

MAGNATHERM FT Boiler

Date: Bid Date:

Project #: Location:

Project Name: Engineer:

Contractor: Prepared By:

**CFH, Indoor/Outdoor
Models 1000, 1500, 2000, 3000**

Specification 

Contractor shall supply and install Qty.: Laars Model No. CFH modulating condensing boiler(s).

The boiler shall be a Laars MagnaTherm FT Model CFH, rated at BTU/hr input and BTU/hr output. The boiler shall modulate up to 5-100% of full fire, for up to 20:1 turndown. The unit(s) shall be design-certified to comply with the current edition of the Harmonized ANSI Z21.13 / CSA 4.9 Standard for Gas-Fired Low Pressure Steam and Hot Water Boilers. The unit(s) shall be designed and constructed in accordance with the ASME Boiler & Pressure Vessel Code, Section IV requirements for 160 psi (1103 kPa) maximum working pressure, shall bear the ASME "H" Stamp and be listed by the National Board.

The boiler shall be listed with AHRI (Air Conditioning, Heating and Refrigeration Institute). The boiler shall have minimum thermal efficiency of 95%. The unit(s) shall be constructed to comply with the efficiency requirements of the latest edition of ASHRAE Standard 90.1.

The boiler shall be sealed combustion, and shall use a vertically-oriented premix burner with a stainless steel woven metal fiber wrap, and a negative pressure gas valve to burn cleanly, with NOx emissions not exceeding 10ppm. The boiler shall meet the emissions requirements of SCAQMD. The gas/air system shall allow the boiler to modulate and remain stable throughout the firing range. An oxygen trim system shall be standard equipment, and shall constantly measure the oxygen in the exhaust gases, and adjust the air/fuel ratio by varying the combustion air speed, relative to the fuel valve settings, to ensure consistent efficiency, clean combustion, and high heat recovery throughout the modulation range.

The boiler shall operate at natural gas pressures of 4-10.5" w.c., and shall need no component changes to operate at high altitude, up to 10,000 feet. The boiler shall be certified for placement indoors and outdoors.

The boiler shall be designed and certified for vertical or horizontal Category IV venting, up to 100 equivalent feet, with 6" (1000), 8" (1500-2000), or 10" (3000) diameter CPVC, polypropylene or stainless steel vent material. The boiler shall be certified for Category II venting with vent pressures of -0.1 to -0.01" w.c.. Air may be taken from the room, or ducted directly to the boiler using up to 100 equivalent feet of 6" (1000), 8" (1500-2000), or 10" (3000) diameter ABS, PVC, CPVC or galvanized pipe. The boiler shall have an integral, washable, combustion air filter with 83% arrestance.

The heat exchanger shall be a stainless steel fire tube design. It shall be a vertical design with a single pass for flue gas. 316L stainless steel shall be used for the tubes, tube sheets, combustion chamber, flue collector, and condensate dish. All other wetted surfaces shall be 304L stainless steel. The boiler shall be fully condensing design with built-in condensate drain and trap that includes automatic boiler shutoff if condensate levels are too high, due to blockage. The heat exchanger shall have a limited non-prorated ten-year warranty, and a limited twenty-five-year thermal shock warranty.

The boiler shall be equipped with an ASME certified pressure relief valve set at 75psi 517 (kPa). Optional pressure relief valves with settings of 30psi (207kPa), 50psi (345 kPa), 60psi (413 kPa), 125psi (861 kPa), or 150psi (1034 kPa) shall be available. The boiler shall have a factory-mounted temperature and pressure relief gauge.

The boiler jacket shall be made from a combination of stainless steel and galvanealed steel panels. Galvanealed steel panels shall have a unitized shell finished with acrylic thermo-set paint baked at not less than 325°F (163°C). The frame shall be constructed of galvanized steel for strength and protection. Chamber shall include a sight glass for viewing flame. To assist in boiler installation, the heat exchanger shall have two welded lifting lugs, and the structural steel based shall have forklift openings.

The boiler shall be available with the following voltages:

Models 1000 and 1500: 120V, 208V, or 220/240V single phase

Model 2000: 120V single phase, 208V single phase, 220/240V single phase, 208V three phase, 480V three phase, or 600V three phase

Model 3000: 208V, 480V, or 600V three phase

The boiler shall have an integrated temperature / ignition control, oxygen trim control, and valve control that work together to ensure boiler operation, safety and combustion functions are harmonized. The boiler shall have a spark ignitor and flame sensor that is controlled to have 100% safety shutdown, and three trials for ignition (CSD-1 models have one trial).

The temperature / ignition control shall be an integrated electronic PID control with large touchscreen and color display. The boiler display shall be visible without the removal of any jacket panels or control panels. The control shall display using icons and words, for clarity. The control's home page shall display security level, quick start access, configuration menu access, service menu access, messages, an indication of which demands are active, a navigation bar, date, and time. In addition, the home screen shall display all set points, actual and target firing rates, outside air temperature, flame signal, O₂ reading, flue temperature, boiler inlet and outlet temperatures, system temperature (when system sensor is used), domestic water temperature (when DHW sensor is used), and status of all pumps.

The control shall have a quick-start menu, configuration menu, and service menu. The quick start menu shall allow configuration of basic functionality and the most common settings, without the need to access all parameters that are available. The configuration menu shall hold all settable/changeable parameters. The service menu shall allow for access to information that will help setup and troubleshoot the boiler.

The control shall have three levels of access, each with a unique password; user, installer and OEM. A verification feature shall be present, to ensure that safety-related parameters are not altered by mistake. The control shall have a lockout feature, so that changes cannot be made without entering the password. The user shall be able to choose how long the control will remain unlocked after user interaction has stopped.

The control shall have two independent space heating setpoints and an indirect domestic water (DHW) setpoint, each with adjustable differentials. The boiler shall come equipped with a DHW sensor, but the control shall be able to recognize a call for DHW via this sensor or a closure from a tank stat on the same terminals. The user shall be able to choose the priority of all demands. It shall have the ability to control the boiler pump, system pump and indirect domestic water pump, each with delay and exercise features. The control shall have a variable speed boiler pump control as standard, to control the pump to maintain a user-selectable fixed temperature rise across the boiler.

The boiler shall have the ability to control an isolation valve (available from the manufacturer) that will allow water flow through the boiler only when the boiler is firing, enabling easy integration into single pump piping systems.

The control shall have built-in outdoor reset feature with warm weather shutdown, DHW override, and customizable reset curves, based on the outdoor

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temperature and desired system water temperature. The boiler shall be shipped with the outdoor reset sensor, as standard equipment. The control shall have a summer kick feature that energizes boiler, system and DHW pumps if they have not cycled for a user-selectable amount of time.

The control shall be able to cascade and lead-lag with up to eight other MagnaTherm FT boilers. The control system shall allow the user to choose the rotation method that is desired. In the event of a loss of communication with the lead boiler, the user shall be able to choose to run the system from the lead boiler's internal set point, or choose another unit to assume lead responsibility. A control that is chosen as master in a system with multiple controllers shall display an icon of each of the controls in the system. The color of the icon shall indicate if the control is in normal operation, in standby mode, in a hold state, locked out, or if there is a communication error.

The control shall have the ability to accept a 4-20mA or 0-10VDC input connection from an external control or building automation system. The control shall allow the user to choose to use this external signal as a temperature setpoint or a modulation signal. The controller shall be able to send and receive information through a Modbus RTU or BACnet MSTP connection, including (but not limited to) inlet and outlet water temperatures, stack temperature, DHW temperature and priority, central heating temperature, frost protection, warm weather shutdown, status of sensors, fan speed, setpoints, remote control input, burner status, lockout codes, alarm reasons, system pump status, boiler pump status and domestic water pump status. Gateways shall be available for additional communication protocols.

The control's service menu shall include access to turn burner on and off, valve information, history, factory default reset, and the ability to recalibrate the touchscreen / display. Control diagnostics shall include, at a minimum, the following: ignition failure, grounded flame rod, safety chain interrupt, boiler high limit exceeded, domestic water high limit exceeded, temperature rise limit exceeded, stack limit exceeded, pressure sensor fault, combustion pressure fault, blocked air intake, sensor errors (open or shorted), 24VAC voltage low or high, modulation fault, pump fault, AC input phases reversed, and fan speed proving rate failure. Valve information shall be viewable via the service menu, and shall include valve phase, fuel actuator position, air actuator position, VSD setting, modulation rate, flame signal, error code, diagnostic code, inputs, outputs, burner ID, lower trim limit, upper trim limit, current trim and fan speed. Boiler history shall be accessible via the service menu, and shall have information on demand cycle counts, burner cycles, pump cycles, recent lockout conditions, boiler temperature statistics and firing time statistics.

The control shall easily allow the user to force the boiler into minimum or maximum firing rate, for setup and diagnostic purposes. The control shall differentiate between a lockout, a hold, or an alert. If an issue occurs, the system will display a brief description of the issue on the control screen. The user shall be able to tap the message icon on the display to be presented with a more detailed explanation of the issue.

Digital inputs accessible in the service menu shall include on/off status of the water flow switch, low water cutoff, manual reset high limit, thermal cutout, high gas pressure switch, low gas pressure switch, condensate level, both calls for space heating, and the DHW call for heat. Digital outputs accessible in the service menu shall include on/off status of boiler run, alarm, safety satisfied, valve enabled, valve reset, boiler pump, system pump, DHW pump, auxiliary power output, and auxiliary dry contact. Analog inputs accessible in the service menu shall include inlet water temperature, outlet water temperature, flue temperature, and DHW temperature. Analog outputs accessible in the service menu shall include percentage depictions for pump speed, fan speed, mixing valve, and auxiliary.

The boiler control shall have a USB port that allows parameter sets to be uploaded from the controller and downloaded from the controller, for diagnostic purposes, and to allow a parameter set to be copied from one boiler to another. The USB port shall also allow runtime data and history to be captured in a tab-delimited text file for use with spreadsheet programs.

Auto and manual reset high limit settings with reset differential shall be programmable, and the control shall have an anti-short-cycle setting that allows the user to choose how long the boiler will wait to fire after a heat demand is satisfied. PID parameters (on hysteresis, off hysteresis, proportional gain, integral time, derivative time) and minimum / maximum delta T (temperature difference) between which the boiler will modulate shall be user-programmable for times when such tuning would be beneficial.

The control shall monitor flue gas temperature and shall reduce boiler input as the maximum flue gas temperature is approached, with manual reset stop if temperature exceeds maximum setting.

To assist in avoiding freeze-up conditions, the user shall be able to set a boiler inlet water temperature that will activate an anti-frost mode. The user shall be able to choose if a pump, multiple pumps, or pump(s) and burner will be energized when the boiler enters this mode.

The control shall have dry alarm contacts for ignition failure.

Each boiler shall be fully test fired, (with water, gas, and venting connected), and all safety components tested, at the factory.

Standard features shall include:

- ASME "H" stamp
- 160 psi maximum working pressure
- Certified for Category II and Category IV vent systems
- Indoor/outdoor
- Low NOx system exceeds the most stringent regulations for air quality
- High condensing efficiency
- Up to 20:1 turndown modulation
- Sophisticated gas/air valve allows for constant control of modulation
- Tru Trac™ real-time O₂ sensing maintains efficiency throughout the modulation range
- Stainless steel vertical fire tube heat exchanger with welded construction
- Sealed combustion chamber
- Pre-mix stainless steel burner
- Electronic PID modulating control with large touchscreen and color display
- Multiple independent heat demands
- VARI-PRIME boiler pump control via user-selectable fixed boiler temperature rise
- Wired and programmed to control boiler isolation valves
- Controller cascades with up to eight MagnaTherm FT boilers
- Accepts 4-20mA or 0-10VDC external modulation or external set point control
- Modbus RTU & BACnet MSTP on board
- Multiple pump control for boiler pump, system pump, & indirect DHW water pump, each with delay
- Indirect water heater priority
- Sensor for indirect DHW tank
- Outdoor reset with air sensor
- Horizontal or vertical direct vent
- Vent and air pipe lengths of up to 100 equivalent feet (each)
- High & low gas pressure switches
- Vent temperature cutoff
- Normally open alarm contact
- Air filter
- Built-in condensate trap
- Temperature & pressure gauge
- Low water cutoff
- Water flow switch
- 75 psi (517kPa) ASME rated pressure relief valve
- Flange water fittings
- Burner site glass
- Heat exchanger warranty: 10-year limited non-prorated 25-year limited thermal shock
- 1-year limited parts warranty