

# NEOTHERM® XTR Boiler

NT2H Indoor

Models 399, 500, 650, 800, 999, 1500



## Specification

Date: Bid Date:

Project #: Location:

Project Name: Engineer:

Contractor: Prepared By:

Contractor shall supply and install Qty.: Laars Model No. NT2H modulating boiler(s).

The boiler shall be a Laars NeoTherm XTR Model NT2H, rated at BTU/hr input and BTU/hr output. The boiler shall modulate 10-100% of full fire. 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 and 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 a minimum AHRI certified combustion efficiency of 97.0%, and a minimum AHRI certified thermal efficiency of 96.0%.

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 certified for placement indoors and the manufacturer shall have a certified field-installed kit for outdoor placement.

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

The water tube heat exchanger shall be stainless steel, rated for 160 psi (1103 kPa) working pressure. The heat exchanger shall be a low water volume design, welded construction, with no gaskets, o-rings or bolts in the header. Heat exchanger shall be accessible for visual inspection and cleaning of all internal surfaces. The boiler shall be fully condensing design with built-in condensate drain and trap. The heat exchanger shall have a limited ten-year warranty.

The boiler shall be available with a pump, packaged with the boiler, to serve the boiler and 30 feet of full-sized piping with a normal number of fittings.

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

The boiler shall be sealed combustion. The boiler jacket shall be 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. Boiler sides and back shall be certified for zero clearance to combustible surfaces.

Boiler shall operate on 3.5-10" w.c. natural gas pressure and shall need no component changes to operate at high altitude, up to 10,000 feet.

The boiler shall use a premix burner with a stainless steel woven metal fiber wrap, and an efficient dual-venturi combustion system, with two independently controlled air and gas injection parts for wide, responsive control range. NOx emissions shall not exceed the most stringent requirements in the U.S. The boiler shall meet the emissions requirements of SCAQMD 2012.

The boiler shall be designed for vertical or horizontal Category IV venting, up to 150 equivalent feet of PVC, CPVC, polypropylene or stainless steel vent material.

Air may be taken from the room or ducted directly to the boiler using up to 150 equivalent feet of PVC, CPVC, stainless steel, polypropylene, or galvanized pipe.

Unit shall be 120VAC, single phase. The control circuit shall be 24VAC.

The boiler shall have an integrated temperature / ignition control and valve control that work together to ensure boiler operation, safety and combustion functions are harmonized. The gas/air system shall allow the boiler to modulate and remain stable throughout the modulation range.

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, 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 set up 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 option, to control the pump to maintain a user-set temperature rise across the boiler.

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

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The control shall be able to cascade and lead-lag with up to eight other NT2H 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 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. 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 to 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 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.

**Standard features shall include:**

- High condensing efficiency
- Stainless steel heat exchanger with welded construction
- ASME 160psi (1104Pa) working pressure heat exchanger
- ASME "H" stamp
- 75psi (517kPa) ASME rated pressure relief valve
- Modulation down to 10% of full fire (10:1 turndown)
- Low NOx system exceeds the most stringent regulations for air quality
- Indoor construction with optional outdoor kit
- Top water and gas connections
- Optional pump (sized to model) included for field installation
- Sealed combustion chamber
- Pre-mix stainless steel burner
- Sophisticated air/gas system allows for consistent combustion control
- Horizontal or vertical direct vent
- Certified for Category II & IV vent
- Category IV vent & air pipe lengths of up to 150 equivalent feet (each)
- Electronic PID modulating control with large touch screen user interface and color display
- Controller cascades with up to eight NeoTherm XTR units
- Modbus RTU & BACnet MSTP on board
- Multiple pump control for boiler pump, system pump, and DHW pump, each with delay
- Direct spark ignition
- Indirect water heater priority
- Outdoor temp sensor
- Alarm output
- Accepts external (4-20mA or 0-10VDC) modulation signal
- On/Off toggle switch
- Top and rear service panels
- Built-in condensate trap
- Water flow switch
- Vent temperature cutoff
- Air filter
- Temperature & pressure gauge
- Drain valve
- Manual reset high limit
- Auto reset high limit
- Burner sight glass
- Zero clearance to combustibles
- 10-year limited warranty