

FR Series Heat Exchanger Unit Heater

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

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

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

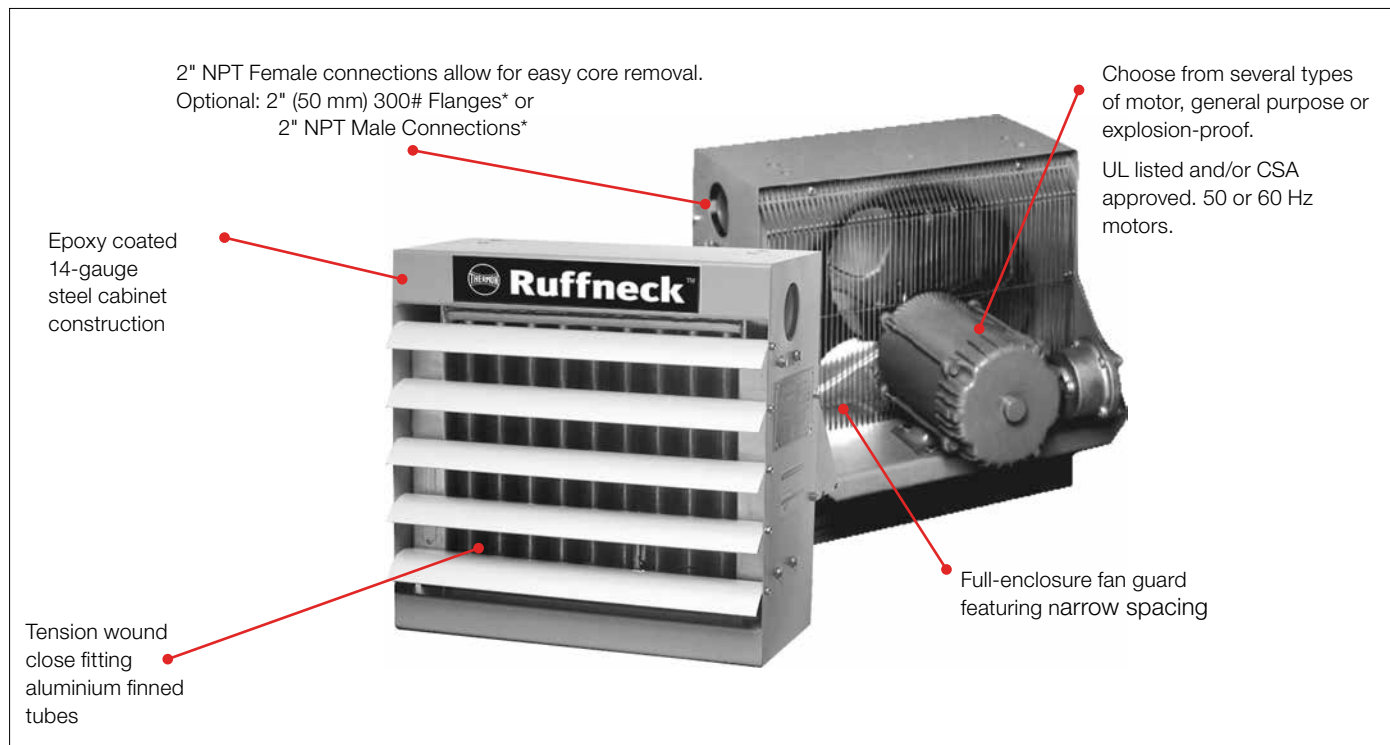
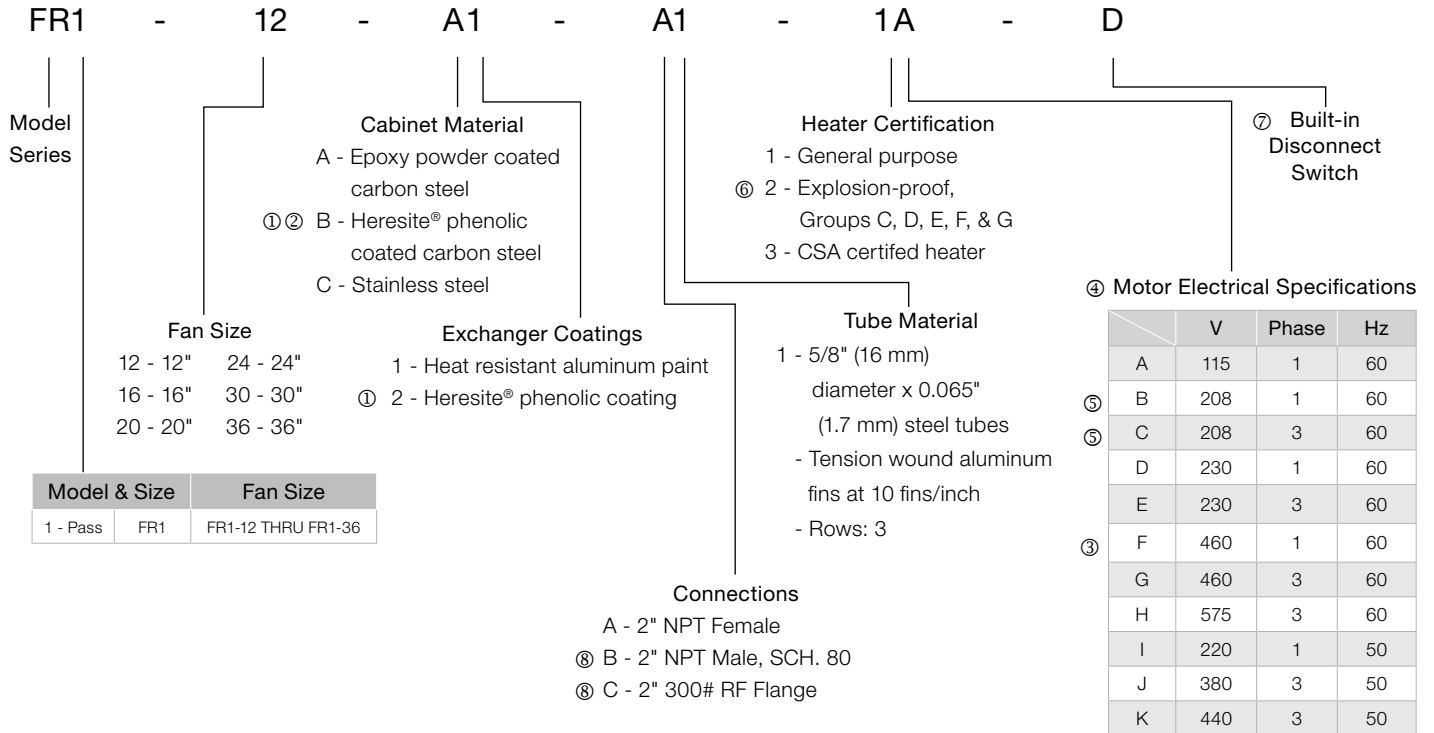


Figure 29

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

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

Model Coding



NOTE:

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

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

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

FR Single-Pass

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

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

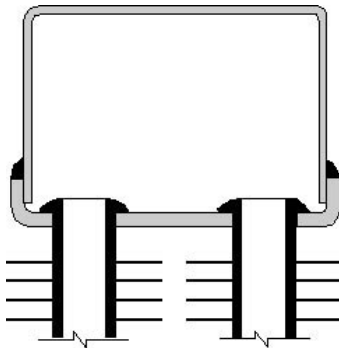


Figure 30

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

Table 34 – Performance Data for FR1-12

Entering Steam Parameters		Entering Air Temperature °F										
psig	°F		-10	0	10	20	30	40	50	60	70	80
2	219	OUTPUT (MBH)	-	-	-	57.3	54.1	50.8	47.7	44.6	41.5	38.4
		COND. (lbs/hr)	-	-	-	57.9	54.6	51.4	48.2	45.0	41.9	38.8
		FAT (°F)	-	-	-	67.4	75.7	83.8	91.9	100.0	107.9	115.8
10	239	OUTPUT (MBH)	-	-	-	63.7	60.4	57.1	53.8	50.6	47.5	44.4
		COND. (lbs/hr)	-	-	-	65.3	61.8	58.5	55.2	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

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

For 50 Hz power supply, derate output by 10%

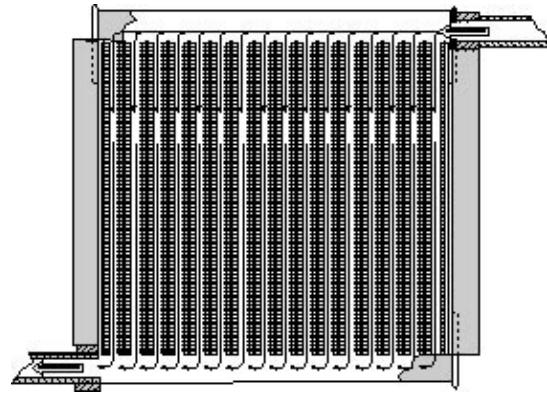


Figure 31

Optional Built-in Disconnect Available

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

Table 35 – Performance Data for FR1-16

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

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

Table 36 – Performance Data for FR1-20

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

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

Table 37 – Performance Data for FR1-24

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

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

Table 38 – Performance Data for FR1-30

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

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

Table 39 – Performance Data for FR1-36

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

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

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

Specifications

FR1-12

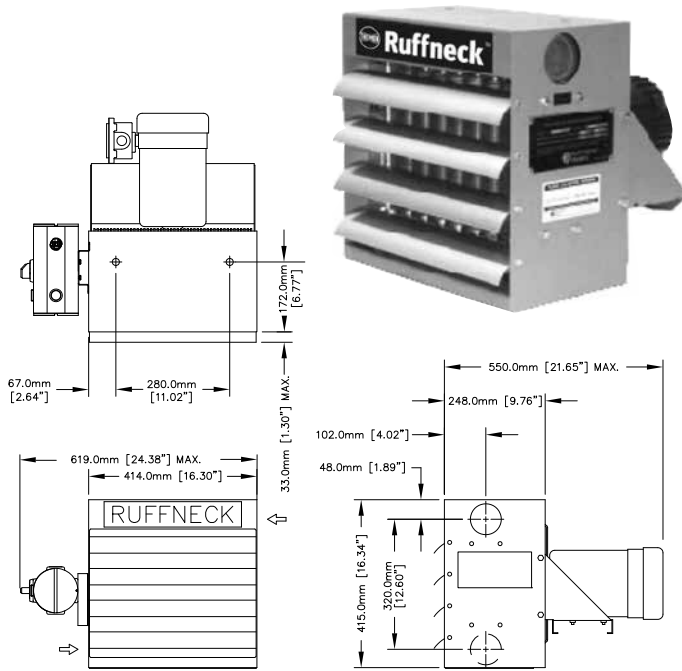


Figure 32

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

General

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

Heat Exchanger

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

FR1-16

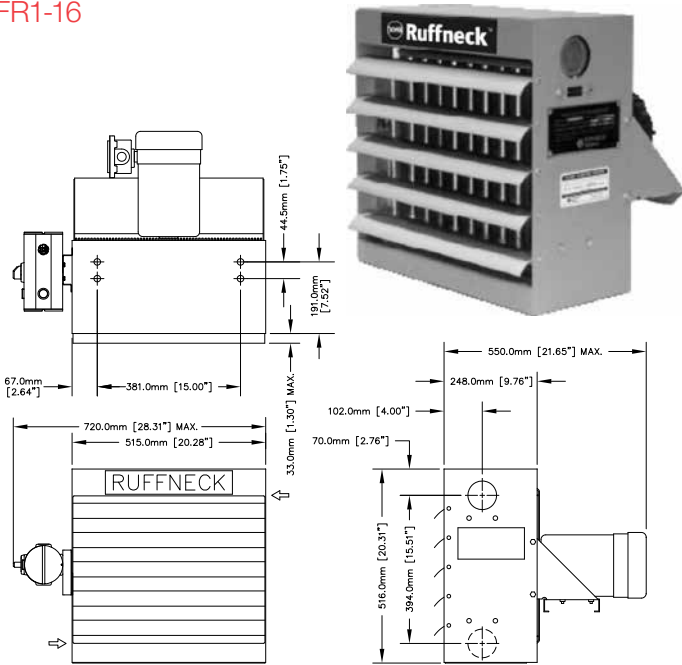


Figure 33

* At 70°F (21°C) at sea level

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

General

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

Heat Exchanger

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

Max. Operating Temp. 572°F (300°C)

FR1-20

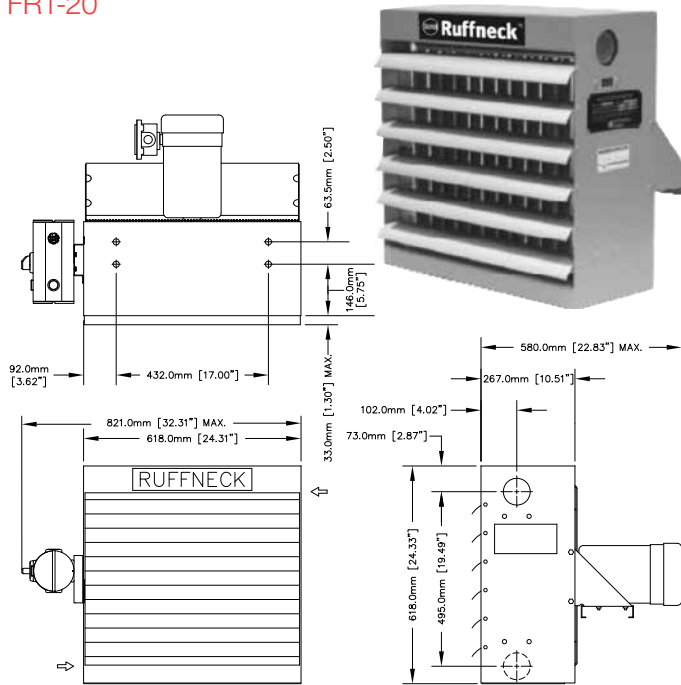


Figure 34

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

General

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

Heat Exchanger

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

FR1-24

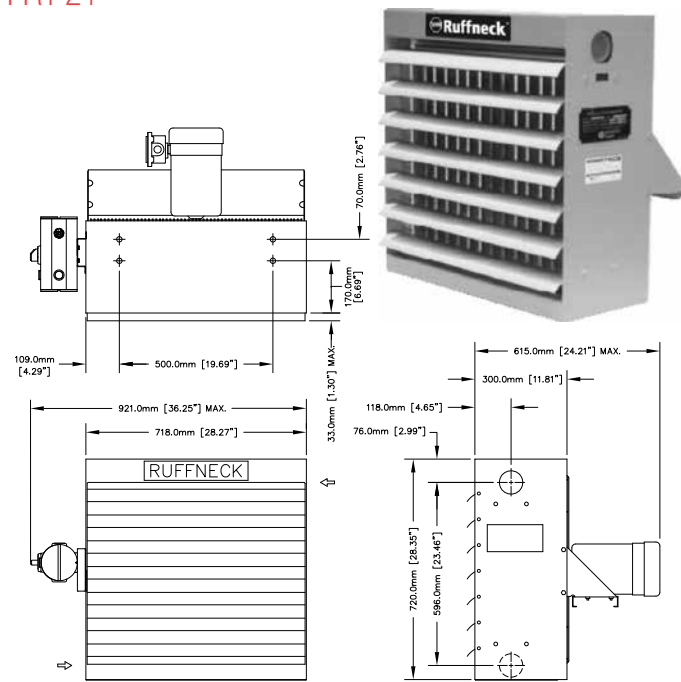


Figure 35

* At 70°F (21°C) at sea level

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

General

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

Heat Exchanger

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

FR1-30

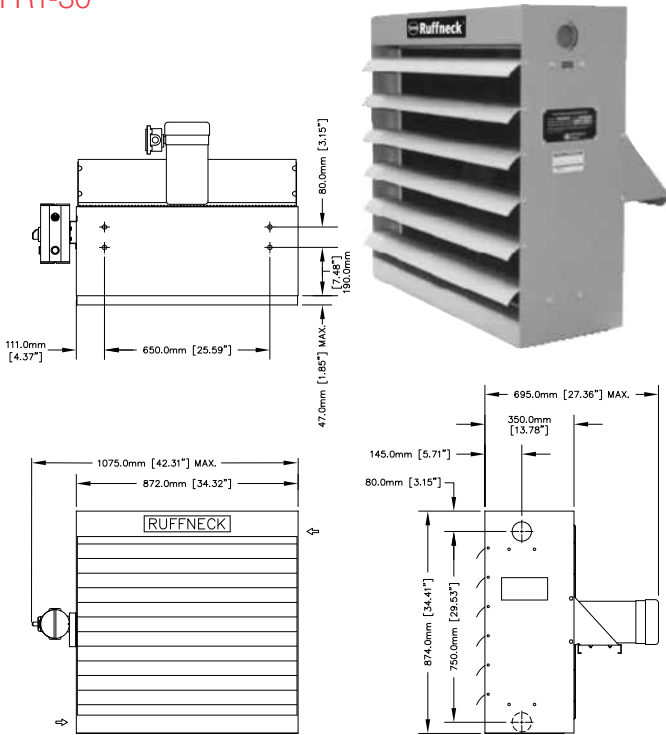


Figure 36

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

General

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

Heat Exchanger

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

FR1-36

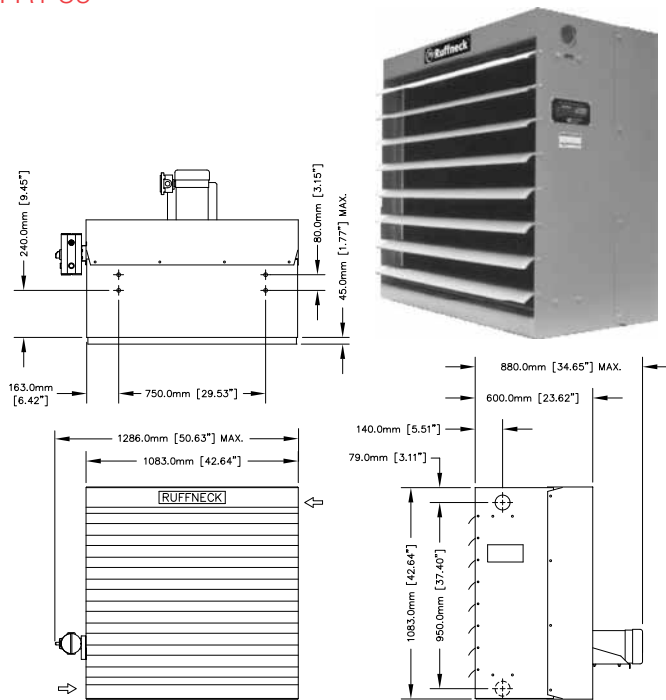


Figure 37

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

General

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

Heat Exchanger

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