

Heat Exchanger Modules



HM & FP

Heat Modules

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Introduction

The HM and FP ranges both consist of fourteen models of high efficiency indirect fired packaged heat exchanger modules with duties from 117kW through to 1000kW. The HM and FP ranges have been specifically designed to meet the needs of the air movement and process markets.

HM units are supplied as fully insulated twin skin models for stand alone installation. FP units are supplied with fully insulated front plate but single skin heat shields in lieu of twin skin insulated panels. The FP models are designed to be incorporated within other air handling plant.

Both ranges are CE certified and comply with current British and European standards, and are designed and manufactured using computer integrated systems. The HM and FP ranges fall within the scope of Benson Heating ISO 9001 - 2000 quality management system, and offer benefits associated with a proven high quality design and compliance with the latest legislation, combined with the flexibility to meet the evolving needs of the environmental warm air and process heating markets.

Each unit is fully test fired and rated to specific heat load requirements, as well as undergoing rigorous performance validation tests prior to despatch.

Specification

Casing

All models are supplied on a rigid base complete with fork lift access points for lifting. The case is manufactured using a rigid framework post structure with removable panels and heat shields to allow access to the combustion chamber and heat exchanger.

The HM modules are supplied with twin skin fully insulated panels with a durable powder coat finish outer panel and a bright spangle galvanised inner skin to provide a highly reflective inner heat shield.

The FP modules are designed to be incorporated within Air Handling Units etc and have a twin skin fully insulated panel for the front plate with single skin galvanised heat shields on the remaining sides.

The panels are complete with high pressure seals and units may be specified up to a maximum working pressure of 2500 pascals.

The front panels on all models is supplied with a stainless steel burner mounting plate and flue exit plate complete with pressure relief.

Combustion chamber

Manufactured from fully welded stainless steel grade 304, the combustion chamber is configured as two pass reverse frame design, to provide optimum surface area for high efficiency and longevity. The combustion chamber is mounted to the structural base by expansion joints to allow for thermal expansion and contraction.

Heat exchanger

Fully welded, two pass, stainless steel grade 304, tubular heat exchanger, with large surface area, providing optimum heat transfer and high levels of efficiency. Each heat exchanger is complete with integral condensate drain tappings, and condensate drains are fitted as standard on all units configured with high/low or modulating burners. In common with the combustion chamber mountings, the heat exchanger is also designed with expansion joints to accommodate expansion and contraction. All combustion chamber and heat exchanger assemblies are fitted with a pressure relief port as standard.

Burner

All burners are fully match tested and CE compliant. The forced draught gas burners offer an option to select on/off, high/low, or modulating controls. All gas burners are manufactured to EN676. Oil fired pressure jet burners offer either on/off or high low controls, and are manufactured to EN267.

Safety interlocks

An integral air pressure switch, monitors the air on and air off differential pressure, and is linked to the burner enable circuit to provide a fail safe facility in the event of loss of air flow over the heat exchanger.

The units are also fitted with a safety high limit thermostat to shut down the burner in the event of overheating.



PERFORMANCE DATA - GAS FIRED UNITS									
		High/Low	Modulating	Maximum Airflow Data			Minimum Airflow Data		
Model	Maximum Heat Output kW	Minimum Heat Output kW	Minimum Heat Output kW	Maximum Airflow m ³ /h	Pressure Drop Pa	Temperature Rise °C	Minimum Airflow m ³ /h	Pressure Drop Pa	Temperature Rise °C
117	117	70	39	20000	408	18	6382	42	55.0
150	150	90	50	20000	408	23	8182	68	55.0
175	167	100	56	23000	232	23	9545	40	55.0
200	200	120	50	23000	232	26	10909	52	55.0
225	225	135	56	30000	343	23	12273	57	55.0
265	265	160	66	30000	343	27	14455	80	55.0
300	300	180	75	40000	255	23	16364	43	55.0
375	375	225	94	40000	255	28	20455	67	55.0
400	400	240	100	50000	194	24.0	21818	37	55.0
500	500	300	125	50000	194	30.0	27273	58	55.0
600	600	360	150	72000	361	25.0	32727	75	55.0
700	700	420	175	72000	361	29	38182	102	55.0

PERFORMANCE DATA - OIL FIRED UNITS								
		High/Low	Maximum Airflow Data			Minimum Airflow Data		
Model	Maximum Heat Output kW	Minimum Heat Output kW	Maximum Airflow m ³ /h	Pressure Drop Pa	Temperature Rise °C	Minimum Airflow m ³ /h	Pressure Drop Pa	Temperature Rise °C
117	117	70	20000	408	18	6382	42	55.0
150	150	90	20000	408	23	8182	68	55.0
175	167	100	23000	232	23	9545	40	55.0
200	200	120	23000	232	26	10909	52	55.0
225	225	135	30000	343	23	12273	57	55.0
265	265	160	30000	343	27	14455	80	55.0
300	300	180	40000	255	23	16364	43	55.0
375	375	225	40000	255	28	20455	67	55.0
400	400	240	50000	194	24.0	21818	37	55.0
500	500	300	50000	194	30.0	27273	58	55.0
600	600	360	72000	361	25.0	32727	75	55.0
700	700	420	72000	361	29	38182	102	55.0

Heat Exchanger Modules

Selection Criteria

HM or FP selection

The criteria used to ascertain whether the proposed application requires a fully insulated twin skin HM module or a FP module with single skin heat shields and insulated front panel is determined by whether the module is designated as a stand alone unit with air ducted to and from the unit, or whether the module is to be built into other air handling plant.

Applications for stand alone units require the HM modules, whereas the FP is suited for inclusion within other air handling plant.

Selection criteria

The five key criteria applied when making the selection should be:

- Required kW duty
- Required temperature rise
- Proposed air volume
- Pressure drop
- Direction of air flow

Duty

Each model has a fixed maximum full load duty, and a recommended minimum load duty. The full load duty cannot exceed that stated within the technical data, however, it is possible to provide a specific full load duty less than the maximum duty. It should be noted that in the case of modulating burners reducing the maximum output will also reduce the turndown ratio of the burner.

Temperature rise

The temperature rise will be determined by the full load duty and the air volume. Reference should be made to the temperature rise and air volume graph. It should be noted that the maximum temperature rise through the Heat Exchange module cannot be greater than 55°C, and the maximum air off temperature cannot exceed 125°C.

Air volume

Recommended maximum and minimum air volumes for each module are detailed within the product selection table and technical data, reference should also be made to the air volume and pressure drop curves for each module size.

In applications where low air volumes relative to the size of the module is proposed, care should be taken to ensure that the air volume is not lower than the recommended minimum.

Pressure drop

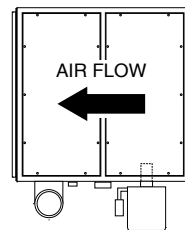
Where a high air volume is required for an application, increased pressure drop must be taken into account when undertaking fan selection. Air bypass facilities can be integrated within the design of the heat exchanger module as an option if required.

Direction of air flow

The units can be specified to suit the airflow direction required for individual applications (designated as either DH-1 or DH-2). The modules are also compatible for use with either a pressure or suction system, therefore the fan can be positioned either upstream or downstream of the Heat Exchanger module. Care should be taken to allow adequate clearance from other equipment within the system (e.g filter sections).

DH1 Heater

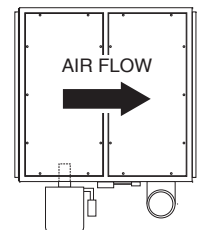
Controls on left in direction of airflow



Plan View

DH2 Heater

Controls on right in direction of airflow



Plan View





On-Off, High-Low and Modulating Gas Fired Units

TECHNICAL DATA													
Model		117	150	175	200	225	265	300	375	400	500	600	700
Heat output (maximum)	kW	117	150	175	200	225	265	300	375	400	500	600	700
Full load gas consumption (G20 natural gas)	m ³ /hr	14.1	18.1	20.8	24.3	26.8	32.4	36.0	44.8	48.8	61.0	70.0	82.0
Full load gas consumption (G31 propane)	kg/hr	10.1	12.9	15.0	17.4	19.1	23.1	25.7	32.0	34.9	43.6	50.0	58.4
Minimum operating inlet pressure (G20)	mbar	17.5	17.5	17.5	17.5	17.5	17.5	17.5	17.5	17.5	17.5	17.5	17.5
Minimum operating inlet pressure (G31)	mbar	37.5	37.5	37.5	37.5	37.5	37.5	37.5	37.5	37.5	37.5	37.5	37.5
Maximum operating inlet pressure (G20)	mbar	100	100	100	350	350	350	350	350	350	350	350	350
Maximum operating inlet pressure (G31)	mbar	100	100	100	350	350	350	350	350	350	350	350	350
Gas connection size (G20)	BSP	¾	¾	1	1¼	1¼	1¼	1¼	1½	2	2	2	2
Gas connection size (G31)	BSP	¾	¾	1	1¼	1¼	1¼	1¼	1½	2	2	2	2
Burner turndown													
High - low gas fired units	%	50	50	50	50	50	50	50	50	50	50	50	50
Modulating gas fired units	Ratio	3:1	3:1	3.5:1	4:1	4:1	4:1	4:1	4:1	4:1	4:1	4:1	4:1
Electrical supply	V-Ph-Hz	230-150	230-150	230-150	230-150	230-150	230-150	230-150	415-3-50	415-3-50	415-3-50	415-3-50	415-3-50
Maximum burner motor current (start)	A	3.9	3.9	3.9	4.8	4.8	4.8	4.8	11.1	13.8	13.8	14.6	16.0
Internal fuse rating	A	6.3	6.3	6.3	6.3	6.3	6.3	6.3	6.3	6.3	6.3	6.3	6.3
Burner motor maximum running current	A	1.3	1.3	1.3	2.1	2.1	2.1	2.1	2.9	3	3	2.8	3.4
Burner sound pressure level (full load at 1m)	dB	72	72	72	68	68	68	68	70	72	72	75	77
External modulation signal requirement													
Modulating gas fired units	0 -10	0 -10	0 -10	0 -10	0 -10	0 -10	0 -10	0 -10	0 -10	0 -10	0 -10	0 -10	0 -10
Electrical protection	IP	44	44	44	44	44	44	44	44	44	44	44	44
Flue size (I/D)	mm	175	175	200	200	225	225	250	250	300	300	350	350
Weight (HM)	Kg	305	305	360	360	410	410	580	580	970	970	1250	1250
Weight (FP)	Kg	290	290	345	345	390	390	550	550	940	940	1210	1210

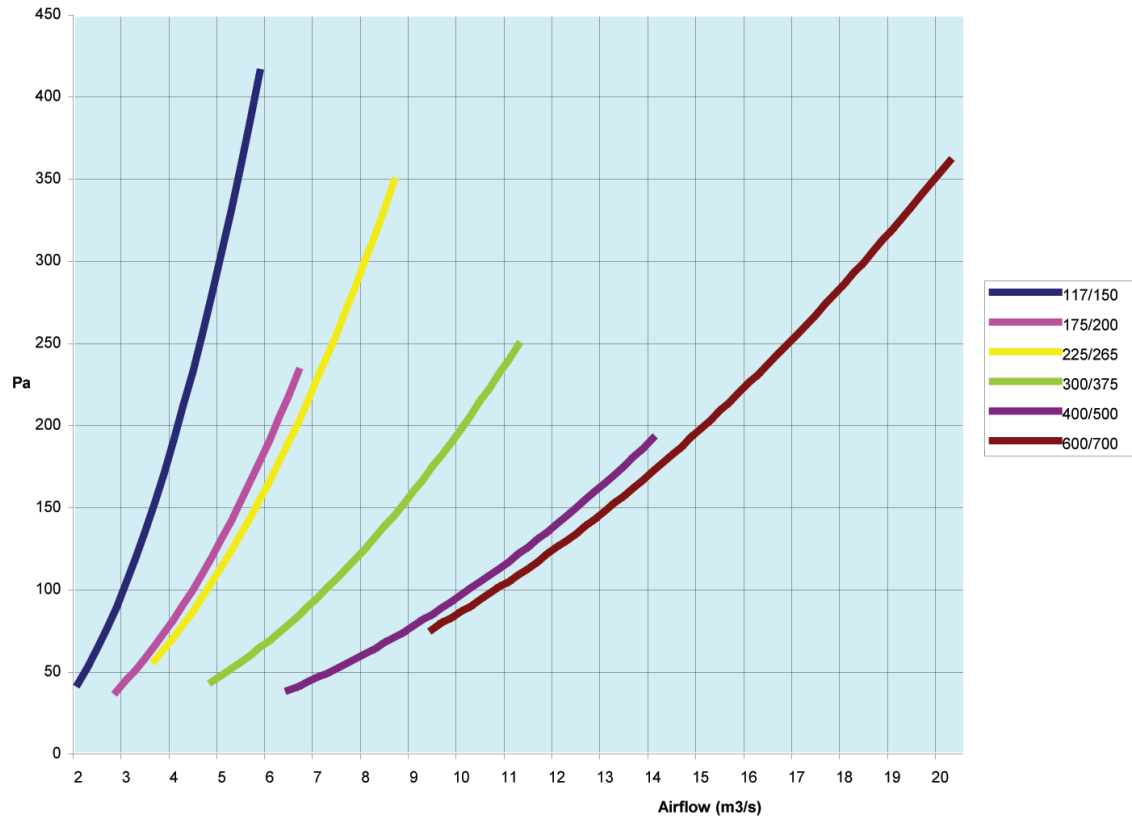
On-Off, High-Low Oil Fired Units

TECHNICAL DATA													
Model		117	150	175	200	225	265	300	375	400	500	600	700
Heat output (maximum)	kW	117	150	175	200	225	265	300	375	400	500	600	700
Gross heat input (maximum)	kW	146	187	219	250	281	331	375	469	500	625	750	875
Full load oil consumption (35 second oil)	l/hr	13.9	17.8	20.8	23.7	26.7	31.4	35.6	44.5	47.5	59.3	71.2	83.1
Maximum operating inlet pressure	p.s.i	6	6	6	6	6	6	6	6	6	6	6	6
Oil filter connection size	BSP	¾	¾	¾	¾	¾	¾	¾	¾	¾	¾	¾	¾
Burner turndown (high - low models)	%	60	60	60	60	60	60	60	60	60	60	60	60
Electrical supply	V-Ph-Hz	230-150	230-150	230-150	230-150	230-150	230-150	230-150	415-3-50	415-3-50	415-3-50	415-3-50	415-3-50
Maximum burner motor current (start)	A	3.9	3.9	3.9	4.8	4.8	4.8	4.8	11.1	13.8	13.8	14.6	16.0
Internal fuse rating	A	6.3	6.3	6.3	6.3	6.3	6.3	6.3	6.3	6.3	6.3	6.3	6.3
Burner motor maximum running current	A	1.3	1.3	1.3	2.1	2.1	2.1	2.1	2.9	3	3	2.8	3.4
Burner sound pressure level (full load at 1m)	dB	72	72	72	68	68	68	68	70	72	72	75	77
Flue size (I/D)	mm	175	175	200	200	225	225	250	250	300	300	350	350
Maximum flue pressure	mbar	+0.6	+0.6	+0.6	+1.6	+1.6	+1.6	+1.6	+1.6	+1.6	+1.6	+1.6	+1.6
Minimum flue pressure	mbar	-0.2	-0.2	-0.2	-0.4	-0.4	-0.4	-0.4	-0.4	-0.4	-0.4	-0.4	-0.4
Weight (HM)	Kg	305	305	360	360	410	410	580	580	970	970	1250	1250
Weight (FP)	Kg	290	290	345	345	390	390	550	550	940	940	1210	1210

Heat Exchanger Modules

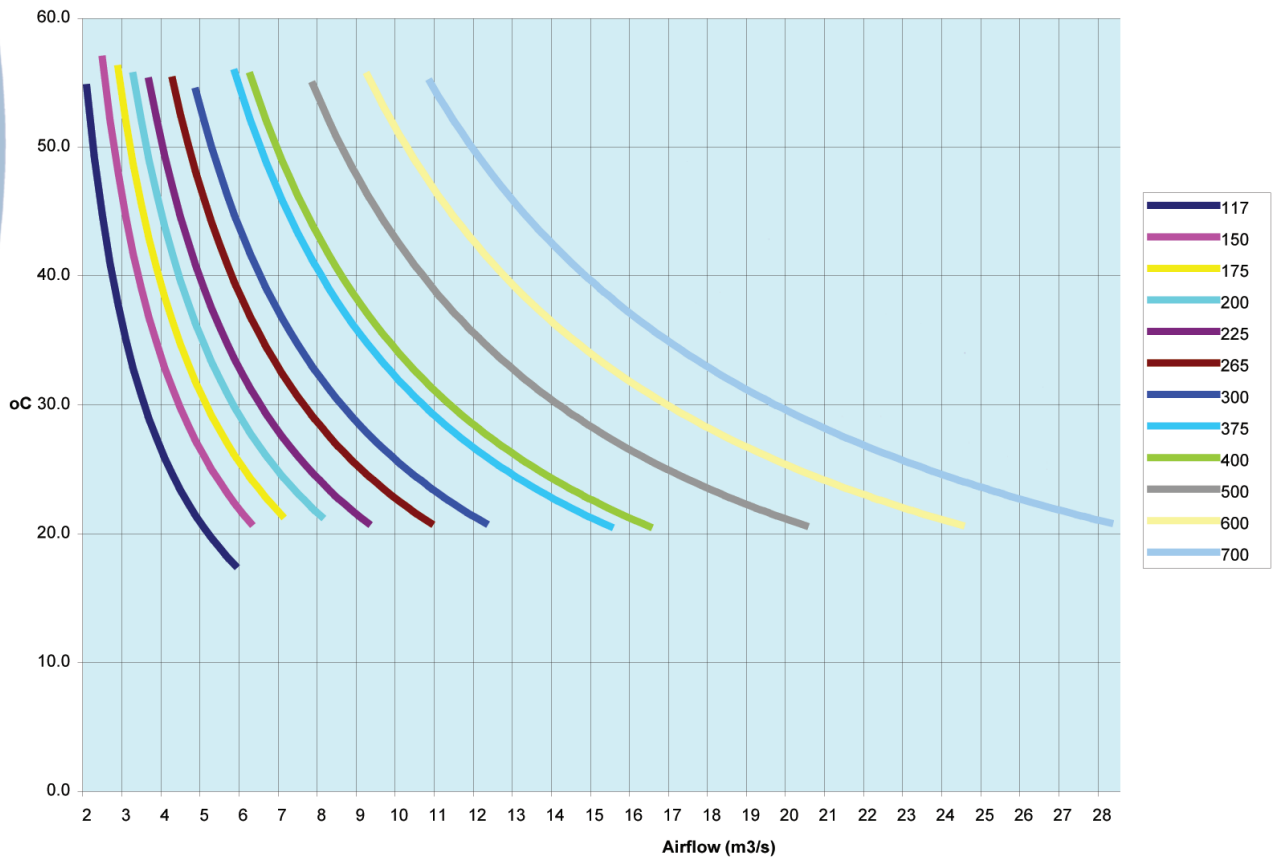
HM & FP Heat Exchange Modules

Pressure drop / air volume graph



HM & FP Heat Exchange Modules

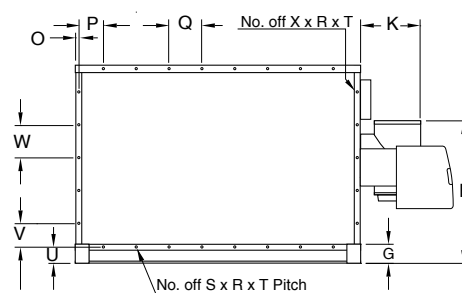
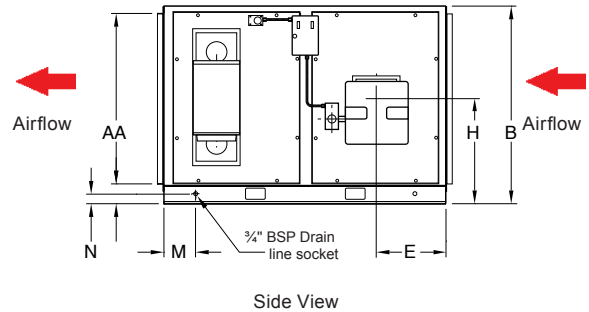
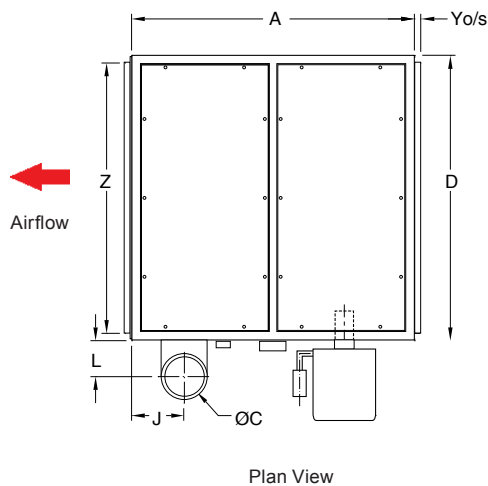
Temperature rise / air volume graph





Dimensions

(DH - 1 Designation shown)



MODEL HM/FP												
DIM	117	150	175	200	225	265	300	375	400	500	600	700
A	1410	1410	1410	1410	1510	1510	2000	2000	2150	2150	2340	2340
B	854.5	854.5	1030	1030	1120	1120	1351	1351	1505	1505	1605	1605
C	175	175	200	200	225	225	250	250	300	300	350	350
D	1025	1025	1380	1380	1510	1510	1558	1558	2167	2167	2450	2450
E	365	365	382.5	382.5	394.5	394.5	587.5	587.5	533	533	595	595
F	673	673	775.5	775.5	826	826	982	982	1086.5	1086.5	1160	1160
G	120	120	120	120	120	120	150	150	150	150	150	150
H	465	465	533	533	588.5	588.5	728	728	804	804	855	855
I	112.5	112.5	120	120	120	120	150.5	150.5	152.5	152.5	152.5	152.5
J	303	303	292.5	292.5	338.5	338.5	358.5	358.5	400	400	372	372
K	349	349	342	342	366.5	366.5	402.5	402.5	454	454	498	498
L	236.5	236.5	217	217	229	229	252.5	252.5	279	279	298	298
M	256	256	202.5	202.5	217	217	226	226	240	240	160	160
N	60	60	60	60	60	60	75	75	75	75	75	75
O	30	30	30	30	30	30	30	30	30	30	30	30
P	0	0	160	160	100	100	0	0	178.5	178.5	90	90
Q	193	193	250	250	250	250	250	250	250	250	170	170
R	M8	M8	M8	M8	M8	M8	M8	M8	M8	M8	M8	M8
S	6	6	5	5	6	6	7	7	8	8	14	14
T	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25
U	97.5	97.5	95	95	95	95	125.5	125.5	125	125	125	125
V	0	0	80	80	50	50	0	0	177.5	177.5	47.5	47.5
W	244	244	250	250	225	225	240	240	250	250	170	170
X	4	4	4	4	5	5	6	6	5	5	9	9
Y	50	50	50	50	50	50	50	50	50	50	50	50
Z	935	935	1270	1270	1400	1400	1450	1450	2057	2057	2340	2340
AA	702	702	860	860	950	950	1150	1150	1300	1300	1400	1400

Common Data and Features

TECHNICAL DATA													
Model		117	150	175	200	225	265	300	375	400	500	600	700
Required Ventilation (at high level)	cm ²	610	705	722	855	917	1052	1137	1350	1447	1740	1960	2240
Required Ventilation (at low level)	cm ²	1220	1410	1545	1710	1835	2105	2275	2700	2895	3480	3920	4480
Maximum Temperature Rise	°C	55	55	55	55	55	55	55	55	55	55	55	55
Maximum Air Temperature	°C	125	125	125	125	125	125	125	125	125	125	125	125
Nominal Maximum Air Volume	m ³ /h	20000	20000	23000	23000	30000	30000	40000	40000	50000	50000	72000	72000
Minimum Air Volume	m ³ /h	6382	8182	9545	10909	12273	14455	16364	20455	21818	27273	32727	38182
Pressure Drop (at nominal maximum air volume)	Pa	408.35	408.35	231.99	231.99	343.20	343.20	254.55	254.55	194.23	194.23	361.38	361.38
Pressure Drop (minimum air volume)	Pa	41.58	68.34	39.96	52.19	57.44	79.67	42.6	66.56	36.98	57.79	74.67	101.63
Differential Air Pressure Switch	Standard	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Thermal Protection Overheat Thermostat	Standard	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

Typical Flue Gas Emissions Data (Based on G20 at Full Load)

TECHNICAL DATA													
Model		117	150	175	200	225	265	300	375	400	500	600	700
Flue Gas Temperature	°C	290	340	300	320	295	340	310	340	270	300	270	300
Flue Gas Volume	m ³ /h	291	406	440	528	558	728	769	1006	971	1280	1393	1721
Carbon Dioxide	%	9.3	9.3	9.3	9.3	9.3	9.3	9.3	9.3	9.3	9.3	9.3	9.3
Carbon Monoxide	ppm(max)	10	10	10	10	10	10	10	10	10	10	10	10
Oxygen	%	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5

Data and Features Specific to FP & HM Range

TECHNICAL DATA													
Model		117	150	175	200	225	265	300	375	400	500	600	700
Twin skin insulated high pressure front panel (FP range)		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Twin skin insulated high pressure casing (HM range)		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Maximum working pressure (front panel or casing)	Pa	2500	2500	2500	2500	2500	2500	2500	2500	2500	2500	2500	2500
Single skin inset (FP range)		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Footprint area (length x width including burner)	mm x mm	1410 x 1410	1410 x 1410	1410 x 1763	1410 x 2046	1510 x 2080	1510 x 2080	2000 x 2133	2000 x 2133	2150 x 2742	2150 x 2742	2340 x 3300	2340 x 3300
Cube size (including burner)	m ³	1.9	1.9	2.8	3.2	3.8	3.8	6.1	6.1	9.3	9.3	13.0	13.0

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