Introduction to Heat Emitters

This section 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 ex-stock from our central warehouse and readily available to all our depots.

Copperad – A Brief History

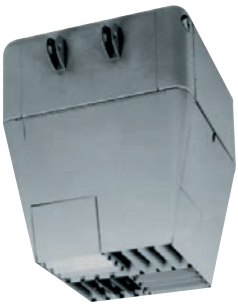
Copperad originated in 1932 as the British Unit Heater Company, founded by Mr. S. J. Holmes and a Mr. R. F. Jarratt. The name “Copperad” first appeared in 1939 when the company moved to St. Pancras Place, London, as the brand name for the unit heaters. In 1945 a second piece of apparatus was designed,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

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
AO	Air outlet spigots	Used as air inlet for D2 units
AI	Air inlet spigots	

Sound Levels

Sound Code	Sound Power Level dB Re 10_{12}W	Suggested Application
VQ	56-60	Laboratories
Q	61-65	Gymnasia, 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								
			Basic Units			Downstream Units		
Unit Size	Motor Speed	Nominal RPM	Code	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 45º to unit heater position when this is mounted at the normally recommended average mounting height corresponding to 45ºC (110ºF) LAT, whichever 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 45ºC (110ºF) LAT, whichever 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 10-5 N/m^2.

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 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

Temperature Rise (TR)

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

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

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

Flow Rate

$$SI = \frac{\text{Thermal output (kW) = kg/5}}{\text{Water Temperature drop (°C) x 4.2}} = kg/s$$

$$Imp = \frac{\text{Thermal output (Btu/h) = 1 b/h}}{\text{Water Temperature drop (°F)}} = lb/hr$$

Method Unlisted Conditions

Step 1

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

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

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

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^3/s

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

Thus:
Leaving Air Temperature = 30.9 + 20 = 50.9°C

Mounting Height

Size	Speed	Effective Throw	Basic Units Mounting Height with Air Temperature as shown Up to 40˚C Min	Up to 40˚C Max	Over 40 to 50˚C Min	Over 40 to 50˚C Max	Coverage at Min Mounting	Downstream Units Mounting Height with Air Temperature as shown Up to 40˚C Min	Up to 40˚C Max	Over 40 to 50˚C Min	Over 40 to 50˚C Max	Over 50 to 60˚C Min	Over 50 to 60˚C 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. Not applicable to F Unit.
S = Slow Speed: 940 rpm on A-F Units. Not applicable to A Unit.
ES = Extra Slow Speed: 700 rpm on B-F Units.

Emissions – LTHW 75°C Mean 10°C Drop

Model	EAT -1°C Emission kW	EAT -1°C LAT °C	EAT 15°C Emission kW	EAT 15°C LAT °C	EAT 20°C Emission kW	EAT 20°C LAT °C	Air Volume m³/s	Mean Basic Rating	Sound Code	Mounting height range (m) LAT up to 40°C Min	LAT up to 40°C Max	LAT 41° to 50°C Min	LAT 41° to 50°C 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		
Unit heater with D2	15-30	30-50	50-70
Air Volume Factors	0.92	0.88	0.84
Emission Factors	0.95	0.92	0.90

Emissions – MTHW 110˚C Mean 20˚C Drop

Model	EAT -1˚C Emission kW	EAT -1˚C LAT ˚C	EAT 15˚C Emission kW	EAT 15˚C LAT ˚C	EAT 20˚C Emission kW	EAT 20˚C LAT ˚C	Air Volume m³/s	Mean Basic Rating	Sound Code	Mounting height range (m) LAT up to 40˚C Min	LAT up to 40˚C Max	LAT 41˚ to 50˚C Min	LAT 41˚ to 50˚C 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	

Continued >

Model	EAT -1˚C Emission kW	LAT ˚C	EAT 15˚C Emission kW	LAT ˚C	EAT 20˚C Emission kW	LAT ˚C	Air Volume m³/s	Mean Basic Rating	Sound Code	Mounting height range (m) LAT up to 40˚C Min	Max	LAT 41˚ to 50˚C Min	Max	
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	

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

	Air Temperature Rise in ˚C		
Unit heater with D2	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 Emission kW	EAT -1°C LAT °C	EAT 15°C Emission kW	EAT 15°C LAT °C	EAT 20°C Emission kW	EAT 20°C LAT °C	Air Volume m^3/s	Mean Basic Rating	Sound Code	Mounting height range (m) LAT up to 40°C Min	LAT up to 40°C Max	LAT 41° to 50°C Min	LAT 41° to 50°C 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.

	Air Temperature Rise in °C		
Unit heater with D2	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 Emission kW	EAT -1˚C LAT ˚C	EAT 15˚C Emission kW	EAT 15˚C LAT ˚C	EAT 20˚C Emission kW	EAT 20˚C LAT ˚C	Air Volume m³/s	Mean Basic Rating	Sound Code	Mounting height range (m) LAT up to 40˚C Min	LAT up to 40˚C Max	LAT 41˚ to 50˚C Min	LAT 41˚ to 50˚C 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.

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

Emissions – Steam 8.0 Bar Gauge (175˚C)

Model	EAT -1˚C Emission kW	EAT -1˚C LAT ˚C	EAT 15˚C Emission kW	EAT 15˚C LAT ˚C	EAT 20˚C Emission kW	EAT 20˚C LAT ˚C	Air Volume m³/s	Mean Basic Rating	Sound Code	Mounting height range (m) LAT up to 40˚C Min	LAT up to 40˚C Max	LAT 41˚ to 50˚C Min	LAT 41˚ to 50˚C 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.

	Air Temperature Rise in ˚C		
Unit heater with D2	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

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

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.

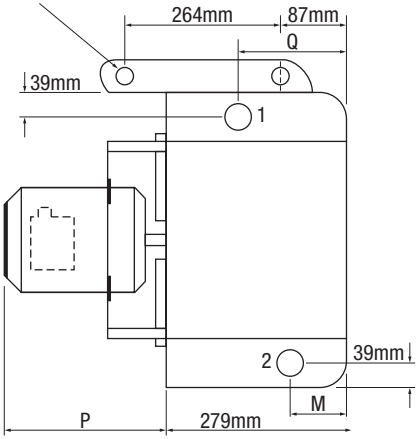
The Downstream D2 unit limitations are not specifically caused by the media being used, as the sub-mounted motor precludes that, however the leaving air temperature must be controlled and held to a maximum of 63˚C (145˚F).

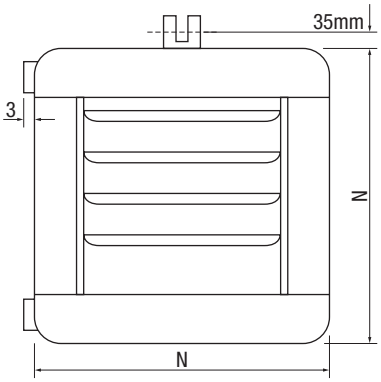
Properties of Saturated Steam – SI Units			
Gauge Pressure (Bar)	Temperature (˚C)	Latent Heat (KJ/Kg)	Volume (m^3/Kg)
0.05	101	2253	1.57
0.1	102.3	2250	1.53
0.2	105	2242	1.4
0.5	115	2226	1.15
1	120.9	2202	0.88
2	134	2163	0.6
4	152.8	2106	0.37
5	159.6	2086	0.31
6	165	2066	0.27
7	171	2048	0.24
8	176.1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

Dimensions

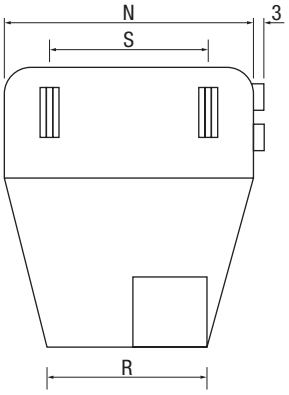
Basic WG

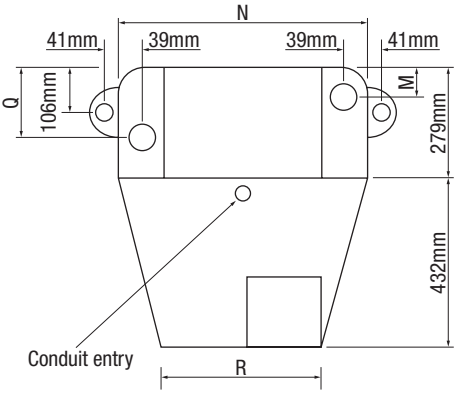
Support cleats have
25mm diameter holes





Downstream Types





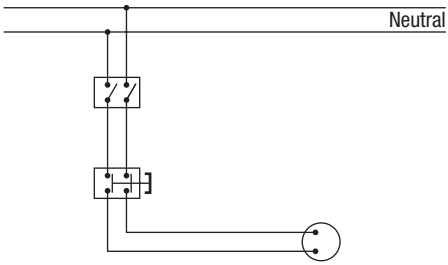
Size and number of rows	Connections inch (mm) Inlet BSP Female	Outlet BSP Female	Dimensions mm M	N	P*	Q	R	S	Weights, Water & Shipping Space Basic units Nett wt Kgs	M^3	Units with D2 diffusers Nett wt Kgs	M^3	Water content Kgs
A1	1 (25)	1 (25)	140	505	248	65	301	178	30	0.23	34	0.28	0.7
A2	1¼ (32)	1¼ (32)	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
D2	1¼ (32)	1¼ (32)	140	705	248	65	502	375	53	0.4	64	0.51	3
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	***Note:*** *Packed weight is net weight plus 50 per cent approximately.*												
Water													

Electrical data and wiring

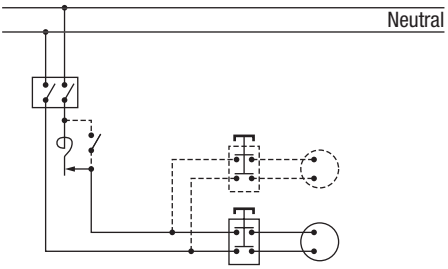
Unit size	RPM	Full load current (amp)	
		Single phase 240V	Three phase 415V
A4	1400	1.4	0.5
A9	940	1.2	0.6
B4	1400	1.4	0.5
B9	940	1.2	0.6
B7	700	1.2	0.6
C4	1400	1.4	0.5
C9	940	1.2	0.6
C7	700	1.2	0.6
D4	1400	4.3	1.8
D9	940	1.2	0.6
D7	700	1.2	0.6
E4	1400	4.3	1.8
E9	940	1.2	0.6
E7	700	1.2	0.6
F9	940	2.3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

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

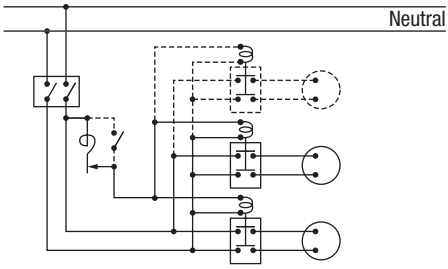
A – Single Phase and DC
Hand control, single unit



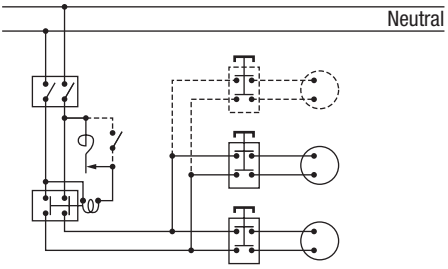
B – Single Phase
Thermostat control for one or two motors without contactor (full load line current not exceeding 3 amps)



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

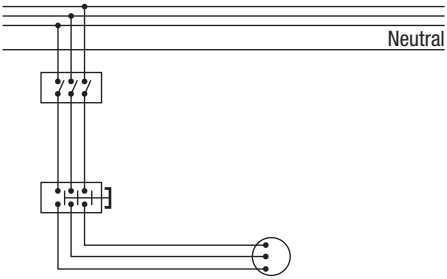


D – Single Phase
Thermostat control for multiple motors with contactor and manual push-button start

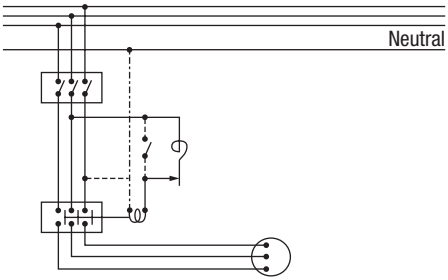


Electrical data and wiring

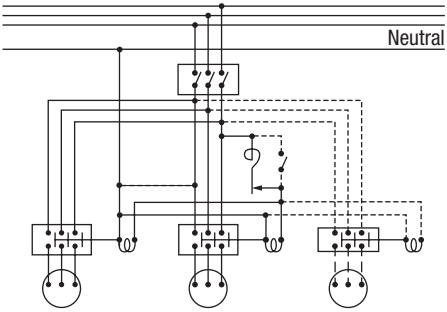
E – Three phase
Hand control, single unit



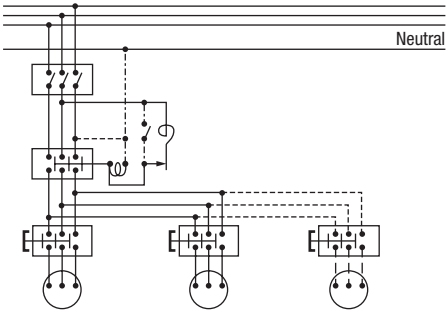
F – Three phase
Thermostat control for single unit with contactor type starter



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



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 louvres 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 sideways 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.