	140	301	178	34	0.23	39	0.28	1.4
B1	1 (25)	1 (25)	140	555	248	65	368	178	34	0.28	41	0.34	1.1
B2	1¼ (32)	1¼ (32)	140	555	248	65	368	178	37	0.28	43	0.34	1.5
BW1	1 (25)	1 (25)	140	555	248	65	368	178	34	0.28	41	0.34	1.1
BW2	1 (25)	1 (25)	65	555	248	140	368	178	37	0.28	43	0.34	1.5
BW3	1 (25)	1 (25)	65	555	248	140	368	178	39	0.28	46	0.34	1.9
C1	1 (25)	1 (25)	140	605	248	65	435	178	39	0.34	48	0.42	1.4
C2	1¼ (32)	1¼ (32)	140	605	248	65	435	178	43	0.34	53	0.42	1.9
CW1	1 (25)	1 (25)	140	605	248	65	435	178	39	0.34	48	0.42	1.4
CW2	1 (25)	1 (25)	65	605	248	140	435	178	43	0.34	53	0.42	1.9
CW3	1 (25)	1 (25)	65	605	248	140	435	178	48	0.34	57	0.42	2.5
D1	1¼ (32)	1¼ (32)	140	705	248	65	502	375	48	0.4	60	0.51	2.1
DW1	1¼ (32)	1¼ (32)	140	705	248	65	502	375	48	0.4	60	0.51	2.1
DW2	1¼ (32)	1¼ (32)	65	705	248	140	502	375	53	0.4	64	0.51	3
DW3	1¼ (32)	1¼ (32)	65	705	248	140	502	375	60	0.4	71	0.51	3.8
E1	1¼ (32)	1¼ (32)	140	806	248	65	602	375	55	0.57	68	0.62	2.6
E2	1¼ (32)	1¼ (32)	140	806	248	65	602	375	62	0.57	75	0.62	3.8
EW1	1¼ (32)	1¼ (32)	140	806	248	65	602	375	55	0.57	68	0.62	2.6
EW2	1¼ (32)	1¼ (32)	65	806	248	140	602	375	62	0.57	75	0.62	3.8
EW3	1¼ (32)	1¼ (32)	65	806	248	140	602	375	71	0.57	82	0.62	5.1
F1	1¼ (32)	1¼ (32)	140	910	257	65	702	375	66	0.68	79	0.79	3.2
F2	1¼ (32)	1¼ (32)	140	910	257	65	702	375	75	0.68	88	0.79	4.8
FW1	1¼ (32)	1¼ (32)	140	910	257	65	702	375	66	0.68	79	0.79	3.2
FW2	1¼ (32)	1¼ (32)	65	910	257	140	702	375	75	0.68	88	0.79	4.8
FW3	1¼ (32)	1¼ (32)	65	910	257	140	702	375	82	0.68	100	0.79	6.4
Steam	<b>Note:</b> Packed weight is net weight plus 50 per cent approximately.												
Water													

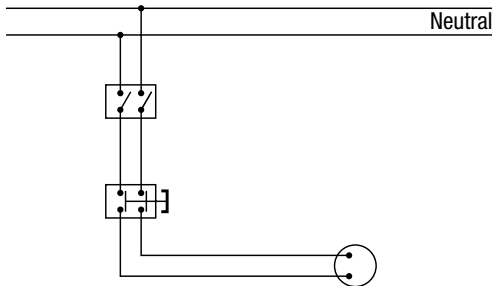
## Electrical data and wiring

Unit size	RPM	Full load current (amp)	
		Single phase 240V	Three phase 415V
A4	1400	1.4	0.5
A9	940	1.2	0.6
B4	1400	1.4	0.5
B9	940	1.2	0.6
B7	700	1.2	0.6
C4	1400	1.4	0.5
C9	940	1.2	0.6
C7	700	1.2	0.6
D4	1400	4.3	1.8
D9	940	1.2	0.6
D7	700	1.2	0.6
E4	1400	4.3	1.8
E9	940	1.2	0.6
E7	700	1.2	0.6
F9	940	2.3	1
F7	700	1.2	0.6

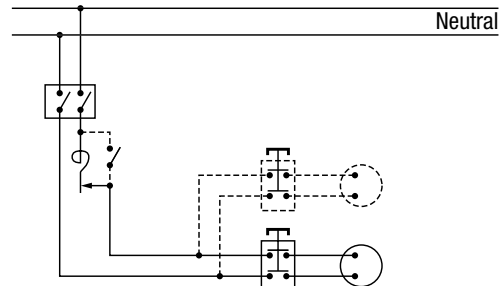
Key	
Motor	
Short circuit switch	
Thermostat	
Contacto starter	
Manual push-button starter	
Isolating switch	
Starter or coil when fitted	-----
between phases	-----
When fitted between phase and neutral	-----



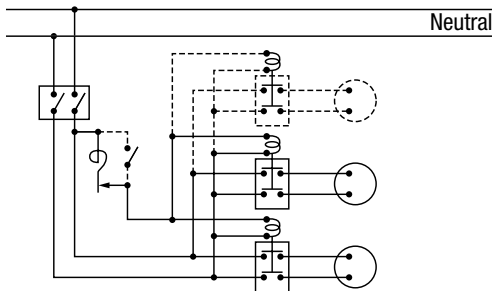
**A – Single Phase and DC**  
Hand control, single unit



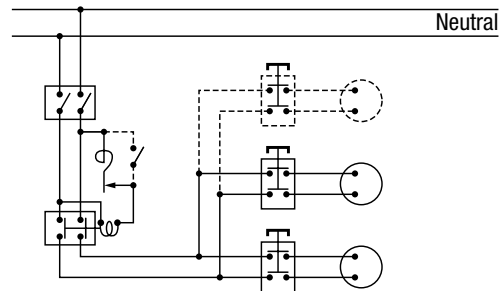
**B – Single Phase**  
Thermostat control for one or two motors without contactor (full load line current not exceeding 3 amps)



**C – Single Phase and DC**  
Thermostat control for multiple motors with contactor type static

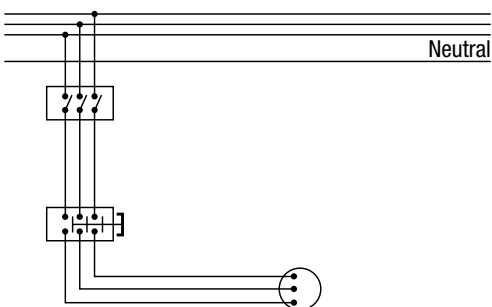


**D – Single Phase**  
Thermostat control for multiple motors with contactor and manual push-button start

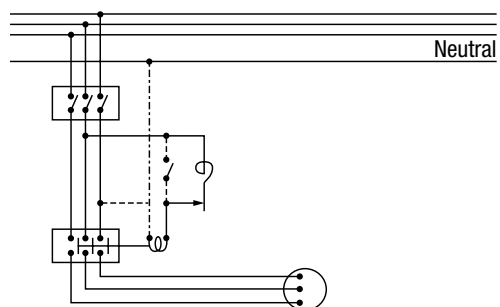


## Electrical data and wiring

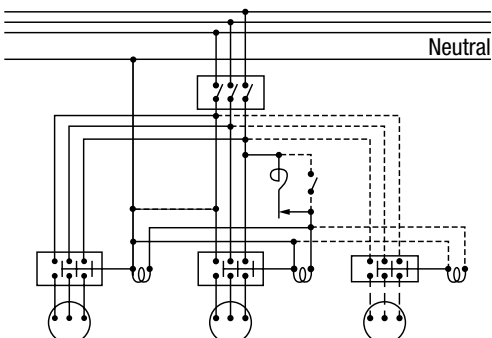
**E – Three phase**  
Hand control, single unit



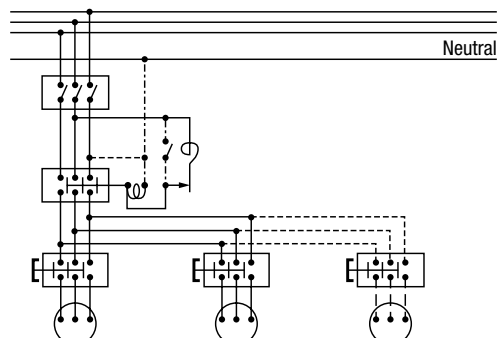
**F – Three phase**  
Thermostat control for single unit with contactor type starter



**G – Three phase**  
Thermostat control for multiple motors with contactor type starter



**H – Three phase**  
Thermostat control for multiple motors with contactor and manual push-button starter



## Unit Heaters

### Engineering Specification

#### Heat Exchanger

- The primary tubes shall be of a solid drawn copper.
- The headers shall be of steel – the primary tubes being securely fixed to the headers by brazing.
- The secondary heat exchange surface shall comprise aluminium fins in close metallic contact with the primary tubes.

#### Maximum working pressure

All standard heat exchangers shall be suitable for a maximum working pressure of 10.0 bar gauge (150 psig).

#### Pressure test

The heat exchanger shall be tested to 22 bar gauge (320 psig).

#### Casing

The casing shall be constructed from heavy gauge sheet steel, degreased, pretreated and finished with a high grade low gloss polyester powder paint to RAL 7000. It shall present a smooth exterior finish with the minimum of external fasteners exposed.

#### Control of airstream – louvered pattern heaters

Louvers shall be provided on the discharge face of the casing. The louvers shall be recessed within the casing and the fixing arrangements shall be such that they may be adjusted to various angles without the necessity of slackening screws etc., and they shall remain in the selected position without sagging. Top and bottom limit stops shall be provided to prevent the louvers being closed entirely.

#### Downstream pattern heaters

A D2 diffuser shall be provided, with hinges, on the bottom or discharge face of the casing. The diffuser shall be so constructed as to provide positive controllable fourway diffusion. Four individual sets of vanes shall be provided for this purpose. The vanes shall be moveable so as to permit adjustment of the air streams between vertical and side ways incline.

#### Motor

The motor shall be totally enclosed complying with BS 5000 Part 11 Three phase motors shall be of the squirrel cage induction type. Single phase motors shall be of permanent capacitor type. All motors shall be ball bearing type, sealed for life and suitable for working with a vertical shaft. Sub mounted motors (that is those beneath the heat exchanger in D2 arrangements) shall be designed to operate in the high temperature heating air stream. Standard motors are rated as IP 44.

#### Fan

The fan shall be of the propeller type, carefully balanced to ensure minimum vibration and securely fixed to the motor shaft.

#### Connections

Connections shall be screwed female BSPT.

#### Suspension

Suitable suspension cleats shall be provided so disposed as to ensure that the heater will hang plumb when free of pipe connections. Ensure that correct cleats are utilised – 4 smaller cleats shall be utilised when a D2 diffuser is fitted.

#### Packaging

Each Unit Heater shall be packed in a purpose made carton together with installation instructions. The carton shall be clearly marked with the model reference and other information as may be called for in the schedule.

#### Performance

The Unit Heater shall be tested and rated in accordance with BS 4856 Part 2 1972. (1983)

#### Notes

Cupro nickel heat exchangers, flanged connections and flameproof motors are no longer available.

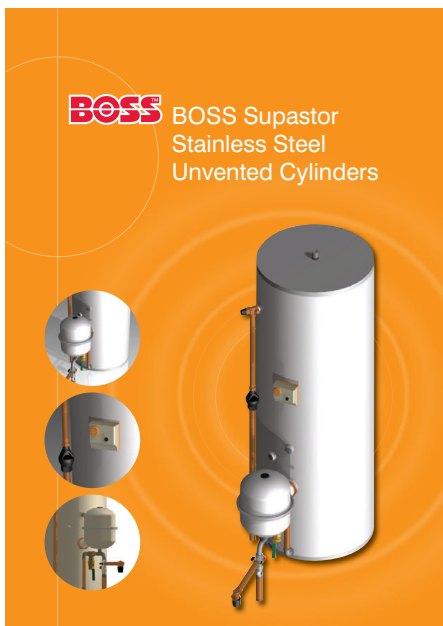
#### Quality Assurance

The manufacturer of Copperad products has been inspected and holds manufacturing systems controlled to ISO9001 standards, and all products conform to the latest CE requirements.

## Other BOSS Heating Literature Available from BSS

Please find below other BOSS Heating literature details. Most BSS brochures are available to download from our website and those that are available as a hard copy can be ordered. Visit [www.bssindustrial.co.uk](http://www.bssindustrial.co.uk) (<http://www.bssindustrial.co.uk>) and click on literature.

### BOSS Supastor



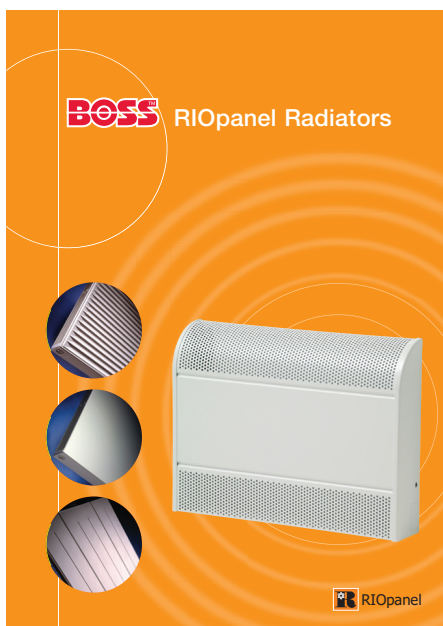
### BOSS Heating & Hot Water Valves Binder



### Services Binder



### BOSS RIO Panel Radiators



### BOSS Tap Water Heaters



### BOSS Infrared Heaters





Pipeline & Heating Solutions

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