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Ruffneck™

Heaters for the Harshest Environments



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FX5 Series Explosion-Proof Electric Air Heaters

Ruffneck™ FX5 heaters are cULus certified for use in hazardous locations. They are designed for the harshest environments such as: dry indoor industrial applications, oil refineries, petrochemical plants, pulp and paper mills, grain elevators, hazardous waste storage facilities, wastewater treatment plants, etc., where specific explosive gases or dusts may be present.

The FX5 offers a larger junction box for easier installation, additional limit controls and a heavy duty core.

The heater core assembly is contained in a sturdy, epoxy-coated 12-gauge steel cabinet, which also carries the motor and fan assembly. Adjustable louvres allow directional control of the airflow. A narrow gap, two-piece fan guard is provided to shield all moving parts. All fasteners are zinc plated for corrosion protection.

Ruffneck™ heaters are built to last. All Ruffneck™ products are subjected to exhaustive technical analysis and testing during design and development, and are manufactured under a registered quality assurance program. As a result, they have consistently proven their safety and reliability.

For hazardous location heating, rely on the Ruffneck™ FX5 heater for the most dependable, trouble-free service available.

Suitable for the following hazardous location classifications:

- Class I, Division 1 & 2, Groups C & D
- Class II, Division 1, Groups E, F & G
- Class II, Division 2, Groups F & G
- Class I, Zones 1 & 2, Groups IIA & IIB
- Temperature Code T3B 329°F (165°C)

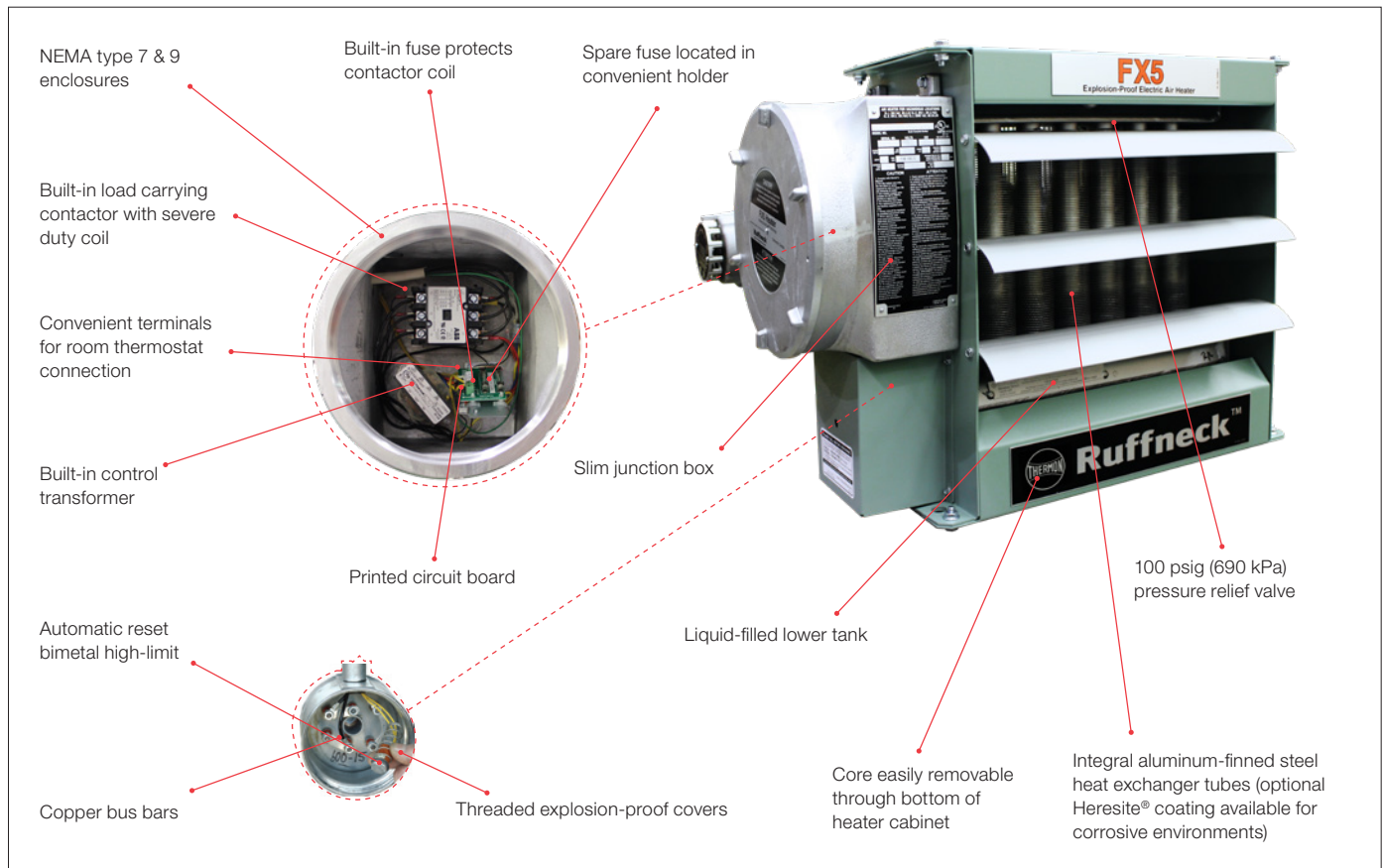


Figure 1

Table 1 – Performance Data for 60 Hz FX5 - cUL_{us} Temperature Code T3B 328°F (165°C)

Nominal Wattage (kW)	Model	Voltage	Phase	Total Current (A)	Optional Built-in Disconnect Switch	Air Temperature Rise		Btu/hr
						°F	°C	
3	FX5-208160-030	208	1	18.5	DS5	19.0	10.5	10,250
	FX5-208360-030	208	3	10.6				
	FX5-240160-030	240	1	16.6				
	FX5-240360-030	240	3	9.6				
	FX5-480160-030**	480	1	7.1				
	FX5-480360-030	480	3	4.8				
5	FX5-208160-050	208	1	28.1	DS5	31.6	17.6	17,050
	FX5-208360-050	208	3	16.2				
	FX5-240160-050	240	1	24.9				
	FX5-240360-050	240	3	14.4				
	FX5-480160-050**	480	1	11.2				
	FX5-480360-050	480	3	7.2				
7.5	FX5-208160-075	208	1	40.2	DS5	27.9	15.5	25,600
	FX5-208360-075	208	3	23.1				
	FX5-240160-075	240	1	35.4				
	FX5-240360-075	240	3	20.5				
	FX5-480160-075**	480	1	16.4				
	FX5-480360-075	480	3	10.2				
10	FX5-208160-100**	208	1	52.2	Not Available	37.2	20.6	34,100
	FX5-208360-100	208	3	30.1	DS5			
	FX5-240160-100	240	1	45.8				
	FX5-240360-100	240	3	26.5				
	FX5-480160-100**	480	1	21.6				
	FX5-480360-100	480	3	13.2				
15	FX5-208160-150**	208	1	52.2	Not Available	27.1	15.1	51,200
	FX5-208360-150	208	3	30.1	DS5			
	FX5-240160-150*	240	1	66.6				
	FX5-240360-150	240	3	38.5				
	FX5-480160-150**	480	1	32.1				
	FX5-480360-150	480	3	19.3				
20	FX5-480160-200**	480	1	42.5	DS5	36.1	20.1	68,250
	FX5-480360-200	480	3	25.3				
	FX5-600360-200	600	3	20				
25	FX5-480360-250	480	3	31.3	DS5	22.0	12.2	85,300
	FX5-600360-250	600	3	24.8				
30	FX5-480360-300	480	3	37.3	DS5	26.4	14.6	102,350
	FX5-600360-300	600	3	29.6				
35	FX5-480360-350	480	3	43.3	DS5	30.7	17.1	119,450
	FX5-600360-350	600	3	34.4				

Notes

* Exceeds the 48 amp circuit limit of NEC 424-22. DS5 not available for these units.

**480 V: 1-phase units are certified for Class I, Div. 1, Group D and Class II, Div. 1 Groups F & G

- Minimum conductor size for 86°F (30°C) ambient. Derate conductor for ambient temperature. Use minimum 194°F (90°C) insulation.
- Heater is functioning normally if at rated voltage the amp draw is within 10% of the value in this table.
- Operation at lower voltages will result in reduced heat output and amp draw.
- Add "T" to model number when adding a built-in thermostat.
- Add "D" to model number when adding a built-in disconnect switch.

- Add "P" to model number when adding a built-in pilot light.
- Add "S" to model number when adding a 3-way switch.
- Add "H" to model number for units with high "off" (deenergized) ambient temperatures.
- Add "U" to model number for units with continuous fan option.
- Add "A" to model number for units with stainless steel cabinet.
- Add "L" to model number for units with pilot and 3-way switch or large box option.
- Add "B" to model number for units with low ambient option (down to -58°F or -50°C).
- Add "K" to model for units with fault indicating light.

For installation and model coding, see page C10.

Consult Terms & Conditions of Sale or FX5 Owner's Manual for warranty information.

Table 2 – Performance Data for 50 Hz FX5 - Class I, Division 1 & 2, Groups C & D; Class II, Division 1, Groups E, F & G; Class II, Division 2, Groups F & G; Class I, Zones 1 & 2, Groups IIA & IIB. Temperature Code T3B 329°F (165°C)

Nominal Wattage	Model	Voltage	Phase	Total Current	Optional Built-in Disconnect Switch	Air Temperature Rise		Btu/hr
				A		°F	°C	
2.5	FX5-220150-025	220	1	16.1	DS5	19.7	11	8,550
4.2	FX5-220150-042			23.8		33.2	18.4	14,350
6.3	FX5-220150-063			33.3		28.5	15.7	21,500
8.4	FX5-220150-084			42.9		37.8	21.1	28,700
12.6	FX5-220150-126*			62.0		27.5	15.2	43,000
2.8	FX5-230150-028	230	1	16.3	DS5	22.1	12.3	9,550
4.6	FX5-230150-046			24.1		36.4	20.2	16,000
6.9	FX5-230150-069			34.1		31.1	17.2	23,550
13.8	FX5-230150-138*			64.1		30.1	16.6	47,100
2.5	FX5-380350-025			380		3	4.9	DS5
4.2	FX5-380350-042	7.5	33.2		18.4		14,350	
6.3	FX5-380350-063	10.7	28.5		15.7		21,500	
8.4	FX5-380350-084	13.9	37.8		21.1		28,700	
12.5	FX5-380350-125	20.1	27.2		15.1		42,700	
20.9	FX5-380350-209	32.9	22		12.1		71,350	
2.8	FX5-400350-028	400	3		5.1		DS5	
4.6	FX5-400350-046			7.7	36.4	20.2		15,700
6.9	FX5-400350-069			11.1	31.1	17.2		23,550
9.3	FX5-400350-093			14.5	42	23.2		31,750
13.9	FX5-400350-139			21.1	30.2	16.7		74,450
18.5	FX5-400350-185			27.8	40.2	22.3		63,150
23.1	FX5-400350-231			34.5	24.2	13.5		78,850
3.7	FX5-415350-037			415	3	6.4		DS5
7.5	FX5-415350-075	11.6	33.8			18.7	25,600	
14.9	FX5-415350-149	22.0	32.5			18.1	50,850	
22.4	FX5-415350-224	32.4	23.5			13.1	76,450	
4.2	FX5-440350-042	440	3	6.7	DS5	33.2	18.4	14,350
8.4	FX5-440350-084			12.2		37.8	21.1	28,700
16.8	FX5-440350-168			23.3		36.5	20.3	57,350
20.9	FX5-440350-209			28.7		22.1	12.2	71,350

Notes

* Exceeds the 48 amp circuit limit of NEC 424-22. DS5 not available for these units.

**480 V: 1-phase units are certified for Class I, Div. 1, Group D and Class II, Div. 1 Groups F & G

- Minimum conductor size for 86°F (30°C) ambient. Derate conductor for ambient temperature. Use minimum 194°F (90°C) insulation.
- Heater is functioning normally if at rated voltage the amp draw is within 10% of the value in this table.
- Operation at lower voltages will result in reduced heat output and amp draw.
- Add "T" to model number when adding a built-in thermostat.
- Add "D" to model number when adding a built-in disconnect switch.
- Add "P" to model number when adding a built-in pilot light.
- Add "S" to model number when adding a 3-way switch.
- Add "H" to model number for units with high "off" (deenergized) ambient temperatures.
- Add "U" to model number for units with continuous fan option.
- Add "A" to model number for units with stainless steel cabinet.
- Add "L" to model number for units with pilot and 3-way switch or large box option.
- Add "B" to model number for units with low ambient option (down to -58°F or -50°C).
- Add "K" to model for units with fault indicating lights.

Installation Conditions

- The FX5 Series Electric Air Heaters are for dry indoor use only. Do not immerse in water. Do not store or use in areas exposed to rain or snow.
- The FX5 heaters are to be used only in atmospheres having an ignition temperature higher than 329°F (165°C).
- Altitude restrictions apply, see General Specifications, page 11
- Heaters should be connected to a fixed power supply and must be permanently mounted in a level, upright position during operation.
- Read and be aware of the terms of our Warranty located in the owner's manual.
- Refer to Owner's Manual.

Table 3 – Specifications for 50 Hz FX5*

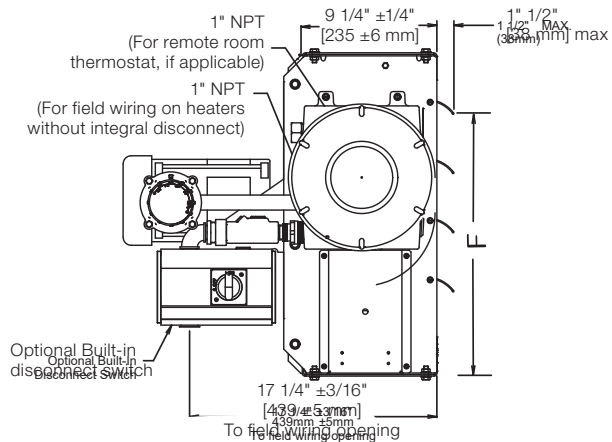
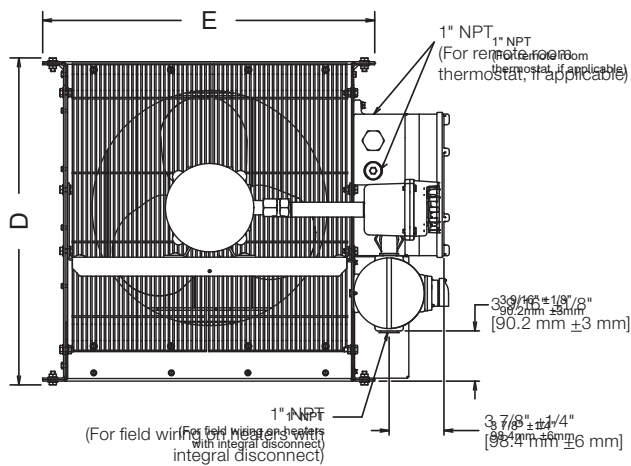
		Nominal kW								
		2.5	3.7 & 4.6	6.3 & 7.5	8.4	12.5 & 12.6	14.9 & 16.7	20.9	22.4	
Maximum Altitude	ft	12,000	8,000	10,000	7,000	10,000	7,000	10,000	7,000	
	m	3,658	2,438	3,048	2,134	3,048	2,134	3,048	2,134	
Air Flow	@ 70°F (CFM)	400		700		1,450		3,000		
	@ 21°C (m³/hr)	679		1,189		2,463		5,096		
Horizontal Air Throw	ft	13		25		35		60		
	m	4.0		7.6		10.7		18.2		
Maximum Mounting Height (to underside)	ft	7				10			20	
	m	2.1			3.0			6.1		
Minimum Motor Power	HP	1/2								
	kW	0.373								
Fan Diameter	in	12				16		20		
	mm	305				406		508		
Net Weight	without DS5	lbs	148			177		212		
		kg	67.1			80.2		96.2		
	with DS5	lbs	160			189		224		
		kg	82.5			95.6		101.6		
Shipping Weight	without DS5	lbs	202			227		263		
		kg	91.6			103.9		119.3		
	with DS5	lbs	214			239		275		
		kg	97			108.3		124.7		

Table 4 – Specifications for 60 Hz FX5*

		Nominal kW								
		3	5	7.5	10	15	20	25	30	35
Maximum Altitude	ft	12,000	8,000	10,000	7,000	10,000	7,000	10,000	7,000	6,000
	m	3,658	2,438	3,048	2,134	3,048	2,134	3,048	2,134	1,829
Air Flow	@ 70°F (CFM)	500		850		1,750		3,600		
	@ 21°C (m³/hr)	850		1,444		2,973		6,116		
Horizontal Air Throw	ft	15		30		40		70		
	m	4.6		9.1		12.2		21.3		
Maximum Mounting Height (to underside)	ft	7			10			20		
	m	2.1		3.0			6.1			
Minimum Motor Power	HP	1/2								
	kW	0.373								
Fan Diameter	in	12				16		20		
	mm	305				406		508		
Net Weight	without DS5	lbs	148			177		212		
		kg	67.1			80.2		96.2		
	with DS5	lbs	160			189		224		
		kg	82.5			95.6		101.6		
Shipping Weight	without DS5	lbs	202			227		263		
		kg	91.6			103.9		119.3		
	with DS5	lbs	214			239		275		
		kg	97			108.3		124.7		

Note:

*For specifications common to all FX5 models, see General Specifications, page 11. Weights are an approximate maximum. Manufacturer reserves the right to replace motors with suitable alternates.



Dimensional Tolerances ±1/8" [±3 mm]
Unless otherwise specified.

DIM.	kW	kW			DIM. TOL. ±
		2.5-10	12.5-20	20.9-35	
A	in.	7	7	7	1/8
	mm	178	178	178	3
B	in.	18-3/16	22-5/16	26-1/4	1/8
	mm	462	566	667	3
C	in.	27	31	35	3/16
	mm	686	787	889	4
D	in.	19	23	27	1/8
	mm	484	586	688	3
E	in.	19-7/16	23-7/16	27-7/16	3/8
	mm	492	596	697	10
F	in.	17-1/2	19-1/2	21-13/16	5/16
	mm	444	495	554	8
G	in.	24-5/8	28-5/8	32-5/8	3/16
	mm	625	727	828	4

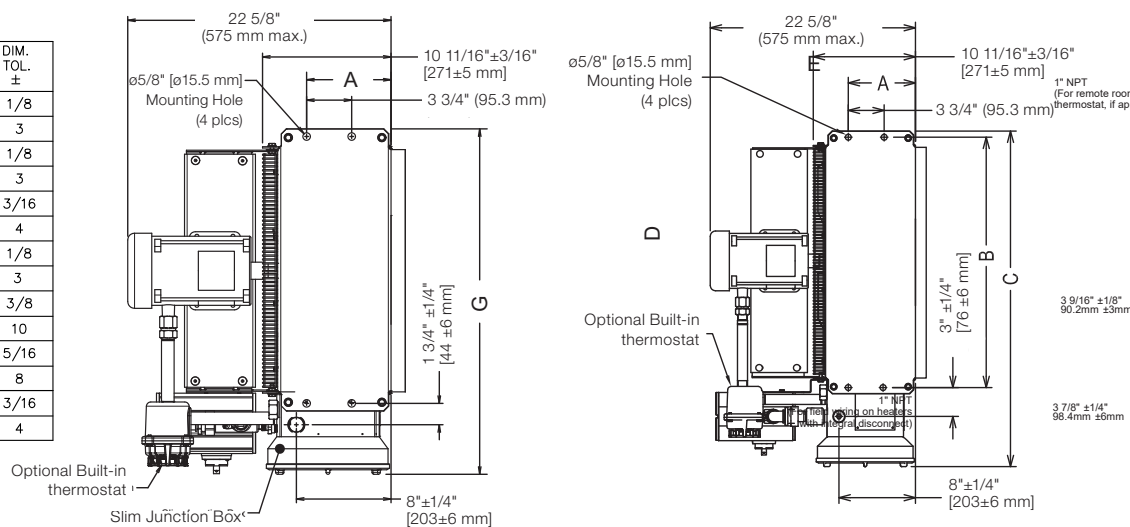


Figure 2

1 1/2" MAX.
(38mm)

Model Coding

FX5 - 480 3 60 - 350 - W - T

Model Series Heater Voltage (208V, 240V, 480V, 600V) Hertz (50, 60) Heater Kilowatts (3, 5, 7, 10, 15, 20, 25, 30, 35, 40, 45, 50, 60, 75, 90, 100, 125, 150, 175, 200, 225, 250, 275, 300, 325, 350, 375, 400, 425, 450, 475, 500, 525, 550, 575, 600, 625, 650, 675, 700, 725, 750, 775, 800, 825, 850, 875, 900, 925, 950, 975, 1000)

T - XT-211 Thermostat with slim junction box
 XT-412 Thermostat with large junction box
 D - Built-in disconnect
 P - Built-in pilot light
 S - 3-way switch

H - Unit with high "off" de-energized ambient temperatures
 C - Heresite® coating
 A - Stainless steel cabinet
 U - Continuous fan
 B - Low ambient option -58°F (-50°C)
 L - Large junction box
 K - Fault light

General Specifications

1. Hazardous Location Rating	Class I, Divisions 1 and 2; Groups C and D; Class II, Groups E, F and G; Class II Division 2, Groups F & G; Class I Zones 1 & 2, Groups IIA & IIB Temperature Code T3B [329°F (165°C)]*
2. Enclosures	NEMA Type 7 & 9. For dry, indoor use only. Do not immerse in water. Do not store or use in areas exposed to rain or snow
3. Motor Type	Explosion-proof. Thermally protected. Permanently lubricated ball bearings. 1725 RPM.
4. Fan	Aluminum blade. Steel spider and hub with 5/8" (15.875 mm) bore
5. Fan Guard	Split design with close wire spacing. 1/4" (6.3 mm) diameter probe will not enter
6. Mounting Holes	Two 9/16". (14.3 mm) diameter holes at top
7. Heating Elements	Three long-life, low watt-density, high grade metal-sheathed elements
8. Temperature High-Limit	Automatic reset type, snap-action bimetal, open on temperature rise. Rated 100,000 cycles at 10 amps, handles 0.128 amps
9. Control Circuit	120 V, 0.128 amps, 15 VA. (Grounded)
10. Slim Junction Box	10.25" (230 mm) x 8.00" (180 mm) x 6.75" (172 mm)
11. Optional Built-in Thermostat	Explosion-proof. 36°F to 82°F (2°C to 28°C)
12. Optional Built-in Disconnect Switch	DS5 for use only on heaters with total current not exceeding 48 amps. Lockout handle accepts 1/4" diameter padlock shackle
13. Optional Three Way Switch	Fan only, Off, Auto
14. Optional Pilot Light	Indicates heat-on cycle
15. Optional Fault Light	Indicates unit needs service
16. Control Transformer	Multi-tap primary, 120 V secondary, 50 VA
17. Contactor	75 amps. Rated for 1,000,000 mechanical operations. 120 V, 15 VA coil (separately fuse-protected)
18. Heat Transfer Fluid	Long life formulated propylene glycol and water
19. Cabinet Material	12 ga. (0.104") (2.60 mm) steel. Epoxy coated with five-stage pretreatment, including iron phosphate. Optional stainless steel.
20. Core	Steel with integral aluminum fins, vacuum charged and hermetically sealed
21. Conduit Material	Heavy walled, 0.122" (3.1 mm) steel
22. Overpressure Protection	Preset 100 psig (690 kPa) pressure relief valve, aluminum body, no field serviceable parts
23. Operational Temperature Limitations	-4°F to 104°F (-20°C to 40°C); for "B" units -58°F to 104°F (-50°C to 40°C)
24. Storage Limitations	-58°F to 176°F (-50°C to 80°C), short term to 248°F (120°C). Do not immerse in water. Do not expose to rain or snow.



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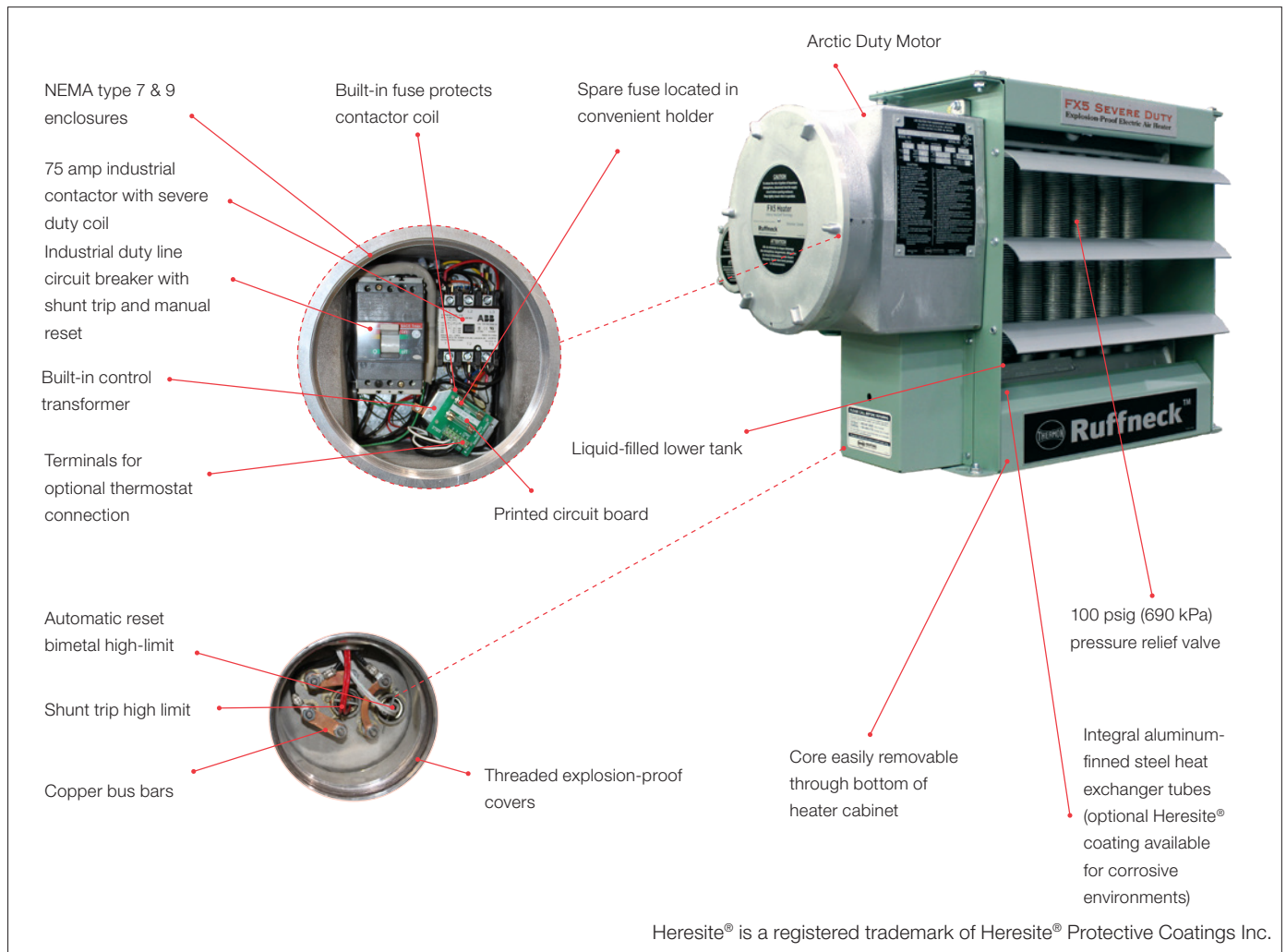
FX5-SD Series Explosion-Proof Electric Air Heaters

The FX5-SD is the next generation Ruffneck™ explosion-proof electric air heater, built for severe duty applications that can lead to accelerated wear of electrical components and damage to the heater core. The FX5-SD is specifically designed for severe duty applications including locations with:

- Fluctuating power quality
- Temporary power generation
- High vibration
- Dirty or corrosive atmospheres or
- Extended maintenance intervals

Only the Ruffneck™ FX5-SD incorporates a dedicated shunt trip circuit breaker which operates independent of the control circuit. It is triggered by a redundant heater core high temperature limit enabling primary interruption of line power to safely protect the heater core. Additional standard features include a definite purpose high capacity contactor, explosion-proof Arctic Duty motor and heavy gauge wiring to make the FX5-SD the safest and most robust explosion-proof unit heater available.

FX5-SD heaters are cUL_{us} approved for use in hazardous locations.



Heresite® is a registered trademark of Heresite® Protective Coatings Inc.

Figure 3

Explosion-Proof Electric Air Heaters – FX5-SD Series

Table 5 – Performance Data for 60 Hertz FX5-SD_{cUL_{us}} Temperature Code T3B 329°F (165°C)

Nominal Wattage kW	Model	Voltage	Phase	Total Current A	Optional Built-in Disconnect Switch	Air Temperature Rise		Btu/hr
						°F	°C	
3	FX5-SD-208160-030	208	1	14.4	DS5	19.0	10.5	10,250
	FX5-SD-208360-030	208	3	8.3				
	FX5-SD-240160-030	240	1	12.5				
	FX5-SD-240360-030	240	3	7.2				
	FX5-SD-480160-030 ^o	480	1	6.3				
	FX5-SD-480360-030	480	3	3.6				
5	FX5-SD-600360-030	600	3	2.9	DS5	31.6	17.6	17,050
	FX5-SD-208160-050	208	1	24				
	FX5-SD-208360-050	208	3	13.9				
	FX5-SD-240160-050	240	1	20.8				
	FX5-SD-240360-050	240	3	12				
	FX5-SD-480160-050 ^o	480	1	10.4				
7.5	FX5-SD-480360-050	480	3	6	DS5	27.9	15.5	25,600
	FX5-SD-600360-050	600	3	4.8				
	FX5-SD-208160-075	208	1	36.1				
	FX5-SD-208360-075	208	3	20.8				
	FX5-SD-240160-075	240	1	31.3				
	FX5-SD-240360-075	240	3	18				
10	FX5-SD-480160-075 ^o	480	1	15.6	DS5	37.2	20.6	34,100
	FX5-SD-480360-075	480	3	9				
	FX5-SD-600360-075	600	3	7.2				
	FX5-SD-208160-100*	208	1	48.1				
	FX5-SD-208360-100	208	3	27.8				
	FX5-SD-240160-100	240	1	41.7				
15	FX5-SD-240360-100	240	3	24.1	DS5	27.1	15.1	51,200
	FX5-SD-480160-100 ^o	480	1	20.8				
	FX5-SD-480360-100	480	3	12				
	FX5-SD-600360-100	600	3	9.6				
	FX5-SD-208360-150	208	3	41.6				
	FX5-SD-240160-150*	240	1	62.5				
20	FX5-SD-240360-150	240	3	36.1	DS5	36.1	20.1	68,250
	FX5-SD-480160-150 ^o	480	1	31.3				
	FX5-SD-480360-150	480	3	18				
25	FX5-SD-600360-150	600	3	14.4	DS5	22.0	12.2	85,300
	FX5-SD-480160-200 ^o	480	1	41.7				
30	FX5-SD-480360-200	480	3	24.1	DS5	26.4	14.6	102,350
	FX5-SD-600360-200	600	3	19.2				
	FX5-SD-480360-250	480	3	30.1				
35	FX5-SD-600360-250	600	3	24.1	DS5	30.7	17.1	119,450
	FX5-SD-480360-300	480	3	36.1				
35	FX5-SD-600360-300	600	3	28.9	DS5	30.7	17.1	119,450
	FX5-SD-480360-350	480	3	42.1				
35	FX5-SD-600360-350	600	3	33.7	DS5	30.7	17.1	119,450
	FX5-SD-480360-350	480	3	42.1				

See Model Coding, page 16 and Installation Conditions, page 14. Consult Terms & Conditions of Sale or FX5 Owner's Manual for warranty information.

Note:

* Exceeds the 48 amp circuit limit of NEC 424-22

^o 480 V 1 Phase units are certified Class I, Div. 1, Group D and Class II, Div. 1, Groups F and G.

1. Minimum conductor size for 86°F (30°C) ambient. Derate conductor for ambient temperature. Use minimum 90°C (194°F) insulation.
2. Heater is functioning normally if at rated voltage the amp draw is within 10% of the value in this table.
3. Operation at lower voltage will result in reduced heat output and amp draw.

4. Add "T" to model number when adding a built-in thermostat.
5. Add "D" to model number when adding a built-in disconnect switch.
6. Add "C" to model number for units with Heresite® coating.
7. Add "A" to model number for units with stainless-steel cabinet.
8. Add "B" to model number for certified use of low ambient of -50°C (-58°F).
9. Add "H" to model number for units with high temperature "OFF" (de-energized ambient temperatures).

Table 6 – Performance Data for 50 Hz FX5-SD - Class I, Division 1 & 2, Groups C & D; Class II, Division 1, Groups E, F & G; Class II, Division 2, Groups F & G; Class I, Zones 1 & 2, Groups IIA & IIB. Temperature Code T3B 329°F (165°F)

Nominal Wattage (kW)	Model	Voltage	Phase	Total Current (A)	Optional Built-in Disconnect Switch	Air Temperature Rise		Btu/hr
						°F	°C	
2.5	FX5-SD-220150-025	220	1	11.4	DS5	19.7	11.0	8,550
4.2	FX5-SD-220150-042			19.1		33.2	18.4	14,350
6.3	FX5-SD-220150-063			28.6		28.5	15.7	21,500
8.4	FX5-SD-220150-084			38.2		37.8	21.1	28,700
12.6	FX5-SD-220150-126*			57.3	Not Available	27.5	15.2	43,000
2.8	FX5-SD-230150-028	230	1	12.20	DS5	22.1	12.3	9,550
4.6	FX5-SD-230150-046			20.0		36.4	20.2	16,000
6.9	FX5-SD-230150-069			30.0		31.1	17.2	23,550
13.8	FX5-SD-230150-138*			59.9	Not Available	30.1	16.6	47,100
2.5	FX5-SD-380350-025	380	3	3.8	DS5	19.7	11.0	8,550
4.2	FX5-SD-380350-042			6.4		33.2	18.4	14,350
6.3	FX5-SD-380350-063			9.6		28.5	15.7	21,500
8.4	FX5-SD-380350-084			12.8		37.8	21.1	28,700
12.5	FX5-SD-380350-125			19.0		27.2	15.1	42,700
20.9	FX5-SD-380350-209			31.8		22.0	12.1	71,350
2.8	FX5-SD-400350-028	400	3	4.0	DS5	22.1	12.3	9,550
4.6	FX5-SD-400350-046			6.6		36.4	20.2	15,700
6.9	FX5-SD-400350-069			10.0		31.1	17.2	23,550
9.3	FX5-SD-400350-093			13.4		42.0	23.2	31,750
13.9	FX5-SD-400350-139			20.1		30.2	16.7	74,450
18.5	FX5-SD-400350-185			26.7		40.2	22.3	63,150
23.1	FX5-SD-400350-231	33.3	24.2	13.5	78,850			
3.7	FX5-SD-415350-037	415	3	5.1	DS5	29.3	16.3	12,650
7.5	FX5-SD-415350-075			10.4		33.8	18.7	25,600
14.9	FX5-SD-415350-149			20.7		32.5	18.1	50,850
22.4	FX5-SD-415350-224			31.2		23.5	13.1	76,450
4.2	FX5-SD-440350-042	440	3	5.5	DS5	33.2	18.4	14,350
8.4	FX5-SD-440350-084			11.0		37.8	21.1	28,700
16.8	FX5-SD-440350-168			27.5		36.5	20.3	57,350
20.9	FX5-SD-440350-209			27.5		22.1	12.2	71,350

Note:

* Exceeds the 48 amp. circuit limit of NEC 424-22.

- Minimum conductor size for 86°F (30°C) ambient. Derate conductor for ambient temperature use minimum 194°F (90°C) insulation.
- Heater is functioning normally if at rated voltage the amp draw is within 10% of the value in this table.
- Operation at lower voltage will result in reduced heat output and amp draw.
- Add "T" to model number when adding a built-in thermostat.
- Add "D" to model number when adding a built-in disconnect switch.
- Add "C" to model number for units with Heresite® coating.
- Add "A" to model number for units with stainless-steel cabinet.
- Add "B" to model number for certified use of low ambient of -50°C (-58°F).
- Add "H" to model number for units with high temperature "OFF" (de-energized ambient temperatures).

Installation Conditions

- The FX5-SD Series Electric Air Heaters are for dry indoor use only. Do not immerse in water. Do not store or use in areas exposed to rain or snow.
- The FX5-SD heaters are to be used only in atmospheres having an ignition temperature higher than 329°F (165°C).
- Altitude restrictions apply - see specifications on next page.
- Heaters should be connected to a fixed power supply and must be permanently mounted in a level, upright position during operation.
- Read and be aware of the terms of our Warranty located in the owner's manual.
- Refer to Owner's Manual.

Table 7 – Specifications for 50 Hz FX5-SD

		Nominal kW								
		2.5	3.7 & 4.6	6.3 & 7.5	8.4	12.5 & 12.6	14.9 & 16.7	20.9	22.4	35
Maximum Altitude	ft	12,000	8,000	10,000	7,000	10,000	7,000	10,000	7,000	6,000
	m	3,658	2,438	3,048	2,134	3,048	2,134	3,048	2,134	1,829
Air Flow	@ 70°F (CFM)	400		700		1,450		3,000		
	@ 21°C (m³/hr)	679		1,189		2,463		5,096		
Horizontal Air Throw	ft	13		25		35		60		
	m	4.0		7.6		10.7		18.2		
Maximum Mounting Height (to underside)	ft	7			10			20		
	m	2.1			3.0			6.1		
Minimum Motor Power	HP	1/2								
	kW	0.373								
Fan Diameter	in	12			16			20		
	mm	305			406			508		
Net Weight	without DS5	lbs	148		177		212			
		kg	67.1		80.2		96.2			
	with DS5	lbs	160		189		224			
		kg	72.5		95.6		101.6			
Shipping Weight	without DS5	lbs	202		227		263			
		kg	91.6		103.9		119.3			
	with DS5	lbs	214		239		275			
		kg	97		108.3		124.7			

Note: For specifications common to all FX5-SD models, see Model Coding, page 16. Weights are an approximate maximum. Manufacturer reserves the right to replace motors with suitable alternates.

Table 8 – Specifications for 60 Hz FX5-SD

		Nominal kW								
		3	5	7.5	10	15	20	25	30	35
Maximum Altitude	ft	12,000	8,000	10,000	7,000	10,000	7,000	10,000	7,000	6,000
	m	3,658	2,438	3,048	2,134	3,048	2,134	3,048	2,134	1,829
Air Flow	@ 70°F (CFM)	500		850		1750		3600		
	@ 21°C (m³/hr)	850		1444		2973		6116		
Horizontal Air Throw	ft	15		30		40		70		
	m	4.6		9.1		12.2		21.3		
Maximum Mounting Height (to underside)	ft	7			10			20		
	m	2.1			3.0			6.1		
Minimum Motor Power	HP	1/2								
	kW	0.373								
Fan Diameter	in	12			16			20		
	mm	305			406			508		
Net Weight	without DS5	lbs	148		177		212			
		kg	67.1		80.2		96.2			
	with DS5	lbs	160		189		224			
		kg	72.5		95.6		101.6			
Shipping Weight	without DS5	lbs	202		227		263			
		kg	91.6		103.9		119.3			
	with DS5	lbs	214		239		275			
		kg	97		108.3		124.7			

Note: For specifications common to all FX5-SD models, see Model Coding, page 16. Weights are an approximate maximum. Manufacturer reserves the right to replace motors with suitable alternates.

DIM.	kW	kW			DIM. TOL. ±
		2.5–10	12.5–20	20.9–35	
A	in.	7	7	7	1/8
	mm	178	178	178	3
B	in.	18–3/16	22–5/16	26–1/4	1/8
	mm	462	566	667	3
C	in.	27	31	35	3/16
	mm	686	787	889	4
D	in.	19	23	27	1/8
	mm	484	586	688	3
E	in.	19–7/16	23–7/16	27–7/16	3/8
	mm	492	596	697	10
F	in.	17–1/2	19–1/2	21–13/16	5/16
	mm	444	495	554	8
G	in.	24–5/8	28–5/8	32–5/8	3/16
	mm	625	727	828	4

DIMENSIONAL TOLERANCES ±1/8" [±3mm] UNLESS OTHERWISE SPECIFIED.

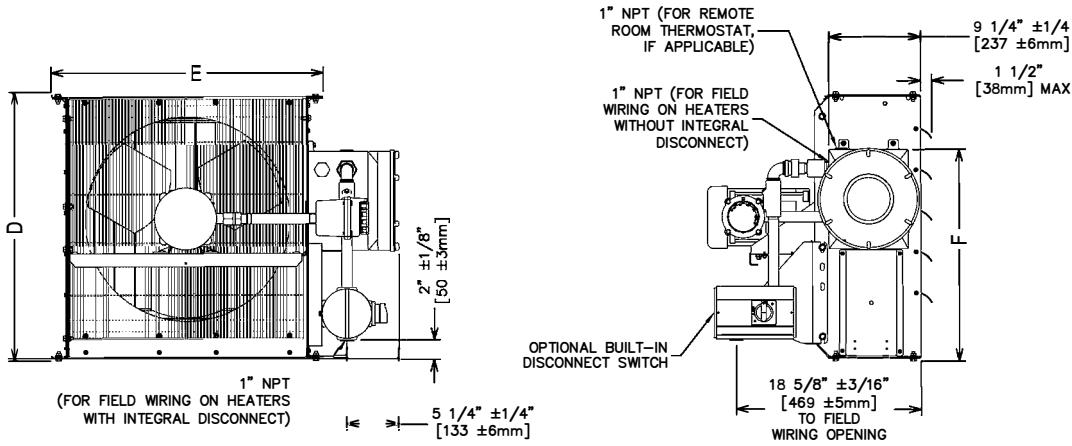
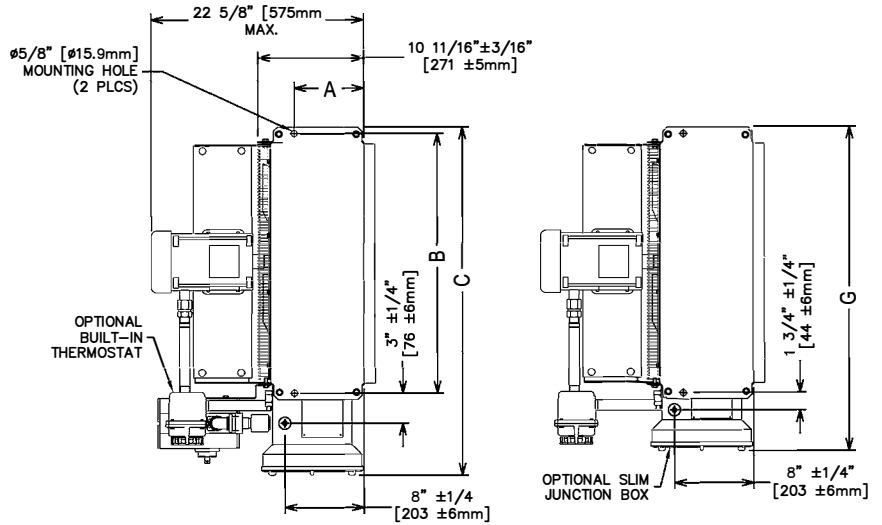
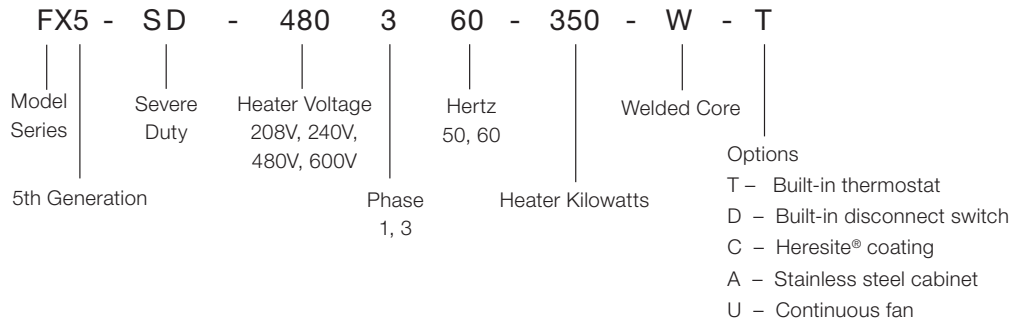


Figure 4

Model Coding



Reminder: This nomenclature illustration is intended primarily to explain how a product part number is defined. Not all voltage and/or wattage combinations are available - please consult the Performance Data chart(s) for product availability.

General Specifications

1. Hazardous Location Rating	Class I, Division 1 & 2, Groups C & D Class II, Division 1, Groups E, F & G Class II, Division 2, Groups F & G Class I, Zones 1 & 2, Group IIA & IIB Temperature Code T3B 329°F (165°C)
2. Motor Type	Explosion-proof. Thermally protected TEFC Arctic Duty. Permanently lubricated ball bearings. Add "B" to model coding for certified use at low temperature -50°C (-58°F).
3. Fan	Aluminum blade. Steel spider and hub with 5/8" (15 mm) bore
4. Fan Guard	Split design with close wire spacing. 1/4" (6.3 mm) diameter probe will not enter
5. Mounting Holes	Four 5/8" (15.9 mm) diameter holes at the top of heater
6. Heating Elements	Long-life metal-sheathed elements
7. Temperature High-Limit	Primary automatic reset type, snap-action bimetal, open on temperature rise. Rated 100,000 cycles at 15 amp, handles 0.128 amps/Secondary automatic reset type, snap-action bimetal, close on temperature rise. Rated 100,000 cycles at 15 amp, handles 0.128 amps
8. Control Circuit	120 V, 0.128 amps, 15 VA. (Grounded)
9. Optional Built-in Thermostat	Explosion-proof 36°F to 82°F (2°C to 28°C)
10. Optional Built-in Thermostat	DS5 uses x-Max ® construction.
11. Contactor	Multiple voltage primary, 120 V secondary, 50 VA
12. Heat Transfer Fluid	Propylene glycol and water
13. Cabinet Material	12-gauge (0.315" / 2.60 mm) epoxy powder coated steel. Optional Heresite® coating available for corrosive atmospheres with an optional stainless-steel casing
14. Core	HD Core (Propylene Glycol) charge under vacuum
15. Conduit Material	Heavy wall, 0.122" (3.1 mm), steel
16. Junction Box	10.25" (230 mm) x 8.00" (180 mm) x 9.12" (205 mm)
17. Circuit Protection	Industrial duty line circuit breaker with shunt trip
18. Field Connection	Two 1" NPT
19. Overpressure Protection	Preset 100 psig (690 kPa) pressure relief valve, aluminum body, no serviceable parts
20. Operational Temperature Limitations	-4°F to 104°F (-20°C to 40°C); for "B" units -58°F to 104°F (-50°C to 40°C)
21. Storage Limitations	-58°F to 176°F (-50°C to 80°C), short term to 248°F (120°C). Do not immerse in water. Do not expose to rain or snow.
22. Weight (for 15 kW Unit)	170 lbs (77.27 kg)
23. Weight with Disconnect (for 15 kW Unit)	182 lbs (82.73 kg) W



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FE2 Series Explosion-Proof Electric Air Heaters



FE2 heaters are CE Marked & ATEX Approved to Directive 94/9/EC for use in hazardous locations. They are designed for dry indoor industrial applications such as oil refineries, petrochemical plants, pulp and paper mills, hazardous waste storage facilities, wastewater treatment plants, etc., where specific explosive gases or dusts maybe present. IP55 rated units available.

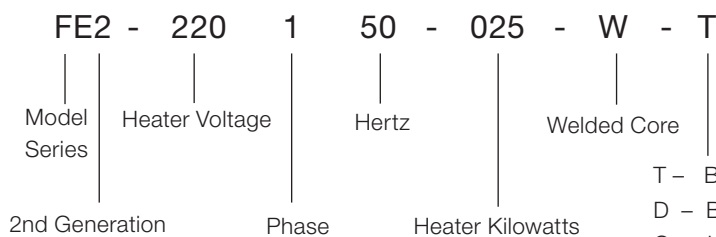
All FE2 heaters utilize the VacuCore® liquid-to-air heat exchanger. The induced vacuum within the sealed core provides greater efficiency, even distribution of heat across the face of the exchanger, and a faster warm-up. When necessary, the entire core can be safely and easily replaced with a new exchanger or core.

The heater core assembly is contained in a sturdy, epoxy-coated, 12-gauge steel cabinet which also carries the motor and fan assembly. Adjustable louvres allow directional control of the airflow. A narrow gap, two-piece fan guard is provided to shield all moving parts. All fasteners are zinc plated for corrosion protection.

All aspects and details of the FE2 are subjected to exhaustive technical analysis and testing during design and development, and are manufactured under a registered quality assurance program. As a result, they have consistently proven their safety and reliability.



Model Coding



- T – Built-in thermostat
- D – Built-in disconnect switch
- C – Heresite® coating
- A – Stainless steel cabinet
- U – Continuous fan
- B – Low ambient option -50°F (-50°C)
- M25 – M25 adapter field entry
- L – Large junction box

Table 9 – Performance Data for 50 Hertz FE2

CE DEMKO 10 ATEX 0910365X  II 2 G, Ex d IIB T3 Gb  1 Ex d IIB T3 Gb X

Volts	Model	Nominal Wattage	BTU/hr	Phase	Air Temperature Rise		
		kW			Total Current A	°C	°F
220	FE2-220150-025	2.5	8,550	1	11.4	10.6	19.2
	FE2-220150-042	4.2	14,350		19.1	17.9	32.2
	FE2-220150-063	6.3	21,500		28.6	15.8	28.4
	FE2-220150-084	8.4	28,700		38.2	21	37.8
	FE2-220150-126	12.6	43,050		57.3	15.3	27.6
230	FE2-230150-028	2.8	9,550		12	12	21.6
	FE2-230150-046	4.6	15,700		20	19.8	35.6
	FE2-230150-069	6.9	23,550		29.9	17.4	31.4
	FE2-230150-092	9.2	31,400		39.9	23.2	41.8
	FE2-230150-138	13.8	47,150		59.9	17	30.5
240	FE2-240150-030	3	10,250		12.4	12.8	23.1
	FE2-240150-050	5	17,100		20.8	21.4	38.5
	FE2-240150-075	7.5	25,600		31.2	18.8	33.9
	FE2-240150-100	10	34,150		41.7	25.1	45.2
	FE2-240150-150	15	51,250		62.5	18.3	32.9
380	FE2-380350-025	2.5	8,550		3.8	11.2	20.1
	FE2-380350-042	4.2	14,350		6.4	18.7	33.7
	FE2-380350-063	6.3	21,500		9.6	16.5	29.7
	FE2-380350-084	8.4	28,700		12.8	22	39.7
	FE2-380350-125	12.5	42,700		19	15.9	28.7
	FE2-380350-167	16.7	57,050	25.4	21.3	38.3	
	FE2-380350-209	20.9	71,400	31.8	12.9	23.3	
400	FE2-400350-028	2.8	9,550	4.1	12.3	22.1	
	FE2-400350-046	4.6	15,700	6.6	20.2	36.3	
	FE2-400350-069	6.9	23,550	10	17.8	32.1	
	FE2-400350-093	9.3	31,750	13.4	24	43.2	
	FE2-400350-139	13.9	47,450	20.1	17.4	31.4	
	FE2-400350-185	18.5	63,200	26.7	23.2	41.8	
	FE2-400350-231	23.1	78,900	33.3	14.1	25.4	
415	FE2-415350-037	3.7	12,650	5.1	16.2	29.1	
	FE2-415350-075	7.5	25,600	10.4	19.2	34.6	
	FE2-415350-149	14.9	50,900	20.7	18.6	33.4	
	FE2-415350-187*	18.7	63,850	26	23.3	41.9	
	FE2-415350-224	22.4	76,500	31.2	13.6	24.4	
	FE2-415350-262*	26.2	89,500	36.5	15.9	28.6	
440	FE2-440350-042	4.2	14,350	5.5	19.3	34.8	
	FE2-440350-084	8.4	28,700	11	21.8	39.2	
	FE2-440350-168	16.8	57,400	22	21	37.9	
	FE2-440350-210	21	71,700	27.6	12.7	22.9	
	FE2-440350-252*	25.2	86,050	33.1	15.2	27.4	
	FE2-440350-294*	29.4	100,400	38.6	17.8	32	

- Note:**
- *Available on "B" models only.
 - 1. Minimum conductor size for 30°C (86°F) ambient. Derate conductor for ambient temperature. Use minimum 90°C (194°F) insulation.
 - 2. Heater is functioning normally if at rated voltage the amp draw is within 10% of the value in this table.
 - 3. Operation at lower voltage will result in reduced heat output and amp draw.
 - 4. Add "T" to model number when adding a built-in thermostat.
 - 5. Add "D" to model number for units with disconnect switch option.
 - 6. Add "A" to model number for units with stainless-steel cabinet.
 - 7. Add "C" to model number for Heresite® coated panels and core.
 - 8. Add "U" to model number for units with a continuous fan.
 - 9. Add "B" for minimum ambient temperature of -50°C. Contact factory for available models.
 - 10. Add "M25" for M25 adapter field entry.

Table 10 – Performance Data for 60 Hertz FE2

CE DEMKO 10 ATEX 0910365X Ex II 2 G, Ex d IIB T3 Gb EAC 1 Ex d IIB T3 Gb X

Volts	Model	Nominal Wattage	BTU/hr	Phase	Total Current		Air Temperature Rise	
		kW			A	°C	°F	
220	FE2-220160-025	2.5	8,550	1	11.4	8.8	15.8	
	FE2-220160-042	4.2	14,350		19.1	14.8	26.6	
	FE2-220160-063	6.3	21,500		28.6	13	23.4	
	FE2-220160-084	8.4	28,700		38.2	17.4	31.3	
	FE2-220160-126	12.6	43,050		57.3	12.7	22.8	
230	FE2-230160-028	2.8	9,550		12	9.8	17.7	
	FE2-230160-046	4.6	15,700		20	16.2	29.1	
	FE2-230160-069	6.9	23,550		29.9	14.3	25.7	
	FE2-230160-092	9.2	31,400		39.9	19	34.2	
	FE2-230160-138	13.8	47,150		59.9	13.9	24.9	
240	FE2-240160-030	3	10,250		12.4	10.5	19	
	FE2-240160-050	5	17,100		20.8	17.6	31.7	
	FE2-240160-075	7.5	25,600		31.2	15.5	27.9	
	FE2-240160-100	10	34,150		41.7	20.7	37.2	
	FE2-240160-150	15	51,250		62.5	15.1	27.1	
440	FE2-440360-042	4.2	14,350		5.5	14.8	26.6	
	FE2-440360-084	8.4	28,700		11	17.4	31.3	
	FE2-440360-168	16.8	57,400		22	16.9	30.4	
	FE2-440360-210	21	71,700		27.6	10.2	18.4	
	FE2-440360-252*	25.2	86,050		33.1	13.4	24.1	
	FE2-440360-294*	29.4	100,400	38.6	15.6	28.1		
480	FE2-480360-030	3	10,250	3.6	10.5	19		
	FE2-480360-050	5	17,100	6	17.6	31.7		
	FE2-480360-075	7.5	25,600	9	15.5	27.9		
	FE2-480360-100	10	34,150	12	20.7	37.2		
	FE2-480360-150	15	51,250	18	15.1	27.1		
	FE2-480360-200	20	68,300	24.1	20.1	36.1		
	FE2-480360-250*	25	85,400	30.1	12.2	22.9		
	FE2-480360-300*	30	102,450	36.1	14.6	27.5		
	FE2-480360-350*	35	119,550	42.1	17.1	32		

Note:

*Available on "B" models only.

1. Minimum conductor size for 30°C (86°F) ambient. Derate conductor for ambient temperature. Use minimum 90°C (194°F) insulation.
2. Heater is functioning normally if at rated voltage the amp draw is within 10% of the value in this table.
3. Operation at lower voltage will result in reduced heat output and amp draw.
4. Add "T" to model number when adding a built-in thermostat.

5. Add "D" to model number for units with disconnect switch option.
6. Add "A" to model number for units with stainless-steel cabinet.
7. Add "C" to model number for Heresite® coated panels and core.
8. Add "U" to model number for units with a continuous fan.
9. Add "B" for minimum ambient temperature of -50°C. Contact factory for available models.
10. Add "M25" for M25 adapter field entry.

Installation Instructions

- The FE2 Series Electric Air Heaters are for dry indoor use only. Do not immerse in water. Do not store or use in areas exposed to rain or snow.
- The FE2 heaters are to be used only in atmospheres having an ignition temperature higher than Temperature Code T3 200°C (329°F) for Class I & II.
- Altitude restrictions apply - see specifications above.
- Heaters should be connected to a fixed power supply and must be permanently mounted in a level, upright position during operation.
- Read and be aware of the terms of our Warranty located in the owner's manual.
- Refer to the Owner's Manual.

Table 11 – Specifications for 50 Hertz FE2

		Nominal kW							
		2.5 – 3.0	3.7 – 5.0	6.3 – 7.5	8.4 – 10.0	12.5 – 13.9	14.9 – 20	20.9 – 21	22.4 – 29.4
Altitude (max.)	ft	12,000	8,000	10,000	7,000	10,000	7,000	10,000	7,000
	m	3,658	2,438	3,048	2,134	3,048	2,134	3,048	2,134
Air Flow (min.)	@ 70°F (CFM)	387		678		1,404		2,905	
	@ 21°C (m³/hr)	658		1,152		2,385		4,936	
Horizontal Air Throw	ft	13		25		35		60	
	m	4.0		7.6		10.7		18.2	
Maximum Mounting Height (to underside)	ft	7		10		10		20	
	m	2.1		3.0		3.0		6.1	
Motor Speed (min.)	RPM	1360							
Fan Diameter	in	12			16			20	
	mm	305			406			508	
Net Weight	without DS5	lbs	174		202		235		
		kg	79		92		107		
	with DS5	lbs	186		214		247		
		kg	84		97		112		
Shipping Weight	without DS5	lbs	228		252		286		
		kg	103		114		130		
	with DS5	lbs	240		264		298		
		kg	109		120		135		

*Weights are an approximate maximum.

Table 12 – Specifications for 60 Hertz FE2

		Nominal kW							
		2.5 – 3.0	3.7 – 5.0	6.3 – 7.5	8.4 – 10	12.5 – 13.9	14.9 – 20	20.9 – 21	22.4 – 35.0
Altitude (max.)	ft	12,000	8,000	10,000	7,000	10,000	7,000	10,000	7,000
	m	3,658	2,438	3,048	2,134	3,048	2,134	3,048	2,134
Air Flow (min.)	@ 70°F (CFM)	394		670		1,380		2,838	
	@ 21°C (m³/hr)	669		1138		2,345		4,822	
Horizontal Air Throw	ft	15		30		40		70	
	m	4.6		9.1		12.2		21.3	
Maximum Mounting Height (to underside)	ft	7		10		10		20	
	m	2.1		3.0		3.0		6.1	
Motor Speed (min.)	RPM	1360							
Fan Diameter	in	12			16			20	
	mm	305			406			508	
Net Weight	without DS5	lbs	174		202		235		
		kg	79		92		107		
	with DS5	lbs	186		214		247		
		kg	84		97		112		
Shipping Weight	without DS5	lbs	228		252		286		
		kg	103		114		130		
	with DS5	lbs	240		264		298		
		kg	109		120		135		

*Weights are an approximate maximum.

General Specifications

1. Approvals ATEX Approved (Directive 2014/34/EU)
2. Hazardous Location Classifications
 - CE DEMKO 10 ATEX 0910365X
 - Ex II 2 G, Ex d IIB T3 Gb
 - ERC 1 Ex d IIB T3 Gb X
3. Enclosures NEMA Type 7 & 9. For dry, indoor use only. Do not immerse in water. Do not store or use in areas exposed to rain or snow
4. Motor Type Explosion-proof. Thermally protected. Permanently lubricated ball bearings 1425 RPM @ 50 Hz or 1725 RPM @ 60 Hz
5. Fan Aluminum blade. Steel spider and hub with 19 mm (3/4") bore
6. Fan Guard Split design with close wire spacing. Meets latest EN standards
7. Mounting Holes Four 16 mm (5/8") diameter holes at top of heater
8. Heating Elements Three long-life, low watt-density, high grade metal-sheathed elements
9. Temperature High-Limit Automatic reset type, snap-action bimetal, open on temperature rise. Rated 100,000 cycles at 10 amps, handles 0.130 amps
10. Control Circuit 115 V, 0.130 amps, 15 VA. (Grounded)
11. Optional Built-in Thermostat Explosion-proof. 2°C to 28°C (36°F to 82°F)
Explosion-proof XTE 412. 0°C to 40°C (43°F to 104°F)
12. Control Transformer Multi-tap primary, 115 V secondary, 50 VA
13. Contactor 75 amp. Rated for 1,000,000 mechanical operations. 120 V, 15 VA coil (separately fused - protected)
14. Heat Transfer Fluid Long life formulated Propylene Glycol and water, freeze protected to -45°C (-49°F)
15. Cabinet Material 12-gauge (0.075" / 2 mm) steel. Epoxy coated with five-stage pretreatment, including iron phosphate
16. Core Steel with integral aluminum fins, vacuum charged and hermetically sealed
17. Conduit Material Heavy wall, 0.122" (3 mm) steel-plated
18. Overpressure Protection Preset 690 kPa (100 psig) seep pressure relief valve, aluminum body, not field serviceable
19. Operational Temperature Limitations -20°C to 40°C (-4°F to 104°F) and -50°C to 40°C for "B" units
20. Ingress Protection IP55 on select models

Table 13 – Cabinet Length, Net Weight, and Shipping Weight

		Nominal kW			
		0.75 – 2.69 & 3.6 (T2A)	3.01 – 3.59, 3.6 (T3) & 4.8	4.76, 5.28 – 7.6	3.13, 3.47, 3.74, 5.0, 6.26
Cabinet Length	in	31.3	49.4	59.5	71.8
	mm	796	1256	1511	1823
Net Weight	lbs	55	80.7	92.8	117.0
	kg	25.1	36.6	42.1	53.2
Shipping Weight	lbs	65	95	105	142
	kg	30	44	48	65.5

CX1 ProVector® Series Explosion-Proof Heaters

For hazardous locations heating, rely on the Ruffneck™ CX1 ProVector® for the most dependable, trouble-free service available. Thermon Heating Systems, Inc. manufactures explosion-proof air heaters to satisfy the demanding requirements of the oil and gas well drilling industry. The harsh operating conditions of this application require the utmost in heater reliability.

The unique design features and rugged, quality construction details that have made Ruffneck™ heaters the choice of the oil and gas industry are also appreciated by other heavy-duty industries throughout the world.



Features

- Available in 1-phase or 3-phase
- Available up to an industry leading 10 kW
- Sloped-top cabinet
- No exposed copper or brass
- High-velocity airflow
- 14-gauge steel cabinet, available with stainless-steel construction
- One of the shortest cabinet lengths available
- Optional built-in thermostat
- Incoloy® 840 heating elements
- Radial-embossed aluminum plate fins
- Galvanized steel mounting brackets
- Approvals - Groups A, B, C, D; IIA, IIB & IIC; available IP55 moisture ingress protection

Benefits

- Prevents objects from being set on top which restrict airflow
- Corrosion resistant, suitable for H2S environments
- Heats up area faster with better heat distribution
- Rugged reliability and unsurpassed corrosion resistance available with stainless-steel construction
- Smaller profile utilizes less wall and floor space
- Reduced field installation costs
- Longer life expectancy
- Reduced fin warping for better heat transfer capabilities
- Quick installation
- Industry first approvals for built-in thermostat with Groups A, B, C, D; IIA, IIB, IIC ratings

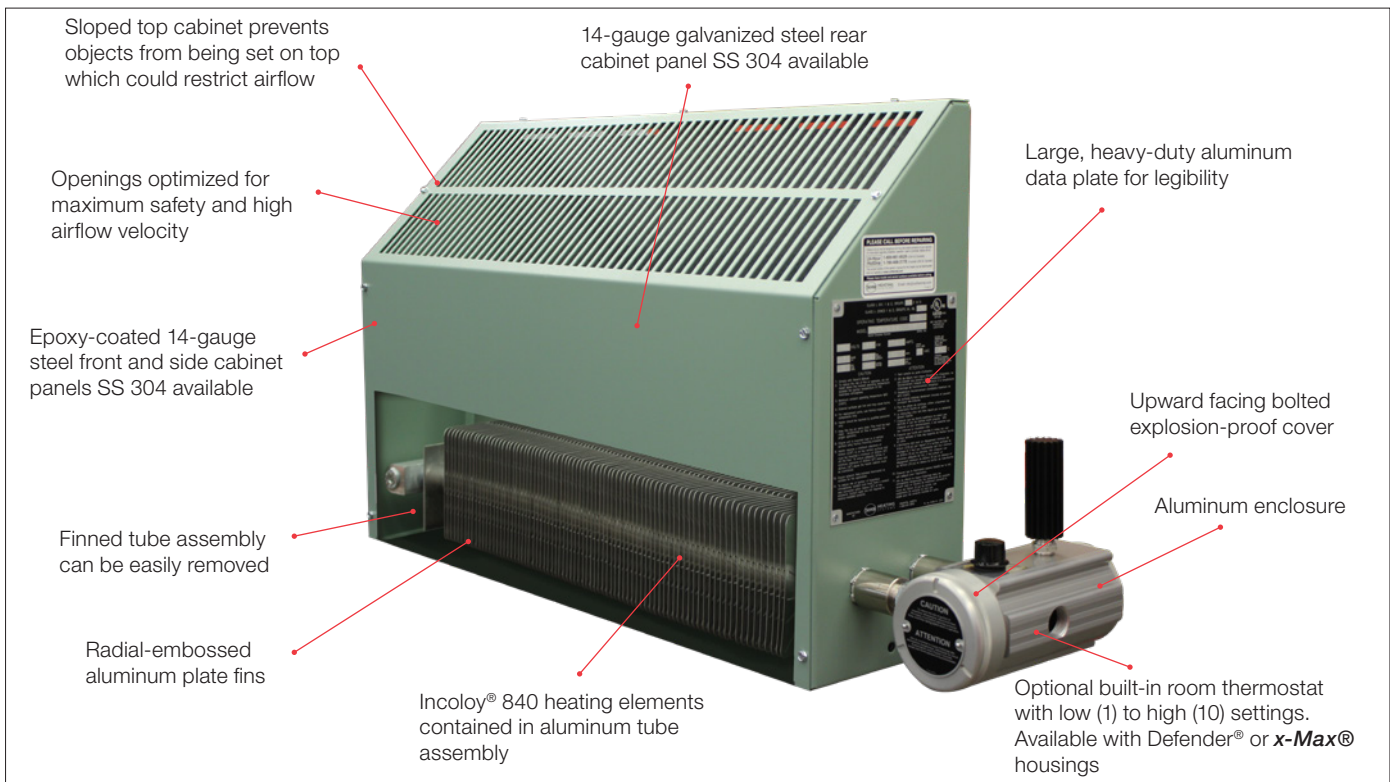
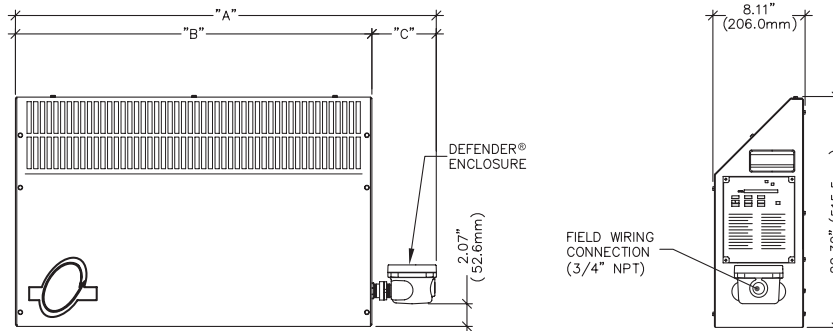


Figure 5

CX1 ProVector® Series – Explosion-Proof Heaters

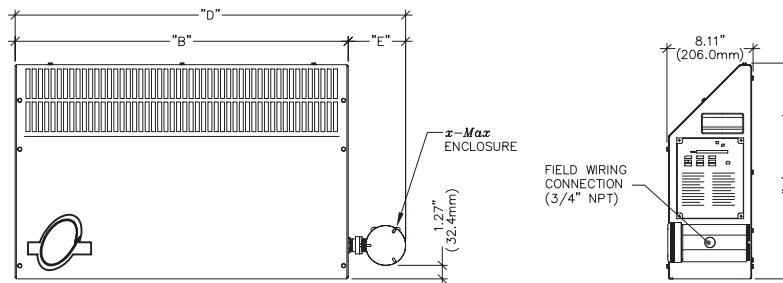
Physical Dimensions

CX1 ProVector® Physical Dimensions with Defender® Housing



Heater kW Rating	'A' Dimension		'B' Dimension	'C' Dimension	
	w/o Extension	w/ Extension		w/o Extension	w/ Extension
	in (mm)	in (mm)	in (mm)	in (mm)	in (mm)
0.75 – 2.69 & 3.6 (T2A)	36.9 (938)	39.0 (991)	31.34 (796)	5.6 (142)	7.7 (195)
3.01 – 3.59, 3.6 (T3) & 4.8	55.0 (1398)	57.1 (1451)	49.45 (1256)		
4.76, 5.28 – 7.6*	65.1 (1653)	67.2 (1706)	59.49 (1511)		
3.13, 3.47, 3.74, 5.0, 6.26, 6.94, 7.47 & 10.0	77.4 (1965)	79.4 (2018)	71.78 (1823)		

CX1 ProVector® Physical Dimensions with x-Max® Housing



Heater kW Rating	'D' Dimension			'B' Dimension	'E' Dimension		
	1Ø w/o Extension	1Ø** w/ Extension	3Ø Units		w/o Extension	w/ Extension	3Ø Units
	in (mm)	in (mm)	in (mm)	in (mm)	in (mm)	in (mm)	in (mm)
0.75 – 2.69 & 3.6 (T2A)	37.6 (954)	39.6 (1007)	38.3 (973)	31.34 (796)	6.2 (158)	8.3 (211)	7.0 (177)
3.01 – 3.59, 3.6 (T3) & 4.8	55.7 (1414)	57.8 (1467)	56.4 (1433)	49.45 (1256)			
4.76, 5.28 – 7.6*	65.7 (1669)	67.8 (1722)	66.5 (1688)	59.49 (1511)			
3.13, 3.47, 3.74, 5.0, 6.26, 6.94, 7.47 & 10.0	78.0 (1981)	80.1 (2034)	78.7 (2000)	71.78 (1823)			

Model	kW (Btu/hr)	Unit Voltage	Gas Group				Supply Wire Size ***	Unit Current	Max. Circuit Fuse*	Cabinet Length	Temperature Code
			IIB + H2	IIB	IIC						
		V	w/o T'stat	w/ T'stat	w/o T'stat	w/ T'stat	AWG	A	A	in (mm)	
CX1-120160-012-T3	1.2 (4095)	120		✓	✓	✓	14	10.0	15	31.3 (796)	T3 (200)
CX1-120160-018-T3	1.8 (6142)	120		✓	✓	✓	12	15.0	20	31.3 (796)	T3 (200)
CX1-208160-012-T3	1.2 (4095)	208		✓	✓	✓	14	5.8	15	31.3 (796)	T3 (200)
CX1-208160-018-T3	1.8 (6142)	208		✓	✓	✓	14	8.7	15	31.3 (796)	T3 (200)
CX1-208160-036-T3**	3.6 (12284)	208		✓	✓	✓	10	17.3	25	49.5 (1256)	T3 (200)
CX1-208160-048-T2A	4.8 (16378)	208		N/A	✓	✓	10	23.1	30	49.5 (1256)	T2A (280)
CX1-208160-050-T3	5.0 (17060)	208		N/A	✓	✓	10	24.0	30	71.8 (1823)	T3 (200)
CX1-208160-076-T2A	7.6 (25932)	208		N/A	✓	N/A	8	36.5	50	59.5 (1511)	T2A (280)
CX1-240160-012-T3	1.2 (4095)	240		✓	✓	✓	14	5.0	15	31.3 (796)	T3 (200)
CX1-240160-018-T3	1.8 (6142)	240		✓	✓	✓	14	7.5	15	31.3 (796)	T3 (200)
CX1-240160-036-T3**	3.6 (12284)	240		✓	✓	✓	12	15.0	20	49.5 (1256)	T3 (200)
CX1-240160-048-T2A	4.8 (16378)	240		✓	✓	✓	10	20.0	25	49.5 (1256)	T2A (280)
CX1-240160-050-T3	5.0 (17060)	240		✓	✓	✓	10	20.8	30	71.8 (1823)	T3 (200)
CX1-240160-076-T2A	7.6 (25932)	240		N/A	✓	N/A	8	31.7	40	59.5 (1511)	T2A (280)
CX1-277160-012-T3	1.2 (4095)	277		✓	✓	✓	14	4.3	15	31.3 (796)	T3 (200)
CX1-277160-018-T3	1.8 (6142)	277		✓	✓	✓	14	6.5	15	31.3 (796)	T3 (200)
CX1-277160-036-T3**	3.6 (12284)	277		✓	✓	✓	12	13.0	20	49.5 (1256)	T3 (200)
CX1-277160-048-T2A	4.8 (16378)	277		✓	✓	✓	10	17.3	25	49.5 (1256)	T2A (280)
CX1-277160-050-T3	5.0 (17060)	277		✓	✓	✓	10	18.1	25	71.8 (1823)	T3 (200)
CX1-277160-076-T2A	7.6 (25932)	277	✓	N/A	✓	N/A	8	27.4	35	59.5 (1511)	T2A (280)
CX1-380160-0075-T3	0.75 (2560)	380		✓	+	+	14	2.0	15	31.3 (796)	T3 (200)
CX1-380160-0113-T3	1.13 (3856)	380		✓	+	+	14	3.0	15	31.3 (796)	T3 (200)
CX1-380160-012-T3	1.2 (4095)	380		✓	✓	✓	14	3.2	15	31.3 (796)	T3 (200)
CX1-380160-018-T3	1.8 (6142)	380		✓	✓	✓	14	4.7	15	31.3 (796)	T3 (200)
CX1-380160-0226-T2A	2.26 (7711)	380		✓	+	+	14	5.9	15	31.3 (796)	T2A (280)
CX1-380160-0301-T3	3.01 (10271)	380		✓	+	+	14	7.9	15	49.5 (1256)	T3 (200)
CX1-380160-0313-T3	3.13 (10680)	380		✓	+	+	14	8.2	15	71.8 (1823)	T3 (200)
CX1-380160-036-T3**	3.6 (12284)	380		✓	✓	✓	14	9.5	15	49.5 (1256)	T3 (200)
CX1-380160-0476-T2A	4.76 (16241)	380		✓	+	+	12	12.5	20	59.5 (1511)	T2A (280)
CX1-380160-048-T2A	4.8 (16378)	380		✓	✓	✓	12	12.6	20	49.5 (1256)	T2A (280)
CX1-380160-050-T3	5.0 (17060)	380		✓	✓	✓	12	13.2	20	71.8 (1823)	T3 (200)
CX1-380160-0626-T2A	62.6 (21360)	380		✓	✓	N/A	10	16.5	25	71.8 (1823)	T2A (280)
CX1-380160-076-T2A	7.6 (25932)	380		✓	✓	N/A	10	20.0	25	59.5 (1511)	T2A (280)
CX1-380160-100-T2A	10.0 (34121)	380		N/A	✓	N/A	8	26.3	35	71.8 (1823)	T2A (280)
CX1-400160-0083-T3	0.83 (2832)	400		✓	+	+	14	2.1	15	31.3 (796)	T3 (200)
CX1-400160-012-T3	1.2 (4095)	400		✓	✓	✓	14	3.0	15	31.3 (796)	T3 (200)
CX1-400160-0125-T3	1.25 (4565)	400		✓	+	+	14	3.1	15	31.3 (796)	T3 (200)
CX1-400160-018-T3	1.8 (6142)	400		✓	✓	✓	14	4.5	15	31.3 (796)	T3 (200)

Notes

- * Or equivalent breaker as per local electrical inspection authority requirements.
 - ** For 3.6 kW heaters rated T3 cabinet length is 49.5" (1256 mm). 3.6 kW heaters rated T2A cabinet length is 31.3" (796 mm).
 - *** Ensure supply wire size adheres to applicable local and national electrical codes.
 - + Available in 50 Hz only.
1. Heater is functioning normally if, at rated voltage, the current draw is within 10% of the value in this table.
 2. Operation at lower voltages that rated will result in reduced output and current draw.
Actual Output (kW) = [(Supply Voltage)² ÷ (Rated Voltage)²] × Rated Unit Wattage (kW)
 3. Add suffix "T" for optional built-in thermostat. Thermostat not available on IIB+H2 models.
 4. Add suffix "H" for high-temperature ambient storage option. High temperature storage option is not available with thermostat option. Not available on IIB models.
 5. For IIB model with Defender® built-in thermostat - Class I, Div. 1 & 2, Groups C & D; Zones 1 & 2, Groups IIA and IIB.
 6. For IIC model with XT built-in thermostat - Class I, Div. 1 & 2, Groups A,B,C & D; Zones 1 & 2, Groups IIA, IIB, IIC.
 7. IIC Grouping units come with **x-Max**® housing.
 8. Remote mounted, Defender, explosion-proof room thermostats are not suitable for Group B & IIC applications.
 9. Remote contactors are required on all 600 V heaters, and heaters with a current draw greater than 22 amps (supplied & installed by others), when utilizing XT-311 remote thermostat.
 10. Temperature code ratings: T2A - 280°C (536°F), T3 - 200°C (392°F)

Table 14 – CX1 Technical Data - 1 Phase (cont'd)

Model	kW (Btu/hr)	Unit Voltage V	Gas Group				Supply Wire Size *** AWG	Unit Current A	Max. Circuit Fuse* A	Cabinet Length in (mm)	Temperature Code
			IIB + H2	IIB	IIC						
			w/o T'stat	w/ T'stat	w/o T'stat	w/ T'stat					
CX1-400160-025-T2A	2.5 (8530)	400		✓	+	+	14	6.3	15	31.3 (796)	T2A (280)
CX1-400160-0333-T3	3.33 (11362)	400		✓	+	+	14	8.3	15	49.5 (1256)	T3 (200)
CX1-400160-0347-T3	3.47 (11840)	400		✓	✓	✓	14	8.7	15	71.8 (1823)	T3 (200)
CX1-400160-036-T3**	3.6 (12284)	400		✓	✓	✓	14	9.0	15	49.5 (1256)	T3 (200)
CX1-400160-048-T2A	4.8 (16378)	400		✓	✓	✓	14	12.0	15	49.5 (1256)	T2A (280)
CX1-400160-050-T3	5.0 (17060)	400		✓	✓	✓	12	12.5	20	71.8 (1823)	T3 (200)
CX1-400160-0528-T2A	5.28 (18016)	400		✓	+	+	12	13.2	20	59.5 (1511)	T2A (280)
CX1-400160-0694-T3	6.94 (23680)	400		✓	✓	N/A	10	17.4	25	71.8 (1823)	T3 (200)
CX1-400160-076-T2A	7.6 (25932)	400		✓	✓	N/A	10	19.0	30	59.5 (1511)	T2A (280)
CX1-400160-100-T2A	10.0 (34121)	400		N/A	✓	N/A	8	25.0	35	71.8 (1823)	T2A (280)
CX1-415160-009-T3	0.9 (3071)	415		✓	+	+	14	2.2	15	31.3 (796)	T3 (200)
CX1-415160-012-T3	1.2 (4095)	415		✓	✓	✓	14	2.9	15	31.3 (796)	T3 (200)
CX1-415160-0135-T3	1.35 (4606)	415		✓	+	+	14	3.3	15	31.3 (796)	T3 (200)
CX1-415160-018-T3	1.8 (6142)	415		✓	✓	✓	14	4.3	15	31.3 (796)	T3 (200)
CX1-415160-0269-T2A	2.69 (9179)	415		✓	+	+	14	6.5	15	31.3 (796)	T2A (280)
CX1-415160-0359-T3	3.59 (12250)	415		✓	+	+	14	8.7	15	49.5 (1256)	T3 (200)
CX1-415160-036-T3**	3.6 (12284)	415		✓	✓	✓	14	8.7	15	49.5 (1256)	T3 (200)
CX1-415160-0374-T3	3.74 (12761)	415		✓	✓	✓	14	9.0	15	71.8 (1823)	T3 (200)
CX1-415160-048-T2A	4.8 (16378)	415	✓	✓	✓	✓	14	11.6	15	49.5 (1256)	T2A (280)
CX1-415160-050-T3	5.0 (17060)	415		✓	✓	✓	14	12.0	15	71.8 (1823)	T3 (200)
CX1-415160-0568-T2A	5.68 (19381)	415		✓	+	+	12	13.7	20	59.5 (1511)	T2A (280)
CX1-415160-0747-T2A	7.47 (25488)	415		✓	✓	N/A	10	18.0	25	71.8 (1823)	T2A (280)
CX1-415160-076-T2A	7.6 (25932)	415		✓	✓	N/A	10	18.3	25	59.5 (1511)	T2A (280)
CX1-415160-100-T2A	10.0 (34121)	415		N/A	✓	N/A	8	24.1	35	71.8 (1823)	T2A (280)
CX1-480160-012-T3	1.2 (4095)	480		✓	✓	✓	14	2.5	15	31.3 (796)	T3 (200)
CX1-480160-018-T3	1.8 (6142)	480		✓	✓	✓	14	3.8	15	31.3 (796)	T3 (200)
CX1-480160-036-T3**	3.6 (12284)	480		✓	✓	✓	14	7.5	15	49.5 (1256)	T3 (200)
CX1-480160-048-T2A	4.8 (16378)	480		✓	✓	✓	14	10.0	15	49.5 (1256)	T2A (280)
CX1-480160-050-T3	5.0 (17060)	480		✓	✓	✓	14	10.4	15	71.8 (1823)	T3 (200)
CX1-480160-076-T2A	7.6 (25932)	480		✓	✓	✓	12	15.8	20	59.5 (1511)	T2A (280)
CX1-480160-100-T2A	10.0 (34121)	480		✓	✓	N/A	10	20.8	30	71.8 (1823)	T2A (280)
CX1-600160-012-T3	1.2 (4095)	600		N/A	✓	✓	14	2.0	15	31.3 (796)	T3 (200)
CX1-600160-018-T3	1.8 (6142)	600		N/A	✓	✓	14	3.0	15	31.3 (796)	T3 (200)
CX1-600160-036-T3**	3.6 (12284)	600		N/A	✓	✓	14	6.0	15	49.5 (1256)	T3 (200)
CX1-600160-048-T2A	4.8 (16378)	600		N/A	✓	✓	14	8.0	15	49.5 (1256)	T2A (280)
CX1-600160-050-T3	5.0 (17060)	600		N/A	✓	✓	14	8.3	15	71.8 (1823)	T3 (200)
CX1-600160-076-T2A	7.6 (25932)	600		N/A	✓	✓	12	12.7	20	59.5 (1511)	T2A (280)
CX1-600160-100-T2A	10.0 (34121)	600		N/A	✓	N/A	10	16.7	25	71.8 (1823)	T2A (280)

Notes

- * Or equivalent breaker as per local electrical inspection authority requirements.
- ** For 3.6 kW heaters rated T3 cabinet length is 49.5" (1256 mm). 3.6 kW heaters rated T2A cabinet length is 31.3" (796 mm).
- *** Ensure supply wire size adheres to applicable local and national electrical codes.
- + Available in 50 Hz only.
- Heater is functioning normally if, at rated voltage, the current draw is within 10% of the value in this table.
 - Operation at lower voltages that rated will result in reduced output and current draw.
Actual Output (kW) = [(Supply Voltage)² ÷ (Rated Voltage)²] × Rated Unit Wattage (kW)
 - Add suffix "T" for optional built-in thermostat. Thermostat not available on IIB+H2 models.
 - Add suffix "H" for high-temperature ambient storage option. High temperature storage option is not available with thermostat option. Not available on IIB models.
 - For IIB model with Defender® built-in thermostat - Class I, Div. 1 & 2, Groups C & D; Zones 1 & 2, Groups IIA and IIB.
 - For IIC model with XT built-in thermostat - Class I, Div. 1 & 2, Groups A,B,C & D; Zones 1 & 2, Groups IIA, IIB, IIC.
 - IIC Grouping units come with **x-Max**® housing.
 - Remote mounted, Defender, explosion-proof room thermostats are not suitable for Group B & IIC applications.
 - Remote contactors are required on all 600 V heaters, and heaters with a current draw greater than 22 amps (supplied & installed by others), when utilizing XT-311 remote thermostat.
 - Temperature code ratings: T2A - 280°C (536°F), T3 - 200°C (392°F)

Table 14 – CX1 Technical Data - 3 Phase

Model	kW (Btu/hr)	Unit Voltage	Gas Group				Supply Wire Size ***	Unit Current	Max. Circuit Fuse*	Cabinet Length	Temperature Code
			IIB + H2	IIB	IIC						
			V	w/o T'stat	w/ T'stat	w/o T'stat					
CX1-208360-012-T3	1.2 (4095)	208	✓		✓	✓	14	3.3	15	31.3 (796)	T3 (200)
CX1-208360-018-T3	1.8 (6142)	208	✓		✓	✓	14	5.0	15	31.3 (796)	T3 (200)
CX1-208360-036-T3**	3.6 (12284)	208	✓		✓	✓	12	10.0	15	49.5 (1256)	T3 (200) T2A (280)
CX1-208360-048-T2A	4.8 (16378)	208	✓		✓	✓	10	13.3	20	49.5 (1256)	T2A (280)
CX1-208360-050-T3	5.0 (17060)	208	✓		✓	✓	10	13.9	20	71.8 (1823)	T3 (200)
CX1-208360-076-T2A	7.6 (25932)	208	N/A		✓	✓	10	21.1	30	59.5 (1511)	T2A (280)
CX1-208360-100-T2A	10.0 (34121)	208	N/A		✓	✓	8	27.8	35	71.8 (1823)	T2A (280)
CX1-240360-012-T3	1.2 (4095)	240	✓		✓	✓	14	2.9	15	31.3 (796)	T3 (200)
CX1-240360-018-T3	1.8 (6142)	240	✓		✓	✓	14	4.3	15	31.3 (796)	T3 (200)
CX1-240360-036-T3**	3.6 (12284)	240	✓		✓	✓	14	8.7	15	49.5 (1256)	T3 (200) T2A (280)
CX1-240360-048-T2A	4.8 (16378)	240	✓		✓	✓	12	11.5	20	49.5 (1256)	T2A (280)
CX1-240360-050-T3	5.0 (17060)	240	✓		✓	✓	14	12.0	15	71.8 (1823)	T3 (200)
CX1-240360-076-T2A	7.6 (25932)	240	✓		✓	✓	10	18.3	25	59.5 (1511)	T2A (280)
CX1-240360-100-T2A	10.0 (34121)	240	N/A		✓	✓	8	24.1	35	71.8 (1823)	T2A (280)
CX1-277360-012-T3	1.2 (4095)	277	✓		✓	✓	14	2.5	15	31.3 (796)	T3 (200)
CX1-277360-018-T3	1.8 (6142)	277	✓		✓	✓	14	3.8	15	31.3 (796)	T3 (200)
CX1-277360-036-T3**	3.6 (12284)	277	✓	N/A	✓	✓	14	7.5	15	49.5 (1256)	T3 (200) T2A (280)
CX1-277360-048-T2A	4.8 (16378)	277	✓	N/A	✓	✓	14	10.0	15	49.5 (1256)	T2A (280)
CX1-277360-050-T3	5.0 (17060)	277	✓	N/A	✓	✓	14	10.4	15	71.8 (1823)	T3 (200)
CX1-277360-076-T2A	7.6 (25932)	277	✓	N/A	✓	✓	12	15.8	20	59.5 (1511)	T2A (280)
CX1-277360-100-T2A	10.0 (34121)	277	N/A	N/A	✓	✓	8	20.8	30	71.8 (1823)	T2A (280)
CX1-380360-0113-T3	1.13 (3856)	380	✓		+	+	14	1.7	15	31.3 (796)	T3 (200)
CX1-380360-0226-T2A	2.26 (7711)	380	✓		+	+	14	3.4	15	31.3 (796)	T2A (280)
CX1-380360-0301-T3	3.01 (10271)	380	✓		+	+	14	4.6	15	49.5 (1256)	T3 (200)
CX1-380360-0313-T3	3.13 (10680)	380	✓		+	+	14	4.8	15	71.8 (1823)	T3 (200)
CX1-380360-0476-T2A	4.76 (16241)	380	✓		+	+	14	7.2	15	59.5 (1511)	T2A (280)
CX1-380360-050-T3	5.0 (17060)	380	✓		✓	✓	14	7.6	15	71.8 (1823)	T3 (200)
CX1-380360-0626-T2A	6.26 (21360)	380	✓		✓	✓	14	9.5	15	71.8 (1823)	T2A (280)
CX1-380360-100-T2A	10.0 (34121)	380	✓		✓	✓	12	15.2	20	71.8 (1823)	T2A (280)
CX1-400360-0125-T3	1.25 (4565)	400	✓		+	+	14	1.8	15	31.3 (796)	T3 (200)
CX1-400360-025-T2A	2.5 (8530)	400	✓		+	+	14	3.6	15	31.3 (796)	T2A (280)
CX1-400360-0333-T3	3.33 (11362)	400	✓		+	+	14	4.8	15	49.5 (1256)	T3 (200)
CX1-400360-0347-T3	3.47 (11840)	400	✓		✓	✓	14	5.0	15	71.8 (1823)	T3 (200)

Notes

- * Or equivalent breaker as per local electrical inspection authority requirements.
 - ** For 3.6 kW heaters rated T3 cabinet length is 49.5" (1256 mm). 3.6 kW heaters rated T2A cabinet length is 31.3" (796 mm).
 - *** Ensure supply wire size adheres to applicable local and national electrical codes.
 - + Available in 50 Hz only
 - Available for IIB only.
1. Heater is functioning normally if, at rated voltage, the current draw is within 10% of the value in this table.
 2. Operation at lower voltages that rated will result in reduced output and current draw.
 3. Actual Output (kW) = [(Supply Voltage)² ÷ (Rated Voltage)²] × Rated Unit Wattage (kW)
 4. Add suffix "T" for optional built-in thermostat. Thermostat not available on IIB+H2 models.

5. Add suffix "H" for high-temperature ambient storage option. High temperature storage option is not available with thermostat option. Not available on IIB models.
6. For IIB model with Defender® built-in thermostat - Class I, Div. 1 & 2, Groups C & D; Zones 1 & 2, Groups IIA and IIB.
7. For IIC model with XT built-in thermostat - Class I, Div. 1 & 2, Groups A,B,C & D; Zones 1 & 2, Groups IIA, IIB, IIC.
8. IIC Grouping units come with **x-Max**® housing.
9. Remote mounted, Defender®, explosion-proof room thermostats are not suitable for Group B & IIC applications.
10. Remote contactors are required on all 600 V heaters, and heaters with a current draw greater than 22 amps (supplied & installed by others), when utilizing XT-311 remote thermostat.
11. Temperature code ratings: T2A - 280°C (536°F), T3 - 200°C (392°F)

Table 14 – CX1 Technical Data - 3 Phase (cont'd)

Model	kW (Btu/hr)	Unit Voltage	Gas Group				Supply Wire Size ***	Unit Current	Max. Circuit Fuse*	Cabinet Length	Temperature Code	
			IIB + H2	IIB	IIC							
			V	w/o T'stat	w/ T'stat	w/o T'stat						w/ T'stat
CX1-400360-050-T3	5.0 (17060)	400	✓			✓	✓	14	7.2	15	71.8 (1823)	T3 (200)
CX1-400360-0528-T2A	5.28 (18016)	400	✓			+	+	14	7.6	15	59.5 (1511)	T2A (280)
CX1-400360-0694-T2A	6.94 (23680)	400	✓			✓	✓	14	1.0	15	71.8 (1823)	T3 (200)
CX1-400360-100-T2A	10.0 (34121)	400	✓			✓	✓	12	14.4	20	71.8 (1823)	T2A (280)
CX1-415360-0135-T3	1.35 (4606)	415	✓			+	+	14	1.9	15	31.3 (796)	T3 (200)
CX1-415360-0269-T2A	2.69 (9179)	415	✓			+	+	14	3.7	15	31.3 (796)	T2A (280)
CX1-415360-0359-T3	3.59 (12250)	415	✓			+	+	14	5.0	15	49.5 (1256)	T3 (200)
CX1-415360-0374-T3	3.74 (12761)	415	✓			✓	✓	14	5.2	15	71.8 (1823)	T3 (200)
CX1-415360-050-T3	5.0 (17060)	415	✓			✓	✓	14	7.0	15	71.8 (1823)	T3 (200)
CX1-415360-0568-T2A	5.68 (19381)	415	✓			+	+	14	7.9	15	59.5 (1511)	T2A (280)
CX1-415360-0747-T2A	7.47 (25488)	415	✓			✓	✓	14	10.4	15	71.8 (1823)	T2A (280)
CX1-415360-100-T2A	10.0 (34121)	415	✓			✓	✓	12	13.9	20	71.8 (1823)	T2A (280)
CX1-480360-018-T3	1.8 (6142)	480	✓	N/A		✓	✓	14	2.2	15	31.3 (796)	T3 (200)
CX1-480360-036-T3**	3.6 (12284)	480	✓			✓	✓	14	4.3	15	49.5 (1256)	T3 (200)
												T2A (280)
CX1-480360-048-T2A	4.8 (16378)	480	✓			✓	✓	14	5.8	15	49.5 (1256)	T2A (280)
CX1-480360-050-T3	5.0 (17060)	480	✓			✓	✓	14	6.0	15	71.8 (1823)	T3 (200)
CX1-480360-076-T2A	7.6 (25932)	480	✓			✓	✓	14	9.1	15	59.5 (1511)	T2A (280)
CX1-480360-100-T2A	10.0 (34121)	480	✓			✓	✓	14	12.0	15	71.8 (1823)	T2A (280)
CX1-600360-036-T3**	3.6 (12284)	600	✓			✓	✓	14	3.5	15	49.5 (1256)	T3 (200)
												T2A (280)
CX1-600360-048-T2A	4.8 (16378)	600	✓			✓	✓	14	4.6	15	49.5 (1256)	T2A (280)
CX1-600360-050-T3	5.0 (17060)	600	✓			✓	✓	14	4.8	15	71.8 (1823)	T3 (200)
CX1-600360-076-T2A	7.6 (25932)	600	✓			✓	✓	14	7.3	15	59.5 (1511)	T2A (280)
CX1-600360-100-T2A	10.0 (34121)	600	✓			✓	✓	14	9.6	15	71.8 (1823)	T2A (280)

Notes

* Or equivalent breaker as per local electrical inspection authority requirements.

** For 3.6 kW heaters rated T3 cabinet length is 49.5" (1256 mm), 3.6 kW heaters rated T2A cabinet length is 31.3" (796 mm).

*** Ensure supply wire size adheres to applicable local and national electrical codes.


+ Available in 50 Hz only

• Available for IIB only.

1. Heater is functioning normally if, at rated voltage, the current draw is within 10% of the value in this table.
2. Operation at lower voltages that rated will result in reduced output and current draw.
3. Actual Output (kW) = [(Supply Voltage)² ÷ (Rated Voltage)²] × Rated Unit Wattage (kW)
4. Add suffix "T" for optional built-in thermostat. Thermostat not available on IIB+H2 models.

5. Add suffix "H" for high-temperature ambient storage option. High temperature storage option is not available with thermostat option. Not available on IIB models.
6. For IIB model with Defender® built-in thermostat - Class I, Div. 1 & 2, Groups C & D; Zones 1 & 2, Groups IIA and IIB.
7. For IIC model with XT built-in thermostat - Class I, Div. 1 & 2, Groups A,B,C & D; Zones 1 & 2, Groups IIA, IIB, IIC.
8. IIC Grouping units come with **x-Max**® housing.
9. Remote mounted, Defender®, explosion-proof room thermostats are not suitable for Group B & IIC applications.
10. Remote contactors are required on all 600 V heaters, and heaters with a current draw greater than 22 amps (supplied & installed by others), when utilizing XT-311 remote thermostat.
11. Temperature code ratings: T2A - 280°C (536°F), T3 - 200°C (392°F)

General Specifications

- Approvals 
- Hazardous Location Classifications

Without Built-in Thermostat: Defender® housing Class I, Div. 1 & 2, Groups B, C, & D; Zones 1 & 2, Groups IIA, IIB + H₂, **x-Max**® housing Class I, Div. 1 & 2, Groups A, B, C, & D; Zones 1 & 2, Groups IIA, IIB, & IIC

With Built-in Thermostat: XCT Defender® thermostat: Class I, Div. 1 & 2, Groups C & D; Zones 1 & 2, Groups IIA & IIB
XT thermostat: Class I, Div. 1 & 2, Groups A, B, C, & D; Zones 1 & 2, Groups IIA, IIB, & IIC
- Enclosures

Defender® housing is cast aluminum with bolt on cover. Groups IIB

x-Max® housing is extruded aluminum with two screwed on covers. The **x-Max**® housing offers IP55 moisture ingress protection. Groups IIC. For dry indoor use only. Do not immerse in water. Do not store in areas exposed to rain or snow.
- Mounting Brackets

Two 14-gauge (0.075" / 12 mm) galvanized steel brackets for standard cabinet.
Stainless-steel brackets provided with optional stainless-steel cabinet
- Heating Elements

Two Incoloy® 840 sheathed elements
- Temperature Code Rating

T2A - 536°F (280°C) or T3 - 392°F (200°C)
- Temperature Limitations

Operational: -49°F to 104°F (-45°C to 40°C)

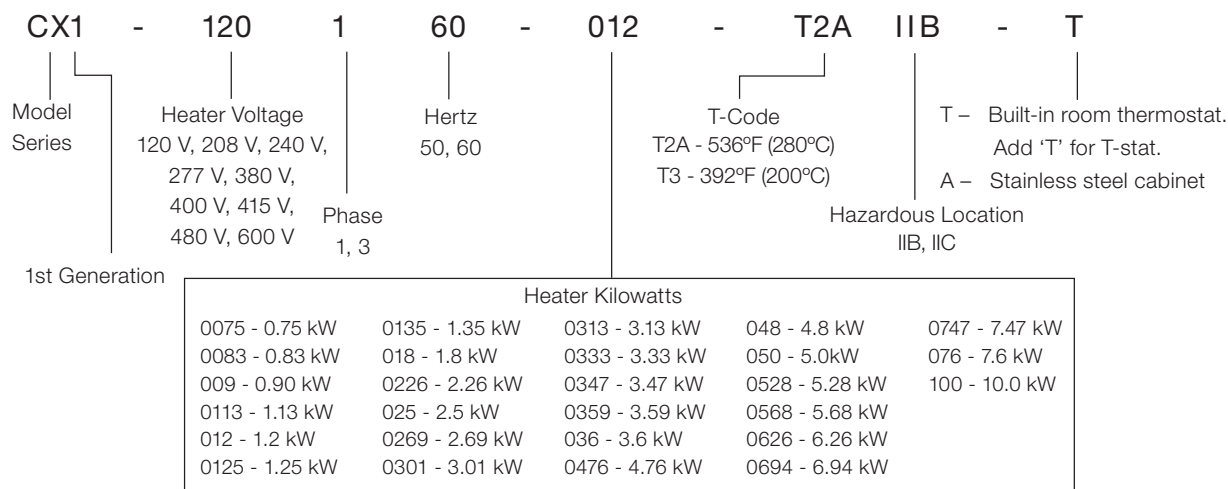
Storage: -49°F to 176°F (-45°C to 80°C). Optional up to 300°F (149°C) available
- Cabinet Materials

14-gauge (0.075" / 1.90 mm) epoxy coated steel with galvanized rear panel.
Optional: 14-gauge 304 stainless-steel cabinet and mounting hardware available

Table 15 – Cabinet Length, Net Weight, and Shipping Weight

		Nominal kW			
		0.75 – 2.69 & 3.6 (T2A)	3.01 – 3.59, 3.6 (T3) & 4.8	4.76, 5.28 – 7.6	3.13, 3.47, 3.74, 5.0, 6.26, 6.94, 7.47, 10.0
Cabinet Length	in	31.3	49.4	59.5	71.8
	mm	796	1256	1511	1823
Net Weight	lbs	55.3	80.7	92.8	117.0
	kg	25.1	36.6	42.1	53.2
Shipping Weight	lbs	65	95	105	122
	kg	30	44	48	55.5

Model Coding



Reminder: This nomenclature illustration is intended primarily to explain how a product part number is defined. Not all voltage and/or wattage combinations are available - please consult the Performance Data chart(s) for product availability.



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CF1 Series ProVector® Explosion-Proof Heaters

The Ruffneck™ CF1 Series ProVector® explosion-proof convection heater offers the most reliable, dependable and trouble-free service available for heating hazardous locations such as those in the oil and gas well industry.

Features

- Sloped-top cabinet
- No exposed copper or brass
- High-velocity airflow
- 14-gauge steel cabinet, available with stainless steel construction
- One of the shortest cabinet lengths available
- Optional built-in thermostat
- Incoloy® 840 heating elements
- Radial-embossed aluminum plate fins
- Galvanized steel mounting brackets
- Approvals for Groups IIA, IIB & IIC

Benefits

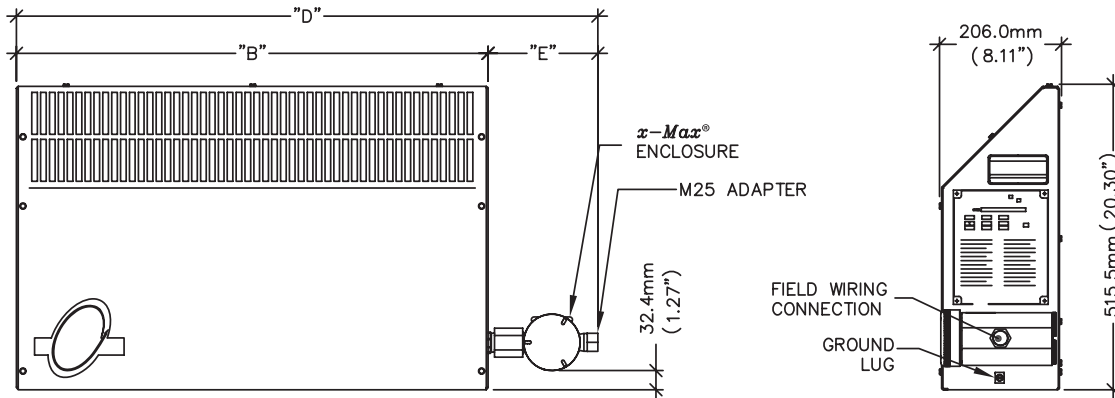
- Prevents objects from being set on top which restricts airflow
- Corrosion resistant, suitable for H₂S environments
- Heats up area faster with better heat distribution
- Rugged reliability and unsurpassed corrosion resistance available with stainless steel construction
- Smaller profile utilizes less wall and floor space
- Reduced field installation costs
- Longer life expectancy
- Reduced fin warping for better heat transfer capabilities
- Quick installation
- Industry first approvals for built-in thermostat with IIA, IIB, IIC ratings



Explosion-Proof Heaters – CF1 Series ProVector®

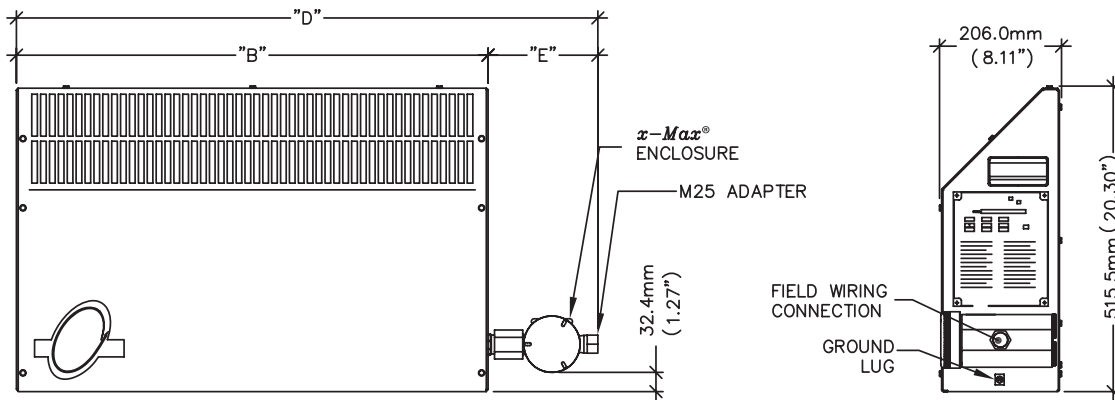
Physical Dimensions

CF1 ProVector® Physical Dimensions with *x-Max*® Housing



Heater kW Rating	'D' Dimension		'B' Dimension	'E' Dimension	
	w/o Extension	w/ Extension		w/o Extension	w/ Extension
0.75 to 3.00 (220 V) & 3.30 (T2) to 3.60 (T2)	984 mm (38.7")	1037 mm (40.8")	796 mm (31.34")	188 mm (7.4")	241 mm (9.5")
3.00 to 4.40 & 4.80 (240 V)	1444 mm (56.9")	1497 mm (58.9")	1256.0 mm (49.45")		
4.80 (380 V) to 7.60	1699 mm (66.9")	1752 mm (69.0")	1511.0 mm (59.49")		

CF1 ProVector® Physical Dimensions with Defender® Housing



Heater kW Rating	'D' Dimension		'B' Dimension	'E' Dimension	
	w/o Extension	w/ Extension		w/o Extension	w/ Extension
0.75 to 3.00 (220 V) & 3.30 (T2) to 3.60 (T2)	973 mm (38.3")	1026 mm (40.4")	796 mm (31.34")	177 mm (7.0")	230 mm (9.1")
3.00 to 4.40 & 4.80 (240 V)	1433 mm (56.4")	1486 mm (58.5")	1256.0 mm (49.45")		
4.80 (380 V) to 7.60	1688 mm (66.5")	1741 mm (68.5")	1511.0 mm (59.49")		

Note: Heaters with built-in thermostat come with tube extensions.

Table 16 – Performance Data for CF1 ProVector®

Model Number	kW (Btu/hr)	Unit Voltage	Basic Unit	Gas Group				Supply Wire Size ***	Unit Current Fuse*	Max. Circuit Fuse	Cabinet Length	Temperature Code
				IIB		IIC						
		V		w/o T'stat	w/ T'stat	w/o T'stat	w/ T'stat	AWG	A	A	mm (in)	
CF1-220150-010-T4	1.0 (3412)	220	✓	✓	✓	✓	✓	12	4.6	15	796 (31.3)	T4
CF1-220150-015-T3	1.5 (5118)	220		✓	✓	✓	✓	12	6.9	15	796 (31.3)	T3
CF1-220150-030-T2	3.0 (10236)	220		✓	✓	–	–	12	13.8	15	796 (31.3)	T2
CF1-220150-040-T3	4.0 (13648)	220		✓	✓	–	–	10	18.3	20	1256 (49.4)	T3
CF1-220150-064-T2**	6.4 (21837)	220		✓	–	–	–	8	29	30	1511 (59.5)	T2
CF1-230150-011-T4	1.1 (3753)	230		✓	✓	✓	✓	12	4.8	15	796 (31.3)	T4
CF1-230150-017-T3	1.7 (5801)	230		✓	✓	✓	✓	12	7.2	15	796 (31.3)	T3
CF1-230150-030-T3	3.0 (10236)	230		✓	✓	✓	✓	12	13	15	1256 (49.4)	T3
CF1-230150-033-T2	3.3 (11260)	230		✓	✓	–	–	10	14.4	15	796 (31.3)	T2
CF1-230150-044-T2	4.4 (15013)	230		✓	✓	–	–	10	19.2	20	1256 (49.4)	T2
CF1-230150-070-T2**	7.0 (23885)	230		✓	–	–	–	8	30.3	35	1511 (59.5)	T2
CF1-240150-012-T4	1.2 (4095)	240		✓	✓	✓	✓	12	5	15	796 (31.3)	T4
CF1-240150-018-T3	1.8 (6142)	240		✓	✓	✓	✓	12	7.5	15	796 (31.3)	T3
CF1-240150-030-T3	3.0 (10236)	240		✓	✓	✓	✓	12	12.5	15	1256 (49.4)	T3
CF1-240150-036-T2	3.6 (12284)	240		✓	✓	–	–	10	15	20	796 (31.3)	T2
CF1-240150-048-T2	4.8 (16378)	240		✓	✓	–	–	10	20	25	1256 (49.4)	T2
CF1-240150-076-T2**	7.6 (25932)	240		✓	–	–	–	8	31.7	35	1511 (59.5)	T2
CF1-254150-030-T3	3.0 (10236)	254		✓	✓	✓	✓	12	11.8	15	1256 (49.4)	T3
CF1-380150-0075-T4	0.75 (2559)	380		✓	✓	✓	✓	12	2	15	796 (31.3)	T4
CF1-380150-011-T4	1.1 (3753)	380		✓	✓	✓	✓	12	3	15	796 (31.3)	T4
CF1-380150-023-T3	2.3 (7848)	380		✓	✓	–	–	12	5.9	15	796 (31.3)	T3
CF1-380150-030-T3	3.0 (10236)	380		✓	✓	✓	✓	12	7.9	15	1256 (49.4)	T3
CF1-380150-036-T3	3.6 (12284)	380		–	–	✓	✓	12	9.4	15	1256 (49.4)	T3
CF1-380150-048-T2	4.8 (16378)	380		✓	✓	–	–	12	12.5	15	1511 (59.5)	T2
CF1-400150-0083-T4	0.83 (2832)	400		✓	✓	✓	✓	12	2.1	15	796 (31.3)	T4
CF1-400150-013-T4	1.3 (4436)	400		✓	✓	✓	✓	12	3.1	15	796 (31.3)	T4
CF1-400150-025-T3	2.5 (8530)	400		✓	✓	–	–	12	6.3	15	796 (31.3)	T3
CF1-400150-033-T3	3.3 (11260)	400		✓	✓	✓	✓	12	8.3	15	1256 (49.4)	T3
CF1-400150-036-T3	3.6 (12284)	400		–	–	✓	✓	12	9	15	1256 (49.4)	T3
CF1-400150-053-T2	5.3 (18084)	400		✓	✓	–	–	12	13.2	15	1511 (59.5)	T2
CF1-415150-009-T4	0.90 (3071)	415	✓	✓	✓	✓	12	2.2	15	796 (31.3)	T4	
CF1-415150-014-T4	1.4 (4777)	415	✓	✓	✓	✓	12	3.2	15	796 (31.3)	T4	
CF1-415150-027-T2	2.7 (9213)	415	✓	✓	–	–	12	6.5	15	796 (31.3)	T2	
CF1-415150-036-T3	3.6 (12284)	415	✓	✓	✓	✓	12	8.7	15	1256 (49.4)	T3	
CF1-415150-057-T2	5.7 (19449)	415	✓	✓	–	–	12	13.7	15	1511 (59.5)	T2	

All units are single phase.

Units can be operated at 50 or 60 Hz.

* Or equivalent breaker as per local electrical inspection authority requirements.

** Optional thermostats not available as it exceeds current rated capacity.

*** Ensure supply wire size adheres to applicable local and national electrical codes.

Note:

1. Heater is functioning normally if, at rated voltage, the current draw is within 10% of the value in this table.
2. Operation at lower voltages that rated will result in reduced output and current draw. Actual Output (kW) = [(Supply Voltage)² ÷ (Rated Voltage)²] × Rated Unit Wattage (kW).
3. Add suffix "T" for optional built-in thermostat.
4. Add suffix "H" for high-temperature ambient storage option. High temperature storage option is not available with thermostat option. Not available on IIB models.
5. For IIB model with XCT built-in thermostat - Zones 1 & 2, Groups IIA and IIB.
6. For IIC model with XTWA built-in thermostat - Zones 1 & 2, Groups IIA, IIB, IIC.
7. IIC Grouping units come with **x-Max®** housing.
8. Remote mounted, Defender, explosion-proof room thermostats are not suitable for IIC applications.
9. Temperature code ratings: T2 - 300°C (572°F), T3 - 200°C (392°F), T4 - 135°C (275°F).

General Specifications

1. Approvals



2. Hazardous Location Classifications

Without built-in thermostat:
 Defender® housing; Zones 1 & 2, Groups IIA, IIB
x-Max® housing; Zones 1 & 2, Groups IIA, IIB, & IIC

With built-in thermostat:
 XCT Defender® thermostat: Zones 1 & 2, Groups IIA & IIB
 XT thermostat: Zones 1 & 2, Groups IIA, IIB, & IIC

3. Enclosures

Cast or extruded aluminum supplied with either a bolt-on cover or two screwed-on covers. Suitable for either a Defender® or **x-Max**® thermostat.

4. Mounting Brackets

Two 14-gauge (2 mm / 0.075") galvanized steel brackets for standard cabinet. Stainless-steel brackets provided with optional stainless-steel cabinet.

5. Heating Elements

Two Incoloy® 840 sheathed elements.

6. Temperature Code Rating

Temperature Code T2 - 300°C (572°F), T3 - 200°C (392°F) or T4 - 135°C (275°F)

7. Temperature Limitations

Operational: -45°C to 40°C (-49°F to 104°F)
 Storage: -45°C to 80°C (-49°F to 176°F).
 Optional up to 149°C (300°F) available.

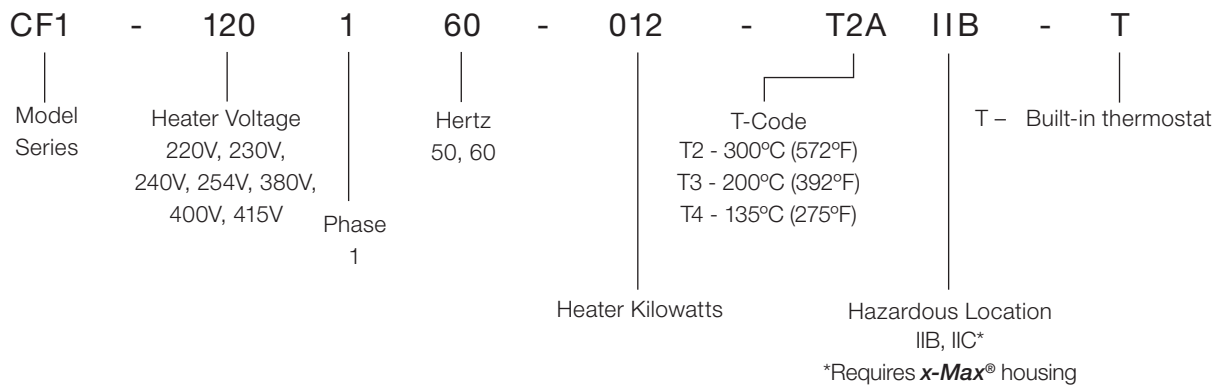
8. Cabinet Material

14-gauge (2 mm / 0.075") epoxy coated steel with galvanized rear panel. Optional 14-gauge 304 stainless-steel cabinet and mounting hardware available

Table 17 – Cabinet Length, Net Weight, & Shipping Weight

		Nominal kW		
		0.75 to 3.00 (220 V) & 3.30 (T2), 3.60 (T2)	3.00 to 4.40 & 4.80 (240 V)	4.80 (380 V) to 7.60
Cabinet Length	in	31.3	49.4	59.5
	mm	796	1256	1511
Net Weight	lbs	58	86	96
	kg	27	39	43.6
Shipping Weight	lbs	65	95	105
	kg	30	44	48

Model Coding



Note:

This nomenclature illustration is intended primarily to explain how a product part number is defined. Not all voltage and/or wattage combinations are available - please consult the catalogue chart(s) for product availability.



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CR1 Series Triton™ Corrosion-Resistant Washdown Heaters

Ruffneck™ CR1 Triton™ Series is a new generation of NEMA 4X corrosion-resistant washdown heaters. The first UL listed Type 4X heater with models ranging from 3 kW to 39 kW.

IMPORTANT: Ruffneck™ CR1 heaters are suitable for non-hazardous locations only. For washdown applications use water pressure less than 70 psi.

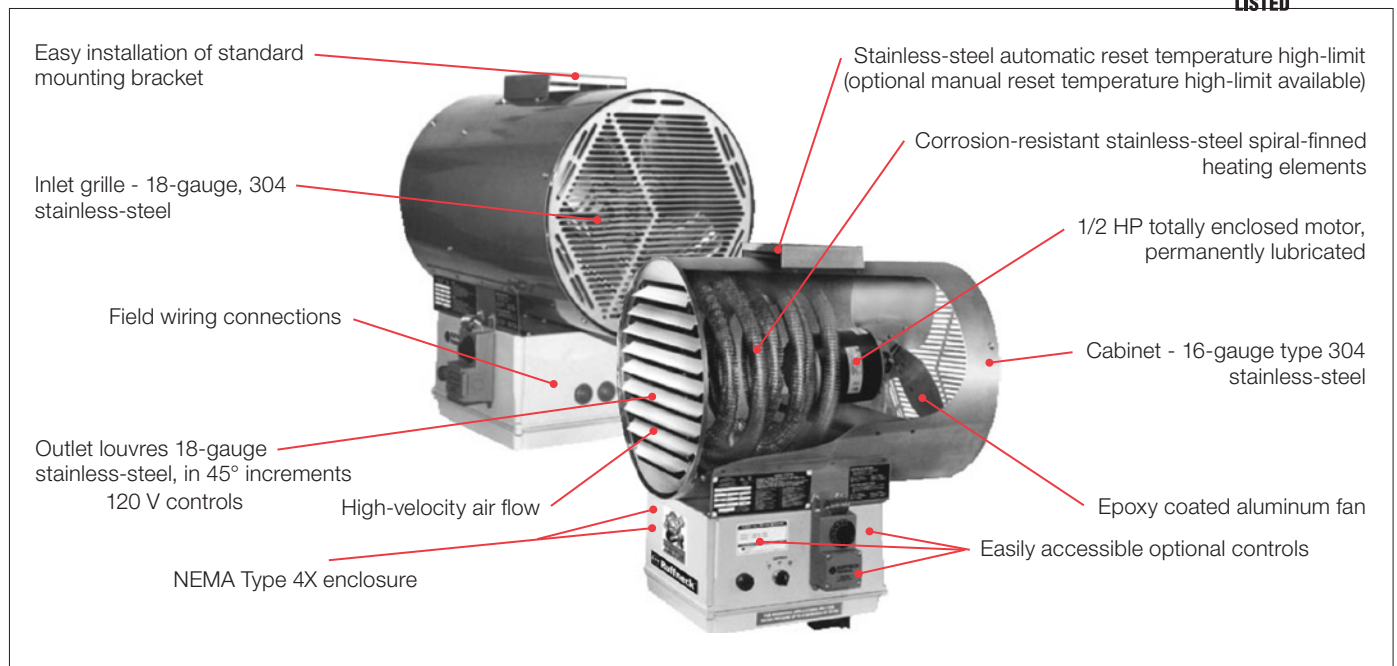


Figure 6

Features

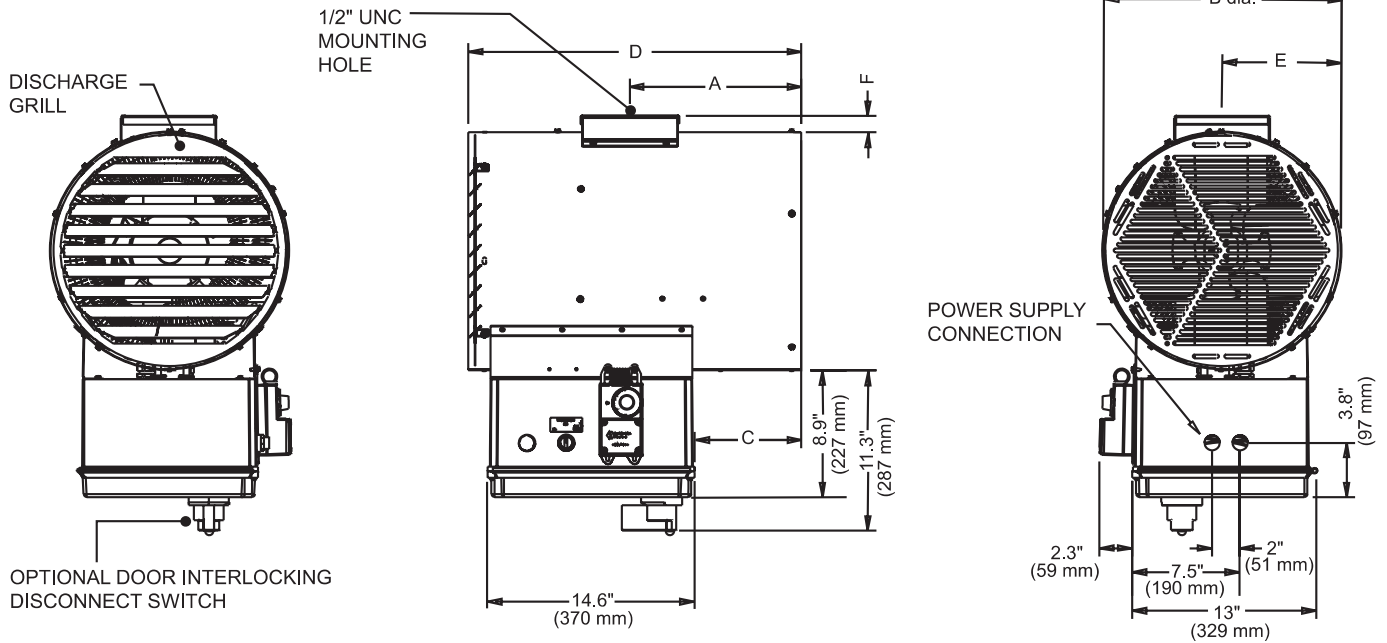
- Entire heater is NEMA Type 4X
- Epoxy coated fan blade
- 16-gauge stainless-steel cabinet
- Custom configured stainless-steel elements
- Optional built-in accessories
- Stainless-steel wall/ceiling mounting kit
- 120 V controls
- Stainless-steel temperature high-limit

Benefits

- Increased safety and protection against water penetration
- Added corrosion protection
- Better resistance to corrosion for longer life
- Improved heat distribution and corrosion protection
- Flexibility and reduced field installation costs
- Flexible options for mounting heater
- Better contactor pull-in reliability
- Increased safety and reliability

Physical Dimensions

CR1 Triton™ Physical Dimensions



Heater kW Rating	Dimensions					
	A	B	C	D	E	F
3 to 10 kW	12.5" (318 mm)	12.8" (325 mm)	8.5" (216 mm)	24.4" (620 mm)	6.4" (162.5 mm)	0.9" (23 mm)
15 and 20 kW	12.1" (307 mm)	16.7" (425 mm)	7.5" (190 mm)	23.4" (595 mm)	8.4" (212.5 mm)	1.2" (30 mm)
25 to 39 kW	12.1" (307 mm)	20.7" (526 mm)	7.5" (190 mm)	23.4" (595 mm)	10.3" (262.5 mm)	1.3" (33 mm)

CR1 Triton™ Mounting Options

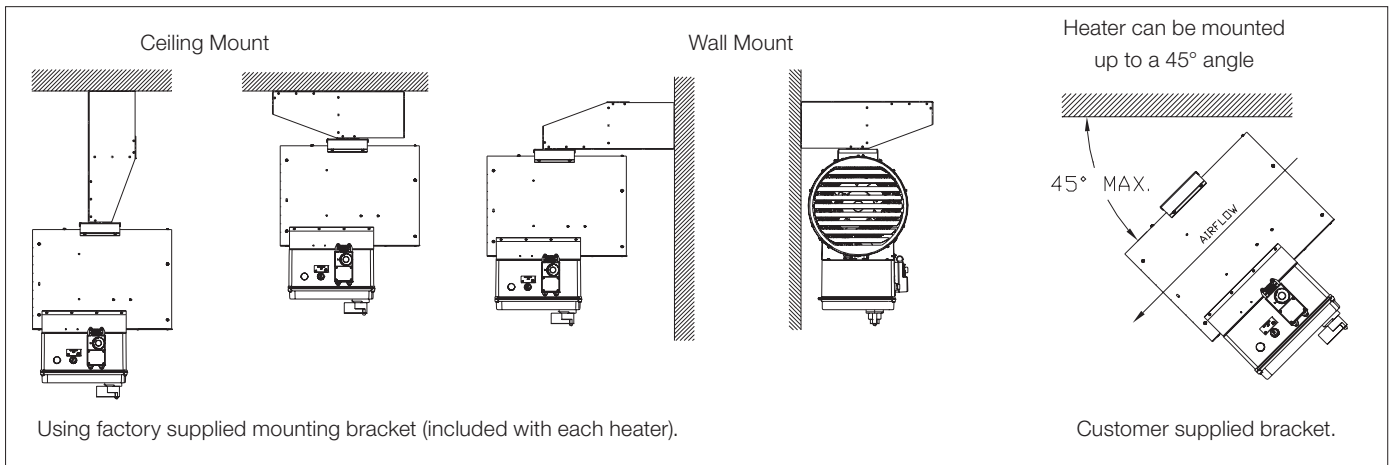


Figure 7 – Mounting options

Table 19 – CR1 Triton™ 60 Hertz Technical Data

Model	Nominal Power	Unit Voltage	Phase	Unit Current	Air Temperature Rise		Btu/hr
	kW			A	°F	°C	
CR1-208160-030	3	208	1	17.4	13.5	7.5	10250
CR1-240160-030	3	240	1	15.5	13.5	7.5	10250
CR1-208360-030	3	208	3	11.3	13.5	7.5	10250
CR1-240360-030	3	240	3	10.2	13.5	7.5	10250
CR1-480360-030	3	480	3	5.1	13.5	7.5	10250
CR1-600360-030	3	600	3	3.9	13.5	7.5	10250
CR1-208160-050	5	208	1	27	22.5	12.5	17050
CR1-240160-050	5	240	1	23.8	22.5	12.5	17050
CR1-208360-050	5	208	3	16.9	22.5	12.5	17050
CR1-240360-050	5	240	3	15	22.5	12.5	17050
CR1-480360-050	5	480	3	7.5	22.5	12.5	17050
CR1-600360-050	5	600	3	5.8	22.5	12.5	17050
CR1-208160-075	7.5	208	1	39.1	33.8	18.8	25600
CR1-240160-075	7.5	240	1	34.3	33.8	18.8	25600
CR1-208360-075	7.5	208	3	23.8	33.8	18.8	25600
CR1-240360-075	7.5	240	3	21	33.8	18.8	25600
CR1-480360-075	7.5	480	3	10.5	33.8	18.8	25600
CR1-600360-075	7.5	600	3	8.2	33.8	18.8	25600
CR1-240160-100	10	240	1	44.7	45	25	34100
CR1-208360-100	10	208	3	30.8	45	25	34100
CR1-240360-100	10	240	3	27.1	45	25	34100
CR1-480360-100	10	480	3	13.5	45	25	34100
CR1-600360-100	10	600	3	10.8	45	25	34100
CR1-208360-150	15	208	3	44.6	32.6	18.1	51200
CR1-240360-150	15	240	3	39.1	32.6	18.1	51200
CR1-480360-150	15	480	3	19.5	32.6	18.1	51200
CR1-600360-150	15	600	3	15.4	32.6	18.1	51200
CR1-480360-200	20	480	3	25.6	43.6	24.2	68250
CR1-600360-200	20	600	3	20.3	43.6	24.2	68250
CR1-480360-250	25	480	3	31.6	37.5	20.9	85300
CR1-600360-250	25	600	3	25.1	37.5	20.9	85300
CR1-480360-300	30	480	3	37.6	45.1	25	102350
CR1-600360-300	30	600	3	29.9	45.1	25	102350
CR1-480360-350	35	480	3	43.6	52.6	29.2	119400
CR1-600360-350	35	600	3	34.7	52.6	29.2	119400
CR1-480360-390	39	480	3	48	58.6	32.5	133100
CR1-600360-390	39	600	3	38.5	58.6	32.5	133100

Note:

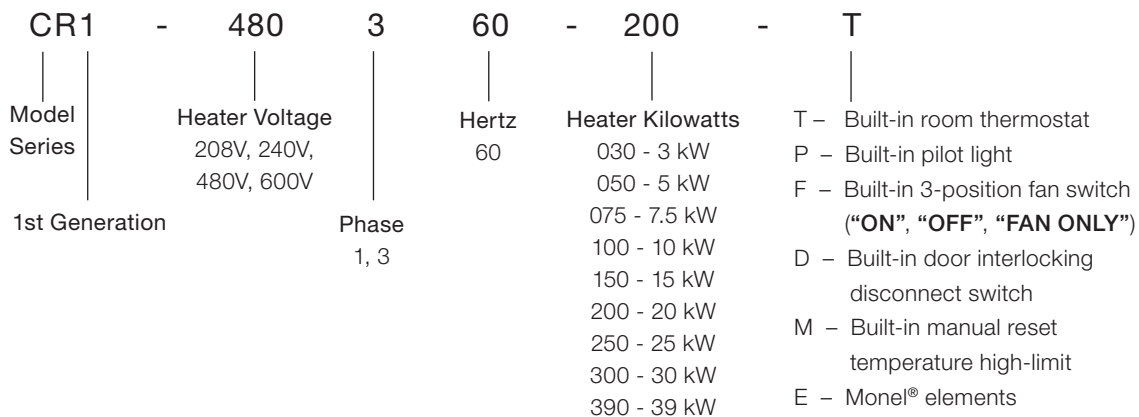
1. To order a heater with a built-in room thermostat add a "T" suffix to model number.
2. To order a heater with a built-in pilot light add a "P" suffix to model number.
3. To order a heater with a built-in 3-position fan switch (on, off, fan only) add an "F" to model number.
4. To order a heater with a built-in door interlocking disconnect switch add a "D" suffix to model number.
5. To order a heater with a built-in manual reset temperature high-limit add an "M" suffix to model number. Also included is a built-in door interlocking disconnect switch to meet UL requirements. This option replaces the automatic reset temperature high-limit.

Note: To order a heater that meets U.S. Coast Guard regulations, order built-in control option #5 above.

Table 20 – Specifications

		Nominal kW			
		3, 5, 7.5, 10	15, 20	25, 30, 35, 39	
Air Delivery (min.)	CFM	700	1450	2100	
	m ³ /hr	1190	2465	3570	
Approx Air Velocity	ft/min	785	950	900	
	m/s	4.0	4.8	4.6	
Horizontal Air Throw	ft	22	35	44	
	m	6.7	10.7	13.4	
Max. Mounting Height	Horizontal (to underside)	ft	8.5	11.5	12.3
		m	2.6	3.5	3.7
	45° Decline (to underside)	ft	12.8	18.0	18.8
		m	3.9	5.5	5.7
Min. Mounting Height	ft	6.0			
	m	1.8			
Fan Diameter	in	12	16	20	
	mm	305	406	508	
Net Weight	lbs	75.0	90.0	130	
	kg	34.1	40.9	59.1	
Shipping Weight	lbs	125.0	140.0	180	
	kg	56.8	63.6	81.8	

Model Coding



Note: This nomenclature illustration is intended primarily to explain how a product part number is defined. Not all voltage and/or wattage combinations are available - please consult the catalogue chart(s) for product availability.

General Specifications

- 1. Approvals** UL listed to U.S. & Canadian safety standards. Type 4X
Complies with U.S. Coast Guard electrical engineering regulations subchapter J (46 CFR Parts 110-113) when manual reset temperature high-limit is ordered
- 2. Enclosure** NEMA Type 4X non-metallic enclosure
- 3. Motor Type** Thermally protected, ½ HP, 1725 RPM, permanently lubricated ball bearings.
- 4. Fan** Epoxy coated, aluminum blade, steel spider
- 5. Mounting Bracket** Type 304 stainless-steel universal mounting bracket
Minimum 16-gauge (0.06" / 1.52 mm)
- 6. Heating Elements** Type 321 stainless-steel sheath with Type 304 stainless-steel spiral fins
- 7. Temperature High-Limit** Automatic reset, stainless-steel bulb and capillary.
Optional manual reset, stainless-steel bulb and capillary. Replaces automatic reset.
- 8. Temperature Limitations** Storage: -4°F to 140°F (-20°C to 60°C)
Operating: -4°F to 104°F (-20°C to 40°C)
- 9. Control Circuit** 120 Vac
- 10. Optional Built-in Thermostat** NEMA Type 4X thermostat
- 11. Control Transformer** Multi-tap primary, 120 V secondary, 50 VA
- 12. Contactor** 40 or 75 amp. Rated for 500,000 mechanical operations. 120 V, 15 VA coil
- 13. Cabinet Material** Type 304 stainless-steel, 16-gauge (0.06" / 1.52 mm)
All external fasteners are stainless-steel
- 14. Inlet Grille** Type 304 stainless-steel, ¼" (6.3 mm) maximum openings
Minimum 18-gauge (0.05" / 1.21 mm)
- 15. Discharge Grille** Type 304 stainless-steel. Rotatable in 45° increments
Minimum 18-gauge (0.05" / 1.21 mm)

CRE1 Triton™ Series Corrosion-Resistant Washdown Heaters

Ruffneck™ CRE1 Triton Series is a new generation of IP55 corrosion-resistant washdown heaters. The first UL listed and European compliant heater with models ranging from 2.5 kW to 40 kW.

IMPORTANT: Ruffneck™ CRE1 heaters are suitable for non-hazardous locations only. For washdown applications use water pressure less than 482 kPa only.

CE
IP66

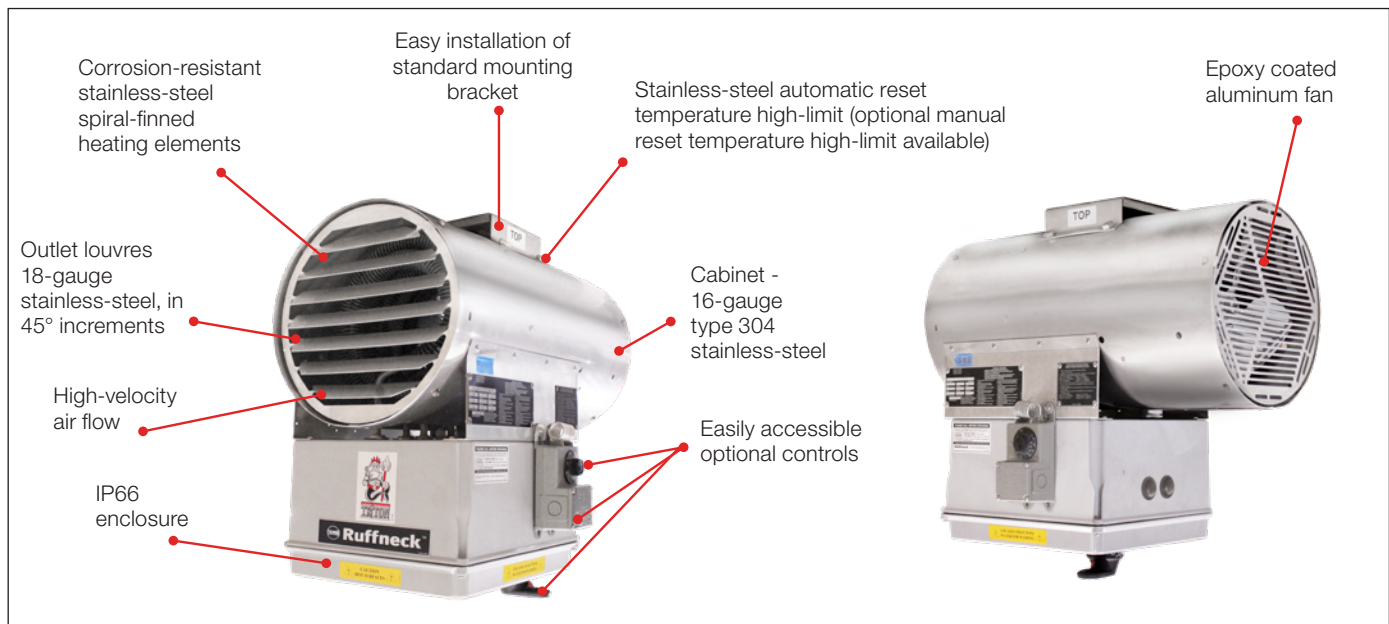


Figure 8

Features

- Entire heater is IP66
- Epoxy coated fan blade
- 16-gauge stainless-steel cabinet
- Custom configured stainless-steel elements
- Optional built-in accessories
- Stainless-steel wall/ceiling mounting kit
- 120 V controls
- Stainless-steel temperature high-limit

Benefits

- Increased safety and protection against water penetration
- Added corrosion protection
- Better resistance to corrosion for longer life
- Improved heat distribution and corrosion protection
- Flexibility and reduced field installation costs
- Flexible options for mounting heater
- Better contactor pull-in reliability
- Increased safety and reliability

Physical Dimensions

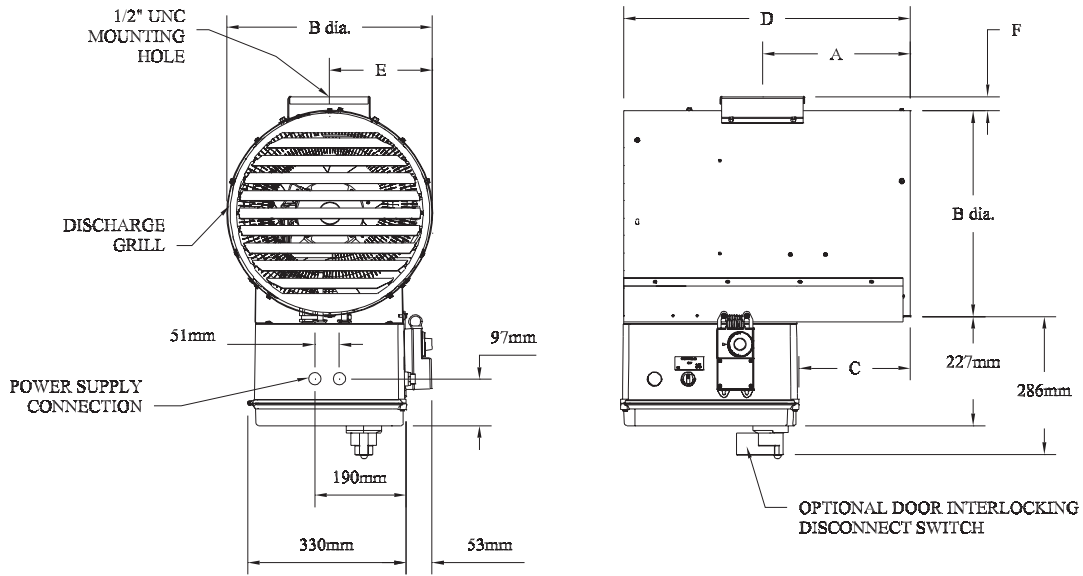


Table 21 – Heating Capacities and Physical Dimensions

Heating Capacity	Dimensions					
	A	B	C	D	E	F
	in (mm)	in (mm)	in (mm)	in (mm)	in (mm)	in (mm)
up to 10 kW	12.5" (318 mm)	12.8" (325 mm)	8.5" (216 mm)	24.4" (620 mm)	6.4" (162.5 mm)	1" (23 mm)
15 and 20 kW	12.1" (307 mm)	16.7" (425 mm)	7.5" (190 mm)	23.4" (595 mm)	8.4" (212.5 mm)	1.1" (30 mm)
25 to 40 kW	12.1" (307 mm)	20.7" (526 mm)	7.5" (190 mm)	23.4" (595 mm)	10.3" (262.5 mm)	1.3" (33 mm)

Table 22 – Specifications

Heating Capacity	Air Delivery	Air Velocity	Horizontal Throw	Net Weight
	m ³ /hr	m/s	m	kg
up to 10 kW	1190	4.0	6.7	34
15 and 20 kW	2465	4.8	10.7	41
25 to 40 kW	3570	4.6	13.4	59

CRE1 Triton™ Mounting Options

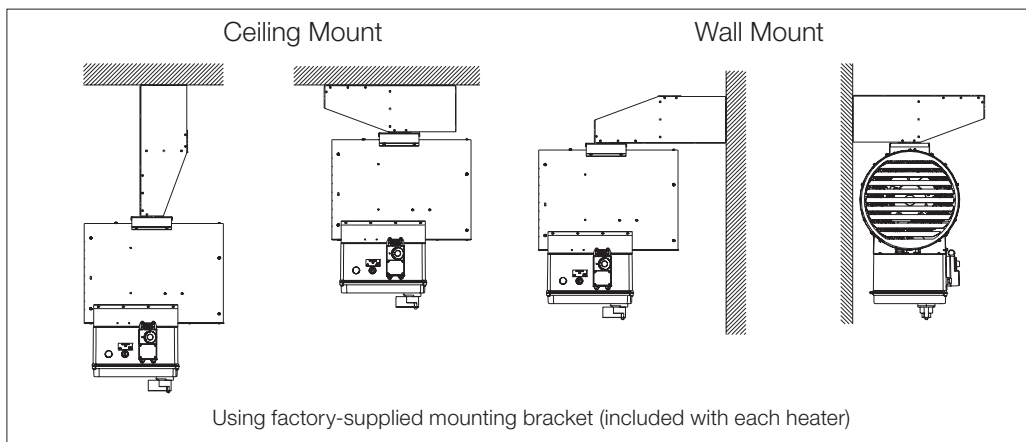


Figure 9

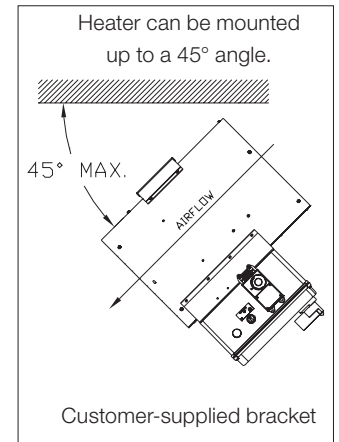


Figure 10

Table 23 – Performance Data for CR1 Triton™

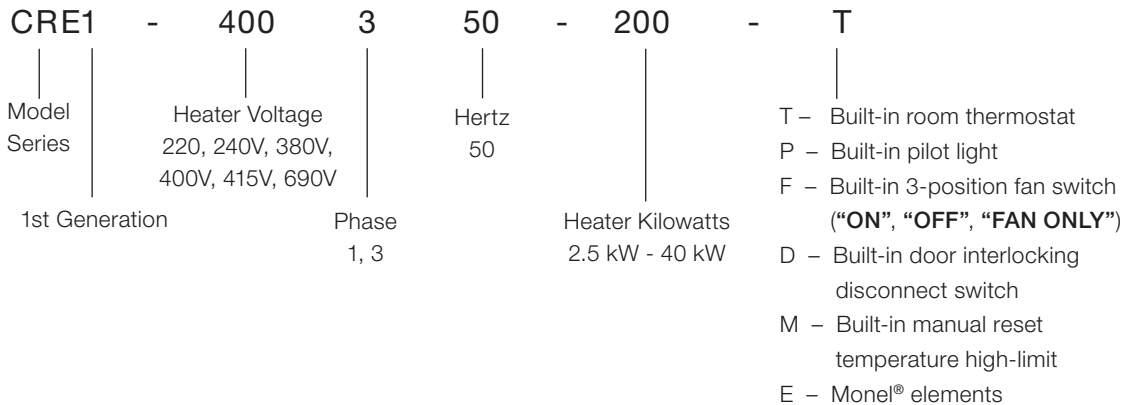
Model	Nominal Power	Unit Voltage	Phase	Unit Current	Cabinet Size
	kW	V		A	
CRE1-220150-025	2.52	220	1	13.6	12
CRE1-220150-042	4.20	220	1	21.2	12
CRE1-220150-063	6.30	220	1	30.7	12
CRE1-240150-030	3.00	240	1	14.6	12
CRE1-240150-050	5.00	240	1	22.9	12
CRE1-240150-075	7.50	240	1	33.4	12
CRE1-240150-100	10.00	240	1	43.8	12
CRE1-380350-025	2.52	380	3	5.0	12
CRE1-380350-042	4.21	380	3	7.6	12
CRE1-380350-063	6.31	380	3	10.8	12
CRE1-380350-094	8.41	380	3	14.0	12
CRE1-380350-126	12.62	380	3	20.4	16
CRE1-380350-168	16.82	380	3	26.8	16
CRE1-380350-210	21.03	380	3	33.2	20
CRE1-380350-252	25.23	380	3	39.5	20
CRE1-400350-028	2.79	400	3	5.2	12
CRE1-400350-047	4.65	400	3	7.9	12
CRE1-400350-070	6.97	400	3	11.3	12
CRE1-400350-093	9.29	400	3	14.6	12
CRE1-400350-139	13.94	400	3	21.3	16
CRE1-400350-186	18.58	400	3	28.0	16

Model	Nominal Power	Unit Voltage	Phase	Unit Current	Cabinet Size
	kW	V		A	
CRE1-400350-232	23.23	400	3	34.7	20
CRE1-400350-279	27.87	400	3	41.4	20
CRE1-415350-030	3.00	415	3	5.4	12
CRE1-415350-050	5.00	415	3	8.2	12
CRE1-415350-075	7.50	415	3	11.6	12
CRE1-415350-100	10.00	415	3	15.1	12
CRE1-415350-150	15.00	415	3	22.1	16
CRE1-415350-200	20.00	415	3	29.0	16
CRE1-415350-250	25.00	415	3	36.0	20
CRE1-415350-300	30.00	415	3	42.9	20
CRE1-690350-030	3.00	690	3	3.1	12
CRE1-690350-050	5.00	690	3	4.8	12
CRE1-690350-075	7.50	690	3	6.9	12
CRE1-690350100	10.00	690	3	9.0	12
CRE1-690350-150	15.0	690	3	13.2	16
CRE1-690350-200	20.00	690	3	17.3	16
CRE1-690350-250	25.00	690	3	21.5	20
CRE1-690350-300	30.00	690	3	25.7	20
CRE1-690350-350	35.00	690	3	29.9	20
CRE1-690350-400	40.00	690	3	34.1	20

Note:

1. To order a heater with a built-in room thermostat add a "T" suffix to model number.
2. To order a heater with a built-in pilot light add a "P" suffix to model number.
3. To order a heater with a built-in 3-position fan switch ("ON", "OFF", "FAN ONLY") add an "F" to model number.
4. To order a heater with a built-in door interlocking disconnect switch add a "D" suffix to model number.
5. To order a heater with a built-in manual reset temperature high-limit add an "M" suffix to model number. Also included is a built-in door interlocking disconnect switch to meet CE requirements. This option replaces the automatic reset temperature high-limit.

Model Coding



General Specifications

1. Approvals CE Mark complies with European standards EN60335-1 & EN60335-2-30.
2. Enclosures IP66 non-metallic enclosure.
3. Motor Type Thermally protected, ½ HP, 1725 RPM, permanently lubricated ball bearings.
4. Fan Epoxy coated, aluminum blade, steel spider.
5. Mounting Bracket Type 304 stainless-steel, minimum 0.05" (1.21 mm) thick. Universal mounting bracket.
6. Heating Elements Type 321 stainless-steel sheath with Type 304 stainless-steel spiral fins.
7. Temperature High-Limit Automatic reset, stainless-steel bulb and capillary. Optional manual reset, stainless-steel bulb and capillary. Replaces automatic reset.
8. Temperature Limitations Storage: -4°F to 140°F (-20°C to 60°C).
Operating: -4°F to 104°F (-20°C to 40°C)
9. Control Circuit 120 Vac
10. Optional Built-in Thermostat IP66 thermostat
11. Control Transformer Multi-tap primary, 120 V secondary, 50 VA
12. Contactor 40 or 75 amp. Rated for 500,000 mechanical operations. 120 V, 15 VA coil
13. Cabinet Material Type 304 stainless-steel, 16-gauge (0.06" / 1.52 mm). All external fasteners are stainless-steel
14. Inlet Grille Type 304 stainless-steel, 1/4" (6 mm) maximum openings. Minimum 18-gauge (0.05" / 1.21 mm)
15. Discharge Grille Type 304 stainless-steel. Rotatable in 45° increments. Minimum 18-gauge (0.05" / 1.21 mm)

Table 24 – Specifications

		Nominal kW		
		2.5 to 10	12.62 to 20	23.23 to 40
Air Delivery	m ³ /hr	1190	2465	3570
Approx. Air Velocity	m/s	4.0	4.8	4.6
Horizontal Throw	m	6.7	10.7	13.4
Max. Mounting Height	Horizontal (to underside)	2.6	3.5	3.7
	45° Decline (to underside)	3.9	5.5	5.7
Min. Mounting Height	m	1.8		
Fan Diameter	in	12	16	20
	mm	305	406	508
Net Weight	kg	34.1	40.9	59.1
Shipping Weight	kg	56.8	63.6	81.8

RGE Series Regular Duty Air Heaters

The Ruffneck™ RGE unit heater is designed by Thermon Heating Systems, Inc. for use in regular duty industrial and commercial space heating applications. This heater features Thermon Heating Systems's robust design which surpasses the standards of most competitive models.

Features

- cCSA-US approved for horizontal air flow
- 2 kW to 40 kW output
- 208 V to 600 V
- Field convertible from 1 to 3 phase
- Tubular heating elements
- Individually adjustable air flow louvres
- Permanently lubricated motors
- Overheat protection
- 18-gauge steel cabinet
- Epoxy painted (ASA 61 Grey)
- Optional thermostats and controls
- Optional wall bracket
- Motors mounted outside element bundle
- Ceiling mounting bracket supplied standard

Applications

- Factories
- Warehouses
- Parking garages
- Boiler rooms
- Arenas
- Grandstands
- Mechanical rooms
- Shopping malls
- Display areas
- Stores

Motors

- 2 kW to 10 kW heaters are standard with dual rated motors: 208/240 V single phase. Where necessary, transformers are used to provide proper motor voltage.
- 15 kW to 40 kW heaters are standard with single phase full voltage rated motors.
- Standard motors have permanently lubricated bearings and built-in thermal overloads.
- Totally enclosed ball bearing motors are standard.
- Motor RPM: 1550 unless otherwise stated.
- Motor HP:
- 2 kW to 10 kW (1/20 HP) / 15 kW to 40 kW (1/10 HP)
- Other ratings available (check with the factory)

In Canada these units are marketed under the Caloritech™ brand name.



Contactors and Transformers

- Factory installed contactors are available when required.
- Transformers are standard when primary voltage is not suitable for motor operation or contactor coil ratings.
- Standard control voltage is 240 V.

Accessories for Field Installation

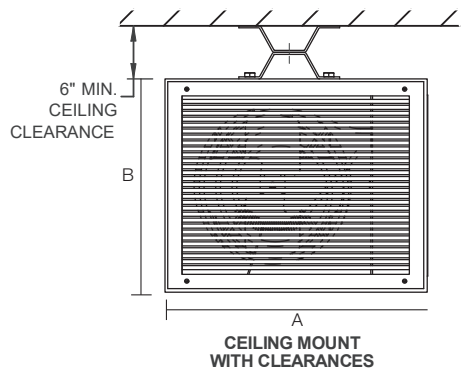
- FAT 8 field installed built-in thermostat kit 41°F to 100°F (5°C to 38°C)
- RWB210 wall mount bracket (2 kW to 10 kW)
- RWB1540 wall mount bracket (15 kW to 40 kW)
- Remote thermostats available

Optional Factory Installed Features

- Built-in thermostat 41°F to 100°F (5°C to 38°C)
- Fused control circuit
- Manual reset high limit
- **"FAN ONLY"** switch
- Low voltage relay for remote 24 V thermostat
- Epoxy painted fan blade and motor
- Special wattages and voltages
- Special control voltages (240 V is standard)
- Available in special finishes

HOLE

T
WALL MOUNT
BRACKET HOLE
PATTERN



A A
FRONT VIEW

REAR VIEW

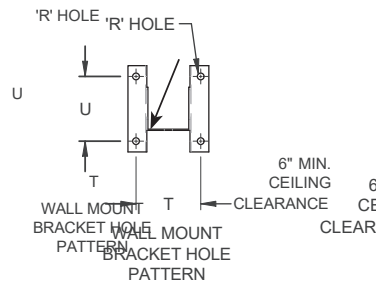
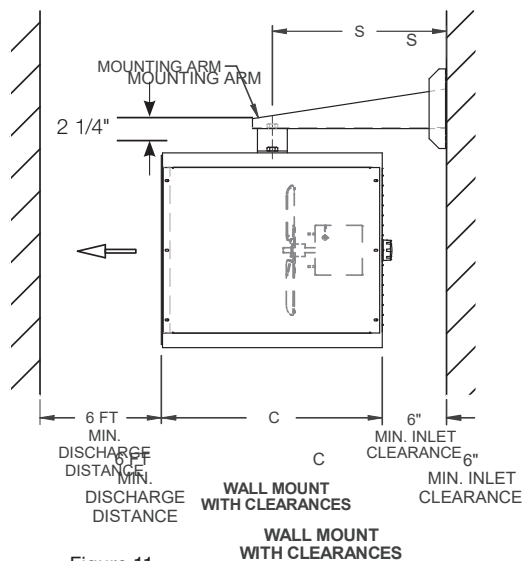


Figure 11

Table 25 – RGE Physical Dimensions - in (mm)

Heater Rating	'A'		'B'		'C' Depth		'D' Hole Dia.		'S'		'T'		'U'	
	in	mm	in	mm	in	mm	in	mm	in	mm	in	mm	in	mm
2 to 10	17.000	432	14.000	356	15.500	394	0.500	13	12.500	318	4.500	114	4.500	114
15 to 40	24.000	610	19.500	495	22.000	559	0.62	16	17.500	445	6.000	152	6.000	152

Mounting Brackets

Units are supplied with ceiling mounting bracket as standard.

RWB210 - Wall Mounting Bracket for 2 kW to 10 kW heaters.

RWB1540 - Wall Mounting Bracket for 15 kW to 40 kW heaters.

Model Coding

Regular Duty Air Heaters – RGE Series

RGE	20	3	C	T	L	-	D
Model Series	Kilowatts	Voltage	Contactor (Optional)	Thermostat (Optional)	Energy Management Controller (Optional)		Other Options
	02 - 2 kW	2 - 208					B - Epoxy painted fan blade and motor
	03 - 3 kW	3 - 240					D - Disconnect switch
	04 - 4 kW	5 - 347					F - Fan only switch
	05 - 5 kW	6 - 416					K - Fused control circuit
	07 - 7.5 kW	7 - 480					M - Manual reset high limit
	10 - 10 kW	8 - 600					N - Low voltage relay (24 V)
	15 - 15 kW						V - 120V control voltage (240 V is standard)
	20 - 20 kW						
	25 - 25 kW						
	30 - 30 kW						
	40 - 40 kW						

Table 26 – Performance Data for RGE Regular Duty Air Heaters

kW (Btu/hr)	Volts	Phase	CFM	Temperature Rise °C (°F)	Motor Volts	Catalog Number			
						Basic Unit	Basic unit with		
							Contactora	Thermostat (1-phase only)	Contactora & Thermostat
2 (6824)	208	1 or 3	460	8 (14)	208 / 240	RGE022	RGE022C	RGE022T	RGE022CT
	240		460	8 (14)		RGE023	RGE023C	RGE023T	RGE023CT
3 (10236)	208		465	12 (21)		RGE032	RGE032C	RGE032T	RGE032CT
	240		465	12 (21)		RGE033	RGE033C	RGE033T	RGE033CT
	600		465	12 (21)		RGE038	RGE038C	RGE038T	RGE038CT
4 (13648)	208		475	16 (28)		RGE042	RGE042C	RGE042T	RGE042CT
	240		475	16 (28)		RGE043	RGE043C	RGE043T	RGE043CT
	480		475	16 (28)		RGE047	RGE047C	RGE047T	RGE047CT
	600		475	16 (28)		RGE048	RGE048C	RGE048T	RGE048CT
5 (17060)	208		480	22 (40)		RGE052	RGE052C	RGE052T	RGE052CT
	240		480	22 (40)		RGE053	RGE053C	RGE053T	RGE053CT
	480		480	22 (40)		RGE057	RGE057C	RGE057T	RGE057CT
	600		480	22 (40)		RGE058	RGE058C	RGE058T	RGE058CT
7.5 (25590)	208		590	24 (43)		RGE072	RGE072C	–	RGE072CT
	240		590	24 (43)		RGE073	RGE073C	–	RGE073CT
	480		590	24 (43)		RGE077	RGE077C	–	RGE077CT
	600	590	24 (43)	RGE078	RGE078C	–	RGE078CT		
10 (34120)	208	760	25 (45)	RGE102	RGE102C	–	RGE102CT		
	240	760	25 (45)	RGE103	RGE103C	–	RGE103CT		
	480	760	25 (45)	RGE107	RGE107C	–	RGE107CT		
	600	760	25 (45)	RGE108	RGE108C	–	RGE108CT		
15 (51180)	208	3	1040	28 (50)	208	RGE152	RGE152C	–	RGE152CT
	240	3	1040	28 (50)	240	RGE153	RGE153C	–	RGE153CT
	480	1 or 3	1040	28 (50)	480	RGE157	RGE157C	–	RGE157CT
	600	1 or 3	1040	28 (50)	600	RGE158	RGE158C	–	RGE158CT
20 (68240)	208	3	1260	31 (55)	208	RGE202	RGE202C	–	RGE202CT
	240	3	1260	31 (55)	240	RGE203	RGE203C	–	RGE203CT
	480	1 or 3	1260	31 (55)	480	RGE207	RGE207C	–	RGE207CT
	600	1 or 3	1260	31 (55)	600	RGE208	RGE208C	–	RGE208CT
25 (85300)	480	3	1500	34 (61)	480	RGE257	RGE257C	–	RGE257CT
	600	3	1500	34 (61)	600	RGE258	RGE258C	–	RGE258CT
30 (102360)	480	3	1500	39 (70)	480	RGE307	RGE307C	–	RGE307CT
	600	3	1500	39 (70)	600	RGE308	RGE308C	–	RGE308CT
40 (136480)	480	3	1500	44 (80)	480	RGE407	RGE407C	–	RGE407CT
	600	3	1500	44 (80)	600	RGE408	RGE408C	–	RGE408CT

To Order Specify

- Catalog number
- Voltage
- Phase
- kW
- Optional features
- Accessories

RGE Series Specification Sheet

Scope

Regular duty electric unit heaters, Ruffneck™ model RGE, as manufactured by Thermon Heating Systems, Inc. complete with ratings and features as specified below.

Ratings

The heater(s) shall be of the regular duty, forced air type, catalog number _____, rated _____ V, _____ phase, _____ Hz, _____ kW.

The heater(s) shall be cCSA_{US} certified to the following standards:

- CSA C22.2 No. 46-M1988 Electric Air Heaters
- UL Standard 1025 Electric Air Heaters

Standard Features

- Units rated 2 kW to 10 kW shall use stainless-steel tubular heating elements; units rated 15 kW to 40 kW shall use finned tubular heating elements to transfer the heat.
- Units shall be field convertible from 1 phase to 3 phase.
- Heater cabinets shall be 18-gauge steel and painted with ASA 61 grey epoxy for rust protection.
- Heaters shall have individually adjustable, aluminum louvres to direct the outlet airflow.
- Motors shall be mounted outside of the element bundle and be of the totally enclosed type with permanently lubricated ball bearings and built-in thermal overloads with ratings as follows:
 - For 2 kW to 10 kW heaters, motors shall be 1/20 HP, 1550 RPM dual rated 208/240 V single phase. For heater voltages above 240 V a transformer shall be included to provide the proper motor voltage.
 - For 15 kW to 40 kW heaters, 1/10 HP, 1550 RPM, full voltage rated, single phase.
- Standard control voltage shall be 240 V. A built-in transformer shall be supplied when the primary voltage differs from the control voltage.
- The heater shall be supplied with built-in overheat protection of the auto-reset, bimetal type.
- The heater shall be supplied with ceiling mount brackets as standard.
- All heaters shall have a ½" x ¾" (12.7 mm x 19.05 mm) multiple conduit knockout. Heaters rated 15 kW to 40 kW shall be provided with an additional 1" x 1¼" (25.4 mm x 31.75 mm) multiple conduit knockout.
- Approximate heater dimensions and weights are as follows:

kW Rating	Height	Width	Depth	Weight
2 to 10 kW	14" (356 mm)	17" (432 mm)	15½" (394 mm)	59 lbs (24 kg)
15 to 40 kW	19½" (495 mm)	24" (610 mm)	22" (559 mm)	104 lbs (47 kg)

Optional Factory Installed Features

The following factory installed optional features (indicated with a check) shall be included:

- Built-in bulb and capillary thermostat, 41°F to 100°F (5°C to 38°C)
- Definite purpose magnetic contactor
- Fused control circuit
- Manual reset high limit
- "FAN-ONLY"** switch
- Low voltage relay for remote 24 V control
- Epoxy painted fan blade and motor

Accessories for Field Installation

The following accessories (indicate with a check) shall be included with the unit for field installation:

- FAT 8 field installed built-in thermostat kit, 41°F to 100°F (5°C to 38°C)
- Wall mount bracket: RWB210 for units rated 2 kW to 10 kW; RWB1540 for units rated 15 kW to 40 kW.

RGX Series Heavy Duty Air Heaters

The Ruffneck™ RGX unit heater was designed by Thermon Heating Systems Inc. specifically for heavy duty use in industrial environments. This heater will reduce the downtime and maintenance costs usually experienced with heaters of standard design.

Applications

- Mine shafts
- Pulp and paper mills
- Hoist houses
- Welding shops
- Maintenance shops
- Sewage treatment plants
- Chemical plants
- Repair shops
- Wash down areas
- Weigh scale pits
- Elevator shafts
- High humidity areas
- Crane cabs

Features

- cCSA_{US} approved for horizontal and vertical air flow
- Automatic reset high limit
- 15, 20, 25, 30, 40, 50 kW units (optional 10 kW unit)
- 40 and 50 kW units incorporate split loads (50%) for remotely controlled energy management systems
- Factory installed transformers, contactors, and thermostats where specified
- Individually adjustable air flow louvres
- Factory balanced aluminum fan blade
- Fan delay in **"ON"** and **"OFF"** cycles
- Full sized control panel with hinged removable door, constructed to NEMA 12 standards
- **"FAN ONLY"** terminals for connection to remote switch
- 14-gauge steel cabinet
- Epoxy painted (ASA 61 Grey) for superior resistance to corrosion
- 1/3 HP motor with sealed ball bearings and totally enclosed construction
- Ceiling mounting bracket supplied
- Motor mounted outside of the element bundle thereby eliminating premature failure due to overheating and providing easy access for motor maintenance
- Elements are robust KX finned tubular sheathed type with epoxy sealed terminals to eliminate contamination from moisture and airborne impurities



In Canada these units are marketed under the Caloritech™ brand name.

Optional Factory Installed Features

- Built-in thermostat 41°F to 100°F (5°C to 38°C)
- Disconnect switch with door interlock
- HRC main load fuses
- Fused control circuit
- Manual reset high limit
- **"FAN ONLY"** switch
- Low voltage relay for remote 24 V thermostat
- Epoxy painted fan blade and motor
- Special wattages and voltages
- Special control voltages (240 V is standard)
- Available in special finishes
- Split load feature 15, 20, 25, 30 kW units
- Alloy elements with brazed alloy fins
- Nickel plated elements
- Stainless-steel cabinet
- EEMAC 4 construction

Accessories for Field Installation

- FAT 8A field installed built-in thermostat kit 41°F to 100°F (5°C to 38°C)
- RWB210 wall mount bracket (2 to 10 kW)
- RWB1540 wall mount bracket (15 to 40 kW)
- Air diffuser (vertical air flow)
- **"FAN ONLY"** switch and cover plate
- Remote thermostats available

Mounting Configurations

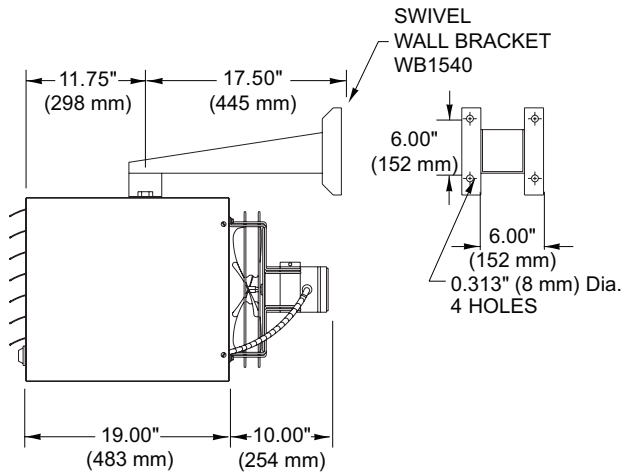


Figure 12 – Horizontal Air Flow Wall Mount

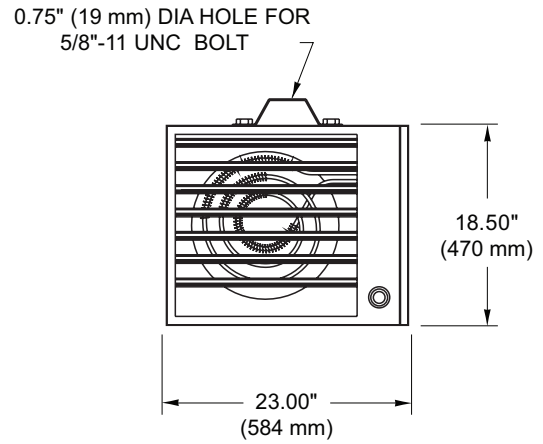


Figure 13 – Horizontal Air Flow Ceiling Mount

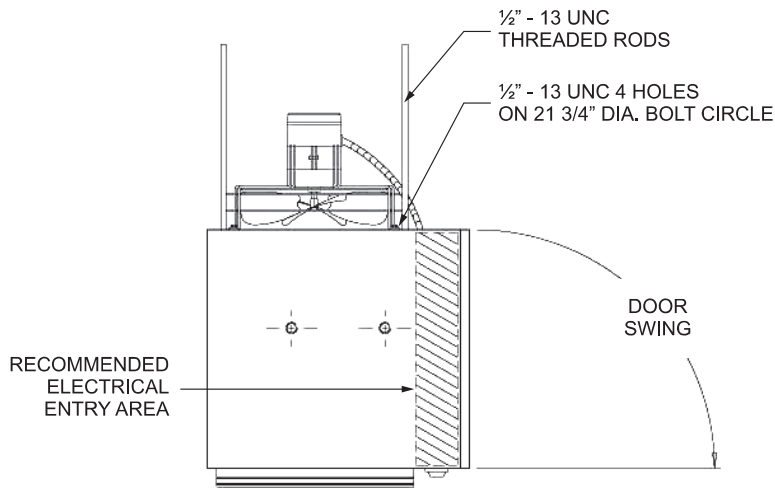


Figure 14 – Vertical Air Flow

To Order Specify

- Catalog number
- Voltage
- Phase
- kW
- Optional features
- Accessories

Table 27 – Performance Data for RGX Heavy Duty Air Heaters

kW (Btu/hr)	Volts	Phase	CFM	TEMP. RISE C° (F°)	Catalog Number			Net Weight
					Without Contactor	With Contactor	With T'stat & Contactor	
15 (51180)	208	3	1800	14 (25)	RGX152	RGX152C	RGX152CT	105 lbs 47.6 kg
	240		1800		RGX153	RGX153C	RGX153CT	
	480		1800		RGX157	RGX157C	RGX157CT	
	600		1800		RGX158	RGX158C	RGX158CT	
20 (68240)	208		1800	19 (34)	RGX202*	RGX202C*	RGX202CT*	105 lbs 47.6 kg
	240		1800		RGX203	RGX203C	RGX203CT	
	480		1800		RGX207	RGX207C	RGX207CT	
	600		1800		RGX208	RGX208C	RGX208CT	
25 (85300)	208		1800	24 (41)	RGX252*	RGX252C*	RGX252CT*	105 lbs 47.6 kg
	240		1800		RGX253*	RGX253C*	RGX253CT*	
	480		1800		RGX257	RGX257C	RGX257CT	
	600		1800		RGX258	RGX258C	RGX258CT	
30 (102360)	480	2100	24 (41)	RGX307	RGX307C	RGX307CT	105 lbs 47.6 kg	
	600	2100		RGX308	RGX308C	RGX308CT		
40 (136500)	480	2100	32 (58)	RGX407	RGX407C	RGX407CT	125 lbs 56.7 kg	
	600	2100		RGX408	RGX408C	RGX408CT		
50 (170600)	480	2100	40 (72)	RGX507	RGX507C	RGX507CT	125 lbs 56.7 kg	
	600	2100		RGX508	RGX508C	RGX508CT		

*These units exceed 48 amps, and may require special split load feature.

Note:

1. Motor voltage and phase is same as heater supply.
2. Standard control voltage is 240 V. A control transformer is included where required. Other control voltages are available. (Check with factory.)
3. 15, 20, 25, 30 kW units are pre-wired as one circuit. The split load feature (50%) is available as an option.
4. 40 and 50 kW units are pre-wired for split load (50%) control by customer unless specified otherwise.
5. All motors are 1/3 HP, totally enclosed ball bearing type, permanently lubricated, thermally protected.

Model Coding

RGX	20	3	C	T	L	-	D
Model Series	Kilowatts	Voltage	Contactor (Optional)	Thermostat (Optional)	Energy Management Controller (Optional)		Other Options
	15 - 15 kW	2 - 208					B - Epoxy painted fan blade and motor
	20 - 20 kW	3 - 240					D - Disconnect switch
	25 - 25 kW	7 - 480					F - Fan only switch
	30 - 30 kW	8 - 600					H - HRC main load fuses
	40 - 40 kW						K - Fused control circuit
	50 - 50 kW						M - Manual reset high limit
							N - Low voltage relay (24V)
							V - 120V control voltage (240V is standard)

RGX Series Specification Sheet

Scope

Heavy duty electric unit heaters, Ruffneck™ model RGX, as manufactured by Thermon Heating Systems, Inc. complete with ratings and features as specified below.

Ratings

- The heater(s) shall be of the heavy duty, forced air type, catalog number _____, rated _____ V, _____ phase, _____ Hz, _____ kW.
- The heater(s) shall be CCSAUS certified to CSA Standard C22.2 No. 46-M1988 Electric Air Heaters, and UL Standard 1025 Electric Air Heaters.

Standard Features

- Heavy duty unit heaters shall be approved for horizontal and vertical airflow.
- Heaters shall use Caloritech™ type KX finned tubular elements to transfer the heat. Elements shall have epoxy sealed terminals to eliminate the possibility of contamination from moisture and airborne impurities.
- Heaters rated 40 kW and 50 kW shall be provided (as standard) with 50% split loads for remotely controlled energy management systems. Split load feature shall be provided if specified on 15 kW to 30 kW units.
- Heater cabinets shall be 14-gauge steel, painted with ASA 61 grey epoxy for superior corrosion protection. The cabinet shall also incorporate a full sized control panel with hinged removable door, constructed to NEMA 12 standards.
- The heater shall have seven (7) individually adjustable, extruded aluminum louvers to direct the outlet airflow.
- Motors shall be of the totally enclosed type with permanently lubricated ball bearings and built-in thermal overload, rated 1/3 HP, 1725 RPM with the voltage rating the same as the heater. The motor shall be mounted outside of the element bundle to eliminate premature failure due to overheating and to provide easy access for maintenance.
- A factory balanced aluminum fan blade shall provide the airflow through the heater.
- The standard control voltage shall be 240 V. A built in transformer shall be supplied when required.
- Heavy duty unit heaters shall incorporate a fan delay in the "ON" and "OFF" cycles. "FAN-ONLY" terminals for connection to a remote switch shall also be supplied as standard.
- The heater shall be supplied with built-in overheat protection of the auto-reset, bimetal type.
- The heater shall be equipped with ceiling mount brackets as standard.
- Approximate heater dimensions shall be 18½" (470 mm) high x 23" (584 mm) wide x 30" (762 mm) long.
- Shipping weight shall be 105 lbs (48 kg) for 15 kW to 30 kW and 125 lbs (57 kg) for 40 kW & 50 kW units.

Optional Factory Installed Features

The following factory installed optional features (indicate with a check) shall be included:

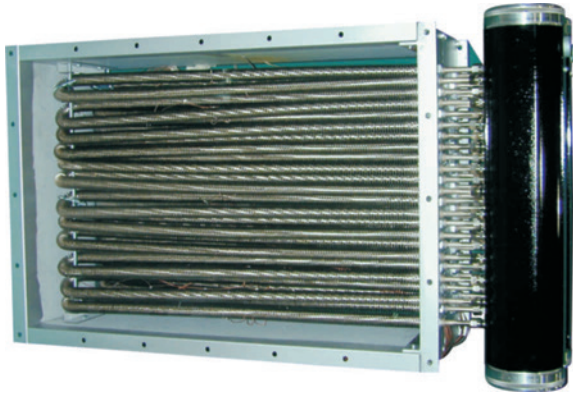
- Built-in bulb and capillary thermostat, 41°F to 100°F (5°C to 38°C)
- Disconnect switch with door interlock
- HRC main load fuses
- Manual reset high limit
- "FAN-ONLY" switch
- Low voltage relay for remote 24 V thermostat
- Epoxy painted fan blade and motor
- Split load feature, 15 kW to 30 kW units
- Nickel plated elements
- Stainless-steel cabinet

Accessories for Field Installation

The following accessories (indicate with a check) shall be included with the unit for field installation:

- FAT 8A field installed built-in thermostat kit 41°F to 100°F (5°C to 38°C)
- Wall mount bracket: model RWB1540
- Air diffuser for vertical air flow

RXDF Series Explosion-Proof Duct Heaters



Application

Ruffneck™ RXDF duct heaters are designed for heating air or gases potentially containing explosive substances.

Designed for Application in Hazardous Environments, such as:

- Oil refineries
- Coal mines
- Pulp and paper mills
- Petrochemical plants
- Grain elevators
- Sewage treatment plants

RXDF heaters feature the unique Ruffneck™ approach to explosion-proof electric heater design which embodies safety, reliability and economic value. The RXDF heater is a factory pre-wired explosion-proof duct heater. Standard models are available in three duct sizes, with either a single or double bank of heating modules. RXDF heaters are available as standard units with a T2D, T3A or T3B hazardous area temperature codes.

Construction

The RXDF explosion-proof duct heater utilizes heavy walled carbon steel finned tubular elements with nickel plated finish to provide safe, efficient, low temperature heat transfer. Standard units have a painted steel duct with mounting holes provided for attachment to the duct section.

RXDF heaters feature the unique copper free aluminum extruded **x-Max**® terminal housing (U.S. Pat. No. 5,798,910, CDN. Pat. No. 2,212,500). A track and trolley system and threaded covers at each end allow easy access to wiring terminal connections. Units are approved for mounting in a horizontal duct section.

Wattage

Units are available in wattages up to 50 kW.

Control Panels

Control panel options are shown in Control Packages, page 55

Thermostats

Thermon Heating Systems, Inc. offers a wide variety of explosion-proof thermostats to suit most every need. All model RXDF heaters are available with remote externally adjustable thermostats which are field convertible to tamper-proof.

Heater Selection

Standard Ruffneck™ RXDF duct heaters may be operated in hazardous areas where the ambient temperature does not exceed 104°F (40°C) and the maximum heater surface temperature does not exceed the temperature code rating.

Use the following steps for heater selection.

1. Determine temperature code rating Standard heaters are available for the T2D, T3A or T3B areas.
2. Determine kW rating Standard heaters are available up to 50 kW.
3. Determine duct size Three standard sizes are available and transition sections can be provided for other duct sizes.
4. Verify air flow requirements Table 29, page 53 lists the minimum air flow (SCFM) required for each heater type.
5. Verify temperature rise using the following formula:

<u>°F Temperature Rise</u>	<u>°C Temperature Rise</u>
°F temp. rise = $\frac{kW \times 3000}{SCFM}$	°C temp. rise = $\frac{kW \times 47.2}{m^3/min}$
6. Determine power supply voltage and phase. Standard units are available in 208, 240, 480 or 600 V (3-phase). Optional 1-phase units also available.

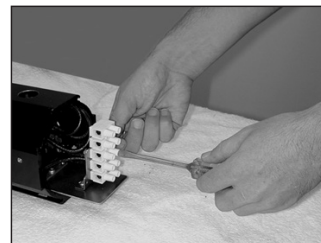


Figure 15

Standard Heater Features

- T2D, T3A or T3B temperature code
- Painted steel duct section
- Differential pressure switch
- Factory installed high limit sensing thermocouples

Optional Features

- Transition sections
- Stainless steel duct section
- Mechanical temperature control
- Outlet air thermocouple
- Special temperature code
- Outlet air thermostat

To Order Specify

- Quantity
- Catalog number
- Voltage
- Phase
- Wattage
- Hazardous location designation
- Temperature code
- Control package
- Optional Features

Table 28 – Dimensions

Duct Size		A		B		C		D		L	
in	mm	in	mm	in	mm	in	mm	in	mm	in	mm
24 x 12	610 x 305	24.0	610	12.0	305	27.0	686	15.0	381	36.5	927
30 x 18	762 x 457	30.0	762	18.0	457	33.0	838	21.0	533	42.5	1080
36 x 24	914 x 610	36.0	914	24.0	610	39.0	991	27.0	686	48.5	1232

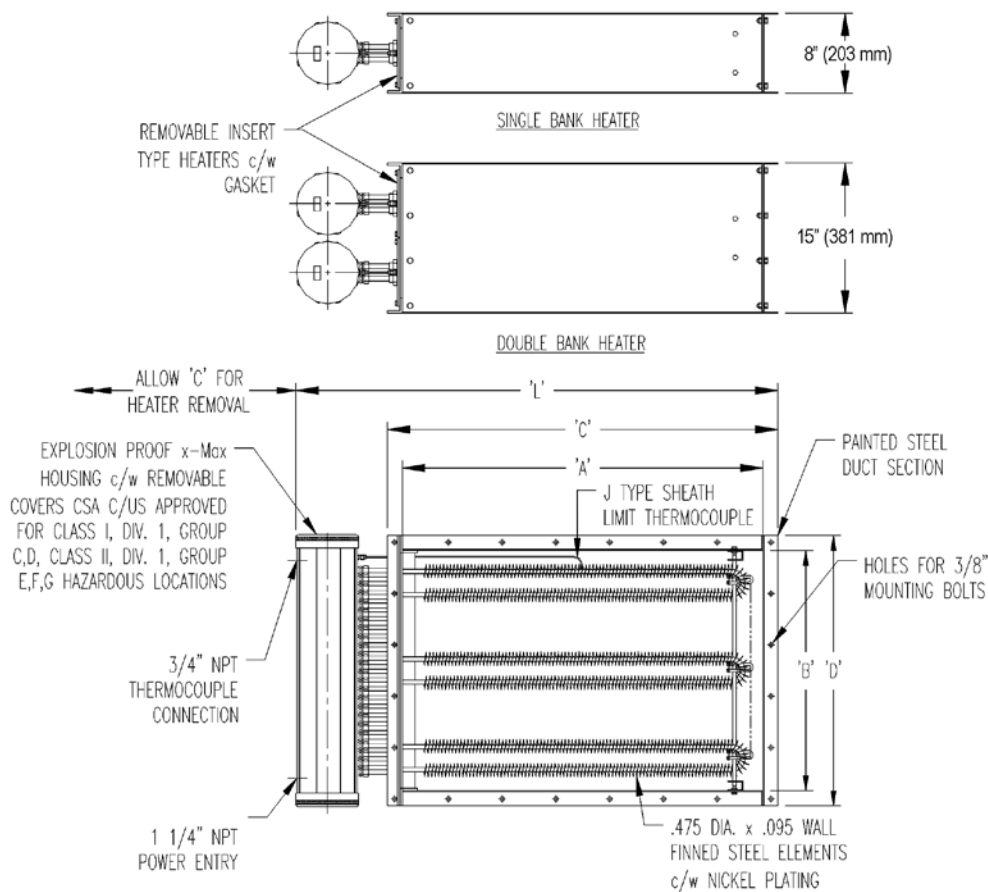


Figure 16

Table 29 – Heater Specifications for High Temperature Rise Units

Duct Size (A x B)		No. of Heating Banks	kW	Available Voltages		High Temperature Rise Units - T2D (482°F / 215°C)						Net Weight							
				208 V	240 V, 480 V, 600 V	Class I, Div. 1 & 2, Groups C, D													
						Temp. Code	Catalog No.	Max. Temp. Rise		Min. Air Flow	Min. Air Flow								
in	mm	3Ø	3Ø			°F	°C	SCFM	m³/min	lbs	kg								
24 x 12	610 x 305	1	2.5	✓	✓	T2D	RXDF1-24X12-025T2D	13.9	7.7	540	15.3	90	41						
			3.75				RXDF1-24X12-038T2D	20.8	11.6	540	15.3								
			5				RXDF1-24X12-050T2D	19.7	11.0	761	21.6								
			7.5				RXDF1-24X12-075T2D	18.0	10.0	1247	35.3								
		2	5				RXDF2-24X12-050T2D	27.8	15.4	540	15.3	160	73						
			7.5				RXDF2-24X12-075T2D	41.7	23.2	540	15.3								
			10				RXDF2-24X12-100T2D	39.4	21.9	761	21.6								
			15				RXDF2-24X12-150T2D	36.1	20.1	1247	35.3								
30 x 18	762 x 457	1	5	✓	✓	T2D	RXDF1-30X18-050T2D	14.8	8.2	1013	29.2	135	61						
			5.25				RXDF1-30X18-063T2D	18.5	10.3	1013	29.2								
			7.5				RXDF1-30X18-075T2D	22.2	12.3	1013	29.2								
			10				RXDF1-30X18-100T2D	19.6	10.8	1538	43.6								
			12.5				RXDF1-30X18-125T2D	18.9	10.5	1989	56.3								
			15				RXDF1-30X18-150T2D	18.4	10.2	2440	69.1								
		2	10				RXDF2-30X18-100T2D	29.5	16.5	1013	29.2	250	114						
			12.5				RXDF2-30X18-125T2D	37.0	20.6	1013	29.2								
			15				RXDF2-30X18-150T2D	44.5	24.7	1013	29.2								
			20				RXDF2-30X18-200T2D	39.0	21.7	1538	43.6								
			25				RXDF2-30X18-250T2D	37.7	21.0	1989	56.3								
			30				RXDF2-30X18-300T2D	36.9	20.5	2440	69.1								
			36 x 24				914 x 610	1	7.5	✓	RXDF1-36X24-075T2D			13.9	7.7	1620	45.9	180	82
									10	✓	RXDF1-36X24-100T2D			18.5	10.3	1620	45.9		
12.5	✓	RXDF1-36X24-125T2D		23.2	12.9	1620			45.9										
15	✓	RXDF1-36X24-150T2D		20.2	11.2	2230			63.1										
20	✓	RXDF1-36X24-200T2D		19.3	10.7	3115			88.2										
2	25	-		RXDF1-36X24-250T2D	18.8	10.4		4000	113.3	325	148								
	15	✓		RXDF2-36X24-150T2D	27.8	15.4		1620	45.9										
	20	✓		RXDF2-36X24-200T2D	37.0	20.6		1620	45.9										
	25	✓		RXDF2-36X24-250T2D	46.3	25.7		1620	45.9										
	30	✓		RXDF2-36X24-300T2D	40.4	22.4		2230	63.1										
40	✓	RXDF2-36X24-400T2D	38.5	21.4	3115	88.2													
50	-	RXDF2-36X24-500T2D	37.5	20.8	4000	113.3													

Table 30 – Heater Specifications for Low Temperature Rise Units

Duct Size (A x B)		No. of Heating Banks	kW	Available Voltages		Low Temperature Rise Units T3A (356°F / 180°C) or T3B (329°F / 165°C)						Net Weight	
				208 V	240 V, 480 V, 600 V	Class I, Div. 1 & 2, Groups C, D Class II, Div. 1 & 2, Groups E, F Class II, Division 1 & 2, Group G (T3B Units Only)				Temp Code	Catalog No.		
in	mm		3Ø	3Ø			°F	°C	SCFM			m³/min	lbs
24 x 12	610 x 305	1	2.5	✓	✓	T3B	RXDF1-24X12-025T3B	6.8	3.8	1107	31.3	90	41
			3.75			T3B	RXDF1-24X12-038T3B	8.4	4.7	1334	37.8		
			5			T3B	RXDF1-24X12-050T3B	9.6	5.3	1562	44.2		
			7.5			T3A	RXDF1-24X12-075T3A	13.0	7.2	1728	48.9		
		2	5			T3B	RXDF2-24X12-050T3B	13.6	7.5	1107	31.3	160	73
			7.5			T3B	RXDF2-24X12-075T3B	16.9	9.4	1334	37.8		
			10			T3B	RXDF2-24X12-100T3B	19.2	10.7	1562	44.2		
			15			T3A	RXDF2-24X12-150T3A	26.0	14.6	1728	48.9		
30 x 18	762 x 457	1	5	✓	✓	T3B	RXDF1-30X18-060T3B	7.1	4.0	2109	59.7	135	61
			5.25			T3B	RXDF1-30X18-063T3B	8.0	4.5	2331	66.0		
			7.5			T3B	RXDF1-30X18-075T3B	8.8	4.9	2553	72.3		
			10			T3B	RXDF1-30X18-100T3B	10.0	5.6	2991	84.7		
			12.5			T3B	RXDF1-30X18-125T3B	10.9	6.1	3434	97.2		
			15			T3A	RXDF1-30X18-150T3A	13.5	7.5	3333	94.4		
		2	10			T3B	RXDF2-30X18-100T3B	14.2	7.9	2109	59.7	250	114
			12.5			T3B	RXDF2-30X18-125T3B	16.1	8.9	2331	66.0		
			15			T3B	RXDF2-30X18-150T3B	17.6	9.8	2553	72.3		
			20			T3B	RXDF2-30X18-200T3B	20.1	11.1	2991	84.7		
			25			T3B	RXDF2-30X18-250T3B	21.8	12.1	3434	97.2		
			30			T3A	RXDF2-30X18-300T3A	27.0	15.0	3333	94.4		
36 x 24	914 x 610	1	7.5	✓	T3B	RXDF1-36X24-075T3B	6.9	3.8	3256	92.2	180	82	
			10	✓	T3B	RXDF1-36X24-100T3B	8.1	4.5	3690	104.5			
			12.5	✓	T3B	RXDF1-36X24-125T3B	9.1	5.1	4125	116.8			
			15	✓	T3B	RXDF1-36X24-150T3B	9.9	5.5	4559	129.1			
			20	✓	T3B	RXDF1-36X24-200T3B	11.1	6.1	5428	153.7			
			25	-	T3A	RXDF1-36X24-250T3A	13.8	7.7	5427	153.7			
			2	15	✓	T3B	RXDF2-36X24-150T3B	13.8	7.7	3256			92.2
		20		✓	T3B	RXDF2-36X24-200T3B	16.3	9.0	3690	104.5			
		25		✓	T3B	RXDF2-36X24-250T3B	18.2	10.1	4125	116.8			
		30		✓	T3B	RXDF2-36X24-300T3B	19.7	11.0	4559	129.1			
		40		✓	T3B	RXDF2-36X24-400T3B	22.1	12.3	5428	153.7			
		50		-	T3B	RXDF2-36X24-500T3B	27.6	15.4	5427	153.7			
				-	T3A	RXDF2-36X24-500T3A	27.6	15.4	5427	153.7			

Note: For optional disconnect switch, add 'D' to end of catalog number.

Control Packages

Package #1 - Basic Unit (“ON/OFF” Control)

All standard features. Terminals are provided for connection to a remote “ON/OFF” temperature control and connection of differential air pressure switch.

Package #2 - Built-in Temperature Controller

Same features as Package #1 except with factory installed digital temperature controller for control of outlet air temperature.

Package #3 - SCR with Remote Temperature Controller

All standard features and a factory installed full load zero fired SCR with terminals provided for remote 4-20 mA temperature control signal and connection of differential air pressure switch.

Package #4 - SCR with Built-in Temperature Controller

Same features as Package #3 except with factory installed digital temperature controller for control of outlet air temperature.

Note: Some amperage limits apply to packages #4 and #4 in E.P. Enclosure. Consult factory for details.

Table 31 – Control Panel Specifications: Type 4 Moisture Resistant

No. of Circuits	kW	Package #1 Basic Unit without Disconnect				Catalog No.			
		208 V 3Ø	240 V 3Ø	480 V 3Ø	600 V 3Ø	Package #1	Package #2	Package #3	Package #4
1	2.5	✓				RCPXD1-025R	RCPXD1-025TR	RCPXD1-025SR	RCPXD1-025STR
	3.75	✓				RCPXD1-038R	RCPXD1-038TR	RCPXD1-038SR	RCPXD1-038STR
	5	✓				RCPXD1-050R	RCPXD1-050TR	RCPXD1-050SR	RCPXD1-050STR
	6.25	✓				RCPXD1-063R	RCPXD1-063TR	RCPXD1-063SR	RCPXD1-063STR
	7.5	✓				RCPXD1-075R	RCPXD1-075TR	RCPXD1-075SR	RCPXD1-075STR
	10	✓	✓		✓	RCPXD1-100R	RCPXD1-100TR	RCPXD1-100SR	RCPXD1-100STR
	12.5	✓				RCPXD1-125R	RCPXD1-125TR	RCPXD1-125SR	RCPXD1-125STR
	15	✓				RCPXD1-150R	RCPXD1-150TR	RCPXD1-150SR	RCPXD1-150STR
	20	✓				RCPXD1-200R	RCPXD1-200TR	RCPXD1-200SR	RCPXD1-200STR
	25	-				RCPXD1-250R	RCPXD1-250TR	RCPXD1-250SR	RCPXD1-250STR
2	5	✓	✓	✓	✓	RCPXD2-050R	RCPXD2-050TR	RCPXD2-050SR	RCPXD2-050STR
	7.5	✓	✓	✓	✓	RCPXD2-075R	RCPXD2-075TR	RCPXD2-075SR	RCPXD2-075STR
	10	✓	✓	✓	✓	RCPXD2-100R	RCPXD2-100TR	RCPXD2-100SR	RCPXD2-100STR
	12.5	✓	✓	✓	✓	RCPXD2-125R	RCPXD2-125TR	RCPXD2-125SR	RCPXD2-125STR
	15	✓	✓	✓	✓	RCPXD2-150R	RCPXD2-150TR	RCPXD2-150SR	RCPXD2-150STR
	20	✓	✓	✓	✓	RCPXD2-200R	RCPXD2-200TR	RCPXD2-200SR	RCPXD2-200STR
	25	-	✓	✓	✓	RCPXD2-250R	RCPXD2-250TR	RCPXD2-250SR	RCPXD2-250STR
	30	-	-	-	-	RCPXD2-300R	RCPXD2-300TR	RCPXD2-300SR	RCPXD2-300STR
	40	-	-	-	-	RCPXD2-400R	RCPXD2-400TR	RCPXD2-400SR	RCPXD2-400STR
	50	-	-	-	-	RCPXD2-500R	RCPXD2-500TR	RCPXD2-500SR	RCPXD2-500STR

Note: For optional disconnect switch, add 'D' to end of catalog number.

Control Packages

Package #1 - Basic Unit (“ON/OFF” Control)

All standard features. Terminals are provided for connection to a remote “ON/OFF” temperature control and connection of differential air pressure switch.

Package #2 - Built-in Temperature Controller

Same features as Package #1 except with factory installed digital temperature controller for control of outlet air temperature.

Package #3 - SCR with Remote Temperature Controller

All standard features and a factory installed full load zero fired SCR with terminals provided for remote 4-20 mA temperature control signal and connection of differential air pressure switch.

Package #4 - SCR with Built-in Temperature Controller

Same features as Package #3 except with factory installed digital temperature controller for control of outlet air temperature.

Table 32 – Control Panel Specifications: Explosion-Proof Class I, Group C, D, Class II, Group E, F, G

No. of Circuits	kW	Package #1 Basic Unit without Disconnect				Catalog No.			
		208 V 3Ø	240 V 3Ø	480 V 3Ø	600 V 3Ø	Package #1	Package #2	Package #3	Package #4
1	2.5	✓	✓			CPXD1-025X	CPXD1-025TX	CPX1-025SX	CPXD1-025STX
	3.75	✓	✓			CPXD1-038X	CPXD1-038TX	CPX1-038SX	CPXD1-038STX
	5	✓	✓			CPXD1-050X	CPXD1-050TX	CPX1-050SX	CPXD1-050STX
	6.25	✓	✓			CPXD1-063X	CPXD1-063TX	CPX1-063SX	CPXD1-063STX
	7.5	✓	✓			CPXD1-075X	CPXD1-075TX	CPX1-075SX	CPXD1-075STX
	10	✓	✓	✓	✓	CPXD1-100X	CPXD1-100TX	CPX1-100SX	CPXD1-100STX
	12.5	✓	✓			CPXD1-125X	CPXD1-125TX	CPX1-125SX	CPXD1-125STX
	15	✓	✓			CPXD1-150X	CPXD1-150TX	CPX1-150SX	CPXD1-150STX
	20	✓	✓			CPXD1-200X	CPXD1-200TX	CPX1-200SX	CPXD1-200STX
	25	-	-			CPXD1-250X	CPXD1-250TX	CPX1-250SX	CPXD1-250STX
2	5	✓	✓	✓	✓	CPXD2-050X	CPXD2-050TX	CPX2-050SX	CPXD2-050STX
	7.5	✓	✓	✓	✓	CPXD2-075X	CPXD2-075TX	CPX2-075SX	CPXD2-075STX
	10	✓	✓	✓	✓	CPXD2-100X	CPXD2-100TX	CPX2-100SX	CPXD2-100STX
	12.5	✓	✓	✓	✓	CPXD2-125X	CPXD2-125TX	CPX2-125SX	CPXD2-125STX
	15	✓	✓	✓	✓	CPXD2-150X	CPXD2-150TX	CPX2-150SX	CPXD2-150STX
	20	✓	✓	✓	✓	CPXD2-200X	CPXD2-200TX	CPX2-200SX	CPXD2-200STX
	25	-	✓	✓	✓	CPXD2-250X	CPXD2-250TX	CPX2-250SX	CPXD2-250STX
	30	-	-	-	✓	CPXD2-300X	CPXD2-300TX	CPX2-300SX	CPXD2-300STX
	40	-	-	-	-	CPXD2-400X	CPXD2-400TX	CPX2-400SX	CPXD2-400STX
	50	-	-	-	-	CPXD2-500X	CPXD2-500TX	CPX2-500SX	CPXD2-500STX

Note: For optional disconnect switch, add 'D' to end of catalog number.

Wiring Diagrams

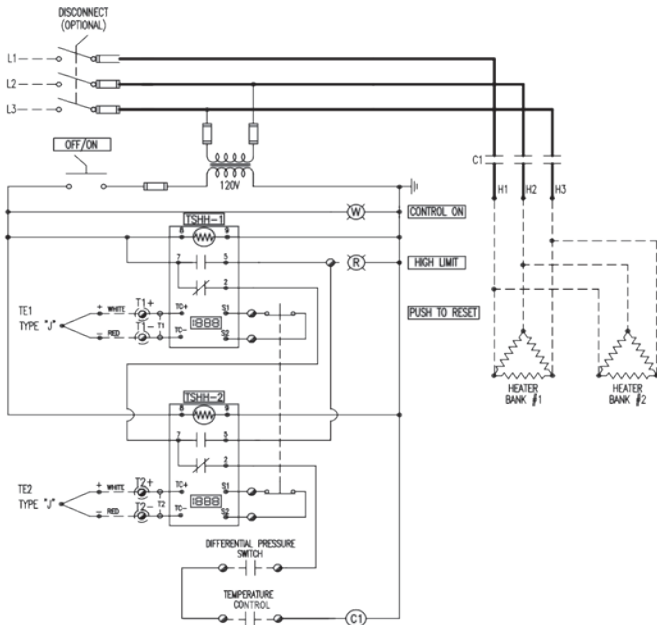


Figure 17 – Package #1 Basic Unit (“ON/OFF” Control)

Note:

One high limit control provided on single bank heaters.
Two high limit controls provided on double bank heaters.

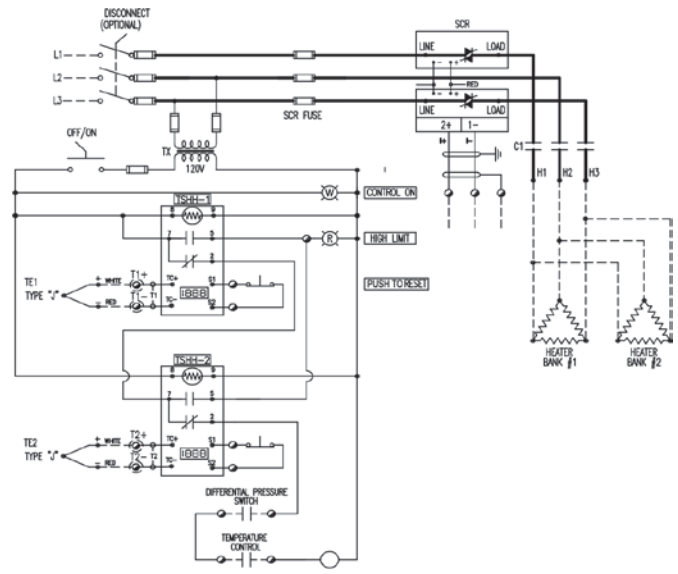


Figure 19 – Package #3 SCR with Remote Temperature Controller

Note:

One high limit control provided on single bank heaters.
Two high limit controls provided on double bank heaters.

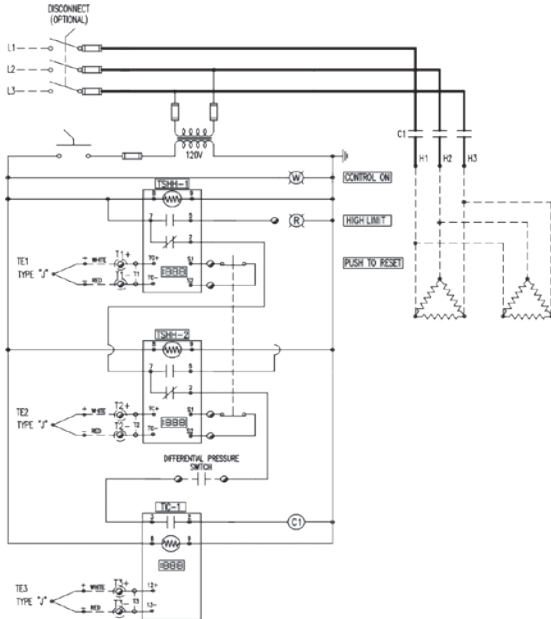


Figure 18 – Package #2 Built-in Temperature Controller

Note:

One high limit control provided on single bank heaters.
Two high limit controls provided on double bank heaters.

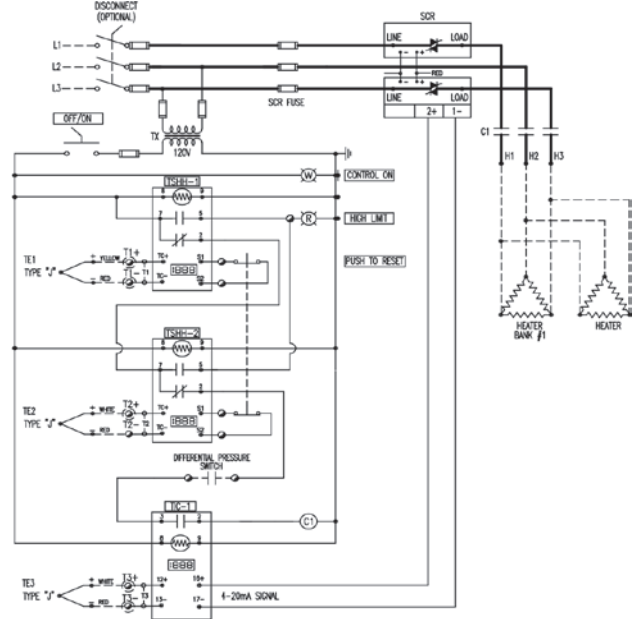


Figure 20 – Package #4 SCR with Built-in Temperature Controller

Note:

One high limit control provided on single bank heaters.
Two high limit controls provided on double bank heaters.

RXDF Series Specification Sheet

Scope

Electric explosion-proof duct heaters shall be Caloritech™ type XDF, from Thermon Heating Systems, Inc., complete with all standard equipment and optional features as specified in this section.

General

1. The heater is to be c_CSA_{US} certified with ratings as specified in Specifications & Rating below.
2. The heater shall be provided with standard features and optional features as outlined in: Standard Features - Duct Heater and Optional Features & Equipment below and on the next page.

Specifications & Ratings

1. The duct heater shall be designed to heat air at:
_____SCFM from _____°F to _____°F (_____°C to _____°C)
2. The heater shall be of the explosion-proof, duct type, catalog number_____, rated _____V, _____Ø, _____Hz, _____kW.
 Class _____, Division _____, Groups; _____,
 Class _____, Division _____, Groups; _____,
3. The duct heater shall be marked with a _____ temperature code, or maximum surface temperature of _____.
4. The minimum rated airflow through the duct heaters shall be _____SCFM.
5. The maximum outlet temperature of the duct heater shall not exceed _____°F (_____°C).
6. The duct heater is to be mounted in a horizontal duct section:
 Downstream
 Upstream from the customer supplied blower.
7. The duct heater shall be suitable for operation in a -40°F (-40°C) min. to 104°F (40°C) max. ambient temperature.

Standard Features - Duct Heater

1. The duct heater shall be supplied with a:
_____ " (W) x _____ " (H) x _____ " (L), or
_____ mm (W) x _____ mm (H) x _____ mm (L) carbon steel duct section with 1" (25 mm) wide mounting flange and painted ASA61 gray epoxy outside and high temperature aluminium inside.
2. The heating elements shall be (0.475"/12 mm) dia., extra heavy wall (0.095"/2.4 mm) finned tubular steel with nickel plated finish. Fins are to be fully brazed to the element sheath for maximum performance and efficiency.
3. The heating elements shall extend through Thermon Heating Systems Inc. certified explosion-proof compression fittings in a patented **x-Max**® explosion-proof, extruded copper-free aluminium terminal housing(s) with _____" NPT power conduit entry and _____" NPT conduit entry for high limit thermocouple connection.

Standard Features - Duct Heater (cont'd)

4. The heating elements shall be mounted as _____ removable heating bank(s) and wired to terminal blocks for _____ x _____ kW, _____ V, _____ phase heating circuits to be
 - Fully SCR controlled
 - "ON/OFF" control.
5. The duct heater shall be supplied with _____ 'J' type sheathed thermocouples welded or brazed to the element sheath for connection to:
 - Customer supplied
 - Factory installed certified high limit controllers. High limit set points will be factory preset.
6. Explosion-proof differential pressure switch shall be factory installed on the heater to prove that air is moving. Customer must ensure that the minimum airflow is maintained at all times. The differential pressure switch is to be:
 - Field wired to the remote control panel
 - Factory mounted onto the heater
7. The duct heater shall be mounted in a horizontal duct section with the terminal box(es) at the side.
8. The approximate weight of the duct heater shall be _____ lbs (_____ kg).

Standard Features - Control Package

1. Enclosure type (check one):
 - Type 4 - moisture proof
 - Explosion-proof
2. Temperature control (check one):
 - Basic unit - customer supplied temperature control signal
 - Built-in temperature controller
 - SCR controller - customer supplied 4-20 mA control signal
 - SCR controller with built-in temperature controller

Optional Features & Equipment (check as desired):

- Stainless steel duct section
- Transition sections to _____" (W) x _____" (H) duct or _____" round duct, or _____ mm (W) x _____ mm (H) duct or _____ mm round duct
- Special temperature code of _____

RDFF, RDIF, RDFT, & RDIT Series Air Duct Heaters

Application

Ruffneck™ air duct heaters are for use in comfort heating applications. Typical applications include:

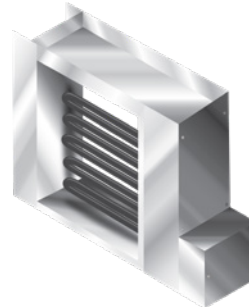
- Make-up air heating
- Air pre-heating
- Air handling equipment
- Fan coils
- Terminal reheating
- Multi-zone reheating
- Heat pump auxiliary systems

Type RDFF is a flanged duct heater with finned tubular heating elements.

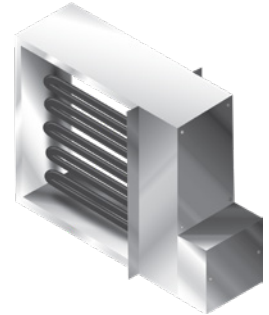
Type RDIF is an insert duct heater with finned tubular heating elements.

Type RDFT is a flanged duct heater with Incoloy® (non-finned) tubular heating elements.

Type RDIT is an insert duct heater with tubular heating elements.



Type RDFT



Type RDIF

In Canada these units are marketed under the Caloritech™ brand name. Refer to Caloritech™ Catalogue Section C.

Standard Features

- Primary linear cutout: 160°F (71°C), 277/600 Vac, 25/10 amp non-inductive
- Secondary linear cutout: Manual reset complete with back-up magnetic contactor on units under 300 V, 30 kW and less, 225°F (107°C) 277/600 Vac, 25/10 amp non-inductive

Optional Auxiliary Duct Heater Controls

These controls are available as factory installed on the duct heater or as an EEMAC rated (specify) control panel for wall mount:

- Wall thermostats:
 - T498A
 - T6051A (1 stage)
 - T6052A (2 stage)
 - T921A (0 - 135 ohm)
- Duct thermostats™
 - T675A (1 stage)
 - T678A (2 stage)
 - T991A (0 - 135 ohm)
- Bulb holders
- Silent contactors
- SCR controllers
- Sail switch
- Differential pressure switch
- Main disconnect
- Pneumatic electric switches
- ON-OFF switch
- Magnetic contactors
- Step controllers
- HRC fusing
- Control transformers
- Fan interlock relay
- Pilot lights

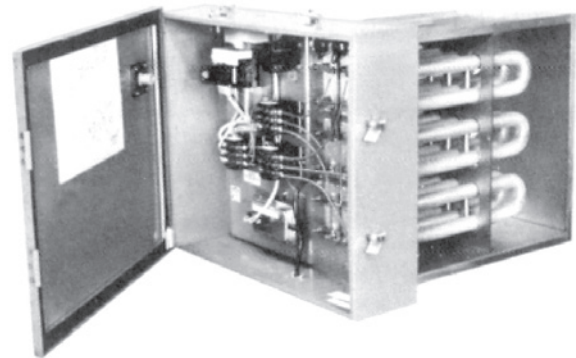


Figure 21 –Duct heater controls

Element Types

The finned tubular element design is the most popular. It incorporates the highest wattage per cross-sectional duct area, thus making it more economical than the Incoloy® tubular design.

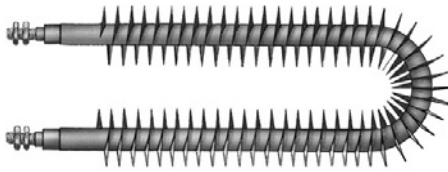


Figure 22 – Finned Tubular Elements

Finned tubular elements are constructed using a steel tube with a corrugated steel fin wrapped around it and brazed together. This increases the heat transfer surface of the element resulting in a lower operating temperature than tubular designs.

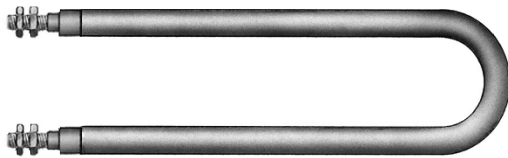


Figure 23 – Tubular Elements

Incoloy® tubular elements are similarly constructed, but without the steel fin in order to increase the corrosion resistance.

The Incoloy® design should be chosen where high humidity or slightly corrosive chemical contaminants are present in the air stream. These units are made and approved on special order only.

Both element types are designed to provide many years of maintenance free service.

Unlike open coil designs, duct heaters fitted with tubular elements are not subject to hazards of electrical shock which allows installation close to a register or grille.

Recommended Kilowatts

In order to select the proper kW for your application, use Figure 24 below.

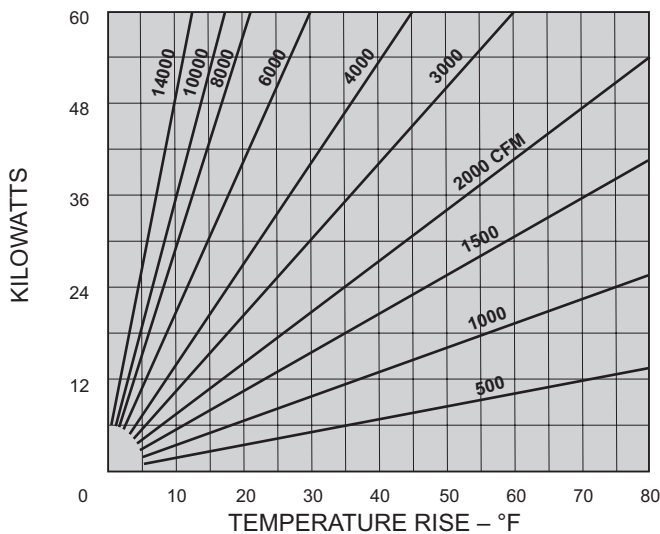


Figure 24 – Recommended Kilowatts

Wiring and Auxiliary Controls

Ruffneck™ electric duct heaters are available for supply voltages up to 600 V, 3 phase. Multi-staging to provide increments of temperature rise can be incorporated where dimensional space and element spacing allows. Special electrical features are available providing simple or sophisticated temperature control to suit individual requirements. See optional controls on previous page.

Construction

Two basic heater frame constructions are available, flange type or insert type (see Figure 25 and Figure 26 below).

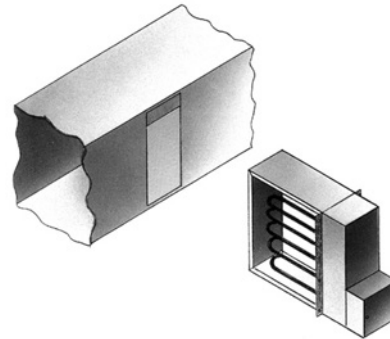


Figure 25 – Insert Type

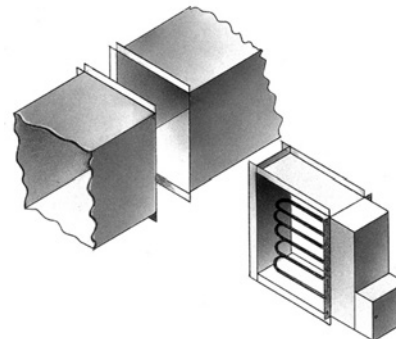


Figure 26 – Flange Type

All frames are fabricated from 16-gauge satin-coat steel. Specially constructed stainless-steel frames are also available.

A unique modular construction using stock frame components is employed using vertical and horizontal dimensional increments of two inches, ensuring rapid delivery.

Standard Dimensions

Insert type duct heaters are slightly undersized to permit installation in ducts having the A and B dimensions listed in Table 33.

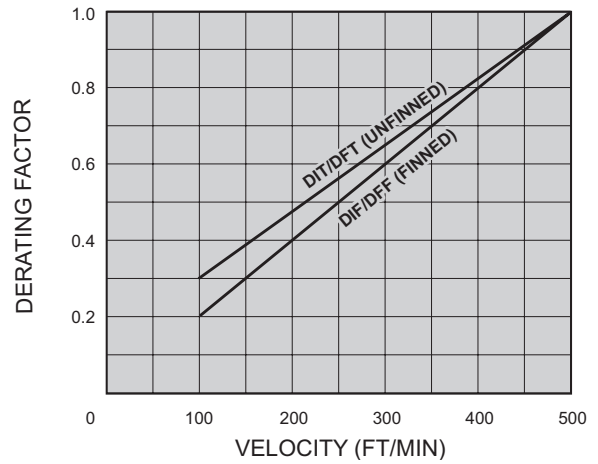


Figure 28 – Derating Factors

Selection and Installation

Finned tubular duct heaters are approved for horizontal duct installation where the maximum inlet air temperature does not exceed 77°F (25°C) and the maximum rating does not exceed 120 kW.

Multiple heaters can be installed in tandem (series) provided that the inlet temperature to any heater section (one heater) is not more than 77°F (25°C) and the air velocity is not less than the requirements of Figure 27. Check factory if you require assistance.

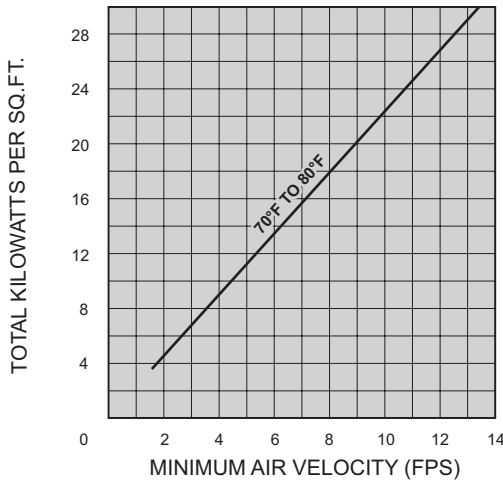


Figure 27 – Air Velocity Requirements

See Table 33 for typical duct heater sizes and kW ratings based on an air flow velocity of 500 ft/min or higher.

If the flow velocity is less than 500 ft/min, the typical maximum kW ratings in the table must be derated using Figure 28

Multiply the kW ratings shown in Table 33 by the appropriate derating factor from Figure 28.

Table 33 lists some of the more common heater sizes with maximum kilowatt ratings for each size. Stock modular frames allow quick delivery for other sizes in increments of 2" (51 mm).

Table 33 – Maximum Single Heater kW Rating for Typical Duct Heater Sizes

Dimensions A x B	Types RDIF / RDFF		Types RDIT / RDFT	
	Max. kW	Max No. of Elements.	Max. kW	Max No. of Elements.
6 x 6 (125 x 152)	2.5	3	1.5	6
8 x 6 (203 x 152)	3	3	3.0	6
10 x 6 (254 x 152)	4	3	2.5	6
10 x 8 (254 x 203)	5.5	4	3.5	8
12 x 6 (305 x 125)	5	3	3.5	6
12 x 8 (305 x 203)	6.5	4	4.5	8
12 x 10 (305 x 254)	8	5	5.5	10
14 x 8 (356 x 203)	7.5	4	5.5	8
14 x 10 (356 x 254)	9.5	5	6.5	10
14 x 12 (356 x 305)	11.5	6	8.0	12
16 x 10 (406 x 254)	11	5	7.5	10
16 x 12 (406 x 305)	13	6	9.0	12
16 x 14 (406 x 356)	15.5	7	10.5	14
18 x 12 (457 x 305)	15	6	10.5	12
18 x 14 (457 x 356)	17.5	7	12	14
18 x 16 (457 x 406)	20	8	14	16
20 x 14 (508 x 356)	19	7	13.5	14
20 x 16 (508 x 406)	22	8	13.5	16
20 x 18 (508 x 457)	25	9	17.5	18
22 x 16 (559 x 406)	24	8	17	16
22 x 18 (406 x 457)	27.5	9	19	18
22 x 20 (406 x 508)	30.5	10	21	20
24 x 18 (610 x 457)	30	9	21	18
24 x 20 (610 x 508)	33	10	23	20
24 x 22 (610 x 559)	36.5	11	25.5	22
26 x 20 (660 x 508)	36	10	25	20
26 x 22 (660 x 406)	39.5	11	27.5	22
26 x 24 (660 x 610)	43	12	30	24
28 x 22 (711 x 559)	42.5	11	29.5	22
28 x 24 (711 x 610)	46.5	12	32.5	24
28 x 26 (711 x 660)	50.5	13	35	26
30 x 24 (762 x 610)	50	12	35	24
30 x 26 (762 x 660)	54	13	37.5	26
30 x 28 (762 x 711)	58	14	40.5	28
30 x 30 (762 x 762)	62.5	15	43.5	30

FR Series Heat Exchanger Unit Heater

Ruffneck™ FR Heat Exchanger Unit Heaters are extra heavy duty (including heavy gauge steel construction) to meet the most demanding service and long life requirements for rugged industrial applications. The FR Series heaters are specifically designed for steam applications that may be subject to freezing conditions, and are of particular value for outdoor applications. Explosion-proof models suitable for hazardous locations are available on custom order.

Engineered for ease of maintenance, all parts are easily removed. All fasteners are plated capscrews; no sheet metal screws are used. Heat exchanger cores are of steel construction with tension wound, close fitting aluminium fins. They are resistant to corrosive agents (including hydrogen sulfide).

All units are equipped with a narrow-gap, epoxy coated fan guard. Choose from several optional UL listed and/or CSA approved motors with various voltages, phases and frequencies. All FR models have Canadian CRN approvals and are CSA certified for hazardous locations: Class I, Division 1 & 2, Groups C & D; Class II, Division 1 & 2, Groups E, F, & G; Class III, Division 1 & 2; Temperature Code T3B 329°F (165°C)—on applicable models only.

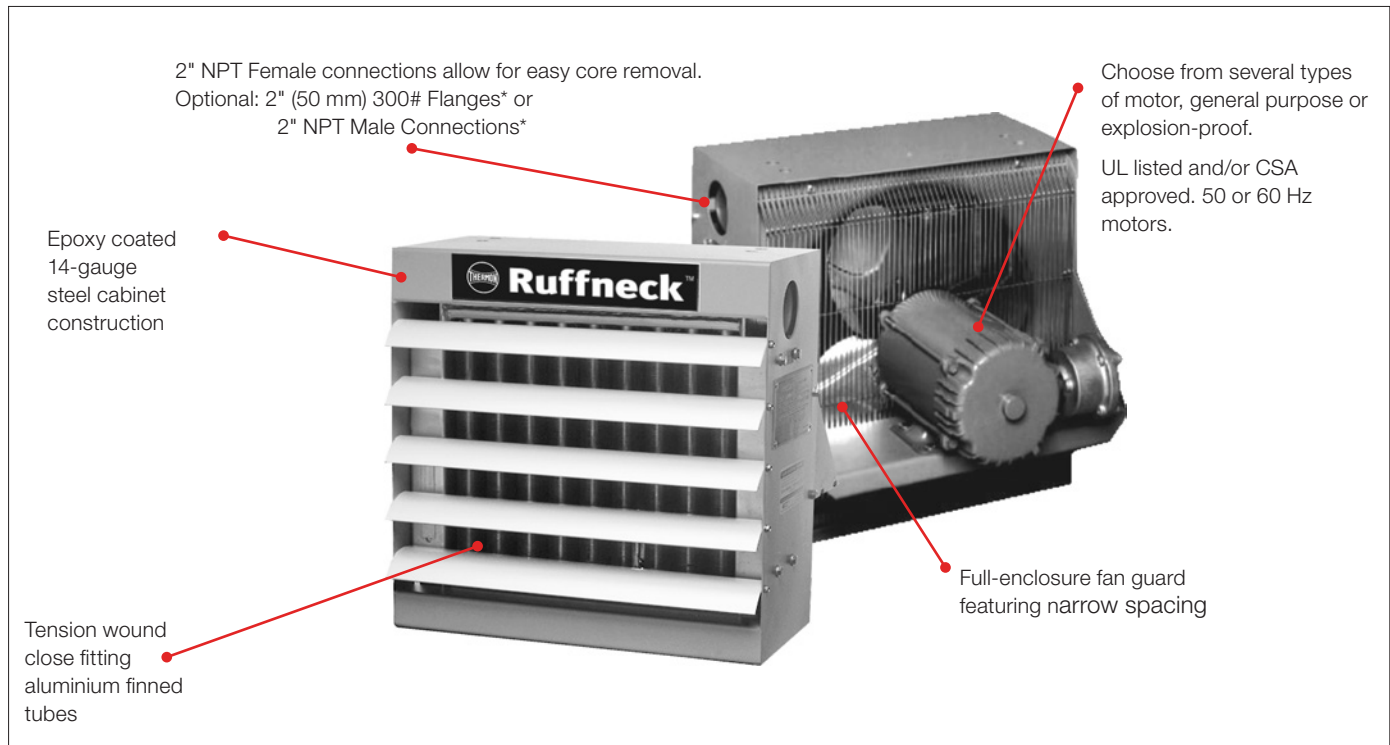
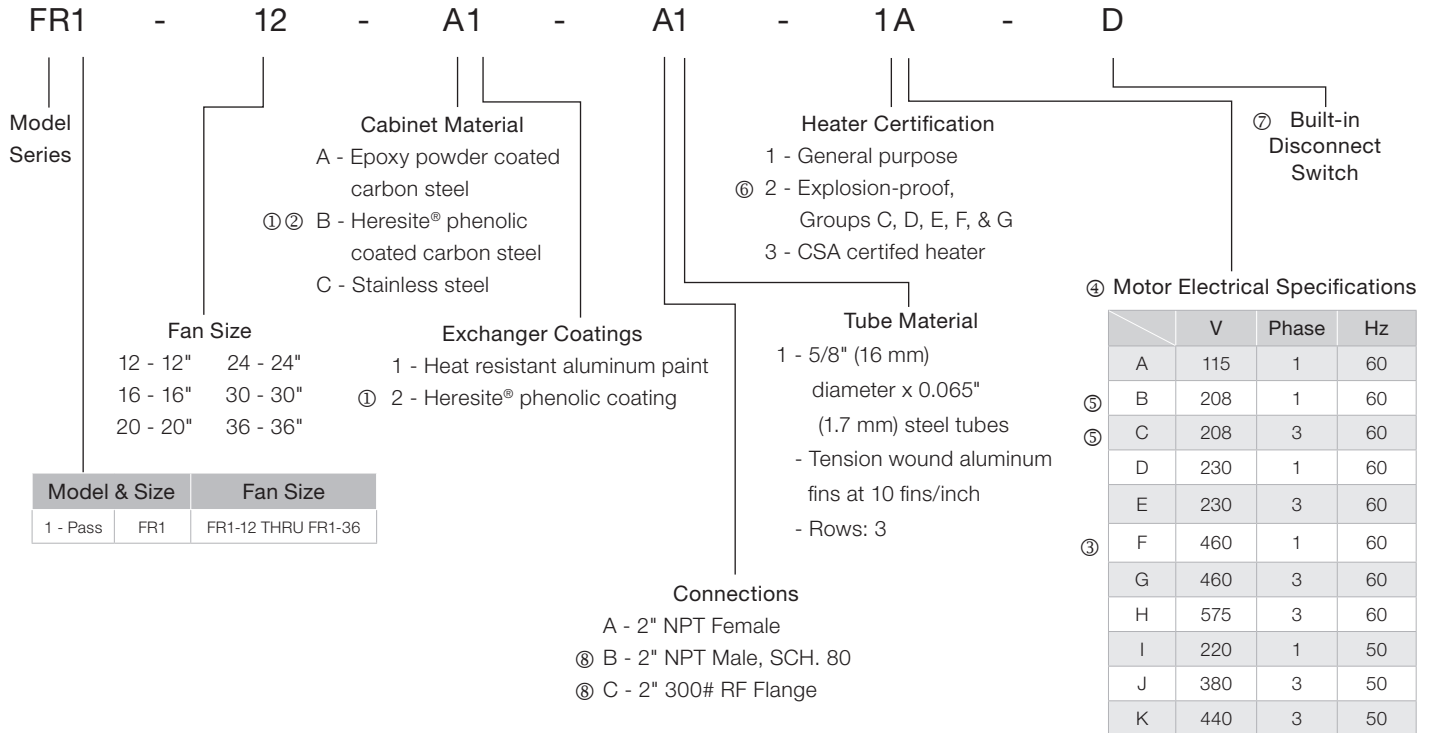


Figure 29

Heresite® is a registered trademark of Heresite® Protective Coatings Inc.
*2" 300# Flanges and 2" NPT Male Connections increase difficulty in core removal.

Model Coding



NOTE:

Ruffneck™ utilizes Doerr/Emerson/Baldor as our standard motor. Specifying any other O.E.M. motor may result in longer lead times. All heat exchangers are registered to C.R.N. OH16596.2C.

They are approved for use in all provinces and territories in Canada.

- ① Heresite® coated exchangers and cabinets: contact factory for quote.
- ② Louvres and fan blades are also Heresite® coated.
- ③ Contact factory for shipping lead time.
- ④ Motor designed to be used at rated voltage with tolerances of ±15%.
- ⑤ Motor may be marked 230V, but is suitable for 208V operation.
- ⑥ 460 1 phase motors are only certified for groups D, F & G.
- ⑦ Built-in Disconnect only available with CSA certified heaters.
- ⑧ Not available on 36" units.

FR Single-Pass

The Ruffneck™ FR Series is designed for steam applications that may be subject to freezing conditions. Maximum operating pressure is to 200 psi.

This heater is of particular value for outdoor applications, such as on drilling rigs, where boiler failure or crew neglect may result in an accidental freeze-up of the heating system. If accidental freeze-up occurs it is highly recommended the heater be returned to Thermon Heating Systems for inspection.

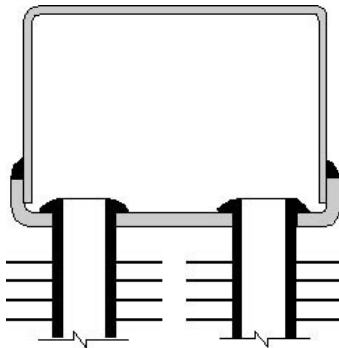


Figure 30

The fluid flow is divided among all tubes. This is best suited to steam and high flow rate liquid applications.

Table 34 – Performance Data for FR1-12

Entering Steam Parameters		Entering Air Temperature °F										
psig	°F		-10	0	10	20	30	40	50	60	70	80
2	219	OUTPUT (MBH)	-	-	-	57.3	54.1	50.8	47.7	44.6	41.5	38.4
		COND. (lbs/hr)	-	-	-	57.9	54.6	51.4	48.2	45.0	41.9	38.8
		FAT (°F)	-	-	-	67.4	75.7	83.8	91.9	100.0	107.9	115.8
10	239	OUTPUT (MBH)	-	-	-	63.7	60.4	57.1	53.8	50.6	47.5	44.4
		COND. (lbs/hr)	-	-	-	65.3	61.8	58.5	55.2 97.4	51.9	48.7	45.5
		FAT (°F)	-	-	-	72.7	81.0	89.3	102.9	105.5	113.5	121.4
20	259	OUTPUT (MBH)	-	-	73.6	70.1	66.7	63.3	60.0	56.8	53.6	50.4
		COND. (lbs/hr)	-	-	76.3	72.7	69.2	65.7 94.7	62.3	58.9	55.5	52.3
		FAT (°F)	-	-	69.7	78.1	86.5	102.9	110.9	119.1	127.1	
40	287	OUTPUT (MBH)	-	86.3	82.7	79.1	75.6	72.2	68.8	65.4	62.2	58.9 62.3
		COND. (lbs/hr)	-	91.4	87.5	83.8	80.0	76.4	72.8	69.2	65.7	135.1
		FAT (°F)	-	68.7	77.2	85.7	94.1	102.5	110.7	118.9	127.0	
60	307	OUTPUT (MBH)	96.7	92.9	89.3	85.6	82.1	78.6	75.1	71.7	68.3	65.0
		COND. (lbs/hr)	104.2	100.1	96.1	92.2	88.3	84.5	80.8	77.1	73.5	69.9
		FAT (°F)	65.4	74.0	82.7	91.2	99.7	108.0	116.3	124.6	132.7	140.8
80	324	OUTPUT (MBH)	102.4	98.6	94.9	91.2	87.5	84.0	80.5	77.0	73.6	70.2
		COND. (lbs/hr)	111.8	107.6	103.5	99.4	95.5	91.6	87.7	83.9	80.2	76.5
		FAT (°F)	69.9	78.6	87.3	95.9	104.4	112.8	121.2	129.4	137.6	145.8
100	338	OUTPUT (MBH)	107.1	103.3	99.5	95.7	92.1	88.5	84.9	81.4	77.9	74.5
		COND. (lbs/hr)	118.3	114.1	109.8	105.7	101.6	97.6	93.7	89.8	86.0	82.2
		FAT (°F)	73.6	82.4	91.1	99.7	108.3	116.8	125.1	133.5	141.7	149.9

Refer to the Ruffneck™ HP model for service above 100 psi.

For 50 Hz power supply, derate output by 10%

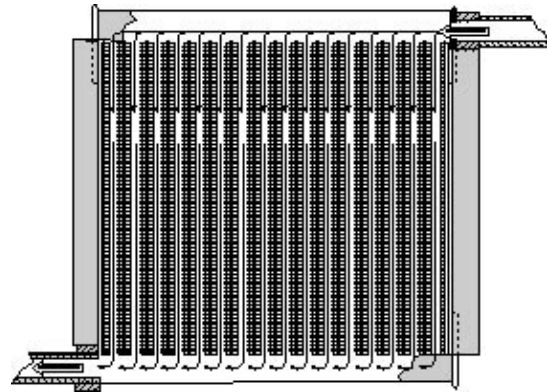


Figure 31

Optional Built-in Disconnect Available

The Ruffneck™ Disconnect Switch is engineered for use in the most demanding applications such as drilling rigs, utilidors and compression stations where high vibration, dirt, moisture, fluctuating power and high impact conditions exist. The built-in disconnect switch is available on all Ruffneck™ FR heaters.

Table 35 – Performance Data for FR1-16

Entering Steam Parameters		Entering Air Temperature °F										
psig	°F		-10	0	10	20	30	40	50	60	70	80
2	219	OUTPUT (MBH)	-	-	-	95.3	89.8	84.5	79.2	74.0	68.9	63.8
		COND. (lbs/hr)	-	-	-	96.8	91.2	85.8	80.4	75.2	70.0	64.8
		FAT (°F)	-	-	-	69.8	77.9	86.0	94.0	101.9	109.8	117.6
10	239	OUTPUT (MBH)	-	-	111.5	105.8	100.3	94.8	89.4	84.1	78.9	73.7
		COND. (lbs/hr)	-	-	114.8	109.0	103.3	97.6	92.1	86.6	81.2	75.9
		FAT (°F)	-	-	67.1	75.3	83.5	91.7	99.7	107.7	115.6	123.4
20	259	OUTPUT (MBH)	-	-	122.2	116.4	100.7	105.2	99.7	94.2	88.9	83.6
		COND. (lbs/hr)	-	-	127.4	121.4	115.5	109.6	103.9	98.2	92.7	87.2
		FAT (°F)	-	-	72.7	81.0	89.2	97.4	105.5	113.5	121.4	129.3
40	287	OUTPUT (MBH)	-	143.3	137.3	131.4	125.5	119.8	114.1	108.5	103.1	97.6
		COND. (lbs/hr)	-	152.6	146.1	139.8	133.6	127.4	121.4	115.5	109.6	103.9
		FAT (°F)	-	72.1	80.5	88.9	97.2	105.5	113.6	121.7	129.7	137.7
60	307	OUTPUT (MBH)	160.5	154.3	148.1	142.1	136.1	130.3	124.5	118.8	113.2	107.7
		COND. (lbs/hr)	173.9	167.1	160.4	153.9	147.4	141.0	134.8	128.6	122.6	116.6
		FAT (°F)	69.1	77.7	86.2	94.7	103.0	111.3	119.5	127.7	135.7	143.7
80	324	OUTPUT (MBH)	170.0	163.6	157.4	151.2	145.2	139.2	133.4	127.6	121.9	116.4
		COND. (lbs/hr)	186.6	179.6	172.7	165.9	159.3	152.7	146.2	140.0	133.7	127.6
		FAT (°F)	73.8	82.5	91.1	99.6	108.0	116.3	124.6	132.7	140.8	148.9
100	338	OUTPUT (MBH)	177.8	171.3	165.0	158.8	152.7	146.6	140.7	134.9	129.1	123.5
		COND. (lbs/hr)	197.6	190.4	183.3	176.4	169.5	162.8	156.2	149.7	143.3	137.0
		FAT (°F)	77.8	86.5	95.1	103.6	112.1	120.4	128.7	136.9	145.1	153.1

Refer to the Ruffneck™ HP model for service above 100 psi. Above figures are based on calculations at sea level and are intended as reference material only. Results may vary due to customer applications.

Table 36 – Performance Data for FR1-20

Entering Steam Parameters		Entering Air Temperature °F										
psig	°F		-10	0	10	20	30	40	50	60	70	80
2	219	OUTPUT (MBH)	-	-	-	161.1	151.9	142.9	134.0	125.2	116.5	108.0
		COND. (lbs/hr)	-	-	-	164.4	155.0	145.8	136.7	127.8	119.0	110.2
		FAT (°F)	-	-	-	68.3	76.5	84.6	92.7	100.7	108.6	116.5
10	239	OUTPUT (MBH)	-	-	188.4	178.9	169.5	160.3	151.2	142.2	133.4	124.7
		COND. (lbs/hr)	-	-	195.2	185.3	175.6	166.0	156.6	147.3	138.1	129.7
		FAT (°F)	-	-	65.4	73.7	82.0	90.1	98.3	106.3	114.3	122.2
20	259	OUTPUT (MBH)	-	-	206.6	196.9	187.3	177.9	168.6	159.4	150.4	141.5
		COND. (lbs/hr)	-	-	216.7	206.4	196.4	186.5	176.7	167.1	157.7	148.3
		FAT (°F)	-	-	70.8	79.2	87.5	95.7	103.9	112.0	120.0	128.0
40	287	OUTPUT (MBH)	-	242.3	232.2	222.2	212.3	202.6	193.0	183.7	174.4	165.3
		COND. (lbs/hr)	-	259.4	248.5	237.8	227.2	216.8	206.6	196.5	186.6	176.8
		FAT (°F)	-	69.9	78.5	86.9	95.3	103.6	111.8	120.0	128.0	136.0
60	307	OUTPUT (MBH)	271.4	260.9	250.5	240.3	230.3	220.4	210.7	201.1	191.6	182.3
		COND. (lbs/hr)	295.7	284.2	272.9	261.7	250.8	240.0	229.4	218.9	208.6	198.5
		FAT (°F)	66.7	75.4	84.0	92.5	100.9	109.3	117.5	125.7	133.9	141.9
80	324	OUTPUT (MBH)	287.4	276.7	266.1	255.8	245.6	235.6	225.7	216.0	206.4	196.9
		COND. (lbs/hr)	317.4	305.5	293.8	282.3	271.1	260.0	249.0	238.3	227.7	217.3
		FAT (°F)	71.4	80.1	88.7	97.3	105.7	114.1	122.4	130.7	138.9	146.9
100	338	OUTPUT (MBH)	300.6	289.7	279.1	268.6	258.2	248.1	238.1	228.2	218.5	209.0
		COND. (lbs/hr)	336.0	323.9	311.9	300.1	288.6	277.2	266.0	255.0	244.1	233.4
		FAT (°F)	75.2	83.9	92.6	101.2	109.7	118.1	126.5	134.8	143.0	151.1

Refer to the Ruffneck™ HP model for service above 100 psi. For 50 Hz power supply, derate output by 10%.

Table 37 – Performance Data for FR1-24

Entering Steam Parameters		Entering Air Temperature °F										
psig	°F		-10	0	10	20	30	40	50	60	70	80
2	219	OUTPUT (MBH)	384.4	364.4	344.7	325.4	306.4	287.7	269.4	251.4	233.7	216.3
		COND. (lbs/hr)	393.6	373.0	352.8	333.0	313.6	294.5	275.7	257.3	239.2	221.3
		FAT (°F)	79.7	86.0	93.9	100.9	107.7	114.4	121.1	127.6	134.0	140.3
10	239	OUTPUT (MBH)	421.4	400.9	380.7	360.9	341.5	322.4	303.6	285.2	267.1	249.3
		COND. (lbs/hr)	437.8	416.4	395.4	374.9	354.7	334.8	315.3	296.2	277.4	258.8
		FAT (°F)	88.6	95.8	103.0	110.0	116.9	123.6	130.3	136.9	143.4	149.7
20	259	OUTPUT (MBH)	458.5	437.5	416.9	396.6	376.7	357.2	338.1	319.2	300.7	282.5
		COND. (lbs/hr)	482.3	460.1	438.4	417.1	396.2	375.6	355.4	335.6	316.1	297.0
		FAT (°F)	97.6	104.9	112.1	119.1	126.1	132.9	139.7	146.3	152.8	159.2
40	287	OUTPUT (MBH)	510.6	488.9	467.6	446.8	426.3	406.2	386.5	367.1	348.0	329.3
		COND. (lbs/hr)	548.3	525.0	502.1	479.7	457.6	436.0	414.8	394.0	373.5	353.4
		FAT (°F)	110.3	117.7	125.0	132.1	139.2	146.1	152.9	159.6	166.2	172.7
60	307	OUTPUT (MBH)	547.8	525.7	504.0	482.7	461.8	441.3	421.2	401.1	382.0	362.9
		COND. (lbs/hr)	598.7	574.5	550.7	527.4	504.5	482.0	460.0	438.4	417.2	396.3
		FAT (°F)	119.5	127.0	134.3	141.5	148.6	155.6	162.5	169.2	175.9	182.4
80	324	OUTPUT (MBH)	579.5	557.0	534.9	513.3	492.1	471.2	450.8	430.7	410.9	391.5
		COND. (lbs/hr)	641.9	616.9	592.4	568.4	544.8	521.7	499.0	476.7	454.8	433.3
		FAT (°F)	127.3	134.8	142.2	149.5	156.7	163.7	170.6	177.5	184.2	190.8
100	338	OUTPUT (MBH)	605.7	582.8	560.5	538.5	517.0	495.9	475.2	454.8	434.8	415.2
		COND. (lbs/hr)	679.3	653.6	628.4	603.8	579.6	555.8	532.5	509.7	487.2	465.2
		FAT (°F)	133.8	141.4	148.8	156.2	163.4	170.4	177.4	184.3	191.0	197.7

Refer to the Ruffneck™ HP model for service above 100 psi. Above figures are based on calculations at sea level and are intended as reference material only. Results may vary due to customer applications.

Table 38 – Performance Data for FR1-30

Entering Steam Parameters		Entering Air Temperature °F										
psig	°F		-10	0	10	20	30	40	50	60	70	80
2	219	OUTPUT (MBH)	559.5	530.0	501.1	472.7	444.9	417.6	390.8	364.5	338.6	312.0
		COND. (lbs/hr)	573.7	543.4	513.7	484.6	456.1	428.1	400.6	373.6	347.1	321.0
		FAT (°F)	87.7	94.6	101.3	107.9	114.4	120.8	127.1	133.3	139.4	145.4
10	239	OUTPUT (MBH)	612.7	582.5	552.9	523.8	495.4	467.4	440.0	413.1	386.7	360.7
		COND. (lbs/hr)	637.5	606.0	575.2	544.9	515.3	486.2	457.7	429.7	402.1	375.1
		FAT (°F)	97.4	104.3	111.1	117.8	124.3	130.8	137.1	143.3	149.5	155.5
20	259	OUTPUT (MBH)	666.0	635.1	604.8	575.1	546.0	517.4	489.4	461.9	434.9	408.4
		COND. (lbs/hr)	701.7	669.1	637.1	605.8	575.1	545.0	515.4	486.4	458.0	430.0
		FAT (°F)	107.1	114.1	120.9	127.7	134.3	140.8	147.2	153.5	159.6	165.7
40	287	OUTPUT (MBH)	740.7	708.9	677.7	647.1	617.1	587.7	558.8	530.5	502.7	474.5
		COND. (lbs/hr)	796.8	762.5	728.9	695.9	663.6	631.9	600.9	570.4	540.5	511.1
		FAT (°F)	120.8	127.9	134.8	141.7	148.4	155.0	161.4	167.8	174.1	180.2
60	307	OUTPUT (MBH)	794.2	761.7	729.8	698.6	668.0	638.0	608.6	579.7	551.4	523.6
		COND. (lbs/hr)	869.5	833.8	798.8	764.6	731.1	698.2	665.9	634.4	603.2	572.8
		FAT (°F)	130.7	137.9	144.9	151.8	158.5	165.2	171.7	178.2	184.5	190.7
80	324	OUTPUT (MBH)	839.6	806.6	774.2	742.4	711.3	680.8	650.9	621.6	592.8	564.5
		COND. (lbs/hr)	931.7	894.9	858.9	823.6	789.0	755.1	721.9	689.3	657.3	625.9
		FAT (°F)	139.2	146.4	153.5	160.4	167.2	173.9	180.5	187.0	193.4	199.6
100	338	OUTPUT (MBH)	877.1	843.6	810.7	778.6	747.0	716.1	685.8	656.1	627.0	598.3
		COND. (lbs/hr)	985.5	947.7	910.7	874.5	839.0	804.2	770.1	736.7	703.9	671.7
		FAT (°F)	146.2	153.4	160.6	167.6	174.4	181.2	187.8	194.4	200.8	207.0

Refer to the Ruffneck™ HP model for service above 100 psi. For 50 Hz power supply, derate output by 10%.

Table 39 – Performance Data for FR1-36

Entering Steam Parameters		Entering Air Temperature °F										
psig	°F		-10	0	10	20	30	40	50	60	70	80
2	219	OUTPUT (MBH)	935.4	886.2	837.9	790.6	744.2	698.6	653.8	609.9	566.7	524.2
		COND. (lbs/hr)	961.3	910.7	861.1	812.4	764.7	717.8	671.8	626.6	582.2	538.6
		FAT (°F)	85.4	92.3	99.2	105.9	112.5	119.0	125.4	131.6	137.8	143.9
10	239	OUTPUT (MBH)	1025.0	974.2	924.8	876.3	828.8	782.1	736.3	691.3	647.2	603.8
		COND. (lbs/hr)	1069.0	1016.0	964.4	913.8	864.2	815.5	767.7	720.8	674.7	619.5
		FAT (°F)	94.8	101.8	108.7	115.5	122.1	128.7	135.1	141.5	147.7	153.8
20	259	OUTPUT (MBH)	1114.0	1062.0	1012.0	962.3	913.6	866.0	819.1	773.2	728.0	683.7
		COND. (lbs/hr)	1177.0	1122.0	1069.0	1016.0	964.7	914.3	864.9	816.3	687.6	721.8
		FAT (°F)	104.3	111.4	118.3	125.2	131.9	138.5	145.0	151.4	157.6	163.8
40	287	OUTPUT (MBH)	1239.0	1186.0	1134.0	1083.0	1033.0	983.7	935.6	888.3	841.8	796.2
		COND. (lbs/hr)	1337.0	1279.0	1223.0	1168.0	1114.0	1061.0	1009.0	957.5	907.4	858.2
		FAT (°F)	117.7	124.9	131.9	138.9	145.7	152.4	158.9	165.4	171.8	178.0
60	307	OUTPUT (MBH)	1329.0	1275.0	1222.0	1169.0	1118.0	1068.0	1019.0	970.7	923.4	876.9
		COND. (lbs/hr)	1459.0	1399.0	1341.0	1283.0	1227.0	1172.0	1118.0	1065.0	1013.0	961.9
		FAT (°F)	127.4	134.6	141.7	148.7	155.6	162.4	169.0	175.5	181.9	188.2
80	324	OUTPUT (MBH)	1405.0	1350.0	1296.0	1243.0	1191.0	1140.0	1090.0	1041.0	992.8	945.6
		COND. (lbs/hr)	1563.0	1502.0	1442.0	1382.0	1325.0	1268.0	1212.0	1158.0	1104.0	1051.0
		FAT (°F)	135.7	143.0	150.1	157.2	164.1	170.9	177.6	184.2	190.7	197.0
100	338	OUTPUT (MBH)	1468.0	1412.0	1357.0	1303.0	1251.0	1199.0	1149.0	1099.0	1050.0	1002.0
		COND. (lbs/hr)	1654.0	1591.0	1529.0	1468.0	1409.0	1350.0	1293.0	1237.0	1182.0	1128.0
		FAT (°F)	142.5	149.9	157.1	164.2	171.2	178.0	184.7	191.4	197.9	204.3

Refer to the Ruffneck™ HP model for service above 100 psi.

Above figures are based on calculations at sea level and are intended as reference material only. Results may vary due to customer applications.

Specifications

FR1-12

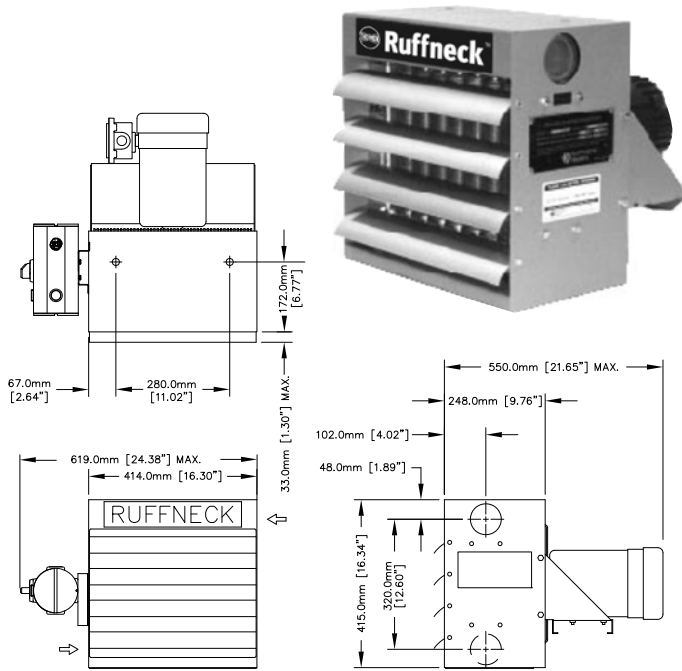


Figure 32

◇ Add 12 lbs (5.4 kg) to flange units * Add 15 lbs (6.8 kg) to disconnect units

General

Air Delivery*	997 CFM
Air Velocity*	1147 FPM
Air Throw*	40 ft @ 15 psi stream
Propeller Fan	3 Wing Aluminum, 12" (305 mm) Dia. x 5/8" (16 mm) Bore
Motor Requirements	1/2 HP, 1725 RPM, Frame 56 Rigid Base (Specify enclosure type, voltage, cycle and phase.)
Fan Guard	Welded, Wire, Powder Coated Epoxy 1/4" (6 mm) probe will not enter.
Hanger Connections	5/8" (16 mm) NC Tap - 2 holes
Cabinet Material	0.075" (2 mm) steel
Louvre Blades	Anodized Extruded Aluminum
Net Weight	75 lbs (34 kg) ◇ *
Shipping Weight	102 lbs (46.3 kg) ◇ *

Heat Exchanger

Tube Outside Dia.	0.625" (16 mm)
Tube Wall Thickness	0.065" (1.65 mm) Average
Tube Material	SA 214 Carbon Steel
Fin Material	1050 Aluminum
Fins Per Inch	10
Number of Tubes	13
Number of Rows	2
Number of Passes	1
Header Material	Min. 0.075" (2 mm) Steel
Inlet/Outlet	2" NPT Female
Max. Operating Press.	200 psi 80 psi for CSA Certified Steam Heaters
Max. Operating Temp.	650°F (343°C)

FR1-16

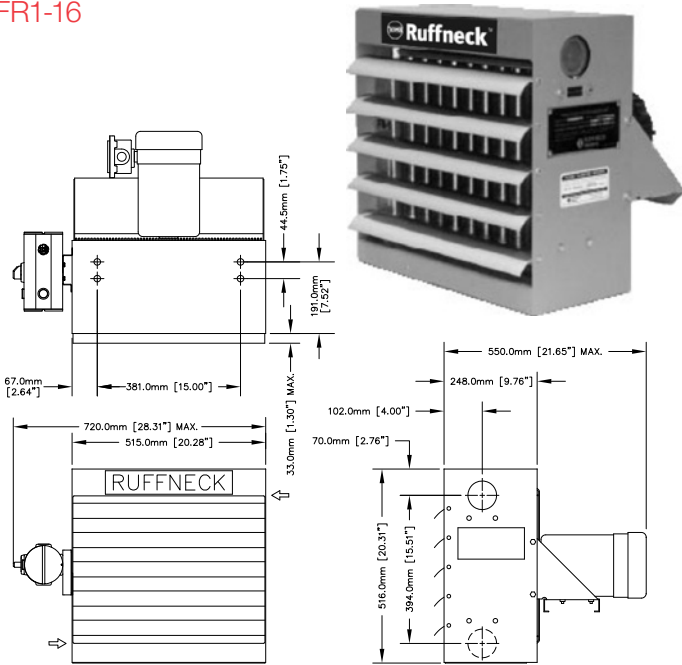


Figure 33

* At 70°F (21°C) at sea level

◇ Add 12 lbs (5.4 kg) to flange units * Add 15 lbs (6.8 kg) to disconnect units

General

Air Delivery*	1588 CFM
Air Velocity*	1069 FPM
Air Throw*	60 ft @ 15 psi stream
Propeller Fan	3 Wing Aluminum, 16" (406 mm) Dia. x 5/8" (16 mm) Bore
Motor Requirements	1/2 HP, 1725 RPM, Frame 56 Rigid Base (Specify enclosure type, voltage, cycle and phase.)
Fan Guard	Welded, Wire, Powder Coated Epoxy 1/4" (6 mm) probe will not enter.
Hanger Connections	5/8" (16 mm) NC Tap - 4 holes
Cabinet Material	0.075" (2 mm) steel
Louvre Blades	Anodized Extruded Aluminum
Net Weight	109 lbs (49.4 kg) ◇ *
Shipping Weight	137 lbs (62.1 kg) ◇ *

Heat Exchanger

Tube Outside Dia.	0.625" (16 mm)
Tube Wall Thickness	0.065" (1.65 mm) Average
Tube Material	SA 214 Carbon Steel
Fin Material	1050 Aluminum
Fins Per Inch	10
Number of Tubes	17
Number of Rows	2
Number of Passes	1
Header Material	Min. 0.075" (2 mm) Steel
Inlet/Outlet	2" NPT Female
Max. Operating Press.	200 psi

Max. Operating Temp. 572°F (300°C)

FR1-20

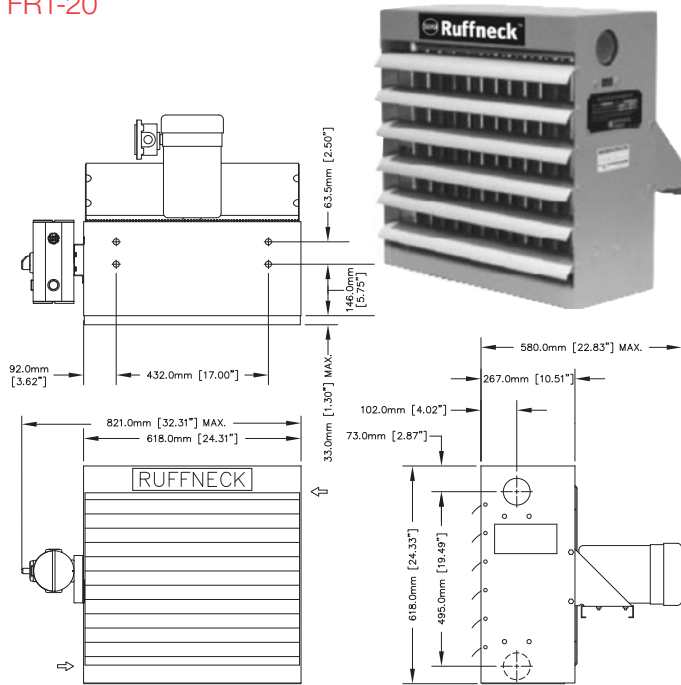


Figure 34

◇ Add 12 lbs (5.4 kg) to flange units * Add 15 lbs (6.8 kg) to disconnect units.

General

Air Delivery*	2780 CFM
Air Velocity*	1153 FPM
Air Throw*	65 ft @ 15 psi stream
Propeller Fan	3 Wing Aluminum, 20" (508 mm) Dia. x 5/8" (16 mm) Bore
Motor Requirements	1/2 HP, 1725 RPM, Frame 56 Rigid Base (Specify enclosure type, voltage, cycle and phase.)
Fan Guard	Welded, Wire, Powder Coated Epoxy 1/4" (6 mm) probe will not enter.
Hanger Connections	5/8" (16 mm) NC Tap - 4 holes
Cabinet Material	0.075" (2 mm) steel
Louvre Blades	Anodized Extruded Aluminum
Net Weight	138 lbs (62.6 kg) ◇ *
Shipping Weight	161 lbs (73 kg) ◇ *

Heat Exchanger

Tube Outside Dia.	0.625" (16 mm)
Tube Wall Thickness	0.065" (1.65 mm) Average
Tube Material	SA 214 Carbon Steel
Fin Material	1050 Aluminum
Fins Per Inch	10
Number of Tubes	21
Number of Rows	2
Number of Passes	1
Header Material	Min. 0.075" (2 mm) Steel
Inlet/Outlet	2" NPT Female
Max. Operating Press.	200 psi
Max. Operating Temp.	650°F (343°C)

FR1-24

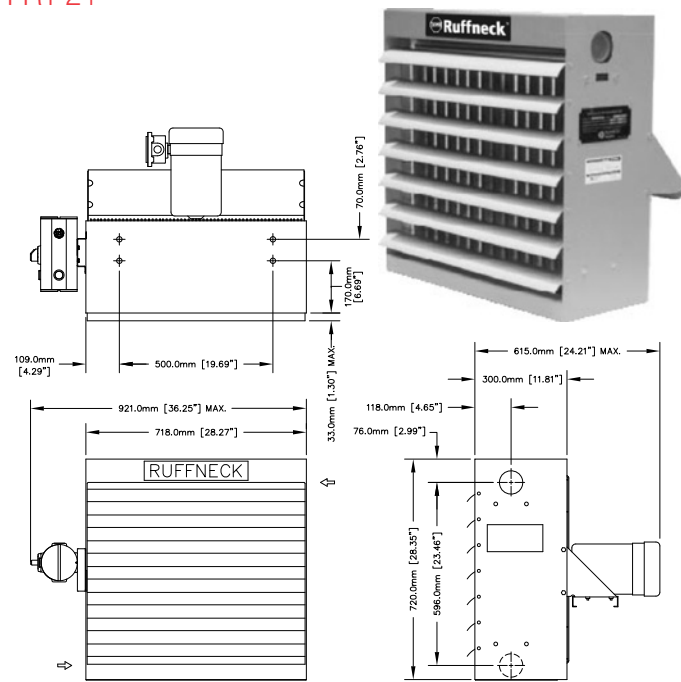


Figure 35

* At 70°F (21°C) at sea level

◇ Add 12 lbs (5.4 kg) to flange units * Add 15 lbs (6.8 kg) to disconnect units

General

Air Delivery*	3405 CFM
Air Velocity*	981 FPM
Air Throw*	70 ft @ 15 psi stream
Propeller Fan	3 Wing Aluminum, 24" (610 mm) Dia. x 5/8" (16 mm) Bore
Motor Requirements	1/2 HP, 1725 RPM, Frame 56 Rigid Base (Specify enclosure type, voltage, cycle and phase.)
Fan Guard	Welded, Wire, Powder Coated Epoxy 7/16" (11 mm) probe will not enter.
Hanger Connections	5/8" (16 mm) NC Tap - 4 holes
Cabinet Material	0.075" (2 mm) steel
Louvre Blades	Anodized Extruded Aluminum
Net Weight	191 lbs (86.6 kg) ◇ *
Shipping Weight	224 lbs (101.6 kg) ◇ *

Heat Exchanger

Tube Outside Dia.	0.625" (16 mm)
Tube Wall Thickness	0.065" (1.65 mm) Average
Tube Material	SA 214 Carbon Steel
Fin Material	1050 Aluminum
Fins Per Inch	10
Number of Tubes	38
Number of Rows	3
Number of Passes	1
Header Material	Min. 0.075" (2 mm) Steel
Inlet/Outlet	2" NPT Female
Max. Operating Press.	200 psi 100 psi for CSA Certified Steam Heaters
Max. Operating Temp.	650°F (343°C)

FR1-30

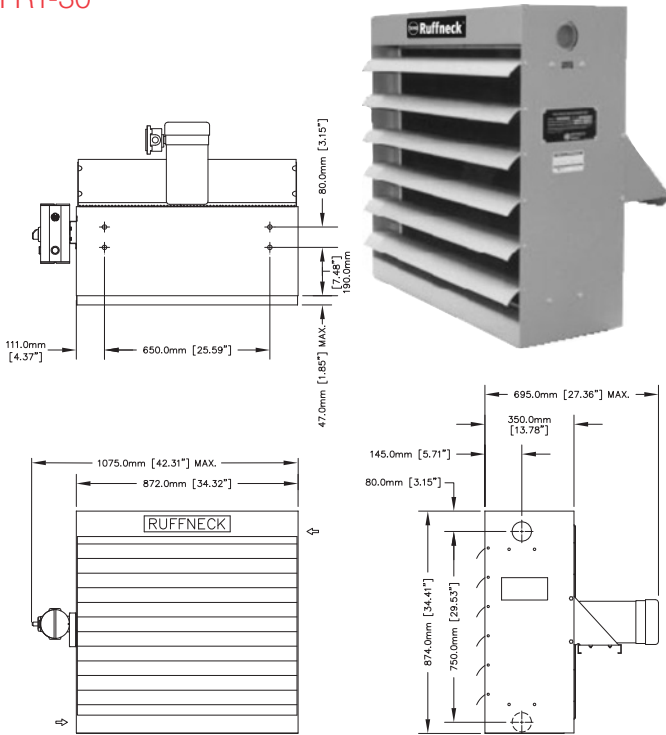


Figure 36

◇ Add 12 lbs (5.4 kg) to flange units * Add 15 lbs (6.8 kg) to disconnect units

General

Air Delivery*	4569 CFM
Air Velocity*	814 FPM
Air Throw*	70 ft @ 15 psi stream
Propeller Fan	3 Wing Aluminum, 30" (762 mm) Dia. x 5/8" (16 mm) Bore
Motor Requirements	3/4 HP, 1140 RPM, Frame 56 Rigid Base (Specify enclosure type, voltage, cycle and phase.)
Fan Guard	Welded, Wire, Powder Coated Epoxy 7/16" (11 mm) probe will not enter.
Hanger Connections	5/8" (16 mm) NC Tap - 4 holes
Cabinet Material	0.075" (2 mm) steel
Louvre Blades	Anodized Extruded Aluminum
Net Weight	286 lbs (121.6 kg) ◇ *
Shipping Weight	345 lbs (156.5 kg) ◇ *

Heat Exchanger

Tube Outside Dia.	0.625" (16 mm)
Tube Wall Thickness	0.065" (1.65 mm) Average
Tube Material	SA 214 Carbon Steel
Fin Material	1050 Aluminum
Fins Per Inch	10
Number of Tubes	47
Number of Rows	3
Number of Passes	1
Header Material	Min. 0.075" (2 mm) Steel
Inlet/Outlet	2" NPT Female
Max. Operating Press.	200 psi 80 psi for CSA Certified Steam Heaters
Max. Operating Temp.	650°F (343°C)

FR1-36

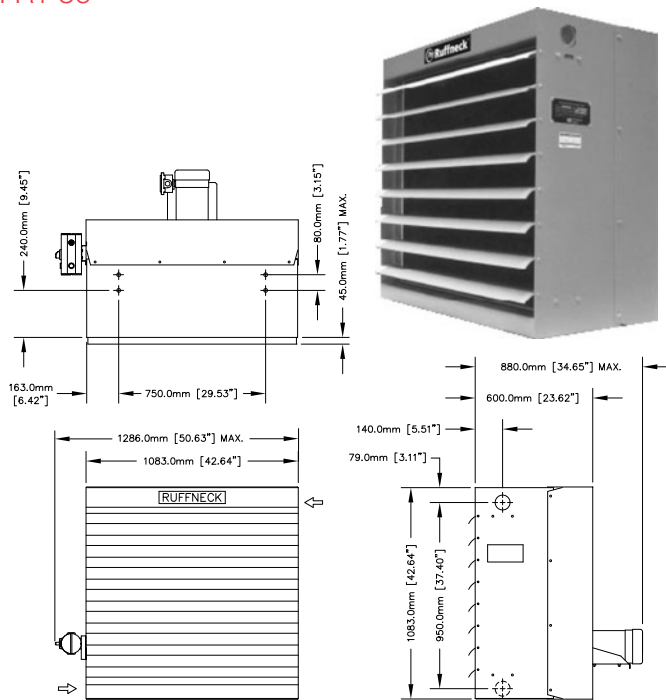


Figure 37

◇ Add 12 lbs (5.4 kg) to flange units * Add 15 lbs (6.8 kg) to disconnect units.

General

Air Delivery*	7830 CFM
Air Velocity*	852 FPM
Air Throw*	65 ft @ 15 psi stream
Propeller Fan	6 Wing Aluminum, 36" (914 mm) Dia. x 1" (25mm) Bore
Motor Requirements	1½ HP, 1725 RPM, Frame 56 Rigid Base (Specify enclosure type, voltage, cycle and phase.)
Drive Pulley	B3.6"
Driven Pulley	B9.9"
Drive Belt	B42 V-Belt
Fan Speed	627 RPM
Fan Guard	Steel, Powder Coated Epoxy, 1/2" (13 mm) gap
Hanger Connections	5/8" (16 mm) NC Tap - 4 holes
Cabinet Material	0.105" (2.66 mm) steel
Louvre Blades	Anodized Extruded Aluminum
Net Weight	534 lbs (242.2 kg) ◇ *
Shipping Weight	597 lbs (270.8 kg) ◇ *

Heat Exchanger

Tube Outside Dia.	0.625" (16 mm)
Tube Wall Thickness	0.065" (1.65 mm) Average
Tube Material	SA 214 Carbon Steel
Fin Material	1050 Aluminum
Fins Per Inch	10
Number of Tubes	59
Number of Rows	3
Number of Passes	1
Header Material	Min. 0.075" (2 mm) Steel
Inlet/Outlet	2" NPT Female
Max. Operating Press.	200 psi 85 psi for CSA Certified Steam Heaters
Max. Operating Temp.	650°F (343°C)

HP Series Heat Exchanger Unit Heater

Ruffneck™ HP Heat Exchanger Unit Heaters are extra heavy duty (including heavy gauge steel construction) to meet the most demanding service and long life requirements for rugged industrial applications, such as space heating and liquid cooling. The HP Series heaters are suitable for a wide range of heating fluids including steam, hot water, glycol, oil, etc. Explosion-proof models suitable for hazardous locations are available on custom order.

Engineered for ease of maintenance, all parts are easily removed. All fasteners are plated capscrews; no sheet metal screws are used. Heat exchanger cores are of steel construction with tension wound, close fitting aluminium fins. They are resistant to corrosive agents (including hydrogen sulfide).

All units are equipped with a narrow-gap, epoxy coated fan guard. Choose from several optional UL listed and/or CSA approved motors with various voltages, phases and frequencies. All HP models have Canadian CRN approvals and are CSA certified for hazardous locations: Class I, Division 1 & 2, Groups c & d; Class II, Division 1 & 2, Groups E, F, & G; Class III, Division 1 & 2; Temperature Code T3B 329°F (165°C) - (on applicable models only).

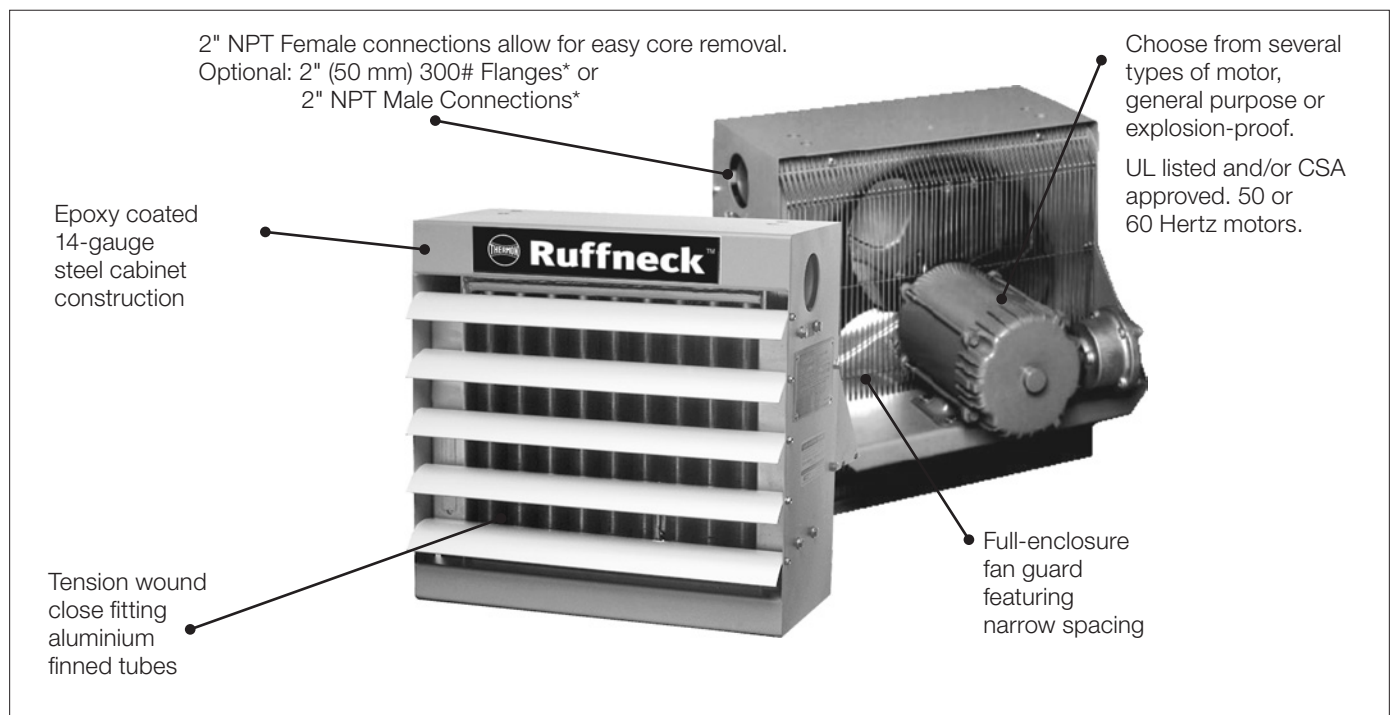
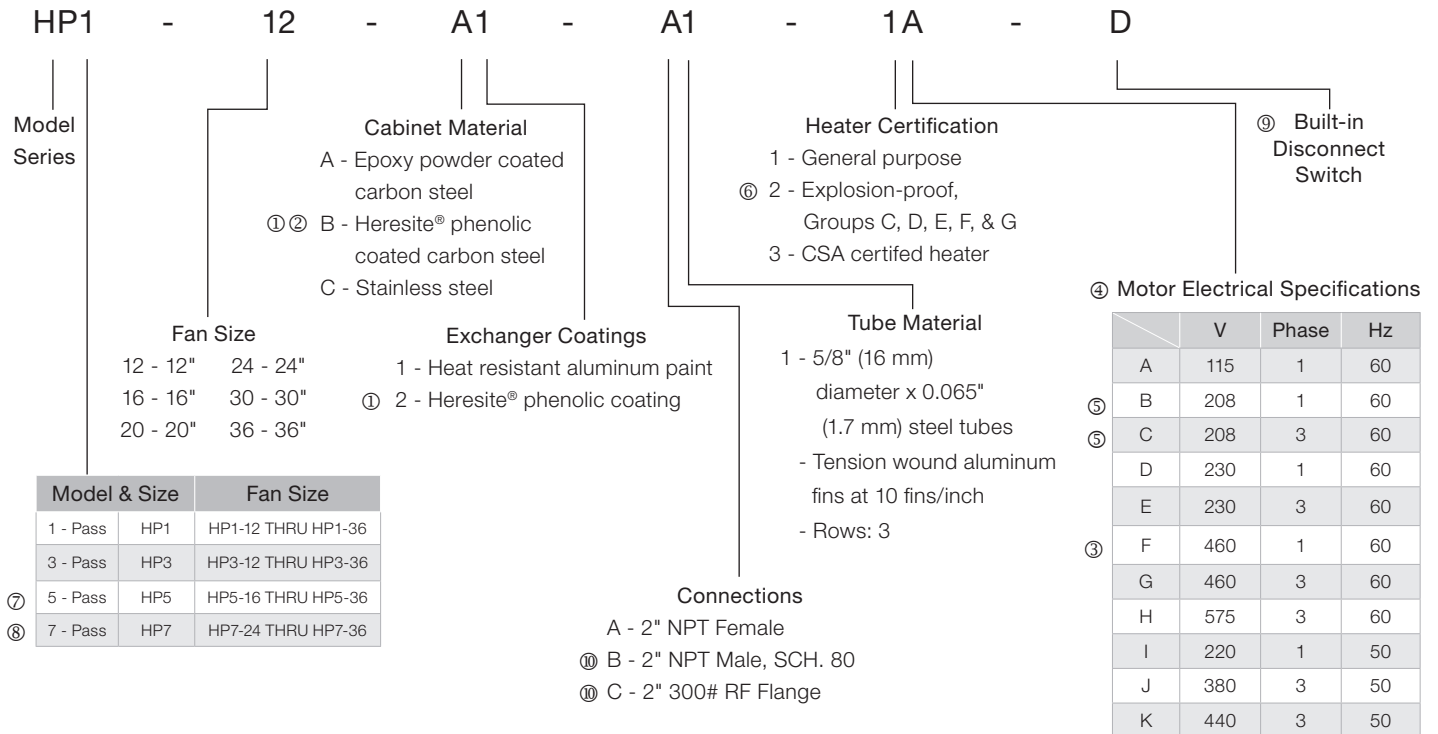


Figure 38

Note: Heresite® is a registered trademark of Heresite® Protective Coatings Inc.

Note: * 2" 300# Flanges and 2" NPT Male Connections increase difficulty in core removal.

Model Coding



NOTE:

Ruffneck™ utilizes Doerr/Emerson/Baldor as our standard motor. Specifying any other O.E.M. motor may result in longer lead times. All heat exchangers are registered to C.R.N. OH0224.2C.

They are approved for use in all provinces and territories in Canada.

- ① Heresite® coated exchangers and cabinets: contact factory for quote.
- ② Louvres and fan blades are also Heresite® coated.
- ③ Contact factory for shipping lead time.
- ④ Motor designed to be used at rated voltage with tolerances of ±15%.
- ⑤ Motor may be marked 230V, but is suitable for 208V operation.
- ⑥ 460 1 phase motors are only certified for groups D, F & G.
- ⑦ Only available in 16" and larger units.
- ⑧ Only available in 24" and larger units.
- ⑨ Built-in Disconnect only available with CSA certified heaters.
- ⑩ Not available on 36" units.

HP Single-Pass & Multi-Pass

The HP Series is designed for pressures up to 400 psi (on select models). These units have semicircular headers that can withstand high operating pressures for steam or liquid service. The HP series is available in single-pass and multi-pass configurations. Single-pass units are desirable for high flow rate liquid service requiring a low pressure drop or for steam applications. Multi-pass units are intended for liquid service only. They are baffled in the top and bottom headers such that the heat transfer liquid will flow through groups of tubes in series within the core. This causes the liquid to travel a longer distance at a higher velocity, thereby increasing the heat transfer rate due to increased turbulence. Units with the greatest number of tube-side passes will always have the highest heat output, but will also have the highest pressure drop. Depending on the application, an HP model in a one, three, five, or seven pass core configuration may be recommended.

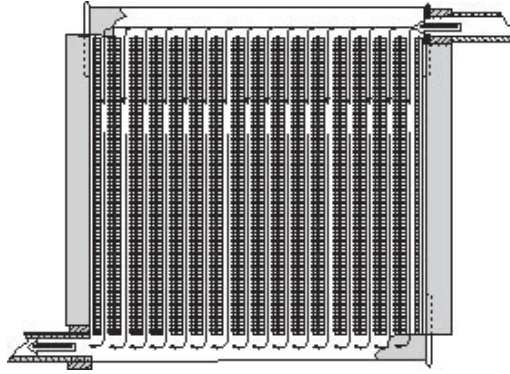


Figure 39

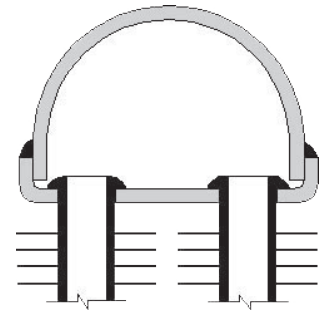


Figure 40 – HP Series heater shape

Single-Pass for HP Series

Typical single-pass heat exchanger configurations are available HP series units. Note that the fluid flow is divided among all tubes. This is best suited to steam and high flow rate liquid applications.

Multi-Pass for HP Series

Note that the flow is baffled into groups of tubes to increase fluid velocity and thermal efficiency. Suitable for liquid service only.

Optional Built-in Disconnect Available

The Ruffneck™ Disconnect Switch is engineered for use in the most demanding applications such as drilling rigs, utilidors and compression stations where high vibration, dirt, moisture, fluctuating power and high impact conditions exist. The Built-in Disconnect Switch is available on all Ruffneck™ HP heaters.

Table 40 – Performance Data for HP1-12

Entering Steam Parameters			Entering Air Temperature °F									
psig	°F		-10	0	10	20	30	40	50	60	70	80
2	219	OUTPUT (MBH) COND. (lbs/hr) FAT (°F)	-	-	-	57.3 57.9 67.4	54.1 54.6 75.7	50.8 51.4 83.8	47.7 48.2 91.9	44.6 45.0 100.0	41.5 41.9 107.9	38.4 38.8 115.8
10	239	OUTPUT (MBH) COND. (lbs/hr) FAT (°F)	-	-	-	63.7 65.3 72.7	60.4 61.8 81.0	57.1 58.5 89.3	53.8 55.2 97.4	50.6 51.9 105.5	47.5 48.7 113.5	44.4 45.5 121.4
20	259	OUTPUT (MBH) COND. (lbs/hr) FAT (°F)	-	-	73.6 76.3 69.7	70.1 72.7 78.1	66.7 69.2 86.5	63.3 65.7 94.7	60.0 62.3 102.9	56.8 58.9 111.0	53.6 55.5 119.1	50.4 52.3 127.1
40	287	OUTPUT (MBH) COND. (lbs/hr) FAT (°F)	-	86.3 91.4 68.7	82.7 87.5 77.2	79.1 83.8 85.7	75.6 80.0 94.1	72.2 76.4 102.5	68.8 72.8 110.7	65.4 69.2 118.9	62.2 65.7 127.0	58.9 62.3 135.1
60	307	OUTPUT (MBH) COND. (lbs/hr) FAT (°F)	96.7 104.2 65.4	92.9 100.1 74.0	89.3 96.1 82.7	85.6 92.2 91.2	82.1 88.3 99.7	78.6 84.5 108.0	75.1 80.8 116.3	71.7 77.1 124.6	68.3 73.5 132.7	65.0 69.9 140.8
80	324	OUTPUT (MBH) COND. (lbs/hr) FAT (°F)	102.4 111.8 69.9	98.6 107.6 78.6	94.9 103.5 87.3	91.2 99.4 95.9	87.5 95.5 104.4	84.0 91.6 112.8	80.5 87.7 121.2	77.0 83.9 129.4	73.6 80.2 137.6	70.2 76.5 145.8
100	338	OUTPUT (MBH) COND. (lbs/hr) FAT (°F)	107.1 118.3 73.6	103.3 114.1 82.4	99.5 109.8 91.1	95.7 105.7 99.7	92.1 101.6 108.3	88.5 97.6 16.8	84.9 93.7 125.1	81.4 89.8 133.5	77.9 86.0 141.7	74.5 82.2 149.9
150	366	OUTPUT (MBH) COND. (lbs/hr) FAT (°F)	116.6 132.2 81.2	112.6 127.7 90.1	108.8 123.3 98.8	104.9 118.9 107.5	101.2 114.6 116.2	97.5 110.4 124.7	93.8 106.3 133.2	90.3 102.2 141.6	86.7 98.2 149.9	83.3 94.2 158.1
200	387	OUTPUT (MBH) COND. (lbs/hr) FAT (°F)	123.7 143.3 86.9	119.7 138.6 95.8	115.8 134.0 104.7	111.9 129.5 113.4	108.0 125.0 122.1	104.3 120.7 130.7	100.6 116.3 139.2	96.9 112.1 147.7	93.3 107.9 156.0	89.8 103.8 164.3
250	406	OUTPUT (MBH) COND. (lbs/hr) FAT (°F)	130.2 154.1 92.1	126.1 149.2 101.0	122.1 144.4 109.9	118.1 139.7 118.8	114.3 135.1 127.5	110.4 130.5 136.2	106.7 126.0 144.7	103.0 121.6 153.2	99.3 117.3 161.7	95.8 113.0 170.0

For applications over 250 psi, please contact the factory. For 50 Hz power supply, derate output by 10%

Table 41 – Performance Data for HP1-16

Entering Steam Parameters			Entering Air Temperature °F									
psig	°F		-10	0	10	20	30	40	50	60	70	80
2	219	OUTPUT (MBH) COND. (lbs/hr) FAT (°F)	-	-	-	95.3 96.8 69.8	89.8 91.2 77.9	84.5 85.8 86.0	79.2 80.4 94.0	74.0 75.2 101.9	68.9 70.0 109.8	63.8 64.8 117.6
10	239	OUTPUT (MBH) COND. (lbs/hr) FAT (°F)	-	-	111.5 114.8 67.1	105.8 109.0 75.3	100.3 103.3 83.5	94.8 97.6 91.7	89.4 92.1 99.7	84.1 86.6 107.7	78.9 81.2 115.6	73.7 75.9 123.4
20	259	OUTPUT (MBH) COND. (lbs/hr) FAT (°F)	-	-	122.2 127.4 72.7	116.4 121.4 81.0	100.7 115.5 89.2	105.2 109.6 97.4	99.7 103.9 105.5	94.2 98.2 113.5	88.9 92.7 121.4	83.6 87.2 129.3
40	287	OUTPUT (MBH) COND. (lbs/hr) FAT (°F)	-	143.3 152.6 72.1	137.3 146.1 80.5	131.4 139.8 88.9	125.5 133.6 97.2	119.8 127.4 105.5	114.1 121.4 113.6	108.5 115.5 121.7	103.1 109.6 129.7	97.6 103.9 137.7
60	307	OUTPUT (MBH) COND. (lbs/hr) FAT (°F)	160.5 173.9 69.1	154.3 167.1 77.7	148.1 160.4 86.2	142.1 153.9 94.7	136.1 147.4 103.0	130.3 141.0 111.3	124.5 134.8 119.5	118.8 128.6 127.7	113.2 122.6 135.7	107.7 116.6 143.7
80	324	OUTPUT (MBH) COND. (lbs/hr) FAT (°F)	170.0 186.6 73.8	163.6 179.6 82.5	157.4 172.7 91.1	151.2 165.9 99.6	145.2 159.3 108.0	139.2 152.7 116.3	133.4 146.2 124.6	127.6 140.0 132.7	121.9 133.7 140.8	116.4 127.6 148.9
100	338	OUTPUT (MBH) COND. (lbs/hr) FAT (°F)	177.8 197.6 77.8	171.3 190.4 86.5	165.0 183.3 95.1	158.8 176.4 103.6	152.7 169.5 112.1	146.6 162.8 120.4	140.7 156.2 128.7	134.9 149.7 136.9	129.1 143.3 145.1	123.5 137.0 153.1
150	366	OUTPUT (MBH) COND. (lbs/hr) FAT (°F)	193.4 220.6 85.7	186.8 213.0 94.4	180.3 205.6 103.1	173.9 198.3 111.8	167.7 191.1 120.3	161.5 184.1 128.7	155.4 177.1 137.1	149.5 170.3 145.4	143.6 163.6 153.6	137.8 157.0 161.8
200	387	OUTPUT (MBH) COND. (lbs/hr) FAT (°F)	205.1 239.2 91.6	198.4 231.3 100.5	191.8 223.6 109.2	185.3 216.0 117.9	179.0 208.5 126.5	172.7 201.1 135.0	166.5 194.0 143.5	160.4 186.8 151.8	154.5 179.8 160.1	148.6 172.9 168.3
250	406	OUTPUT (MBH) COND. (lbs/hr) FAT (°F)	215.8 257.0 97.0	209.0 248.8 106.0	202.3 240.8 114.8	195.7 232.9 123.5	189.2 225.2 132.2	182.9 217.5 140.7	176.6 210.1 149.2	170.4 202.7 157.6	164.4 195.4 166.0	158.4 188.3 174.2

Above figures are based on calculations at sea level and are intended as reference material only. Results may vary due to customer applications.

Table 42 – Performance Data for HP1-20

Entering Steam Parameters			Entering Air Temperature °F									
psig	°F		-10	0	10	20	30	40	50	60	70	80
2	219	OUTPUT (MBH)	–	–	–	161.1	151.9	142.9	134.0	125.2	116.5	108.0
		COND. (lbs/hr)	–	–	–	164.4	155.0	145.8	136.7	127.8	119.0	110.2
		FAT (°F)	–	–	–	68.3	76.5	84.6	92.7	100.7	108.6	116.5
10	239	OUTPUT (MBH)	–	–	188.4	178.9	169.5	160.3	151.2	142.2	133.4	124.7
		COND. (lbs/hr)	–	–	195.2	185.3	175.6	166.0	156.6	147.3	138.1	129.7
		FAT (°F)	–	–	65.4	73.7	82.0	90.1	98.3	106.3	114.3	122.2
20	259	OUTPUT (MBH)	–	–	206.6	196.9	187.3	177.9	168.6	159.4	150.4	141.5
		COND. (lbs/hr)	–	–	216.7	206.4	196.4	186.5	176.7	167.1	157.7	148.3
		FAT (°F)	–	–	70.8	79.2	87.5	95.7	103.9	112.0	120.0	128.0
40	287	OUTPUT (MBH)	–	242.3	232.2	222.2	212.3	202.6	193.0	183.7	174.4	165.3
		COND. (lbs/hr)	–	259.4	248.5	237.8	227.2	216.8	206.6	196.5	186.6	176.8
		FAT (°F)	–	69.9	78.5	86.9	95.3	103.6	111.8	120.0	128.0	136.0
60	307	OUTPUT (MBH)	271.4	260.9	250.5	240.3	230.3	220.4	210.7	201.1	191.6	182.3
		COND. (lbs/hr)	295.7	284.2	272.9	261.7	250.8	240.0	229.4	218.9	208.6	198.5
		FAT (°F)	66.7	75.4	84.0	92.5	100.9	109.3	117.5	125.7	133.9	141.9
80	324	OUTPUT (MBH)	287.4	276.7	266.1	255.8	245.6	235.6	225.7	216.0	206.4	196.9
		COND. (lbs/hr)	317.4	305.5	293.8	282.3	271.1	260.0	249.0	238.3	227.7	217.3
		FAT (°F)	71.4	80.1	88.7	97.3	105.7	114.1	122.4	130.7	138.9	146.9
100	338	OUTPUT (MBH)	300.6	289.7	279.1	268.6	258.2	248.1	238.1	228.2	218.5	209.0
		COND. (lbs/hr)	336.0	323.9	311.9	300.1	288.6	277.2	266.0	255.0	244.1	233.4
		FAT (°F)	75.2	83.9	92.6	101.2	109.7	118.1	126.5	134.8	143.0	151.1
150	366	OUTPUT (MBH)	327.0	315.9	305.0	294.2	283.6	273.2	263.0	252.9	243.0	233.2
		COND. (lbs/hr)	375.4	362.6	350.0	337.6	325.4	313.5	301.7	290.1	278.7	267.4
		FAT (°F)	82.9	91.7	100.5	109.1	117.7	126.2	134.7	143.0	151.3	159.5
200	387	OUTPUT (MBH)	346.9	335.6	324.5	313.5	302.8	292.2	281.8	271.5	261.4	251.5
		COND. (lbs/hr)	407.1	398.7	380.6	367.7	355.0	342.6	330.3	318.3	306.4	294.7
		FAT (°F)	88.7	97.6	106.4	115.1	123.8	132.3	140.8	149.3	157.6	165.8
250	406	OUTPUT (MBH)	365.0	353.4	342.1	331.1	320.1	309.4	298.8	288.4	278.1	268.0
		COND. (lbs/hr)	437.5	423.6	410.0	396.6	383.5	370.6	357.9	345.3	333.0	320.9
		FAT (°F)	93.9	102.9	111.8	120.6	129.3	137.9	146.5	154.9	163.3	171.6

For applications over 250 psi, please contact the factory. For 50 Hz power supply, derate output by 10%.

Table 43 – Performance Data for HP1-24

Entering Steam Parameters			Entering Air Temperature °F									
psig	°F		-10	0	10	20	30	40	50	60	70	80
2	219	OUTPUT (MBH)	384.4	364.4	344.7	325.4	306.4	287.7	269.4	251.4	233.7	216.3
		COND. (lbs/hr)	393.6	373.0	352.8	333.0	313.6	294.5	275.7	257.3	239.2	221.3
		FAT (°F)	79.7	86.0	93.9	100.9	107.7	114.4	121.1	127.6	134.0	140.3
10	239	OUTPUT (MBH)	421.4	400.9	380.7	360.9	341.5	322.4	303.6	285.2	267.1	249.3
		COND. (lbs/hr)	437.8	416.4	395.4	374.9	354.7	334.8	315.3	296.2	277.4	258.8
		FAT (°F)	88.6	95.8	103.0	110.0	116.9	123.6	130.3	136.9	143.4	149.7
20	259	OUTPUT (MBH)	458.5	437.5	416.9	396.6	376.7	357.2	338.1	319.2	300.7	282.5
		COND. (lbs/hr)	482.3	460.1	438.4	417.1	396.2	375.6	355.4	335.6	316.1	297.0
		FAT (°F)	97.6	104.9	112.1	119.1	126.1	132.9	139.7	146.3	152.8	159.2
40	287	OUTPUT (MBH)	510.6	488.9	467.6	446.8	426.3	406.2	386.5	367.1	348.0	329.3
		COND. (lbs/hr)	548.3	525.0	502.1	479.7	457.6	436.0	414.8	394.0	373.5	353.4
		FAT (°F)	110.3	117.7	125.0	132.1	139.2	146.1	152.9	159.6	166.2	172.7
60	307	OUTPUT (MBH)	547.8	525.7	504.0	482.7	461.8	441.3	421.2	401.1	382.0	362.9
		COND. (lbs/hr)	598.7	574.5	550.7	527.4	504.5	482.0	460.0	438.4	417.2	396.3
		FAT (°F)	119.5	127.0	134.3	141.5	148.6	155.6	162.5	169.2	175.9	182.4
80	324	OUTPUT (MBH)	579.5	557.0	534.9	513.3	492.1	471.2	450.8	430.7	410.9	391.5
		COND. (lbs/hr)	641.9	616.9	592.4	568.4	544.8	521.7	499.0	476.7	454.8	433.3
		FAT (°F)	127.3	134.8	142.2	149.5	156.7	163.7	170.6	177.5	184.2	190.8
100	338	OUTPUT (MBH)	605.7	582.8	560.5	538.5	517.0	495.9	475.2	454.8	434.8	415.2
		COND. (lbs/hr)	679.3	653.6	628.4	603.8	579.6	555.8	532.5	509.7	487.2	465.2
		FAT (°F)	133.8	141.4	148.8	156.2	163.4	170.4	177.4	184.3	191.0	197.7
150	366	OUTPUT (MBH)	658.0	634.6	611.6	589.1	567.0	545.4	524.1	503.2	482.7	462.6
		COND. (lbs/hr)	757.8	730.7	704.2	678.2	652.7	627.7	603.2	579.1	555.4	532.2
		FAT (°F)	146.9	154.5	162.1	169.5	176.8	184.0	191.1	198.0	204.9	211.6
200	387	OUTPUT (MBH)	697.3	673.4	650.0	627.1	604.6	582.5	560.9	539.6	518.6	498.3
		COND. (lbs/hr)	820.9	792.7	765.0	737.9	711.4	685.3	659.8	634.7	610.0	585.9
		FAT (°F)	156.7	164.5	172.1	179.6	187.0	194.3	201.4	208.4	215.4	222.1
250	406	OUTPUT (MBH)	732.9	708.6	684.8	661.5	638.6	616.2	594.2	572.6	551.4	530.6
		COND. (lbs/hr)	881.5	852.2	823.5	795.3	767.7	740.7	714.1	688.1	662.5	637.4
		FAT (°F)	165.7	173.5	181.3	188.8	196.3	203.6	210.8	217.9	224.9	231.8

Above figures are based on calculations at sea level and are intended as reference material only. Results may vary due to customer applications.

Table 44 – Performance Data for HP1-30

Entering Steam Parameters			Entering Air Temperature °F									
psig	°F		-10	0	10	20	30	40	50	60	70	80
2	219	OUTPUT (MBH)	559.5	530.0	501.1	472.7	444.9	417.6	390.8	364.5	338.6	331.2
		COND. (lbs/hr)	573.7	543.4	513.7	484.6	456.1	428.1	400.6	373.6	347.1	321.0
		FAT (°F)	87.7	94.6	101.3	107.9	114.4	120.8	127.1	133.3	139.4	145.4
10	239	OUTPUT (MBH)	612.7	582.5	552.9	523.8	495.4	467.4	440.0	413.1	386.7	360.7
		COND. (lbs/hr)	637.5	606.0	575.2	544.9	515.3	486.2	457.7	429.7	402.1	375.1
		FAT (°F)	97.4	104.3	111.1	117.8	124.3	130.8	137.1	143.3	149.5	155.5
20	259	OUTPUT (MBH)	666.0	635.1	604.8	575.1	546.0	517.4	489.4	461.9	434.9	408.4
		COND. (lbs/hr)	701.7	669.1	637.1	605.8	575.1	545.0	515.4	486.4	458.0	430.0
		FAT (°F)	107.1	114.1	120.9	127.7	134.3	140.8	147.2	153.5	159.6	165.7
40	287	OUTPUT (MBH)	740.7	708.9	677.7	647.1	617.1	587.7	558.8	530.5	502.7	474.5
		COND. (lbs/hr)	796.8	762.5	728.9	695.9	663.6	631.9	600.9	570.4	540.5	511.1
		FAT (°F)	120.8	127.9	134.8	141.7	148.4	155.0	161.4	167.8	174.1	180.2
60	307	OUTPUT (MBH)	794.2	761.7	729.8	698.6	668.0	638.0	608.6	579.7	551.4	523.6
		COND. (lbs/hr)	869.5	833.8	798.8	764.6	731.1	698.2	665.9	634.4	603.2	572.8
		FAT (°F)	130.7	137.9	144.9	151.8	158.5	165.2	171.7	178.2	184.5	190.7
80	324	OUTPUT (MBH)	839.6	806.6	774.2	742.4	711.3	680.8	650.9	621.6	592.8	564.5
		COND. (lbs/hr)	931.7	894.9	858.9	823.6	789.0	755.1	721.9	689.3	657.3	625.9
		FAT (°F)	139.2	146.4	153.5	160.4	167.2	173.9	180.5	187.0	193.4	199.6
100	338	OUTPUT (MBH)	877.1	843.6	810.7	778.6	747.0	716.1	685.8	656.1	627.0	598.3
		COND. (lbs/hr)	985.5	947.7	910.7	874.5	839.0	804.2	770.1	736.7	703.9	671.7
		FAT (°F)	146.2	153.4	160.6	167.6	174.4	181.2	187.8	194.4	200.8	207.0
150	366	OUTPUT (MBH)	952.0	917.6	883.9	850.9	818.6	786.9	755.8	725.3	695.4	666.1
		COND. (lbs/hr)	1099.0	1059.0	1020.0	981.5	944.1	907.4	871.5	836.3	801.7	767.8
		FAT (°F)	160.3	167.6	174.9	182.0	189.0	195.8	202.5	209.2	215.7	222.0
200	387	OUTPUT (MBH)	1008.0	973.2	938.9	905.2	872.3	840.0	808.4	777.3	746.9	717.0
		COND. (lbs/hr)	1189.0	1148.0	1107.0	1067.0	1028.0	990.2	952.8	916.1	880.1	844.8
		FAT (°F)	170.9	178.4	185.7	192.9	199.9	206.8	213.7	220.3	226.9	233.4
250	406	OUTPUT (MBH)	1059.0	1024.0	988.6	954.4	920.9	888.1	855.9	824.4	793.5	763.1
		COND. (lbs/hr)	1277.0	1233.0	1191.0	1150.0	1109.0	1070.0	1031.0	992.7	955.3	918.7
		FAT (°F)	180.6	188.1	195.5	202.8	209.9	216.9	223.8	230.5	237.2	243.7

Note: For applications over 250 psi, please contact the factory. For 50 Hz power supply, derate output by 10%.

Table 45 – Performance Data for HP1-36

Entering Steam Parameters			Entering Air Temperature °F									
psig	°F		-10	0	10	20	30	40	50	60	70	80
2	219	OUTPUT (MBH)	935.4	886.2	837.9	790.6	744.2	698.6	653.8	609.9	566.7	524.2
		COND. (lbs/hr)	961.3	910.7	861.1	812.4	764.7	717.8	671.8	626.6	582.2	538.6
		FAT (°F)	85.4	92.3	99.2	105.9	112.5	119.0	125.4	131.6	137.8	143.9
10	239	OUTPUT (MBH)	1025.0	974.2	924.8	876.3	828.8	782.1	736.3	691.3	647.2	603.8
		COND. (lbs/hr)	1069.0	1016.0	964.4	913.8	864.2	815.5	767.7	720.8	674.7	619.5
		FAT (°F)	94.8	101.8	108.7	115.5	122.1	128.7	135.1	141.5	147.7	153.8
20	259	OUTPUT (MBH)	1114.0	1062.0	1012.0	962.3	913.6	866.0	819.1	773.2	728.0	683.7
		COND. (lbs/hr)	1177.0	1122.0	1069.0	1018.0	964.7	914.3	864.9	816.3	768.6	721.8
		FAT (°F)	104.3	111.4	118.3	125.2	131.9	138.5	145.0	151.4	157.6	163.8
40	287	OUTPUT (MBH)	1239.0	1186.0	1134.0	1083.0	1033.0	983.7	935.6	888.3	841.8	796.2
		COND. (lbs/hr)	1337.0	1279.0	1223.0	1168.0	1114.0	1061.0	1009.0	957.5	907.4	858.2
		FAT (°F)	117.7	124.9	131.9	138.9	145.7	152.4	158.9	165.4	171.8	178.0
60	307	OUTPUT (MBH)	1329.0	1275.0	1222.0	1169.0	1118.0	1068.0	1019.0	970.7	923.4	876.9
		COND. (lbs/hr)	1459.0	1399.0	1341.0	1283.0	1227.0	1172.0	1118.0	1065.0	1013.0	961.9
		FAT (°F)	127.4	134.6	141.7	148.7	155.6	162.4	169.0	175.5	181.9	188.2
80	324	OUTPUT (MBH)	1405.0	1350.0	1296.0	1243.0	1191.0	1140.0	1090.0	1041.0	992.8	945.6
		COND. (lbs/hr)	1563.0	1502.0	1442.0	1382.0	1325.0	1268.0	1212.0	1158.0	1104.0	1051.0
		FAT (°F)	135.7	143.0	150.1	157.2	164.1	170.9	177.6	184.2	190.7	197.0
100	338	OUTPUT (MBH)	1468.0	1412.0	1357.0	1303.0	1251.0	1199.0	1149.0	1099.0	1050.0	1002.0
		COND. (lbs/hr)	1654.0	1591.0	1529.0	1468.0	1409.0	1350.0	1293.0	1237.0	1182.0	1128.0
		FAT (°F)	142.5	149.9	157.1	164.2	171.2	178.0	184.7	191.4	197.9	204.3
150	366	OUTPUT (MBH)	1594.0	1536.0	1480.0	1425.0	1371.0	1318.0	1266.0	1215.0	1165.0	1116.0
		COND. (lbs/hr)	1844.0	1777.0	1712.0	1648.0	1586.0	1524.0	1464.0	1405.0	1347.0	1290.0
		FAT (°F)	156.3	163.7	171.1	178.3	185.3	192.3	199.1	205.8	212.5	218.9
200	387	OUTPUT (MBH)	1688.0	1629.0	1572.0	1516.0	1461.0	1407.0	1354.0	1302.0	1251.0	1201.0
		COND. (lbs/hr)	1997.0	1927.0	1859.0	1793.0	1727.0	1664.0	1601.0	1539.0	1479.0	1420.0
		FAT (°F)	166.7	174.2	181.6	188.9	196.1	203.1	210.0	216.8	223.5	230.0
250	406	OUTPUT (MBH)	1773.0	1714.0	1656.0	1598.0	1543.0	1488.0	1434.0	1381.0	1330.0	1279.0
		COND. (lbs/hr)	2144.0	2071.0	2001.0	1932.0	1864.0	1797.0	1732.0	1668.0	1606.0	1544.0
		FAT (°F)	176.2	183.8	191.3	198.6	205.8	212.9	219.9	226.8	233.5	240.1

Note: Above figures are based on calculations at sea level and are intended as reference material only. Results may vary due to customer applications.

Table 46 – HP Heat Exchanger Capacities - 50% Ethylene Glycol, 60°F (16°C) EAT

Model	Change in Glycol Temp.	Entering Glycol Temperature															
		180°F (82°C)				200°F (93°C)				220°F (104°C)				240°F (116°C)			
		ΔT °F (°C)	Output MBH	Flow USGPM	FAT °F (°C)	PD psi	Output MBH	Flow USGPM	FAT °F (°C)	PD psi	Output MBH	Flow USGPM	FAT °F (°C)	PD psi	Output MBH	Flow USGPM	FAT °F (°C)
HP1-12*	10 (5.6)	8.09	1.61	66.8 (19.3)	0.00	9.90	1.95	68.3 (20.2)	0.00	11.77	2.29	69.9 (21.1)	0.00	24.1	4.83	81.3 (27.4)	0.01
	20 (11.1)	5.96	0.57	64.9 (18.3)	0.00	7.37	0.70	66.0 (18.9)	0.00	8.82	0.83	67.2 (19.6)	0.00	10.3	0.96	68.4 (20.2)	0.00
	40 (22.2)	4.11	0.19	63.1 (17.3)	0.00	5.19	0.023	64.0 (17.8)	0.00	6.30	0.28	64.8 (18.2)	0.00	7.45	0.33	65.7 (18.7)	0.00
HP3-12	10 (5.6)	23.0	4.88	80.8 (27.1)	0.36	31.3	6.57	88.4 (31.3)	0.64	38.2	7.94	94.8 (34.9)	0.92	45.2	9.28	101.1 (38.4)	1.25
	20 (11.1)	8.82	0.89	67.5 (19.7)	0.01	14.9	1.52	73.0 (22.8)	0.04	24.8	2.54	82.0 (27.8)	0.10	34.9	3.56	91.4 (33.0)	0.20
	40 (22.2)	6.13	0.30	65.0 (18.3)	0.00	7.73	0.37	66.3 (19.1)	0.00	9.40	0.45	67.7 (19.9)	0.00	11.1	0.53	69.2 (20.7)	0.01
HP1-16*	10 (5.6)	15.0	3.07	68.2 (20.1)	0.00	17.9	3.64	69.7 (20.9)	0.01	39.1	8.07	82.0 (27.8)	0.02	53.3	10.9	90.3 (32.4)	0.04
	20 (11.1)	11.1	1.11	65.9 (18.8)	0.00	13.7	1.35	67.3 (19.6)	0.00	16.3	1.60	68.7 (20.4)	0.00	19.1	1.85	70.2 (21.2)	0.00
	40 (22.2)	7.54	0.36	63.8 (17.7)	0.00	9.52	0.46	64.9 (18.3)	0.00	11.6	0.55	65.9 (18.8)	0.00	13.7	0.64	67.0 (19.4)	0.00
HP3-16	10 (5.6)	44.5	9.52	85.5 (29.7)	0.83	55.9	11.8	92.1 (33.4)	1.25	67.2	14.1	98.7 (37.1)	1.75	78.5	16.3	105.3 (40.7)	2.32
	20 (11.1)	20.9	2.19	71.6 (22.2)	0.05	36.9	3.88	80.9 (27.2)	0.15	52.7	5.50	90.0 (32.2)	0.29	64.3	6.64	96.8 (36.0)	0.41
	40 (22.2)	11.3	0.57	66.0 (18.9)	0.01	14.3	0.72	67.6 (19.8)	0.01	17.4	0.86	69.3 (20.7)	0.01	20.4	0.99	70.9 (21.6)	0.01
HP5-16	10 (5.6)	50.2	10.8	88.8 (31.6)	4.70	61.4	13.0	95.3 (35.2)	6.79	72.5	15.2	101.9 (38.8)	9.19	83.7	17.3	108.4 (42.4)	11.9
	20 (11.1)	36.9	3.95	81.0 (27.2)	0.68	50.4	5.34	83.0 (31.6)	1.21	61.9	6.48	95.5 (35.3)	1.75	73.3	7.59	102.1 (38.9)	2.38
	40 (22.2)	13.5	0.69	67.3 (19.6)	0.03	18.7	0.95	70.2 (21.2)	0.05	37.3	1.93	80.9 (27.2)	0.17	51.0	2.63	88.9 (31.6)	0.31
HP1-20*	10 (5.6)	31.0	6.52	69.9 (21.1)	0.01	61.3	12.9	80.0 (26.7)	0.04	84.4	17.7	87.6 (30.9)	0.08	109.2	22.6	95.9 (35.5)	0.13
	20 (11.1)	19.9	2.05	66.2 (19.0)	0.00	24.6	2.51	67.7 (19.8)	0.00	29.4	2.97	69.2 (20.7)	0.00	34.4	3.42	70.2 (21.6)	0.00
	40 (22.2)	12.6	0.63	63.8 (17.7)	0.00	17.0	0.85	65.2 (18.4)	0.00	20.7	1.02	66.3 (19.1)	0.00	24.5	1.20	67.5 (19.7)	0.00
HP3-20	10 (5.6)	81.3	17.5	86.8 (30.4)	1.91	100.5	21.4	93.2 (34.0)	2.81	119.6	25.2	99.6 (37.6)	3.83	138.7	28.9	106.0 (41.0)	4.99
	20 (11.1)	53.4	5.73	77.4 (25.2)	0.23	78.9	8.40	85.9 (29.9)	0.47	98.6	10.4	92.4 (33.6)	0.69	118.1	12.3	99.0 (37.2)	0.96
	40 (22.2)	20.3	1.06	66.4 (19.1)	0.01	25.6	1.32	68.0 (20.0)	0.02	42.9	2.22	73.7 (23.2)	0.04	71.5	3.70	83.2 (28.4)	0.10
HP5-20	10 (5.6)	89.1	19.2	89.4 (31.9)	10.3	—	—	—	—	—	—	—	—	—	—	—	—
	20 (11.1)	72.7	7.84	83.9 (28.8)	1.82	92.0	9.8	90.3 (32.4)	2.79	111.3	11.7	96.7 (35.9)	3.92	130.5	13.6	103.2 (39.6)	5.21
	40 (22.2)	27.7	1.25	67.5 (19.7)	0.06	55.5	2.95	78.0 (25.6)	0.29	82.3	4.35	87.0 (30.6)	0.59	102.2	5.34	93.6 (34.2)	0.86
HP1-24*	10 (5.6)	96.9	20.8	85.9 (29.9)	0.04	144.2	30.7	98.9 (37.2)	0.08	193.7	40.8	112.6 (44.8)	0.13	232.4	48.4	123.4 (50.8)	0.18
	20 (11.1)	45.4	4.78	71.8 (22.1)	0.00	56.1	5.83	74.6 (23.7)	0.00	67.1	6.89	77.5 (25.3)	0.01	133.3	13.8	95.6 (35.3)	0.02
	40 (22.2)	27.0	1.39	66.8 (19.3)	0.00	38.9	2.00	69.9 (21.1)	0.00	47.4	2.40	72.1 (22.3)	0.00	56.1	2.82	74.4 (23.6)	0.00
HP3-24	10 (5.6)	168.6	36.5	105.9 (41.1)	2.65	206.5	44.1	116.3 (46.8)	3.79	243.5	51.5	126.7 (52.6)	5.08	280.6	58.6	137.1 (58.4)	6.55
	20 (11.1)	122.9	13.3	93.1 (33.9)	0.39	169.2	18.1	105.9 (41.1)	0.69	207.6	22.2	116.5 (46.9)	0.99	245.7	25.7	127.2 (52.9)	1.33
	40 (22.2)	46.1	2.44	72.0 (22.2)	0.02	58.1	3.04	75.2 (24.0)	0.03	121.4	6.39	92.5 (33.6)	0.10	168.8	8.82	105.5 (40.8)	0.18
HP5-24	10 (5.6)	181.5	39.3	109.5 (43.1)	13.6	—	—	—	—	—	—	—	—	—	—	—	—
	20 (11.1)	152.9	16.6	101.5 (38.6)	2.60	190.8	20.4	112.0 (44.4)	3.85	228.5	24.2	122.4 (50.2)	5.30	265.9	27.8	132.9 (56.1)	6.93
	40 (22.2)	81.8	4.41	81.8 (27.7)	0.22	129.3	6.93	94.8 (34.9)	0.50	177.5	9.42	108.1 (42.3)	0.88	216.3	11.35	118.9 (48.3)	1.24
HP7-24	10 (5.6)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	20 (11.1)	163.5	17.7	104.4 (40.2)	7.89	201.1	21.5	114.8 (46.0)	11.4	—	—	—	—	—	—	—	—
	40 (22.2)	110.2	5.97	89.3 (31.8)	1.00	156.3	8.40	102.3 (39.1)	1.88	194.8	10.4	113.0 (45.0)	2.78	233.0	12.2	123.6 (50.9)	3.82
HP1-30*	10 (5.6)	178.0	38.4	95.9 (35.5)	0.09	247.9	53.0	110.3 (43.5)	0.16	302.7	64.0	121.7 (49.8)	0.23	357.2	74.6	133.1 (56.2)	0.30
	20 (11.1)	77.6	8.26	75.3 (24.1)	0.01	95.7	10.1	78.8 (26.0)	0.01	183.5	19.3	96.8 (36.0)	0.03	253.4	26.4	111.2 (44.0)	0.04
	40 (22.2)	42.5	2.22	68.1 (20.1)	0.00	61.2	3.18	71.8 (22.1)	0.00	81.9	4.23	75.9 (24.4)	0.00	96.9	4.95	78.9 (26.1)	0.00
HP3-30	10 (5.6)	252.7	54.8	110.4 (43.6)	4.19	305.7	65.5	122.5 (50.3)	5.85	358.5	75.9	133.5 (56.4)	7.73	411.1	86.0	144.6 (62.6)	9.83
	20 (11.1)	207.0	22.5	101.9 (38.8)	0.77	261.5	28.1	113.2 (45.1)	1.16	315.6	33.5	124.4 (51.3)	1.61	369.4	38.7	135.7 (57.6)	2.12
	40 (22.2)	78.0	4.17	75.3 (24.1)	0.04	151.5	8.10	90.3 (32.4)	0.12	219.3	11.6	104.2 (40.1)	0.22	290.7	15.3	119.0 (48.3)	0.37
HP5-30	10 (5.6)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	20 (11.1)	232.3	25.2	107.2 (41.8)	4.23	285.8	30.7	118.3 (47.9)	6.08	339.0	36.0	129.4 (54.1)	8.19	392.0	41.1	140.5 (50.3)	10.6
	40 (22.2)	151.9	8.25	90.5 (32.5)	0.52	220.9	11.9	104.7 (40.4)	1.01	276.1	14.7	116.1 (46.7)	1.49	330.7	17.4	127.5 (53.1)	2.04
HP7-30	10 (5.6)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	20 (11.1)	244.1	26.5	109.6 (43.1)	12.4	—	—	—	—	—	—	—	—	—	—	—	—
	40 (22.2)	186.3	10.2	97.6 (36.4)	2.00	241.0	13.0	108.9 (42.7)	3.16	295.5	15.7	120.2 (49.0)	4.52	349.5	18.4	131.5 (55.3)	6.05
HP1-36*	10 (5.6)	354.9	77.0	102.0 (38.9)	.024	446.6	95.8	113.1 (45.1)	0.36	537.7	114.0	124.2 (51.2)	0.49	628.2	131.7	135.3 (57.4)	0.64
	20 (11.1)	139.0	4.9	76.1 (24.5)	0.01	275.3	29.5	92.3 (33.5)	0.04	388.9	41.2	106.0 (41.1)	0.08	511.0	53.6	20.8 (49.3)	0.12
	40 (22.2)	69.6	3.7	67.9 (19.9)	0.00	101.5	5.3	71.6 (22.2)	0.00	147.0	7.7	76.9 (24.9)	0.00	174.0	9.0	80.0 (26.7)	0.00
HP3-36	10 (5.6)	437.5	95.1	112.1 (44.5)	8.6	526.1	113.0	122.8 (50.4)	11.8	—	—	—	—	—	—	—	—
	20 (11.1)	370.7	40.3	103.9 (39.9)	1.7	461.3	49.6	114.9 (46.1)	2.48	551.4	58.6	125.9 (52.3)	3.37	641.0	67.4	136.9 (52.3)	4.35
	40 (22.2)	201.6	11.0	83.6 (28.7)	0.16	315.9	17.0	97.2 (36.2)	0.34	431.9	23.0	111.2 (44.0)	0.58	524.6	27.7	122.5 (50.3)	0.81
HP5-36	10 (5.6)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	20 (11.1)	405.4	44.2	108.2 (42.3)	8.81	494.7	53.3	119.0 (48.3)	12.4	—	—	—	—	—	—	—	—
	40 (22.2)	292.7	16.0	94.5 (34.7)	1.31	397.1	21.5	107.1 (41.7)	2.24	488.7	26.1	118.2 (47.9)	3.21	579.6	30.6	129.3 (54.1)	4.3
HP7-36	10 (5.6)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	20 (11.1)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	40 (22.2)	333.4	18.2	99.4 (37.4)	4.4	424.8	23.0	110.4 (43.6)	6.7	515.4	27.6	121.4 (49.7)	9.4	605.3	32.0	132.4 (55.8)	12.4

* Single-pass heaters are not recommended for liquid service. In many cases, a smaller multi-pass model would be a more economical choice.

Note:

For 50 Hz power supply, derate output by 10%. Above figures are based on calculations at sea level and are intended as reference material only. Results may vary due to customer applications.

Metric or Customary?

This chart has been produced using customary units of measurement. We would be pleased to provide any information required in metric units.

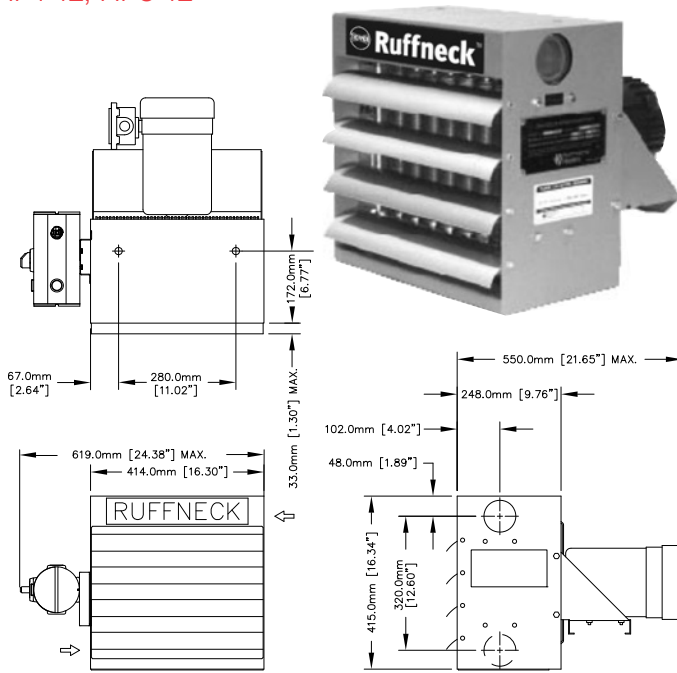
Table 47 – HP Heat Exchanger Capacities - Water 60°F (16°C) EAT

Model	Change in Water Temp. ΔT °F (°C)	Entering Water Temperature															
		180°F (82°C)				200°F (93°C)				220°F (104°C)				240°F (116°C)			
		Output MBH	Flow USGPM	FAT °F (°C)	PD psi	Output MBH	Flow USGPM	FAT °F (°C)	PD psi	Output MBH	Flow USGPM	FAT °F (°C)	PD psi	Output MBH	Flow USGPM	FAT °F (°C)	PD psi
HP1-12*	10 (5.6)	19.3	3.66	77.2 (25.1)	0.01	27.1	5.15	84.4 (29.1)	0.01	35.6	6.77	92.2 (33.4)	0.02	42.5	8.07	98.6 (37.0)	0.03
	20 (11.1)	8.84	0.80	67.5 (19.7)	0.00	11.1	1.00	69.4 (20.8)	0.00	15.3	1.40	73.2 (22.9)	0.00	26.2	2.44	83.2 (28.4)	0.00
	40 (22.2)	6.11	0.27	65.0 (18.3)	0.00	7.86	0.34	66.5 (19.2)	0.00	9.72	0.43	68.0 (20.0)	0.00	11.7	0.51	69.7 (20.9)	0.00
HP3-12	10 (5.6)	30.6	5.90	87.9 (31.1)	0.46	37.4	7.18	94.1 (34.5)	0.68	44.1	8.44	100.3 (37.9)	0.93	50.8	9.70	106.5 (41.4)	1.23
	20 (11.1)	23.1	2.21	80.8 (27.1)	0.07	30.1	2.96	88.1 (31.2)	0.12	37.8	3.61	94.4 (34.7)	0.18	44.7	4.25	100.7 (38.2)	0.24
	40 (22.2)	8.84	0.40	67.5 (19.7)	0.00	14.4	0.66	72.5 (22.5)	0.01	23.7	1.11	81.0 (27.2)	0.02	31.6	1.49	88.3 (31.3)	0.03
HP1-16*	10 (5.6)	38.8	7.47	92.1 (33.4)	0.02	52.3	10.1	90.0 (32.2)	0.03	63.6	12.2	96.5 (35.8)	0.05	74.9	14.4	103.1 (39.5)	0.06
	20 (11.1)	16.3	1.15	68.9 (20.5)	0.00	25.8	2.42	74.3 (23.5)	0.00	41.4	3.93	83.4 (28.6)	0.01	54.7	5.20	91.1 (32.8)	0.01
	40 (22.2)	11.5	0.51	66.0 (18.9)	0.00	14.5	0.66	67.7 (19.8)	0.00	17.9	0.81	69.6 (20.9)	0.00	21.5	0.97	71.6 (22.0)	0.00
HP3-16	10 (5.6)	52.9	10.2	90.4 (32.4)	0.84	63.9	12.4	96.8 (36.0)	1.21	74.9	14.4	103.3 (39.6)	1.65	86.0	16.5	109.7 (43.2)	2.15
	20 (11.1)	43.7	4.22	85.0 (29.4)	0.15	54.9	5.29	91.5 (33.1)	0.23	66.1	6.36	98.0 (36.7)	0.33	77.3	7.41	104.5 (40.3)	0.45
	40 (22.2)	19.3	0.91	70.7 (21.5)	0.01	34.5	1.64	79.5 (26.4)	0.02	47.4	2.26	86.9 (30.5)	0.04	61.3	2.93	95.0 (35.0)	0.07
HP5-16	10 (5.6)	55.8	10.8	92.1 (33.4)	4.23	66.7	12.9	98.5 (36.9)	5.98	77.7	15.0	104.9 (40.5)	8.04	88.6	17.0	111.3 (44.1)	10.4
	20 (11.1)	48.7	4.71	87.9 (31.1)	0.84	59.8	5.77	94.4 (34.7)	1.24	70.9	6.82	100.8 (38.2)	1.72	81.9	7.87	107.3 (41.8)	2.88
	40 (22.2)	33.5	1.61	79.0 (26.1)	0.10	46.7	2.25	86.0 (30.3)	0.20	58.0	2.78	93.2 (34.0)	0.30	69.3	3.32	99.8 (37.7)	0.42
HP1-20*	10 (5.6)	76.4	14.8	85.1 (29.5)	0.05	95.4	18.5	91.5 (33.1)	0.07	114.5	22.1	97.8 (36.6)	0.11	133.6	25.8	104.2 (40.1)	0.14
	20 (11.1)	39.3	3.77	72.7 (22.6)	0.00	64.0	6.16	80.9 (27.2)	0.01	85.7	8.25	88.1 (31.2)	0.02	109.7	10.6	96.1 (35.6)	0.03
	40 (22.2)	20.2	0.94	66.1 (19.6)	0.00	25.9	1.21	68.1 (20.1)	0.00	32.1	1.49	70.1 (21.2)	0.00	37.8	1.77	71.9 (22.2)	0.00
HP3-20	10 (5.6)	92.8	18.1	90.7 (32.6)	1.79	111.5	21.7	96.9 (36.1)	2.54	130.2	25.2	103.2 (39.6)	3.43	148.9	28.8	109.5 (43.1)	4.44
	20 (11.1)	79.2	7.71	86.1 (30.1)	0.34	98.2	9.53	92.4 (33.6)	0.52	117.1	11.3	98.7 (37.1)	0.72	136.0	13.1	105.1 (40.6)	0.96
	40 (22.2)	48.6	2.35	75.8 (24.3)	0.04	70.0	3.38	82.9 (28.3)	0.07	92.7	4.48	90.5 (32.5)	0.12	112.0	5.40	96.9 (36.1)	0.17
HP5-20	10 (5.6)	96.8	18.9	92.0 (33.3)	8.78	115.4	22.4	98.3 (36.8)	12.3	—	—	—	—	—	—	—	—
	20 (11.1)	86.1	8.39	88.4 (31.3)	1.81	104.9	10.2	94.7 (34.8)	2.64	123.7	12.0	101.0 (38.3)	3.62	142.4	13.8	107.3 (41.8)	4.75
	40 (22.2)	65.8	3.19	81.6 (27.6)	0.28	84.9	4.12	87.9 (31.1)	0.46	104.0	5.03	94.3 (34.6)	0.67	123.2	5.94	100.7 (38.2)	0.93
HP1-24*	10 (5.6)	160.4	31.3	103.6 (39.8)	0.07	197.8	38.5	113.9 (45.5)	0.10	235.1	45.6	124.3 (57.3)	1.14	272.3	52.7	134.8 (57.1)	0.19
	20 (11.1)	102.4	9.93	87.5 (30.8)	0.01	146.2	14.2	99.5 (37.5)	0.02	193.6	18.8	112.6 (44.8)	0.03	231.7	22.4	123.2 (50.7)	0.04
	40 (22.2)	45.7	2.17	71.9 (22.2)	0.00	58.6	2.78	75.3 (24.1)	0.00	72.3	3.42	78.9 (26.1)	0.00	130.0	6.22	94.7 (34.8)	0.00
HP3-24	10 (5.6)	187.5	36.6	111.1 (43.9)	2.33	224.1	43.7	121.3 (49.6)	3.28	260.6	50.6	131.6 (55.3)	4.38	297.1	57.5	141.9 (61.1)	5.64
	20 (11.1)	167.7	16.0	104.5 (40.3)	0.47	200.8	19.6	114.8 (46.0)	0.69	237.9	23.1	125.1 (51.7)	0.95	274.8	26.6	135.5 (57.5)	1.26
	40 (22.2)	111.2	5.41	89.9 (32.2)	0.06	156.7	7.61	102.4 (39.1)	0.11	194.6	9.44	112.9 (44.9)	0.17	232.5	11.3	123.4 (50.8)	0.24
HP5-24	10 (5.6)	194.0	37.9	113.0 (45.0)	11.2	—	—	—	—	—	—	—	—	—	—	—	—
	20 (11.1)	175.1	17.1	107.7 (42.1)	2.40	211.9	20.6	117.9 (47.7)	3.44	248.6	24.2	128.2 (53.4)	4.67	285.2	27.6	138.5 (59.2)	6.08
	40 (22.2)	138.2	6.74	97.4 (36.3)	0.40	175.8	8.56	107.8 (42.1)	0.63	213.4	10.4	118.2 (47.9)	0.91	250.7	12.1	128.7 (53.7)	1.23
HP7-24	10 (5.6)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	20 (11.1)	180.4	17.6	109.2 (42.9)	6.82	217.1	21.2	119.4 (48.6)	9.72	253.6	24.6	129.6 (54.2)	13.1	—	—	—	—
	40 (22.2)	147.5	7.20	100.0 (37.8)	1.22	184.9	9.01	110.3 (43.5)	1.86	222.2	10.8	120.7 (49.3)	2.63	259.3	12.6	131.0 (55.0)	3.53
HP1-30*	10 (5.6)	243.3	47.6	109.5 (43.1)	0.11	296.2	57.8	120.5 (49.2)	0.16	349.0	67.9	131.5 (55.3)	0.22	401.7	77.9	142.6 (61.4)	0.29
	20 (11.1)	179.3	17.6	96.2 (35.7)	0.02	245.6	23.9	109.8 (43.2)	0.03	299.6	29.1	121.0 (49.4)	0.04	353.4	34.2	132.3 (55.7)	0.06
	40 (22.2)	77.0	3.69	75.2 (24.0)	0.00	98.5	4.72	79.4 (26.3)	0.00	174.8	8.43	95.0 (35.0)	0.00	242.3	11.7	108.9 (42.7)	0.01
HP3-30	10 (5.6)	273.8	53.6	115.8 (46.1)	3.48	325.8	63.6	126.7 (52.6)	4.85	377.6	73.5	137.6 (58.7)	6.42	429.4	83.3	148.5 (64.7)	8.20
	20 (11.1)	244.3	23.9	109.7 (43.2)	0.74	296.9	29.0	120.6 (49.2)	1.06	349.5	34.0	131.6 (55.3)	1.44	401.8	39.0	142.6 (61.4)	1.88
	40 (22.2)	180.9	8.83	96.5 (35.8)	0.11	241.3	11.80	108.9 (42.7)	0.19	295.1	14.1	120.1 (48.9)	0.28	348.7	16.9	131.3 (55.2)	0.38
HP5-30	10 (5.6)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	20 (11.1)	257.1	25.2	112.3 (44.6)	3.62	309.3	30.2	123.2 (50.7)	5.14	361.5	35.2	134.1 (56.7)	6.90	413.4	40.1	145.1 (62.8)	8.91
	40 (22.2)	209.5	10.2	102.4 (39.1)	0.65	263.0	12.8	113.5 (45.3)	1.00	316.2	15.4	124.6 (57.4)	1.40	369.2	17.9	135.7 (57.6)	1.87
HP7-30	10 (5.6)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	20 (11.1)	263.1	25.8	113.6 (45.3)	10.2	—	—	—	—	—	—	—	—	—	—	—	—
	40 (22.2)	220.1	10.8	104.6 (40.3)	1.91	273.3	13.3	115.6 (46.4)	2.86	326.2	15.9	126.6 (52.6)	3.98	378.8	18.4	137.7 (58.7)	5.28
HP1-36*	10 (5.6)	424.5	83.2	110.5 (43.6)	0.24	513.3	100.3	121.2 (49.6)	0.33	601.2	117.2	132.0 (55.6)	0.45	689.2	134.0	142.9 (61.6)	0.57
	20 (11.1)	349.1	34.2	101.3 (38.5)	0.04	439.1	42.9	112.2 (44.6)	0.07	529.1	51.6	123.1 (50.6)	0.09	618.8	60.1	134.1 (56.7)	0.13
	40 (22.2)	137.2	6.60	75.9 (24.4)	0.00	257.0	12.53	90.1 (32.3)	0.01	366.6	17.8	103.3 (39.6)	0.01	467.9	22.7	115.5 (46.4)	0.02
HP3-36	10 (5.6)	466.5	91.5	115.6 (46.4)	6.89	553.6	108.3	126.2 (52.3)	9.51	640.5	124.9	136.9 (58.3)	12.5	—	—	—	—
	20 (11.1)	421.9	41.4	110.2 (43.4)	1.51	510.0	49.9	120.9 (49.4)	2.14	597.8	58.3	131.6 (55.3)	2.88	685.5	66.7	142.4 (61.3)	3.73
	40 (22.2)	334.7	16.4	99.6 (37.6)	0.26	424.9	20.8	110.4 (43.6)	0.41	514.7	25.1	121.3 (49.6)	0.58	604.1	29.4	132.3 (55.7)	0.78
HP5-36	10 (5.6)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	20 (11.1)	439.5	43.1	112.3 (44.6)	7.22	527.0	51.6	123.0 (50.6)	10.2	—	—	—	—	—	—	—	—
	40 (22.2)	365.4	17.9	103.3 (39.6)	1.36	454.9	22.3	114.1 (45.6)	20.3	543.8	26.5	124.9 (51.6)	2.83	632.3	30.8	135.8 (57.7)	3.75
HP7-36	10 (5.6)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	20 (11.1)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	40 (22.2)	380.0	18.6	105.1 (40.6)	3.88	469.0	23.0	115.8 (46.6)	5.73	557.5	27.2	126.6 (52.6)	7.93	645.6	31.4	137.4 (58.6)	10.5

* Single-pass heaters are not recommended for liquid service. In many cases, a smaller multi-pass model would be a more economical choice.

Specifications

HP1-12, HP3-12



◇ Add 12 lbs (5.4 kg) to flange units * Add 15 lbs (6.8 kg) to disconnect units

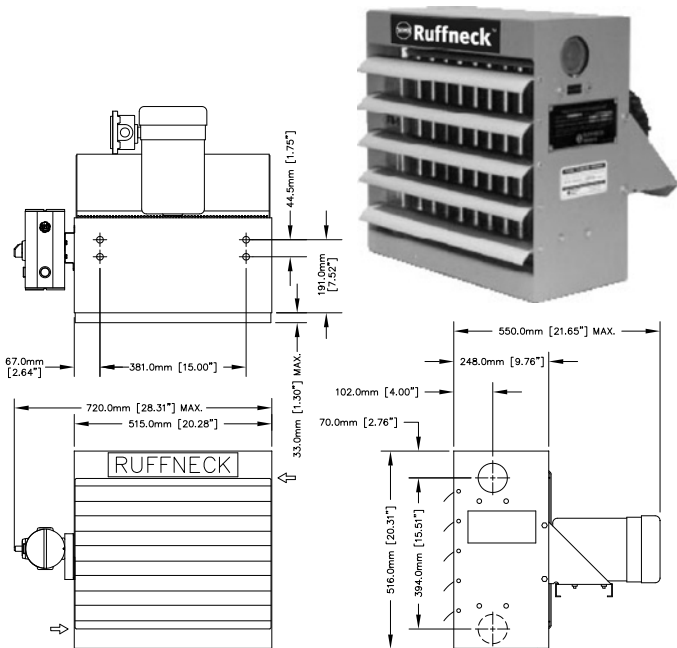
General

Air Delivery*	997 CFM
Air Velocity*	1147 FPM
Air Throw*	40 ft @ 15 psi stream
Propeller Fan	3 Wing Aluminum, 12" (305 mm) Dia. x 5/8" (16 mm) Bore
Motor Requirements	1/2 HP, 1725 RPM, Frame 56 Rigid Base (Specify enclosure type, voltage, cycle and phase.)
Fan Guard	Welded, Wire, Powder Coated Epoxy 1/4" (6 mm) probe will not enter.
Hanger Connections	5/8" (16 mm) NC Tap - 2 holes
Cabinet Material	0.075" (2 mm) steel
Louvre Blades	Anodized Extruded Aluminum
Net Weight	75 lbs (34 kg) ◇ *
Shipping Weight	102 lbs (46.3 kg) ◇ *

Heat Exchanger

Tube Outside Dia.	0.625" (16 mm)
Tube Wall Thickness	0.065" (1.65 mm) Average
Tube Material	SA 214 Carbon Steel
Fin Material	1050 Aluminum
Fins Per Inch	10
Number of Tubes	13
Number of Rows	2
Number of Passes	1 or 3
Header Material	Min. 0.135" (3.4 mm) Steel
Inlet/Outlet	2" NPT Female
Max. Operating Press.	450 psi
Max. Operating Temp.	650°F (343°C)

HP1-16, HP3-16, HP5-16



* at 70°F (21°C) at sea level

◇ Add 12 lbs (5.4 kg) to flange units * Add 15 lbs (6.8 kg) to disconnect units

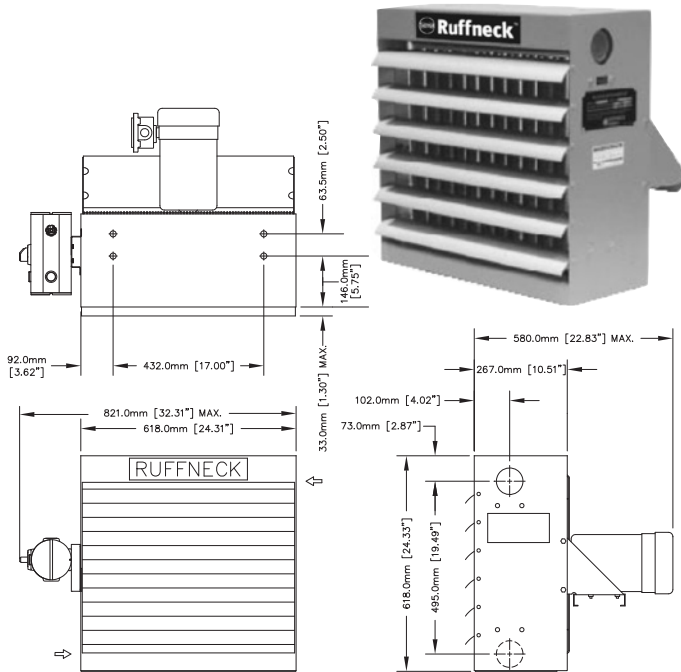
General

Air Delivery*	1588 CFM
Air Velocity*	1069 FPM
Air Throw*	60 ft @ 15 psi stream
Propeller Fan	3 Wing Aluminum, 16" (406 mm) Dia. x 5/8" (16 mm) Bore
Motor Requirements	1/2 HP, 1725 RPM, Frame 56 Rigid Base (Specify enclosure type, voltage, cycle and phase.)
Fan Guard	Welded, Wire, Powder Coated Epoxy 1/4" (6 mm) probe will not enter.
Hanger Connections	5/8" (16 mm) NC Tap - 4 holes
Cabinet Material	0.075" (2 mm) steel
Louvre Blades	Anodized Extruded Aluminum
Net Weight	109 lbs (49.4 kg) ◇ *
Shipping Weight	137 lbs (62.1 kg) ◇ *

Heat Exchanger

Tube Outside Dia.	0.625" (16 mm)
Tube Wall Thickness	0.065" (1.65 mm) Average
Tube Material	SA 214 Carbon Steel
Fin Material	1050 Aluminum
Fins Per Inch	10
Number of Tubes	17
Number of Rows	2
Number of Passes	1, 3 or 5
Header Material	Min. 0.135" (3.4 mm) Steel
Inlet/Outlet	2" NPT Female
Max. Operating Press.	450 psi
Max. Operating Temp.	650°F (343°C)

HP1-20, HP3-20, HP5-20



◇ Add 12 lbs (5.4 kg) to flange units

* Add 15 lbs (6.8 kg) to disconnect units.

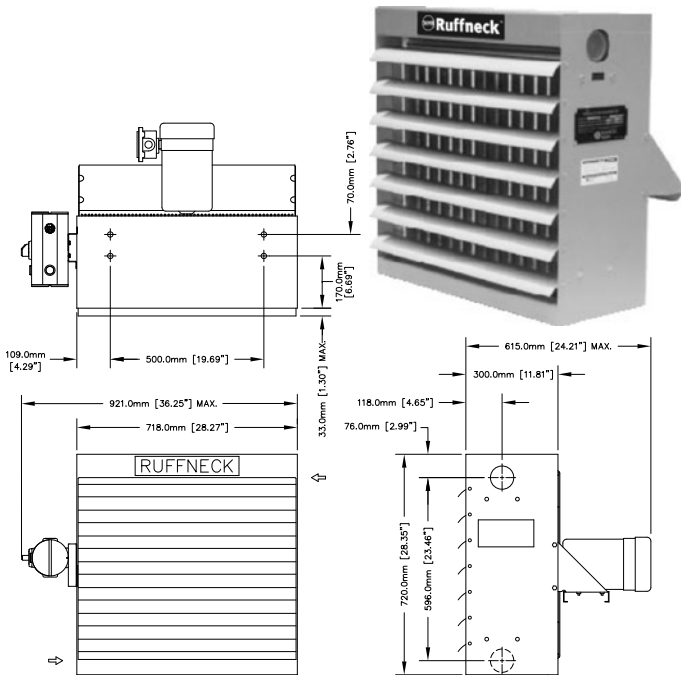
General

Air Delivery*	2780 CFM
Air Velocity*	1153 FPM
Air Throw*	65 ft @ 15 psi stream
Propeller Fan	3 Wing Aluminum, 20" (508 mm) Dia. x 5/8" (16 mm) Bore
Motor Requirements	1/2 HP, 1725 RPM, Frame 56 Rigid Base (Specify enclosure type, voltage, cycle and phase.)
Fan Guard	Welded, Wire, Powder Coated Epoxy 1/4" (6 mm) probe will not enter.
Hanger Connections	5/8" (16 mm) NC Tap - 4 holes
Cabinet Material	0.075" (2 mm) steel
Louvre Blades	Anodized Extruded Aluminum
Net Weight	138 lbs (62.6 kg) ◇ *
Shipping Weight	161 lbs (73 kg) ◇ *

Heat Exchanger

Tube Outside Dia.	0.625" (16 mm)
Tube Wall Thickness	0.065" (1.65 mm) Average
Tube Material	SA 214 Carbon Steel
Fin Material	1050 Aluminum
Fins Per Inch	10
Number of Tubes	21
Number of Rows	2
Number of Passes	1, 3 or 5
Header Material	Min. 0.135" (3.4 mm) Steel
Inlet/Outlet	2" NPT Female
Max. Operating Press.	450 psi
Max. Operating Temp.	650°F (343°C)

HP1-24, HP3-24, HP5-24, HP7-24



* at 70°F (21°C) at sea level

◇ Add 12 lbs (5.4 kg) to flange units * Add 15 lbs (6.8 kg) to disconnect units

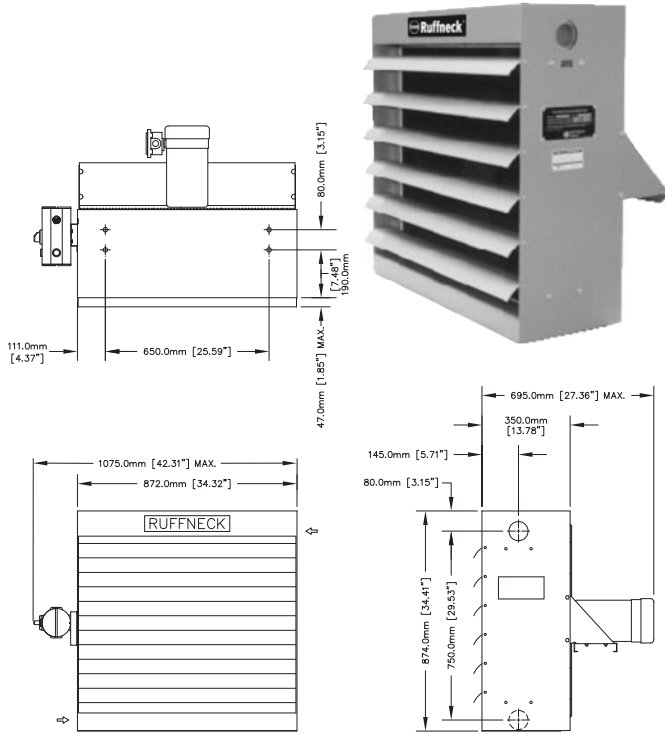
General

Air Delivery*	3405 CFM
Air Velocity*	981 FPM
Air Throw*	70 ft @ 15 psi stream
Propeller Fan	3 Wing Aluminum, 24" (610 mm) Dia. x 5/8" (16 mm) Bore
Motor Requirements	1/2 HP, 1725 RPM, Frame 56 Rigid Base (Specify enclosure type, voltage, cycle and phase.)
Fan Guard	Welded, Wire, Powder Coated Epoxy 7/16" (11 mm) probe will not enter.
Hanger Connections	5/8" (16 mm) NC Tap - 4 holes
Cabinet Material	0.075" (2 mm) steel
Louvre Blades	Anodized Extruded Aluminum
Net Weight	191 lbs (86.6 kg) ◇ *
Shipping Weight	224 lbs (101.6 kg) ◇ *

Heat Exchanger

Tube Outside Dia.	0.625" (16 mm)
Tube Wall Thickness	0.065" (1.65 mm) Average
Tube Material	SA 214 Carbon Steel
Fin Material	1050 Aluminum
Fins Per Inch	10
Number of Tubes	38
Number of Rows	3
Number of Passes	1, 3, 5 or 7
Header Material	Min. 0.135" (3.43 mm) Steel
Inlet/Outlet	2" NPT Female
Max. Operating Press.	Up to 450 psi 100 psi for CSA Certified Steam Heaters
Max. Operating Temp.	650°F (343°C)

HP1-30, HP3-30, HP5-30, HP7-30



◇ Add 12 lbs (5.4 kg) to flange units
 * Add 15 lbs (6.8 kg) to disconnect units

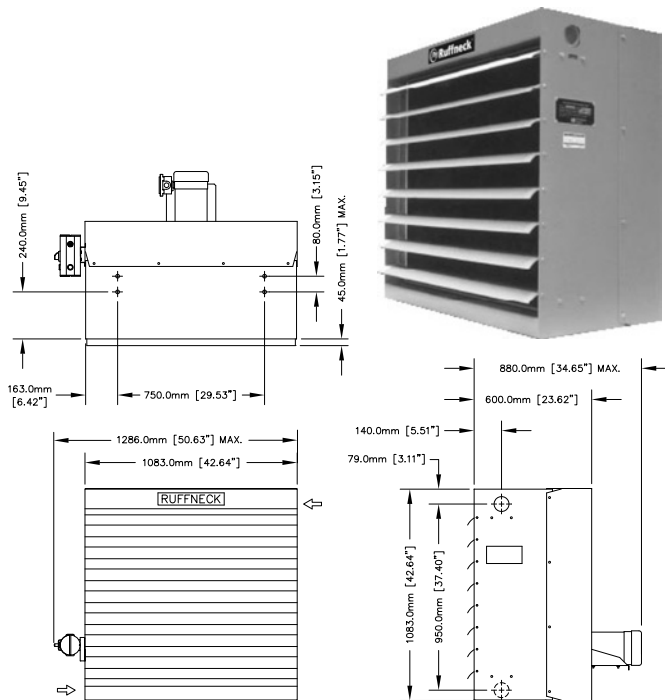
General

Air Delivery* 4569 CFM
 Air Velocity* 814 FPM
 Air Throw* 70 ft @ 15 psi stream
 Propeller Fan 3 Wing Aluminum, 30" (762 mm) Dia. x 5/8" (16 mm) Bore
 Motor Requirements 3/4 HP, 1140 RPM, Frame 56 Rigid Base (Specify enclosure type, voltage, cycle and phase.)
 Fan Guard Welded, Wire, Powder Coated Epoxy 7/16" (11 mm) probe will not enter.
 Hanger Connections 5/8" (16 mm) NC Tap - 4 holes
 Cabinet Material 0.075" (2 mm) steel
 Louvre Blades Anodized Extruded Aluminum
 Net Weight 286 lbs (121.6 kg) ◇ *
 Shipping Weight 345 lbs (156.5 kg) ◇ *

Heat Exchanger

Tube Outside Dia. 0.625" (16 mm)
 Tube Wall Thickness 0.065" (1.65 mm) Average
 Tube Material SA 214 Carbon Steel
 Fin Material 1050 Aluminum
 Fins Per Inch 10
 Number of Tubes 47
 Number of Rows 3
 Number of Passes 1, 3, 5 or 7
 Header Material Min. 0.135" (3.43 mm) Steel
 Inlet/Outlet 2" NPT Female
 Max. Operating Press. Up to 450 psi
 80 psi for CSA Certified Steam Heaters
 Max. Operating Temp. 650°F (343°C)

HP1-36, HP3-36, HP5-36, HP7-36



* at 70°F (21°C) at sea level
 ◇ Add 12 lbs (5.4 kg) to flange units * Add 15 lbs (6.8 kg) to disconnect units

General

Air Delivery* 7830 CFM
 Air Velocity* 852 FPM
 Air Throw* 65 ft @ 15 psi stream
 Propeller Fan 6 Wing Aluminum, 36" (914 mm) Dia. x 1" (25mm) Bore
 Motor Requirements 1½ HP, 1725 RPM, Frame 56 Rigid Base (Specify enclosure type, voltage, cycle and phase.)
 Drive Pulley B3.6"
 Driven Pulley B9.9"
 Drive Belt B42 V-Belt
 Fan Speed 627 RPM
 Fan Guard Steel, Powder Coated Epoxy, 1/2" (13 mm) gap
 Hanger Connections 5/8" (16 mm) NC Tap - 4 holes
 Cabinet Material 0.105" (2.66 mm) steel
 Louvre Blades Anodized Extruded Aluminum
 Net Weight 534 lbs (242.2 kg) ◇ *
 Shipping Weight 597 lbs (270.8 kg) ◇ *

Heat Exchanger

Tube Outside Dia. 0.625" (16 mm)
 Tube Wall Thickness 0.065" (1.65 mm) Average
 Tube Material SA 214 Carbon Steel
 Fin Material 1050 Aluminum
 Fins Per Inch 10
 Number of Tubes 59
 Number of Rows 3
 Number of Passes 1, 3, 5 or 7
 Header Material Min. 0.135" (3.43 mm) Steel
 Inlet/Outlet 2" NPT Female
 Max. Operating Press. Up to 450 psi
 85 psi for CSA Certified Steam Heaters
 Max. Operating Temp. 650°F (343°C)



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Advanced Series Heaters

The Ruffneck™ Advanced Series heaters are designed for rugged industrial applications and are available in 37 models from 6,000 to 1,200,000 Btu/hr with a maximum operating pressure and temperature rating of 550 psi and 600°F (315°C) respectively, the Advanced Series

is perfect for steam, circulating hot water, and glycol heating systems or liquid cooling applications that include: flash stream condensers, lube oil coolers, and pump seal coolers, etc.

1½" or 2" NPT male inlet and outlet connections for reduced cost and ease of installation. 1½" (40 mm) or 2" (50 mm) 300# RF flanges are available as an option.

Epoxy powder coated 14-gauge (0.075" / 2 mm) steel cabinet provides protection and durability. Special Heresite® coatings are available as an option.

Bolt-together cabinet offers ease of maintenance and cleaning of heat-exchanger core without disturbing the heater mounting arrangement or electrical connections.

Heavy gauge, embossed, high performance fan blade offers long life and improved air flow.

Epoxy powder coated, split fan guard designed for safety and ease of fan blade replacement.

Extruded aluminium louvres provide two-way directional control of discharge air.

Optional XS40 Disconnect Switch

Standard motors are UL listed and/or CSA approved industrial-duty, totally enclosed, 1725 RPM, 56 frame, 1/2 HP. Built for rugged environments, this motor is also available in explosion-proof models for hazardous locations.

Epoxy powder coated bolt-together motor mount provides exceptional vibration handling.

The Advanced Series are CRN registered heat exchangers. Maximum operating pressure of 350 psi and maximum operating temperature of 600°F (315°C) provide greater versatility. Steel headers are 3/16" (8 mm) thick to ensure ruggedness and long-lasting performance.

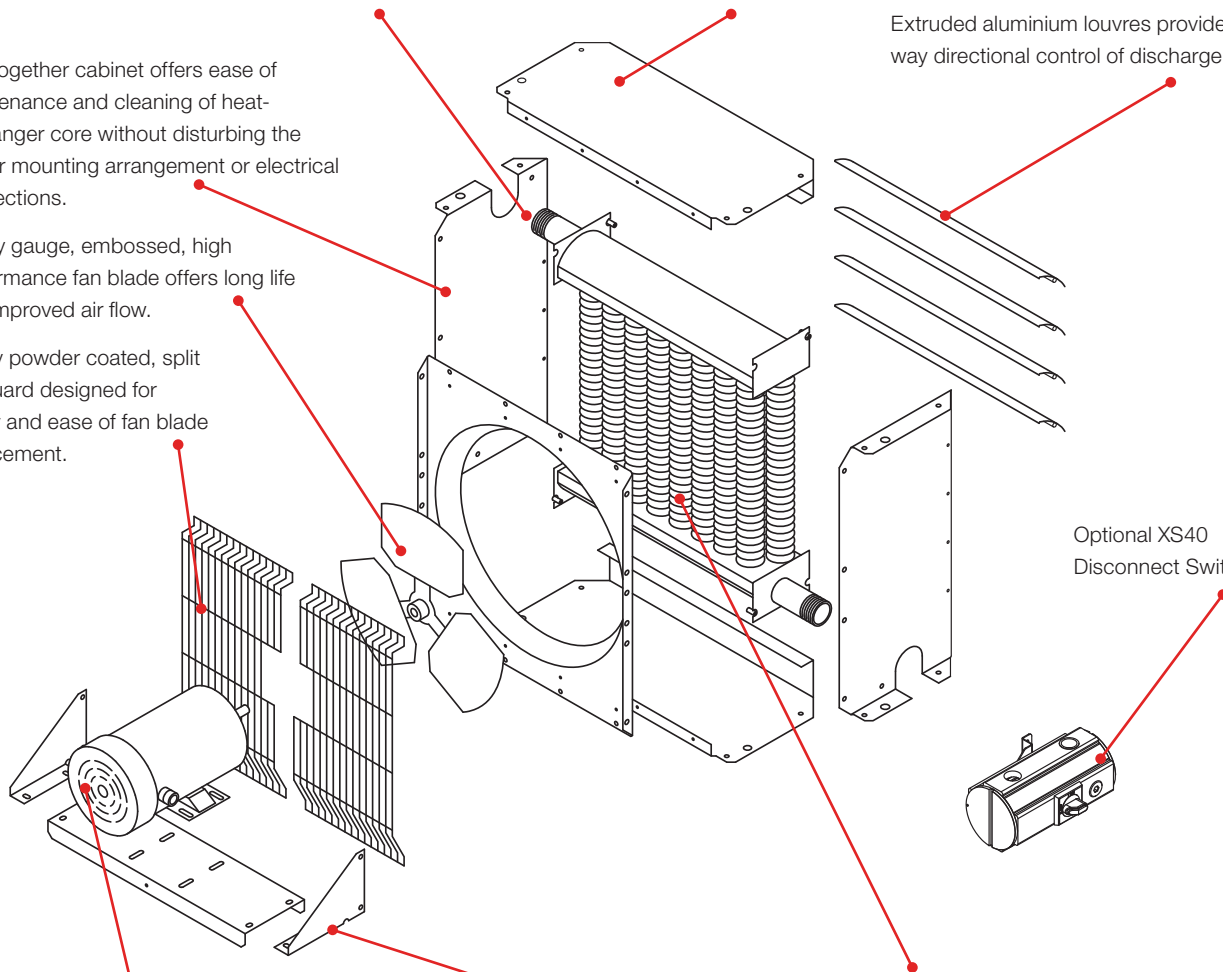


Figure 41

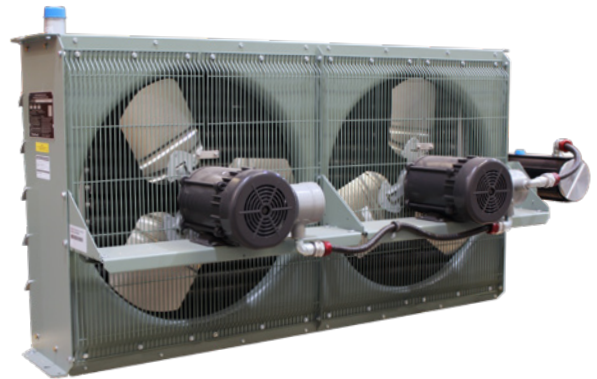
AH Series - Advanced Horizontal Model



The Advanced Horizontal unit heater exchanger can be customised for your application. The heat exchanger is comprised of extruded finned tubing in 10, 9 and 5 fins per inch for varying steam conditions and/or where atmospheric particulate may cause premature fouling of the heater core. Additionally, the AH can handle more pressure than the HP and FR.

Available with Disconnect Switch (not shown).

AH - Advanced Horizontal Tandem Model (below)



The 24" (610 mm) Tandem Advanced Horizontal Series is the largest unit in our line-up. Rather than expanding the cabinet and heat exchanger in both height and width, we just doubled the width to produce this unique model. This side-by-side arrangement also produces the lowest mounting profile in its class for a heater of equivalent output.

The dual fan arrangement allows for two smaller fans that can be operated at the standard 1725 RPM. Furthermore, dual fans provide for output modulation if separate motor thermostats are used. Separate motor thermostats produce better control of heating during periods of low demand by reducing the output of the heater.

Available with Disconnect Switch (shown).

AV Series - Advanced Vertical Model



Ruffneck's Advanced Series unit heaters are designed for rugged industrial applications meeting the most demanding service and long life requirements.

While perfect for steam, circulating hot water or glycol heating systems, the Ruffneck™ Vertical Throw heaters are also suitable for a wide range of other heating fluids. In addition, they can be used for both space heating and liquid cooling applications.

Extruded Finned Tubing Types



Figure 42 – 5/8" (16 mm) Tension-Wound Finned Tubing 10 Fins per Inch

Recommended for glycol or water applications, we offer our standard 5/8" (16 mm) outside diameter (16-gauge, 0.065" / 1.65 mm wall thickness) carbon steel tubes with tension wound aluminum fins (10 per inch). In most cases, the 5/8" (16 mm) tubing will be the most economical choice on a cost per Btu basis.

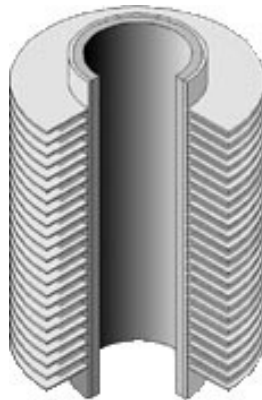


Figure 43 – 1" (25 mm) Extruded Finned Tubing 9 Fins per Inch

Select this configuration of extruded finned tubing for more demanding applications. It utilizes 1" (25 mm) outside diameter (14-gauge, 0.083" / 2 mm wall thickness) carbon steel tubes with extruded aluminum fins (9 per inch)..



Figure 44 – 1" (25 mm) Extruded Finned Tubing 5 Fins per Inch

For the harshest steam applications and/or where atmospheric particulate may cause premature fouling of the heater core, use the 1" (25 mm) outside diameter (10 gauge, 0.135" / 3.4 mm wall thickness) carbon steel tubes with extruded aluminum fins (5 per inch).

Table 48 – AH Series - Model Specifications

Base Model	Air Delivery*	Air Throw @15 psi Stream	Motor† Requirements	Tube Passes	Max. Allowable Pressure for Steam Units	Net Weight†Δ	Shipping Weight†Δ	Air Velocity	Max. Mounting Height	
	CFM	ft (m)	HP		psi	lbs (kg)	lbs (kg)	(ft/min)	ft (m)	
AH-12A-A_	1150	28 (8.5)	1/2	1 or 3	150	102 (46.3)	146 (66.2)	1441	12 (3.66)	
AH-12A-B_	1160			1 or 3	200	107 (48.5)	151 (68.5)	1454	12 (3.66)	
AH-12A-C1	1030			1	300	118 (53.5)	164 (74.4)	1291	12 (3.66)	
AH-16A-A_	1840	40 (12.2)		1, 3 or 5	135	127 (57.6)	174 (80.0)	1301	16 (4.88)	
AH-16A-B_	1780			1, 3 or 5	150	138 (62.6)	177 (80.3)	1259	16 (4.88)	
AH-16A-C1	1840			1	395	153 (69.4)	199 (90.3)	1301	16 (4.88)	
AH-20A-A_	2930			1, 3 or 5	180	155 (70.3)	209 (94.8)	1499	18 (5.49)	
AH-20A-B_	2700			1, 3 or 5	140	170 (77.1)	209 (94.8)	1382	18 (5.49)	
AH-20A-C1	3000			1	450	195 (88.5)	242 (109.8)	1535	18 (5.49)	
AH-24A-A_	3890	65 (19.8)		2 x 1/2	1, 3, 5 or 7	165	189 (85.7)	247 (112.0)	1288	20 (6.10)
AH-24A-B_	3640				1, 3, 5 or 7	190	212 (96.1)	251 (113.9)	1205	20 (6.10)
AH-24A-C1	3490				1	335	258 (117.0)	293 (132.9)	1115	20 (6.10)
AH-24B-A_	7650		1, 3, 5 or 7		235	313 (142.0)	361 (163.7)	—	20 (6.10)	
AH-24B-B_	7420		1, 3, 5 or 7		295	376 (170.6)	424 (192.3)	—	20 (6.10)	
AH-24B-C1	6690		1		450	440 (200.0)	488 (221.4)	—	20 (6.10)	

See Model Coding, page 89.

* at 70°F (21°C) at sea level.

† Thermon Heating Systems, Inc. reserves the right to substitute motors of higher horsepower.

‡ Add 12 lbs to flanged units.

Δ Add 15 lbs (6.8 kg) to Disconnect units

° Pressure restrictions for CSA Certified heaters only

Table 49 – AV Series - Model Specifications

Base Model	Air Delivery*	Air Throw @15 psi Stream	Motor† Requirements	Tube Passes	Net Weight†	Shipping Weight†	Air Velocity	Max. Mounting Height	
	CFM	ft (m)	HP		lbs (kg)	lbs (kg)	(ft/min)	ft (m)	
AV-12A-A_	1150	28 (8.5)	1/2	1 or 3	102 (46.3)	146 (66.2)	1441	12 (3.66)	
AV-12A-B_	1160			1 or 3	107 (48.5)	151 (68.5)	1454	12 (3.66)	
AV-12A-C1	1030			1	118 (52.5)	164 (74.4)	1291	12 (3.66)	
AV-16A-A_	1840	40 (12.2)		1, 3 or 5	127 (57.6)	174 (78.9)	1301	16 (4.88)	
AV-16A-B_	1780			1, 3 or 5	138 (62.6)	177 (80.3)	1259	16 (4.88)	
AV-16A-C1	1840			1	153 (69.4)	199 (90.3)	1301	16 (4.88)	
AV-20A-A_	2930			1, 3 or 5	155 (70.3)	209 (94.8)	1499	18 (5.49)	
AV-20A-B_	2700			1, 3 or 5	170 (77.1)	209 (94.8)	1382	18 (5.49)	
AV-20A-C1	3000			1	195 (88.5)	242 (109.8)	1535	18 (5.49)	
AV-24A-A_	3890	65 (19.8)		2 x 1/2	1, 3, 5 or 7	189 (85.7)	247 (112.0)	1288	20 (6.10)
AV-24A-B_	3640				1, 3, 5 or 7	212 (96.2)	251 (113.9)	1205	20 (6.10)
AV-24A-C1	3490				1	258 (117.0)	293 (132.9)	1115	20 (6.10)

See Model Coding, page 89.

* at 70°F (21°C) at sea level.

† Thermon Heating Systems, Inc. reserves the right to substitute motors of higher horsepower.

‡ Add 12 lbs to flanged units.

AH Physical Dimensions

Table 50 – Advanced Horizontal

Dim.	AH-12A	AH-16A	AH-20A	AH-24A
	in (mm)	in (mm)	in (mm)	in (mm)
A	15 $\frac{1}{8}$ (401)	19 $\frac{1}{8}$ (503)	23 $\frac{1}{8}$ (605)	27 $\frac{1}{8}$ (707)
B	19 $\frac{1}{8}$ (494)	23 $\frac{1}{8}$ (598)	27 $\frac{1}{8}$ (698)	31 $\frac{1}{8}$ (800)
C	4 $\frac{1}{8}$ (107)	4 $\frac{1}{8}$ (107)	4 $\frac{1}{8}$ (107)	4 $\frac{1}{8}$ (107)
D	7 $\frac{1}{8}$ (201)	7 $\frac{1}{8}$ (192)	7 $\frac{1}{8}$ (183)	8 $\frac{1}{8}$ (174)
E	23 $\frac{1}{8}$ (600)	23 $\frac{1}{8}$ (600)	23 $\frac{1}{8}$ (600)	23 $\frac{1}{8}$ (600)
F	18 $\frac{1}{8}$ (482)	22 $\frac{1}{8}$ (564)	26 $\frac{1}{8}$ (665)	30 $\frac{1}{8}$ (768)
G	$\frac{1}{8}$ (14.3)	$\frac{1}{8}$ (14.3)	$\frac{1}{8}$ (14.3)	$\frac{1}{8}$ (14.3)
H	23 $\frac{1}{8}$ (608.5)	27 $\frac{1}{8}$ (708.5)	31 $\frac{1}{8}$ (808.5)	35 $\frac{1}{8}$ (911.5)
I	1 $\frac{1}{8}$ (30)	1 $\frac{1}{8}$ (30)	1 $\frac{1}{8}$ (30)	1 $\frac{1}{8}$ (30)
J	$\frac{1}{2}$ (18)	$\frac{1}{2}$ (18)	$\frac{1}{2}$ (18)	$\frac{1}{2}$ (18)
K	27 $\frac{1}{8}$ (698.5)	31 $\frac{1}{8}$ (802.5)	35 $\frac{1}{8}$ (903)	39 $\frac{1}{8}$ (1005)

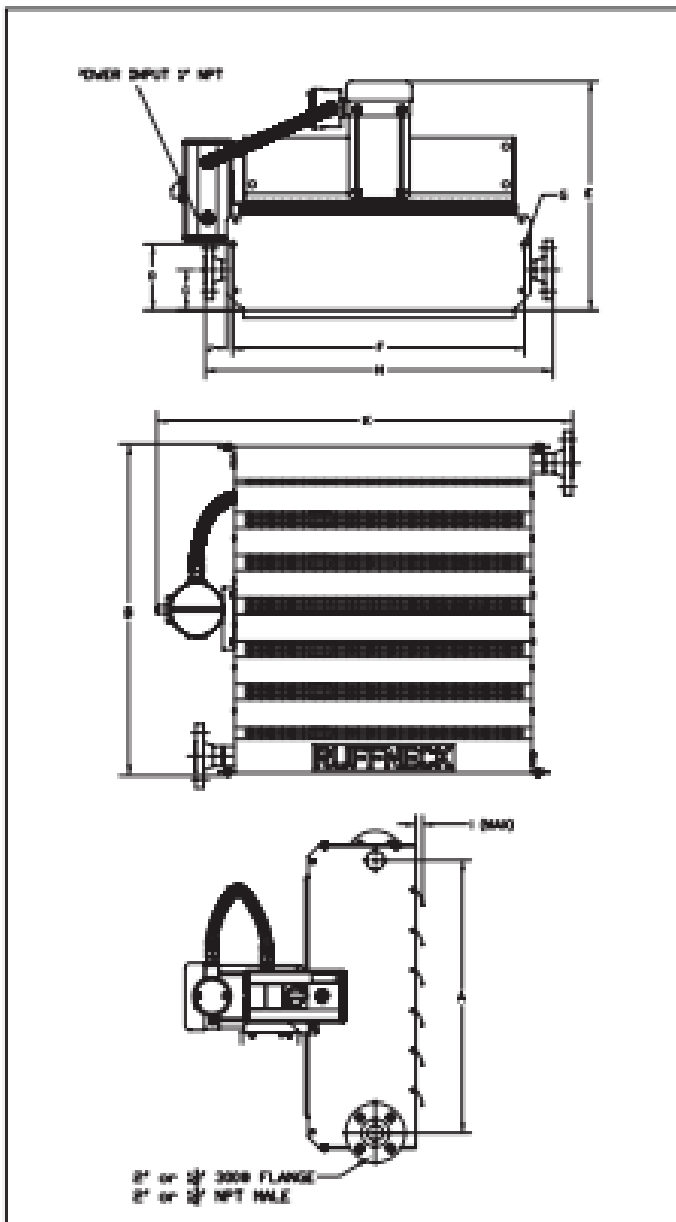


Table 51 – Advanced Horizontal Tandem

Dim.	AH-24B TANDEM	Dim.	AH-24B TANDEM
	in (mm)		in (mm)
A	52 $\frac{1}{8}$ (1345)	G	$\frac{1}{8}$ (14.3)
B	31 $\frac{1}{8}$ (800)	H	38 $\frac{1}{8}$ (937)
C	4 $\frac{1}{8}$ (122)	I	2 $\frac{1}{8}$ (53)
D	7 $\frac{1}{8}$ (189)	J	$\frac{1}{2}$ (18)
E	24 $\frac{1}{8}$ (615)	K	59 $\frac{1}{8}$ (1512)
F	58 $\frac{1}{8}$ (1480)	L	65 $\frac{1}{8}$ (1682.5)

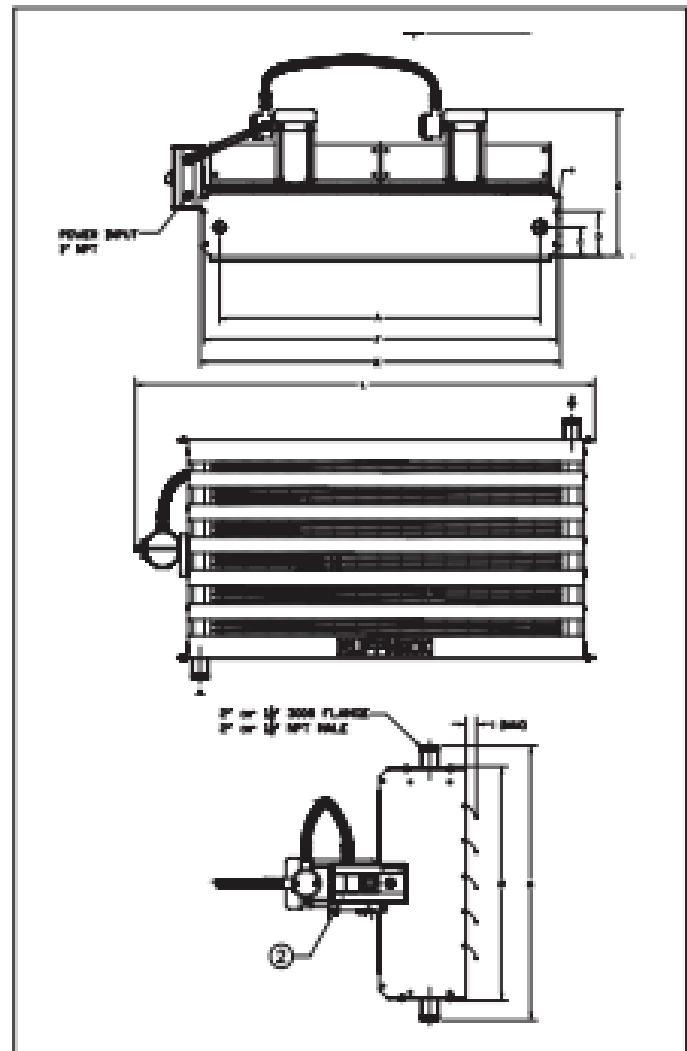


Figure 46 – Advanced Horizontal Tandem Heater

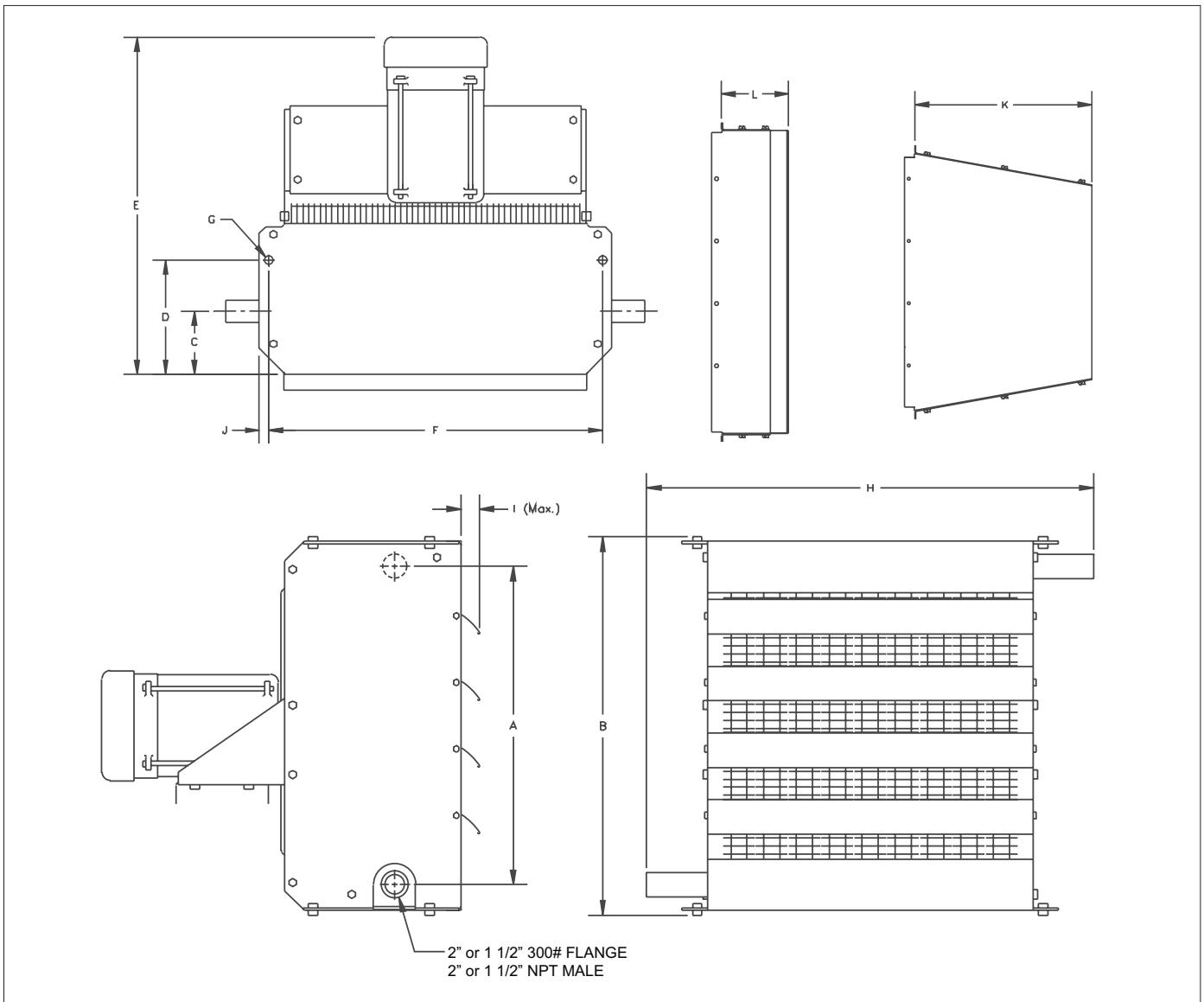
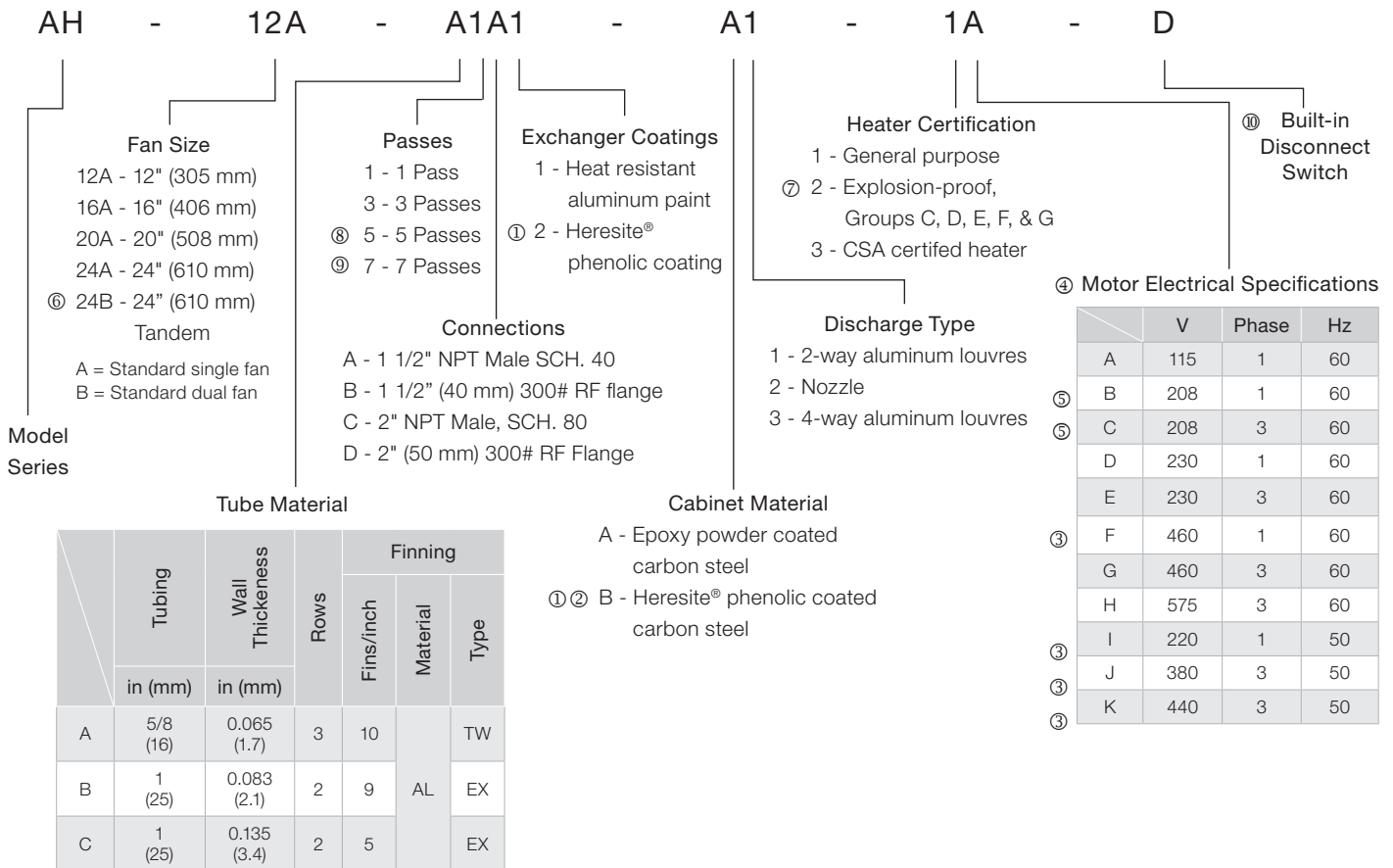


Figure 47 – Advanced Vertical Heater

Table 52 – Advanced Vertical

Dim.	AV-12A	AV-16A	AV-20A	AV-24A
	in (mm)	in (mm)	in (mm)	in (mm)
A	15 ¹³ / ₁₆ (401)	19 ¹³ / ₁₆ (503)	23 ¹³ / ₁₆ (605)	27 ⁷ / ₈ (707)
B	19 ⁷ / ₁₆ (494)	23 ¹ / ₂ (596)	27 ¹ / ₂ (698)	31 ¹ / ₂ (800)
C	4 ³ / ₁₆ (107)	4 ³ / ₁₆ (107)	4 ³ / ₁₆ (107)	4 ³ / ₁₆ (107)
D	7 ¹⁵ / ₁₆ (201)	7 ⁹ / ₁₆ (192)	7 ³ / ₁₆ (183)	6 ⁷ / ₈ (174)
E	23 ⁵ / ₈ (600)	23 ⁵ / ₈ (600)	23 ⁵ / ₈ (600)	23 ⁵ / ₈ (600)
F	18 ³ / ₁₆ (462)	22 ³ / ₁₆ (564)	26 ³ / ₁₆ (665)	30 ³ / ₁₆ (766)
G	⁹ / ₁₆ (14.3)	⁹ / ₁₆ (14.3)	⁹ / ₁₆ (14.3)	⁹ / ₁₆ (14.3)
H	23 ⁷ / ₈ (606.5)	27 ⁷ / ₈ (708.5)	31 ⁷ / ₈ (809.5)	35 ⁷ / ₈ (911.5)
I	1 ⁹ / ₁₆ (39)	1 ⁹ / ₁₆ (39)	1 ⁹ / ₁₆ (39)	1 ⁹ / ₁₆ (39)
J	⁵ / ₈ (16)	⁵ / ₈ (16)	⁵ / ₈ (16)	⁵ / ₈ (16)
K	11 ¹³ / ₁₆ (300)	11 ¹³ / ₁₆ (300)	15 ¹¹ / ₁₆ (398)	15 ¹¹ / ₁₆ (398)
L	4 ¹⁵ / ₁₆ (122)	4 ¹⁵ / ₁₆ (122)	4 ¹⁵ / ₁₆ (122)	4 ¹⁵ / ₁₆ (122)

Model Coding



Tube Material

	Tubing	Wall Thickness	Rows	Finning		
				Fins/inch	Material	Type
	in (mm)	in (mm)				
A	5/8 (16)	0.065 (1.7)	3	10	AL	TW
B	1 (25)	0.083 (2.1)	2	9		EX
C	1 (25)	0.135 (3.4)	2	5		EX

Cabinet Material

A - Epoxy powder coated carbon steel
 ① ② B - Heresite® phenolic coated carbon steel

Model Series

NOTE:

Thermon Heating Systems Inc. units utilize a standard motor. Specifying any other O.E.M. motor may result in longer lead times.

They are approved for use in all provinces and territories in Canada.

- ① Heresite® coated exchangers and cabinets: contact factory for quote.
- ② Louvres and fan blades are also Heresite® coated.
- ③ Contact factory for shipping lead time.
- ④ Motor designed to be used at rated voltage with tolerances of ±15%.
- ⑤ Motor may be marked 230V, but is suitable for 208V operation.
- ⑥ Tandem configuration not available on AV models.
- ⑦ 460 1-phase motors are only certified for groups D, F, and G.
- ⑧ Only available in 16" (406 mm) and larger units.
- ⑨ Only available in 24" (610 mm) and larger units.
- ⑩ Built-in Disconnect only available with CSA certified heater.

AH-12A-A1 (Single Pass)

Table 53 – 5/8" (16 mm) Tension-Wound Finned Tubing (10 fins/inch), Single Fan

Operating Pressure		Entering Air Temperature °F (°C)						
		-10 (-23)	0 (-18)	20 (-7)	40 (4)	60 (16)	70 (21)	80 (27)
2	OUTPUT (MBH)	117.6	111.6	100.1	88.8	77.9	72.5	67.3
	COND. (lbs/hr)	120.1	114.0	102.2	90.7	79.5	74.1	68.7
	FAT °F (°C)	72.9 (22.7)	80.2 (26.8)	94.4 (34.7)	108.2 (42.3)	121.7 (49.8)	128.4 (53.6)	134.9 (57.2)
50	OUTPUT (MBH)	162.0	155.7	143.2	131.2	119.5	113.7	108.1
	COND. (lbs/hr)	175.1	168.2	154.7	141.7	129.0	122.8	116.7
	FAT °F (°C)	105.2 (40.7)	112.6 (44.8)	127.2 (52.7)	141.5 (60.8)	155.4 (68.6)	162.2 (72.3)	168.9 (76.1)
100	OUTPUT (MBH)	184.7	178.1	165.3	152.8	140.8	134.9	129.0
	COND. (lbs/hr)	206.3	198.9	184.5	170.6	157.1	150.5	143.9
	FAT °F (°C)	121.8 (49.9)	129.4 (54.1)	144.2 (62.3)	158.7 (70.4)	172.8 (78.2)	179.7 (82.1)	186.5 (85.8)
200	OUTPUT (MBH)	213.0	206.2	192.8	179.9	167.4	161.2	155.2
	COND. (lbs/hr)	249.1	241.1	225.4	210.3	195.6	188.4	181.3
	FAT °F (°C)	142.6 (61.4)	150.4 (65.8)	165.5 (74.2)	180.3 (82.4)	194.7 (90.4)	201.7 (94.3)	208.7 (98.2)

AH-12A-B1 (Single Pass)

Table 54 – 1" (25 mm) Extruded Finned Tubing (9 fins/inch), Single Fan

Operating Pressure		Entering Air Temperature °F (°C)						
		-10 (-23)	0 (-18)	20 (-7)	40 (4)	60 (16)	70 (21)	80 (27)
2	OUTPUT (MBH)	110.0	104.5	93.7	83.2	73.0	68.0	63.0
	COND. (lbs/hr)	112.2	160.6	95.6	84.9	74.5	69.4	64.3
	FAT °F (°C)	66.9 (19.4)	74.3 (23.5)	88.9 (31.6)	103.2 (39.6)	117.2 (47.3)	124.1 (51.2)	130.9 (54.9)
50	OUTPUT (MBH)	151.7	145.8	134.2	123.0	112.0	106.7	101.4
	COND. (lbs/hr)	163.8	157.8	144.8	132.7	120.9	115.1	109.4
	FAT °F (°C)	96.8 (36)	104.4 (40.2)	119.4 (48.6)	134.1 (56.7)	148.4 (64.7)	155.4 (68.6)	162.4 (72.4)
100	OUTPUT (MBH)	173.1	166.9	155.0	143.4	132.1	126.6	121.1
	COND. (lbs/hr)	193.1	186.2	172.8	159.8	147.2	141.1	135.0
	FAT °F (°C)	112.2 (44.6)	119.9 (48.8)	135.1 (52.3)	150.0 (65.6)	164.5 (73.6)	171.7 (77.6)	178.7 (81.5)
200	OUTPUT (MBH)	199.7	193.3	180.9	168.8	157.1	151.4	145.8
	COND. (lbs/hr)	233.3	225.8	211.2	197.1	183.4	176.7	170.1
	FAT °F (°C)	131.5 (55.3)	139.4 (59.7)	154.9 (68.3)	170.1 (76.7)	184.8 (84.4)	192.1 (88.9)	199.3 (92.9)

AH-12A-C1 (Single Pass)

Table 55 – 1" (25 mm) Extruded Finned Tubing 5 fins/inch), Single Fan

Operating Pressure		Entering Air Temperature °F (°C)						
		-10 (-23)	0 (-18)	20 (-7)	40 (4)	60 (16)	70 (21)	80 (27)
2	OUTPUT (MBH)	88.2	83.8	75.1	66.7	58.5	54.5	50.5
	COND. (lbs/hr)	89.7	85.1	76.3	67.8	59.4	55.4	51.3
	FAT °F (°C)	59.1 (15.1)	66.8 (19.3)	27.8 (82.0)	36.1 (96.9)	44.2 (111.5)	48.2 (118.7)	52.2 (125.9)
50	OUTPUT (MBH)	121.4	116.7	107.4	98.4	89.6	85.3	81.1
	COND. (lbs/hr)	130.5	125.4	115.4	105.7	96.3	91.7	87.7
	FAT °F (°C)	85.6 (29.8)	93.5 (34.2)	42.8 (109.1)	51.3 (124.3)	59.6 (139.3)	63.7 (146.7)	67.8 (154.0)
100	OUTPUT (MBH)	138.4	133.5	123.9	114.6	105.6	101.2	96.9
	COND. (lbs/hr)	153.7	148.3	137.6	127.2	117.2	112.3	107.4
	FAT °F (°C)	99.2 (37.3)	107.3 (41.8)	123.0 (50.6)	138.5 (59.2)	153.7 (67.6)	161.1 (71.7)	168.5 (75.8)
200	OUTPUT (MBH)	159.6	154.5	144.6	135.0	125.6	121.1	116.6
	COND. (lbs/hr)	185.6	179.7	168.1	156.8	145.9	140.6	135.6
	FAT °F (°C)	116.3 (46.8)	124.5 (51.4)	140.6 (60.3)	156.3 (69.1)	171.7 (77.6)	179.3 (81.8)	186.8 (86.0)

AH-16A-A1 (Single Pass)

Table 56 – 5/8" (16 mm) Tension-Wound Finned Tubing (10 fins/inch), Single Fan

Operating Pressure		Entering Air Temperature °F (°C)						
		-10 (-23)	0 (-18)	20 (-7)	40 (4)	60 (16)	70 (21)	80 (27)
2	OUTPUT (MBH)	194.3	184.5	165.3	146.7	128.6	119.7	111.0
	COND. (lbs/hr)	199.0	188.9	169.3	150.2	131.7	122.6	113.7
	FAT °F (°C)	75.9 (24.4)	83.0 (28.3)	97.0 (36.1)	110.6 (43.7)	123.8 (51)	130.4 (54.7)	138.8 (59.3)
50	OUTPUT (MBH)	267.6	257.0	236.4	216.4	197.0	187.6	178.0
	COND. (lbs/hr)	290.0	278.6	256.2	234.5	213.5	203.2	193.0
	FAT °F (°C)	109.2 (42.9)	116.6 (47.0)	131.0 (55.0)	145.0 (62.8)	158.6 (70.3)	165.3 (74.1)	171.9 (77.7)
100	OUTPUT (MBH)	305.0	294.0	272.7	252.1	232.1	222.3	212.7
	COND. (lbs/hr)	341.7	329.4	305.5	282.3	259.9	248.9	238.1
	FAT °F (°C)	126.4 (52.4)	133.9 (56.6)	148.5 (64.7)	162.8 (72.7)	176.6 (80.3)	183.4 (84.1)	190.1 (87.8)
200	OUTPUT (MBH)	351.5	340.2	318.0	296.6	275.9	265.7	255.7
	COND. (lbs/hr)	412.6	399.2	373.2	348.0	323.6	311.6	299.9
	FAT °F (°C)	148.0 (64.4)	155.6 (68.7)	170.6 (77)	185.1 (85.1)	199.3 (92.9)	206.2 (96.8)	213.0 (100.1)

AH-16A-B1 (Single Pass)

Table 57 – 1" Extruded Finned Tubing (9 fins/inch), Single Fan

Operating Pressure		Entering Air Temperature °F (°C)						
		-23 (-10)	0 (-18)	20 (-7)	40 (4)	60 (16)	70 (21)	80 (27)
2	OUTPUT (MBH)	182.5	173.3	155.2	137.7	120.7	112.4	104.2
	COND. (lbs/hr)	186.8	177.4	158.9	141.0	123.5	115.0	106.6
	FAT °F (°C)	73.2 (22.9)	80.4 (26.9)	94.5 (34.7)	108.3 (42.4)	121.8 (49.9)	128.4 (53.6)	135.0 (57.2)
50	OUTPUT (MBH)	251.5	241.5	222.1	203.3	185.0	176.1	167.3
	COND. (lbs/hr)	272.4	261.6	240.5	220.1	200.3	190.6	181.1
	FAT °F (°C)	105.4 (40.8)	112.8 (44.9)	127.4 (53)	141.6 (60.9)	155.4 (68.6)	162.2 (72.3)	168.9 (76.1)
100	OUTPUT (MBH)	286.7	276.4	256.3	236.9	218.0	208.8	199.8
	COND. (lbs/hr)	321.0	309.4	286.9	265.1	243.9	233.6	223.4
	FAT °F (°C)	122.0 (50.0)	129.6 (54.2)	144.4 (62.4)	158.8 (70.4)	172.8 (78.2)	179.7 (82.1)	186.5 (85.8)
200	OUTPUT (MBH)	330.6	319.9	299.0	278.8	259.2	249.7	240.3
	COND. (lbs/hr)	387.7	375.1	350.5	326.8	303.8	292.6	281.5
	FAT °F (°C)	142.9 (61.6)	150.6 (65.9)	165.6 (74.2)	180.3 (82.4)	194.7 (90.4)	201.7 (94.3)	208.6 (98.1)

AH-16A-C1 (Single Pass)

Table 58 – 1" Extruded Finned Tubing (5 fins/inch), Single Fan

Operating Pressure		Entering Air Temperature °F (°C)						
		-10(-23)	0 (-18)	20 (-7)	40 (4)	60 (16)	70 (21)	80 (27)
2	OUTPUT (MBH)	146.4	139.1	124.7	110.8	97.2	90.6	84.0
	COND. (lbs/hr)	149.5	142.0	127.3	113.1	99.2	92.4	85.7
	FAT °F (°C)	54.1 (12.3)	61.9 (16.6)	77.5 (25.3)	92.8 (33.8)	107.8 (72.1)	115.3 (46.3)	122.6 (50.3)
50	OUTPUT (MBH)	201.4	193.5	178.2	163.3	148.8	141.7	134.7
	COND. (lbs/hr)	217.4	208.9	192.3	176.2	160.6	152.9	145.4
	FAT °F (°C)	78.5 (25.8)	86.6 (30.3)	102.5 (39.2)	118.2 (47.9)	133.6 (56.4)	141.1 (60.6)	148.7 (64.8)
100	OUTPUT (MBH)	229.5	221.4	205.5	190.2	175.3	168.0	160.8
	COND. (lbs/hr)	256.0	247.0	229.3	212.1	195.5	187.3	179.3
	FAT °F (°C)	91.1 (32.8)	99.3 (37.4)	115.4 (46.3)	131.3 (55.2)	146.8 (63.8)	154.5 (68.1)	162.1 (72.3)
200	OUTPUT (MBH)	264.5	256.1	239.7	223.8	208.4	200.8	193.4
	COND. (lbs/hr)	309.1	299.2	280.0	261.3	243.3	234.4	225.7
	FAT °F (°C)	106.9 (41.6)	115.2 (46.2)	131.6 (55.3)	147.7 (64.3)	163.5 (73.1)	171.3 (77.4)	179.0 (81.7)

AH-10A-A1 (Single Pass)

Table 59 – 5/8" (16 mm) Tension-Wound Finned Tubing (10fins/inch), Single Fan

Operating Pressure		Entering Air Temperature °F (°C)						
		-10 (-23)	0 (-18)	20 (-7)	40 (4)	60 (16)	70 (21)	80 (27)
2	OUTPUT (MBH)	285.6	271.2	243.1	215.9	189.3	176.3	163.5
	COND. (lbs/hr)	293.0	278.3	249.5	221.5	194.2	180.9	167.7
	FAT °F (°C)	20.8 (69.4)	76.8 (24.9)	91.3 (32.9)	105.4 (40.8)	119.2 (48.4)	126.0 (52.2)	132.7 (55.9)
50	OUTPUT (MBH)	392.5	377.1	347.0	317.9	289.5	275.7	262.0
	COND. (lbs/hr)	426.3	409.5	376.8	345.1	314.3	299.2	284.4
	FAT °F (°C)	100.0 (37.8)	107.6 (42.0)	122.5 (50.3)	137.0 (58.3)	151.2 (66.2)	158.2 (70.1)	165.1 (73.9)
100	OUTPUT (MBH)	447.1	431.2	400.1	370.0	340.8	326.6	312.5
	COND. (lbs/hr)	501.9	484.0	449.1	415.3	382.5	366.4	350.6
	FAT °F (°C)	115.8 (46.6)	123.5 (50.8)	138.6 (59.2)	153.4 (67.4)	167.8 (75.4)	174.8 (79.3)	181.8 (83.2)
200	OUTPUT (MBH)	514.9	498.4	466.2	435.0	404.8	390.0	375.4
	COND. (lbs/hr)	605.8	586.3	548.3	511.5	475.9	458.5	441.3
	FAT °F (°C)	135.5 (57.5)	143.4 (61.9)	158.8 (70.4)	173.9 (78.8)	188.6 (87.0)	195.8 (91.0)	202.9 (94.9)

AH-20A-B1 (Single Pass)

Table 60 – 1" (25 mm) Extruded Finned Tubing (9 /inch), Single Fan

Operating Pressure		Entering Air Temperature °F (°C)						
		-10 (-23)	0 (-18)	20 (-7)	40 (4)	60 (16)	70 (21)	80 (27)
2	OUTPUT (MBH)	283.4	269.0	240.8	213.5	187.1	174.1	161.4
	COND. (lbs/hr)	209.8	276.0	247.1	219.1	191.9	178.6	165.6
	FAT °F (°C)	74.8 (23.8)	81.9 (27.7)	96.0 (35.6)	109.7 (43.2)	123.0 (50.5)	129.6 (54.2)	136.1 (57.8)
50	OUTPUT (MBH)	390.6	375.0	344.6	315.2	286.8	272.9	259.2
	COND. (lbs/hr)	424.1	407.2	374.1	342.2	311.3	296.2	281.3
	FAT °F (°C)	107.6 (42.0)	115.0 (46.1)	129.4 (54.1)	143.5 (61.9)	157.3 (69.6)	164.0 (73.3)	170.6 (77.0)
100	OUTPUT (MBH)	445.3	429.2	397.7	367.3	337.9	323.6	309.4
	COND. (lbs/hr)	499.9	481.7	446.4	412.2	379.2	363.0	347.2
	FAT °F (°C)	124.5 (51.4)	132.0 (55.6)	146.7 (63.5)	161.0 (71.7)	175.0 (79.4)	181.8 (83.2)	188.6 (87.0)
200	OUTPUT (MBH)	513.5	496.7	464.0	432.4	401.8	386.9	372.2
	COND. (lbs/hr)	604.1	584.2	545.6	508.4	472.3	454.8	437.5
	FAT °F (°C)	145.7 (63.2)	153.4 (67.4)	168.4 (75.8)	183.0 (83.9)	197.2 (91.8)	204.2 (95.7)	211.1 (99.5)

AH-20A-C1 (Single Pass)

Table 61 – 1" (25 mm) Extruded Finned Tubing (5 fins/inch), Single Fan

Operating Pressure		Entering Air Temperature °F (°C)						
		-10 (-23)	0 (-18)	20 (-7)	40 (4)	60 (16)	70 (21)	80 (27)
2	OUTPUT (MBH)	224.9	213.6	191.7	170.3	149.5	139.3	129.2
	COND. (lbs/hr)	230.2	218.7	196.2	174.3	153.0	142.5	132.2
	FAT °F (°C)	50.6 (10.3)	14.8 (58.6)	74.4 (23.6)	90.0 (32.2)	105.3 (40.7)	112.9 (44.9)	120.4 (49.1)
50	OUTPUT (MBH)	309.2	297.2	273.7	250.9	228.7	217.9	207.2
	COND. (lbs/hr)	334.9	321.8	296.4	271.6	247.6	235.9	224.2
	FAT °F (°C)	73.7 (23.2)	27.7 (81.9)	98.1 (36.7)	114.0 (45.6)	129.7 (52.3)	137.4 (58.6)	145.0 (62.8)
100	OUTPUT (MBH)	352.2	339.8	315.6	292.2	269.4	258.2	247.2
	COND. (lbs/hr)	394.3	380.4	353.3	326.9	301.4	288.9	276.5
	FAT °F (°C)	85.6 (29.8)	34.4 (93.9)	110.3 (43.5)	126.4 (52.4)	142.2 (61.2)	150.0 (65.6)	157.8 (69.9)
200	OUTPUT (MBH)	405.9	393.0	368.0	343.7	320.1	308.6	297.2
	COND. (lbs/hr)	476.0	460.9	431.4	402.8	375.1	361.6	348.2
	FAT °F (°C)	100.5 (38.1)	108.9 (42.7)	125.6 (52.0)	141.9 (61.1)	158.0 (70.0)	165.9 (74.4)	173.8 (78.8)

AH-24A-A1 (Single Pass)

Table 62 – 5/8" (16 mm) Tensions-Wound Finned Tubing (10fins/inch), Single Fan

Operating Pressure		Entering Air Temperature °F (°C)						
		-10 (-23)	0 (-18)	20 (-7)	40 (4)	60 (16)	70 (21)	80 (27)
2	OUTPUT (MBH)	390.0	370.4	332.0	294.6	258.4	240.6	223.0
	COND. (lbs/hr)	399.6	379.4	340.0	301.8	264.6	246.4	228.4
	FAT °F (°C)	71.5 (21.9)	78.8 (26.0)	93.1 (33.9)	107.0 (41.7)	120.7 (49.3)	127.4 (53.0)	134.0 (56.7)
50	OUTPUT (MBH)	536.0	514.9	473.7	433.8	395.0	376.1	357.4
	COND. (lbs/hr)	581.1	558.2	513.4	470.1	428.1	407.5	387.2
	FAT °F (°C)	102.8 (39.3)	110.3 (43.5)	125.1 (51.7)	139.4 (59.7)	153.4 (67.4)	160.3 (71.3)	167.1 (75.1)
100	OUTPUT (MBH)	610.5	588.7	546.2	505.0	465.0	445.4	426.2
	COND. (lbs/hr)	684.1	659.6	611.8	565.6	520.8	498.9	477.3
	FAT °F (°C)	119.0 (48.3)	126.6 (52.6)	141.6 (69.0)	156.2 (69.0)	170.4 (76.9)	177.4 (80.8)	184.3 (84.6)
200	OUTPUT (MBH)	703.1	680.5	636.4	593.7	552.3	532.1	512.1
	COND. (lbs/hr)	825.5	798.8	746.9	696.6	647.9	624.1	600.7
	FAT °F (°C)	139.2 (59.6)	147.0 (63.9)	162.3 (72.4)	177.2 (80.7)	191.7 (88.7)	198.8 (92.7)	205.9 (96.6)

AH-24A-B1 (Single Pass)

Table 63 – 1" (25 mm) Extruded Finned Tubing (9 fins/inch), Single Fan

Operating Pressure		Entering Air Temperature °F (°C)						
		-10 (-23)	0 (-18)	20 (-7)	40 (4)	60 (16)	70 (21)	80 (27)
2	OUTPUT (MBH)	353.9	336.0	300.9	266.9	233.9	217.8	202.8
	COND. (lbs/hr)	362.2	343.8	307.9	273.1	239.3	222.8	206.5
	FAT °F (°C)	68.4 (20.2)	75.7 (24.8)	90.3 (32.4)	104.5 (40.3)	118.3 (47.9)	125.2 (51.8)	131.9 (55.5)
50	OUTPUT (MBH)	486.6	467.3	429.6	393.2	357.9	340.6	323.6
	COND. (lbs/hr)	526.9	505.9	465.1	425.6	387.3	368.6	350.1
	FAT °F (°C)	98.4 (36.9)	106.0 (41.1)	120.9 (49.4)	135.5 (57.5)	149.8 (65.4)	156.8 (69.3)	163.7 (73.2)
100	OUTPUT (MBH)	554.4	534.4	495.5	457.9	421.4	403.6	386.1
	COND. (lbs/hr)	620.5	598.0	554.4	512.2	471.3	451.4	431.7
	FAT °F (°C)	113.8 (45.4)	121.5 (49.7)	136.7 (58.2)	151.5 (66.4)	166.0 (74.4)	173.1 (78.4)	180.1 (82.3)
200	OUTPUT (MBH)	638.9	618.1	577.7	538.6	500.8	482.3	464.2
	COND. (lbs/hr)	749.0	724.6	677.0	631.1	586.7	565.0	543.6
	FAT °F (°C)	133.2 (56.2)	141.1 (60.6)	156.5 (69.2)	171.6 (77.6)	186.4 (85.8)	193.6 (89.8)	200.8 (93.8)

AH-24A-C1 (Single Pass)

Table 64 – 1" (25 mm) Extruded Finned Tubing (5 fins/inch), Single Fan

Operating Pressure		Entering Air Temperature °F (°C)						
		-10 (-23)	0 (-18)	20 (-7)	40 (4)	60 (16)	70 (21)	80 (27)
2	OUTPUT (MBH)	290.8	276.2	247.6	219.9	192.9	179.6	166.6
	COND. (lbs/hr)	296.9	281.9	252.7	224.4	196.8	183.3	170.0
	FAT °F (°C)	57.2 (14.0)	65.0 (18.3)	80.3 (26.8)	95.3 (35.2)	110.1 (43.4)	117.4 (47.4)	124.6 (51.4)
50	OUTPUT (MBH)	399.3	383.6	353.1	323.4	294.7	280.6	266.7
	COND. (lbs/hr)	431.1	414.1	381.1	349.1	318.0	302.8	287.7
	FAT °F (°C)	82.7 (28.2)	90.7 (32.6)	106.4 (41.3)	121.8 (49.9)	136.9 (58.8)	144.4 (62.4)	151.8 (66.6)
100	OUTPUT (MBH)	454.6	438.5	407.0	376.5	346.9	332.4	318.1
	COND. (lbs/hr)	507.3	489.2	453.9	419.8	386.7	370.5	354.6
	FAT °F (°C)	95.9 (35.5)	103.9 (39.9)	119.9 (48.8)	135.5 (57.5)	150.8 (66.0)	158.3 (70.2)	165.8 (74.3)
200	OUTPUT (MBH)	523.6	506.9	474.2	442.7	412.0	397.0	382.3
	COND. (lbs/hr)	611.9	592.3	554.0	516.9	481.0	463.5	446.2
	FAT °F (°C)	112.3 (44.6)	120.5 (49.2)	136.7 (58.2)	152.6 (67.0)	168.1 (75.6)	175.8 (79.9)	183.4 (84.1)

AH-24B-A1, Single Pass

Table 65 – 5/8" (16 mm) Tensions-Wound Finned Tubing (10 fins/inch), Tandem Fan

Operating Pressure		Entering Air Temperature °F (°C)						
		-10 (-23)	0 (-18)	20 (-7)	40 (4)	60 (16)	70 (21)	80 (27)
2	OUTPUT (MBH)	694.1	659.3	591.1	524.8	460.4	428.8	397.6
	COND. (lbs/hr)	713.3	677.5	607.4	539.3	473.1	440.6	408.5
	FAT °F (°C)	63.8 (17.7)	71.3 (21.8)	86.2 (30.1)	100.8 (38.2)	115.0 (46.1)	122.1 (50.1)	129.0 (53.9)
50	OUTPUT (MBH)	951.4	914.1	841.3	770.7	702.2	668.6	635.4
	COND. (lbs/hr)	1035.0	994.4	915.2	838.3	763.7	727.1	691.0
	FAT °F (°C)	91.9 (32.3)	99.7 (37.6)	114.9 (46.1)	129.9 (54.4)	144.6 (62.6)	151.8 (66.6)	158.9 (70.5)
100	OUTPUT (MBH)	1082.5	1044.1	969.1	896.4	825.8	791.3	757.2
	COND. (lbs/hr)	1217.6	1174.3	1089.8	1007.9	928.5	889.6	851.2
	FAT °F (°C)	106.3 (41.3)	114.2 (45.7)	129.7 (54.3)	144.9 (62.7)	159.8 (71.0)	167.1 (75.1)	174.3 (79.1)
200	OUTPUT (MBH)	1245.6	1205.7	1128.1	1052.8	979.9	944.2	909.0
	COND. (lbs/hr)	1468.2	1421.1	1329.4	1240.5	1154.4	1112.3	1070.7
	FAT °F (°C)	124.4 (51.3)	132.5 (55.8)	148.3 (64.6)	163.8 (73.2)	178.9 (81.6)	186.4 (85.8)	193.7 (89.8)

AH-24B-B1

Table 66 – 1" (25 mm) Extruded Finned Tubing (9 fins/inch), Tandem Fan

Operating Pressure		Entering Air Temperature °F (°C)						
		-10 (-23)	0 (-18)	20 (-7)	40 (4)	60 (16)	70 (21)	80 (27)
2	OUTPUT (MBH)	637.6	605.5	542.8	481.8	422.6	393.6	364.9
	COND. (lbs/hr)	654.9	621.9	557.4	494.8	434.0	404.2	374.7
	FAT °F (°C)	59.7 (15.4)	67.4 (19.7)	82.5 (28.1)	97.4 (36.3)	112.0 (44.4)	119.2 (48.4)	126.3 (52.4)
50	OUTPUT (MBH)	874.3	839.9	772.9	707.9	644.8	614.0	583.5
	COND. (lbs/hr)	950.4	913.0	840.1	769.4	700.8	667.2	634.1
	FAT °F (°C)	86.2 (30.1)	94.1 (34.5)	109.6 (43.1)	124.8 (51.6)	139.8 (59.9)	147.1 (63.9)	154.4 (68.0)
100	OUTPUT (MBH)	994.9	959.5	890.4	823.5	758.5	726.8	695.5
	COND. (lbs/hr)	1118.2	1078.3	1000.5	925.2	852.2	816.4	781.2
	FAT °F (°C)	99.8 (37.7)	107.8 (42.1)	123.5 (50.8)	139.0 (59.4)	154.1 (67.8)	161.6 (72.0)	169.0 (76.1)
200	OUTPUT (MBH)	1147.2	1108.4	1036.8	967.5	900.3	867.5	835.1
	COND. (lbs/hr)	1348.7	1305.3	1220.8	1139.0	1059.8	1021.1	982.9
	FAT °F (°C)	116.8 (47.1)	125.0 (51.7)	141.0 (60.6)	156.7 (69.3)	172.1 (77.8)	179.7 (82.4)	187.2 (86.2)

AH-24B-C1, Single Pass

Table 67 – 1" (25 mm) Extruded Finned Tubing (5 fins/inch), Tandem Fan

Operating Pressure		Entering Air Temperature °F (°C)						
		-10 (-23)	0 (-18)	20 (-7)	40 (4)	60 (16)	70 (21)	80 (27)
2	OUTPUT (MBH)	499.4	474.3	425.3	377.7	331.4	308.7	286.3
	COND. (lbs/hr)	511.8	486.1	435.8	387.1	339.6	316.3	293.4
	FAT °F (°C)	50.3 (10.2)	58.3 (14.6)	74.1 (23.4)	89.7 (32.1)	105.5 (40.8)	112.6 (44.8)	120.1 (48.9)
50	OUTPUT (MBH)	683.6	656.8	604.7	554.1	504.9	480.9	457.1
	COND. (lbs/hr)	741.3	712.2	655.6	600.7	547.4	521.2	495.5
	FAT °F (°C)	73.0 (22.8)	81.2 (27.3)	97.4 (36.3)	113.3 (45.2)	128.9 (53.8)	136.7 (58.2)	144.4 (62.4)
100	OUTPUT (MBH)	777.5	750.5	696.3	644.2	593.7	569.0	544.6
	COND. (lbs/hr)	871.5	840.6	780.3	721.9	665.2	637.4	610.1
	FAT °F (°C)	84.6 (29.2)	92.9 (33.8)	109.3 (42.9)	125.4 (51.9)	141.3 (60.7)	149.1 (65.1)	156.9 (69.4)
200	OUTPUT (MBH)	894.4	865.9	810.4	756.6	704.4	678.9	653.8
	COND. (lbs/hr)	1050.4	1016.9	951.5	888.1	826.8	796.7	767.1
	FAT °F (°C)	99.1 (37.3)	107.6 (42.0)	124.2 (51.2)	140.6 (60.3)	156.7 (69.3)	164.6 (73.7)	172.5 (78.1)

50% Ethylene Glycol - 60°F (16°C) EAT

Table 68 – 5/8" (16 mm) Tension-Wound Finned Tubing (10 fins/inch)

Model	ΔT °F (°C)	Entering Glycol Temperature											
		180°F (82°C)				200°F (93°C)				220°F (104°C)			
		Output MBH	Flow USGPM	FAT	PD	Output MBH	Flow USGPM	FAT	PD	Output MBH	Flow USGPM	FAT	PD
				°F (°C)	psi			°F (°C)	psi			°F (°C)	psi
AH-12A-A1* One pass	10 (5.6)	17.6	3.69	73.3 (22.9)	0.00	21.5	4.45	76.3 (24.6)	0.00	33.6	6.95	85.8 (29.9)	0.01
	20 (11.1)	13.0	1.35	69.7 (20.9)	0.00	16.1	1.65	72.0 (22.2)	0.00	19.3	1.95	74.4 (23.6)	0.00
	40 (22.2)	8.9	0.45	66.4 (19.1)	0.00	11.2	0.56	68.1 (20.1)	0.00	13.6	0.68	69.9 (21.1)	0.00
AH-12A-A3 Three pass	10 (5.6)	43.0	9.26	93.7 (34.3)	0.31	56.5	12.0	104.5 (40.3)	0.52	68.1	14.3	113.7 (45.4)	0.73
	20 (11.1)	19.0	2.00	74.4 (23.6)	0.02	34.0	3.59	86.3 (30.2)	0.05	48.8	5.12	98.1 (36.7)	0.10
	40 (22.2)	13.3	0.69	69.9 (21.1)	0.00	16.7	0.86	72.5 (22.5)	0.00	20.4	1.04	75.3 (24.1)	0.01
AH-16A-A1* One pass	10 (5.6)	32.1	6.82	75.4 (24.1)	0.01	54.3	11.5	86.4 (30.2)	0.01	80.0	16.8	99.2 (37.3)	0.03
	20 (11.1)	24.0	2.53	71.4 (21.9)	0.00	29.6	3.09	74.1 (23.4)	0.00	35.4	3.65	76.9 (24.9)	0.00
	40 (22.2)	15.8	0.82	67.3 (19.6)	0.00	20.7	1.06	69.6 (20.9)	0.00	25.1	1.28	71.7 (22.1)	0.00
AH-16A-A3 Three pass	10 (5.6)	80.3	17.4	99.5 (37.5)	0.74	99.2	21.2	109.0 (42.8)	1.08	118.1	24.9	118.5 (48.1)	1.48
	20 (11.1)	48.6	5.23	83.6 (28.7)	0.08	72.5	7.73	95.5 (35.3)	0.16	97.3	10.3	107.9 (42.2)	0.27
	40 (22.2)	24.3	1.29	71.5 (21.9)	0.01	30.6	1.61	74.6 (23.7)	0.01	37.2	1.93	77.7 (25.4)	0.01
AH-16A-A5 Five pass	10 (5.6)	88.0	19.1	103.4 (39.7)	3.96	106.7	22.8	112.8 (44.9)	5.60	125.3	26.5	122.2 (50.1)	7.46
	20 (11.1)	69.0	7.46	93.8 (34.3)	0.65	90.9	9.73	104.8 (40.4)	1.08	109.9	11.6	114.3 (45.7)	1.52
	40 (22.2)	28.6	1.53	73.7 (23.2)	0.03	49.5	2.63	84.0 (28.9)	0.09	74.5	3.94	96.4 (35.8)	0.19
AH-20A-A1* One pass	10 (5.6)	61.1	13.1	78.7 (25.9)	0.01	101.6	21.7	91.3 (32.9)	0.03	134.4	28.4	101.6 (38.7)	0.05
	20 (11.1)	40.7	4.34	72.3 (22.4)	0.00	50.1	5.28	75.2 (24.0)	0.00	59.9	6.24	78.1 (25.6)	0.00
	40 (22.2)	25.0	1.32	67.4 (19.7)	0.00	35.0	1.83	70.4 (21.3)	0.00	43.1	2.23	72.9 (22.7)	0.00
AH-20A-A3 Three pass	10 (5.6)	123.0	26.7	98.2 (26.8)	1.09	150.4	32.2	106.8 (41.6)	1.56	177.7	37.6	115.5 (46.4)	3.09
	20 (11.1)	86.9	9.41	86.8 (30.4)	0.15	118.5	12.7	96.7 (35.9)	0.26	151.7	16.07	107.2 (41.8)	0.41
	40 (22.2)	40.8	2.19	72.3 (22.4)	0.01	51.3	2.72	75.5 (24.2)	0.02	79.8	4.21	84.4 (29.1)	0.03
AH-20A-A5 Five pass	10 (5.6)	132.3	28.7	101.2 (38.4)	5.58	159.4	34.2	109.7 (43.2)	7.77	186.4	39.5	118.2 (47.9)	10.3
	20 (11.1)	111.6	12.1	94.6 (34.8)	1.07	139.3	14.9	103.3 (39.6)	1.59	166.8	17.7	112.0 (44.4)	2.18
	40 (22.2)	49.4	2.66	75.0 (23.9)	0.06	91.1	4.89	88.0 (31.1)	0.19	123.6	6.57	98.2 (26.8)	0.33
AH-24A-A1* One pass	10 (5.6)	110.2	23.7	85.4 (29.7)	0.03	156.3	33.3	96.3 (35.7)	0.06	205.1	43.2	107.8 (42.1)	0.09
	20 (11.1)	60.0	6.37	73.6 (23.1)	0.00	73.8	7.75	76.7 (24.8)	0.00	87.7	9.01	79.9 (26.6)	0.01
	40 (22.2)	35.1	1.83	67.8 (19.9)	0.00	49.2	2.56	71.0 (21.7)	0.00	64.0	3.30	74.3 (23.5)	0.00
AH-24A-A3 Three pass	10 (5.6)	173.0	37.4	100.4 (38.0)	1.68	210.1	44.9	109.1 (42.8)	2.37	247.1	52.2	117.9 (47.7)	3.15
	20 (11.1)	131.7	14.2	90.5 (32.5)	0.27	177.5	19.0	101.3 (38.5)	0.46	215.4	22.8	110.3 (43.5)	0.64
	40 (22.2)	59.8	3.20	73.6 (23.1)	0.02	74.0	3.91	76.8 (24.9)	0.03	137.5	7.26	91.7 (33.2)	0.08
AH-24A-A5 Five pass	10 (5.6)	183.8	39.8	103.0 (39.4)	8.39	220.5	47.2	111.7 (44.3)	11.6	—	—	—	—
	20 (11.1)	158.3	17.2	96.9 (36.1)	1.68	195.7	21.0	105.7 (40.9)	2.45	233.0	24.7	114.5 (45.8)	3.32
	40 (22.2)	93.2	5.04	81.4 (27.4)	0.17	139.6	7.48	92.3 (33.5)	0.35	187.1	9.94	103.5 (39.7)	0.59
AH-24A-A7 Seven pass	10 (5.6)	—	—	—	—	—	—	—	—	—	—	—	—
	20 (11.1)	167.2	18.1	99.0 (37.2)	4.98	204.3	21.9	107.8 (42.1)	7.09	241.3	25.6	116.5 (46.9)	9.48
	40 (22.2)	118.1	6.41	87.3 (30.7)	0.69	163.6	8.80	98.0 (36.7)	1.25	201.6	10.7	107.0 (41.7)	1.80
AH-24B-A1* One pass Tandem	10 (5.6)	286.4	62.1	94.0 (34.4)	0.25	352.4	75.6	101.9 (38.8)	0.36	418.1	88.6	43.3 (109.9)	0.48
	20 (11.1)	173.8	18.8	80.5 (26.9)	0.03	260.1	27.9	90.8 (32.7)	0.06	335.6	35.6	37.7 (99.8)	0.09
	40 (22.2)	69.2	3.69	67.9 (19.9)	0.00	96.7	5.12	71.2 (21.8)	0.00	156.0	8.22	25.7 (78.2)	0.01
AH-24B-A3 Three pass Tandem	10 (5.6)	330.2	71.7	99.3 (37.4)	7.73	394.6	84.7	107.1 (41.7)	10.4	458.8	97.3	114.9 (46.1)	13.5
	20 (11.1)	290.2	31.6	94.5 (34.7)	1.67	355.7	38.3	102.3 (39.1)	2.35	420.8	44.7	110.2 (43.4)	3.12
	40 (22.2)	194.0	10.6	82.9 (28.3)	0.22	269.8	14.6	91.9 (33.3)	0.39	348.2	18.6	101.4 (38.6)	0.61
AH-24B-A5 Five pass Tandem	10 (5.6)	—	—	—	—	—	—	—	—	—	—	—	—
	20 (11.1)	308.7	33.6	96.7 (35.9)	8.14	373.4	40.2	104.5 (40.3)	11.12	437.9	46.6	112.3 (44.6)	14.7
	40 (22.2)	239.5	13.1	88.3 (31.3)	1.41	312.2	16.9	97.1 (36.2)	2.23	378.3	20.2	105.0 (40.6)	3.07
AH-24B-A7 Seven pass Tandem	10 (5.6)	—	—	—	—	—	—	—	—	—	—	—	—
	20 (11.1)	—	—	—	—	—	—	—	—	—	—	—	—
	40 (22.2)	261.0	14.3	90.9 (32.7)	4.35	326.9	17.7	98.9 (37.2)	6.37	392.4	21.0	106.7 (41.5)	8.65

* Single-pass heaters are not recommended for liquid service. In many cases, a smaller multi-pass model would be a more economical choice.
For 50 Hz power supply, derate output by 10%. For complete model coding, refer to Model Coding, page 89. Above figures are based on calculations at sea level.

50% Ethylene Glycol - 60°F (16°C) EAT

Table 69 – 1" (25 mm) Tension-Wound Finned Tubing (9 fins/inch)

Model	ΔT °F (°C)	Entering Glycol Temperature											
		180°F (82°C)				200°F (93°C)				220°F (104°C)			
		Output MBH	Flow USGPM	FAT °F (°C)	PD	Output MBH	Flow USGPM	FAT °F (°C)	PD	Output MBH	Flow USGPM	FAT °F (°C)	PD
					psi				psi				psi
AH-12A-A1* One pass	10 (5.6)	9.1	1.83	66.6 (19.2)	0.00	11.2	2.22	68.0 (20.0)	0.00	13.3	2.61	69.6 (21.1)	0.00
	20 (11.1)	6.6	0.64	64.6 (18.1)	0.00	8.2	0.78	65.6 (18.7)	0.00	9.7	0.93	66.8 (19.3)	0.00
	40 (22.2)	4.4	0.21	62.9 (17.2)	0.00	5.6	0.26	63.7 (17.6)	0.00	6.8	0.31	64.5 (18.1)	0.00
AH-12A-A3 Three pass	10 (5.6)	26.7	5.68	80.4 (26.9)	0.05	42.0	8.88	92.4 (33.6)	0.11	53.1	11.1	101.2 (38.4)	0.17
	20 (11.1)	10.1	1.03	67.3 (19.6)	0.00	12.5	1.25	69.1 (20.6)	0.00	14.6	1.47	70.6 (21.4)	0.00
	40 (22.2)	6.8	0.34	64.8 (18.2)	0.00	8.6	0.42	66.0 (18.9)	0.00	10.5	0.51	67.4 (19.7)	0.00
AH-16A-A1* One pass	10 (5.6)	17.4	3.61	68.4 (20.2)	0.00	21.4	4.37	70.3 (21.3)	0.00	25.4	5.13	72.3 (22.4)	0.00
	20 (11.1)	12.6	1.27	65.9 (18.8)	0.00	15.5	1.56	67.3 (19.6)	0.00	18.6	1.84	68.8 (20.4)	0.00
	40 (22.2)	8.4	0.41	63.8 (17.7)	0.00	10.6	0.51	64.8 (18.2)	0.00	12.9	0.62	65.9 (18.8)	0.00
AH-16A-A3 Three pass	10 (5.6)	57.2	12.3	88.9 (31.6)	0.13	78.6	16.8	99.9 (37.7)	0.23	96.7	20.4	109.2 (42.9)	0.34
	20 (11.1)	19.2	2.01	69.3 (20.7)	0.00	32.9	3.44	76.2 (24.6)	0.01	59.6	6.24	89.9 (32.2)	0.03
	40 (22.2)	13.0	0.66	66.1 (18.9)	0.00	16.4	0.83	67.8 (19.9)	0.00	20.0	1.00	69.5 (20.8)	0.00
AH-16A-A5 Five pass	10 (5.6)	72.5	15.7	96.8 (36.0)	0.91	90.3	19.3	106.0 (41.1)	1.37	108.1	22.8	115.2 (46.2)	1.91
	20 (11.1)	44.1	4.73	82.1 (27.8)	0.09	68.6	7.31	94.7 (24.8)	0.21	86.9	9.16	104.1 (40.1)	0.32
	40 (22.2)	15.8	0.82	67.6 (19.8)	0.00	20.0	1.03	69.6 (20.9)	0.00	24.3	1.24	71.7 (22.1)	0.01
AH-20A-A1* One pass	10 (5.6)	29.2	6.14	69.4 (20.8)	0.00	36.1	7.43	71.5 (21.9)	0.00	80.3	16.8	86.5 (30.3)	0.01
	20 (11.1)	21.0	2.18	66.7 (19.3)	0.00	26.3	2.66	68.2 (20.1)	0.00	31.1	3.15	69.9 (21.1)	0.00
	40 (22.2)	14.0	0.71	64.3 (17.9)	0.00	18.0	0.88	65.4 (18.6)	0.00	21.5	1.06	66.6 (19.2)	0.00
AH-20A-A3 Three pass	10 (5.6)	102.9	22.2	94.3 (34.6)	0.28	130.8	28.0	103.8 (39.9)	0.43	158.6	33.5	113.2 (45.1)	0.62
	20 (11.1)	32.1	3.37	70.4 (21.3)	0.01	79.3	8.45	86.3 (30.2)	0.04	119.2	12.6	99.7 (37.6)	0.09
	40 (22.2)	21.7	1.13	66.9 (19.4)	0.00	27.5	1.42	68.7 (20.4)	0.00	33.4	1.71	70.6 (21.4)	0.00
AH-20A-A5 Five pass	10 (5.6)	118.6	25.7	99.7 (37.6)	1.65	146.0	31.3	109.0 (42.8)	2.43	173.3	36.7	118.3 (47.9)	3.32
	20 (11.1)	83.0	8.98	87.6 (30.9)	0.22	116.5	12.5	98.9 (37.2)	0.41	144.6	15.3	108.4 (42.4)	0.60
	40 (22.2)	26.4	1.39	68.5 (20.3)	0.01	33.4	1.74	70.7 (21.5)	0.01	78.1	4.12	85.7 (29.8)	0.05
AH-24A-A1* One pass	10 (5.6)	43.6	9.14	70.4 (21.3)	0.00	79.4	16.7	79.3 (26.3)	0.01	127.2	26.6	91.8 (33.2)	0.01
	20 (11.1)	31.9	3.29	67.5 (19.7)	0.00	39.4	4.02	69.2 (20.7)	0.00	47.2	4.76	71.1 (21.7)	0.00
	40 (22.2)	21.4	1.08	64.9 (18.3)	0.00	27.1	1.35	66.2 (19.0)	0.00	32.9	1.63	67.5 (19.7)	0.00
AH-24A-A3 Three pass	10 (5.6)	136.2	29.4	93.7 (34.3)	0.35	170.4	36.4	102.3 (39.1)	0.53	204.5	43.1	110.8 (43.8)	0.74
	20 (11.1)	74.3	7.94	78.1 (25.6)	0.03	117.7	12.5	88.9 (31.6)	0.07	162.3	17.1	100.1 (37.8)	0.12
	40 (22.2)	32.7	1.70	67.7 (19.8)	0.00	41.3	2.13	69.7 (20.9)	0.00	50.2	2.56	71.8 (22.1)	0.00
AH-24A-A5 Five pass	10 (5.6)	152.5	33.0	97.8 (36.6)	1.99	186.1	39.8	106.3 (41.3)	2.86	219.7	46.4	114.7 (45.9)	3.86
	20 (11.1)	119.9	13.0	89.6 (32.0)	0.33	154.3	16.5	98.2 (36.8)	0.52	188.7	19.9	106.8 (41.6)	0.75
	40 (22.2)	39.2	2.06	69.3 (20.7)	0.01	73.8	3.90	77.9 (25.5)	0.03	119.7	6.31	89.3 (31.8)	0.08
AH-24A-A7 Seven pass	10 (5.6)	160.2	34.6	99.8 (37.7)	5.90	193.5	41.4	108.1 (42.3)	8.34	226.9	47.9	116.5 (46.9)	11.2
	20 (11.1)	133.1	14.4	92.9 (38.3)	1.07	167.2	17.9	101.4 (38.6)	1.63	201.2	21.3	110.0 (43.3)	2.28
	40 (22.2)	65.9	3.53	76.0 (24.4)	0.07	109.4	5.84	86.8 (30.4)	0.19	153.1	8.11	97.8 (36.6)	0.35
AH-24B-A1* One pass Tandem	10 (5.6)	202.8	43.9	84.7 (29.3)	0.04	277.9	59.5	93.9 (34.4)	0.07	339.4	71.8	101.5 (38.6)	0.10
	20 (11.1)	81.3	8.66	69.7 (20.9)	0.00	117.0	12.4	23.3 (74.0)	0.00	214.9	22.7	86.0 (30.0)	0.01
	40 (22.2)	44.1	2.30	65.1 (18.4)	0.00	65.6	3.42	19.8 (67.7)	0.00	85.3	4.41	70.0 (21.1)	0.00
AH-24B-A3 Three pass Tandem	10 (5.6)	282.8	61.4	94.6 (34.8)	1.81	342.5	73.4	102.0 (38.9)	2.53	402.1	85.2	109.4 (43.0)	3.36
	20 (11.1)	231.7	25.2	88.3 (31.3)	0.33	292.7	31.4	95.8 (35.4)	0.50	353.6	37.5	103.3 (39.6)	0.70
	40 (22.2)	81.9	4.39	69.7 (20.9)	0.01	176.6	9.47	81.4 (27.4)	0.05	249.3	13.3	90.3 (32.4)	0.10
AH-24B-A5 Five pass Tandem	10 (5.6)	298.9	64.9	96.6 (35.9)	8.94	358.1	76.8	104.0 (40.0)	12.3	—	—	—	—
	20 (11.1)	259.7	28.2	91.7 (33.2)	1.82	319.9	34.3	99.2 (37.3)	2.63	379.9	40.3	106.6 (41.4)	3.55
	40 (22.2)	173.1	9.42	81.0 (27.2)	0.23	247.4	13.3	90.1 (32.3)	0.44	309.1	16.5	97.8 (36.6)	0.64
AH-24B-A7 Seven pass Tandem	10 (5.6)	—	—	—	—	—	—	—	—	—	—	—	—
	20 (11.1)	273.0	29.7	93.4 (34.1)	5.33	332.7	35.8	100.8 (38.2)	7.56	392.2	41.7	108.2 (42.3)	10.1
	40 (22.2)	208.3	11.4	85.4 (29.7)	0.86	269.7	14.6	92.9 (33.8)	1.36	330.7	17.6	100.5 (38.1)	1.95

* Single-pass heaters are not recommended for liquid service. In many cases, a smaller multi-pass model would be a more economical choice. For 50 Hz power supply, derate output by 10%. For complete model coding, refer to page 69. Above figures are based on calculations at sea level.

Water - 60°F (16°C) EAT

Table 70 – 5/8" (16 mm) Tension-Wound Finned Tubing (10 fins/inch)

Model	ΔT	Entering Water Temperature											
		180°F (82°C)				200°F (93°C)				220°F (104°C)			
	°F (°C)	Output MBH	Flow USGPM	FAT	PD	Output MBH	Flow USGPM	FAT	PD	Output MBH	Flow USGPM	FAT	PD
				°F (°C)	psi			°F (°C)	psi			°F (°C)	psi
AH-12A-A1* One pass	10 (5.6)	37.6	7.29	89.4 (31.9)	0.01	50.4	9.75	99.5 (37.5)	0.01	64.3	12.4	110.6 (43.7)	0.02
	20 (11.1)	18.9	1.79	74.4 (23.6)	0.00	23.6	2.23	78.0 (25.6)	0.00	37.2	3.55	88.7 (31.5)	0.00
	40 (22.2)	13.2	0.61	69.8 (21.0)	0.00	16.9	0.79	72.7 (22.6)	0.00	20.9	0.97	75.7 (24.3)	0.00
AH-12A-A3 Three pass	10 (5.6)	53.7	10.5	102.3 (39.1)	0.35	64.9	12.6	111.3 (44.1)	0.51	76.1	14.7	120.3 (49.1)	0.69
	20 (11.1)	42.5	4.13	93.3 (34.1)	0.06	55.6	5.39	103.7 (39.8)	0.10	67.0	6.48	112.8 (44.9)	0.14
	40 (22.2)	18.6	0.88	74.2 (23.4)	0.00	31.7	1.52	84.4 (29.1)	0.01	46.0	2.21	95.8 (35.4)	0.02
AH-16A-A1* One pass	10 (5.6)	72.3	14.1	95.5 (35.3)	0.02	94.2	18.3	106.5 (41.4)	0.03	113.0	21.9	115.9 (46.6)	0.04
	20 (11.1)	34.2	3.28	76.4 (24.7)	0.00	58.2	5.62	88.3 (31.3)	0.00	81.7	7.89	100.0 (37.8)	0.01
	40 (22.2)	24.0	1.14	71.4 (21.9)	0.00	30.8	1.46	74.7 (23.7)	0.00	38.0	1.80	78.1 (25.6)	0.00
AH-16A-A3 Three pass	10 (5.6)	91.7	17.9	105.3 (40.7)	0.69	110.1	21.4	114.5 (45.8)	0.98	128.5	25.0	123.8 (51.0)	1.32
	20 (11.1)	78.2	7.63	98.5 (36.9)	0.13	96.9	9.43	107.8 (42.1)	0.20	115.6	11.2	117.2 (47.3)	0.28
	40 (22.2)	44.0	2.13	81.3 (27.4)	0.01	67.0	3.25	92.7 (33.7)	0.03	87.9	4.26	103.2 (39.6)	0.04
AH-16A-A5 Five pass	10 (5.6)	95.6	18.7	107.3 (41.8)	3.37	113.9	22.2	116.5 (26.9)	4.73	132.2	25.7	125.7 (52.1)	6.30
	20 (11.1)	85.1	8.31	102.0 (38.9)	0.70	103.6	10.1	111.2 (44.0)	1.02	122.1	11.9	120.5 (49.2)	1.39
	40 (22.2)	62.2	3.03	90.4 (32.4)	0.10	83.8	4.08	101.2 (38.4)	0.18	102.7	4.98	110.7 (43.7)	0.26
AH-20A-A1* One pass	10 (5.6)	117.1	22.9	96.3 (35.7)	0.03	144.4	28.1	104.9 (40.5)	0.04	171.6	33.4	113.5 (45.3)	0.06
	20 (11.1)	68.1	6.61	72.2 (22.3)	0.00	103.4	10.0	91.9 (33.3)	0.01	134.6	13.1	101.7 (38.7)	0.01
	40 (22.2)	40.3	1.93	72.2 (22.3)	0.00	51.4	2.47	75.6 (24.2)	0.00	63.2	3.02	79.2 (26.2)	0.00
AH-20A-A3 Three pass	10 (5.6)	136.7	26.7	102.5 (39.2)	0.95	163.4	31.9	111.0 (43.9)	1.34	190.2	37.0	119.5 (48.6)	1.79
	20 (11.1)	119.3	11.7	97.0 (36.1)	0.19	146.4	14.3	105.6 (40.9)	0.28	173.5	16.9	114.1 (45.6)	0.39
	40 (22.2)	78.4	3.82	84.1 (28.9)	0.02	109.2	5.31	93.7 (34.3)	0.04	142.0	6.90	104.1 (40.1)	0.07
AH-20A-A5 Five pass	10 (5.6)	141.4	27.7	104.0 (40.0)	4.58	168.0	32.8	112.5 (44.7)	6.37	194.6	37.9	120.9 (49.4)	8.45
	20 (11.1)	127.6	12.5	99.6 (37.6)	0.98	154.4	15.1	108.1 (42.3)	1.41	181.3	17.6	116.6 (47.0)	1.91
	40 (22.2)	100.7	4.92	91.2 (32.9)	0.17	128.2	6.25	99.8 (37.7)	0.26	155.6	7.57	108.4 (42.4)	0.37
AH-24A-A1* One pass	10 (5.6)	165.9	32.4	98.7 (37.1)	0.04	202.9	39.5	107.4 (41.9)	0.07	239.9	46.6	116.2 (46.8)	0.09
	20 (11.1)	113.2	11.0	86.2 (30.1)	0.01	156.3	15.2	96.3 (35.7)	0.01	196.9	19.1	105.9 (41.1)	0.02
	40 (22.2)	59.0	2.82	73.4 (23.0)	0.00	75.2	3.59	77.1 (25.1)	0.00	92.2	4.40	81.0 (27.2)	0.00
AH-24A-A3 Three pass	10 (5.6)	188.8	36.9	104.2 (40.1)	1.42	225.2	43.9	112.8 (44.9)	1.98	261.6	50.8	121.4 (49.7)	2.63
	20 (11.1)	167.3	16.3	99.0 (37.2)	0.30	204.1	19.9	107.7 (42.1)	0.43	240.9	23.4	116.6 (47.0)	0.59
	40 (22.2)	118.7	5.77	87.4 (30.8)	0.04	159.0	7.73	96.9 (36.1)	0.07	201.3	9.77	104.1 (40.1)	0.11
AH-24A-A5 Five pass	10 (5.6)	194.4	38.0	105.5 (40.8)	6.73	230.6	44.9	114.1 (45.6)	9.32	266.7	51.8	122.7 (50.4)	12.3
	20 (11.1)	176.9	17.3	101.3 (38.5)	1.47	213.4	20.8	110.0 (43.3)	2.09	249.9	24.3	118.6 (48.1)	2.82
	40 (22.2)	142.8	6.97	93.2 (34.0)	0.26	180.0	8.76	102.0 (38.9)	0.40	217.2	10.6	110.8 (43.8)	0.57
AH-24A-A7 Seven pass	10 (5.6)	—	—	—	—	—	—	—	—	—	—	—	—
	20 (11.1)	181.5	17.7	102.4 (39.1)	4.13	217.8	21.2	111.0 (43.9)	5.85	254.2	24.7	119.7 (48.7)	7.85
	40 (22.2)	150.6	7.35	95.0 (35.0)	0.77	187.7	9.14	103.8 (39.9)	1.16	224.7	10.91	112.6 (44.8)	1.62
AH-24B-A1* One pass Tandem	10 (5.6)	323.2	63.3	98.5 (36.9)	0.22	387.5	75.7	106.2 (41.2)	0.30	451.7	88.0	114.0 (45.6)	0.40
	20 (11.1)	278.4	27.3	93.0 (33.9)	0.05	343.6	33.6	100.9 (32.3)	0.07	408.7	39.8	108.7 (42.6)	0.09
	40 (22.2)	155.7	7.58	78.3 (25.7)	0.00	239.4	11.7	88.3 (31.3)	0.01	313.4	15.2	97.1 (36.2)	0.02
AH-24B-A3 Three pass Tandem	10 (5.6)	345.6	67.8	101.2 (38.4)	5.92	409.2	80.0	108.9 (42.7)	8.09	472.7	92.2	116.6 (47.0)	10.6
	20 (11.1)	317.3	31.1	97.8 (36.6)	1.35	381.4	37.3	105.5 (40.8)	1.89	445.4	43.4	113.2 (45.1)	2.51
	40 (22.2)	261.4	12.8	91.0 (32.8)	0.26	326.7	16.0	98.8 (37.1)	0.39	391.8	19.1	106.0 (41.5)	0.54
AH-24B-A5 Five pass Tandem	10 (5.6)	—	—	—	—	—	—	—	—	—	—	—	—
	20 (11.1)	326.7	32.0	98.9 (37.2)	6.26	390.5	38.2	106.6 (41.4)	8.72	454.2	44.3	114.3 (45.7)	11.5
	40 (22.2)	277.8	13.6	93.0 (33.9)	1.26	342.7	16.8	100.8 (38.2)	1.83	407.3	19.9	108.0 (42.6)	2.50
AH-24B-A7 Seven pass Tandem	10 (5.6)	—	—	—	—	—	—	—	—	—	—	—	—
	20 (11.1)	—	—	—	—	—	—	—	—	—	—	—	—
	40 (22.2)	285.5	14.0	93.9 (34.4)	3.48	350.2	17.1	101.7 (38.7)	5.03	414.6	20.2	109.5 (43.1)	6.88

* Single-pass heaters are not recommended for liquid service. In many cases, a smaller multi-pass model would be a more economical choice. For 50 Hz power supply, derate output by 10%. For complete model coding, refer to page 69. Above figures are based on calculations at sea level.

Water - 60°F (16°C) EAT

Table 71 – 1" (25 mm) Extruded Finned Tubing (9 fins/inch)

Model	ΔT °F (°C)	Entering Glycol Temperature											
		180°F (82°C)				200°F (93°C)				220°F (104°C)			
		Output MBH	Flow USGPM	FAT °F (°C)	PD psi	Output MBH	Flow USGPM	FAT °F (°C)	PD psi	Output MBH	Flow USGPM	FAT °F (°C)	PD psi
AH-12A-B1* One pass	10 (5.6) 20 (11.1) 40 (22.2)	13.8 10.2 6.8	2.55 0.93 0.30	70.2 (21.2) 67.4 (19.7) 64.8 (18.2)	0.00 0.00 0.00	31.5 12.8 8.8	6.03 1.17 0.39	84.1 (28.9) 69.3 (20.7) 66.2 (19.0)	0.00 0.00 0.00	44.3 15.6 10.9	8.48 1.43 0.49	94.1 (34.5) 71.4 (21.9) 67.7 (19.8)	0.00 0.00 0.00
AH-12A-B3 Three pass	10 (5.6) 20 (11.1) 40 (22.2)	44.5 28.3 10.3	8.64 2.72 0.47	94.6 (34.8) 81.7 (27.6) 67.5 (19.7)	0.09 0.01 0.00	55.2 42.4 13.2	10.7 4.09 0.61	103.0 (39.4) 92.8 (33.8) 69.7 (20.9)	0.14 0.02 0.00	65.9 53.3 18.1	12.7 5.13 0.84	111.5 (44.2) 101.4 (38.6) 73.4 (23.0)	0.20 0.03 0.00
AH-16A-B1* One pass	10 (5.6) 20 (11.1) 40 (22.2)	46.8 19.3 13.0	9.06 1.82 0.60	83.5 (28.6) 69.4 (20.8) 66.1 (18.9)	0.00 0.00 0.00	67.2 24.3 16.8	13.0 2.28 0.77	93.9 (34.4) 71.8 (22.1) 68.0 (20.0)	0.00 0.00 0.00	89.2 29.4 20.8	17.2 2.70 0.96	105.3 (40.7) 74.3 (23.5) 69.9 (21.1)	0.01 0.00 0.00
AH-16A-B3 Three pass	10 (5.6) 20 (11.1) 40 (22.2)	78.3 60.5 19.5	15.3 5.88 0.92	99.8 (37.7) 90.6 (32.6) 69.5 (20.8)	0.17 0.03 0.00	95.7 78.2 32.5	18.6 7.59 1.55	108.8 (42.7) 99.7 (37.6) 76.0 (24.4)	0.25 0.04 0.00	113.2 96.0 57.3	22.0 9.29 2.75	117.9 (47.7) 108.8 (42.7) 88.7 (31.5)	0.35 0.07 0.01
AH-16A-B5 Five pass	10 (5.6) 20 (11.1) 40 (22.2)	84.5 70.9 40.4	16.5 69.1 1.95	103.0 (39.4) 96.0 (35.6) 80.2 (26.8)	0.91 0.17 0.01	101.8 88.5 60.6	19.8 8.60 2.93	112.0 (44.4) 105.0 (40.6) 90.5 (32.5)	1.31 0.25 0.03	119.1 106.1 81.9	23.1 10.3 3.96	121.0 (49.4) 114.1 (45.6) 101.5 (38.6)	1.78 0.36 0.06
AH-20A-B1* One pass	10 (5.6) 20 (11.1) 40 (22.2)	87.6 32.3 21.7	17.1 3.07 1.01	89.1 (31.7) 70.4 (21.3) 66.9 (19.4)	0.01 0.00 0.00	120.9 41.0 28.0	23.5 3.89 1.31	100.4 (38.0) 73.3 (22.9) 68.9 (20.5)	0.01 0.00 0.00	148.6 88.4 34.7	28.8 8.52 1.62	109.8 (43.2) 89.2 (31.8) 71.1 (21.7)	0.02 0.00 0.00
AH-20A-B3 Three pass	10 (5.6) 20 (11.1) 40 (22.2)	126.0 101.6 31.7	24.6 9.92 1.52	102.2 (39.0) 93.9 (34.4) 70.3 (21.3)	0.30 0.05 0.00	153.0 129.0 74.8	29.8 12.6 3.62	111.4 (44.1) 103.2 (39.6) 84.7 (29.3)	0.44 0.08 0.01	179.9 156.4 106.7	35.0 15.2 5.16	120.6 (49.2) 112.5 (44.7) 95.4 (35.2)	0.60 0.12 0.01
AH-20A-B5 Five pass	10 (5.6) 20 (11.1) 40 (22.2)	134.1 115.3 75.4	26.2 11.3 3.67	105.0 (40.6) 98.6 (37.0) 85.0 (29.4)	1.54 0.30 0.03	160.8 142.5 108.1	31.4 13.9 5.26	114.1 (45.6) 107.8 (42.1) 96.0 (35.6)	2.20 0.44 0.07	187.5 169.6 135.8	36.5 16.5 6.59	123.2 (50.7) 117.0 (47.2) 105.4 (40.8)	2.97 0.62 0.10
AH-24A-B1* One pass	10 (5.6) 20 (11.1) 40 (22.2)	126.2 47.5 32.5	24.5 4.50 1.51	91.2 (32.9) 71.4 (21.9) 67.6 (19.8)	0.01 0.00 0.00	160.0 90.1 41.8	31.1 8.65 1.95	99.6 (37.6) 81.9 (27.7) 69.9 (21.1)	0.01 0.00 0.00	193.9 132.5 51.8	37.5 12.7 2.41	108.1 (42.3) 92.5 (33.6) 72.2 (22.3)	0.02 0.00 0.00
AH-24A-B3 Three pass	10 (5.6) 20 (11.1) 40 (22.2)	160.2 133.5 68.2	31.3 13.0 3.28	99.8 (37.7) 93.0 (33.9) 76.6 (24.8)	0.35 0.06 0.00	193.3 167.1 109.6	37.6 16.2 5.29	108.1 (42.3) 101.4 (28.6) 86.9 (30.5)	0.51 0.10 0.01	226.5 200.8 153.3	43.9 19.5 7.40	116.4 (46.9) 109.9 (43.3) 97.8 (36.6)	0.69 0.14 0.02
AH-24A-B5 Five pass	10 (5.6) 20 (11.1) 40 (22.2)	168.5 147.8 108.8	32.9 14.4 5.29	101.9 (38.8) 96.6 (35.9) 86.8 (30.4)	1.77 0.35 0.05	201.4 181.1 142.7	39.2 17.6 6.92	110.1 (43.4) 105.0 (40.6) 95.2 (35.1)	2.50 0.52 0.09	234.3 214.4 176.7	45.5 20.8 8.55	118.4 (48.0) 113.3 (45.2) 103.7 (39.8)	3.35 0.72 0.13
AH-24A-B7 Seven pass	10 (5.6) 20 (11.1) 40 (22.2)	172.4 154.6 120.3	33.7 15.1 5.86	102.9 (39.4) 98.3 (36.8) 89.7 (32.1)	5.01 1.04 0.17	205.2 187.7 154.1	40.0 18.3 7.48	111.1 (43.9) 106.7 (41.5) 98.1 (36.7)	7.02 1.51 0.27	238.0 220.8 187.8	46.2 21.4 9.10	119.4 (48.6) 115.0 (46.1) 106.6 (41.4)	9.37 20.7 0.39
AH-24B-B1* One pass Tandem	10 (5.6) 20 (11.1) 40 (22.2)	272.2 203.2 80.9	53.3 19.8 3.89	93.3 (34.1) 84.7 (29.3) 69.6 (20.9)	0.05 0.01 0.00	331.8 275.0 112.1	64.8 26.8 5.39	100.7 (38.2) 93.6 (34.2) 73.4 (23.0)	0.07 0.01 0.00	391.3 335.5 204.3	76.2 32.6 9.88	108.1 (42.3) 101.1 (38.4) 84.7 (29.3)	0.10 0.02 0.00
AH-24B-B3 Three pass Tandem	10 (5.6) 20 (11.1) 40 (22.2)	306.5 273.1 209.4	60.0 26.7 10.2	97.6 (36.4) 93.4 (34.1) 85.5 (29.7)	1.51 0.32 0.05	365.1 332.4 269.8	71.3 32.5 13.2	104.8 (40.4) 100.7 (38.2) 92.9 (33.8)	2.10 0.46 0.08	243.7 391.6 330.2	82.5 38.1 16.1	112.1 (44.5) 108.1 (42.3) 100.4 (38.0)	2.79 0.63 0.12
AH-24B-B5 Five pass Tandem	10 (5.6) 20 (11.1) 40 (22.2)	314.7 287.5 234.1	61.7 28.2 11.5	98.6 (37.0) 95.2 (35.1) 88.6 (31.4)	7.13 1.56 0.28	373.1 346.3 294.0	72.9 33.8 14.4	105.8 (41.0) 102.5 (39.2) 95.5 (35.5)	9.86 2.23 0.34	431.5 405.2 353.9	84.0 39.5 17.2	113.1 (45.1) 109.8 (43.2) 103.4 (39.7)	13.0 3.00 0.61
AH-24B-B7 Seven pass Tandem	10 (5.6) 20 (11.1) 40 (22.2)	— 294.2 245.8	— 28.8 12.0	— 96.0 (35.6) 90.0 (32.2)	— 4.39 0.82	— 352.9 305.5	— 34.5 14.9	— 103.3 (39.6) 97.4 (36.3)	— 6.21 1.23	— 411.5 365.0	— 40.1 17.8	— 110.6 (43.7) 104.8 (40.4)	— 8.31 1.72

General Specifications

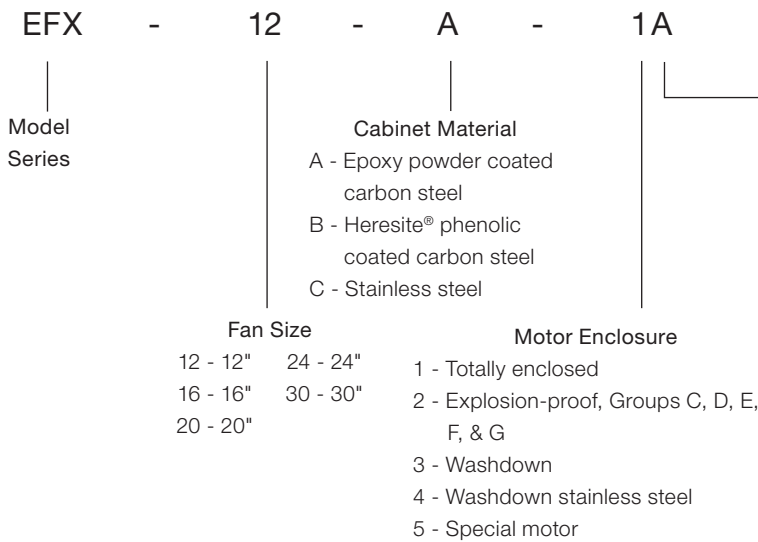
- 1. Approvals** CRN (Canada) - Steam and HVAC liquids only. CSA certified Class I, Division 1 & 2, Groups C & D; Class II, Division 1 & 2, Groups E, F, & G; Class III, Division 1 & 2, Temperature Code T3B 329°F (165°C)
- 2. Fan** Three blade aluminum, steel spider and hub with 5/8" (16 mm) bore
- 3. Fan Guard** Two piece design with close wire spacing. 3/8" (9.5 mm) diameter probe will not enter.
Epoxy coated to match cabinet colour
- 4. Mounting Holes** 9/16" (14 mm) diameter holes, two at top and two at bottom of heater
- 5. Cabinet Material and Nozzle** 14-gauge (0.075" / 2 mm) epoxy coated steel
- 6. Motors** CSA and/or UL listed 1725 RPM permanently lubricated ball bearing type with rigid base.
Explosion-proof or general purpose construction. All 50 and 60 hertz standard voltages are available.
- 7. Louvre Blades** Anodized extruded aluminum
- 8. Header Material** 3/16" (5 mm) carbon steel
- 9. Fluid Connections** 1 1/2" or 2" NPT Male or 1 1/2" (40 mm) or 2" (50 mm) 300# RF Flanges
- 10. Maximum Operating Pressure** 550 psi. Contact manufacturer for steam operating restrictions.
- 11. Maximum Operating Temperature** 600°F (315°C)
- 12. Finned Tubes** 5/8" (16 mm) outside diameter (16-gauge, 0.065" / 1.7 mm wall thickness) carbon steel tubes
Tension wound aluminum fins @ 10 fins per inch, or 1" (25 mm) outside diameter (14-gauge, 0.083" / 2 mm wall thickness) carbon steel tubes.
Extruded aluminum fins @ 9 fins per inch or 1" (25 mm) outside diameter (10-gauge, 0.135" / 3.4 mm wall thickness) carbon steel tubes.
Extruded aluminum fins @ 5 fins per inch.
- 13. Optional Disconnect** XS40 Disconnect Switch suitable for 1 or 3 phase motors.

EXF Series Explosion-Proof Exhaust Fan

The EXF Explosion-Proof Exhaust Fan is designed for hazardous and general purpose industrial applications. The EXF is constructed with epoxy-coated steel panels and spark resistant aluminum fan blades for ventilation of combustible materials, vapors and hazardous fumes. The EXF is fully assembled for easy installation, has explosion-proof motors that are CSA approved and/or UL listed with fan guards conforming to OSHA specifications.



Model Coding



Motor Electrical Specifications

	V	Phase	Hz
A	115	1	60
B	208	1	60
C	208	3	60
D	230	1	60
E	230	3	60
① ② F	460	1	60
G	460	3	60
H	575	3	60
I	220	1	50
② J	380	3	50
② K	440	3	50

- ① Only available for Class I Group D, Class II Group F & G.
- ② Consult factory for motor availability.

Physical Dimensions

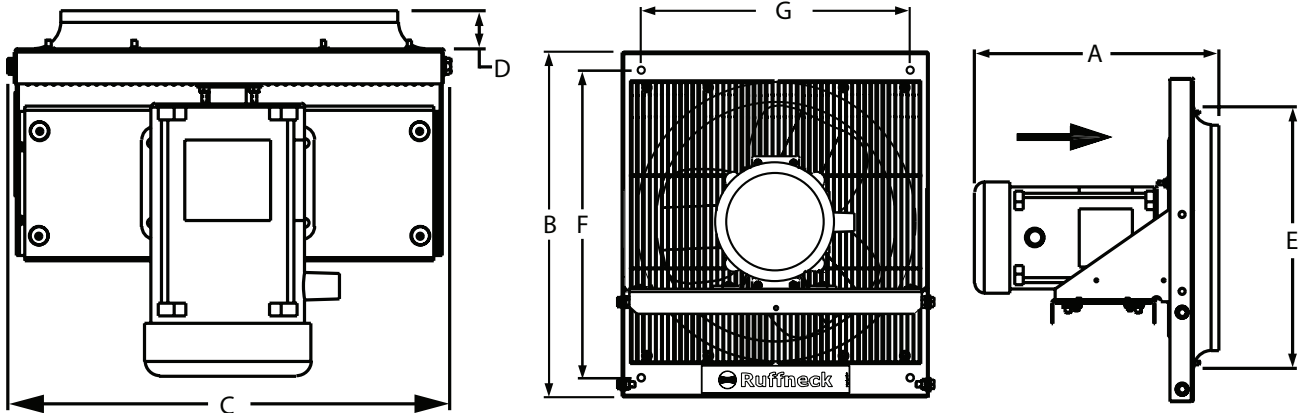


Figure 48

Table 72 – EFX Physical Dimensions

DIMENSION		EFX-12	EFX-16	EFX-20	EFX-24	EFX-30
A	mm	392.1	377.8	409.6	393.7	396.9
	in	15.4	14.9	16.1	15.5	15.6
B	mm	461.9	588	687.9	787.9	842.3
	in	18.2	23.2	27.1	31.0	33.1
C	mm	410.0	512.5	614.5	714.0	812.5
	in	16.1	20.2	24.2	28.1	32.0
D	mm	79.4	57.2	91.7	76.2	88.9
	in	3.1	2.2	3.6	3.0	3.5
E*	mm	373.3	475.6	577.3	677.3	835.3
	in	14.7	18.7	22.7	26.7	32.9
F	mm	411.1	537.2	637.1	737.1	891.5
	in	16.2	21.12	25.1	29.0	35.1
G	mm	359.2	461.7	563.7	663.7	811.7
	in	14.1	18.2	22.2	26.1	32.0

*This dimension is the minimum square opening size.

Air Flow Rating

Table 73 – Air Flow Rating

Model		Air Delivery at Static Pressure (Inches-Water Gage)									
		0.00	0.05	0.10	0.15	0.20	0.25	0.288	0.35	0.40	0.50
EFX12	CFM	1199	1155	1110	1057	990	849	779	710	677	618
	m ³ /hr	2037	1962	1886	1796	1682	1442	1324	1206	1150	1050
EFX16	CFM	2173	2103	2031	1949	1825	1690	1567	1469	1384	1263
	m ³ /hr	3692	3573	3451	3311	3101	2871	2662	2496	2351	2146
EFX20	CFM	3303	3238	3172	3115	3032	2944	2830	2696	2560	2280
	m ³ /hr	5612	5501	5389	5292	5151	5002	4808	4581	4349	3874
EFX24	CFM	3947	3858	3775	3691	3518	3475	3357	3232	3102	2821
	m ³ /hr	6706	6555	6413	6271	5977	5904	5704	5491	5270	4793
EFX30	CFM	6600	6416	6213	6037	5822	5551	5311	4993	4654	4070
	m ³ /hr	11213	10901	10556	10257	9892	9431	9023	8483	7907	6915

Table 74 – Performance Data for 60 Hz EFX
 Class 1 Div. 1 & 2, Groups C, D, Class II, Div. 1 & 2,
 Groups E, F, G

Model	Fan Size	Voltage	Phase	Approx. Shipping Weight	
				lbs	kg
EFX-12A-2A	12	115	1	56	26
EFX-12A-2B		208	1	56	26
EFX-12A-2C		208	3	56	26
EFX-12A-2D		240	1	56	26
EFX-12A-2E		230	3	56	26
EFX-12A-2G		460	3	56	26
EFX-12A-2H		575	3	56	26
EFX-16A-2A		16	115	1	61
EFX-16A-2B	208		1	61	29
EFX-16A-2C	208		3	61	29
EFX-16A-2D	230		1	61	29
EFX-16A-2E	230		3	61	29
EFX-16A-2G	460		3	61	29
EFX-16A-2H	575		3	61	29
EFX-20A-2A	20		115	1	67
EFX-20A-2B		208	1	67	31
EFX-20A-2C		208	3	67	31
EFX-20A-2D		230	1	67	31
EFX-20A-2E		230	3	67	31
EFX-20A-2G		460	3	67	31
EFX-20A-2H		575	3	67	31
EFX-24A-2A		24	115	1	96
EFX-24A-2B	208		1	96	44
EFX-24A-2C	208		3	96	44
EFX-24A-2D	230		1	96	44
EFX-24A-2E	230		3	96	44
EFX-24A-2G	460		3	96	44
EFX-24A-2H	575		3	96	44
EFX-30A-2A	30		115	1	114
EFX-30A-2B		208	1	114	52
EFX-30A-2C		208	3	114	52
EFX-30A-2D		230	1	114	52
EFX-30A-2E		230	3	114	52
EFX-30A-2G		460	3	114	52
EFX-30A-2H		575	3	114	52

Table 75 – Performance Data for 50 Hz EFX
 Class I, Div. 1 & 2, Groups C,D, Class II, Div. 1 & 2,
 Groups E,F,G

Model	Fan Size	Voltage	Phase	Approx. Shipping Weight	
				lbs	kg
EFX-12A-2I	12	220	1	56	26
EFX-12A-2J		380	3	56	26
EFX-12A-2K		440	3	56	26
EFX-16A-2I	16	220	1	61	29
EFX-16A-2J		380	3	61	29
EFX-16A-2K		440	3	61	29
EFX-20A-2I	20	220	1	67	31
EFX-20A-2J		380	3	67	31
EFX-20A-2K		440	3	67	31
EFX-24A-2I	24	220	1	96	44
EFX-24A-2J		380	3	96	44
EFX-24A-2K		440	3	96	44
EFX-30A-2I	30	220	1	114	52
EFX-30A-2J		380	3	114	52
EFX-30A-2K		440	3	114	52

Table 76 – Specifications

		EFX-12	EFX-16	EFX-20	EFX-24	EFX-30	
Fan Diameter	in	12	16	20	24	30	
	mm	305	406	508	610	762	
Motor*	1/2 HP, 60 Hz						
	1/2 HP, 0.373 kW						
Air Flow Rating @70°F (21°C)	CFM	850	1825	3760	4180	4759	
	m ³ /hr	1444	3101	6388	7102	8086	
Motor Speed	RPM	1725				1140	
Net Weight	lbs	48.0	52.0	56.0	61.0	67.0	
	kg	21.8	23.6	25.4	27.7	30.4	
Shipping Weight	lbs	56.0	62.0	68.0	81.0	87.0	
	kg	25.4	28.1	30.8	36.7	39.5	
Dimensions	Width	in	16.1	20.2	24.2	28.1	34.0
		mm	410	513	615	715	863
	Height	in	18.2	23.1	27.1	31.0	37.1
		mm	462	588	688	788	942
	Depth	in	15.4	14.9	16.1	15.5	15.6
		mm	392	378	410	394	397

Note: 50 Hz units also available.

General Specifications

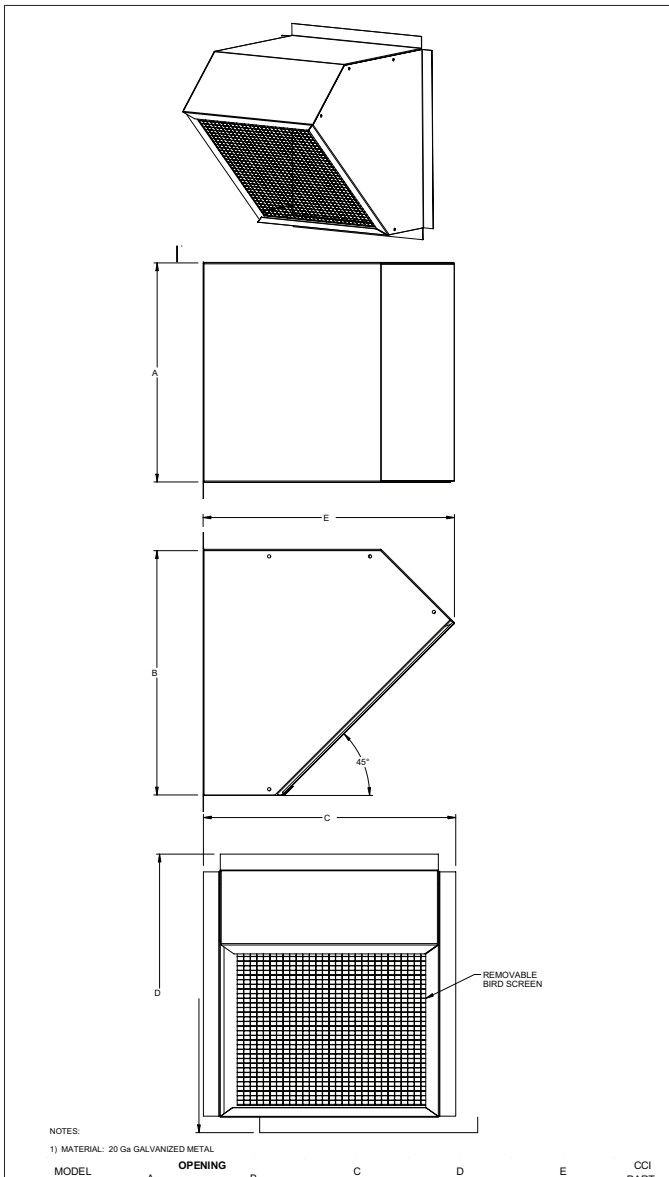
- Hazardous Location Classification**
 - Class I, Div 1 & 2, Groups C, D
 - Class II, Div 1 & 2, Groups E, F, G.
 - Temperature Code: T3B 165°C (329°F)
 - EAC, Ex d IIB T3 Gb X
- Ambient Temperature**
 - 20°C (4°F) to 40°C (104°F)
- Approvals**
 - Motors are CSA approved and/or UL listed.
- Fan**
 - Aluminum blade. Steel spider and hub with 5/8" (15.875 mm) bore. Optional Heresite® coating for corrosive atmospheres.
- Fan Guard**
 - Split design with close wire spacing, meets OSHA requirements.
- Motors**
 - CSA approved and/or UL listed permanently lubricated ball bearing type with rigid base. Explosion-proof or totally enclosed construction. All standard voltages for 60 and 50 hertz are available.
- Frame Material**
 - 16 ga. (0.060" or 1.52 mm) epoxy-coated steel. Optional stainless steel or Heresite® coating for corrosive atmospheres.
- Mounting**
 - Four 3/8" (9.5 mm) diameter holes. Must be mounted to a rigid structure.

Accessories

Stormhood

Table 77 – Dimensions and Part numbers

Model Size	in (mm)					Part No.
	Opening		C	D	E	
	A	B				
12	16 5/8 (422.3)	18 5/8 (473.1)	19 1/8 (485.8)	21 1/8 (536.6)	19 1/8 (486.1)	10210
16	20 5/8 (523.9)	23 5/8 (600.1)	23 1/6 (587.4)	26 1/8 (663.6)	24 1/4 (616.5)	10211
20	24 5/8 (625.5)	27 1/2 (698.5)	689 (27 1/8)	30 (762)	28 1/4 (717.7)	10212
24	28 5/8 (727.1)	31 1/2 (800.1)	790.6 (31 1/8)	34 (863.6)	32 3/8 (822)	10213
30	34 5/8 (876.3)	37 1/2 (952.5)	37 (939.8)	40 (1016)	38 1/2 (978.7)	10214



NOTES:

1) MATERIAL: 20 Ga GALVANIZED METAL

MODEL SIZE	OPENING					CCI PART NUMBER
	A	B	C	D	E	
12	422.3	473.1	485.8	536.6	486.1	10210
16	523.9	600.1	587.4	663.6	616.5	10211
20	625.5	698.5	689	762	717.7	10212
24	727.1	800.1	790.6	863.6	822	10213
30	876.3	952.5	939.8	1016	978.7	10214

Backdraft Damper

Table 78 – Dimensions and Part Numbers

Model Size	in (mm)					Part No.				
	Opening		C	D	E					
	A	B								
12	20 1/4 (514.4)	19 1/4 (489.0)	18 1/4 (463.6)	16 1/8 (409.6)		10205				
16	26 1/4 (666.8)	23 1/4 (590.6)	22 9/16 (573.6)	20 1/8 (511.2)		10206				
20	30 1/8 (765.2)	27 1/4 (692.2)	27 1/8 (689.0)	24 1/4 (616.0)	2 (50.8)	10207				
24	34 1/8 (866.8)	31 1/4 (793.8)	31 (787.4)	28 1/4 (717.6)		10208				
MODEL SIZE	40 1/8 (1019.2)	Inches 37 (939.8)	mm 37 (939.8)	Inches 34 (863.6)	mm 34 (863.6)	Inches 30 (762.0)	mm 30 (762.0)	Inches 28 (711.8)	mm 28 (711.8)	CCI PART NUMBER
30	666.8	26 1/4 (666.8)	19 1/4 (489.0)	18 1/4 (463.6)	22 9/16 (573.6)	511.2	20 1/8 (511.2)	409.6	16 1/8 (409.6)	10205
16	666.8	23 1/4 (590.6)	22 9/16 (573.6)	20 1/8 (511.2)	20 1/8 (511.2)	511.2	20 1/8 (511.2)	409.6	16 1/8 (409.6)	10206
20	765.2	30 1/8 (765.2)	27 1/4 (692.2)	27 1/8 (689.0)	27 1/8 (689.0)	689.0	27 1/8 (689.0)	616.0	24 1/4 (616.0)	10207
24	866.8	34 1/8 (866.8)	31 1/4 (793.8)	31 (787.4)	31 (787.4)	787.4	31 (787.4)	717.6	28 1/4 (717.6)	10208
30	1019.2	40 1/8 (1019.2)	37 (939.8)	37 (939.8)	37 (939.8)	939.8	37 (939.8)	863.6	34 (863.6)	10209

Material: Aluminum extrusions

1) MATERIAL: ALUMINUM EXTRUSIONS.

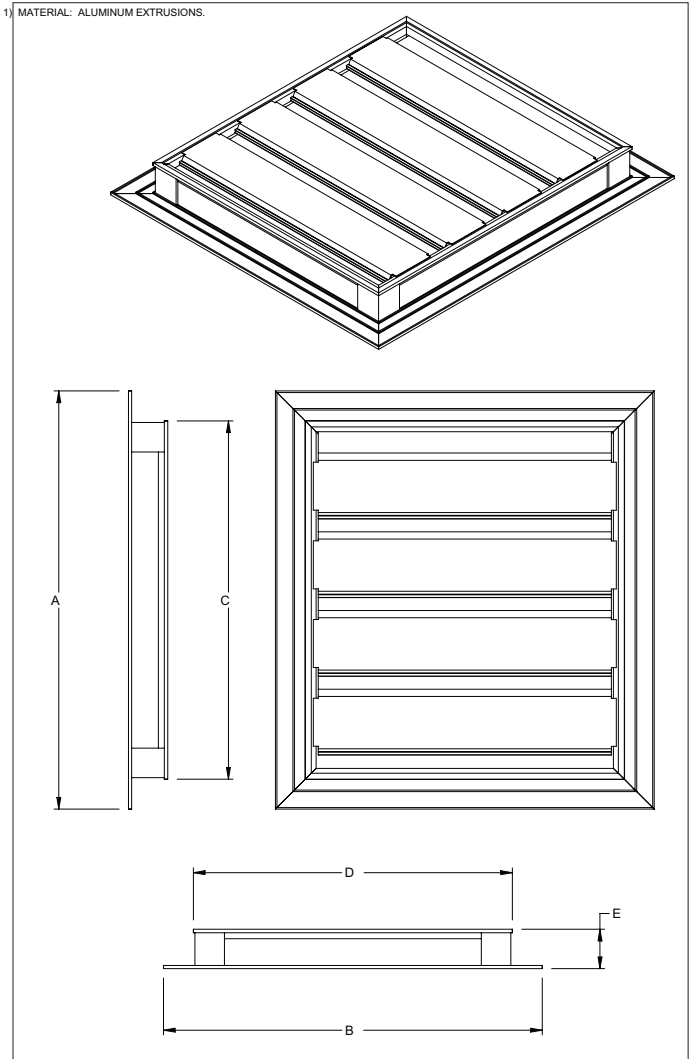


Figure 50 – Backdraft Damper Dimensions

XS Series Disconnect Switch

The Ruffneck™ XS Disconnect Switch is engineered for use in the most demanding applications such as drilling rigs, utilidors and compression stations where high vibration, dirt, moisture, fluctuating power and high impact conditions exist. The XS Disconnect Switch is suitable for all Ruffneck™ heaters (FX, XL, AH, FR, HP) as well as main switches for equipment and machines.

It is designed for use in hazardous locations where specific explosive gases or dusts are present.

Features and Benefits

- Anodized aluminum, copper free aluminum exterior
- Corrosion-resistant, suitable for H₂S environments
- Precision extruded aluminum components
- Suitable for high vibration installations
- Suitable for dirty environments
- Impact resistant with no moving parts
- 600 Vac maximum
- Comes pre-wired for easy installation
- Compatible with all Ruffneck™ heaters (FX, XL, AH, FR, HP)
- Suitable for single phase and three phase systems

Specifications

Temperature Range: -40°F to 104°F (-40°C to 40°C)

Net Weight: 12 lbs (5.5 kg)

Switching: Disconnect

Conduit Opening: 2 x 1" NPT ports

Electrical Rating

Table 79 – Part Number and Electrical Rating

Part No.	Volts	Phase	Hertz	Amps
XS40	600	3	50/60	40
XS60	600	3	50/60	60

- Class I, Division 1 & 2, Groups A, B, C & D
- Class II, Division 1 & 2, Groups E, F & G
- Class III, Division 1 & 2

Approvals

-  Certified

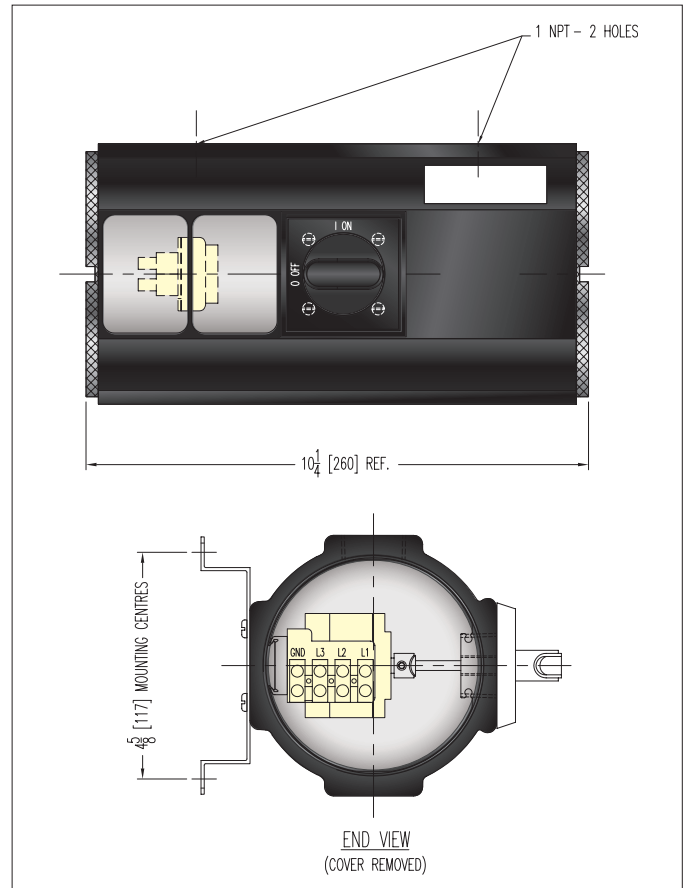


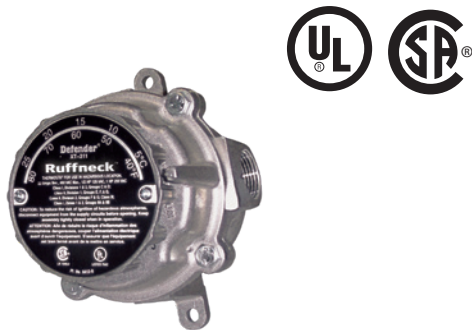
Figure 51 – Dimensions

Thermostats

XT-311 and XT-312 Defender® Thermostat

Ruffneck™ Defender® XT-311 and XT-312 explosion-proof heavy-duty thermostats are the smallest, lightest and most durable thermostats available. These thermostats are designed to control heating only, cooling only, or ventilation systems in demanding industrial applications. These include oil refineries, petro-chemical plants, pulp and paper mills, coal mines, grain elevators, hazardous waste storage facilities, and other hazardous locations where specific explosive gases or dusts are present.

For hazardous-location temperature controls, rely on Defender® thermostats for the most dependable and trouble-free service available. Ruffneck™ Defender® XT-311 and XT-312 thermostat's unique and highly engineered design offers outstanding features and benefits.



Defender®
Explosion-Proof Thermostats

Features and Benefits

- All-aluminum exterior
- No breakable external plastic parts
- No exposed copper or brass
- Corrosion resistant, suitable for H₂S environments
- Compact & lightweight
- More competitively priced
- CFC & mercury free
- Environmentally safe, no leveling required
- 3-year warranty: longest trouble-free warranty in the industry
- Precision die-cast components
- Greater consistency, better quality
- Bimetal sensing element
- Fast-acting, reliable, unaffected by altitude
- No delicate coils or bellows
- Rugged reliability
- 480 Vac maximum
- Wider range of applications

Specifications

Temperature range: 36°F to 82°F (2°C to 28°C)

Temperature differential: 2.5 F° (1.5 C°)

Net weight: 2.1 lbs (0.95 kg)

Switching: Snap acting

Conduit opening: 3/4" - 14 NPT

Electrical Rating

22 amps Res., 480 Vac Max.;

1/2 HP @ 125 Vac, 1 HP @ 250 Vac

Class I, Division 1 & 2, Groups C & D;

Class II, Division 1, Groups E, F, & G;

Class II, Division 2, Groups F & G; Class III;

Class I, Zones 1 & 2, Groups IIA & IIB

Available in Two Models

XT-311 (Feed-Through, Single Pole, Single Throw)

For heating-only applications.

XT-312 (Feed-Through, Single Pole, Double Throw)

For heating or cooling / ventilation applications.

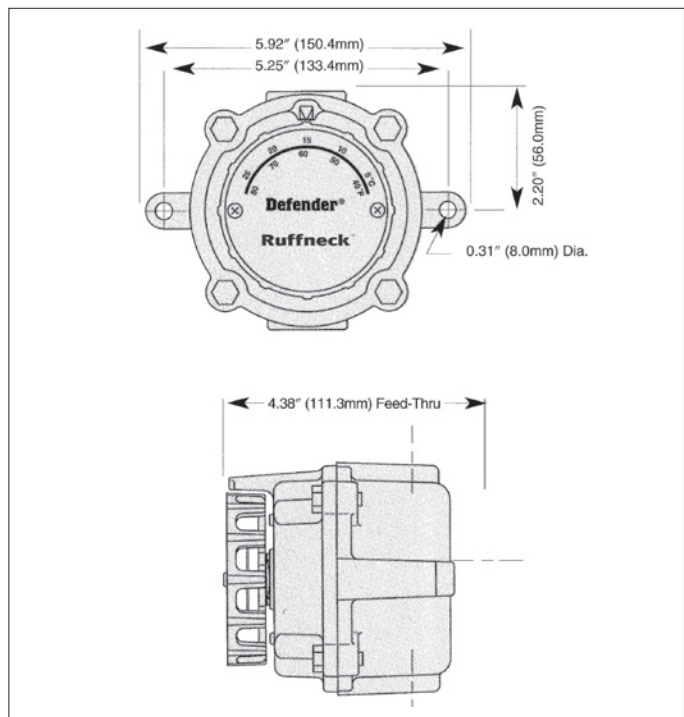


Figure 52 – Dimensions

XTE-411 Defender® Thermostat

Ruffneck™ Defender® XT-411 is engineered for use in the most demanding applications such as drilling rigs, utilidors and compression stations where dirt, fluctuating power and high impact conditions exist. It is considered the most robust and trouble-free thermostat in the market due to its solid construction.

The Ruffneck™ Defender® XT-411 thermostat is for heating only and is suitable for ventilation systems in demanding industrial applications. It is designed for use in hazardous locations where specific explosive gases or dusts are present. The Ruffneck™ Defender® XT-411 thermostat is the only available explosion-proof thermostat for line voltage or pilot duty for up to 600 Vac.

Features and Benefits

- All aluminum exterior
- No breakable external plastic parts
- No exposed copper or brass
- Corrosion resistant, suitable for H₂S environments
- CFC & mercury free, no leveling required
- Precision die cast components
- Sensing bulb is protected by a sturdy thermowell
- Impact resistant and will not lose its calibration set-point
- 600 Vac maximum
- Compact and light-weight
- Comes pre-wired for easy installation
- Compatible with all previous and current Defender® thermostat housings
- Compatible with all Ruffneck™ FX4 and FX5 heaters

Specifications

- Temperature range: 40°F to 90°F (5°C to 30°C)
- Temperature differential: 6.5°F (3.6°C)
- Net weight: 3.1 lbs (1.41 kg)
- Switching: Snap acting
- Conduit opening: 3/4" - 14 NPT

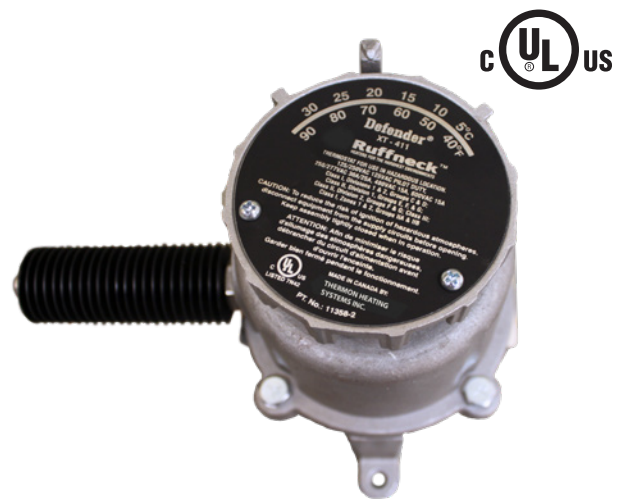
Electrical Rating

600 Vac Max. (Canada) / 480 Vac Max. (US);
 240 V / 30 A (Canada and US)
 480 V / 15 A (Canada and US)
 600 V / 15 A (Canada Only)

Class I, Division 1 & 2, Groups C & D;
 Class II, Division 1, Groups E, F & G;
 Class II, Division 2, Groups F & G; Class III;
 Class I, Zones 1 & 2, Groups IIA & IIB

Part Number

- XT-411L



Defender® Explosion-Proof Thermostats

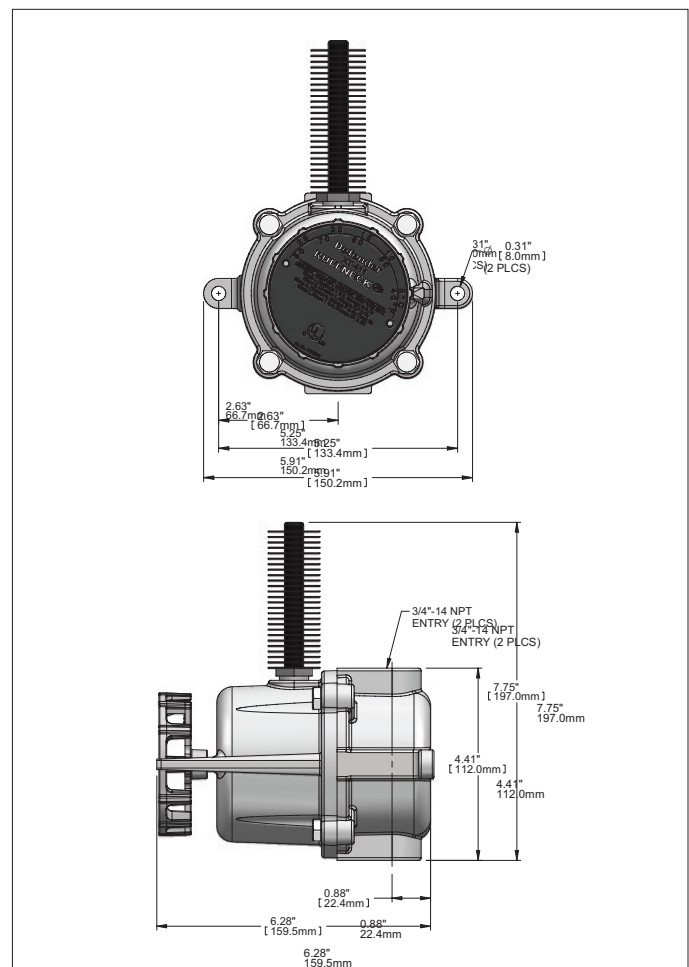


Figure 53 – Dimensions

XTE-412 Defender® Thermostat

Ruffneck™ Defender® XTE-412 is engineered for use in the most demanding applications such as drilling rigs, utilidors and industrial facilities where severe service conditions exist.

The Ruffneck™ Defender® XTE-412 thermostat is for heating and cooling control in demanding industrial applications. It is designed for use in hazardous locations where explosive gases or dusts are present. The Ruffneck™ Defender® XTE-412 thermostat is available for line duty up to 240 Vac or pilot duty for up to 120 Vac.

Features

- All aluminum exterior
- No breakable external plastic parts
- No exposed copper or brass
- Precision die cast components
- Thermal sensor is protected by a sturdy thermowell
- 24 Vac/dc, 120 V / 240 Vac
- Compact and light-weight
- Compatible with all previous and current Defender® thermostat housings
- Microcontroller design
- Electronic relay switch

Specifications

Temperature range: 32°F to 104°F (0°C to 40°C)

Temperature differential: 5.4°F (3°C)

Net weight: 3.1 lbs (1.41 kg)

Switching: Relay contact

Conduit opening: 3/4" NPT

Electrical Rating

Resistive: 240 VAC, N.O. 20 A, N.C.10 A

Pilot Duty: 120 VAC, N.O. 470 VA, N.C. 275 VA

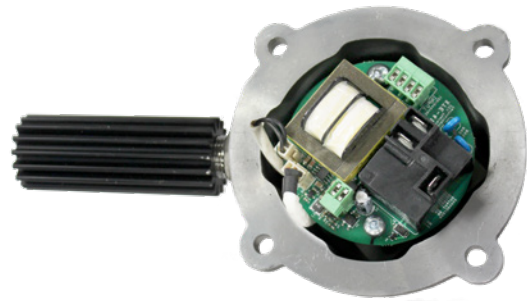
Hazardous Location Ratings

Class I, Division 1 & 2, Groups C & D;

Class II, Division 1, Groups E, F & G;

Class II, Division 2, Groups F & G; Class III;

Class I, Zones 1 & 2, Groups IIA & IIB



Defender®
Explosion-Proof Thermostats

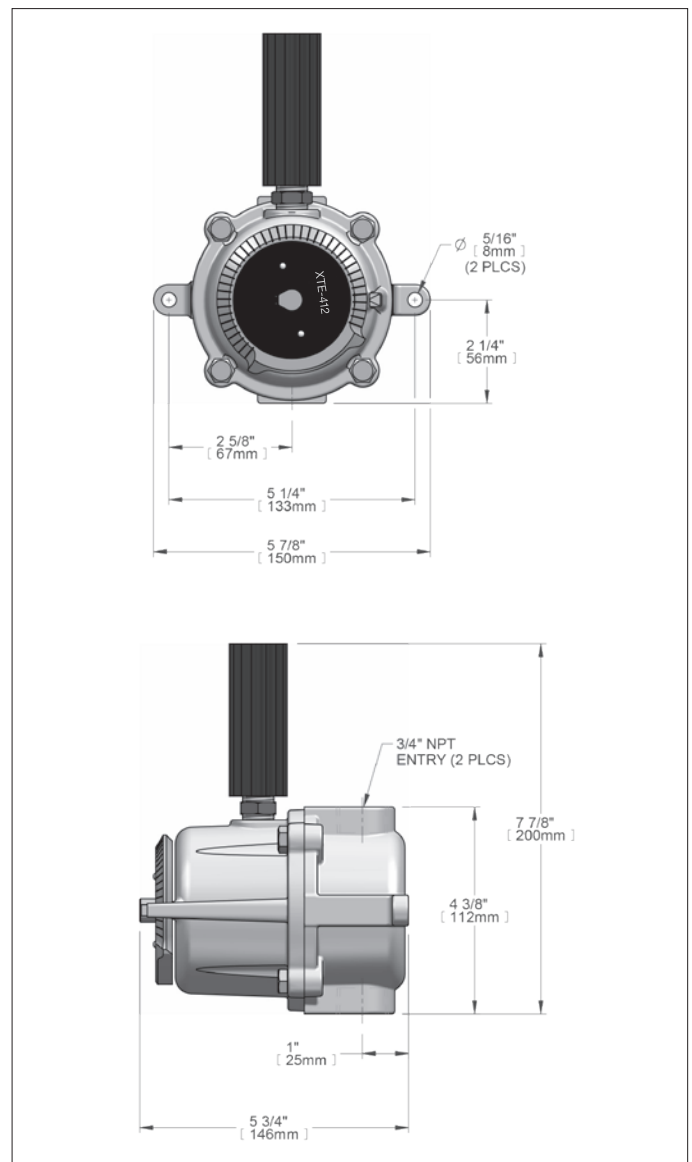


Figure 54 – Dimensions

ET9 Standard Ruffneck™ Thermostat



Heavy Duty Line Voltage Thermostat

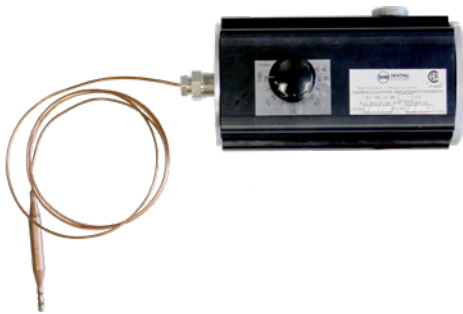
- Temperature range: 50°F to 90°F (10°C to 32°C)
- 22 amps, 277 Vac
- ¼ HP @ 125 Vac
- 1½ HP @ 250 / 277 Vac
- Single pole
- Single Throw*
- Approximate Shipping Weight: 0.6 lbs (0.28 kg)

TF115 NEMA 4X Corrosion Resistant Thermostat



- Temperature range: 40°F to 110°F (4.4°C to 43.3°C)
- 25 amps Res., 240 VAC: 5A @ 480 Vac
- Full load = 16 amps @ 120 Vac
12 amps @ 240 Vac
- Lock Rotor = 80 amps @ 120 Vac
60 amps @ 240 Vac
- Single pole, double throw (heating or cooling applications)
- Approximate Shipping Weight: 0.69 lbs (0.31 kg)

XTB Explosion-Proof Thermostat



- Temperature range: 0°F to 100°F (-18°C to 40°C)
- Class I, Division 1 & 2 Groups C & D
- Class II, Division 1 & 2 Groups E, F & G
- Class III, Division 1 & 2
- Remote sensing bulb with 57" capillary length
- 15 amps Res., 600 VAC Max. - 25 amps Res., 277 Max.
- XTBO4481 (Single Pole, Single Throw)*
- XTBO4483 (Double Pole, Single Throw)*
- Approximate Shipping Weight: 3.8 lbs (1.7 kg)

Note:

All 3 phase motors on AH, HP and FR heaters require a motor starter (supplied by others).

*Heating applications only

XTWA Explosion-Proof Thermostat

- Temperature range: 0°F to 100°F (-18°C to 40°C)
- Class I, Division 1 & 2 Groups A, B, C & D
Class II, Division 1 & 2 Groups E, F & G
Class III, Division 1 & 2
- Sensing bulb in Finned Thermowell for Air Sensing
- 15 amps Res., 600 Vac Max. - 25 amps Res., 277 Max.
- XTWA04481 (Single Pole, Single Throw)*
- XTWA04483 (Double Pole, Single Throw)*
- Approximate Shipping Weight: 4.0 lbs (1.8 kg)



XTD8-S Explosion-Proof Thermostat

- Temperature range: 40°F to 80°F (5°C to 25°C)
- Class I, Division 1 & 2 Groups C & D
Class II, Division 1 & 2 Groups E, F & G
Class III, Division 1 & 2
- Feed-thru model (includes explosion-proof plug)
- ¾" - 14 NPT conduit opening (½" conduit adapter included)
- Single pole, double throw (heating or cooling applications)
- 22 amps, 277 Vac Max.
- ¾ HP @ 125 Vac
- 1½ HP @ 250/277 Vac
- Approximate Shipping Weight: 5.3 lbs (2.4 kg)



Note:

All 3 phase motors on AH, HP and FR heaters require a motor starter (supplied by others).

*Heating applications only

Mounting Kits

To Order Specify

- Quantity
- Type of kit
- Basic heater model to be mounted

Basic Mounting Kit (BMK)*

The BMK is suitable for applications where the support arm can be bolted or welded directly to structural steel or concrete.

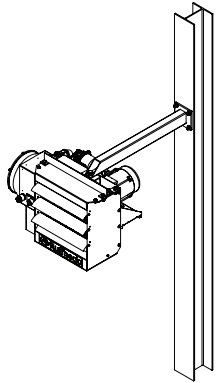


Table 80 – BMK

Model	Approx. Shipping Weight	
	lbs	kg
FX4/FX5 (12" / 305 mm fan)	16.5	7
FX4/FX5 (16" / 406 mm fan)	18.2	8
FX4/FX5 (20" / 508 mm fan)	19.3	9
HP / FR 12 / 16	16.5	7
HP / FR 20 / 24	18.2	8
AH-12A	16.5	7
AH-16A	18.2	8
AH-20A	19.3	9
AH-24A	20.3	9

Swivel Hanging Mounting Kit (SHMK)*

Swivels 360°. Requires ½" (13 mm) pipe, cut and threaded (not supplied)

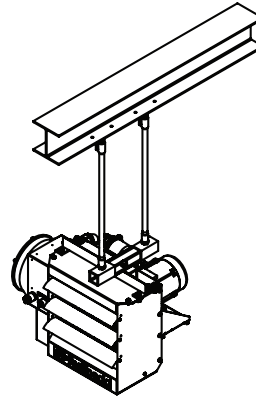


Table 83 – SHMK

Model	Approx. Shipping Weight	
	lbs	kg
FX4/FX5 (12" / 305 mm fan)	18.2	8
FX4/FX5 (16" / 406 mm fan)	19.4	9
FX4/FX5 (20" / 508 mm fan)	20.4	9
HP / FR 12 / 16	18.3	8
HP / FR 20 / 24	20.1	9
AH-12A	18.2	8
AH-16A	19.4	9
AH-20A	20.4	9
AH-24A	21.4	10

Wall Mounting Kit (WMK)*

Ideal for use in buildings that have substantial walls. The Z sections provide additional support where necessary.

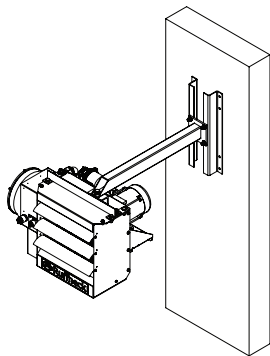


Table 81 – WMK

Model	Approx. Shipping Weight	
	lbs	kg
FX4/FX5 (12" / 305 mm fan)	24.3	11
FX4/FX5 (16" / 406 mm fan)	25.4	12
FX4/FX5 (20" / 508 mm fan)	26.5	12
HP / FR 12 / 16	24.3	11
HP / FR 20 / 24	25.4	12
AH-12A	24.3	11
AH-16A	25.4	12
AH-20A	26.5	12
AH-24A	27.5	12

Pipe Mounting Kit (PMK)*

Particularly useful in buildings with insufficient structural strength to use other types of mounts. Requires 3" (76 mm) pipe (3½" / 89 mm O.D.) (not supplied).

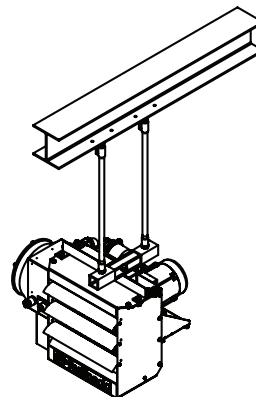


Table 84 – PMK

Model	Approx. Shipping Weight	
	lbs	kg
FX4/FX5 (12" / 305 mm fan)	23.7	11
FX4/FX5 (16" / 406 mm fan)	25.4	12
FX4/FX5 (20" / 508 mm fan)	26.5	12
HP / FR 12 / 16	23.7	11
HP / FR 20 / 24	25.4	12
AH-12A	23.7	11
AH-16A	25.4	12
AH-20A	26.5	12
AH-24A	27.5	12

Vertical Hanging Mounting Kit (VHMK)

Simple and economical when mounting to an appropriate overhead structure. (Requires 3/8" / 10 mm THD Rod)

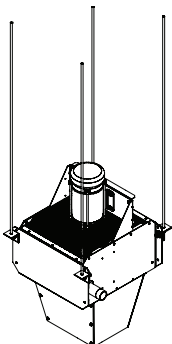


Table 82 – VHMK

Model	Approx. Shipping Weight	
	lbs	kg
All AV	4.5.3	2

Hanging Mounting Kit (HMK)

Simple and economical if an adequate overhead structure exists. Requires ½" (13 mm) pipe, cut and threaded (not supplied).

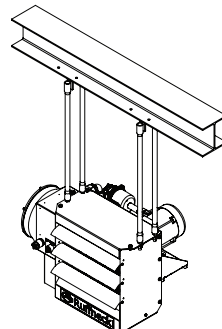


Table 85 – PMK

Model	Approx. Shipping Weight	
	lbs	kg
All FX4/FX5	4.5	2
All HP/FR		
All AH		

Note:

Mounting kits are made of steel with wet applied enamel paint. If the heater is installed on a structure that is to be transported, provide additional support for the heater during transit. The suspended weight should not exceed 300 lbs (136 kg).

*Not suitable for models - HP 30, FR 30, HP 36, FR 36, or Tandem AH Series (24B fan configuration).

Ruffneck™

Thermal Performance Analysis Service

You are encouraged to take advantage of our computerized service available for calculating heating capabilities for Ruffneck™ heat-exchanger unit heaters. This service accurately computes complete performance parameters and output capacities for all Ruffneck™ models under a wide range of operating conditions.

The software used is powerful and flexible, and offers metric or imperial unit measures to rate unit heaters based on flow rate or fluid temperature drop. The program is also designed to rate standard unit heaters; to rate heat-exchangers only for non-standard air flows in duct applications; or to quickly rate units for the following pre-programmed fluid types:

- Steam
- Ethylene Glycol / Water
- Water
- Triethylene Glycol / Water
- Dowtherm G
- Dowtherm A
- Dowtherm E
- Therminol FR-1
- Therminol 66
- Humbletherm 500
- Mobiltherm 600
- Sun 21 Thermal Oil
- SAE 20 Lube Oil
- SAE 30 Lube Oil

This program can also rate units for other fluids by manually inputting fluid properties.

Thermon Heating Systems, Inc. can provide long or short printouts of all calculations. All this can be performed quickly and easily by simply providing the following information:

- Type of fluid used
- Inlet fluid temperature
- Outlet fluid temperature or available flow rate
- Altitude above sea level
- Entering air temperature

This service is particularly helpful for large complex projects requiring multiple heaters. We are able to perform dozens of calculations in search of the most economic system. Along with the thermal performance analysis, our staff can assist you with common heat loss calculations for your building.

These reports are samples only.

Additionally, this program is available for your use, free of charge, from our website at: www.ruffneck.com.

Technical Data

Abbreviations Used

Btu = British Thermal Unit

MBH = Btu/hr × 1000

EAT = Entering Air Temperature

FAT = Final Air Temperature

USGPM = U.S. Gallons Per Minute

PD = Pressure Drop, psi

psig = Pounds Per Sq. In. Gauge Pressure

ΔT = Liquid Temperature Differential

CFM = Cubic Feet Per Minute

FPM = Feet Per Minute

COND. = Condensate Flow

Table 86 – Properties of Steam

Gauge Pressure	Temperature	Latent Heat	Density
psig	°F (°C)	Btu/lbs	lb/ft ³
2	219 (104)	965	0.0434
10	239 (115)	952	0.0612
20	259 (126)	939	0.0855
40	287 (142)	919	0.1351
60	307 (153)	904	0.1818
80	324 (162)	891	0.2127
100	338 (170)	880	0.2564
150	366 (186)	857	0.3634
200	387 (197)	838	0.4686
250	406 (208)	820	0.5720
450	460 (238)	764	1.0000

Useful Formulas

$$1. \text{ Condensate, lb/hr} = \frac{\text{actual Btu/hr}}{\text{Latent Heat of Steam at psig}}$$

$$2. \text{ Specific heat of air from } 0^{\circ}\text{F to } 150^{\circ}\text{F} = 0.24 \text{ Btu/lb}^{\circ}\text{F}$$

$$3. \text{ Weight of one cubic foot of air at } 70^{\circ}\text{F} = 0.75 \text{ lb}$$

$$4. \text{ Btu/hr} = \text{CFM} \times \text{Air Temp. Rise } (^{\circ}\text{F}) \times 1.08$$

(Note: 1.08 = 0.24 × 0.75 × 60)

$$5. \text{ Water temperature drop } (^{\circ}\text{F}) = \frac{\text{actual Btu/hr}}{500 \times \text{USGPM}}$$

$$6. \text{ CFM at FAT} = \text{CFM at } 70^{\circ}\text{F} \times \frac{460 + \text{FAT}}{530}$$

$$7. \text{ CFM at } 70^{\circ}\text{F} = \text{CFM at FAT} \times \frac{530}{460 + \text{FAT}}$$

$$8. \text{ Air temperature rise } (^{\circ}\text{F}) = \frac{\text{actual Btu/hr}}{1.08 \times \text{CFM}}$$

$$9. \text{ Final air temperature } (^{\circ}\text{F}) = \text{EAT} + \text{Temp. Rise}$$

$$10. \text{ 1 Boiler Horsepower} = 33,479 \text{ Btu/hr at } 70 \text{ psi}$$

$$11. \text{ 1 Boiler Horsepower} = 30 \text{ lbs/hr of feed water at } 100^{\circ}\text{F converted to steam at } 70 \text{ psi}$$

$$12. \text{ 1 U.S. Gallon of water} = 8.34 \text{ pounds of water}$$

$$13. \text{ 1 Imperial Gallon of water} = 10 \text{ pounds of water}$$

$$14. \text{ 1 psi pressure drop} = 27.6 \text{ inches of water}$$

$$15. \text{ 1 kW} = 3,414 \text{ Btu/hr}$$

$$16. \text{ 1 U.S. Gallon} = 0.83267 \text{ Imperial Gallons}$$

$$17. \text{ 1 U.S. Gallon} = 3.785 \text{ litres}$$

$$18. \text{ } ^{\circ}\text{C} = 5/9 (^{\circ}\text{F} - 32)$$

Equivalent Resistance of Valves & Fittings

Table 87 – Feet of Pipe

Pipe Size in	Globe Valve Open	Gate Valve Open	Close Return Bend	Tee 90° Flow	Tee 0° Flow	Elbow 90° Standard	Elbow 45° Standard	Reducer D/d = 2
1	27	1.1	6	6	1.7	2.6	1.3	1.0
1¼	37	1.3	8	8	2.3	3.5	1.6	1.3
1½	44	1.6	10	9	2.7	4.5	2.0	1.5
2	55	2.2	13	12	3.5	5.3	2.5	1.9
2½	65	2.7	15	14	4.2	6.3	3.0	2.2
3	80	3.3	18	17	5.0	8.0	3.7	2.8

Heat Loss of Steam Lines

Heat loss of uncovered steam lines in a 15 MPH wind:

$$\text{Btu/hr} = \text{td} \times \text{C} \times \text{S}$$

WHERE: td = temperature difference between steam and ambient air

- C = 5.32 for 200°F td
- 5.92 for 250°F td
- 6.52 for 300°F td
- 7.29 for 350°F td
- 8.06 for 400°F td

S = surface area of pipe in square feet

EXAMPLE: Calculate heat loss for one foot of 2" (51 mm) pipe at 316°F (70 psi) steam temperature inside, with an ambient air temperature of -34°F outside.

$$\text{td} = 350 \text{ F}^\circ (-34^\circ\text{F to } 316^\circ\text{F})$$

$$\text{C} = 7.29$$

$$\text{S} = \frac{2.375" \text{ O.D.} \times \pi \times 12"}{144 \text{ sq.in.} / \text{sq.ft}} = 0.6218$$

$$\text{Heat Loss} = 350 \times 7.29 \times 0.6218 = 1587 \text{ Btu/hr}$$

Babcock Formula for Steam Flow

$$\text{PRESSURE DROP (psi)} = \frac{0.0001307W^2L}{p \cdot d^5} \left(1 + \frac{3.6}{d}\right)$$

WHERE: W = Steam Flow Rate, lb per minute

L = Length of Pipe, ft

- p = 0.0434 for 2 psig Steam
- 0.0612 for 10 psig Steam
- 0.0855 for 20 psig Steam
- 0.1351 for 40 psig Steam
- 0.1818 for 60 psig Steam
- 0.2127 for 80 psig Steam
- 0.2564 for 100 psig Steam

d = Inside diameter of Pipe, inches

EXAMPLE: Calculate pressure drop for 100 ft of 2" (1 mm) sch. 40 pipe used to deliver all the steam of a 100 h.p. boiler (3000 lb/hr) at 80 psi.

WHERE: W = 50, L = 100, p = 0.2127, d = 2.067

$$\text{Pressure Drop (psi)} = \frac{0.0001307 \times 50^2 \times 100}{0.2127 \times 2.067^5} \left(1 + \frac{3.6}{2.067}\right)$$

$$\text{Pressure Drop} = 11.16 \text{ psi}$$

Engineer's Specifications

Supply and install Ruffneck™ Heat-Exchanger Unit Heaters as shown on the following plans.

For FR-1 and HP-1 Series in fluid applications, including standard features listed below.

-----DESCRIPTION-----			-----PERFORMANCE-----		-----MOTOR-----			
Item	Quantity	Model	MBH @ psi @ EAT	FAT	Type	Volts	Phase	Hertz

FR Series units shall be suitable for use on steam pressures to 100 psi and shall be warranted against frost damage for a period of one year.

For HP-1, HP-3, HP-5, HP-7 Series in fluid applications, including standard features listed below.

For use on _____
(type of liquid)

-----DESCRIPTION-----			-----PERFORMANCE-----		-----MOTOR-----			
Item	Quantity	Model	MBH @ psi @ EAT	FAT	Type	Volts	Phase	Hertz

HP series units shall be suitable for use on pressures up to _____ psi (400 psi available on select models) and shall be warranted for a period of one year.

Standard Features for all Models

Cabinet

Cabinet shall be an all-welded design of 14 GA steel (12 GA on model 36) and shall be 5-stage phosphate treated and finished with a powder coated green-grey epoxy. Louvre blades shall be adjustable heavy duty type. Motor mount shall be of heavy-duty formed steel construction.

Motor

Shall be UL listed and/or CSA approved permanently lubricated ball bearing type with rigid base (Type, voltage, phase, hertz, etc. as required).

Heat Exchanger

Shall be a heavy-duty welded steel construction using 5/8" (16 mm) dia. x .065" (1.7 mm) average wall thickness carbon steel tubing with tension wound close fitting 0.014" (3.6 mm) thickness x 7/16" (11 mm) high aluminum fins. Inlet and outlet connections are to be 2" NPT female extra heavy-duty steel type. Completed heat exchangers shall have heat resistant aluminum paint applied. The entire assembly shall be warranted for a period of one year against damage due to over-torquing.

Fan

Shall be an accurately balanced 3-wing design employing aluminum propeller blades, riveted to a steel hub, driven directly by the motor (size 36 models shall use a balance 6-wing, painted, all-steel, belt driven fan).

Fan Guard

The fan shall be shielded with a heavy-duty epoxy coated guard. To provide easy maintenance and cleaning of the fan and motor, the fan guard shall be of a two-piece construction. Gaps in guard not to exceed 1/4" (6 mm). (Size 36 models shall be welded design of perforated sheet steel, powder coated to match the heater).

Hazardous Locations Definitions

The following information is to be used only as a general reference. For detailed information concerning hazardous location definitions and installation requirements, refer to either the 1999 National Electrical Code (NEC), Chapter 5 Articles 500 through 516, available from the National Fire Protection Association, or the 1998 Canadian Electrical Code (CEC), Part 1 Section 18, available from the Canadian Standards Association.

NEC and CE Classification System

Class I Locations: A location where there is a danger of explosion due to the presence of a flammable gas or vapor.

Class II Locations: A location where there is a danger of explosion due to the presence of a flammable dust.

Class III Locations: A location where there is a danger of explosion due to the presence of flammable fibers or flyings.

Division 1 Locations: A location where the hazard is expected to be present during normal operating conditions.

Division 2 Locations: A location where the hazards would only exist as a result of an accident or other abnormal event, such as an accidental rupture of a vessel or container or failure of a ventilating system.

Class I Groups

Group A: Atmospheres containing acetylene.

Group B: Atmospheres containing hydrogen (H₂), fuel and combustible process gases containing more than 30% hydrogen by volume, or gases or vapors of equivalent hazard such as butadiene, ethylene oxide, propylene oxide, and acrolein.

Group C: Atmospheres containing ethyl ether, ethylene, or gases or vapors of equivalent hazard.

Group D: Atmospheres containing acetone, alcohol, ammonia, benzene, butane, cyclopropane, ethanol, gasoline, hexane, methanol, methane, natural gas, propane, or gases or vapors of equivalent hazard.

Hazardous Locations: Areas where fire or explosion hazards exist due to the possible presence of flammable gases or vapors, flammable liquids, combustible dusts, or ignitable fibers or flyings.

Class II Groups

Group E: Atmospheres containing combustible metal dusts, including aluminum, magnesium, and their commercial alloys, or other combustible dusts whose particle size, abrasiveness, and conductivity present similar hazards in the use of electrical equipment.

Group F: Atmospheres containing combustible carbonaceous dusts including coal, coke, carbon black, and charcoal dust having more than 8% total entrapped volatiles; or dusts that have been sensitized by other materials so that they present an explosion hazard.

Group G: Atmospheres containing combustible dusts not included in Group E or F, including flour, starch, grain, wood, plastic,

Note:

There is potential for confusion between the NEC/CE and IEC gas classification systems since the Group letters are reversed and even combined. Care should also be taken to avoid confusing Group II and Class II, since both use Roman numerals. An unintended result of specifying the IEC gas groups, which combine the traditional Groups A and B into Group IIC, is that equipment approved for hydrogen (H₂) would also have to be approved for acetylene. Since very little equipment is designed for acetylene, the wording as originally adopted severely limits the availability of equipment for hydrogen applications. As a result, NEC Section 505-7(d) now allows for equipment to be listed for a specific gas or vapor, specific mixtures of gases or vapors, or any specific combination of gases or vapors. One common example is equipment marked for "IIB + H₂". At present, the NEC or CE Code does not recognize any CENELEC or IEC dust classifications.

CENELEC (and IEC) Zone Classification System

Introduced to North America in 1996, the European CENELEC (and IEC) system of classification of hazardous locations is also permitted to apply to installations in the U.S. and Canada as an alternative in Class I Locations, and is now part of the NEC (Article 505) and CE Code (Section 18).

Class I, Zone 0: A location in which explosive gas atmospheres are present continuously or for long periods of time.

Class I, Zone 1: A location in which explosive gas atmospheres are likely to exist in normal operation or may exist frequently because of repairs, maintenance operations, and leakage or where equipment breakdowns could release gases or vapors and also cause simultaneous failure of electrical equipment in a mode to cause the electrical equipment to become a source of ignition.

Class I, Zone 2: A location in which explosive gas atmospheres are not likely to occur in normal operation and, if they do occur, will exist for a short time only; or where volatile flammable liquids, flammable gas, or flammable vapors are handled, processed, or used, but are normally confined within closed containers or systems from which they can escape only as a result of accidental rupture or breakdown of the containers or system, or as a result of abnormal operation of the equipment with which the liquids or gases are handled, processed, or used; or where ignitable concentrations of flammable gases or vapors are normally prevented by adequate ventilation, but which may occur as a result of failure or abnormal operation of the ventilation system.

Class I Groups

Group I: Atmospheres containing explosive gas in underground coal mines. Electrical apparatus that is intended for use in underground mines.

Group IIC: Atmospheres containing acetylene, hydrogen (H₂), or gases of equivalent hazard.

Group IIB: Atmospheres containing acetaldehyde, ethylene, or gases or vapors of equivalent hazard.

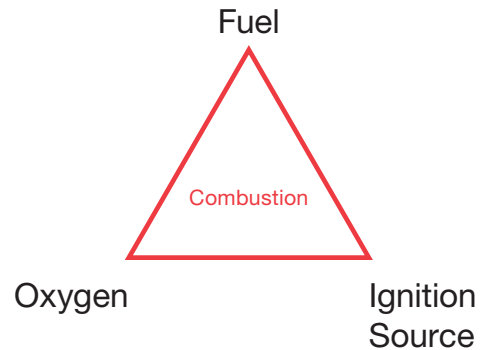
Group IIA: Atmospheres containing acetone, ammonia, ethyl alcohol, gasoline, methane, propane, or gases or vapors of equivalent hazard.

Combustion Principles

Three basic conditions must be satisfied for a fire or explosion to occur. First, a flammable liquid, vapor or combustible dust must be present in sufficient quantity. Second, the flammable liquid, vapor or combustible dust must be mixed with air or oxygen in the proportions required to produce an explosive mixture. Finally, a source of energy must be applied to the explosive mixture.

In applying these principles, the quantity of the flammable liquid or vapor that may be liberated and its physical characteristics must be recognized. Vapors from flammable liquids also have a natural tendency to disperse into the atmosphere, and rapidly become diluted to concentrations below the lower explosion limit, particularly when there is natural or mechanical ventilation. In order to have an explosive gas atmosphere, the concentration of the gas or vapor must be above the Lower Explosive Ignition Limit (LEL) but below the Upper Explosive Limit (UEL). The possibility that the gas concentration may be above the upper explosion limit does not afford any degree of safety, as the concentration must first pass through the explosive range to reach the upper explosion limit.

Combustion Triangle



Equipment Marking Requirements

Electrical equipment permitted for use in hazardous locations must be marked to show the Class, Division (or Zone under NEC Article 505 and CEC Section 18), Group, and maximum surface operating temperature or temperature code referenced to a 104°F (40°C) ambient temperature (some exceptions apply). Note that the maximum external temperature of the equipment shall not exceed the minimum ignition temperature of the atmosphere that the equipment is located in.

Electrical equipment approved for operation at ambient temperatures exceeding 104°F (40°C) shall be marked with the maximum ambient temperature for which the equipment is approved, and the operating temperature or temperature range at that ambient temperature.

Equipment not marked to indicate a division, or marked "Division 1" or "Div. 1", is suitable for both Division 1 and 2 locations. Equipment marked "Division 2" or "Div. 2" is suitable for Division 2 locations only. Equipment that is listed for a Zone 0 location shall be permitted in a Zone 1 or Zone 2 location of the same gas or vapor. Equipment that is listed for a Zone 1 location shall be permitted in a Zone 2 location of the same gas or vapor.

Table 88 – Maximum Surface Temperature Codes

Maximum Surface Temperature	Identification Number	
	NEC/CEC T-Code	IEC T-Code
842°F (450°C)	T1	T1
572°F (300°C)	T2	T2
536°F (280°C)	T2A	
500°F (260°C)	T2B	
446°F (230°C)	T2C	—
419°F (215°C)	T2D	
392°F (200°C)	T3	T3
356°F (180°C)	T3A	
329°F (165°C)	T3B	—
320°F (160°C)	T3C	
275°F (135°C)	T4	T4
248°F (120°C)	T4A	—
212°F (100°C)	T5	T5
185°F (85°C)	T6	T6