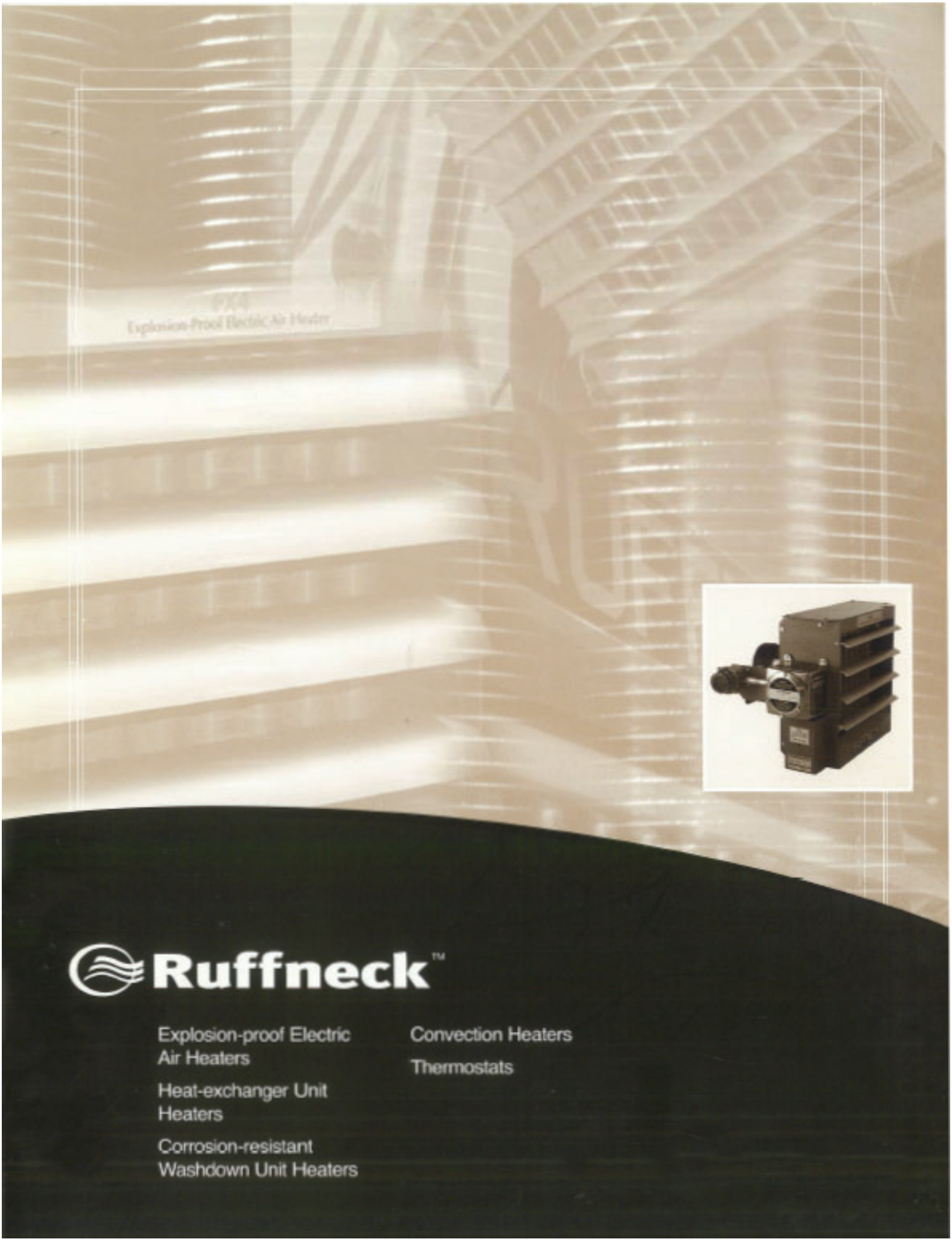


Ruffneck™

Explosion-proof Electric Air Heaters

Heat-exchanger Unit Heaters

Corrosion-resistant Washdown Unit Heaters

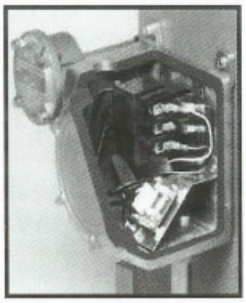
Convection Heaters

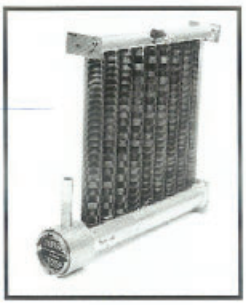
Thermostats

Contents

FX4 Explosion-Proof Electric Air Heater

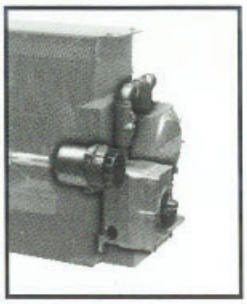
FX4 heaters are UL listed and/or CSA certified for use in hazardous locations. They are designed for dry indoor industrial applications such as oil refineries, petrochemical plants, pulp and paper mills, coal mines, grain elevators, hazardous waste storage facilities, wastewater treatment plants, etc., where specific explosive gases or dusts are present.





All FX4 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 exchange unit.

The heater core assembly is contained in a sturdy, epoxy-coated 14-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.

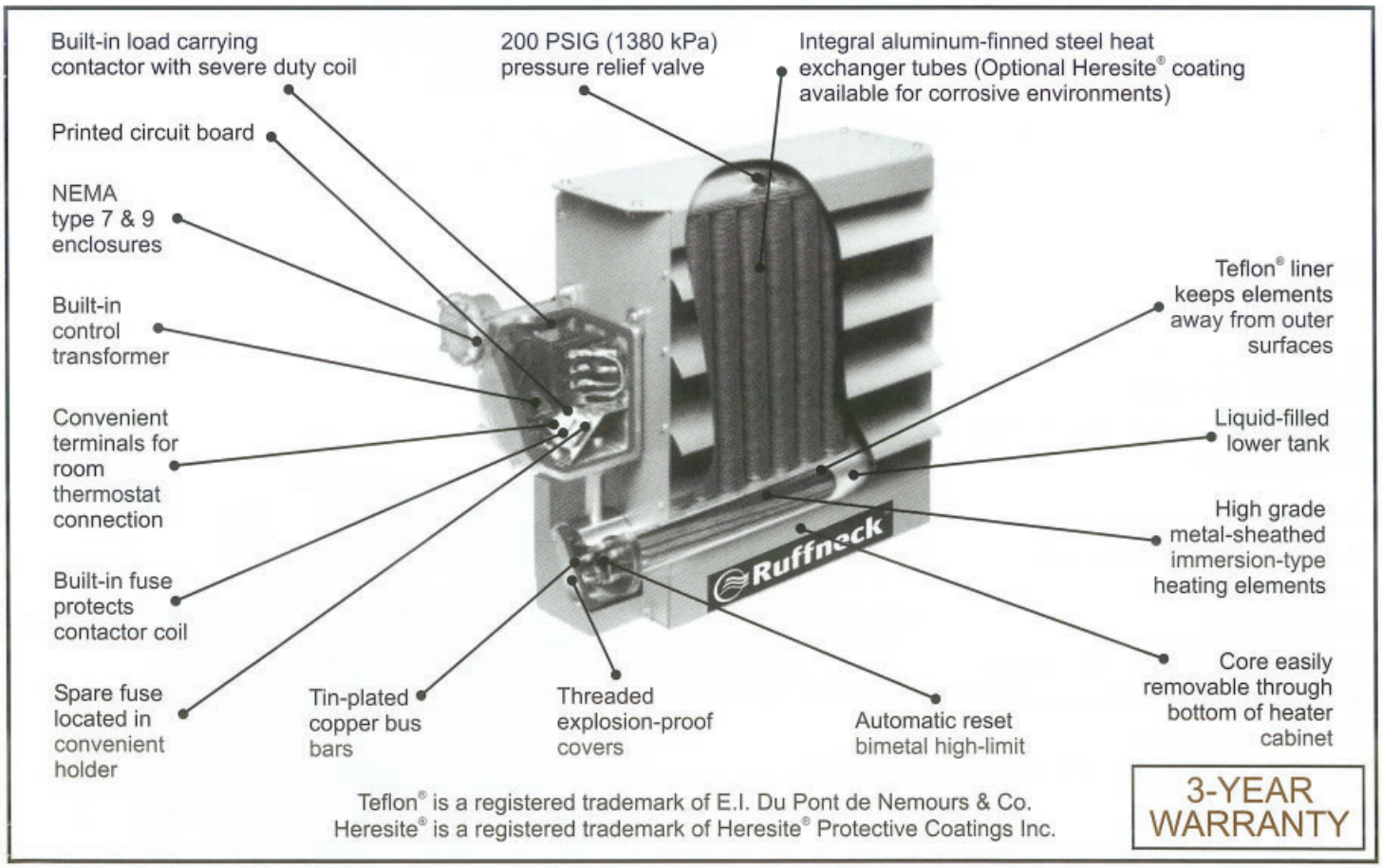


Ruffneck™ heaters are built to last. All aspects and details of Ruffneck™ products are subjected to exhaustive technical analysis and testing during design and development, and are manufactured under a registered quality assurance program. As a result, they have consistently proven their safety and reliability.

For hazardous location heating, rely on the Ruffneck™ FX4 heater for the most dependable, trouble-free service available.

SUITABLE FOR THE FOLLOWING HAZARDOUS LOCATION CLASSIFICATIONS:

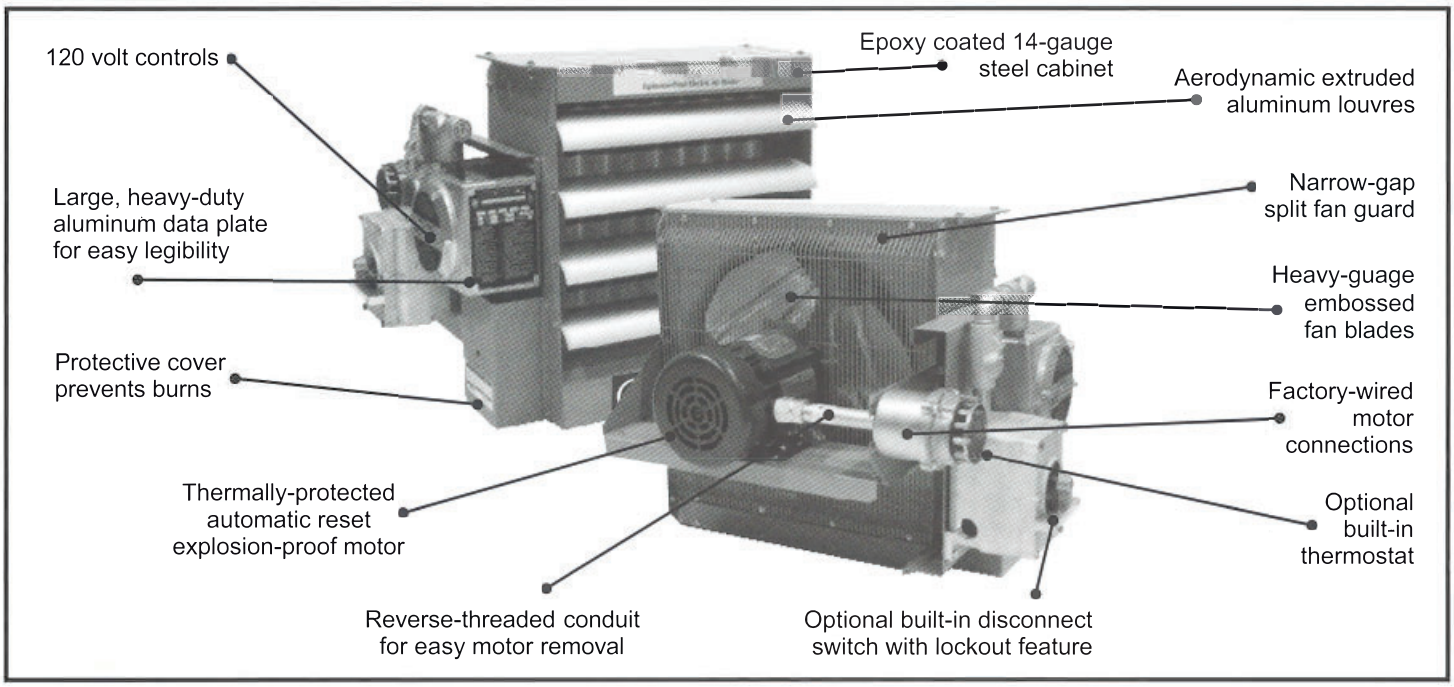
- **Class I, Divisions 1 & 2, Groups C & D**
- **Class II, Divisions 1 & 2, Groups E, F & G**
- **Class I, Zones 1 & 2, Groups IIA & IIB**
- **Temperature Code T3B 165°C (329°F)**



Teflon® is a registered trademark of E.I. Du Pont de Nemours & Co.
Heresite® is a registered trademark of Heresite® Protective Coatings Inc.

3-YEAR WARRANTY

FEATURE	BENEFIT
evacuated core	• heats up faster, with even heat distribution
greater kW range - up to 35 kW	• more economical to heat large areas
three year warranty	• trouble-free, peace of mind
split fan guard	• easy access to fan
optional built-in accessories	• reduced field installation costs
bimetal high-limit	• high altitude applications, better reliability
large explosion-proof control box with screw-on cover	• easy access for installation and maintenance

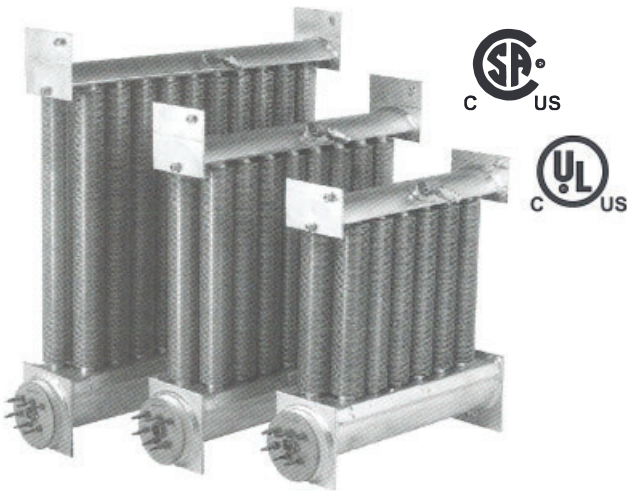


XD CORE

Do you have a harsh work environment? The **Ruffneck™ XD CORE,** developed by , is a rugged heater core designed for difficult conditions.

- **Available in:** Available in all sizes of the FX4
- **Nominal wattage (kW):** 3-35
- **Voltage:** 208V, 240V, 480V, and 600V
- **Phase:** 1 or 3
- **Temperature Code:** T3B (165°C)
- **Material:** Steel with integrated aluminum fins
- **Number of rows:** 2
- **Number of tubes:** 13 (12”), 17 (16”), and 21 (20”)

•XD Core is interchangeable with FX4/XL4 and XL3 heaters.
•Optional on new heaters.



Performance Data for 60 Hertz FX4

UL listed and/or CSA certified. Temperature Code T3B 165°C (329°F)

NOMINAL WATTAGE (kW)	MODEL	VOLTAGE	PHASE	TOTAL CURRENT (A)	OPTIONAL BUILT-IN DISCONNECT SWITCH	AIR TEMPERATURE RISE °F	AIR TEMPERATURE RISE °C	BTU/HR
3	FX4-208160-030	208	1	14.4	DS4-48	19.0	10.5	10,250
	FX4-240160-030	240	1	12.5	DS4-48			
	FX4-208360-030	208	3	8.3	DS4-48			
	FX4-240360-030	240	3	7.2	DS4-48			
	FX4-480160-030*	480	1	6.3	DS4-48			
	FX4-480360-030	480	3	3.6	DS4-48			
	FX4-600360-030*	600	3	2.9	DS4-48			
5	FX4-208160-050	208	1	24.0	DS4-48	31.6	17.6	17,050
	FX4-240160-050	240	1	20.8	DS4-48			
	FX4-208360-050	208	3	13.9	DS4-48			
	FX4-240360-050	240	3	12.0	DS4-48			
	FX4-480160-050*	480	1	10.4	DS4-48			
	FX4-480360-050	480	3	6.0	DS4-48			
	FX4-600360-050*	600	3	4.8	DS4-48			
7.5	FX4-208160-075	208	1	36.1	DS4-48	27.9	15.5	25,600
	FX4-240160-075	240	1	31.3	DS4-48			
	FX4-208360-075	208	3	20.8	DS4-48			
	FX4-240360-075	240	3	18.0	DS4-48			
	FX4-480160-075*	480	1	15.6	DS4-48			
	FX4-480360-075	480	3	9.0	DS4-48			
	FX4-600360-075*	600	3	7.2	DS4-48			
10	FX4-208160-100*•	208	1	48.1	Not Available	37.2	20.6	34,100
	FX4-240160-100	240	1	41.7	DS4-48			
	FX4-208360-100	208	3	27.8	DS4-48			
	FX4-240360-100	240	3	24.1	DS4-48			
	FX4-480160-100*	480	1	20.8	DS4-48			
	FX4-480360-100	480	3	12.0	DS4-48			
	FX4-600360-100*	600	3	9.6	DS4-48			
15	FX4-240160-150*•	240	1	62.5	Not Available	27.1	15.0	51,200
	FX4-208360-150	208	3	41.6	DS4-48			
	FX4-240360-150	240	3	36.1	DS4-48			
	FX4-480160-150*	480	1	31.3	DS4-48			
	FX4-480360-150	480	3	18.0	DS4-48			
	FX4-600360-150*	600	3	14.4	DS4-48			
20	FX4-208360-200*•	208	3	55.5	Not Available	36.1	20.1	68,250
	FX4-240360-200*•	240	3	48.1	Not Available			
	FX4-480160-200*	480	1	41.7	DS4-48			
	FX4-480360-200	480	3	24.1	DS4-48			
	FX4-600360-200*	600	3	19.2	DS4-48			
25	FX4-240360-250*•	240	3	60.1	Not Available	21.9	12.2	85,300
	FX4-480360-250	480	3	30.1	DS4-48			
	FX4-600360-250*	600	3	24.1	DS4-48			
30	FX4-480360-300	480	3	36.1	DS4-48	26.3	14.6	102,350
	FX4-600360-300*	600	3	28.9	DS4-48			
35	FX4-480360-350	480	3	42.1	DS4-48	28.0	15.6	119,450
	FX4-600360-350*	600	3	33.7	DS4-48			

240V heaters are also suitable for 220V & 230V with derated wattage. 480V heaters are also suitable for 460V with derated wattage.
600V heaters are also suitable for 575V with derated wattage.

Note: (*) CSA certified only. (•) Exceeds the 48 amp. circuit limit of NEC 424-22

To order a heater with a built-in room thermostat, add a "T" suffix to model number.
To order a heater with a built-in disconnect switch, add a "D" suffix to model number.
To order a heater with a XD Core, add an "X" suffix to model number.
Please specify CSA or UL heater when ordering.
Defender explosion-proof thermostats are suitable for all FX4 models.

See page 8 for model coding.
See page 5 for installation conditions.

Performance Data for 50 Hertz FX4

CSA certified only. Class I, Divisions 1 & 2, Groups C & D;
Class II, Divisions 1 & 2, Groups E, F & G;
Class I, Zones 1 & 2, Groups IIA & IIB.
Temperature Code T3B 165°C (329°F)

NOMINAL WATTAGE (kW)	MODEL	VOLTAGE	PHASE	TOTAL CURRENT (A)	OPTIONAL BUILT-IN DISCONNECT SWITCH	AIR TEMPERATURE RISE °F	AIR TEMPERATURE RISE °C	BTU/HR
2.5	FX4-220150-025	220	1	11.4	DS4-48	19.7	11.0	8,550
4.2	FX4-220150-042	220	1	19.1	DS4-48	33.2	18.4	14,350
6.3	FX4-220150-063	220	1	28.6	DS4-48	28.4	15.8	21,500
8.4	FX4-220150-084	220	1	38.2	DS4-48	37.9	21.1	28,650
12.6	FX4-220150-126	220	1	57.3	Not Available	27.5	15.3	43,000
2.5	FX4-380350-025	380	3	3.8	DS4-48	19.7	11.0	8,550
4.2	FX4-380350-042	380	3	6.4	DS4-48	33.2	18.4	14,350
6.3	FX4-380350-063	380	3	9.6	DS4-48	28.4	15.8	21,500
8.4	FX4-380350-084	380	3	12.8	DS4-48	37.9	21.1	28,650
12.5	FX4-380350-125	380	3	19.0	DS4-48	27.2	15.1	42,650
16.7	FX4-380350-167	380	3	25.4	DS4-48	36.4	20.2	57,000
20.9	FX4-380350-209	380	3	31.8	DS4-48	22.0	12.2	71,300
3.7	FX4-415350-037	415	3	5.1	DS4-48	29.2	16.2	12,600
7.5	FX4-415350-075	415	3	10.4	DS4-48	33.9	18.8	25,600
14.9	FX4-415350-149	415	3	20.7	DS4-48	32.5	18.0	50,850
22.4	FX4-415350-224	415	3	31.2	DS4-48	23.6	13.1	76,450

To order a heater with a built-in room thermostat, add a "T" suffix to model number.
To order a heater with a built-in disconnect switch, add a "D" suffix to model number.
To order a heater with a XD CORE, add a "X" suffix to model number.

Installation Conditions

1. The FX4 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.
2. The FX4 heaters are to be used only in atmospheres having an ignition temperature higher than Temperature Code T3B 165°C (329°F) for Class I & II.
3. Altitude restrictions apply – see specifications on next page.
4. Heaters should be connected to a fixed power supply and must be permanently mounted in a level, upright position during operation.
5. Read and be aware of the terms of our Warranty located in the owner's manual.
6. Refer to Owner's Manual.

Specifications for 60 Hertz FX4

60 HERTZ		FX4								
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 Delivery @ 70°F	(CFM)	500		850		1,750		3,600		3,950
@ 21°C	(m^3/hr.)	850		1,444		2,973		6,116		6,711
Horizontal Throw	(ft.)	15		30		40		70		
	(m)	4.6		9.1		12.2		21.3		
Maximum Mounting Height	(ft.)	7		10		10		20		
(to underside)	(m)	2.1		3.0		3.0		6.1		
Motor Power	(HP)	1/4				1/4		1/2		
	(kW)	0.187				0.187		0.373		
Motor Speed	(RPM)	1,725				1,725		1,725		
Fan Diameter	(in.)	12				16		20		
	(mm)	305				406		508		
Net Weight		without disconnect	with disconnect	with XD core		without disconnect	with disconnect	with XD core	without disconnect	with disconnect	with XD core
	(lbs.)	111	125	146		133	147	174	154	168	198
	(kg)	50	57	66		61	67	79	70	76	90
Shipping Weight	(lbs.)	156	170	191		178	192	219	204	218	245
	(kg)	71	77	87		81	88	99	93	99	111

See page 7 for general specifications common to all FX4 models.

Specifications for 50 Hertz FX4

50 HERTZ		FX4							
NOMINAL KW		2.5	3.7 & 4.2	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 Delivery @ 70°F	(CFM)	400		700		1,450		3,000	
@ 21°C	(m^3/hr.)	679		1,189		2,463		5,096	
Horizontal Throw	(ft.)	13		25		35		60	
	(m)	4.0		7.6		10.7		18.2	
Maximum Mounting Height	(ft.)	7		10		10		20	
(to underside)	(m)	2.1		3.0		3.0		6.1	
Motor Speed	(RPM)	1,437				1,437		1,437	
Fan Diameter	(in.)	12				16		20	
	(mm)	305				406		508	
Net Weight		without disconnect	with disconnect	with XD core		without disconnect	With disconnect	with XD core	without disconnect	with disconnect	with XD core
	(lbs.)	111	125	146		133	147	174	154	168	198
	(kg)	50	57	66		61	67	79	70	76	90
Shipping Weight	(lbs.)	156	170	191		178	192	219	204	218	245
	(kg)	71	77	87		81	88	99	93	99	111

See page 7 for general specifications common to all FX4 models.

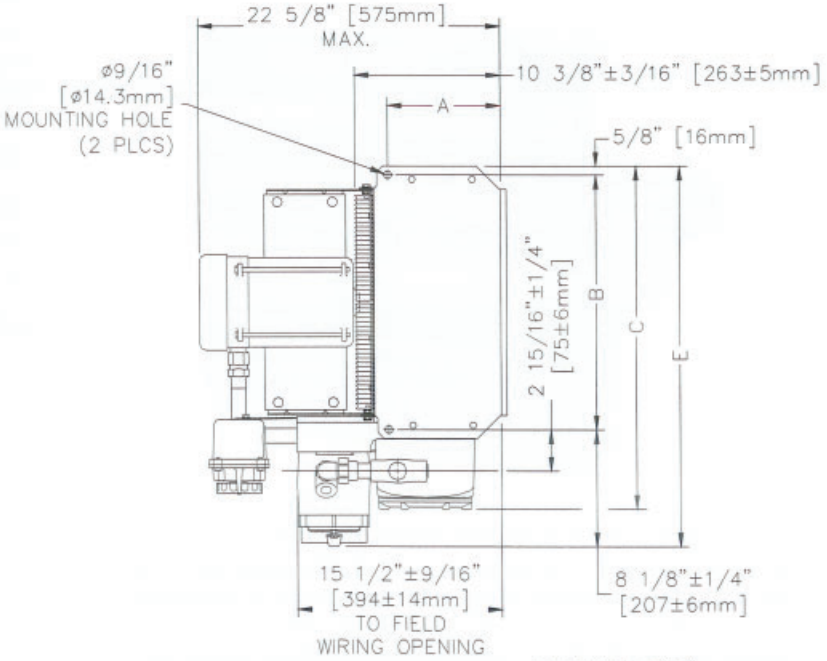
General Specifications for all FX4 Models

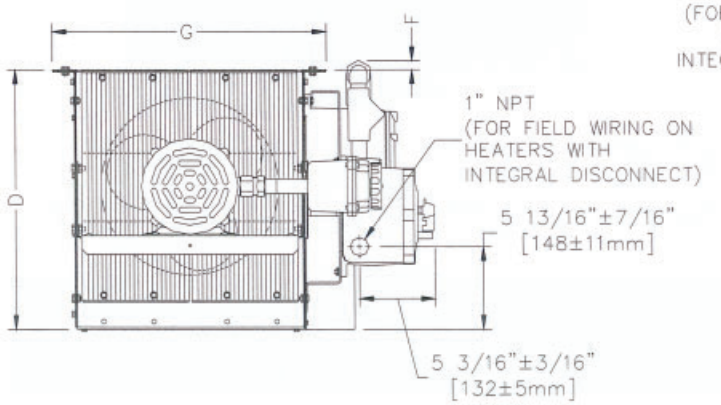
Approvals	UL listed and/or CSA certified
Hazardous Location Classifications	Class I, Divisions 1& 2, Groups C & D; Class II, Divisions 1 & 2, Groups E, F & G; Class I, Zones 1& 2, Group IIA & IIB Temperature Code T3B 165°C (329°F)
Enclosures	NEMA Type 7 & 9. For indoor use only. Do not immerse in water. Do not store or use in areas exposed to rain or snow.
Motor Type	Explosion-proof. Thermally protected. Permanently lubricated ball bearings.
Fan	Aluminum blade. Steel spider and hub with 5/8 in. (15.875 mm) bore.
Fan Guard	Split design with close wire spacing. 1/4 in. (6.3 mm) diameter probe will not enter.
Mounting Holes	Two 9/16 in. (14.3 mm) diameter holes at top of heater.
Heating Elements	Long-life metal-sheathed elements.
Temperature High-Limit	Automatic reset type, snap-action bimetal, open on temperature rise. Rated 100,000 cycles at 10 amp, handles 0.128 amps.
Control Circuit	120 Volts, 0.128 amps, 15VA. (Grounded)
Optional Built-in Thermostat	Explosion-proof. 36°F to 82°F (2°C to 28°C).
Optional Built-in Disconnect Switch	For heaters with a total current no greater than 48-Amps. Lockout bar accepts 1/4" to 7/16" diameter padlock shackle. Provision for field installed remote room thermostat.
Control Transformer	Multiple voltage primary, 120 V secondary, 25 VA.
Contactor	40 or 75 amp. Rated for 500,000 mechanical operations. 120 Volts, 15 VA coil (separately fuse-protected).
Heat Transfer Fluid	Long-life formulated ethylene glycol and water.
Cabinet Material	14 ga. (0.075 in.) (1.90 mm) epoxy powder coated steel. Optional Heresite® coating available for corrosive atmospheres.
Core	Steel with integral aluminum fins, vacuum charged and sealed. Optional Heresite® coating available for corrosive atmospheres.
Conduit Material	Heavy wall, 0.122 in. (3.1 mm), steel.
Overpressure Protection	Preset 200 psig (1380 kPa) pressure relief valve, aluminum body, no serviceable parts.
Operational Temperature Limitations	-4°F to 104°F (-20°C to 40°C).
Storage Limitations	-49°F to 176°F (-45°C to 80°C). Do not immerse in water. Do not store or use in areas exposed to rain or snow.

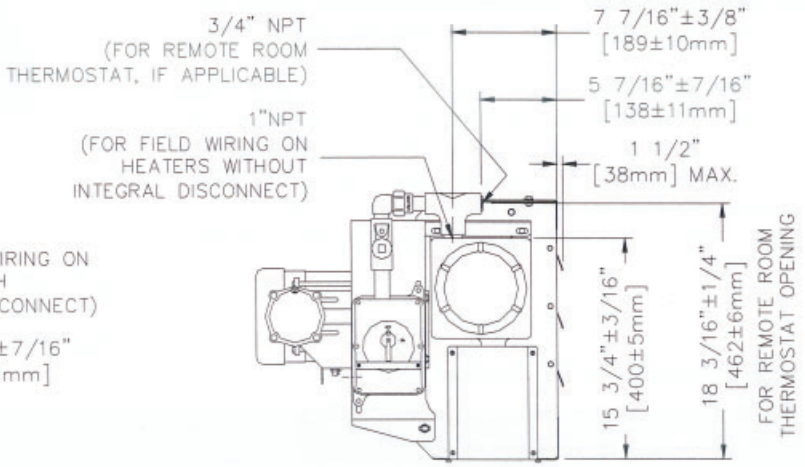
See page 6 for additional specifications for 60 Hertz & 50 Hertz models.

DIM. \ kW		2.5–10	12.5–20	20.9–35	DIM. TOL. ±
A	in.	8–1/16	6–11/16	7–1/16	1/8
	mm	204	170	179	3
B	in.	18–3/16	22–3/16	26–3/16	1/8
	mm	462	564	665	3
C	in.	24–5/8	28–5/8	32–5/8	5/16
	mm	625	727	828	8
D	in.	18–1/2	22–1/2	26–1/2	1/8
	mm	470	572	674	3
E	in.	26–15/16	31	34–15/16	3/8
	mm	685	787	888	10
F	in.	9/16	N/A	N/A	3/8
	mm	15	N/A	N/A	10
G	in.	19–7/16	23–7/16	27–7/16	1/8
	mm	494	596	697	3

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







Model Coding

FX4	480	3	60	350	T, D, or X
MODEL SERIES	HEATER VOLTAGE	PHASE	HERTZ	HEATER KILOWATTS	OPTIONS
4th GENERATION	208V 240V 480V 600V			030 - 3 kW 050 - 5 kW 075 - 7.5 kW 100 - 10 kW 150 - 15 kW 200 - 20 kW 250 - 25 kW 300 - 30 kW 350 - 35 kW	**T -** Built-in Thermostat **D -** Built-in Disconnect Switch **X-** XD Core

Ask about available Heresite® coatings.

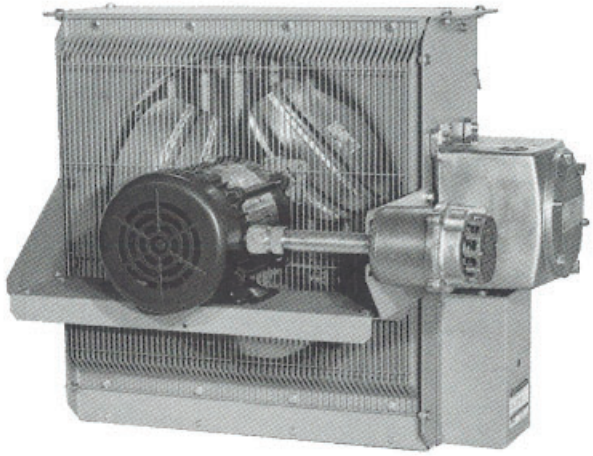
FE1 Explosion-Proof Electric Air Heater

The heater core assembly is contained in a sturdy, epoxy-coated, 14-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 FE1 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.

FE1 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 are present.

All FE1 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 or factory reconditioned exchange unit.



CE 3-YEAR WARRANTY Ex

Specifications for 50 Hertz FE1

50 HERTZ		FE112				FE116		FE120	
	NOMINAL KW	2.5	3.7 & 4.2	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 Delivery @ 70°F @ 21°C	(CFM)	400		700		1,450		3,000	
	(m^3/hr.)	679		1,189		2,463		5,096	
Horizontal 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	(RPM)	1,437				1,437		1,437	
Fan Diameter	(in.)	12				16		20	
	(mm)	305				406		508	
Net Weight	(lbs.)	111				133		154	
	(kg)	50				61		70	
Shipping Weight	(lbs.)	151				173		204	
	(kg)	69				79		93	

General Specifications for all FE1 Models

Approvals	ATEX Approved (Directive 94/9/EC)
Hazardous Location Classifications	II 2 G, EEx d IIB T3 Zones 1 & 2, Groups IIA & IIB *
Enclosures	NEMA Type 7 & 9. For indoor use only. Do not immerse in water. Do not store or use in areas exposed to rain or snow.
Motor Type	Flame-proof. Thermally protected. Permanently lubricated ball bearings.
Fan	Aluminum blade. Steel spider and hub with 15.875 mm (5/8 in.) bore.
Fan Guard	Split design with close wire spacing. 6.3 mm (1/4 in.) diameter probe will not enter.
Mounting Holes	Two 14.3 mm (9/16 in.) diameter holes at top of heater.
Heating Elements	Three long-life, low watt-density, high grade metal-sheathed elements.
Temperature High-Limit	Automatic reset type, snap-action bimetal, open on temperature rise. Rated 100,000 cycles at 10 amp, handles 0.128 amps.
Control Circuit	120 Volts, 0.128 amps, 15VA. (Grounded)
Optional Built-in Thermostat	Flame-proof. 2°C to 28°C (36°F to 82°F).
Control Transformer	Multiple primary, 120 volts secondary, 25 VA.
Contactor	40 or 75 amp. Rated for 500,000 mechanical operations. 120 Volts, 15 VA coil (separately fuse-protected).
Heat Transfer Fluid	Long-life formulated ethylene glycol and water, freeze protected to -45°C (-49°F)
Cabinet Material	14 gauge (1.90 mm) (0.075 in.) Steel. Epoxy coated with five-stage pretreatment, including iron phosphate. Core steel with integral aluminum fins, vacuum charged and sealed. Optional Heresite® coating available for corrosive atmospheres.
Conduit Material	Heavy wall, 3.1 mm (0.122 in.) steel.
Overpressure Protection	Preset 1380 kPa (200 psig) pressure relief valve, aluminum body, no serviceable parts.
Operational Temperature Limitations	-20°C to 40°C (-4°F to 104°F)
Storage Limitations	-45°C to 80°C (-49°F to 176°F), short term to 150°C (302°F) maximum 16 hours continuous . Do not immerse in water. Do not store or use in areas exposed to rain or snow.

*** For FE1 performance data see page 5 for FX4 performance data.**

Performance Data for FE1

Ⓔx II 2 G, EEx d IIB T3 Zones 1 & 2, Groups IIA & IIB

NOMINAL WATTAGE (kW)	MODEL	VOLTAGE	PHASE	TOTAL CURRENT (A)	AIR TEMPERATURE RISE °F	AIR TEMPERATURE RISE °C	BTU/HR
2.5	FE1-220150-025	220	1	11.4	19.7	11.0	8,550
4.2	FE1-220150-042	220	1	19.1	33.2	18.4	14,350
6.3	FE1-220150-063	220	1	28.6	28.4	15.8	21,500
8.4	FE1-220150-084	220	1	38.2	37.9	21.1	28,650
12.6	FE1-220150-126	220	1	57.3	27.5	15.3	43,000
2.5	FE1-380350-025	380	3	3.8	19.7	11.0	8,550
4.2	FE1-380350-042	380	3	6.4	33.2	18.4	14,350
6.3	FE1-380350-063	380	3	9.6	28.4	15.8	21,500
8.4	FE1-380350-084	380	3	12.8	37.9	21.1	28,650
12.5	FE1-380350-125	380	3	19.0	27.2	15.1	42,650
16.7	FE1-380350-167	380	3	25.4	36.4	20.2	57,000
20.9	FE1-380350-209	380	3	31.8	22.0	12.2	71,300
3.7	FE1-415350-037	415	3	5.1	29.2	16.2	12,600
7.5	FE1-415350-075	415	3	10.4	33.9	18.8	25,600
14.9	FE1-415350-149	415	3	20.7	32.5	18.0	50,850
22.4	FE1-415350-224	415	3	31.2	23.6	13.1	76,450

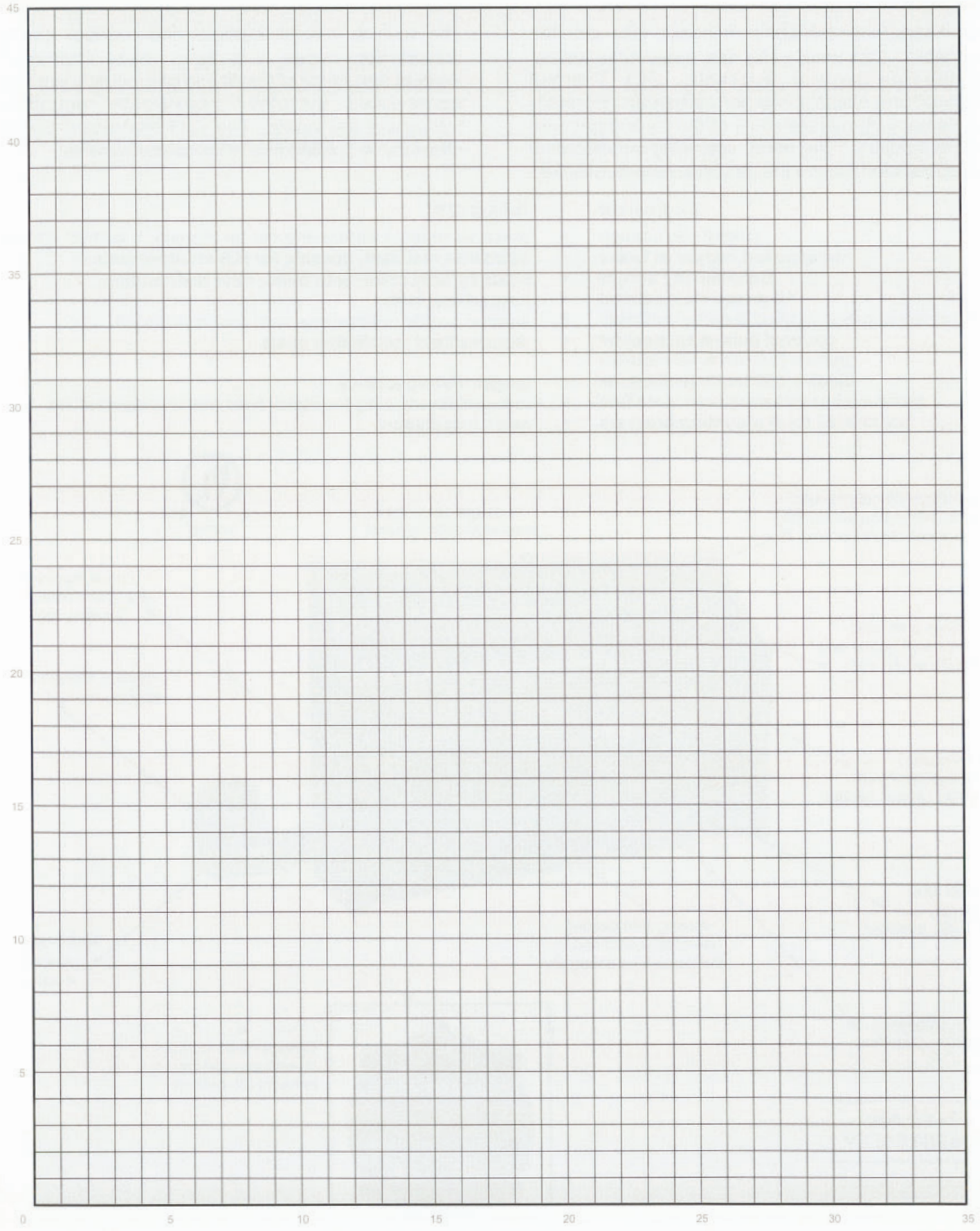
To order a heater with a built-in room thermostat, add a "T" suffix to model number.

Model Coding

FE1 220 1 50 126 T

- **FE1** — MODEL SERIES; 1st GENERATION
- **220** — HEATER VOLTAGE: 220V, 380V, 415V
- **1** — PHASE
- **50** — HERTZ
- **126** — HEATER KILOWATTS: 025 - 2.5 kW; 037 - 3.7 kW; 042 - 4.2 kW; 063 - 6.3 kW; 075 - 7.5 kW; 084 - 8.4 kW; 125 - 12.5 kW; 126 - 12.6 kW; 149 - 14.9 kW; 167 - 16.7 kW; 209 - 20.9 kW; 224 - 22.4 kW
- **T** — OPTION: T - Built-in Thermostat

Ask about available Heresite® coatings.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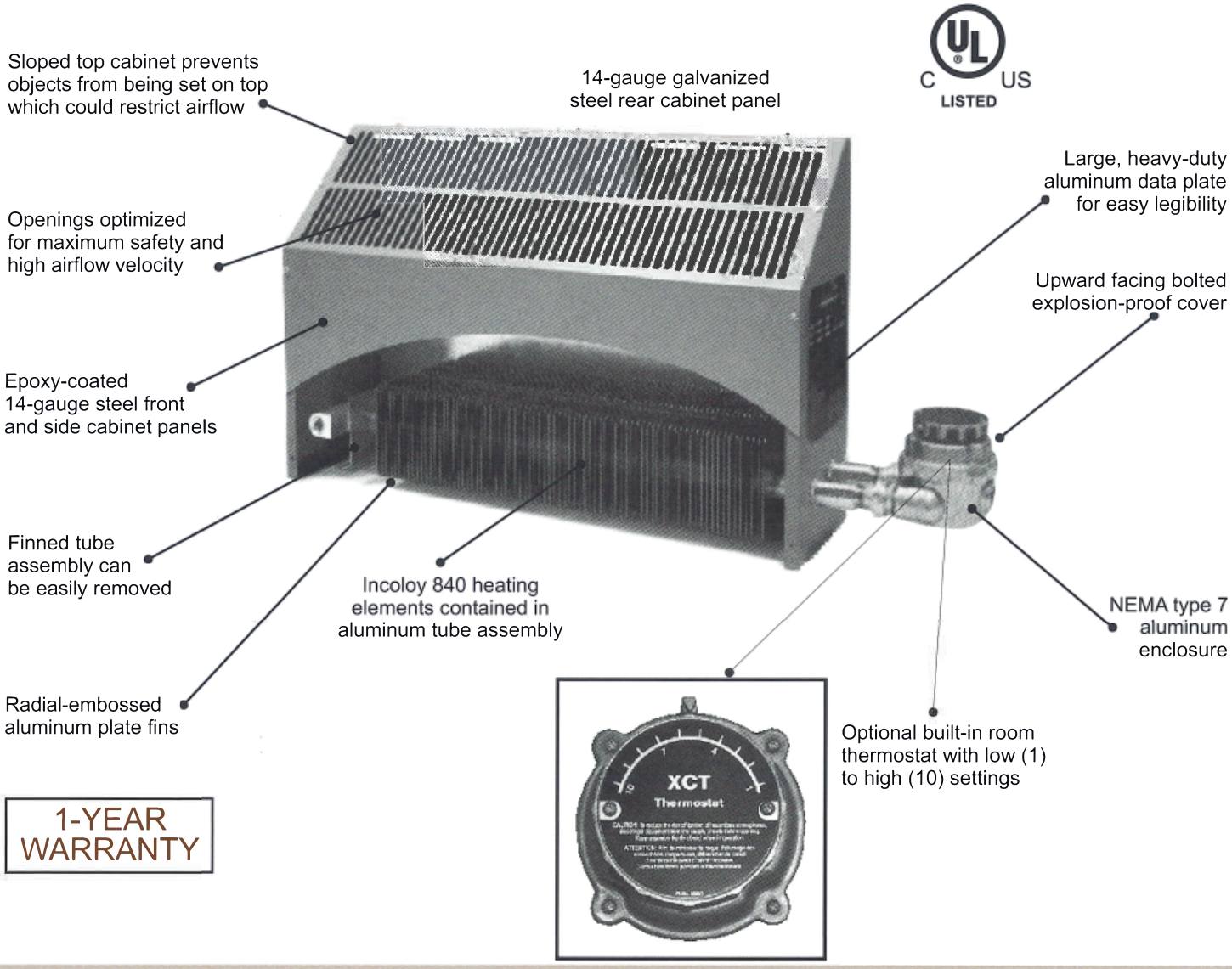
CX1 ProVector® Explosion-Proof Heaters

For hazardous locations heating, rely on the Ruffneck™ CX1 heater for the most dependable, trouble-free service available. 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. The CX1 ProVector® Series offers these outstanding features and benefits:

FEATURE		BENEFIT
sloped-top cabinet	•	**prevents objects from being set on top which restrict airflow**
no exposed copper or brass	•	**corrosion resistant, suitable for H_2S environments**
high-velocity airflow	•	**heats up area faster with better heat distribution**
14-gauge steel cabinet	•	**rugged reliability**
one of the shortest cabinet lengths available	•	**smaller profile utilizes less wall and floor space**
optional built-in thermostat (group C,D, IIA & IIB models)	•	**reduced field installation costs**
incoloy 840 heating elements	•	**longer life expectancy**
radial-embossed aluminum plate fins	•	**reduced fin warping for better heat transfer capabilities**
galvanized steel mounting brackets	•	**quick installation**



1-YEAR WARRANTY

CX1 ProVector® Temperature Code - T2A 280°C (536°F)

Model #	Unit Wattage (kW)	Unit Output (BTU/HR)	Cabinet Length (inches)	Cabinet Length (mm)	Unit Voltage (volts)	Unit Current (amps)	Phase
Without XCT built-in room thermostat - Class I, Div. 1 & 2, Groups B, C, & D; Zones 1 & 2, Groups IIA, (IIB + H_2)							
CX1-120160-012	1.2	4097	31.34	796	120	10.0	1
CX1-208160-012	1.2	4097	31.34	796	208	5.8	1
CX1-240160-012	1.2	4097	31.34	796	240	5.0	1
CX1-480160-012	1.2	4097	31.34	796	480	2.5	1
CX1-600160-012	1.2	4097	31.34	796	600	2.0*	1
CX1-277160-012	1.2	4097	31.34	796	277	4.3	1
CX1-120160-018	1.8	6146	31.34	796	120	15.0	1
CX1-208160-018	1.8	6146	31.34	796	208	8.7	1
CX1-240160-018	1.8	6146	31.34	796	240	7.5	1
CX1-480160-018	1.8	6146	31.34	796	480	3.8	1
CX1-600160-018	1.8	6146	31.34	796	600	3.0*	1
CX1-277160-018	1.8	6146	31.34	796	277	6.5	1
CX1-208160-036	3.6	12292	31.34	796	208	17.3	1
CX1-240160-036	3.6	12292	31.34	796	240	15.0	1
CX1-480160-036	3.6	12292	31.34	796	480	7.5	1
CX1-600160-036	3.6	12292	31.34	796	600	6.0*	1
CX1-277160-036	3.6	12292	31.34	796	277	13.0	1
CX1-208160-048	4.8	16389	49.45	1256	208	23.1*	1
CX1-240160-048	4.8	16389	49.45	1256	240	20.0	1
CX1-480160-048	4.8	16389	49.45	1256	480	10.0	1
CX1-600160-048	4.8	16389	49.45	1256	600	8.0*	1
CX1-277160-048	4.8	16389	49.45	1265	277	17.3	1
CX1-208160-076	7.6	25950	59.49	1511	208	36.5*	1
CX1-240160-076	7.6	25950	59.49	1511	240	31.7*	1
CX1-480160-076	7.6	25950	59.49	1511	480	15.8	1
CX1-600160-076	7.6	25950	59.49	1511	600	12.7*	1
CX1-277160-076	7.6	25950	59.49	1511	277	27.4*	1
With XCT built-in room thermostat - Class I, Div. 1 & 2, Groups C & D; Zones 1 & 2, Groups IIA & IIB							
CX1-120160-012T	1.2	4097	31.34	796	120	10.0	1
CX1-208160-012T	1.2	4097	31.34	796	208	5.8	1
CX1-240160-012T	1.2	4097	31.34	796	240	5.0	1
CX1-480160-012T	1.2	4097	31.34	796	480	2.5	1
CX1-277160-012T	1.2	4097	31.34	796	277	4.3	1
CX1-120160-018T	1.8	6146	31.34	796	120	15.0	1
CX1-208160-018T	1.8	6146	31.34	796	208	8.7	1
CX1-240160-018T	1.8	6146	31.34	796	240	7.5	1
CX1-480160-018T	1.8	6146	31.34	796	480	3.8	1
CX1-277160-018T	1.8	6146	31.34	796	277	6.5	1
CX1-208160-036T	3.6	12292	31.34	796	208	17.3	1
CX1-240160-036T	3.6	12292	31.34	796	240	15.0	1
CX1-480160-036T	3.6	12292	31.34	796	480	7.5	1
CX1-277160-036T	3.6	12292	31.34	796	277	13.0	1
CX1-240160-048T	4.8	16389	49.45	1256	240	20.0	1
CX1-480160-048T	4.8	16389	49.45	1256	480	10.0	1
CX1-277160-048T	4.8	16389	49.45	1256	277	17.3	1
CX1-480160-076T	7.6	25950	59.49	1511	480	15.8	1

* Or equivalent breaker as per Local Electrical Inspection Authority Requirements.

Notes:

1. Remote mounted, Defender® explosion-proof room thermostats are not suitable for Group B & IIC applications. Remote contactors are also required on all 600V heaters and heaters with a current draw greater than 22 amps. See * below.
2. Remote mounted explosion-proof room thermostats suitable for Group B, IIB + H_2 applications are available.
3. Operation at lower voltages than rated will result in reduced kW output and amp draw.

Actual Output (kW) = (supply voltage/rated voltage)^2 times rated unit wattage (kW)

* - Remote mounted explosion-proof room thermostats suitable for 22 amps and greater. Consult the factory for thermostats greater than 480V and/or 22 amps.

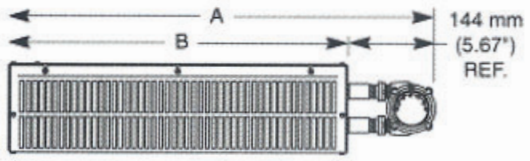
CX1 ProVector® General Specifications

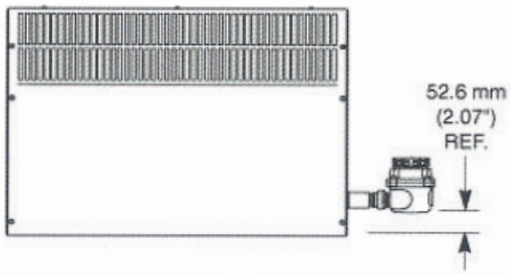
	Nominal kW	1.2	1.8	3.6	4.8	7.6
Net weight	(lbs.)	54.0	54.0	54.0	79.4	91.5
	(kg)	24.5	24.5	24.5	36.0	41.5
Shipping weight	(lbs.)	61.3	61.3	61.3	88.4	104.3
	(kg)	27.8	27.8	27.8	40.1	47.3

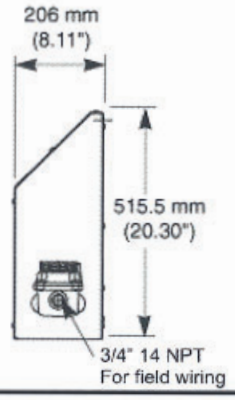
Approvals	**UL & $_c$UL Listed**
Enclosures	NEMA Type 7. For dry indoor use only. Do not immerse in water. Do not store or use in areas exposed to rain or snow.
Mounting brackets	Two 14-gauge (0.075 in)(1.90 mm) galvanized steel brackets.
Heating elements	Two incoloy 840 sheathed elements.
Optional built-in XCT thermostat	Explosion-proof room thermostat with low (1) to high (10) settings.
Cabinet material	14 Ga. (0.075 in)(1.90 mm) steel. Rear panel is galvanized. Front and side panels are epoxy powder coated.
Temperature code rating	Temperature Code T2A - 280°C (536°F)
Hazardous location classifications	
Without built-in thermostat	Class I, Div. 1 & 2, Groups B, C, & D; Zones 1 & 2, Groups IIA, IIB + H_2
With built-in XCT thermostat	Class I, Div. 1 & 2, Groups C & D; Zones 1& 2, Groups IIA & IIB
Temperature limitations	Operational: -45°C to 40°C (-49°F to 104°F)
	Storage: -45°C to 80°C (-49°F to 176°F)

Physical Dimensions

Heater kW Rating	"A" Dimension	"B" Dimension
1.2 - 3.6	940.0 mm (37.0")	796.0 mm (31.34")
4.8	1400.0 mm (55.13")	1256.0 mm (49.45")
7.6	1654.0 mm (65.13")	1511.0 mm (59.49")







Model Coding

CX 1 120 1 60 012 T

- **CX** — MODEL SERIES
- **1** — 1ST GENERATION
- **120** — HEATER VOLTAGE: 120V, 208V, 240V, 480V, 600V
- **1** — PHASE
- **60** — HERTZ
- **012** — HEATER KILOWATTS: 012 - 1.2 kW, 018 - 1.8 kW, 036 - 3.6 kW, 048 - 4.8 kW, 076 - 7.6 kW
- **T** — THERMOSTAT*

* Not available in Group B, (IIB + H_2) and certain voltages (refer to CX1 Technical Data Table)

CF1 ProVector® Explosion-proof Heaters

For hazardous locations heating, rely on the Ruffneck™ CF1 heater for the most dependable, trouble-free service available. 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. The CF1 ProVector® Series offers these outstanding features and benefits:

FEATURE		BENEFIT
sloped-top cabinet	•	prevents objects from being set on top which restrict airflow
no exposed copper or brass	•	corrosion resistant, suitable for H_2S environments
high-velocity airflow	•	heats up area faster with better heat distribution
14-gauge steel cabinet	•	rugged reliability
one of the shortest cabinet lengths available	•	smaller profile utilizes less wall and floor space
optional built-in thermostat (group C,D, IIA & IIB models)	•	reduced field installation costs
incoloy 840 heating elements	•	longer life expectancy
radial-embossed aluminum plate fins	•	reduced fin warping for better heat transfer capabilities
galvanized steel mounting brackets	•	quick installation

CF1 ProVector® General Specifications

Nominal kW		0.75-2.69 & 3.03	3.03 & 3.33-4.03	4.76-6.39
Net Weight	(lbs.)	58.1	83.5	95.6
	(kg)	26.4	37.9	43.4
Shipping Weight	(lbs.)	65.4	92.5	108.4
	(kg)	29.7	42.0	49.2
Approvals		CE and Ⓔx II2 G EEx d II B T2 - T4		
Enclosures		NEMA Type 7. For dry indoor use only. Do not immerse in water. Do not store or use in areas exposed to rain or snow.		
Mounting Brackets		Two 14 gauge (0.075 in)(1.90 mm) galvanized steel brackets.		
Heating Elements		Two incoloy 840 sheathed elements.		
Optional Built-in XCT Thermostat		Explosion-proof room thermostat with low (1) to high (10) settings.		
Cabinet Material		14 gauge (0.075 in)(1.90 mm) steel. Rear panel is galvanized. Front and side panels are baked green-grey epoxy powder coated with 5-stage pretreatment, including iron phospate.		
Temperature Code Rating		II2 G EEx d II B T2, T3 or T4		
Hazardous Location Classifications				
	Without Built-in T'stat	Class I, Div. 1 & 2, Groups B,C, &D; Zones 1 & 2, Groups IIA, IIB + H_2		
	With Built-in XCT T'stat	Class I, Div. 1 & 2, Groups C & D; Zones 1 & 2, Groups IIA & IIB		
Temperature Limitations		Operational: -45°C to 40°C (-49°F to 104°F)		
		Storage: -45°C to 60°C (-49°F to 140°F)		

Performance Data for CF1 ProVector®

Ex II 2 G, EEx d IIB T2, T3 & T4

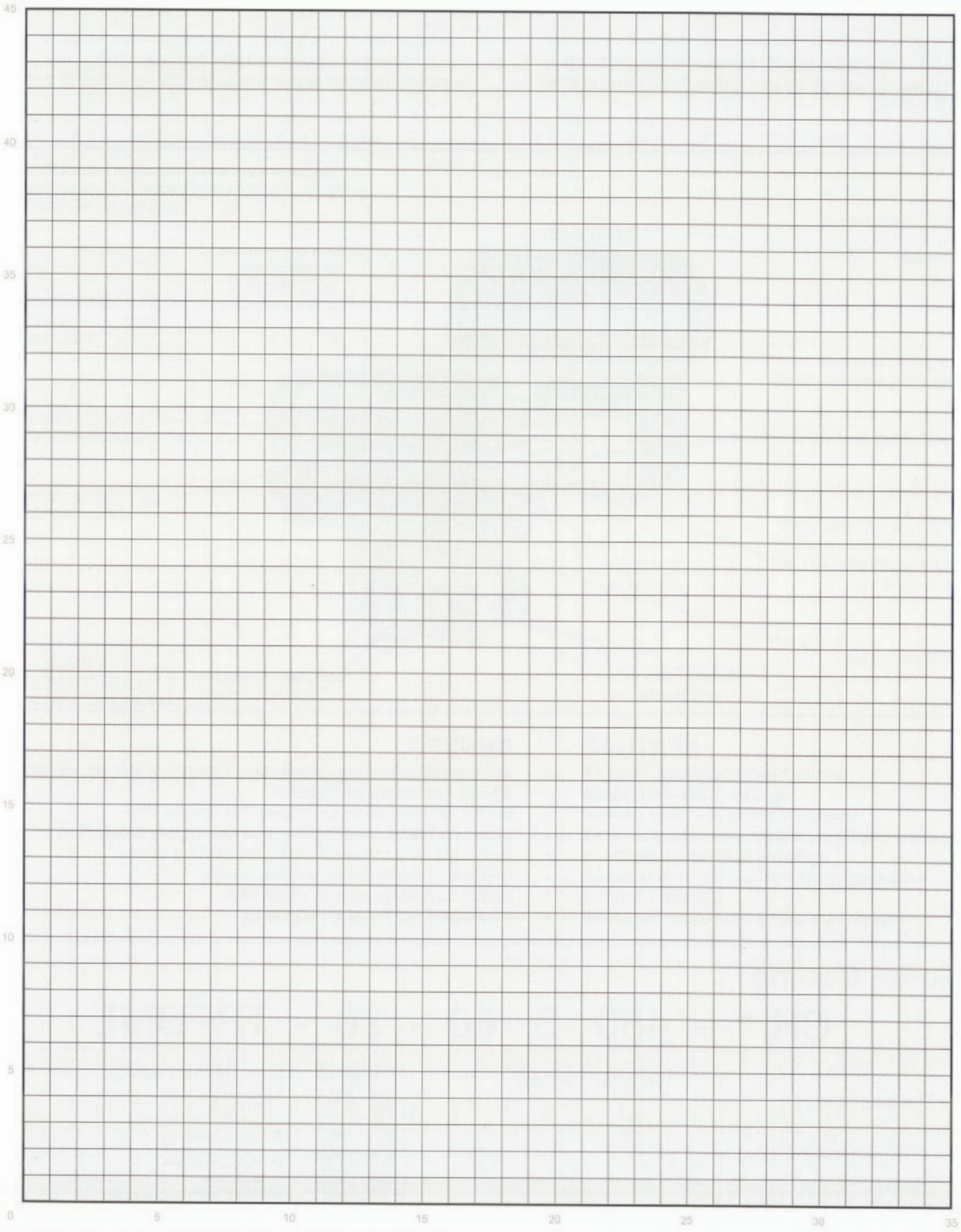
Model #	Unit Wattage (kW)	Unit Output (BTU/HR)	Cabinet Length (inches)	Cabinet Length (mm)	Unit Voltage (volts)	Unit Current (amps)	Phase	Temperature Coding
Without XCT built-in room thermostat - Ex II 2 G, EEx d IIB T2, T3								
CF1-220150-010	1.0	3412	31	796	220	4.6	1	T4
CF1-220150-015	1.5	5118	31	796	220	6.9	1	T3
CF1-220150-030	3.0	10236	31	796	220	13.8	1	T2
CF1-220150-040	4.0	13648	49	1256	220	18.3	1	T3
CF1-220150-064*	6.4	21837	59	1511	220	29	1	T2
CF1-230150-011	1.1	3760	31	796	230	4.8	1	T3
CF1-230150-017	1.7	5640	31	796	230	7.2	1	T3
CF1-230150-033	3.3	11312	31	796	230	14.4	1	T2
CF1-230150-044	4.4	15041	49	1256	230	19.2	1	T2
CF1-230150-070*	7.0	23815	59	1511	230	30.3	1	T2
CF1-240150-012	1.2	4101	31	796	240	5.0	1	T4
CF1-240150-018	1.8	6131	31	796	240	7.5	1	T3
CF1-240150-036	3.6	12304	31	796	240	15.0	1	T2
CF1-240150-048	4.8	16364	49	1256	240	20.0	1	T2
CF1-240150-076*	7.6	25947	59	1511	240	31.7	1	T2
CF1-380150-0075	0.75	2559	31	796	380	2.0	1	T4
CF1-380150-011	1.1	3753	31	796	380	3.0	1	T4
CF1-380150-023	2.3	7848	31	796	380	5.9	1	T3
CF1-380150-030	3.0	10236	49	1256	380	7.9	1	T3
CF1-380150-048	4.8	16378	59	1511	380	12.5	1	T2
CF1-400150-0083	0.83	2832	31	796	400	2.1	1	T4
CF1-400150-013	1.3	4436	31	796	400	3.1	1	T4
CF1-400150-025	2.5	8530	31	796	400	6.3	1	T3
CF1-400150-033	3.3	11260	49	1256	400	8.3	1	T3
CF1-400150-053	5.3	18084	59	1511	400	13.2	1	T2
CF1-415150-009	0.9	3071	31	796	415	2.2	1	T4
CF1-415150-014	1.4	4777	31	796	415	3.2	1	T4
CF1-415150-027	2.7	9212	31	796	415	6.5	1	T2
CF1-415150-036	3.6	12283	49	1256	415	8.7	1	T3
CF1-415150-057	5.7	19448	59	1511	415	13.7	1	T2

To add a thermostat, add suffix 'T' to model number.
* - thermostat is not available on unit exceeding 22 amps.

Model Coding

CF 1 220 1 50 010 T

- CF — MODEL SERIES
- 1 — 1ST GENERATION
- 220 — HEATER VOLTAGE: 220V, 380V, 400V, 415V
- 1 — PHASE
- 50 — HERTZ
- 010 — HEATER KILOWATTS:
  - 0075 - 0.75 kW
  - 0083 - 0.83 kW
  - 009 - 0.9 kW
  - 010 - 1.0 kW
  - 013 - 1.3 kW
  - 014 - 1.4 kW
  - 015 - 1.5 kW
  - 023 - 2.3 kW
  - 025 - 2.5 kW
  - 027 - 2.7 kW
  - 030 - 3.0 kW
  - 033 - 3.3 kW
  - 036 - 3.6 kW
  - 040 - 4.0 kW
  - 048 - 4.8 kW
  - 053 - 5.3 kW
  - 057 - 5.7 kW
  - 064 - 6.4 kW
- T — THERMOSTAT*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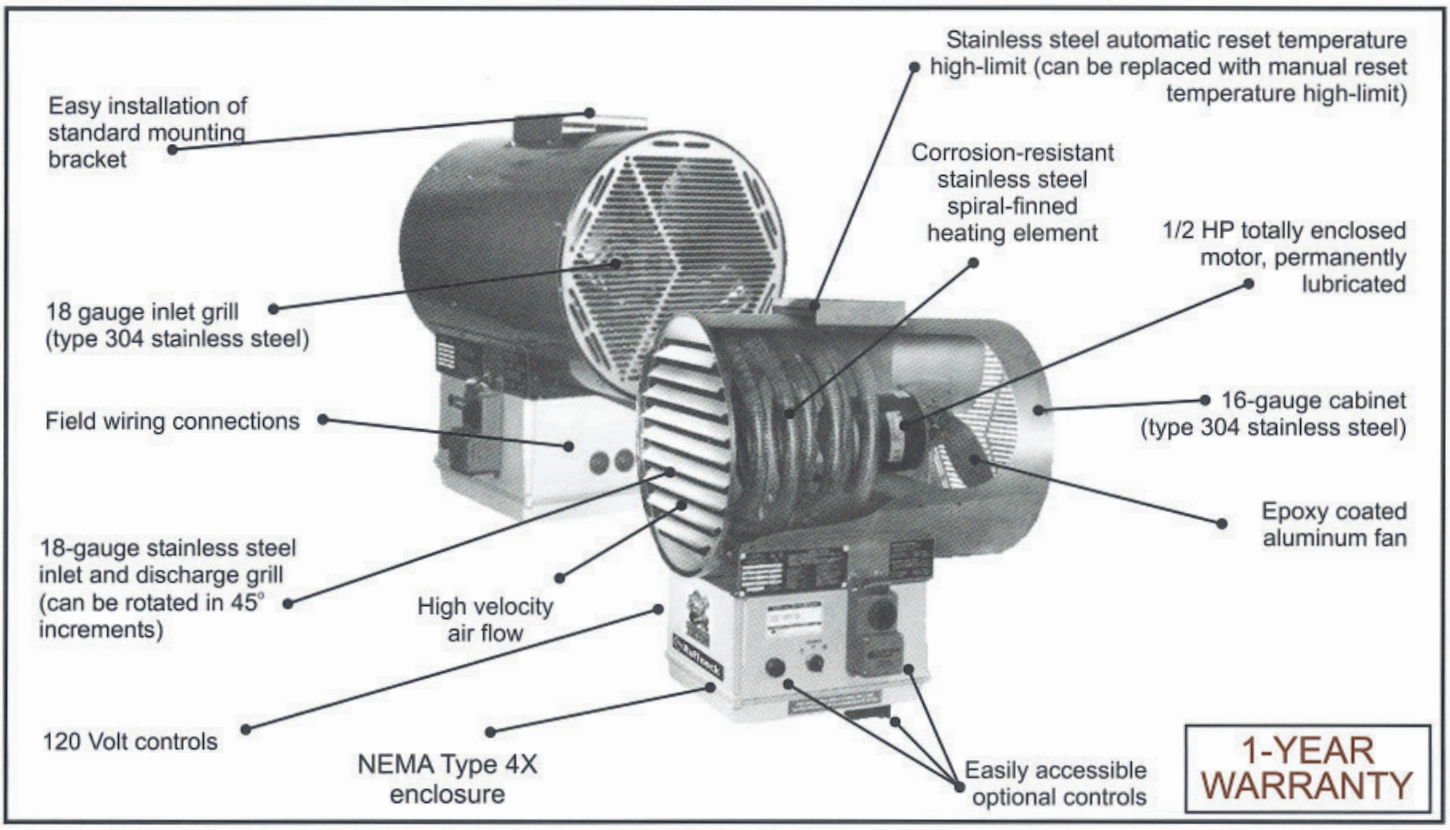
CR1 Triton™ Corrosion-Resistant Washdown Heaters

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 3kW to 39kW.

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



FEATURE		BENEFIT
entire heater is NEMA Type 4X	•	increased safety and protection against water penetration
epoxy coated fan blade	•	added corrosion protection
16-gauge stainless steel cabinet	•	better resistance to corrosion for longer life
custom configured stainless steel elements	•	improved heat distribution and corrosion protection
optional built-in accessories	•	flexibility and reduced field installation costs
stainless steel wall/ceiling mounting kit	•	flexible options for mounting heater
120 volt controls	•	better contactor pull-in reliability
stainless steel temperature high-limit	•	increased safety and reliability

Model Coding

CR 1 - 480 3 60 - 20 - TPFDME

- CR 1 - MODEL SERIES: 1ST GENERATION
- 480 - VOLTAGE: 208, 240, 480, 600
- 3 - PHASE: 1, 3
- 60 - HERTZ: 60
- 20 - KILOWATTS: 030 - 3kW; 050 - 5kW; 075 - 7.5kW; 100 - 10kW; 150 - 15kW; 200 - 20kW; 250 - 25kW; 300 - 30kW; 350 - 35kW; 390 - 39kW
- TPFDME - BUILT-IN CONTROL OPTIONS:
  - T - Room Thermostat
  - P - Pilot Light
  - F - 3-position Fan Switch
  - D - Door Interlocking Disconnect switch
  - M - Manual Rest Temp. High Limit
  - E - Monel® elements (special order)

CR1 Triton™ 60 Hertz Technical Data

MODEL	NOMINAL (kW)	UNIT VOLTAGE (V)	PHASE	UNIT CURRENT (Amps)	AIR TEMPERATURE RISE (°C)	(°F)	BTU/HR
CR1-208160-030	3	208	1	17.4	7.5	13.5	10250
CR1-240160-030	3	240	1	15.5	7.5	13.5	10250
CR1-208360-030	3	208	3	11.3	7.5	13.5	10250
CR1-240360-030	3	240	3	10.2	7.5	13.5	10250
CR1-480360-030	3	480	3	5.1	7.5	13.5	10250
CR1-600360-030	3	600	3	3.9	7.5	13.5	10250
CR1-208160-050	5	208	1	27.0	12.5	22.5	17050
CR1-240160-050	5	240	1	23.8	12.5	22.5	17050
CR1-208360-050	5	208	3	16.9	12.5	22.5	17050
CR1-240360-050	5	240	3	15.0	12.5	22.5	17050
CR1-480360-050	5	480	3	7.5	12.5	22.5	17050
CR1-600360-050	5	600	3	5.8	12.5	22.5	17050
CR1-208160-075	7.5	208	1	39.1	18.8	33.8	25600
CR1-240160-075	7.5	240	1	34.3	18.8	33.8	25600
CR1-208360-075	7.5	208	3	23.8	18.8	33.8	25600
CR1-240360-075	7.5	240	3	21.0	18.8	33.8	25600
CR1-480360-075	7.5	480	3	10.5	18.8	33.8	25600
CR1-600360-075	7.5	600	3	8.2	18.8	33.8	25600
CR1-240160-100	10	240	1	44.7	25.0	45.0	34100
CR1-208360-100	10	208	3	30.8	25.0	45.0	34100
CR1-240360-100	10	240	3	27.1	25.0	45.0	34100
CR1-480360-100	10	480	3	13.5	25.0	45.0	34100
CR1-600360-100	10	600	3	10.6	25.0	45.0	34100
CR1-208360-150	15	208	3	44.6	18.1	32.6	51200
CR1-240360-150	15	240	3	39.1	18.1	32.6	51200
CR1-480360-150	15	480	3	19.5	18.1	32.6	51200
CR1-600360-150	15	600	3	15.4	18.1	32.6	51200
CR1-480360-200	20	480	3	25.6	24.2	43.6	68250
CR1-600360-200	20	600	3	20.3	24.2	43.6	68250
CR1-480360-250	25	480	3	31.6	20.9	37.5	85300
CR1-600360-250	25	600	3	25.1	20.9	37.5	85300
CR1-480360-300	30	480	3	37.6	25.0	45.1	102350
CR1-600360-300	30	600	3	29.9	25.0	45.1	102350
CR1-480360-350	35	480	3	43.6	29.2	52.6	119400
CR1-600360-350	35	600	3	34.7	29.2	52.6	119400
CR1-480360-390	39	480	3	48.0	32.5	58.6	133100
CR1-600360-390	39	600	3	38.5	32.5	58.6	133100

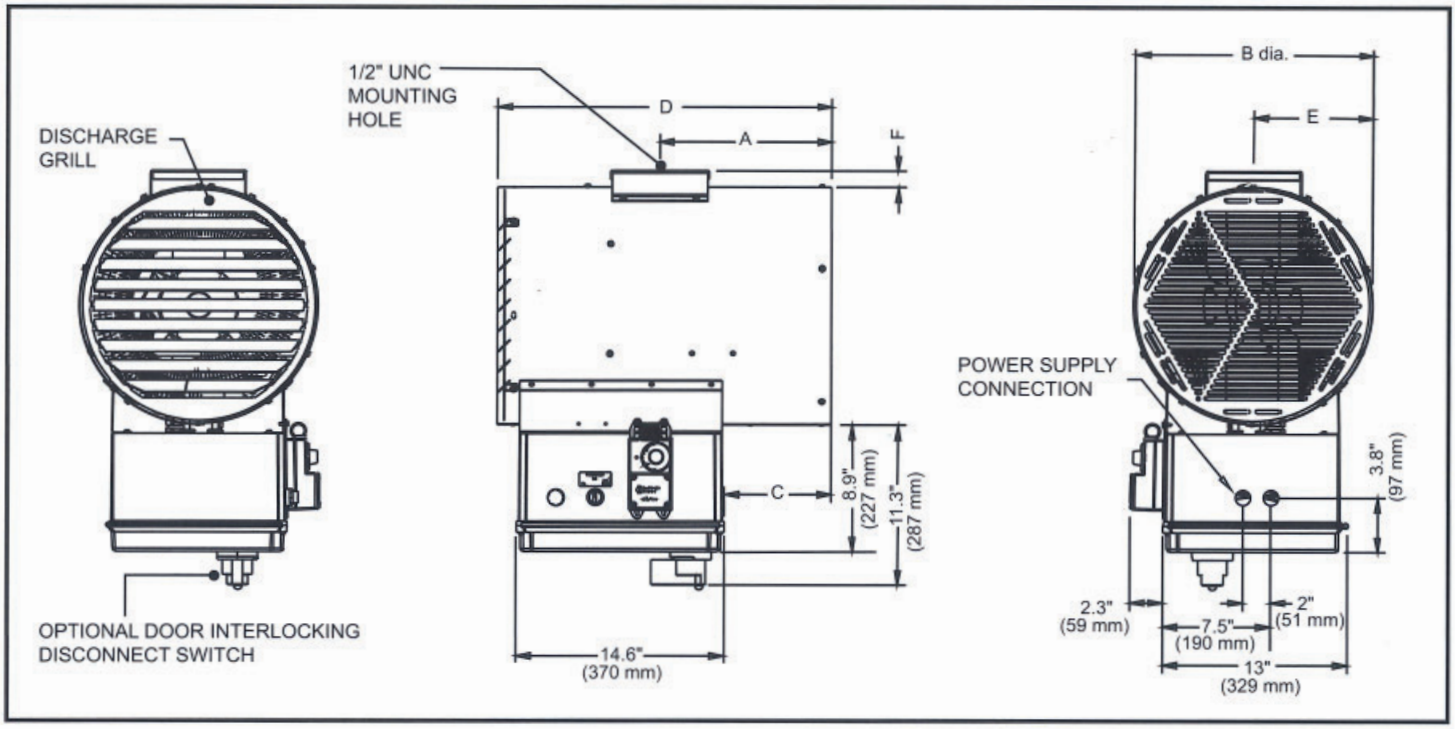
Built-in Control Options:

c UL us LISTED MARINE UL

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.

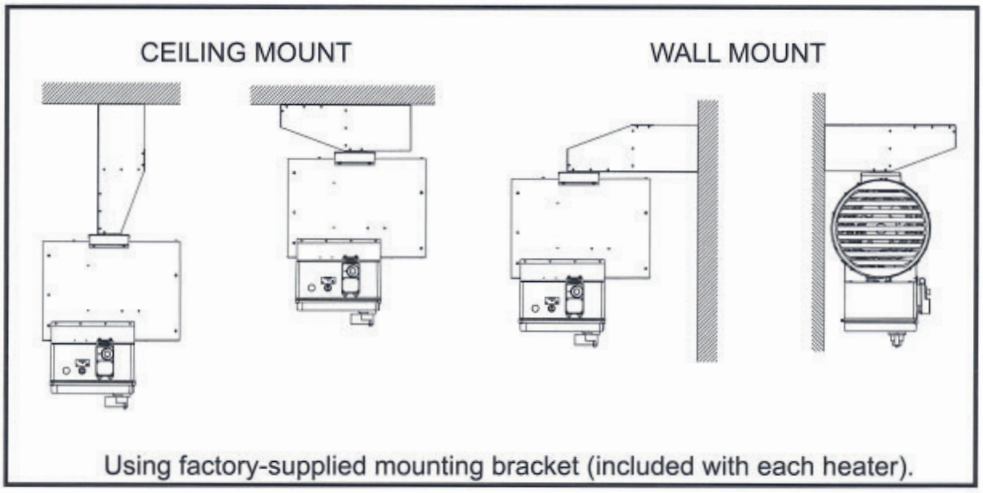
Note: To order a heater that meets U.S. Coast Guard regulations, order built-in control option #5 above.

CR1 Triton™ Physical Dimensions



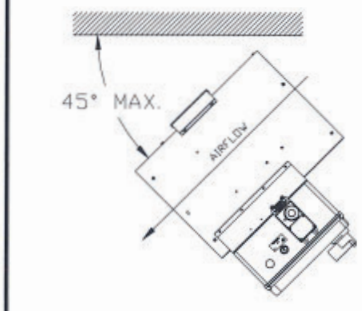
DIMENSIONS	A	B	C	D	E	F
5 to 10 kW	12.5" (318 mm)	12.8" (325 mm)	8.5" (216 mm)	24.4" (620 mm)	6.4" (162.5 mm)	0.9" (23 mm)
15 and 20 kW	12.1" (307 mm)	16.7" (425 mm)	7.5" (190 mm)	23.4" (595 mm)	8.4" (212.5 mm)	1.2" (30 mm)
25 to 39 kW	12.1" (307 mm)	20.7" (525 mm)	7.5" (190 mm)	23.4" (595 mm)	10.3" (262.5 mm)	1.3" (32 mm)

CR1 Triton™ Mounting Options



Using factory-supplied mounting bracket (included with each heater).

Heater can be mounted up to a 45° angle.



Customer-supplied bracket.

CR1 Triton™ General Specifications

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

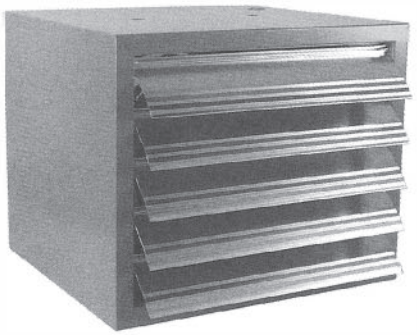
Approvals	UL listed to U.S. & Canadian safety standards. Type 4X.
	Complies with U.S. Coast Guard electrical engineering regulations subchapter J (46 CFR Parts 110-113) when manual reset temperature high-limit is ordered.
Enclosures	NEMA Type 4X non-metallic enclosure.
Motor Type	Thermally protected,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

Note: Contact factory for suitable applications.

* - Maximum mounting height to ensure warm air reaches the floor.

RGE Regular Duty Air Heaters

The Ruffneck™ RGE unit heater is designed for use in regular duty industrial and commercial space heating applications. This heater features a robust design which surpasses the standards of most competitive models.



2-10kW UNIT
WITH 5 LOUVRES
UNITS OVER 10kW
HAVE 7 LOUVRES

NOT AVAILABLE IN CANADA

Features:

- CSA C/US approved for horizontal air flow
- 2 kW to 40 kW output
- 208V to 600V - 1 to 3 phase
- field convertible from 1 to 3 phase
- tubular heating elements
- individually adjustable air flow louvres
- permanently lubricated motors
- overheat protection
- phosphate coated
- epoxy painted (ASA 61 Grey)
- optional thermostats and controls
- optional wall bracket
- motors mounted outside element bundle
- ceiling mounting bracket supplied

Motors

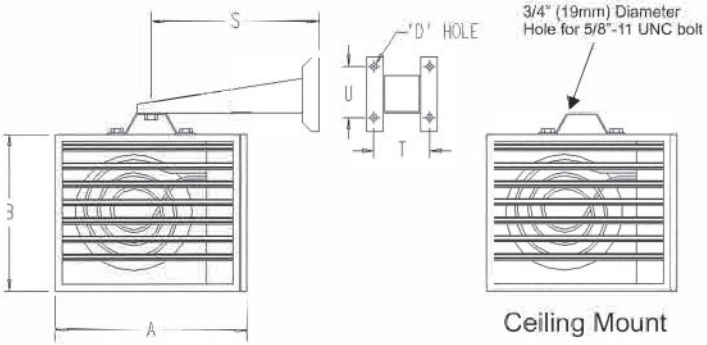
- 2-10 kW heaters are standard with dual rated motors; 208/240V single phase.
- Where necessary, transformers are used to provide proper motor voltage.
- 15-40 kW heaters are standard with single phase full voltage rated motors.
- standard motors have permanently lubricated bearings and built-in thermal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

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 240V.

Mounting Brackets

RWB210	Wall Mounting Bracket for 2-10kW heaters
RWB1540	Wall Mounting Bracket for 15-40kW heaters



Wall Mount

Ceiling Mount

Dimensions - IN. (MM)

HEATER RATING kW	A	B	C DEPTH	D HOLE DIA	S	T	U
2-10	17 (432)	14 (356)	15½ (394)	½ (13)	12½ (318)	4½ (114)	4½ (114)
15-40	24 (610)	19½ (495)	22 (559)	5/8 (16)	17½ (445)	6 (152)	6 (152)

Height & Weight

KW	NORMAL MOUNTING HEIGHT (ft. (m))	SHIPPING WEIGHT lbs. (kg)
2-10	6 - 8 (1.8 - 2.4)	59 (24)
15-40	8 - 12 (2.4 - 3.0)	104 (47)

Optional Factory Installed Features:

- built-in thermostat 41°F to 100°F (5°C to 38°C)
- disconnect switch with door interlock
- fused control circuit
- manual reset high limit
- "Fan Only" switch
- low voltage relay for remote 24V thermostat
- epoxy painted fan blade and motor
- special wattages and voltages
- special control voltages (240V is standard)

RGE Regular Duty Air Heater Specifications

KW (Btu./HR)	VOLTS	PHASE	CFM	TEMP. RISE (°F)	TEMP. RISE (°C)	MOTOR VOLTS	CATALOG NUMBER		
							BASIC UNIT WITH		
							CONTACTOR	THERMOSTAT (1 phase only)	CONTACTOR & THERMOSTAT
2 (6824)	208 240	1 or 3 1 or 3	460 460	14 14	8 8	208/240 280/240	RGE022C RGE023C	RGE022T RGE023T	RGE022CT RGE023CT
3 (10236)	208 240 600	1 or 3 1 or 3 1 or 3	465 465 465	21 21 21	12 12 12	208/240 208/240 208/240	RGE032C RGE033C RGE038C	RGE032T RGE033T RGE038T	RGE032CT RGE033CT RGE038CT
4 (13648)	208 240 480 600	1 or 3 1 or 3 1 or 3 1 or 3	475 475 475 475	28 28 28 28	16 16 16 16	208/240 208/240 208/240 208/240	RGE042C RGE043C RGE047C RGE048C	RGE042T RGE043T RGE047T RGE048T	RGE042CT RGE043CT RGE047CT RGE048CT
5 (17060)	208 240 480 600	1 or 3 1 or 3 1 or 3 1 or 3	480 480 480 480	40 40 40 40	22 22 22 22	208/240 208/240 208/240 208/240	RGE052C RGE053C RGE057C RGE058C	RGE052T RGE053T RGE057T RGE058T	RGE052CT RGE053CT RGE057CT RGE058CT
7.5 (25590)	208 240 480 600	1 or 3 1 or 3 1 or 3 1 or 3	590 590 590 590	43 43 43 43	24 24 24 24	208/240 208/240 208/240 208/240	RGE072C RGE073C RGE077C RGE078C	– – – –	RGE072CT RGE073CT RGE077CT RGE078CT
10 (34120)	208 240 480 600	1 or 3 1 or 3 1 or 3 1 or 3	760 760 760 760	45 45 45 45	25 25 25 25	208/240 208/240 208/240 208/240	RGE102C RGE103C RGE107C RGE108C	– – – –	RGE102CT RGE103CT RGE107CT RGE108CT
15 (51180)	208 240 480 600	3 3 1 or 3 1 or 3	1040 1040 1040 1040	50 50 50 50	28 28 28 28	208 240 480 600	RGE152C RGE153C RGE157C RGE158C	– – – –	RGE152CT RGE153CT RGE157CT RGE158CT
20 (68240)	208 240 480 600	3 3 1 or 3 1 or 3	1260 1260 1260 1260	55 55 55 55	31 31 31 31	208 240 480 600	RGE202C RGE203C RGE207C RGE208C	– – – –	RGE202CT RGE203CT RGE207CT RGE208CT
25 (85300)	480 600	3 3	1500 1500	61 61	34 34	480 600	RGE257C RGE258C	– –	RGE257CT RGE258CT
30 (102360)	480 600	3 3	1500 1500	70 70	39 39	480 600	RGE307C RGE308C	– –	RGE307CT RGE308CT
40 (136480)	480 600	3 3	1500 1500	80 80	44 44	480 600	RGE407C RGE408C	– –	RGE407CT RGE408CT

Accessories for Field Installation:

- RWB210 wall mount bracket (2-10 kW)
- RWB1540 wall mount bracket (15-40 kW)
- remote thermostats available
- built-in thermostats kits available

To Order Specify:

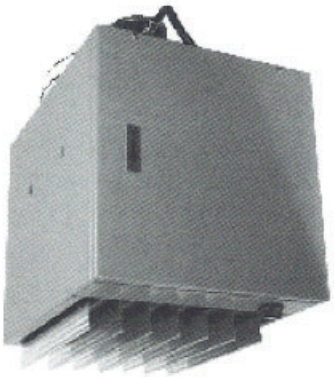
Catalog Number, Voltage, Phase, Kilowatts, Optional Features, Accessories

Applications:

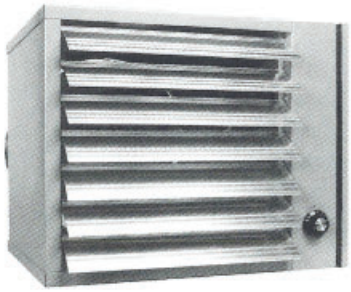
- factories
- warehouses
- parking garages
- boiler rooms
- arenas
- grandstands
- mechanical rooms
- shopping malls
- display areas
- stores

RGX Heavy Duty Air Heaters

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



NOT AVAILABLE IN CANADA

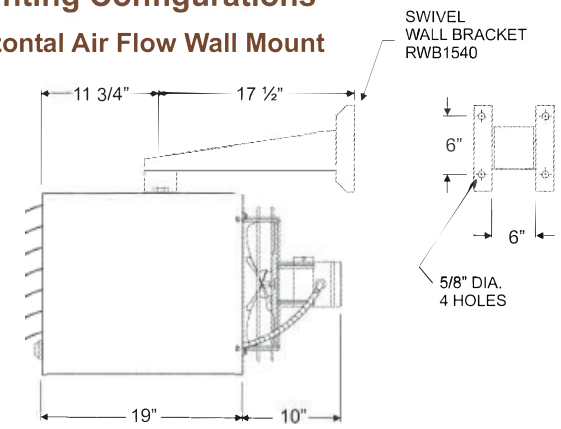


Features:

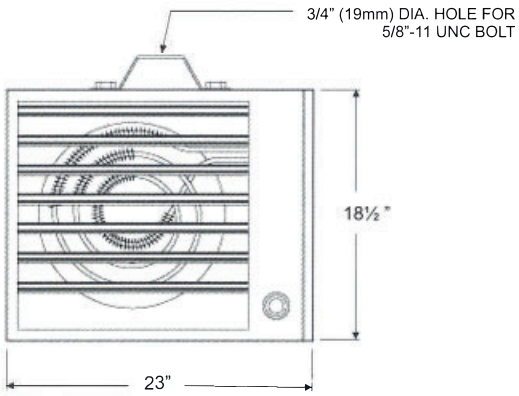
- CSA C/US approved for horizontal and vertical air flow
- automatic reset high limit
- 15, 20, 25, 30, 40, 50 kW units (optional 10 kW unit)
- 40 and 50 kW units incorporate split loads (50%) for remotely controlled energy management systems
- factory installed transformers, contactors, and thermostats 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

Mounting Configurations

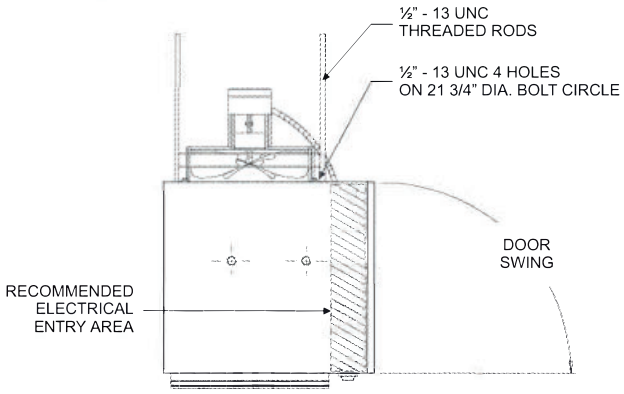
Horizontal Air Flow Wall Mount



Horizontal Air Flow Wall Mount



Vertical Air Flow



RGX Heavy Duty Air Heaters

KW (BTU/HR)	VOLTS	PHASE	CFM	TEMP. RISE °F (°C)	BASIC UNIT			NET WEIGHT
					WITHOUT CONTACTOR	WITH CONTACTOR	WITH T'STAT & CONTACTOR	
15 (51180)	208	3	1800	25 (14)	RGX152	RGX152C	RGX152CT	105 LBS. 47.6 KG
	240	3	1800	25 (14)	RGX153	RGX153C	RGX153CT	
	480	3	1800	25 (14)	RGX157	RGX157C	RGX157CT	
	600	3	1800	25 (14)	RGX158	RGX158C	RGX158CT	
20 (68240)	208	3	1800	34 (19)	RGX202*	RGX202C*	RGX202CT*	105 LBS. 47.6 KG
	240	3	1800	34 (19)	RGX203	RGX203C	RGX203CT	
	480	3	1800	34 (19)	RGX207	RGX207C	RGX207CT	
	600	3	1800	34 (19)	RGX208	RGX208C	RGX208CT	
25 (85300)	208	3	1800	41 (24)	RGX252*	RGX252C*	RGX252CT*	105 LBS. 47.6 KG
	240	3	1800	41 (24)	RGX253*	RGX253C*	RGX253CT*	
	480	3	1800	41 (24)	RGX257	RGX257C	RGX257CT	
	600	3	1800	41 (24)	RGX258	RGX258C	RGX258CT	
30 (102300)	480	3	2100	41 (24)	RGX307	RGX307C	RGX307CT	105 LBS. 47.6 KG
	600	3	2100	41 (24)	RGX308	RGX308C	RGX308CT	
40 (136500)	480	3	2100	58 (32)	RGX407	RGX407C	RGX407CT	125 LBS. 56.7 KG
	600	3	2100	58 (32)	RGX408	RGX408C	RGX408CT	
50 (170600)	480	3	2100	72 (40)	RGX507	RGX507C	RGX507CT	125 LBS. 56.7 KG
	600	3	2100	72 (40)	RGX508	RGX508C	RGX508CT	

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

Notes:

1. Motor voltage and phase is same as heater supply.
2. Standard control voltage is 240V. 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.

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 24V thermostat
- epoxy painted fan blade and motor
- special wattages and voltages
- special control voltages (240V is standard)
- available in special finishes
- split load feature 15, 20, 25, 30 kW units
- alloy elements with brazed alloy fins
- nickel plated elements
- NEMA 4 construction
- stainless steel cabinet

To Order Specify:

Catalog Number, Voltage, Phase, Kilowatts, Optional Features, Accessories

Accessories for Field Installation:

- RWB210 wall mount bracket (2-10 kW)
- RWB1540 wall mount bracket (15-40 kW)
- remote thermostats available
- built-in thermostats kits available

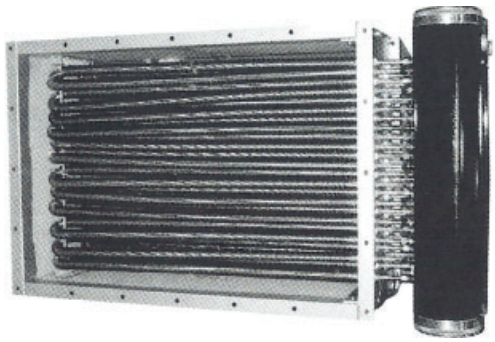
Applications:

- mine shafts
- pulp & paper mills
- hoist houses
- welding shops
- maintenance shops
- sewage treatment plants
- chemical plants
- repair shops
- weigh scale pits
- elevator shafts
- high humidity areas
- crane cabs

Explosion-Proof Duct Heaters Type RXDF

Ruffneck™ type RXDF duct heaters are designed for heating air or gases which contain potentially explosive substances. RXDF heaters feature the unique Ruffneck™ approach to explosion-proof electric heater design which embodies safety, reliability and economy.

The RXDF 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.



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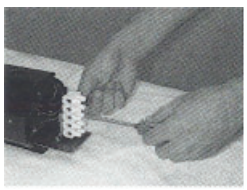
Construction

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 50kW.

Designed for Application in Hazardous Environments, Such as:

- oil refineries
- coal mines
- pulp and paper mills
- petrochemical plants
- grain elevators
- sewage treatment plants

Control Panels

Control panel options are shown on page 27.

Thermostats

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 T2D, T3A or T3B areas.
2. Determine kW rating Standard heaters are available up to 50kW.
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 2 lists the minimum air flow (SCFM) required for each heater type.
5. Verify temperature rise using the following formula:

F° Temperature Rise

$$F^\circ \text{ temp. rise} = \frac{kW \times 3000}{SCFM}$$

C° Temperature Rise

$$C^\circ \text{ temp. rise} = \frac{kW \times 1667}{SCFM}$$

6. Determine power supply voltage and phase Standard units are available in 208, 240, 480 or 600V - 3 phase. Optional 1 phase units also available.

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
- special temperature code
- outlet air thermostat
- outlet air thermocouple

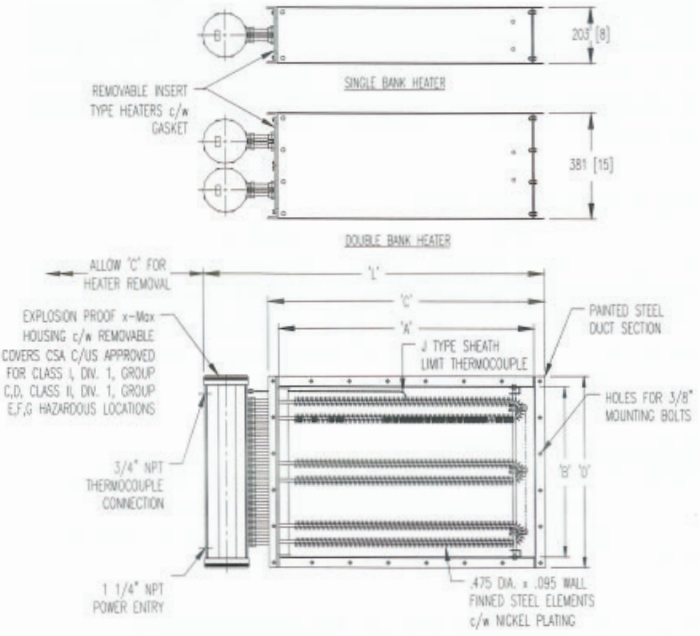


Table 1 - Dimensions Inches (mm)

DUCT SIZE	A	B	C	D	L
24" x 12" (610 x 305)	24 (610)	12 (305)	27 (686)	15 (381)	36½ (927)
30" x 18" (762 x 457)	30 (762)	18 (457)	33 (838)	21 (533)	42½ (1080)
36" x 24" (914 x 610)	36 (914)	24 (610)	39 (991)	27 (686)	48½ (1232)

Table 2 - Heater Specifications

DUCT SIZE (A x B)	NUMBER OF HEATING BANKS	KW	AVAILABLE VOLTAGES				HIGH TEMP. RISE UNITS - T2D (215°C) Class I, Div. 1 & 2, Groups C,D				LOW TEMP. RISE UNITS - T3A (180°C) or T3B (165°C) Class I, Div. 1 & 2, Groups C,D Class II, Div. 1 & 2, Groups E,F Class II, Div. 1 & 2, Groups G (T3B units only)				NET WEIGHT LBS. (KG)
			208V 3Ø	240V 3Ø	480V 3Ø	600V 3Ø	TEMP CODE	CATALOG NO.	MAX. TEMP. RISE °F	MAX. TEMP. RISE °C	MIN. AIR FLOW (SCFM)	TEMP CODE	CATALOG NO.	MAX. TEMP. RISE °F	MAX. TEMP. RISE °C	MIN. AIR FLOW (SCFM)	
24" x 12" 610x305mm	1	2.5	✓	✓	✓	✓	T2D	RXDF1-24x12-025T2D	13.9	7.7	540	T3B	RXDF1-24x12-025T3B	6.8	3.8	1107	90 (41)
		3.75	✓	✓	✓	✓	T2D	RXDF1-24x12-038T2D	20.8	11.6	540	T3B	RXDF1-24x12-038T3B	8.4	4.7	1334	
		5	✓	✓	✓	✓	T2D	RXDF1-24x12-050T2D	19.7	11.0	761	T3B	RXDF1-24x12-050T3B	9.6	5.3	1562	
		7.5	✓	✓	✓	✓	T2D	RXDF1-24x12-075T2D	18.0	10.0	1247	T3A	RXDF1-24x12-075T3A	13.0	7.2	1728	
	2	5	✓	✓	✓	✓	T2D	RXDF2-24x12-050T2D	27.8	15.4	540	T3B	RXDF2-24x12-050T3B	13.6	7.5	1107	160 (73)
		7.5	✓	✓	✓	✓	T2D	RXDF2-24x12-075T2D	41.7	23.2	540	T3B	RXDF2-24x12-075T3B	16.9	9.4	1334	
		10	✓	✓	✓	✓	T2D	RXDF2-24x12-100T2D	39.4	21.9	761	T3B	RXDF2-24x12-100T3B	19.2	10.7	1562	
		15	✓	✓	✓	✓	T2D	RXDF2-24x12-150T2D	36.1	20.1	1247	T3A	RXDF2-24x12-150T3A	26.0	14.5	1728	
30" x 18" 762x457mm	1	5	✓	✓	✓	✓	T2D	RXDF1-30x18-050T2D	14.8	8.2	1013	T3B	RXDF1-30x18-050T3B	7.1	4.0	2109	135 (61)
		6.25	✓	✓	✓	✓	T2D	RXDF1-30x18-063T2D	18.5	10.3	1013	T3B	RXDF1-30x18-063T3B	8.0	4.5	2331	
		7.5	✓	✓	✓	✓	T2D	RXDF1-30x18-075T2D	22.2	12.3	1013	T3B	RXDF1-30x18-075T3B	8.8	4.9	2553	
		10	✓	✓	✓	✓	T2D	RXDF1-30x18-100T2D	19.5	10.8	1538	T3B	RXDF1-30x18-100T3B	10.0	5.6	2991	
		12.5	✓	✓	✓	✓	T2D	RXDF1-30x18-125T2D	18.9	10.5	1989	T3B	RXDF1-30x18-125T3B	10.9	6.1	3434	
		15	✓	✓	✓	✓	T2D	RXDF1-30x18-150T2D	18.4	10.2	2440	T3A	RXDF1-30x18-150T3A	13.5	7.5	3333	
	2	10	✓	✓	✓	✓	T2D	RXDF2-30x18-100T2D	29.6	16.5	1013	T3B	RXDF2-30x18-100T3B	14.2	7.9	2109	250 (114)
		12.5	✓	✓	✓	✓	T2D	RXDF2-30x18-125T2D	37.0	20.6	1013	T3B	RXDF2-30x18-125T3B	16.1	8.9	2331	
		15	✓	✓	✓	✓	T2D	RXDF2-30x18-150T2D	44.5	24.7	1013	T3B	RXDF2-30x18-150T3B	17.6	9.8	2553	
		20	✓	✓	✓	✓	T2D	RXDF2-30x18-200T2D	39.0	21.7	1538	T3B	RXDF2-30x18-200T3B	20.1	11.1	2991	
		25	✓	✓	✓	✓	T2D	RXDF2-30x18-250T2D	37.7	21.0	1989	T3B	RXDF2-30x18-250T3B	21.8	12.1	3434	
		30	✓	✓	✓	✓	T2D	RXDF2-30x18-300T2D	36.9	20.5	2440	T3A	RXDF2-30x18-300T3A	27.0	15.0	3333	
36" x 24" 914x610mm	1	7.5	✓	✓	✓	✓	T2D	RXDF1-36x24-075T2D	13.9	7.7	1620	T3B	RXDF1-36x24-075T3B	6.9	3.8	3256	180 (82)
		10	✓	✓	✓	✓	T2D	RXDF1-36x24-100T2D	18.5	10.3	1620	T3B	RXDF1-36x24-100T3B	8.1	4.5	3690	
		12.5	✓	✓	✓	✓	T2D	RXDF1-36x24-125T2D	23.2	12.9	1620	T3B	RXDF1-36x24-125T3B	9.1	5.1	4125	
		15	✓	✓	✓	✓	T2D	RXDF1-36x24-150T2D	20.2	11.2	2230	T3B	RXDF1-36x24-150T3B	9.9	5.5	4559	
		20	✓	✓	✓	✓	T2D	RXDF1-36x24-200T2D	19.3	10.7	3115	T3B	RXDF1-36x24-200T3B	11.1	6.1	5428	
		25	–	✓	✓	✓	T2D	RXDF1-36x24-250T2D	18.8	10.4	4000	T3A	RXDF1-36x24-250T3A	13.8	7.7	5427	
	2	15	✓	✓	✓	✓	T2D	RXDF2-36x24-150T2D	27.8	15.4	1620	T3B	RXDF2-36x24-150T3B	13.8	7.7	3256	325 (148)
		20	✓	✓	✓	✓	T2D	RXDF2-36x24-200T2D	37.0	20.6	1620	T3B	RXDF2-36x24-200T3B	16.3	9.0	3690	
		25	✓	✓	✓	✓	T2D	RXDF2-36x24-250T2D	46.3	25.7	1620	T3B	RXDF2-36x24-250T3B	18.2	10.1	4125	
		30	✓	✓	✓	✓	T2D	RXDF2-36x24-300T2D	40.4	22.4	2230	T3B	RXDF2-36x24-300T3B	19.7	11.0	4559	
		40	✓	✓	✓	✓	T2D	RXDF2-36x24-400T2D	38.5	21.4	3115	T3B	RXDF2-36x24-400T3B	22.1	12.3	5428	
		50	–	✓	✓	✓	T2D	RXDF2-36x24-500T2D	37.5	20.8	4000	T3A	RXDF2-36x24-500T3A	27.6	15.4	5427	

To Order: Specify quantity, catalog no., voltage and phase, wattage, hazardous location designation, temperature code, control package and optional features.

Control Panels for RXDF Duct Heaters Type RCPXD

Ruffneck™ type RXDF duct heaters are normally supplied with a type RCPXD control panel. These control panels are available in two basic types - type 4 moisture resistant or explosion proof, and with four different control packages as listed.

Standard Features

All RCPXD control panels are supplied with magnetic contactor, HRC fusing, fused 120V control transformer, high limit controls, control circuit, ON/OFF switch, control ON light, high limit indicator light, high limit push-to-reset, terminals for connection of temperature controls and differential air pressure switch.

Enclosure Types

RCPXD control panels are available for either type 4 moisture resistant locations, or hazardous locations Class I, Div. 1 & 2, Groups C, D and Class II, Div. 1 & 2, Groups E, F, G.

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.

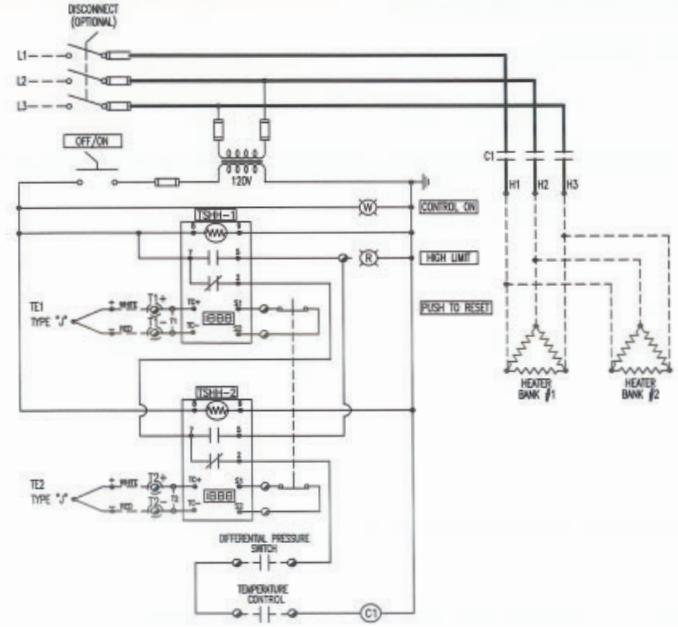
Note: Some amperage limits apply to packages #3 and #4 in E.P. Enclosure. Consult factory for details.

Table 3 - Control Panel Specifications

ENCLOSURE TYPE	NUMBER OF CIRCUITS	KW	AVAILABLE VOLTAGES				CATALOG NUMBER			
			208V 3Ø	240V 3Ø	480V 3Ø	600V 3Ø	PACKAGE #1	PACKAGE #2	PACKAGE #3	PACKAGE #4
TYPE 4 MOISTURE RESISTANT	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
EXPLOSION PROOF CLASS I, GROUP C,D CLASS II, GROUP E,F,G	1	2.5	✓	✓	✓	✓	RCPXD1-025X	RCPXD1-025TX	RCPXD1-025SX	RCPXD1-025STX
		3.75	✓	✓	✓	✓	RCPXD1-038X	RCPXD1-038TX	RCPXD1-038SX	RCPXD1-038STX
		5	✓	✓	✓	✓	RCPXD1-050X	RCPXD1-050TX	RCPXD1-050SX	RCPXD1-050STX
		6.25	✓	✓	✓	✓	RCPXD1-063X	RCPXD1-063TX	RCPXD1-063SX	RCPXD1-063STX
		7.5	✓	✓	✓	✓	RCPXD1-075X	RCPXD1-075TX	RCPXD1-075SX	RCPXD1-075STX
		10	✓	✓	✓	✓	RCPXD1-100X	RCPXD1-100TX	RCPXD1-100SX	RCPXD1-100STX
		12.5	✓	✓	✓	✓	RCPXD1-125X	RCPXD1-125TX	RCPXD1-125SX	RCPXD1-125STX
		15	✓	✓	✓	✓	RCPXD1-150X	RCPXD1-150TX	RCPXD1-150SX	RCPXD1-150STX
		20	✓	✓	✓	✓	RCPXD1-200X	RCPXD1-200TX	RCPXD1-200SX	RCPXD1-200STX
		25	–	–	✓	✓	RCPXD1-250X	RCPXD1-250TX	RCPXD1-250SX	RCPXD1-250STX
	2	5	✓	✓	✓	✓	RCPXD2-050X	RCPXD2-050TX	RCPXD2-050SX	RCPXD2-050STX
		7.5	✓	✓	✓	✓	RCPXD2-075X	RCPXD2-075TX	RCPXD2-075SX	RCPXD2-075STX
		10	✓	✓	✓	✓	RCPXD2-100X	RCPXD2-100TX	RCPXD2-100SX	RCPXD2-100STX
		12.5	✓	✓	✓	✓	RCPXD2-125X	RCPXD2-125TX	RCPXD2-125SX	RCPXD2-125STX
		15	✓	✓	✓	✓	RCPXD2-150X	RCPXD2-150TX	RCPXD2-150SX	RCPXD2-150STX
		20	✓	✓	✓	✓	RCPXD2-200X	RCPXD2-200TX	RCPXD2-200SX	RCPXD2-200STX
		25	–	✓	✓	✓	RCPXD2-250X	RCPXD2-250TX	RCPXD2-250SX	RCPXD2-250STX
		30	–	–	✓	✓	RCPXD2-300X	RCPXD2-300TX	RCPXD2-300SX	RCPXD2-300STX
		40	–	–	✓	✓	RCPXD2-400X	RCPXD2-400TX	RCPXD2-400SX	RCPXD2-400STX
		50	–	–	✓	✓	RCPXD2-500X	RCPXD2-500TX	RCPXD2-500SX	RCPXD2-500STX

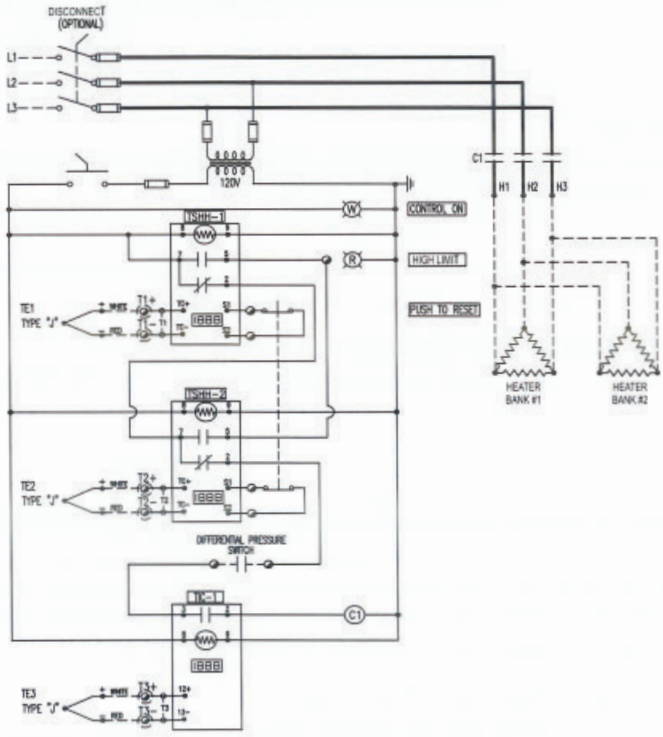
Note: For optional disconnect switch, add 'D' to end of catalog number.

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



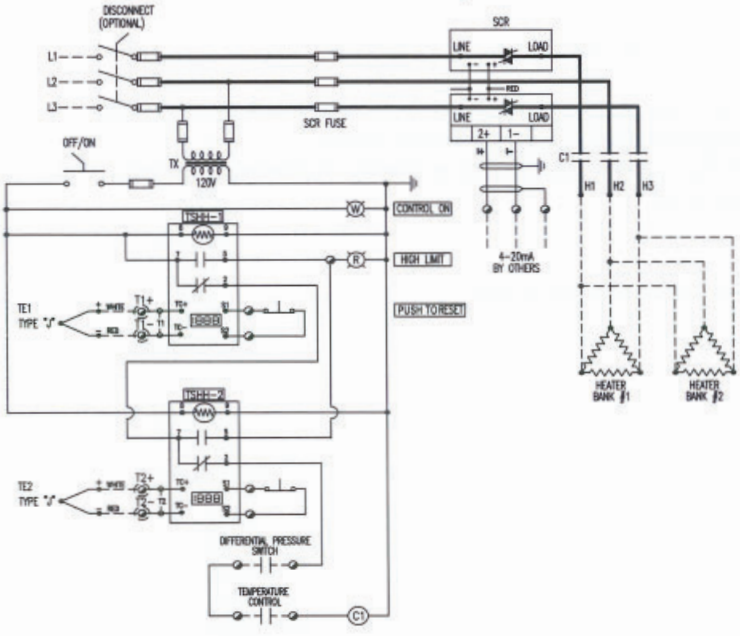
Notes:
ONE HIGH LIMIT CONTROL PROVIDED ON SINGLE BANK HEATERS.
TWO HIGH LIMIT CONTROLS PROVIDED ON DOUBLE BANK HEATERS.

Package #2 - Built-in Temperature Controller



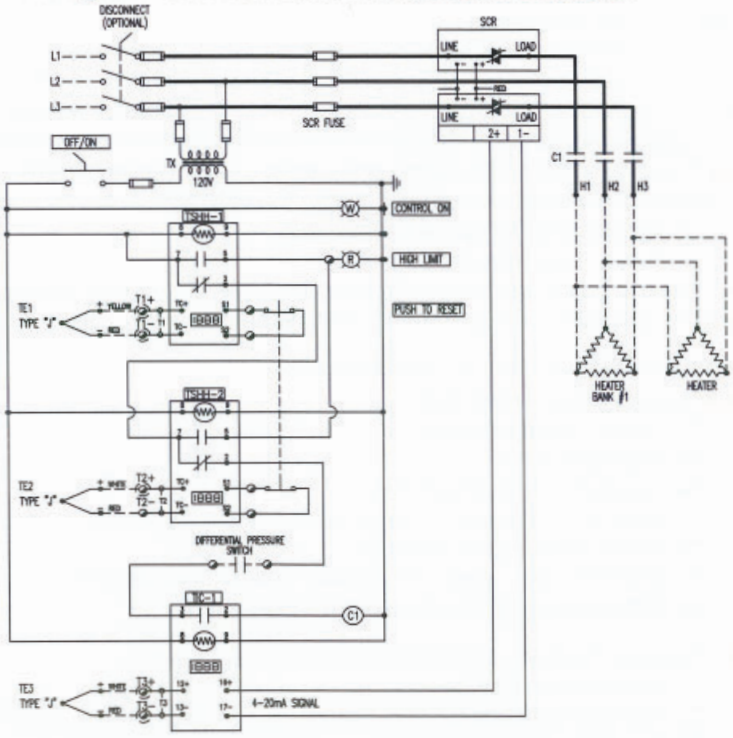
Notes:
ONE HIGH LIMIT CONTROL PROVIDED ON SINGLE BANK HEATERS.
TWO HIGH LIMIT CONTROLS PROVIDED ON DOUBLE BANK HEATERS.

Package #3 - SCR with Remote Temperature Controller



Notes:
ONE HIGH LIMIT CONTROL PROVIDED ON SINGLE BANK HEATERS.
TWO HIGH LIMIT CONTROLS PROVIDED ON DOUBLE BANK HEATERS.

Package #4 - SCR with Built-in Temperature Controller



Notes:
ONE HIGH LIMIT CONTROL PROVIDED ON SINGLE BANK HEATERS.
TWO HIGH LIMIT CONTROLS PROVIDED ON DOUBLE BANK HEATERS.

EXPLOSION-PROOF HEATERS TYPE RXDF
SPECIFICATION SHEET

1.0 Scope
Electric explosion-proof duct heaters shall be **Ruffneck™ type RXDF,** from **,** complete with all standard equipment and optional features as specified below.

2.0 General
2.1 The heater is to be CSA C/US certified with ratings as specified in 3.0.
2.2 The heater shall be provided with standard features and optional features as outlined in 4.0 and 6.0.

3.0 Specifications and Ratings
3.1 The duct heater shall be designed to heat air at _____ SCFM from _____ °F to _____°F (_____°C to _____°C).
3.2 The heater shall be of the explosion-proof, duct type, catalog number_____,
rated _____ V, _____ Ø, _____ Hz., _____ kW.
- ❒ Class _____, Divisions _____, Groups _____;
- ❒ Class _____, Divisions _____, Groups _____,

3.4 The duct heater shall be marked with a _____ temperature code, or maximum surface temperature of _____.
3.5 The minimum rated airflow through the duct heater shall be _____ SCFM.
3.6 The maximum outlet temperature of the duct heater shall not exceed _____°F (_____°C).
3.7 The duct heater is to be mounted in a horizontal duct section ❒ downstream / ❒ upstream from the customer supplied blower.
3.8 The duct heater shall be suitable for operation in a -40°F (-40°C) min. to 104°F (40°C) max. ambient temperature.

4.0 Standard Features – Duct Heater
4.1 The duct heater shall be supplied with a _____"(W) x _____" (H) x _____" (L) carbon steel duct section with 1" wide mounting flange and painted ASA61 gray epoxy outside and high temperature aluminum inside.
4.2 The heating elements shall be 0.475" dia., extra heavy wall (0.095") finned tubular steel with nickel plated finish. Fins are to be fully brazed to the element sheath for maximum performance and efficiency.
4.3 The heating elements shall extend through certified explosion-proof compression fittings into a patented ***x-Max***® explosion-proof, extruded copper-free aluminum terminal housing(s) with 1¼ " NPT power conduit entry and ¾" NPT conduit entry for high limit thermocouple connection.
4.4 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, or ❒ ON/OFF control.
4.5 The duct heater shall be supplied with _____ 'J' type sheathed thermocouples welded or brazed to the element sheath for connection to

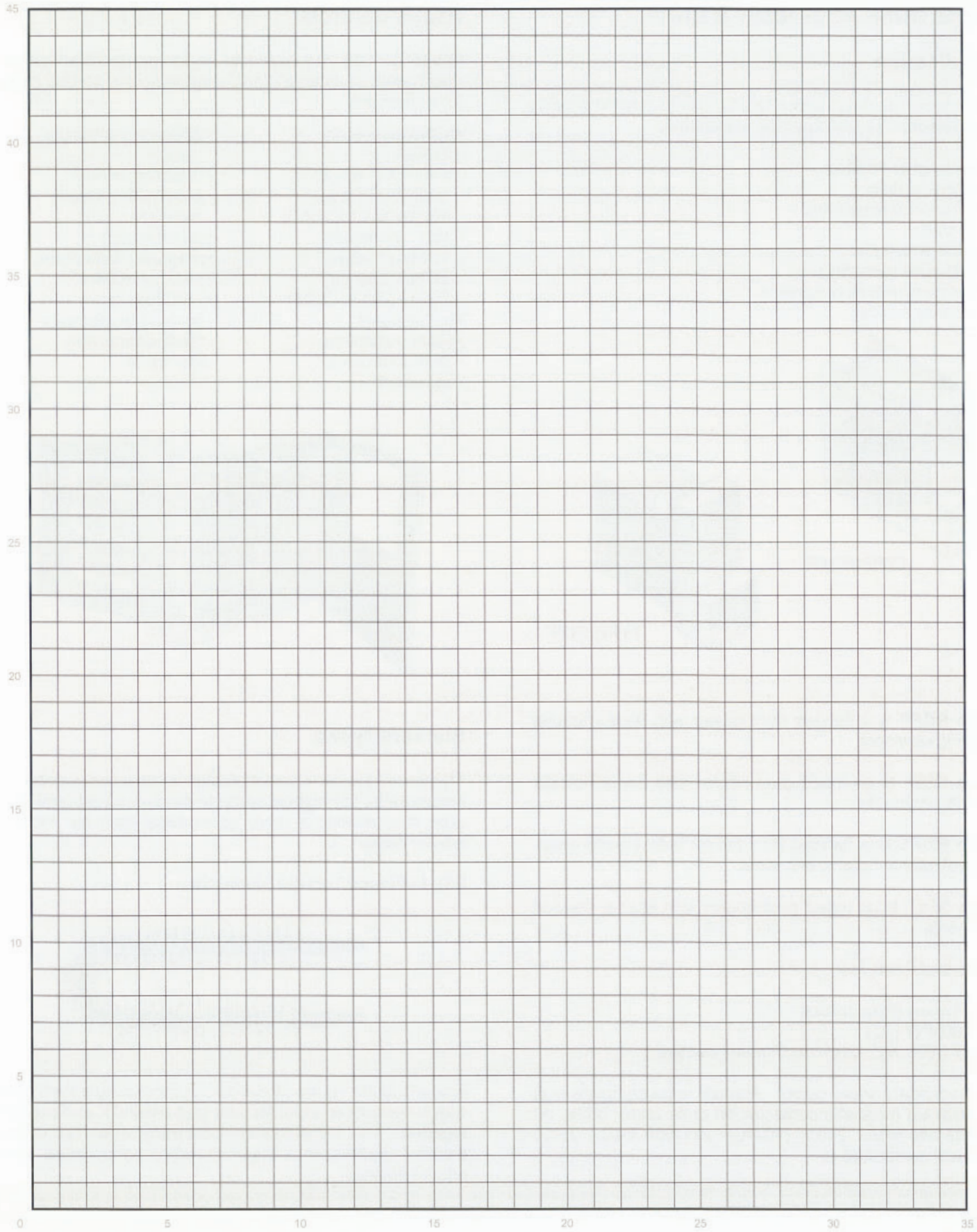
❒ customer supplied / ❒ factory installed certified high limit controllers. High limit set points will be factory preset.
4.6 Explosion-proof differential pressure switch shall be factory installed on the heater to prove that air is moving. Customer must ensure that the minimum airflow is maintained at all times. The differential pressure switch is to be:
- ❒ field wired to the remote control panel;
- ❒ factory mounted onto the heater.

4.7 The duct heater shall be mounted in a horizontal duct section with the terminal box(es) at the side.
4.9 The approximate weight of the duct heater shall be _____ lbs.

5.0 Standard Features – Control Package
5.1 Enclosure type (check one):
- ❒ Type 4 - moisture-proof
- ❒ Explosion-proof

5.2 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

6.0 Optional Features and Equipment (check as desired)
- ❒ Stainless steel duct section
- ❒ Transition sections to _____"(H) x _____" (W) duct or _____" round duct.
- ❒ Special temperature code of _____.

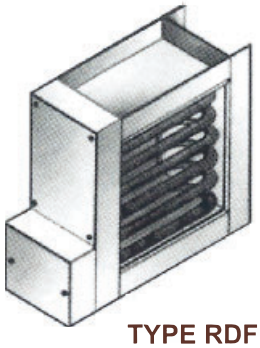

45
40
35
30
25
20
15
10
5
0
5
10
15
20
25
30
35

Air Duct Heaters
Types RDFF, RDIF, RDFT & RDIT

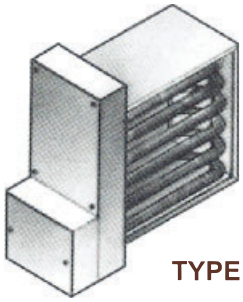
Application

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
- return air heating



TYPE RDFF



TYPE RDIF

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.

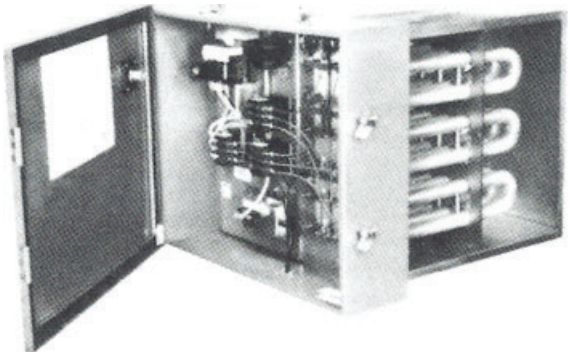
Standard Features

- 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 300V, 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:

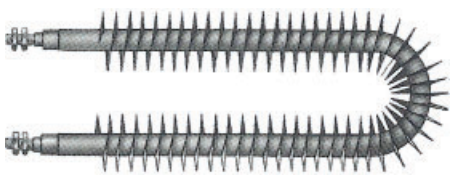
- wall thermostats
  T498A
  T6051A (1 stage)
  T6052A (2 stage)
  T921A (0-135 OHM)
- duct thermostats
  T675A (1 stage)
  T678A (2 stage)
  T991A (0-135 OHM)
- bulb holders
- silent contactors
- SCR controllers
- sail switch
- differential pressure switch
- main disconnect
- pneumatic electric switches
- on-off switch
- magnetic contactors
- step controllers
- HRC fusing
- control transformers
- fan interlock relay
- pilot lights



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.

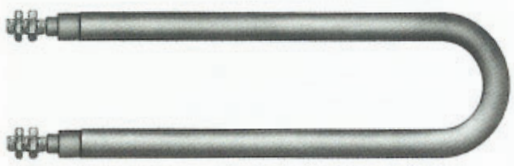
FIG. 1 - Finned Tubular Elements



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.

Element Types (continued)

Fig. 2 - Tubular Elements



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

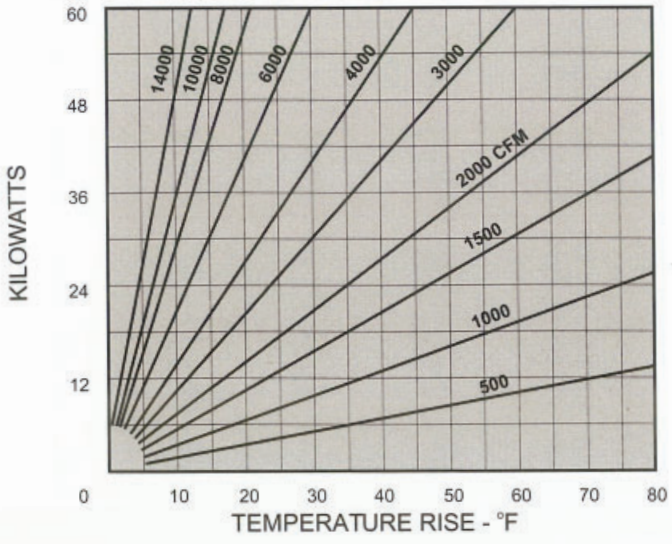
The incoloy design should be chosen where high humidity or slightly corrosive chemical contaminants are present in the air stream. These units are made and approved on special order only.

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 3 below.

Fig. 3 - Recommended Kilowatts



Wiring And Auxiliary Controls

Ruffneck™ electric duct heaters are available for supply voltages up to 600V, 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 Figures 4 and 5 below).

Fig. 4 - Insert Type

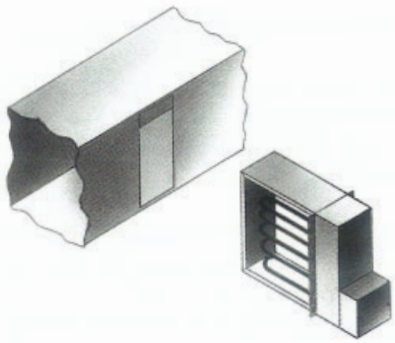
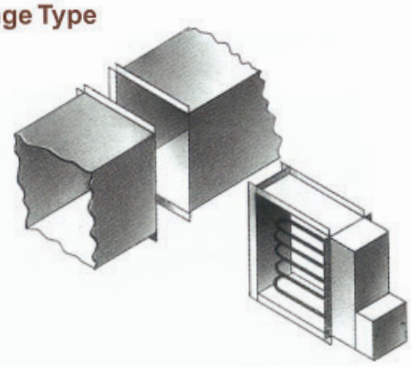


Fig. 5 - Flange Type



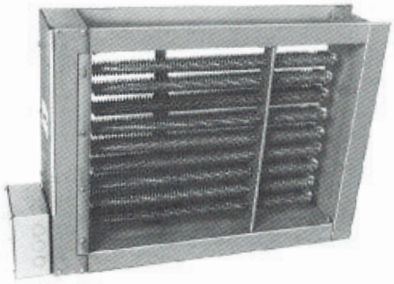
All frames are fabricated from 16 gauge satin coat steel. Specially constructed stainless steel frames are also available.

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

Air Duct Heaters (continued)

Standard Dimensions

Insert type duct heaters are slightly undersized to permit installation in ducts having the A and B dimensions listed in Table 1.

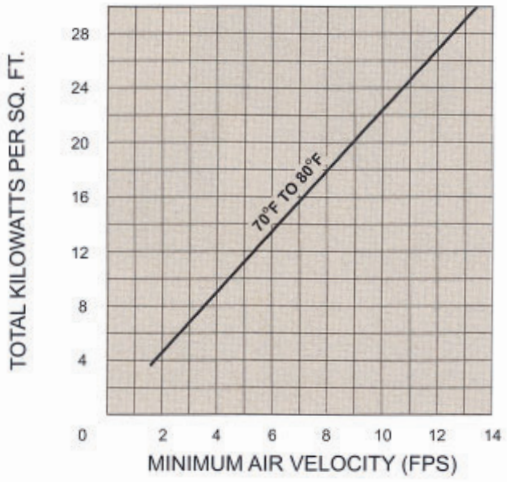


Selection and Installation

Finned tubular duct heaters are approved for horizontal duct installation where the maximum inlet air temperature does not exceed 25°C (77°F) 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 25°C (77°F) and the air velocity is not less than the requirements of Figure 6. Check factory if you require assistance.

Fig. 6 - Air Velocity Requirements



See Table 1 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 7.

Multiply the kW ratings shown in Table 1 by the appropriate derating factor from Figure 7.

Fig.7 - Derating Factors

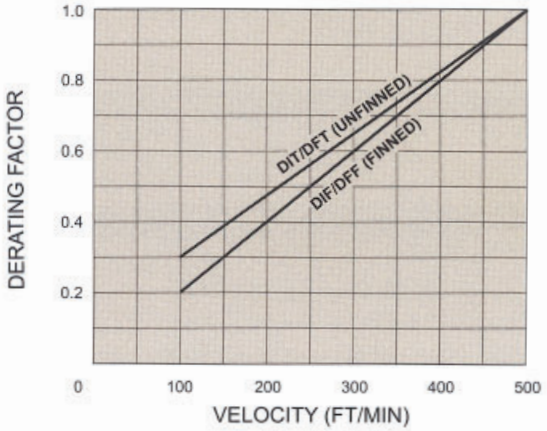


Table 1 below lists some of the more common heater sizes with maximum kilowatt ratings for each size. Stock modular frames allow quick delivery for other sizes in increments of 2".

Table 1 - Maximum Single Heater kW Rating for Typical Duct Heater Sizes

DIMENSIONS INCHES A x B	TYPES RDIF/RDFF MAX. kW	TYPES RDIF/RDFF MAX. NO. OF ELEMS.	TYPES RDIT/RDFT MAX. kW	TYPES RDIT/RDFT MAX. NO. OF ELEMS.
6x6	2.5	3	1.5	6
8x6	3	3	3.0	6
10x6	4	3	2.5	6
10x8	5.5	4	3.5	8
12x6	5	3	3.5	6
12x8	6.5	4	4.5	8
12x10	8	5	5.5	10
14x8	7.5	4	5.5	8
14x10	9.5	5	6.5	10
14x12	11.5	6	8.0	12
16x10	11	5	7.5	10
16x12	13	6	9.0	12
16x14	15.5	7	10.5	14
18x12	15	6	10.5	12
18x14	17.5	7	12	14
18x16	20	8	14	16
20x14	19	7	13.5	14
20x16	22	8	13.5	16
20x18	25	9	17.5	18
22x16	24	8	17	16
22x18	27.5	9	19	18
22x20	30.5	10	21	20
24x18	30	9	21	18
24x20	33	10	23	20
24x22	36.5	11	25.5	22
26x20	36	10	25	20
26x22	39.5	11	27.5	22
26x24	43	12	30	24
28x22	42.5	11	29.5	22
28x24	46.5	12	32.5	24
28x26	50.5	13	35	26
30x24	50	12	35	24
30x26	54	13	37.5	26
30x28	58	14	40.5	28
30x30	62.5	15	43.5	30

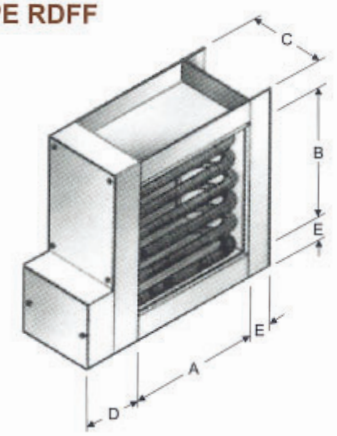
Air Duct Heaters (continued)

Types RDFF and RDIF duct heaters are designed and approved for comfort heating applications. Unit must be installed in a horizontal duct with the terminal housing at the side or bottom.

Tandem mounting (more than one heater in series) is permitted within certain limitations. See previous discussion.

Units listed in Table 2 are representative only. It is reasonably safe to specify any similar unit using this table as a guideline, and we will build to your specifications.

TYPE RDFF



DIM.	IN.	MM
C	6½	163
D	7	178
E	2	51

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 300V, 30 kW and less,
  225°F (107°C)
  277/600 VAC, 25/10 AMP non-inductive

Optional Features

See page 31.

Note: Incoloy tubular duct heaters, types RDFT and RDIT, are available on special order only.

TYPE RDIF

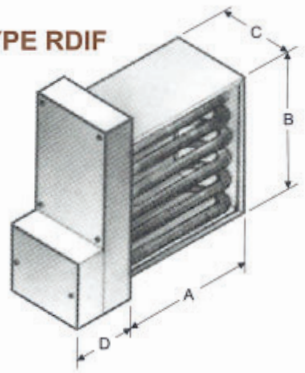


Table 2 - Types RDFF/RDIF Duct Heaters with Finned Elements

kW	STANDARD VOLTAGES 120V 1Ø	208V 1Ø	240V 3Ø	480V 1Ø	600V 3Ø	DIMENSIONS IN. (MM) A		B		MINIMUM AIR FLOW CFM (M^3/MIN)		NO. OF ELEMS.	CATALOG NUMBERS FLANGE TYPE	INSERT TYPE	APPROX. WEIGHT LBS (KG)	
1	✓	✓	–	–	–	6	(152)	6	(152)	50	(1.4)	2	RDFF06x06-01	RDIF06x06-01	15	(7)
2.5	✓	✓	✓	–	–	6	(152)	6	(152)	150	(4.2)	3	RDFF06x06-02.5	RDIF06x06-02.5	15	(7)
7.5	–	✓	✓	✓	–	14	(356)	8	(203)	390	(11.0)	4	RDFF14x08-07.5	RDIF14x08-07.5	20	(9)
10	–	✓	✓	✓	✓	14	(356)	12	(305)	500	(14.1)	6	RDFF14x12-10	RDIF14x12-10	25	(11)
12.5	–	✓	✓	✓	✓	16	(406)	12	(305)	625	(17.7)	6	RDFF16x12-12.5	RDIF16x12-12.5	30	(14)
15	–	✓	✓	✓	✓	18	(457)	12	(305)	750	(21.2)	6	RDFF18x12-15	RDIF18x12-15	30	(14)
17.5	–	✓	✓	✓	✓	18	(457)	14	(356)	875	(24.8)	6	RDFF18x14-17.5	RDIF18x14-17.5	35	(16)
20	–	✓	✓	✓	✓	18	(457)	16	(406)	1000	(28.3)	6	RDFF18x16-20	RDIF18x16-20	35	(16)
25	–	–	✓	✓	✓	20	(508)	18	(457)	1250	(35.4)	9	RDFF20x18-25	RDIF20x18-25	50	(23)
30	–	–	✓	✓	✓	24	(610)	18	(457)	1500	(42.4)	9	RDFF24x18-30	RDIF24x18-30	55	(25)
35	–	–	✓	✓	✓	24	(610)	22	(559)	1650	(46.7)	9	RDFF24x22-35	RDIF24x22-35	60	(27)
40	–	–	✓	✓	✓	26	(660)	24	(610)	2050	(58.0)	12	RDFF26x24-40	RDIF26x24-40	70	(32)
45	–	–	✓	✓	✓	28	(711)	24	(610)	2200	(62.2)	12	RDFF28x24-45	RDIF28x24-45	75	(34)
50	–	–	✓	✓	✓	28	(711)	26	(660)	2500	(70.7)	12	RDFF28x26-50	RDIF28x26-50	80	(36)
60	–	–	✓	✓	✓	30	(762)	30	(762)	3000	(84.9)	15	RDFF30x30-60	RDIF30x30-60	95	(43)
80	–	–	✓	✓	✓	36	(914)	32	(813)	4000	(113.1)	15	RDFF36x32-80	RDIF36x32-80	105	(48)
100	–	–	✓	✓	✓	42	(1067)	36	(914)	5250	(148.5)	18	RDFF42x36-100	RDIF42x36-100	130	(59)
120	–	–	✓	✓	✓	48	(1219)	36	(914)	6000	(170.0)	18	RDFF48x36-120	RDIF48x36-120	150	(68)

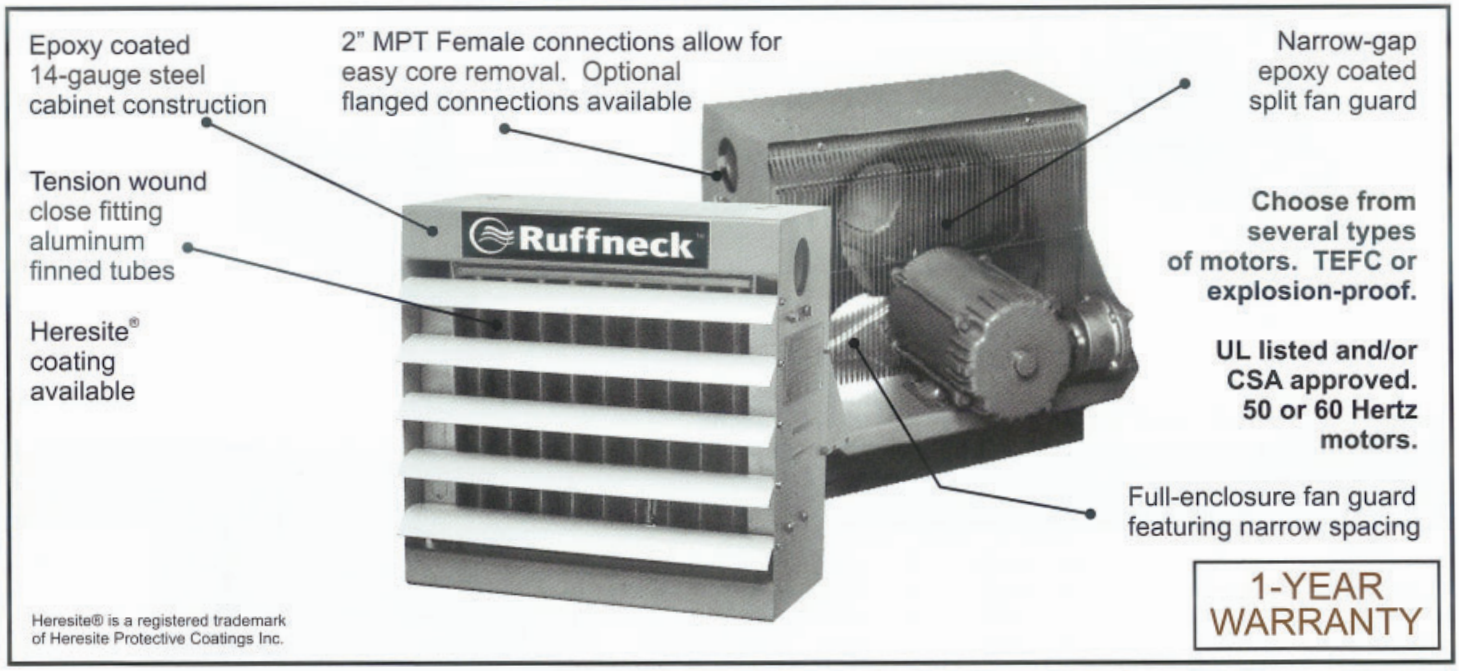
To Order: Specify quantity, catalog number, volts, phase, kW, minimum CFM, duct dimensions, and optional features.

HP/FR Heat Exchanger Unit Heater

Ruffneck™ HP/FR Heat Exchanger Unit Heaters are designed for rugged industrial applications with all features being extra heavy duty to meet the most demanding service and long life requirements. Heavy gauge steel construction is used throughout the heater. Ruffneck™ heaters are suitable for a wide range of heating fluids and are perfect for steam, hot water, glycol, etc. They are also efficient for use with other fluids such as oil, for both space heating and liquid cooling applications.

Engineered for ease of maintenance, all parts are easily removed. Even the core can be removed without disturbing the heater mounting arrangement or electrical connections. All fasteners are plated capscrews; no sheet metal screws are used. Heat exchanger cores are of steel construction with tension wound, close fitting aluminum fins. They are resistant to corrosive agents (including hydrogen sulphide). Pressure ratings are based on a nominal, 5:1 safety factor and all units are 100% leak tested. The FR Series is warranted against frost damage.

All units are equipped with a narrow-gap, epoxy coated fan guard. Choose from several optional motors with various voltages, phases and frequencies.



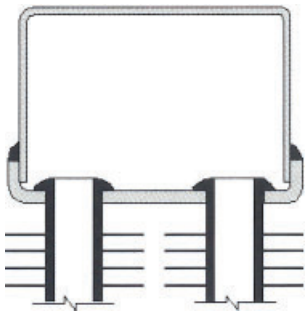
Model Coding

FR	1	12	EP	240	1	60
MODEL SERIES FR - FROST RESISTANT HP - HIGH PRESSURE	**TUBESIDE PASSES** 1 - 1 PASS 3 - 3 PASS* 5 - 5 PASS* 7 - 7 PASS**	**FAN SIZE** 12 - 12"Ø 16 - 16"Ø 20 - 20"Ø 24 - 24"Ø 30 - 30"Ø 36 - 36"Ø	**OPTIONS** EP - EXPLOSION-PROOF MOTOR GP - GENERAL PURPOSE MOTOR C - HERESITE® CORE & CABINET C1 - HERESITE® CABINET C2 - HERESITE® CORE	**VOLTS** 115 208 220 230 380 440 460 575	**PHASE** 1 3	**HERTZ** 50 60

* Available for HP Series only
** Available for HP24, HP30 & Hp36 inch fan sizes only
Contact the factory for pricing and delivery on Heresite® coated units
Contact the factory for other available motors

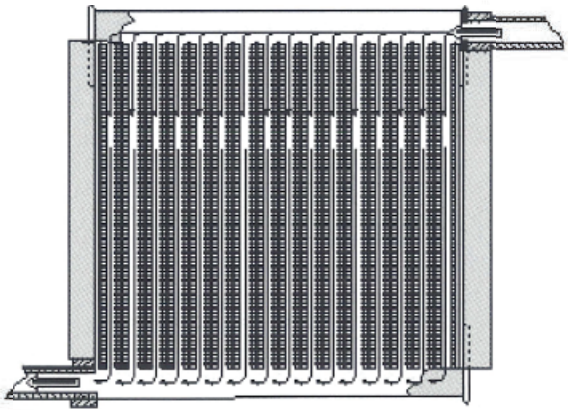
HP/FR Single-Pass & Multi-Pass

Two basic types of Heat Exchanger configurations are available from . The FR (Frost Resistant) Series is for steam service to 100 PSI and the HP (High Pressure) Series is for steam and liquid service up to 400 PSI (on select models).

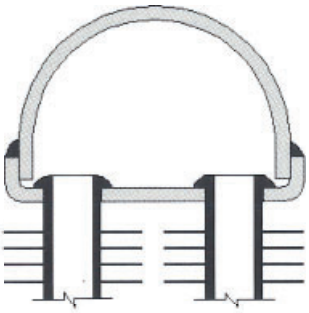


FR Series heater shape.
Available in single-pass configurations only. Maximum 100 PSI operating pressure.

The FR Series is designed for steam applications that may be subject to freezing conditions. Maximum operating pressure is 100 PSI. These units gain their resistance to frost damage through the use of rectangular top and bottom headers. During accidental freeze-up, the headers will distort to a circular shape due to ice expansion. This allows the heaters to be frozen several times without serious damage. These features are 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.

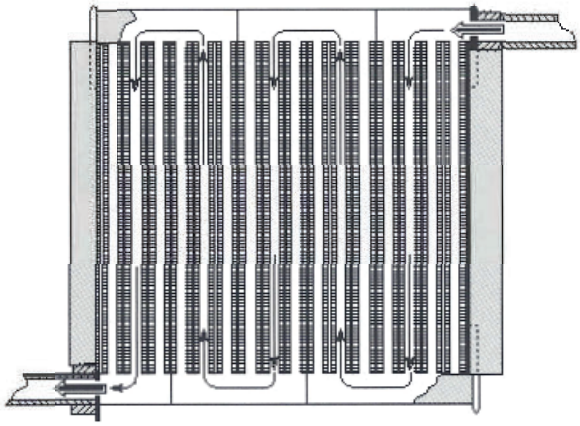


Single-Pass for FR and HP Series
Typical single-pass heat exchanger configuration available for both the FR and HP series units. Note that the fluid flow is divided among all tubes. This is best suited to steam and high flow rate liquid applications.



HP Series heater shape.
Available in one, three, five and seven pass configurations depending on model. Pressure up to 400 PSI. Operating pressure on select models.

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.



Multi-pass for HP Series only.
Typical multi-pass heat exchanger configuration available for the HP series units only. Note that the flow is baffled into groups of tubes to increase fluid velocity and thermal efficiency. Suitable for liquid service only.

FR1-12 & HP1-12 Performance Data

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	51.9	48.7	45.5
		FAT (°F)				72.7	81.0	89.3	97.4	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	62.3	58.9	55.5	52.3
		FAT (°F)			69.7	78.1	86.5	94.7	102.9	111.0	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
		COND. (LBS./HR)		91.4	87.5	83.8	80.0	76.4	72.8	69.2	65.7	62.3
		FAT (°F)		68.7	77.2	85.7	94.1	102.5	110.7	118.9	127.0	135.1
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
150	366	OUTPUT (MBH)	116.6	112.6	108.8	104.9	101.2	97.5	93.8	90.3	86.7	83.3
		COND. (LBS./HR)	132.2	127.7	123.3	118.9	114.6	110.4	106.3	102.2	98.2	94.2
		FAT (°F)	81.2	90.1	98.8	107.5	116.2	124.7	133.2	141.6	149.9	158.1
200	387	OUTPUT (MBH)	123.7	119.7	115.8	111.9	108.0	104.3	100.6	96.9	93.3	89.8
		COND. (LBS./HR)	143.3	138.6	134.0	129.5	125.0	120.7	116.3	112.1	107.9	103.8
		FAT (°F)	86.9	95.8	104.7	113.4	122.1	130.7	139.2	147.7	156.0	164.3
250	406	OUTPUT (MBH)	130.2	126.1	122.1	118.1	114.3	110.4	106.7	103.0	99.3	95.8
		COND. (LBS./HR)	154.1	149.2	144.4	139.7	135.1	130.5	126.0	121.6	117.3	113.0
		FAT (°F)	92.1	101.0	109.9	118.8	127.5	136.2	144.7	153.2	161.7	170.0

HP models are mandatory for service above 100 PSI

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

FR1-16 & HP1-16 Performance Data

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
150	366	OUTPUT (MBH)	193.4	186.8	180.3	173.9	167.7	161.5	155.4	149.5	143.6	137.8
		COND. (LBS./HR)	220.6	213.0	205.6	198.3	191.1	184.1	177.1	170.3	163.6	157.0
		FAT (°F)	85.7	94.4	103.1	111.8	120.3	128.7	137.1	145.4	153.6	161.8
200	387	OUTPUT (MBH)	205.1	198.4	191.8	185.3	179.0	172.7	166.5	160.4	154.5	148.6
		COND. (LBS./HR)	239.2	231.3	223.6	216.0	208.5	201.1	194.0	186.8	179.8	172.9
		FAT (°F)	91.6	100.5	109.2	117.9	126.5	135.0	143.5	151.8	160.1	168.3
250	406	OUTPUT (MBH)	215.8	209.0	202.3	195.7	189.2	182.9	176.6	170.4	164.4	158.4
		COND. (LBS./HR)	257.0	248.8	240.8	232.9	225.2	217.5	210.1	202.7	195.4	188.3
		FAT (°F)	97.0	106.0	114.8	123.5	132.2	140.7	149.2	157.6	166.0	174.2

HP models are mandatory 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.

FR1-20 & HP1-20 Performance Data

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	148.5	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	277.7	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

HP models are mandatory for service above 100 PSI

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

FR1-24 & HP1-24 Performance Data

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	518.8	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

HP models are mandatory 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.

FR1-30 & HP1-30 Performance Data

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

HP models are mandatory for service above 100 PSI

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

FR1-36 & HP1-36 Performance Data

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	974.2	924.8	876.3	828.8	782.1	736.3	691.3	647.2	603.8
		COND. (LBS./HR)	1069	1016	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	1062.	1012	962.3	913.6	866.0	819.1	773.2	728.0	683.7
		COND. (LBS./HR)	1177	1122	1069	1016	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	1186	1134	1083	1033	983.7	935.6	888.3	841.8	796.2
		COND. (LBS./HR)	1337	1279	1223	1168	1114	1061	1009	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	1275	1222	1169	1118	1068	1019	970.7	923.4	876.9
		COND. (LBS./HR)	1459	1399	1341	1283	1227	1172	1118	1065	1013	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	1350	1296	1243	1191	1140	1090	1041	992.8	945.6
		COND. (LBS./HR)	1563	1502	1442	1382	1325	1268	1212	1158	1104	1051
		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	1412	1357	1303	1251	1199	1149	1099	1050	1002
		COND. (LBS./HR)	1654	1591	1529	1468	1409	1350	1293	1237	1182	1128
		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	1536	1480	1425	1371	1318	1266	1215	1165	1116
		COND. (LBS./HR)	1844	1777	1712	1648	1586	1524	1464	1405	1347	1290
		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	1629	1572	1516	1461	1407	1354	1302	1251	1201
		COND. (LBS./HR)	1997	1927	1859	1973	1727	1664	1601	1539	1479	1420
		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	1714	1656	1598	1543	1488	1434	1381	1330	1279
		COND. (LBS./HR)	2144	2071	2001	1932	1864	1797	1732	1668	1606	1544
		FAT (°F)	176.2	183.8	191.3	198.6	205.8	212.9	219.9	226.8	233.5	204.1

HP models are mandatory for service above 100 PSI.
Above figures are based on calculations at sea level.

HP/FR Heat Exchanger Capacities - 50% Ethylene Glycol, 60°F EAT

MODEL	CHANGE IN GLYCOL TEMPERATURE ΔT °F	ENTERING GLYCOL TEMPERATURE 180°F OUTPUT MBH	FLOW USGPM	FAT °F	PD PSI	200°F OUTPUT MBH	FLOW USGPM	FAT °F	PD PSI	220°F OUTPUT MBH	FLOW USGPM	FAT °F	PD PSI	240°F OUTPUT MBH	FLOW USGPM	FAT °F	PD PSI
HP1-12*	10	8.09	1.61	66.8	0.00	9.90	1.95	68.3	0.00	11.77	2.29	69.9	0.00	24.1	4.83	81.3	0.01
	20	5.96	.57	64.9	0.00	7.37	0.70	66.0	0.00	8.82	0.83	67.2	0.00	10.3	0.96	68.4	0.00
	40	4.11	.19	63.1	0.00	5.19	.023	64.0	0.00	6.30	0.28	64.8	0.00	7.45	0.33	65.7	0.00
HP3-12	10	23.0	4.88	80.8	0.36	31.3	6.57	88.4	0.64	38.2	7.94	94.8	0.92	45.2	9.28	101.1	1.25
	20	8.82	0.89	67.5	0.01	14.9	1.52	73.0	0.04	24.8	2.54	82.0	0.10	34.9	3.56	91.4	0.20
	40	6.13	0.30	65.0	0.00	7.73	0.37	66.3	0.00	9.40	0.45	67.7	0.00	11.1	0.53	69.2	0.01
HP1-16*	10	15.0	3.07	68.2	0.00	17.9	3.64	69.7	0.01	39.1	8.07	82.0	0.02	53.3	10.9	90.3	0.04
	20	11.1	1.11	65.9	0.00	13.7	1.35	67.3	0.00	16.3	1.60	68.7	0.00	19.1	1.85	70.2	0.00
	40	7.54	0.36	63.8	0.00	9.52	0.46	64.9	0.00	11.6	0.55	65.9	0.00	13.7	0.64	67.0	0.00
HP3-16	10	44.5	9.52	85.5	0.83	55.9	11.8	92.1	1.25	67.2	14.1	98.7	1.75	78.5	16.3	105.3	2.32
	20	20.9	2.19	71.6	0.05	36.9	3.88	80.9	0.15	52.7	5.50	90.0	0.29	64.3	6.64	96.8	0.41
	40	11.3	0.57	66.0	0.01	14.3	0.72	67.6	0.01	17.4	0.86	69.3	0.01	20.4	0.99	70.9	0.01
HP5-16	10	50.2	10.8	88.8	4.70	61.4	13.0	95.3	6.79	72.5	15.2	101.9	9.19	83.7	17.3	108.4	11.9
	20	36.9	3.95	81.0	0.68	50.4	5.34	88.8	1.21	61.9	6.48	95.5	1.75	73.3	7.59	102.1	2.38
	40	13.5	0.69	67.3	0.03	18.7	0.95	70.2	0.05	37.3	1.93	80.9	0.17	51.0	2.63	88.9	0.31
HP1-20*	10	31.0	6.52	69.9	0.01	61.3	12.9	80.0	0.04	84.4	17.7	87.6	0.08	109.2	22.6	95.9	0.13
	20	19.9	2.05	66.2	0.00	24.6	2.51	67.7	0.00	29.4	2.97	69.2	0.00	34.4	3.42	70.8	0.00
	40	12.6	0.63	63.8	0.00	17.0	0.85	65.2	0.00	20.7	1.02	66.3	0.00	24.5	1.20	67.5	0.00
HP3-20	10	81.3	17.5	86.8	1.91	100.5	21.4	93.2	2.81	119.6	25.2	99.6	3.83	138.7	28.9	106.0	4.99
	20	53.4	5.73	77.4	0.23	78.9	8.40	85.9	0.47	98.6	10.4	92.4	0.69	118.1	12.3	99.0	0.96
	40	20.3	1.06	66.4	0.01	25.6	1.32	68.0	0.02	42.9	2.22	73.7	0.04	71.5	3.70	83.2	0.10
HP5-20	10	89.1	19.2	89.4	10.3	-	-	-	-	-	-	-	-	-	-	-	-
	20	72.7	7.84	83.9	1.82	92.0	9.8	90.3	2.79	111.3	11.7	96.7	3.92	130.5	13.6	103.2	5.21
	40	23.7	1.25	67.5	0.06	55.5	2.95	78.0	0.29	82.3	4.35	87.0	0.59	102.2	5.34	93.6	0.86
HP1-24*	10	96.9	20.8	85.9	0.04	144.2	30.7	98.9	0.08	193.7	40.8	112.6	0.13	232.4	48.4	123.4	0.18
	20	45.4	4.78	71.8	.000	56.1	5.83	74.6	0.00	67.1	6.89	77.5	0.01	133.3	13.8	95.6	0.02
	40	27.0	1.39	66.8	0.00	38.9	2.00	69.9	0.00	47.4	2.40	72.1	0.00	56.1	2.82	74.4	0.00
HP3-24	10	168.6	36.5	105.9	2.65	206.5	44.1	116.3	3.79	243.5	51.5	126.7	5.08	280.6	58.6	137.1	6.55
	20	122.9	13.3	93.1	0.39	169.2	18.1	105.9	0.69	207.6	22.0	116.5	0.99	245.7	25.7	127.2	1.33
	40	46.1	2.44	72.0	0.02	58.1	3.04	75.2	0.03	121.4	6.39	92.5	0.10	168.8	8.82	105.5	0.18
HP5-24	10	181.5	39.3	109.5	13.6	-	-	-	-	-	-	-	-	-	-	-	-
	20	152.9	16.6	101.5	2.60	190.8	20.4	112.0	3.85	228.5	24.2	122.4	5.30	265.9	27.8	132.9	6.93
	40	81.8	4.41	81.8	0.22	129.3	6.93	94.8	0.50	177.5	9.42	108.1	0.88	216.3	11.35	118.9	1.24
HP7-24	10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	20	163.5	17.7	104.4	7.89	201.1	21.5	114.8	11.4	-	-	-	-	-	-	-	-
	40	110.2	5.97	89.3	1.00	156.3	8.40	102.3	1.88	194.8	10.4	113.0	2.78	233.0	12.2	123.6	3.82
HP1-30*	10	178.0	38.4	95.9	0.09	247.9	53.0	110.3	0.16	302.7	64.0	121.7	0.23	357.2	74.6	133.1	0.30
	20	77.6	8.26	75.3	0.01	95.7	10.1	78.8	0.01	183.5	19.3	96.8	0.03	253.4	26.4	111.2	0.04
	40	42.5	2.22	68.1	0.00	61.2	3.18	71.8	0.00	81.9	4.23	75.9	0.00	96.9	4.95	78.9	0.00
HP3-30	10	252.7	54.8	11.4	4.19	305.7	65.5	122.5	5.85	358.5	75.9	133.5	7.73	411.1	86.0	144.6	9.83
	20	207.0	22.5	101.9	0.77	261.5	28.1	113.2	1.16	315.6	33.5	124.4	1.61	369.4	38.7	135.7	2.12
	40	78.0	4.17	75.3	0.04	151.5	8.10	90.3	0.12	219.3	11.6	104.2	0.22	290.7	15.3	119.0	0.37
HP5-30	10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	20	232.3	25.2	107.2	4.23	285.8	30.7	118.3	6.08	339.0	36.0	129.4	8.19	392.0	41.1	140.5	10.6
	40	151.9	8.25	90.5	0.52	220.9	11.9	104.7	1.01	276.1	14.7	116.1	1.49	330.7	17.4	127.5	2.04
HP7-30	10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	20	244.1	26.5	109.6	12.4	-	-	-	-	-	-	-	-	-	-	-	-
	40	186.3	10.2	97.6	2.00	241.0	13.0	108.9	3.16	295.5	15.7	120.2	4.52	349.5	18.4	131.5	6.05
HP1-36*	10	354.9	77.0	102.0	.024	446.6	95.8	113.1	0.36	537.7	114.0	124.2	0.49	628.2	131.7	135.3	0.64
	20	139.0	14.9	76.1	0.01	275.3	29.5	92.3	0.04	388.9	41.2	106.0	0.08	511.0	53.6	120.8	0.12
	40	69.6	3.7	67.9	0.00	101.5	5.3	71.6	0.00	147.0	7.7	76.9	0.00	174.0	9.0	80.0	0.00
HP3-36	10	437.5	95.1	112.1	8.6	526.1	113.0	122.8	11.8	-	-	-	-	-	-	-	-
	20	370.7	40.3	103.9	1.7	461.3	49.6	114.9	2.48	551.4	58.6	125.9	3.37	641.0	67.4	136.9	4.35
	40	201.6	11.0	83.6	0.16	315.9	17.0	97.2	0.34	431.9	23.0	111.2	0.58	524.6	27.7	122.5	0.81
HP5-36	10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	20	405.4	44.2	108.2	8.81	494.7	53.3	119.0	12.4	-	-	-	-	-	-	-	-
	40	292.7	16.0	94.5	1.31	397.1	21.5	107.1	2.24	488.7	26.1	118.2	3.21	579.6	30.6	129.3	4.3
HP7-36	10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	20	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	40	333.4	18.2	99.4	4.4	424.8	23.0	110.4	6.7	515.4	27.6	121.4	9.4	605.3	32.0	132.4	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 50Hz 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 Imperial?
This chart has been produced using imperial units of measurement. We would be pleased to provide any information required in metric units.

HP/FR Heat Exchanger Capacities - Water 60°F EAT

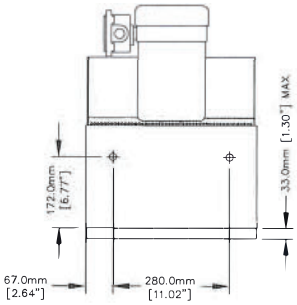
MODEL	CHANGE IN GLYCOL TEMPERATURE ΔT °F	ENTERING GLYCOL TEMPERATURE 180°F OUTPUT MBH	FLOW USGPM	FAT °F	PD PSI	200°F OUTPUT MBH	FLOW USGPM	FAT °F	PD PSI	220°F OUTPUT MBH	FLOW USGPM	FAT °F	PD PSI	240°F OUTPUT MBH	FLOW USGPM	FAT °F	PD PSI
HP1-12*	10	19.3	3.66	77.2	0.01	27.1	5.15	84.4	0.01	35.6	6.77	92.2	0.02	42.5	8.07	98.6	0.03
	20	8.84	0.80	67.5	0.00	11.1	1.00	69.4	0.00	15.3	1.40	73.2	0.00	26.2	2.44	83.2	0.00
	40	6.11	0.27	65.0	0.00	7.86	0.34	66.5	0.00	9.72	0.43	68.0	0.00	11.7	0.51	69.7	0.00
HP3-12	10	30.6	5.90	87.9	0.46	37.4	7.18	94.1	0.68	44.1	8.44	100.3	0.93	50.8	9.70	106.5	1.23
	20	23.1	2.21	80.8	0.07	30.1	2.96	88.1	0.12	37.8	3.61	94.4	0.18	44.7	4.25	100.7	0.24
	40	8.84	0.40	67.5	0.00	14.4	0.66	72.5	0.01	23.7	1.11	81.0	0.02	31.6	1.49	88.3	0.03
HP1-16*	10	38.8	7.47	82.1	0.02	52.3	10.1	90.0	0.03	63.6	12.2	96.5	0.05	74.9	14.4	103.1	0.06
	20	16.3	1.15	68.9	0.00	25.8	2.42	74.3	0.00	41.4	3.93	83.4	0.01	54.7	5.20	91.1	0.01
	40	11.5	0.51	66.0	0.00	14.5	0.66	67.7	0.00	17.9	0.81	69.6	0.00	21.5	0.97	71.6	0.00
HP3-16	10	52.9	10.2	90.4	0.84	63.9	12.4	96.8	1.21	74.9	14.4	103.3	1.65	86.0	16.5	109.7	2.15
	20	43.7	4.22	85.0	0.15	54.9	5.29	91.5	0.23	66.1	6.36	98.0	0.33	77.3	7.41	104.5	0.45
	40	19.3	0.91	70.7	0.01	34.5	1.64	79.5	0.02	47.4	2.26	86.9	0.04	61.3	2.93	95.0	0.07
HP5-16	10	55.8	10.8	92.1	4.23	66.7	12.9	98.5	5.98	77.7	15.0	104.9	8.04	88.6	17.0	111.3	10.4
	20	48.7	4.71	87.9	0.84	59.8	5.77	94.4	1.24	70.9	6.82	100.8	1.72	81.9	7.87	107.3	2.28
	40	33.5	1.61	79.0	0.10	46.7	2.25	86.6	0.20	58.0	2.78	93.2	0.30	69.3	3.32	99.8	0.42
HP1-20*	10	76.4	14.8	85.1	0.05	95.4	18.5	91.5	0.07	114.5	22.1	97.8	0.11	133.6	25.8	104.2	0.14
	20	39.3	3.77	72.7	0.00	64.0	6.16	80.9	0.01	85.7	8.25	88.1	0.02	109.7	10.6	96.1	0.03
	40	20.2	0.94	66.3	0.00	25.9	1.21	68.1	0.00	32.1	1.49	70.1	0.00	37.8	1.77	71.9	0.00
HP3-20	10	92.8	18.1	90.7	1.79	111.5	21.7	96.9	2.54	130.2	25.2	103.2	3.43	148.9	28.8	109.5	4.44
	20	79.2	7.71	86.1	0.34	98.2	9.53	92.4	0.52	117.1	11.3	98.7	0.72	136.0	13.1	105.1	0.96
	40	48.6	2.35	75.8	0.04	70.0	3.38	82.9	0.07	92.7	4.48	90.5	0.12	112.0	5.40	96.9	0.17
HP5-20	10	96.8	18.9	92.0	8.78	115.4	22.4	98.3	12.3	-	-	-	-	-	-	-	-
	20	86.1	8.39	88.4	1.81	104.9	10.2	94.7	2.64	123.7	12.0	101.0	3.62	142.4	13.8	107.3	4.75
	40	65.8	3.19	81.6	0.28	84.9	4.12	87.9	0.46	104.0	5.03	94.3	0.67	123.2	5.94	100.7	0.93
HP1-24*	10	160.4	31.3	103.6	0.07	197.8	38.5	113.9	0.10	235.1	45.6	124.3	1.14	272.3	52.7	134.8	0.19
	20	102.4	9.93	87.5	0.01	146.2	14.2	99.5	0.02	193.6	18.8	112.6	0.03	231.7	22.4	123.2	0.04
	40	45.7	2.17	71.9	0.00	58.6	2.78	75.3	0.00	72.3	3.42	78.9	0.00	130.0	6.22	94.7	0.00
HP3-24	10	187.5	36.6	111.1	2.33	224.1	43.7	121.3	3.28	260.6	50.6	131.6	4.38	297.1	57.5	141.9	5.64
	20	16.7	16.0	104.5	0.47	200.8	19.6	114.8	0.69	237.9	23.1	125.1	0.95	274.8	26.6	135.5	1.26
	40	111.2	5.41	89.9	0.06	156.7	7.61	102.4	0.11	194.6	9.44	112.9	0.17	232.5	11.3	123.4	0.24
HP5-24	10	194.0	37.9	113.0	11.2	-	-	-	-	-	-	-	-	-	-	-	-
	20	175.1	17.1	107.7	2.40	211.9	20.6	117.9	3.44	248.6	24.2	128.2	4.67	285.2	27.6	138.5	6.08
	40	138.2	6.74	97.4	0.40	175.8	8.56	107.8	0.63	213.4	10.4	118.2	0.91	250.7	12.1	128.67	1.23
HP7-24	10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	20	180.4	17.6	109.2	6.82	217.1	21.2	119.4	9.72	253.6	24.6	129.6	13.1	-	-	-	-
	40	147.5	7.20	100.0	1.22	184.9	9.01	110.3	1.86	222.2	10.8	120.7	2.63	259.3	12.6	131.0	3.53
HP1-30*	10	243.3	47.6	109.5	0.11	296.2	57.8	120.5	0.16	349.0	67.9	131.5	0.22	401.7	77.9	142.6	0.29
	20	179.3	17.6	96.2	0.02	245.6	23.9	109.8	0.03	299.6	29.1	121.0	0.04	353.4	34.2	132.3	0.06
	40	77.0	3.69	75.2	0.00	98.5	4.72	79.4	0.00	174.8	8.43	95.0	0.00	242.3	11.7	108.9	0.01
HP3-30	10	273.8	53.6	115.8	3.48	325.8	63.6	126.7	4.85	377.6	73.5	137.6	6.42	429.4	83.3	148.5	8.20
	20	244.3	23.9	109.7	0.74	296.9	29.0	120.6	1.06	349.5	34.0	131.6	1.44	401.8	39.0	142.6	1.88
	40	180.9	8.83	96.5	0.11	241.3	11.80	108.9	0.19	295.1	14.1	120.1	0.28	348.7	16.9	131.3	0.38
HP5-30	10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	20	257.1	25.2	112.3	3.62	309.3	30.2	123.2	5.14	361.5	35.2	134.1	6.90	413.4	40.1	145.1	8.91
	40	209.5	10.2	102.4	0.65	263.0	12.8	113.5	1.00	316.2	15.4	124.6	1.40	369.2	17.9	135.7	1.87
HP7-30	10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	20	263.1	25.8	113.6	10.2	-	-	-	-	-	-	-	-	-	-	-	-
	40	220.1	10.8	104.6	1.91	273.3	13.3	115.6	2.86	326.2	15.9	126.6	3.98	378.8	18.4	137.7	5.28
HP1-36*	10	424.5	83.2	110.5	0.24	513.3	100.3	121.2	0.33	601.2	117.2	132.0	0.45	689.2	134.0	142.9	0.57
	20	349.1	34.2	101.3	0.04	439.1	42.9	112.2	0.07	529.1	51.6	123.1	0.09	618.8	60.1	134.1	0.13
	40	137.2	6.60	75.9	0.00	257.0	12.53	90.1	0.01	366.6	17.8	103.3	0.01	467.9	22.7	115.5	0.02
HP3-36	10	466.5	91.5	115.6	6.89	553.6	108.3	126.2	9.51	640.5	124.9	136.9	12.5	-	-	-	-
	20	421.9	41.4	110.2	1.51	510.0	49.9	120.9	2.14	597.8	58.3	131.6	2.88	685.5	66.7	142.4	3.73
	40	334.7	16.4	99.6	0.26	424.9	20.8	110.4	0.41	514.7	25.1	121.3	0.58	604.1	29.4	132.3	0.78
HP5-36	10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	20	439.5	43.1	112.3	7.22	527.0	51.6	123.0	10.2	-	-	-	-	-	-	-	-
	40	365.4	17.9	103.3	1.36	454.9	22.3	114.1	20.3	543.8	26.5	124.9	2.83	632.3	30.8	135.8	3.75
HP7-36	10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	20	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	40	380.0	18.6	105.1	3.88	469.0	23.0	115.8	5.73	557.5	27.2	126.6	7.93	645.6	31.4	137.4	10.5

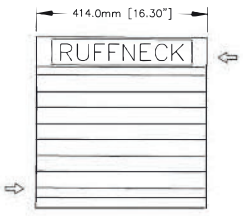
* - HP and FR single-pass heaters are not recommended for liquid service. In many cases, a smaller HP multi-pass model would be a more economical choice.

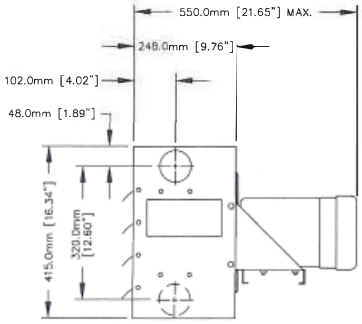
Note: For 50Hz power supply, derate output by 10%. Above figures are based on calculations at sea level.

Thermal Performance Analysis or Heat Loss Calculation Service: Thermal Performance Analysis service accurately computes performance parameters and output capacities for all Ruffneck™ models. Accompanied with the computerized Heat Loss Calculation for your project, our staff can inform you of the best choice of Ruffneck™ models for your needs.

Specifications: HP1-12, HP3-12 FR1-12







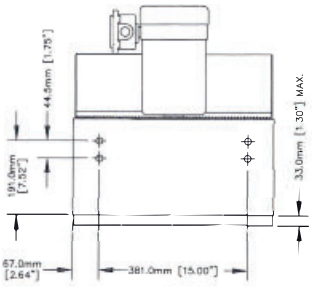
General

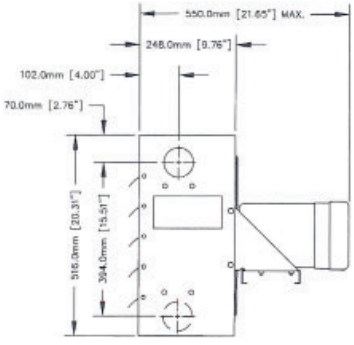
Air Delivery*	997 CFM
Air Velocity*	1147 FPM
Air Throw*	40 ft. @ 15 PSI stream
Propeller Fan	3 Wing Aluminum, 12” Dia. x 5/8” Bore 1/4 HP, 1725 RPM, Frame 56
Motor Requirements	Rigid Base (Specify enclosure type, voltage, cycle and phase.)
Fan Guard	Welded, Wire, Powder Coated Epoxy 1/4” probe will not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

Heat Exchanger

Tube Outside Dia.	0.625”
Tube Wall Thickness	0.065” 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. 0.075” Steel for FR Series Min. 0.135” Steel for HP Series
Inlet/Outlet	2” NPT Female
Max. Operating Press.	100 PSI for FR Series Up to 400 PSI for HP Series
Max. Operating Temp.	572°F

Specifications: HP1-16, HP3-16, HP5-16 & FR1-16





General

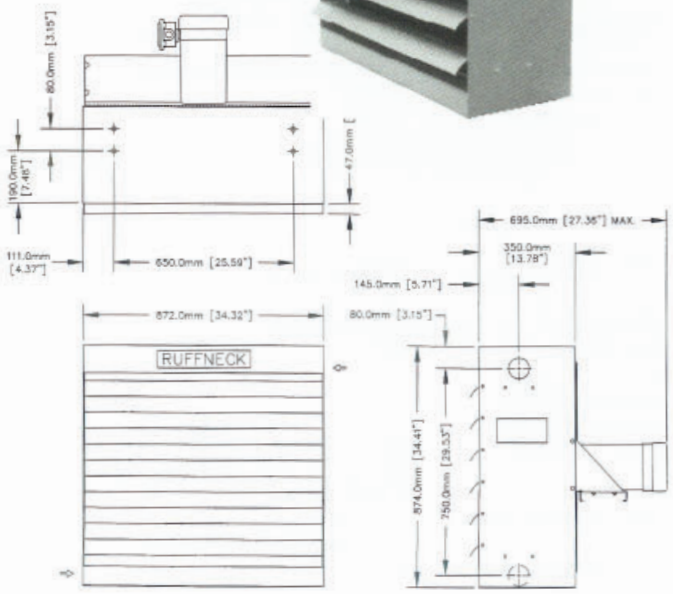
Air Delivery*	1588 CFM
Air Velocity*	1069 FPM
Air Throw*	60 ft. @ 15 PSI Stream
Propeller Fan	3 Wing Aluminum, 16” Dia. x 5/8” Bore 1/4 HP, 1725 RPM, Frame 56
Motor Requirements	Rigid Base (Specify enclosure type, voltage, cycle and phase.)
Fan Guard	Welded, Wire, Powder Coated Epoxy 1/4” probe will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

Heat Exchanger

Tube Outside Dia.	0.625”
Tube Wall Thickness	0.065” 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. 0.075” Steel for FR Series Min. 0.135” Steel for HP Series
Inlet/Outlet	2” NPT Female
Max. Operating Press.	100 PSI for FR Series Up to 400 PSI for HP Series
Max. Operating Temp.	572°F

*** at 70°F at sea level**

Specifications: HP1-30, HP3-30, HP5-30, HP7-30, & FR1-30



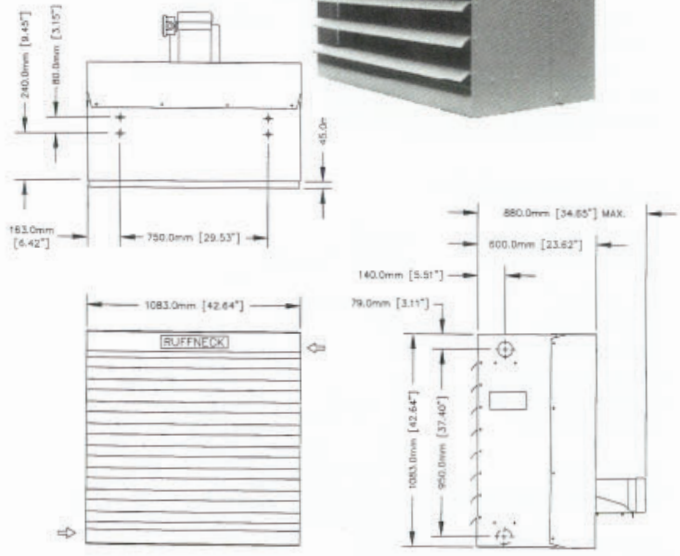
General

Air Delivery*	4569 CFM
Air Velocity*	814 FPM
Air Throw*	70 ft. @ 15 PSI stream
Propeller Fan	3 Wing Aluminum, 30" Dia. x 5/8" 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" probe will not enter
Hanger Connections	5/8" NC Tap - 4 holes
Cabinet Material	0.075" steel
Louvre Blades	Anodized Extruded Aluminum
Net Weight	286 lbs.
Shipping Weight	345 lbs.

Heat Exchanger

Tube Outside Dia.	0.625"
Tube Wall Thickness	0.065" 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. 0.075" Steel for FR Series Min. 0.135" Steel for HP Series
Inlet/Outlet	2" NPT Female
Max. Operating Press.	100 PSI for FR Series Up to 300 PSI for HP Series
Max. Operating Temp.	572°F

Specifications: HP1-36, HP3-36, HP5-36, HP7-36, & FR1-36



General

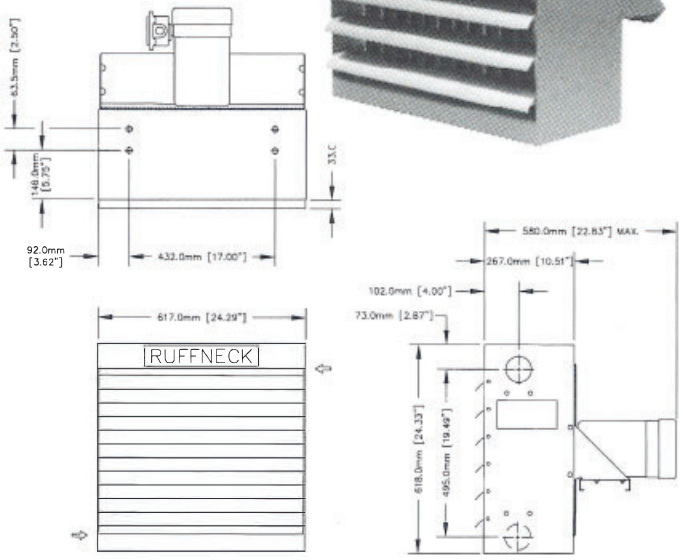
Air Delivery*	7830 CFM
Air Velocity*	852 FPM
Air Throw*	65 ft. @ 15 PSI Stream
Propeller Fan	6 Wing Aluminum, 36" Dia. x 1" Bore 1 1/2 HP, 1725 RPM, Frame 56
Motor Requirements	Rigid Base (Specify enclosure type, voltage, cycle and phase.)
Drive Pulley	B3.6"
Driven Pulley	B9.9"
Drive Belt	B42 V-Belt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

Heat Exchanger

Tube Outside Dia.	0.625"
Tube Wall Thickness	0.065" 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. 0.075" Steel for FR Series Min. 0.135" Steel for HP Series
Inlet/Outlet	2" NPT Female
Max. Operating Press.	100 PSI for FR Series Up to 300 PSI for HP Series
Max. Operating Temp.	572°F

*** at 70°F at sea level**

Specifications: HP1-20, HP3-20, HP5-20 & FR1-20



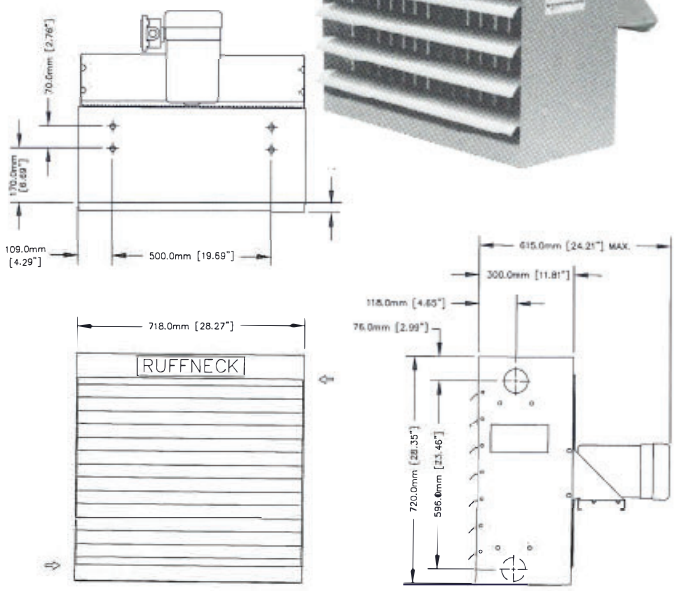
General

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

Heat Exchanger

Tube Outside Dia.	0.625"
Tube Wall Thickness	0.065" 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. 0.075" Steel for FR Series Min. 0.135" Steel for HP Series
Inlet/Outlet	2" NPT Female
Max. Operating Press.	100 PSI for FR Series Up to 400 PSI for HP Series
Max. Operating Temp.	572°F

Specifications: HP1-24, HP3-24, HP5-24, HP7-24 & FR1-24



General

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

Heat Exchanger

Tube Outside Dia.	0.625"
Tube Wall Thickness	0.065" 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. 0.075" Steel for FR Series Min. 0.135" Steel for HP Series
Inlet/Outlet	2" NPT Female
Max. Operating Press.	100 PSI for FR Series Up to 300 PSI for HP Series
Max. Operating Temp.	572°F

*** at 70°F at sea level**

AH Series- Advanced Horizontal Heaters

The Ruffneck™ Advanced Horizontal 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 450 psi and 650° F respectively, the AH 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. The AH series has a 1-year warranty.

With 37 models available for use in steam or liquid applications, the AH Series features:

1-1/2" NPT male inlet and outlet connections for reduced cost and ease of installation. 1-1/2" 300# RF flanges are available as an option.

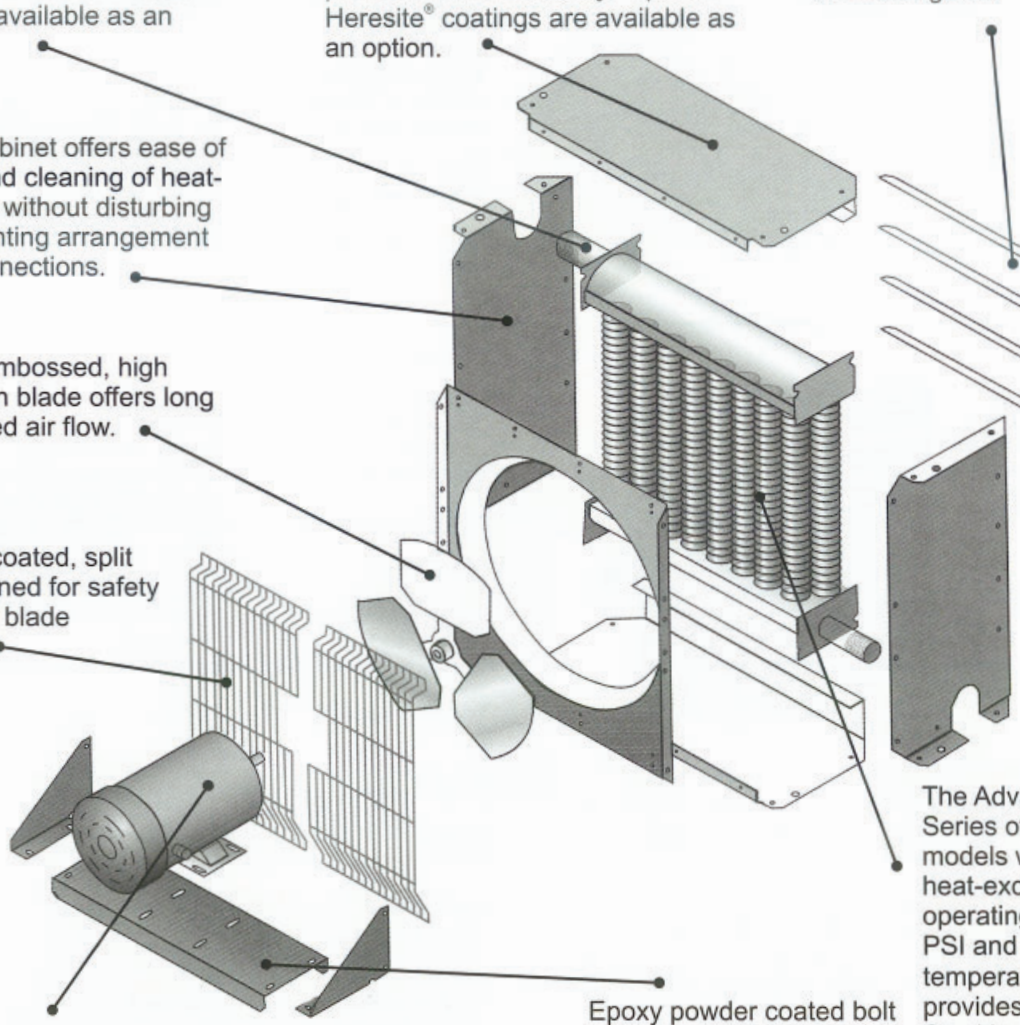
Epoxy powder coated 14-gauge (0.075") steel cabinet provides protection and durability. Special Heresite® coatings are available as an option.

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

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.



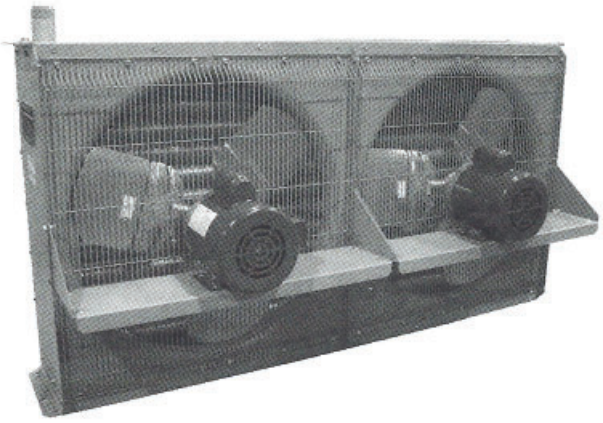
1-YEAR WARRANTY

The Advanced Horizontal Series offers a total of 37 models with CRN registered heat-exchangers. Maximum operating pressure of 450 PSI and maximum operating temperature of 650°F provides greater versatility. Steel headers are 3/16" (0.187") thick to ensure ruggedness and long lasting performance.

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

Standard motors are industrial duty totally enclosed 1725 RPM, 56 frame, 1/4 and 1/2 HP. Built for rugged environments, this motor is also available in explosion-proof models for hazardous locations.

AH Tandem Model

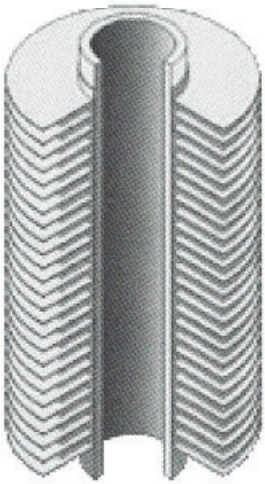


The 24" Tandem Advanced Horizontal Series is the largest unit in our line-up. Rather than expanding the cabinet and heat exchanger in both height and width, we just doubled the width to produce this unique model. This side-by-side arrangement also produces the lowest mounting profile in its class for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

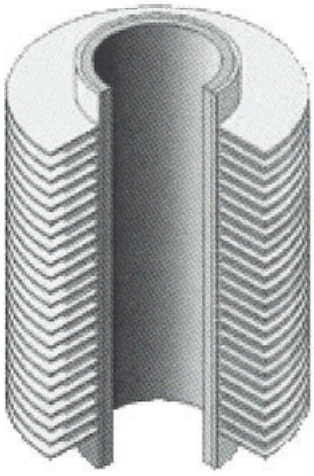
Extruded Finned Tubing Types

5/8" Tension-Wound
Finned Tubing
10 Fins per Inch



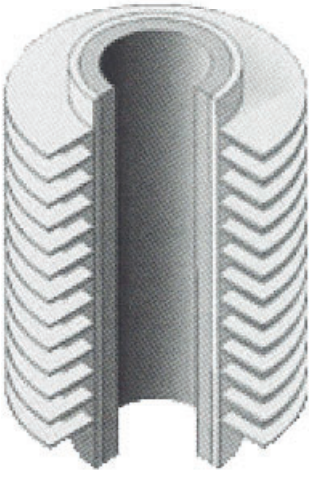
Recommended for glycol or water applications, we offer our standard 5/8" outside diameter (16 gauge, 0.065" wall thickness) carbon steel tubes with tension wound aluminum fins (10 per inch). In most cases, the 5/8" tubing will be the most economical choice on a cost per BTU basis.

1" Extruded
Finned Tubing
9 Fins per Inch



Select this configuration of extruded finned tubing for more demanding applications. It utilizes 1" outside diameter (14 gauge, 0.083" wall thickness, 12 gauge optional wall thickness) carbon steel tubes with extruded aluminum fins (9 per inch).

1" 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" outside diameter (10 gauge, 0.135" wall thickness) carbon steel tubes with extruded aluminum fins (5 per inch).

AH Series- General Specifications

Approvals	CRN (Canada) - Steam and HVAC liquids only.
Fan	Three blade aluminum, steel spider and hub with 5/8" bore.
Fan Guard	Two piece design with close wire spacing. 3/8" diameter probe will not enter. Epoxy coated to match cabinet color.
Mounting Holes	9/16" diameter holes, two at top and two at bottom of heater.
Cabinet Material	14-gauge (0.075") epoxy coated steel.
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.
Louvre Blades	Anodized extruded aluminum.
Header Material	3/16" (0.187") carbon steel.
Fluid Connections	1-1/2" NPT male Sch. 40 or 1-1/2" 300# RF flanges.
Max. Operating Press.	450 PSI.
Max. Operating Temp.	650°F.
Finned Tubes	5/8" outside diameter (16-gauge, 0.065" wall thickness) carbon steel tubes. Tension wound aluminum fins @ 10 fins per inch, or 1" outside diameter (14-gauge, 0.083" wall thickness) carbon steel tubes. Extruded aluminum fins @ 9 fins per inch, (optional 12 gauge) or 1" outside diameter (10-gauge, 0.135" wall thickness) carbon steel tubes. Extruded aluminum fins @ 5 fins per inch.

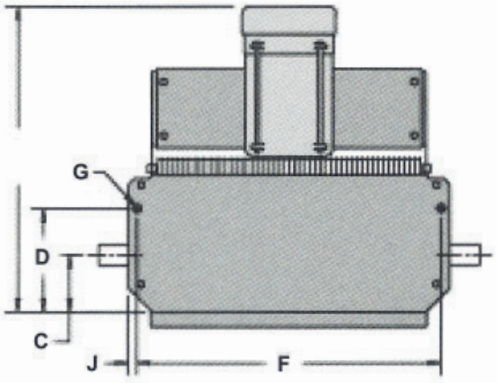
AH Series- Model Specifications

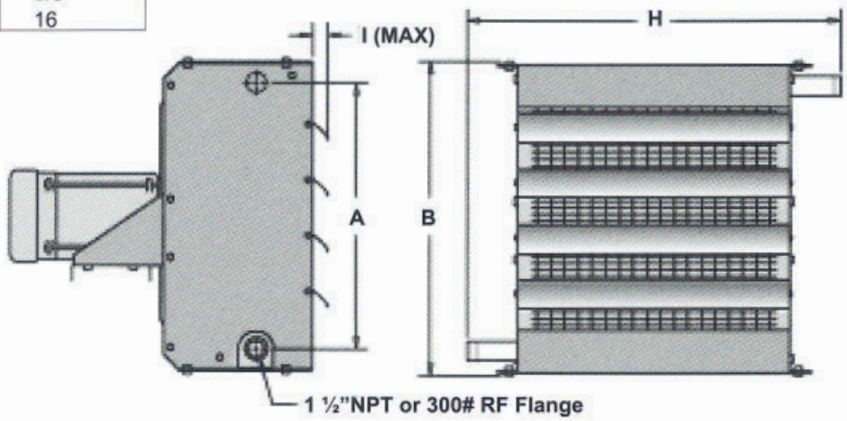
BASE MODEL	AIR ① DELIVERY	AIR THROW AT 15 PSI STREAM	MOTOR ② REQUIREMENTS	TUBE PASSES	NET ③ WEIGHT	SHIPPING ③ WEIGHT
AH-12A-A_	1150 CFM	28' (8.5m)	1/4 HP	1 or 3	102 lbs.	146 lbs.
AH-12A-B_	1160 CFM	28' (8.5m)	1/4 HP	1 or 3	107 lbs.	151 lbs.
AH-12A-C1	1030 CFM	28' (8.5m)	1/4 HP	1	118 lbs.	164 lbs.
AH-16A-A_	1840 CFM	40' (12.2m)	1/4 HP	1,3 or 5	127 lbs.	174 lbs.
AH-16A-B_	1780 CFM	40' (12.2m)	1/4 HP	1,3 or 5	138 lbs.	177 lbs.
AH-16A-C1	1840 CFM	40' (12.2m)	1/4 HP	1	153 lbs.	199 lbs.
AH-20A-A_	2930 CFM	40' (12.2m)	1/2 HP	1,3 or 5	155 lbs.	209 lbs.
AH-20A-B_	2700 CFM	40' (12.2m)	1/2 HP	1,3 or 5	170 lbs.	209 lbs.
AH-20A-C1	3000 CFM	40' (12.2m)	1/2 HP	1	195 lbs.	242 lbs.
AH-24A-A_	3890 CFM	40' (12.2m)	1/2 HP	1,3,5 or 7	189 lbs.	247 lbs.
AH-24A-B_	3640 CFM	40' (12.2m)	1/2 HP	1,3,5 or 7	212 lbs.	251 lbs.
AH-24A-C1	3490 CFM	40' (12.2m)	1/2 HP	1	258 lbs.	293 lbs.
AH-24B-A_	7650 CFM	65' (19.8m)	2-1/2 HP	1,3,5 or 7	313 lbs.	361 lbs.
AH-24B-B_	7420 CFM	65' (19.8m)	2-1/2 HP	1,3,5 or 7	376 lbs.	424 lbs.
AH-24B-C1	6690 CFM	65' (19.8m)	2-1/2 HP	1	440 lbs.	488 lbs.

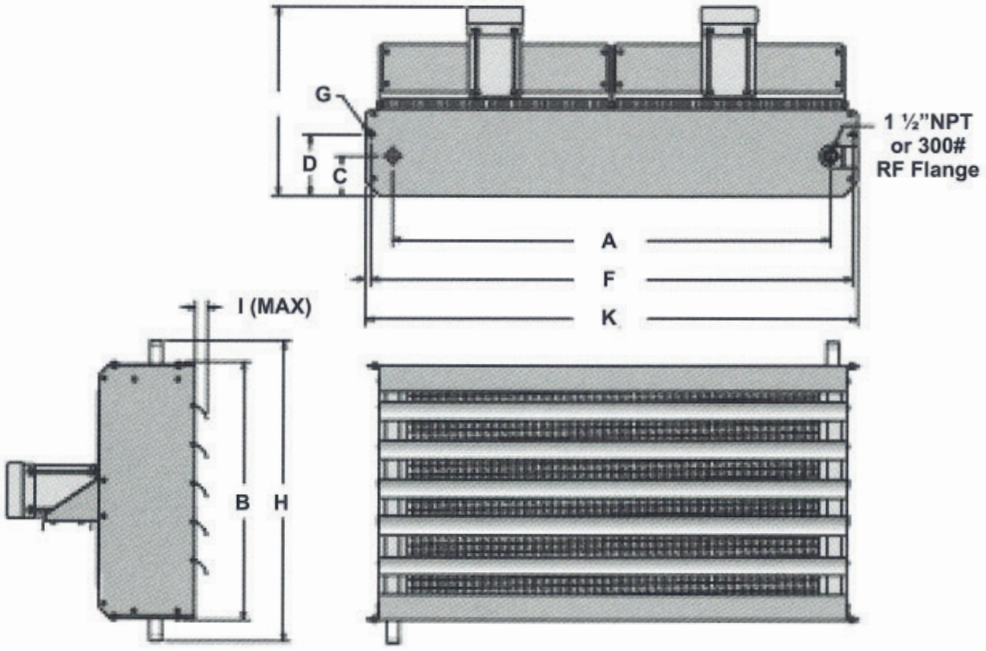
See page 49 for model coding. ① at 70°F at sea level. ② reserves the right to substitute motors of higher horsepower. ③ Add 12 lbs. to flanged units.

AH Physical Dimensions

DIM		AH-12A	AH-16A	AH-20A	AH-24A
A	IN.	15-13/16	19-13/16	23-13/16	27-7/8
	MM	401	503	605	707
B	IN.	19-7/16	23-1/2	27-1/2	31-1/2
	MM	494	596	698	800
C	IN.	4-3/16	4-3/16	4-3/16	4-3/16
	MM	107	107	107	107
D	IN.	7-15/16	7-9/16	7-3/16	6-7/8
	MM	201	192	183	174
E	IN.	23-5/8	23-5/8	23-5/8	23-5/8
	MM	600	600	600	600
F	IN.	18-3/16	22-3/16	26-3/16	30-3/16
	MM	462	564	665	766
G	IN.	9/16	9/16	9/16	9/16
	MM	14.3	14.3	14.3	14.3
H	IN.	23-7/8	27-7/8	31-7/8	35-7/8
	MM	606.5	708.5	809.5	911.5
I	IN.	1-9/16	1-9/16	1-9/16	1-9/16
	MM	39	39	39	39
J	IN.	5/8	5/8	5/8	5/8
	MM	16	16	16	16







DIM		AH-24B TANDEM
A	IN.	52-15/16
	MM	1345
B	IN.	31-1/2
	MM	800
C	IN.	4-13/16
	MM	122
D	IN.	7-7/16
	MM	189
E	IN.	24-3/16
	MM	615
F	IN.	58-1/4
	MM	1480
G	IN.	9/16
	MM	14.3
H	IN.	36-7/8
	MM	937
I	IN.	2-1/16
	MM	53
J	IN.	5/8
	MM	16
K	IN.	59-1/2
	MM	1512

BASE MODEL

SERIES | FAN | HEAT EXCHANGER | CABINET | MOTOR

AH - 12A - A1A1 - A1 - 1A

FAN	
12”	12A
16”	16A
20”	20A
24”	24A
24” tandem	24B
A=Standard single fan B=Standard dual fan	

FINNED TUBING						
TUBING	WALL THICKNESS	ROWS	FINNING			
			FIN/ INCH	MATERIAL	TYPE	
5/8”	.065”	3	10	AL	TW	A
1”	.083”	2	9	AL	EX	B
1”	.135”	2	5	AL	EX	C
TW = Tension Wound EX = Extruded AL = Aluminum						

TUBESIDE PASSES	
1 - Pass	1
3 - Pass	3
5 - Pass	5
7 - Pass	7

CONNECTIONS	
1-1/2” NPT male Sch.40	A
1-1/2” 300# RF flange	B

EXCHANGER COATINGS	
Heat resistant aluminum paint	1
① Heresite® phenolic coating	2

④ MOTOR ELECTRICAL SPECS.			
	VOLTS	PHASE	HERTZ
A	115	1	60
⑤ B	208	1	60
⑤ C	208	3	60
D	230	1	60
E	230	3	60
③ F	460	1	60
G	460	3	60
H	575	3	60
③ I	220	1	50
③ J	380	3	50
③ K	440	3	50

MOTOR ENCLOSURE	
1	Totally enclosed
2	X-proof, groups C,D,E,F, & G

DISCHARGE TYPE	
1	2-way aluminum louvers

CABINET MATERIAL	
A	Epoxy powder coated carbon steel
①,② B	Heresite® phenolic coated carbon steel

Note: units utilize a standard motor. Specifying any other O.E.M. Motor may result in longer lead times.

① Heresite® coated exchangers and cabinets, contact factory time 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 230 volts, but is suitable for 208 volt operation.

5/8" Tension-wound Finned Tubing (10 fins/inch) — AH-16A-A1 Single Pass

PSIG		Entering Air Temperature (°F) -10	0	20	40	60	70	80
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)	75.9	83.0	97.0	110.6	123.8	130.4	138.8
50	OUTPUT (MBH)	267.6	257.0	236.4	216.4	197.0	187.6	178.2
	COND. (LBS./HR)	290.0	278.6	256.2	234.5	213.5	203.2	193.0
	FAT (°F)	109.2	116.6	131.0	145.0	158.6	165.3	171.9
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	283.1
	FAT (°F)	126.4	133.9	148.5	162.8	176.6	183.4	190.1
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)	148.0	155.6	170.6	185.1	199.3	206.2	213.0

1" Extruded Finned Tubing (9 fins/inch) — AH-16A-B1 Single Pass

PSIG		Entering Air Temperature (°F) -10	0	20	40	60	70	80
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)	73.2	80.4	94.5	108.3	121.8	128.4	135.0
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)	105.4	112.8	127.4	141.6	155.4	162.2	168.9
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)	122.0	129.6	144.4	158.8	172.8	179.7	186.5
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)	142.9	150.6	165.6	180.3	194.7	201.7	208.6

1" Extruded Finned Tubing (5 fins/inch) — AH-16A-C1 Single Pass

PSIG		Entering Air Temperature (°F) -10	0	20	40	60	70	80
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)	54.1	61.9	77.5	92.8	107.8	115.3	122.6
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)	78.5	86.6	102.5	118.2	133.6	141.1	148.7
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)	91.1	99.3	115.4	131.3	146.8	154.5	162.1
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)	106.9	115.2	131.6	147.7	163.5	171.3	179.0

For 50 Hz power supply, derate output by 10%. For model coding, refer to page 49. Above figures are based on calculations at sea level.
MBH = million Btu/hr **COND** = Condensate Flow **FAT** = Final Air Temperature.

5/8" Tension-wound Finned Tubing (10 fins/inch) — AH-12A-A1 Single Pass

PSIG		Entering Air Temperature (°F) -10	0	20	40	60	70	80
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)	72.9	80.2	94.4	108.2	121.7	128.4	134.9
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)	105.2	112.6	127.2	141.5	155.4	162.2	168.9
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)	121.8	129.4	144.2	158.7	172.8	179.7	186.5
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)	142.6	150.4	165.5	180.3	194.7	201.7	208.7

1" Extruded Finned Tubing (9 fins/inch) — AH-12A-B1 Single Pass

PSIG		Entering Air Temperature (°F) -10	0	20	40	60	70	80
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)	66.9	74.3	88.9	103.2	117.2	124.1	130.9
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)	96.8	104.4	119.4	134.1	148.4	155.4	162.4
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)	112.2	119.9	135.1	150.0	164.5	171.7	178.7
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)	131.5	139.4	154.9	170.1	184.8	192.1	199.3

1" Extruded Finned Tubing (5 fins/inch) — AH-12A-C1 Single Pass

PSIG		Entering Air Temperature (°F) -10	0	20	40	60	70	80
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)	59.1	66.8	82.0	96.9	111.5	118.7	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)	85.6	93.5	109.1	124.3	139.3	146.7	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)	99.2	107.3	123.0	138.5	153.7	161.1	168.5
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	135.3
	FAT (°F)	116.3	124.5	140.6	156.3	171.7	179.3	186.8

For 50 Hz power supply, derate output by 10%. For model coding, refer to page 49. Above figures are based on calculations at sea level.
MBH = million Btu/hr **COND** = Condensate Flow **FAT** = Final Air Temperature.

5/8" Tension-wound Finned Tubing (10 fins/inch)

AH-20A-A1 Single Pass


Single Fan

PSIG		Entering Air Temperature (°F) -10	0	20	40	60	70	80
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)	69.4	76.8	91.3	105.4	119.2	126.0	132.7
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)	100.0	107.6	122.5	137.0	151.2	158.2	165.1
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)	115.8	123.5	138.6	153.4	167.8	174.8	181.8
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)	135.5	143.4	158.8	173.9	188.6	195.8	202.9

1" Extruded Finned Tubing (9 fins/inch)

AH-20A-B1 Single Pass


Single Fan

PSIG		Entering Air Temperature (°F) -10	0	20	40	60	70	80
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	165.5
	FAT (°F)	74.8	81.9	96.0	109.7	123.0	129.6	136.1
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)	107.6	115.0	129.4	143.5	157.3	164.0	170.6
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)	124.5	132.0	146.7	161.0	175.0	181.8	188.6
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)	145.7	153.4	168.4	183.0	197.2	204.2	211.1

1" Extruded Finned Tubing (5 fins/inch)

AH-20A-C1 Single Pass


Single Fan

PSIG		Entering Air Temperature (°F) -10	0	20	40	60	70	80
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)	50.6	58.6	74.4	90.0	105.3	112.9	120.4
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)	73.7	81.9	98.1	114.0	129.7	137.4	145.0
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)	85.6	93.9	110.3	126.4	142.2	150.0	157.8
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)	100.5	108.9	125.6	141.9	158.0	165.9	173.8

For 50 Hz power supply, derate output by 10%. For model coding, refer to page 49. Above figures are based on calculations at sea level.
MBH = million Btu/hr **COND** = Condensate Flow **FAT** = Final Air Temperature.

5/8" Tension-wound Finned Tubing (10 fins/inch)

AH-24A-A1 Single Pass


Single Fan

PSIG		Entering Air Temperature (°F)						
		-10	0	20	40	60	70	80
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)	71.5	78.8	93.1	107.0	120.7	127.4	134.0
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)	102.8	110.3	125.1	139.4	153.4	160.3	167.1
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)	119.0	126.6	141.6	156.2	170.4	177.4	184.3
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)	139.2	147.0	162.3	177.2	191.7	198.8	205.9

1" Extruded Finned Tubing (9 fins/inch)

AH-24A-B1 Single Pass


Single Fan

PSIG		Entering Air Temperature (°F)						
		-10	0	20	40	60	70	80
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)	68.4	75.7	90.3	104.5	118.3	125.2	131.9
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)	98.4	106.0	120.9	135.5	149.8	156.8	163.7
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)	113.8	121.5	136.7	151.5	166.0	173.1	180.1
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)	133.2	141.1	156.5	171.6	186.4	193.6	200.8

1" Extruded Finned Tubing (5 fins/inch)

AH-24A-C1 Single Pass


Single Fan

PSIG		Entering Air Temperature (°F)						
		-10	0	20	40	60	70	80
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)	57.2	65.0	80.3	95.3	110.1	117.4	124.6
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)	82.7	90.7	106.4	121.8	136.9	144.4	151.8
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)	95.9	103.9	119.9	135.5	150.8	158.3	165.8
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)	112.3	120.5	136.7	152.6	168.1	175.8	183.4

For 50 Hz power supply, derate output by 10%. For model coding, refer to page 49. Above figures are based on calculations at sea level.
MBH = million Btu/hr **COND** = Condensate Flow **FAT** = Final Air Temperature.

5/8" Tension-wound Finned Tubing (10 fins/inch)

AH-24B-A1 Single Pass


Tandem Fan

PSIG		Entering Air Temperature (°F) -10	0	20	40	60	70	80
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)	63.8	71.3	86.2	100.8	115.0	122.1	129.0
50	OUTPUT (MBH)	951.4	914.1	841.3	770.7	702.2	668.6	635.4
	COND. (LBS./HR)	1,035.0	994.4	915.2	838.3	763.7	727.1	691.0
	FAT (°F)	91.9	99.7	114.9	129.9	144.6	151.8	158.9
100	OUTPUT (MBH)	1,082.5	1,044.1	969.1	896.4	825.8	791.3	757.2
	COND. (LBS./HR)	1,217.6	1,174.3	1,089.8	1,007.9	928.5	889.6	851.2
	FAT (°F)	106.3	114.2	129.7	144.9	159.8	167.1	174.3
200	OUTPUT (MBH)	1,245.6	1,205.7	1,128.1	1,052.8	979.9	944.2	909.0
	COND. (LBS./HR)	1,468.2	1,421.1	1,329.4	1,240.5	1,154.4	1,112.3	1,070.7
	FAT (°F)	124.4	132.5	148.3	163.8	178.9	186.4	193.7

1" Extruded Finned Tubing (9 fins/inch)

AH-24B-B1 Single Pass


Tandem Fan

PSIG		Entering Air Temperature (°F) -10	0	20	40	60	70	80
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)	59.7	67.4	82.5	97.4	112.0	119.2	126.3
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)	86.2	94.1	109.6	124.8	139.8	147.1	154.4
100	OUTPUT (MBH)	994.9	959.5	890.4	823.5	758.5	726.8	695.5
	COND. (LBS./HR)	1,118.2	1,078.3	1,000.5	925.2	852.2	816.4	781.2
	FAT (°F)	99.8	107.8	123.5	139.0	154.1	161.6	169.0
200	OUTPUT (MBH)	1,147.2	1,108.4	1,036.8	967.5	900.3	867.5	835.1
	COND. (LBS./HR)	1,348.7	1,305.3	1,220.8	1,139.0	1,059.8	1,021.1	982.9
	FAT (°F)	116.8	125.0	141.0	156.7	172.1	179.7	187.2

1" Extruded Finned Tubing (5 fins/inch)

AH-24B-C1 Single Pass


Tandem Fan

PSIG		Entering Air Temperature (°F) -10	0	20	40	60	70	80
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)	50.3	58.3	74.1	89.7	105.5	112.6	120.1
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)	73.0	81.2	97.4	113.3	128.9	136.7	144.4
100	OUTPUT (MBH)	777.5	750.0	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)	84.6	92.9	109.3	125.4	141.3	149.1	156.9
200	OUTPUT (MBH)	894.4	865.9	810.4	756.6	704.4	678.9	653.8
	COND. (LBS./HR)	1,050.4	1,016.9	951.5	888.1	826.8	796.7	767.1
	FAT (°F)	99.1	107.6	124.2	140.6	156.7	164.6	172.5

For 50 Hz power supply, derate output by 10%. For model coding, refer to page 49. Above figures are based on calculations at sea level.
MBH = million Btu/hr **COND** = Condensate Flow **FAT** = Final Air Temperature.

5/8" Tension-wound Finned Tubing (10 fins/inch)

50% Ethylene Glycol - 60°F EAT

MODEL	ΔT °F	ENTERING GLYCOL TEMPERATURE (°F)											
		180°F				200°F				220°F			
		OUTPUT MBH	FLOW USGPM	FAT °F	PD PSI	OUTPUT MBH	FLOW USGPM	FAT °F	PD PSI	OUTPUT MBH	FLOW USGPM	FAT °F	PD PSI
AH-12A-A1* *One pass*	10	17.6	3.69	73.3	0.00	21.5	4.45	76.3	0.00	33.6	6.95	85.8	0.01
	20	13.0	1.35	69.7	0.00	16.1	1.65	72.0	0.00	19.3	1.95	74.4	0.00
	40	8.9	0.45	66.4	0.00	11.2	0.56	68.1	0.00	13.6	0.68	69.9	0.00
AH-12A-A3 *Three pass*	10	43.0	9.26	93.7	0.31	56.5	12.0	104.5	0.52	68.1	14.3	113.7	0.73
	20	19.0	2.00	74.4	0.02	34.0	3.59	86.3	0.05	48.8	5.12	98.1	0.10
	40	13.3	0.69	69.9	0.00	16.7	0.86	72.5	0.00	20.4	1.04	75.3	0.01
AH-16A-A1* *One pass*	10	32.1	6.82	75.4	0.01	54.3	11.5	86.4	0.01	80.0	16.8	99.2	0.03
	20	24.0	2.53	71.4	0.00	29.6	3.09	74.1	0.00	35.4	3.65	76.9	0.00
	40	15.8	0.82	67.3	0.00	20.7	1.06	69.6	0.00	25.1	1.28	71.7	0.00
AH-16A-A3 *Three pass*	10	80.3	17.4	99.5	0.74	99.2	21.2	109.0	1.08	118.1	24.9	118.5	1.48
	20	48.6	5.23	83.6	0.08	72.5	7.73	95.5	0.16	97.3	10.3	107.9	0.27
	40	24.3	1.29	71.5	0.01	30.6	1.61	74.6	0.01	37.2	1.93	77.7	0.01
AH-16A-A5 *Five pass*	10	88.0	19.1	103.4	3.96	106.7	22.8	112.8	5.60	125.3	26.5	122.2	7.46
	20	69.0	7.46	93.8	0.65	90.9	9.73	104.8	1.08	109.9	11.6	114.3	1.52
	40	28.6	1.53	73.7	0.03	49.5	2.63	84.0	0.09	74.5	3.94	96.4	0.19
AH-20A-A1* *One pass*	10	61.1	13.1	78.7	0.01	101.6	21.7	91.3	0.03	134.4	28.4	101.6	0.05
	20	40.7	4.34	72.3	0.00	50.1	5.28	75.2	0.00	59.9	6.24	78.1	0.00
	40	25.0	1.32	67.4	0.00	35.0	1.83	70.4	0.00	43.1	2.23	72.9	0.00
AH-20A-A3 *Three pass*	10	123.0	26.7	98.2	1.09	150.4	32.2	106.8	1.56	177.7	37.6	115.5	3.09
	20	86.9	9.41	86.8	0.15	118.5	12.7	96.7	0.26	151.7	16.07	107.2	0.41
	40	40.8	2.19	72.3	0.01	51.3	2.72	75.5	0.02	79.8	4.21	84.4	0.03
AH-20A-A5 *Five pass*	10	132.3	28.7	101.2	5.58	159.4	34.2	109.7	7.77	186.4	39.5	118.2	10.3
	20	111.6	12.1	94.6	1.07	139.3	14.9	103.3	1.59	166.8	17.7	112.0	2.18
	40	49.4	2.66	75.0	0.06	91.1	4.89	88.0	0.19	123.6	6.57	98.2	0.33
AH-24A-A1* *One pass*	10	110.2	23.7	85.4	0.03	156.3	33.3	96.3	0.06	205.1	43.2	107.8	0.09
	20	60.0	6.37	73.6	0.00	73.8	7.75	76.7	0.00	87.7	9.01	79.9	0.01
	40	35.1	1.83	67.8	0.00	49.2	2.56	71.0	0.00	64.0	3.30	74.3	0.00
AH-24A-A3 *Three pass*	10	173.0	37.4	100.4	1.68	210.1	44.9	109.1	2.37	247.1	52.2	117.9	3.15
	20	131.7	14.2	90.5	0.27	177.5	19.0	101.3	0.46	215.4	22.8	110.3	0.64
	40	59.8	3.20	73.6	0.02	74.0	3.91	76.8	0.03	137.5	7.26	91.7	0.08
AH-24A-A5 *Five pass*	10	183.8	39.8	103.0	8.39	220.5	47.2	111.7	11.6	-	-	-	-
	20	158.3	17.2	96.9	1.68	195.7	21.0	105.7	2.45	233.0	24.7	114.5	3.32
	40	93.2	5.04	81.4	0.17	139.6	7.48	92.3	0.35	187.1	9.94	103.5	0.59
AH-24A-A7 *Seven pass*	10	-	-	-	-	-	-	-	-	-	-	-	-
	20	167.2	18.1	99.0	4.98	204.3	21.9	107.8	7.09	241.3	25.6	116.5	9.48
	40	118.1	6.41	87.3	0.69	163.6	8.80	98.0	1.25	201.6	10.7	107.0	1.80
AH-24B-A1* *One pass Tandem*	10	286.4	62.1	94.0	0.25	352.4	75.6	101.9	0.36	418.1	88.6	109.9	0.48
	20	173.8	18.8	80.5	0.03	260.1	27.9	90.8	0.06	335.6	35.6	99.8	0.09
	40	69.2	3.69	67.9	0.00	96.7	5.12	71.2	0.00	156.0	8.22	78.2	0.01
AH-24B-A3 *Three pass Tandem*	10	330.2	71.7	99.3	7.73	394.6	84.7	107.1	10.4	458.8	97.3	114.9	13.5
	20	290.2	31.6	94.5	1.67	355.7	38.3	102.3	2.35	420.8	44.7	110.2	3.12
	40	194.0	10.6	82.9	0.22	269.8	14.6	91.9	0.39	348.2	18.6	101.4	0.61
AH-24B-A5 *Five pass Tandem*	10	-	-	-	-	-	-	-	-	-	-	-	-
	20	308.7	33.6	96.7	8.14	373.4	40.2	104.5	11.12	437.9	46.6	112.3	14.7
	40	239.5	13.1	88.3	1.41	312.2	16.9	97.1	2.23	378.3	20.2	105.0	3.07
AH-24B-A7 *Seven pass Tandem*	10	-	-	-	-	-	-	-	-	-	-	-	-
	20	-	-	-	-	-	-	-	-	-	-	-	-
	40	261.0	14.3	90.9	4.35	326.9	17.7	98.9	6.37	392.4	21.0	106.7	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 page 49. Above figures are based on calculations at sea level.

1" Extruded Finned Tubing (9 fins/inch)

50% Ethylene Glycol - 60°F EAT

MODEL	ΔT °F	ENTERING GLYCOL TEMPERATURE (°F)											
		180°F				200°F				220°F			
		OUTPUT MBH	FLOW USGPM	FAT °F	PD PSI	OUTPUT MBH	FLOW USGPM	FAT °F	PD PSI	OUTPUT MBH	FLOW USGPM	FAT °F	PD PSI
AH-12A-B1* *One pass*	10	9.1	1.83	66.6	0.00	11.2	2.22	68.0	0.00	13.3	2.61	69.6	0.00
	20	6.6	0.64	64.6	0.00	8.2	0.78	65.6	0.00	9.7	0.93	66.8	0.00
	40	4.4	0.21	62.9	0.00	5.6	0.26	63.7	0.00	6.8	0.31	64.5	0.00
AH-12A-B3 *Three pass*	10	26.7	5.68	80.4	0.05	42.0	8.88	92.4	0.11	53.1	11.1	101.2	0.17
	20	10.1	1.03	67.3	0.00	12.5	1.25	69.1	0.00	14.6	1.47	70.6	0.00
	40	6.8	0.34	64.8	0.00	8.6	0.42	66.0	0.00	10.5	0.51	67.4	0.00
AH-16A-B1* *One pass*	10	17.4	3.61	68.4	0.00	21.4	4.37	70.3	0.00	25.4	5.13	72.3	0.00
	20	12.6	1.27	65.9	0.00	15.5	1.56	67.3	0.00	18.6	1.84	68.8	0.00
	40	8.4	0.41	63.8	0.00	10.6	0.51	64.8	0.00	12.9	0.62	65.9	0.00
AH-16A-B3 *Three pass*	10	57.2	12.3	88.9	.013	78.6	16.8	99.9	0.23	96.7	20.4	109.2	0.34
	20	19.2	2.01	69.3	0.00	32.9	3.44	76.2	0.01	59.6	6.24	89.9	0.03
	40	13.0	0.66	66.1	0.00	16.4	0.83	67.8	0.00	20.0	1.00	69.5	0.00
AH-16A-B5 *Five pass*	10	72.5	15.7	96.8	0.91	90.3	19.3	106.0	1.37	108.1	22.8	115.2	1.91
	20	44.1	4.73	82.1	0.09	68.6	7.31	94.7	0.21	86.9	9.16	104.1	0.32
	40	15.8	0.82	67.6	0.00	20.0	1.03	69.6	0.00	24.3	1.24	71.7	0.01
AH-20A-B1* *One pass*	10	29.2	6.14	69.4	0.00	36.1	7.43	71.5	0.00	80.3	16.8	86.5	0.01
	20	21.0	2.18	66.7	0.00	26.3	2.66	68.2	0.00	31.1	3.15	69.9	0.00
	40	14.0	0.71	64.3	0.00	18.0	0.88	65.4	0.00	21.5	1.06	66.6	0.00
AH-20A-B3 *Three pass*	10	102.9	22.2	94.3	0.28	130.8	28.0	103.8	0.43	158.6	33.5	113.2	0.62
	20	32.1	3.37	70.4	0.01	79.3	8.45	86.3	0.04	119.2	12.6	99.7	0.09
	40	21.7	1.13	66.9	0.00	27.5	1.42	68.7	0.00	33.4	1.71	70.6	0.00
AH-20A-B5 *Five pass*	10	118.6	25.7	99.7	1.65	146.0	31.3	109.0	2.43	173.3	36.7	118.3	3.32
	20	83.0	8.98	87.6	0.22	116.5	12.5	98.9	0.41	144.6	15.3	108.4	0.60
	40	26.4	1.39	68.5	0.01	33.4	1.74	70.7	0.01	78.1	4.12	85.7	0.05
AH-24A-B1* *One pass*	10	43.6	9.14	70.4	0.00	79.4	16.7	79.3	0.01	127.2	26.6	91.8	0.01
	20	31.9	3.29	67.5	0.00	39.4	4.02	69.2	0.00	47.2	4.76	71.1	0.00
	40	21.4	1.08	64.9	0.00	27.1	1.35	66.2	0.00	32.9	1.63	67.5	0.00
AH-24A-B3 *Three pass*	10	136.2	29.4	93.7	0.35	170.4	36.4	102.3	0.53	204.5	43.1	110.8	0.74
	20	74.3	7.94	78.1	0.03	117.7	12.5	88.9	0.07	162.3	17.1	100.1	0.12
	40	32.7	1.70	67.7	0.00	41.3	2.13	69.7	0.00	50.2	2.56	71.8	0.00
AH-24A-B5 *Five pass*	10	152.5	33.0	97.8	1.99	186.1	39.8	106.3	2.86	219.7	46.4	114.7	3.86
	20	119.9	13.0	89.6	0.33	154.3	16.5	98.2	0.52	188.7	19.9	106.8	0.75
	40	39.2	2.06	69.3	0.01	73.8	3.90	77.9	0.03	119.7	6.31	89.3	0.08
AH-24A-B7 *Seven pass*	10	160.2	34.6	99.8	5.90	193.5	41.4	108.1	8.34	226.9	47.9	116.5	11.2
	20	133.1	14.4	92.9	1.07	167.2	17.9	101.4	1.63	201.2	21.3	110.0	2.28
	40	65.9	3.53	76.0	0.07	109.4	5.84	86.8	0.19	153.1	8.11	97.8	0.35
AH-24B-B1* *One pass Tandem*	10	202.8	43.9	84.7	0.04	277.9	59.5	93.9	0.07	339.4	71.8	101.5	0.10
	20	81.3	8.66	69.7	0.00	117.0	12.4	74.0	0.00	214.9	22.7	86.0	0.01
	40	44.1	2.30	65.1	0.00	65.6	3.42	67.7	0.00	85.3	4.41	70.0	0.00
AH-24B-B3 *Three pass Tandem*	10	282.8	61.4	94.6	1.81	342.5	73.4	102.0	2.53	402.1	85.2	109.4	3.36
	20	231.7	25.2	88.3	0.33	292.7	31.4	95.8	0.50	353.6	37.5	103.3	0.70
	40	81.9	4.39	69.7	0.01	176.6	9.47	81.4	0.05	249.3	13.3	90.3	0.10
AH-24B-B5 *Five pass Tandem*	10	298.9	64.9	96.6	8.94	358.1	76.8	104.0	12.3	-	-	-	-
	20	259.7	28.2	91.7	1.82	319.9	34.3	99.2	2.63	379.9	40.3	106.6	3.55
	40	173.1	9.42	81.0	0.23	247.4	13.3	90.1	0.44	309.1	16.5	97.8	0.64
AH-24B-B7 *Seven pass Tandem*	10	-	-	-	-	-	-	-	-	-	-	-	-
	20	273.0	29.7	93.4	5.33	332.7	35.8	100.8	7.56	392.2	41.7	108.2	10.1
	40	208.3	11.4	85.4	0.86	269.7	14.6	92.9	1.36	330.7	17.6	100.5	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 49. Above figures are based on calculations at sea level.

5/8" Tension-wound Finned Tubing (10 fins/inch)

Water - 60°F EAT

		ENTERING WATER TEMPERATURE (°F)											
		180°F				200°F				220°F			
MODEL	ΔT °F	OUTPUT MBH	FLOW USGPM	FAT °F	PD PSI	OUTPUT MBH	FLOW USGPM	FAT °F	PD PSI	OUTPUT MBH	FLOW USGPM	FAT °F	PD PSI
AH-12A-A1* *One pass*	10	37.6	7.29	89.4	0.01	50.4	9.75	99.5	0.01	64.3	12.4	110.6	0.02
	20	18.9	1.79	74.4	0.00	23.6	2.23	78.0	0.00	37.2	3.55	88.7	0.00
	40	13.2	0.61	69.8	0.00	16.9	0.79	72.7	0.00	20.9	0.97	75.7	0.00
AH-12A-A3 *Three pass*	10	53.7	10.5	102.3	0.35	64.9	12.6	111.3	0.51	76.1	14.7	120.3	0.69
	20	42.5	4.13	93.3	0.06	55.6	5.39	103.7	0.10	67.0	6.48	112.8	0.14
	40	18.6	0.88	74.2	0.00	31.7	1.52	84.4	0.01	46.0	2.21	95.8	0.02
AH-16A-A1* *One pass*	10	72.3	14.1	95.5	0.02	94.2	18.3	106.5	0.03	113.0	21.9	115.9	0.04
	20	34.2	3.28	76.4	0.00	58.2	5.62	88.3	0.00	81.7	7.89	100.0	0.01
	40	24.0	1.14	71.4	0.00	30.8	1.46	74.7	0.00	38.0	1.80	78.1	0.00
AH-16A-A3 *Three pass*	10	91.7	17.9	105.3	0.69	110.1	21.4	114.5	0.98	128.5	25.0	123.8	1.32
	20	78.2	7.63	98.5	0.13	96.9	9.43	107.8	0.20	115.6	11.2	117.2	0.28
	40	44.0	2.13	81.3	0.01	67.0	3.25	92.7	0.03	87.9	4.26	1032.2	0.04
AH-16A-A5 *Five pass*	10	95.6	18.7	107.3	3.37	113.9	22.2	116.5	4.73	132.2	25.7	125.7	6.30
	20	85.1	8.31	102.0	0.70	103.6	10.1	111.2	1.02	122.1	11.9	120.5	1.39
	40	62.2	3.03	90.4	0.10	83.8	4.08	101.2	0.18	102.7	4.98	110.7	0.26
AH-20A-A1* *One pass*	10	117.1	22.9	96.3	0.03	144.4	28.1	104.9	0.04	171.6	33.4	113.5	0.06
	20	68.1	6.61	72.2	0.00	103.4	10.0	91.9	0.01	134.6	13.1	101.7	0.01
	40	40.3	1.93	72.2	0.00	51.4	2.47	75.6	0.00	63.2	3.02	79.2	0.00
AH-20A-A3 *Three pass*	10	136.7	26.7	102.5	0.95	163.4	31.9	111.0	1.34	190.2	37.0	119.5	1.79
	20	119.3	11.7	97.0	0.19	146.4	14.3	105.6	0.28	173.5	16.9	114.1	0.39
	40	78.4	3.82	84.1	0.02	109.2	5.31	93.7	0.04	142.0	6.90	104.1	0.07
AH-20A-A5 *Five pass*	10	141.4	27.7	104.0	4.58	168.0	32.8	112.5	6.37	194.6	37.9	120.9	8.45
	20	127.6	12.5	99.6	0.98	154.4	15.1	108.1	1.41	181.3	17.6	116.6	1.91
	40	100.7	4.92	91.2	0.17	128.2	6.25	99.8	0.26	155.6	7.57	108.4	0.37
AH-24A-A1* *One pass*	10	165.9	32.4	98.7	0.04	202.9	39.5	107.4	0.07	239.9	46.6	116.2	0.09
	20	113.2	11.0	86.2	0.01	156.3	15.2	96.3	0.01	196.9	19.1	105.9	0.02
	40	59.0	2.82	73.4	0.00	75.2	3.59	77.1	0.00	92.2	4.40	81.0	0.00
AH-24A-A3 *Three pass*	10	188.8	36.9	104.2	1.42	225.2	43.9	112.8	1.98	261.6	50.8	121.4	2.63
	20	167.3	16.3	99.0	0.30	204.1	19.9	107.7	0.43	240.9	23.4	116.4	0.59
	40	118.7	5.77	87.4	0.04	159.0	7.73	96.9	0.07	201.3	9.77	106.9	0.11
AH-24A-A5 *Five pass*	10	194.4	38.0	105.5	6.73	230.6	44.9	114.1	9.32	266.7	51.8	122.7	12.3
	20	176.9	17.3	101.3	1.47	213.4	20.8	110.0	2.09	249.9	24.3	118.6	2.82
	40	142.8	6.97	93.2	0.26	180.0	8.76	102.0	0.40	217.2	10.6	110.8	0.57
AH-24A-A7 *Seven pass*	10	-	-	-	-	-	-	-	-	-	-	-	-
	20	181.5	17.7	102.4	4.13	217.8	21.2	111.0	5.85	254.2	24.7	119.7	7.85
	40	150.6	7.35	95.0	0.77	187.7	9.14	103.8	1.16	224.7	10.91	112.6	1.62
AH-24B-A1* *One pass Tandem*	10	323.2	63.3	98.5	0.22	387.5	75.7	106.2	0.30	451.7	88.0	114.0	0.40
	20	278.4	27.3	93.0	0.05	343.6	33.6	100.9	0.07	408.7	39.8	108.7	0.09
	40	155.7	7.58	78.3	0.00	239.4	11.7	88.3	0.01	313.4	15.2	97.1	0.02
AH-24B-A3 *Three pass Tandem*	10	345.6	67.8	101.2	5.92	409.2	80.0	108.9	8.09	472.7	92.2	116.6	10.6
	20	317.3	31.1	97.8	1.35	381.4	37.3	105.5	1.89	445.4	43.4	113.2	2.51
	40	261.4	12.8	91.0	0.26	326.7	16.0	98.8	0.39	391.8	19.1	106.7	0.54
AH-24B-A5 *Five pass Tandem*	10	-	-	-	-	-	-	-	-	-	-	-	-
	20	326.7	32.0	98.9	6.26	390.5	38.2	106.6	8.72	454.2	44.3	114.3	11.5
	40	277.8	13.6	93.0	1.26	342.7	16.8	100.8	1.83	407.3	19.9	108.6	2.50
AH-24B-A7 *Seven pass Tandem*	10	-	-	-	-	-	-	-	-	-	-	-	-
	20	-	-	-	-	-	-	-	-	-	-	-	-
	40	285.5	14.0	93.9	3.48	350.2	17.1	101.7	5.03	414.6	20.2	109.5	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 49. Above figures are based on calculations at sea level.

1" Extruded Finned Tubing (9 fins/inch)

Water - 60°F EAT

		ENTERING WATER TEMPERATURE (°F)											
		180°F				200°F				220°F			
MODEL	ΔT °F	OUTPUT MBH	FLOW USGPM	FAT °F	PD PSI	OUTPUT MBH	FLOW USGPM	FAT °F	PD PSI	OUTPUT MBH	FLOW USGPM	FAT °F	PD PSI
AH-12A-B1* *One pass*	10	13.8	2.55	70.2	0.00	31.5	6.03	84.1	0.00	44.3	8.48	94.1	0.00
	20	10.2	0.93	67.4	0.00	12.8	1.17	69.3	0.00	15.6	1.43	71.4	0.00
	40	6.8	0.30	64.8	0.00	8.8	0.39	66.2	0.00	10.9	0.49	67.7	0.00
AH-12A-B3 *Three pass*	10	44.5	8.64	94.6	0.09	55.2	10.7	103.0	0.14	65.9	12.7	111.5	0.20
	20	28.3	2.72	81.7	0.01	42.4	4.09	92.8	0.02	53.3	5.13	101.4	0.03
	40	10.3	0.47	67.5	0.00	13.2	0.61	69.7	0.00	18.1	0.84	73.4	0.00
AH-16A-B1* *One pass*	10	46.8	9.06	83.5	0.00	67.2	13.0	93.9	0.00	89.2	17.2	105.3	0.01
	20	19.3	1.82	69.4	0.00	24.3	2.28	71.8	0.00	29.4	2.70	74.3	0.00
	40	13.0	0.60	66.1	0.00	16.8	0.77	68.0	0.00	20.8	0.96	69.9	0.00
AH-16A-B3 *Three pass*	10	78.3	15.3	99.8	0.17	95.7	18.6	108.8	0.25	113.2	22.0	117.9	0.35
	20	60.5	5.88	90.6	0.03	78.2	7.59	99.7	0.04	96.0	9.29	108.8	0.07
	40	19.5	0.92	69.5	0.00	32.5	1.55	76.0	0.00	57.3	2.75	88.7	0.01
AH-16A-B5 *Five pass*	10	84.5	16.5	103.0	0.91	101.8	19.8	112.0	1.31	119.1	23.1	121.0	1.78
	20	70.9	69.1	96.0	0.17	88.5	8.60	105.0	0.25	106.1	10.3	114.1	0.36
	40	40.4	1.95	80.2	0.01	60.6	2.93	90.5	0.03	81.9	3.96	101.5	0.06
AH-20A-B1* *One pass*	10	87.6	17.1	89.1	0.01	120.9	23.5	100.4	0.01	148.6	28.8	109.8	0.02
	20	32.3	3.07	70.4	0.00	41.0	3.89	73.3	0.00	88.4	8.52	89.2	0.00
	40	21.7	1.01	66.9	0.00	28.0	1.31	68.9	0.00	34.7	1.62	71.1	0.00
AH-20A-B3 *Three pass*	10	126.0	24.6	102.2	0.30	153.0	29.8	111.4	0.44	179.9	35.0	120.6	0.60
	20	101.6	9.92	93.9	0.05	129.0	12.6	103.2	0.08	156.4	15.2	112.5	0.12
	40	31.7	1.52	70.3	0.00	74.8	3.62	84.7	0.01	106.7	5.16	95.4	0.01
AH-20A-B5 *Five pass*	10	134.1	26.2	105.0	1.54	160.8	31.4	114.1	2.20	187.5	36.5	123.2	2.97
	20	115.3	11.3	98.6	0.30	142.5	13.9	107.8	0.44	169.6	16.5	117.0	0.62
	40	75.4	3.67	85.0	0.03	108.1	5.26	96.0	0.07	135.8	6.59	105.4	0.10
AH-24A-B1* *One pass*	10	126.2	24.5	91.2	0.01	160.0	31.1	99.6	0.01	193.9	37.5	108.1	0.02
	20	47.5	4.50	71.4	0.00	90.1	8.65	81.9	0.00	132.5	12.7	92.5	0.00
	40	32.5	1.51	67.6	0.00	41.8	1.95	69.9	0.00	51.8	2.41	72.2	0.00
AH-24A-B3 *Three pass*	10	160.2	31.3	99.8	0.35	193.3	37.6	108.1	0.51	226.5	43.9	116.4	0.69
	20	133.5	13.0	93.0	0.06	167.1	16.2	101.4	0.10	200.8	19.5	109.9	0.14
	40	68.2	3.28	76.6	0.00	109.6	5.29	86.9	0.01	153.3	7.40	97.8	0.02
AH-24A-B5 *Five pass*	10	168.5	32.9	101.9	1.77	201.4	39.2	110.1	2.50	234.3	45.5	118.4	3.35
	20	147.8	14.4	96.6	0.35	181.1	17.6	105.0	0.52	214.4	20.8	113.3	0.72
	40	108.8	5.29	86.8	0.05	142.7	6.92	95.2	0.09	176.7	8.55	103.7	0.13
AH-24A-B7 *Seven pass*	10	172.4	33.7	102.9	5.01	205.2	40.0	111.1	7.02	238.0	46.2	119.4	9.37
	20	154.6	15.1	98.3	1.04	187.7	18.3	106.7	1.51	220.8	21.4	115.0	20.7
	40	120.3	5.86	89.7	0.17	154.1	7.48	98.1	0.27	187.8	9.10	106.6	0.39
AH-24B-B1* *One pass Tandem*	10	272.2	53.3	93.3	0.05	331.8	64.8	100.7	0.07	391.3	76.2	108.1	0.10
	20	203.2	19.8	84.7	0.01	275.0	26.8	93.6	0.01	335.5	32.6	101.1	0.02
	40	80.9	3.89	69.6	0.00	112.1	5.39	73.4	0.00	204.3	9.88	84.7	0.00
AH-24B-B3 *Three pass Tandem*	10	306.5	60.0	97.6	1.51	365.1	71.3	104.8	2.10	243.7	82.5	112.1	2.79
	20	273.1	26.7	93.4	0.32	332.4	32.5	100.7	0.46	391.6	38.1	108.1	0.63
	40	209.4	10.2	85.5	0.05	269.8	13.2	92.9	0.08	330.2	16.1	100.4	0.12
AH-24B-B5 *Five pass Tandem*	10	314.7	61.7	98.6	7.13	373.1	72.9	105.8	9.86	431.5	84.0	113.1	13.0
	20	287.5	28.2	95.2	1.56	346.3	33.8	102.5	2.23	405.2	39.5	109.8	3.00
	40	234.1	11.5	88.6	0.28	294.0	14.4	95.9	0.343	353.9	17.2	103.4	0.61
AH-24B-B7 *Seven pass Tandem*	10	-	-	-	-	-	-	-	-	-	-	-	-
	20	294.2	28.8	96.0	4.39	352.9	34.5	103.3	6.21	411.5	40.1	110.6	8.31
	40	245.8	12.0	90.0	0.82	305.5	14.9	97.4	1.23	365.0	17.8	104.8	1.72

* - 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 27. Above figures are based on calculations at sea level.

Defender®
Explosion-Proof Thermostats

Defender® Explosion-Proof Thermostats

Ruffneck™ Defender® explosion-proof, heavy-duty thermostats are the smallest, lightest, and most durable thermostats available. They are designed to control heating only, cooling only, or ventilation systems in demanding industrial applications. These include oil refineries, petrochemical 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, trouble-free service available. The Defender® Thermostat's unique and highly engineered design offers outstanding features and benefits.

More Features...More 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 max.
- 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
Enclosure: NEMA Type 7 & 9

Electrical Rating

22 Amps Res., 480 VAC Max.;
1/2 HP @ 125 VAC, 1 HP @ 250 VAC
Class I, Divisions 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

Approvals

UL Listed & C.S.A. Certified

Patents

Pat. 08/583,929 USA
Pat. Pending 2,151,641 CAN
Des. Pat. 376,109 USA; Rd. 1996, 78975 CDN

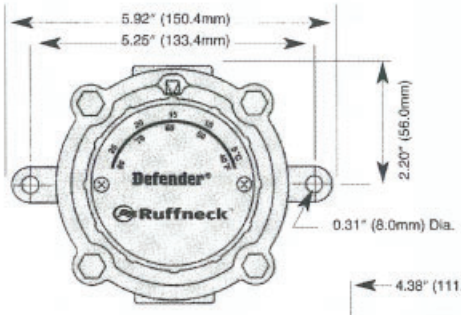
Available in two models...

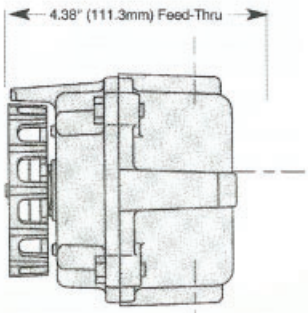
XT-311 (Feed-Thru, Single Pole, Single Throw)

For heating-only applications.

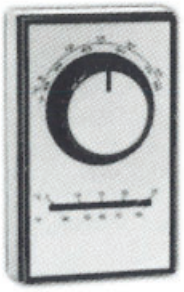
XT-312 (Feed-Thru, Single Pole, Double Throw)

For heating or cooling/ventilation applications.





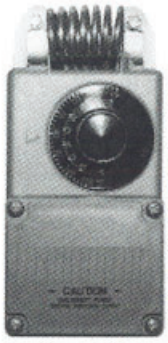
ET5-S Standard Ruffneck™ Thermostat (Heating Only)



Heavy Duty Line Voltage Thermostat

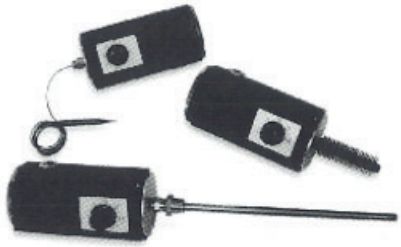
- Temp. range: (5 - 25°C/40 - 80°F)
- 22 Amps., 277 VAC
- 3/4 HP @ 125 VAC
- 1-1/2 HP @ 250/277 VAC
- ET5-S (Heating Only)
- Approximate Shipping Weight:
  0.6 lbs (0.28 kg)

TF115 Raintight Resistant Thermostat NEMA 4X



- Temp. range: (4 - 30°C/40 - 100°F)
- 25 Amps Res., 480 VAC MAX
- Full load = 16 Amps @ 120 VAC
  12 Amps @ 240 VAC
  Lock Rotor = 80 Amps @ 120 VAC
  60 Amps @ 240 VAC
- Approximate Shipping Weight:
  0.69 lbs (0.31 kg)

XTB Explosion-Proof Thermostat



- Temp. range: (-18 to 40°C/0 to 100°F)
- Class 1 Division 1 Group A,B,C & D. Class 1 Division 2 Group 2 E,F & G. Class 1 Division 3
- Remote sensing bulb with 57 in. capillary length
- Electrical rating: 15 Amps Res., 600 VAC MAX - 25 Amps Res., 277 MAX
- Approximate Shipping Weight:
  3.8 lbs (1.7 kg)

XTW Explosion-Proof Thermostat

- Temp. range: (-18 to 40°C/0 to 100°F)
- Class 1 Division 1 Group A,B,C & D. Class 1 Division 2 Group 2 E,F & G. Class 1 Division 3
- Sensing bulb in Finned Thermowell for Air Sensing
- Electrical rating: 15 Amps Res., 600 VAC MAX - 25 Amps Res., 277 MAX
- Approximate Shipping Weight:
  4.0 lbs (1.8 kg)

XTD8-S Explosion-Proof Room Thermostat

- Temp. range: (5 - 25°C/40 - 80°F)
- Class I, Groups C&D; Class II, Groups E,F&G
- Feed-thru model (includes explosion-proof plug)
- 3/4" - 14 NPT conduit opening (½"conduit adapter included)

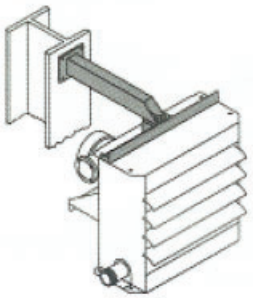
NOTE: All 3 phase motors on AH, HP and FR heaters require a motor starter (supplied by others).

- single pole, double throw
- 22 Amps., 277 VAC MAX
- 3/4 HP @ 125 VAC
- 1-1/2 HP @ 250/277 VAC
- Approximate Shipping Weight:
  5.3 lbs (2.4 kg)

Mounting Kits

BMK

Basic Mounting Kit (BMK)*

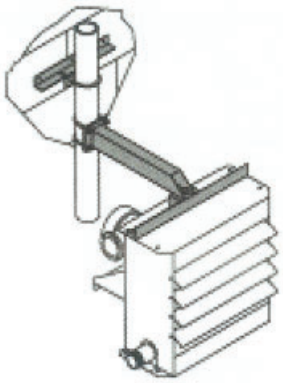


The BMK is suitable for applications where the support arm can be bolted or welded directly to structural steel or concrete.

Model	Approximate Shipping Weight Lbs.	Kg.
FX4 (3,5,7.5 & 10 kW)	16.5	7
FX4 (15 & 20 kW)	18.2	8
FX4 (25, 30 & 35 kW)	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

PMK

Pipe Mounting Kit (PMK)*

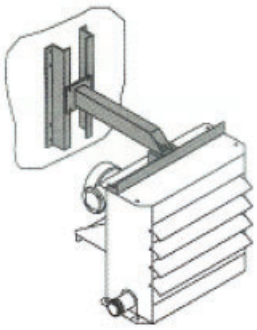


Particularly useful in buildings with insufficient structural strength to use other types of mounts. Requires 3" pipe (3-1/2" O.D.) (not supplied).

Model	Approximate Shipping Weight Lbs.	Kg.
FX4 (3,5,7.5 & 10 kW)	2.7	11
FX4 (15 & 20 kW)	25.4	12
FX4 (25, 30 & 35 kW)	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

WMK

Wall Mounting Kit (WMK)*

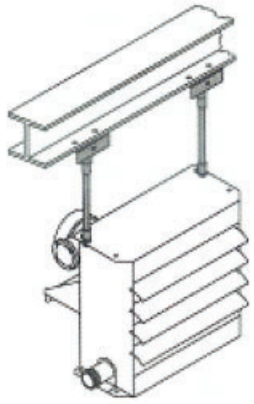


Ideal for use in buildings that have substantial walls. The Z sections provide additional support where necessary.

Model	Approximate Shipping Weight Lbs.	Kg.
FX4 (3,5,7.5 & 10 kW)	24.3	11
FX4 (15 & 20 kW)	25.4	12
FX4 (25, 30 & 35 kW)	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

HMK

Hanging Mounting Kit

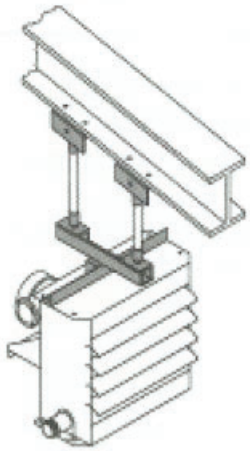


Simple and economical if an adequate overhead structure exists. Requires 1/2" pipe, cut and threaded (not supplied).

Model	Approximate Shipping Weight Lbs.	Kg.
All FX4	4.5	2
All HP/FR	4.5	2
All AH	4.5	2

SHMK

Swivel Hanging Mounting Kit (SHMK)*



Swivels 360°. Requires 1/2" pipe, cut and threaded (not supplied).

Model	Approximate Shipping Weight Lbs.	Kg.
FX4 (3,5,7.5 & 10 kW)	18.2	8
FX4 (15 & 20 kW)	19.4	9
FX4 (25, 30 & 35 kW)	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

NOTE:

Mounting kits are made of steel with a 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).

How to Order Mounting Kits:

When ordering mounting kits, specify the type of kit required and the basic model of the heater to be mounted.

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

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:

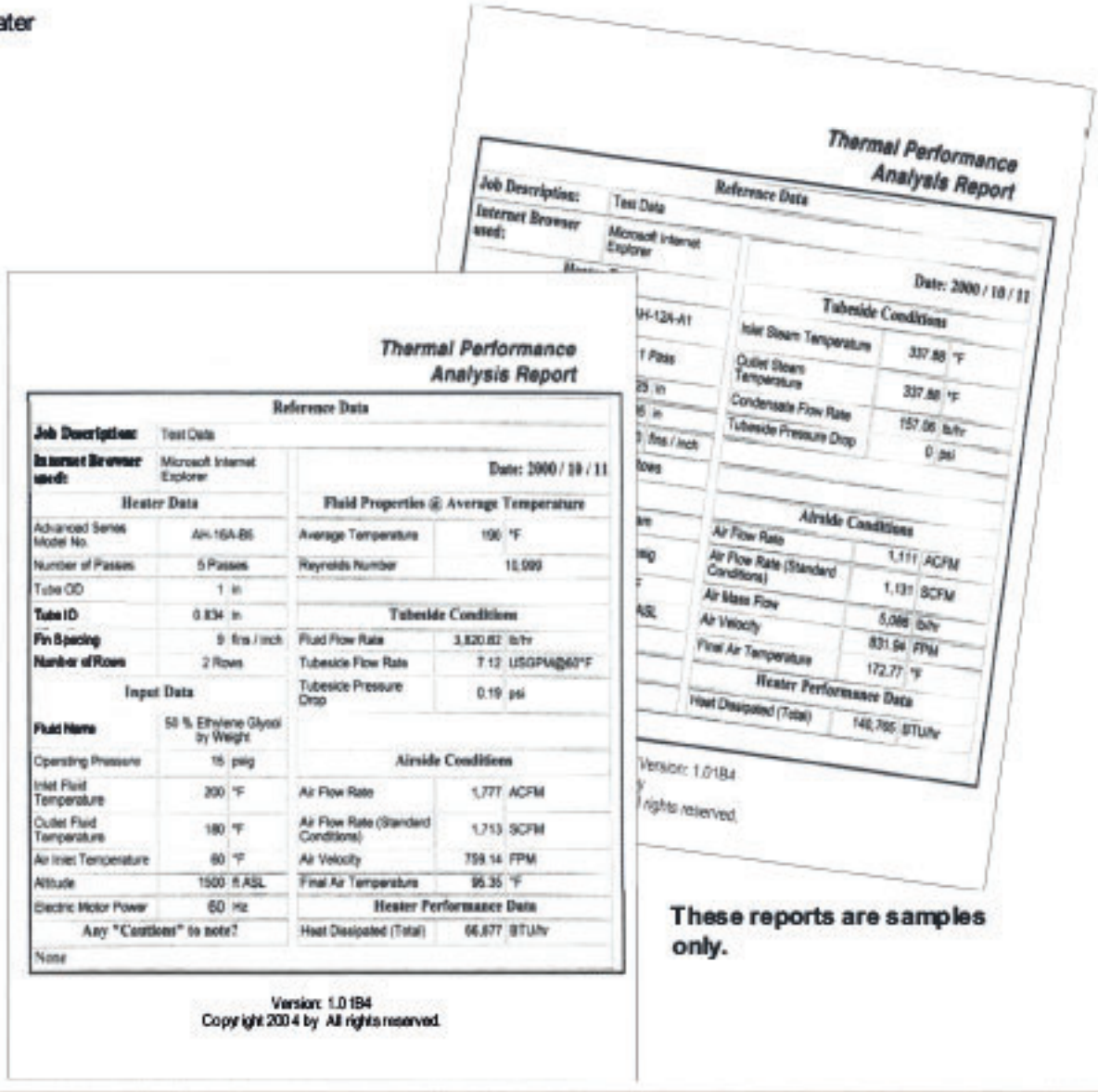
- Steam
- Ethylene/Glycol/Water
- Water
- Triethylene Glycol/Water
- Dowtherm G
- Dowtherm A
- Dowtherm E
- Therminol FR-1
- Therminol 66
- Humbletherm 500
- Mobiltherm 600
- Sun 21 Thermal Oil
- SAE 20 Lube Oil
- SAE 30 Lube Oil

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

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 seal 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.



Thermal Performance Analysis Report

Reference Data

Job Description:	Test Data
Internet Browser used:	Microsoft Internet Explorer

Date: 2000 / 10 / 11

Heater Data	
Advanced Series Model No.	AH-16A-B6
Number of Passes	6 Passes
Tube OD	1 in
Tube ID	0.834 in
Fin Spacing	9 fins / inch
Number of Rows	2 Rows

Input Data		
Fluid Name	50 % Ethylene Glycol by Weight	
Operating Pressure	15	psig
Inlet Fluid Temperature	200	°F
Outlet Fluid Temperature	180	°F
Air Inlet Temperature	60	°F
Altitude	1500	ft ASL
Electric Motor Power	60	Hz

Any "Cautions" to note?

None

Fluid Properties @ Average Temperature		
Average Temperature	190	°F
Reynolds Number	10,000	

Tubeside Conditions		
Fluid Flow Rate	3,820.82	lb/hr
Tubeside Flow Rate	7.12	USGPM@60°F
Tubeside Pressure Drop	0.19	psi

Airside Conditions		
Air Flow Rate	1,777	ACFM
Air Flow Rate (Standard Conditions)	1,713	SCFM
Air Velocity	759.14	FPM
Final Air Temperature	95.35	°F

Heater Performance Data		
Heat Dissipated (Total)	66,877	BTU/hr

Version: 1.01B4
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These reports are samples only.

PROPERTIES OF STEAM

GAUGE PRESSURE (PSIG)	TEMPERATURE (°F)	LATENT HEAT (BTU/LB)	DENSITY (LB/FT³)
2	219	965	0.0434
10	239	952	0.0612
20	259	939	0.0855
40	287	919	0.1351
60	307	904	0.1818
80	324	891	0.2127
100	338	880	0.2564
150	366	857	0.3634
200	387	838	0.4686
250	406	820	0.5720
450	460	764	1.0000

ABBREVIATIONS USED

1. BTU = British Thermal Unit
2. MBH = BTU/HR x 1000
3. EAT = Entering Air Temperature
4. FAT = Final Air Temperature
5. USGPM = U.S. Gallons Per Minute
6. PD = Pressure Drop, psi
7. PSIG = Pounds Per Sq. In. Gauge Pressure
8. $\triangle T$ = Liquid Temperature Differential
9. CFM = Cubic Feet Per Minute
10. FPM = Feet Per Minute
11. COND. = Condensate Flow

USEFUL FORMULAS

1. Condensate, (LB/HR) = $\frac{\text{actual BTU/HR}}{\text{Latent Heat of Steam at PSIG}}$

2. Specific heat of air from 0°F to 150°F = 0.24 BTU/LB °F

3. Weight of one cubic foot of air at 70°F = .075 LB

4. BTU/HR = CFM x Air Temp, Rise (°F) x 1.08
   (Note: 1.08 = .24 x .075 x 60)

5. Water temperature drop (°F) = $\frac{\text{actual BTU/HR}}{500 \times \text{USGPM}}$

6. CFM at FAT = CFM at 70°F x $\left(\frac{460 + \text{FAT}}{460 + 70}\right)$

7. CFM at 70°F = CFM at FAT x $\left(\frac{460 + 70}{460 + \text{FAT}}\right)$

8. Air temperature rise (°F) = $\frac{\text{actual BTU/HR}}{1.08 \times \text{CFM}}$

9. Final air temperature (°F) EAT + Temp. Rise

10. 1 Boiler Horsepower = 33,478.8 BTU/Hr at 70 psi

11. 1 Boiler Horsepower = 30 LB/Hr of feed water at 100°F converted to steam at 70 psi

12. 1 U.S. Gallon of water = 8.34 pounds of water

13. 1 Imperial Gallon of water = 10 pounds of water

14. 1 psi pressure drop = 27.6 inches of water

15. 1 kW = 3,414 BTU/Hr

16. 1 U.S. Gallon = 0.83267 Imperial Gallons

17. 1 U.S. Gallon = 3.785 Litres

18. °C = 5/9 (°F - 32)

EQUIVALENT RESISTANCE OF VALVE AND FITTINGS

PIPE SIZE	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
1 1/4"	37	1.3	8	8	2.3	3.5	1.6	1.3
1 1/2"	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
2 1/2"	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:
BTU/HR= td x C x 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 BTU/HR heat loss for 1 foot of 2" pipe at 316°F (70 PSI) steam temperature inside with an ambient air temperature of -34°F outside.

td = 350°F (-34°F to 316°F)
C = 7.29
S = 2.375" O.D. X x 12" = .62
144 sq. in. per sq. f

BTU/HR = 350 x 7.29 x .6218

BABCOCK FORMULA FOR STEAM FLOW

$$\text{PRESSURE DROP (PSI)} = \frac{.000130W^2L}{p\,d^5}\left(1+\frac{3.6}{d}\right)$$

WHERE: W = Steam Flow Rate, lb. per min.

L = Length pf Pipe, ft.
p = .0434 for 2 PSIG Steam
.0612 for 10 PSIG Steam
.0855 for 20 PSIG Steam
.1351 for 40 PSIG Steam
.1818 for 60 PSIG Steam
.2127 for 80 PSIG Steam
.2564 for 100 PSIG Steam
d = Inside dia. of Pipe, in.

EXAMPLE Calculate pressure drop for 100 ft. of 2" sch. 40 pipe used to deliver all the steam of a 100 hp boiler (3000 lb/hr) at 80 PSI.

WHERE: W = 50 L = 100 p = .2127 nd = 2.067

$$\text{PRESSURE DROP (PSI)} = \frac{.0001307 \times 50^2 \times 100}{.2127 \times 2.067^5}\left(1+\frac{3.6}{2.067}\right)$$

PRESSURE DROP (PSI) = 11.16

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	VOLT	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	VOLT	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.

Heat Exchanger
Shall be a heavy-duty welded steel construction using 5/8" dia. X .065" average wall thickness carbon steel tubing with tension wound close fitting aluminum fins .014" thickness x 7/16" 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 1/2". (Size 36 models shall be welded design of perforated sheet steel, powder coated to match the heater).

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

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 (CE) Code, Part 1 Section 18, available from the Canadian Standards Association.

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

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, benzine, butane, cyclopropane, ethanol, gasoline, hexane, methanol, methane, natural gas, propane, or gases or vapors of equivalent hazard.

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, and chemicals.

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

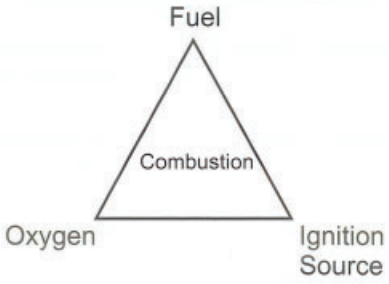
Group I	Atmospheres containing explosive gas in underground coal mines. Electrical apparatus that is intended for use in underground mines.
Group IIC	Atmospheres containing acetylene, hydrogen (H2), or gases of equivalent hazard.
Group IIB	Atmospheres containing acetaldehyde, ethylene, or gases or vapors of equivalent hazard.
Group IIA	Atmospheres containing acetone, ammonia, ethyl alcohol, gasoline, methane, propane, or gases or vapors of equivalent hazard.
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.

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 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 CE Section 18), Group, and maximum surface operating temperature or temperature code referenced to a 40°C (104°F) 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 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.

Maximum Surface Temperature Codes

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

MISSION STATEMENT

To be recognized as a world-wide industry leader in heating technology. We will provide our customers with the broadest based industry knowledge, expertise and products in space and process heating.

To create an internal environment promoting participation, teamwork, training and development for our employees.

To deliver the highest possible quality standards and continue to build a loyal customer base through dedicated customer service.

To promote continuous improvement in all existing product lines and develop and market a wide range of quality heating products through a commitment to research and development.

is a leader in advanced heating solutions. We offer our customers the broadest based industry knowledge, expertise and industrial heating products. In addition to our focus on product quality, we are setting a new industry standard for customer service.

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This catalog presents the products manufactured by under the Ruffneck™ brand name.

Ruffneck™ , a key brand of , has a broad product line including heat-exchanger unit heaters, explosion-proof electric air heaters, industrial electric air heaters and explosion-proof thermostats. Established in 1975, Ruffneck™ has a long and proud history of supplying quality products to a worldwide customer base. All products are designed for rugged, industrial applications and Ruffneck™ is well known for its "ship the heat in a week" policy in which 95% of all standard orders are shipped within one week. The acquisition of Ruffneck™ has enhanced position as one of North America's leading manufacturers of industrial heating equipment.

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