



Typical Specifications for Dynaforce Hydronic Heating Boilers

Condensing Models DR(H) 0600 – DR(H) 5000

The heating boiler shall be a CAMUS Dynaforce® model _____ having an input rating of _____ Btu/hr (kW). and _____ Btu/hr (kW) output for hydronic heating.

The hydronic heating boiler shall be design certified by UL and shall meet the requirements of ANSI Z21.13, and CSA 4.9. The heating boiler shall be vented as a Category II or IV condensing appliance.

Performance Overview:

- Boiler shall operate up to 99% thermal efficiency.
- Heat exchanger shall be a fully condensing vertical cylindrical counter-flow water tube design with 439 grade tubes and 316L grade headers of stainless steel construction and all welded design with constant allowable system return temperatures of 40F.
- Fine-tuned combustion premix providing homogeneous air and gas combustion mix to a radial burner incorporating a knitted stainless steel wrap ensuring stable light off and efficient clean combustion.
- Up to 10:1 gas input turn-down ratio with sustained efficient combustion characteristics throughout entire modulating range.
- Oxides of Nitrogen (NOx) of 9 ppm corrected to 3% oxygen.
- Category II venting certification with Category II and IV venting options.
- The boiler is fully factory fire tested to obtain optimum combustion characteristics and to establish certified gas input rates.
- System safety and operating devices and controls are fully configured, calibrated and factory tested.
- Models consist of an input range of 300 MBTUH to 4999 MBTUH.
- The boiler shall comply with the energy efficiency requirements of the latest edition of the ASHRAE 90.1 Standard.

Combustion Chamber:

The combustion chamber shall be an all welded stainless steel construction and an integral part of the heat exchanger which shall be an all welded vertical cylindrical stainless steel counter-flow design consisting of an upper section for primary heat transfer and a lower section for extracting latent heat from flue gases. Stainless steel access heat exchanger wraps shall be provided for ease of service and inspection of the external heat exchanger and an easily removable radial fired knitted fiber stainless steel burner to access the internal combustion chamber for inspection, service, and cleaning. A window view port shall be provided for visual inspection of the boiler combustion during firing.

Heat Exchanger:

The stainless steel heat exchanger shall be inspected and tested to A.S.M.E. Section IV requirements. The A.S.M.E. Section IV seal of approval will not be provided as standard for jurisdictions not requiring the A.S.M.E. Section IV seal of approval. The stainless steel heat exchanger shall be a 12 pass construction with a maximum working pressure of 160 psig (1100 kPa). The heat exchanger shall be of 439 grade stainless steel welded construction with a vertical cylindrical counter-flow water tube design complete with integral 439 grade stainless steel finned heat transfer tubes and 316L waterways. The heat exchanger design shall be capable of 40°F constant system return temperatures and have a fully condensing heat exchanger complete with condensate trap and drains. A pressure relief valve of _____ lb/hr shall be furnished with the heater.

Gas Train:

The gas train shall consist of a pressure regulating electro-hydraulic proportional air/gas main gas actuator providing a slow opening, fast closing shutoff valve and proportional 1:1 air/gas ratio control, a fast closing safety shutoff gas pressure regulator with 1 PSI allowable static pressure, and a low gas pressure switch. Optional high gas pressure switch is available. A factory pre-set combination metering valve and orifice shall be provided for setting combustion parameters. Models DR 600 – DR 5000 operate with a 5:1 turndown ratio. Models DR 600 – 1800 are available to operate with a 10:1 turndown ratio.

Burner/Combustion:

The combustion air fan draws gas under negative pressure and mixes it with air to generate a fine-tuned air gas mixture which is delivered under positive pressure to the radial knitted stainless steel burner. Combustion modulation is established by either a pulse width modulation signal on models (DR600 – DR1000) or by a variable frequency drive on models (DR1200 – DR5000). The burner shall be a 100% stainless steel vertical mounted radial fired type with stainless knitted metal fiber construction. The burner shall combust a precise amount of premixed combustion air and gas to provide equal distribution of heat for heat transfer throughout the entire heat exchanger. Combustion products are exhausted under minimum back pressure. Combustion operates with a 5:1 (or available 10:1 on DR600 – 1800 models) turn down ratio while sustaining combustion characteristics throughout the entire modulating range. Operation of up to 99% thermal efficiency and shall be certified for Oxides of Nitrogen (NOx) of 9 ppm corrected to 3% oxygen.



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Firing Mode:

The burner combustion shall operate as proportional modulating with a 5:1 turndown ratio with a minimum 20% firing rate. Models 600 – 1800 are available to modulate with a 10:1 turndown ratio with a minimum 10% firing rate. Multiple boiler "Cascade" firing algorithms are proportional modulation. Light off shall be at no more than 50% input to assure rumble free soft start. Combustion shall be optionally suitable for natural gas, propane and dual fuels operation.

Controls:

Standard controls include a SOLA electronic proportional integrated combination ignition limit/operator control accurate to 1°F (0.5°C) having a 4-20 mA output signal suitable for control of a variable frequency motor drive or a pulse width modulation signal output for modulating fan speeds. Controls are lead lag "Cascade" ready for control of up to eight boilers c/w Indoor outdoor reset and lead lag control. Control shall be equipped and ready with 4-20 mA remote set point or modulating control, capable with 0-10 VDC remote set point or modulating control. Control is BMS Modbus RTU protocol ready and capable of other alternate protocol conversions with additional optional gateway protocol converter. Control shall be supplied with a mounted touchscreen display which shall also provide for control system configuration and set up, readouts of boiler target, differential and inlet/outlet temperatures as well as accumulated runtime, enunciator diagnostics, and firing rates. Touchscreen display shall provide full diagnostics including real time data logging and support for up to eight (8) boilers in "Cascade" sequencing application, Modbus ready. The complete control package shall be mounted on the front panel with a hinged door for easy access to all control modules. The boiler safety control string shall be furnished with controls for low gas pressure, optional high gas pressure, fan air proving, blocked flue, water pressure, high limit, stack limit and flow switch. A flow switch shall be installed on the boiler outlet. Additional control safeties shall include flue gas stack temperature, flame rectification, fan speed, and auto recycling high limit.

Ignition Module:

The ignition module shall employ a direct igniter with 3 tries for ignition followed by lockout for DR 600 - DR 2500. A proven pilot is used on DR 3000 – DR 5000. Trial for ignition shall proceed with 15 seconds between retries. Ignition control shall include times for pre-purge, pre-ignition, ignition, and post purge.

Venting Options

The following venting options shall be utilized:

- Category II Venting – single or combined vent*
- Category IV Outside Air (Horizontal & Vertical)
- Category IV Through-wall Venting (Horizontal & Vertical)
- Outdoor Venting
- Category II & IV Direct Venting

* Category II combined vent shall only employ an engineered designed vent system prepared by a certified vent manufacturer

The following category II and IV optional vent materials shall be utilized

- Stainless or AL29-4C for all system applications
- PPE or polypropylene for all system applications
- PVC for select low temperature systems only – consult factory
- CPVC for domestic hot water systems and select low temperature systems – consult factory

External Jacket and Fasteners:

The external jacket shall be of 430 stainless steel mirror finish panels and a powder paint coated access top cover assembled utilizing interference fit locks and minimal non-strip self-tapping screws for ease of removal and access to the heat exchanger and combustion air/gas control.



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Heat Exchanger Water Content

Model	Water Content (Gal)
600	6.6
800	6.6
1000	8.9
1200	8.9
1400	9.6
1600	9.9
1800	9.9
2000	11.4
2500	13.2
3000	15.6
3500	18.6
4000	18.6
4500	20.1
5000	21.2

Input and Output

Model	Input [MBTU/hr]	Output [MBTU/hr]	5:1 Minimum Input [MBTU/hr]	10:1 Minimum Input [MBTU/hr]
0600	600	564	120	60
0800	800	752	160	80
1000	1000	940	200	100
1200	1200	1137	240	120
1400	1400	1327	280	140
1600	1600	1516	320	160
1800	1800	1706	360	180
2000	2000	1896	400	--
2500	2500	2362	500	--
3000	3000	2835	600	--
3500	3500	3307	700	--
4000	4000	3780	800	--
4500	4500	4252	900	--
5000	4999	4725	1000	--

Voltage Requirement

Model	Voltage Requirement	Max Amp Draw – Boiler Only
600 – 2000	120VAC, 60Hz	20
2500	120VAC, 60Hz	30
3000 – 3500	208/230VAC, 60Hz*	30
4000 – 5000	208/230VAC, 60Hz, 3 Phase**	30
1200 – 5000 ^Δ	460VAC, 60Hz, 3 Phase	10

*This is a 4-wire power supply requiring two (2) lives, a neutral and a ground

**This is a 5-wire power supply requiring three (3) lives, a neutral and a ground

^Δ Optional power supply available upon request

Heat Exchanger Head Loss & Flow

Size	Output Max Btu/hr	10°F		15°F		20°F		25°F	
		Flow (GPM)	ΔP-Ft.	Flow (GPM)	ΔP-Ft.	Flow (GPM)	ΔP-Ft.	Flow (GPM)	ΔP-Ft.
600	564,000	112.7	29.07	75.1	14	56.3	7.75	--	--
800	752,000	150.3	51.45	100.2	24.32	75.1	14	--	--
1000	940,000	187.8	76.22	125.2	34.19	93.9	21.9	75.1	13.04
1200	1,137,600	227.3	106.6	151.6	49	113.7	28.38	90.9	19.53
1400	1,327,200	265.2	129	176.8	59.3	132.6	33	106.1	20.7

Head loss is for boiler only with no piping

Size	Output Max Btu/hr	25°F		30°F		35°F		40°F	
		Flow (GPM)	ΔP-Ft.	Flow (GPM)	ΔP-Ft.	Flow (GPM)	ΔP-Ft.	Flow (GPM)	ΔP-Ft.
1600	1,516,800	121.2	15.87	101	11.02	86.6	8.1	75.8	5.95
1800	1,706,400	136.4	19.26	113.7	13.47	97.4	10.03	85.2	7.77
2000	1,896,000	151.6	21.6	126.3	14.77	108.3	10.9	94.7	7.78
2500	2,362,500	188.8	37	157.4	25.25	134.9	17.93	118	13.8
3000	2,835,000	226.6	37	188.8	26.5	161.9	19.35	141.6	15.3
3500	3,307,500	264.4	42.82	220.3	30.1	188.8	22.22	165.2	16.77
4000	3,780,000	302.2	55.07	251.8	38.41	215.8	28.65	188.8	22.22
4500	4,252,500	339.9	66.31	283.3	47.8	242.8	35.21	212.4	26.72
5000	4,725,000	377.7	71	314.7	48.8	269.8	36.04	236.1	27.95

Head loss is for boiler only with no piping



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Date: _____

Quote No.: _____

Engineer: _____

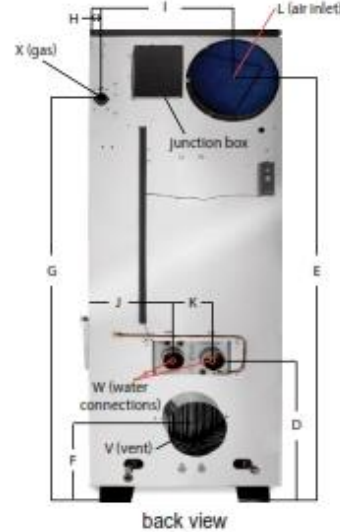
Prepared by: _____

Job Name: _____

Job Location: _____

Buyers Name: _____

Buyers Address: _____



Dynaforce Dimensional Data

Model	Dim. "A"	Dim. "B"	Dim. "C"	Dim. "D"	Dim. "E"	Dim. "F"	Dim. "G"	Dim. "H"	Dim. "I"	Dim. "J"	Dim. "K"	Ø Dim. "L" Air Inlet*	Ø Air Inlet up to 100 Ft. Equiv. Length	Ø Dim. "V" Vent CAT. IV up to 100 Ft. Equiv. Length (as shipped)	Ø Dim. "V" Vent CAT. II	Dim. "M"	Ø Dim. "W" Water	Ø Dim. "X" Gas	Shipping Weight (lbs)
600	25"	27"	55 1/4"	18 1/2"	46"	11 1/2"	45 7/8"	10 1/2"	4 5/8"	12"	6"	8"	6"	5"	6"	5"	2"	1"	585
800	25"	27"	55 1/4"	18 1/2"	46"	11 1/2"	45 7/8"	10 1/2"	4 5/8"	12"	6"	8"	6"	6"	6"	5"	2"	1"	640
1000	25"	27"	65"	20 3/4"	57"	13"	57 3/4"	10 3/8"	4 3/8"	12"	6"	8"	8"	6"	7"	5"	2 1/2"	1"	750
1200	29 3/8"	31 3/4"	70 1/2"	20 3/4"	59 1/2"	13"	56 3/8"	1 7/8"	23 1/4"	12"	6"	10"	8"	7"	8"	5"	2 1/2"	1 1/4"	845
1400	29 3/8"	31 3/4"	73 1/2"	22 5/8"	62 1/2"	14"	59 1/4"	1 7/8"	23 1/4"	12"	6"	10"	8"	7"	8"	5"	2 1/2"	1 1/4"	845
1600	29 3/8"	31 3/4"	73 1/2"	22 5/8"	62 1/2"	13 1/2"	59 1/4"	1 7/8"	23"	12"	6"	12"	10"	7"	9"	5"	2 1/2"	1 1/4"	875
1800	29 3/8"	31 3/4"	73 1/2"	22 5/8"	62 1/2"	13 1/2"	59 1/4"	1 7/8"	23"	12"	6"	12"	10"	8"	9"	5"	2 1/2"	1 1/4"	1120
2000	29 3/8"	31 3/4"	81 1/4"	24 5/8"	72 3/8"	14 3/8"	69"	1 7/8"	22 3/4"	12 1/2"	6 1/2"	12"	10"	8"	10"	5"	3"	1 1/4"	1138
2500	29 3/8"	31 3/4"	82 5/8"	25"	74"	15 3/4"	69 1/2"	1 7/8"	22 1/2"	11 1/4"	6 1/2"	12"	12"	9"	10"	5 1/2"	3"	1 1/2"	1250
3000	35 3/4"	39 1/4"	85 3/4"	25 1/2"	75 7/8"	16"	70 1/2"	1 7/8"	27 3/4"	14"	7 3/4"	12"	12"	9"	10"	5 1/2"	3"	1 1/2"	1425
3500	35 3/4"	39 1/4"	93"	26 7/8"	82 1/4"	15 1/2"	76 1/4"	4 1/2"	27 3/4"	12"	12"	12"	12"	10"	12"	7"	4"	2"	1840
4000	35 3/4"	39 1/4"	93"	26 7/8"	82 1/4"	15 1/2"	76 1/4"	4 1/2"	27 3/4"	12"	12"	12"	12"	10"	12"	7"	4"	2"	1912
4500	35 3/4"	39 1/4"	96"	29"	81 1/4"	16 1/2"	79 1/4"	4 1/2"	28"	12"	12"	14"	14"	12"	12"	7 1/2"	4"	2 1/2"	2000
5000	35 3/4"	39 1/4"	102"	29 1/2"	87 1/2"	16 3/4"	85 1/2"	4 1/2"	27 3/4"	12"	12"	14"	14"	12"	12"	8"	4"	2 1/2"	2200

Model No.: _____ No. of Units: _____ Type of Gas: _____

Total Input: _____ BTU/hr Total Output: _____ BTU/hr

Flow: _____ USGPM @ Allowable Pressure Drop _____ ft.

Optional Accessories: _____