



UNIFLUX STEAM CONDENSING HEATER SPECIFICATION

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1.0 GENERAL DESCRIPTION

The heater shall be a complete factory-assembled, forced draft unit including heat exchanger, burner equipment, firetube, blower, gas train, stack, piping connections including process headers, and steel supports. The heater shall be of complete factory assembled design, with minimum field bolt-up assembly required. Field welding shall not be necessary.

Coil surface shall be sufficient to provide heat transfer at rated efficiency. Accessories shall include a fuel gas pressure regulator, fuel safety shutoff valves, electronically linked fuel and air control valve with actuator and ultraviolet flame safety detection system.

The heater shall be designed to have two distinctive sections enclosed in one pressure vessel. The firetube shall be installed in the lower portion of the shell, immersed in water. The heat from the burner will vaporize the water surrounding the firetube. Above the firetube there will be process piping which is not immersed in the waterbath. Steam generated by the firetube will condense on the process coils, transferring heat to the process.

A heat exchanger principle is to be used that will assure uniform heat transfer flux rates throughout the heat exchanger portion of the heater. As a guard against high flux rates in one area and low flux rates in another, heat transfer shall be by convection and condensation. The fuel/air ratio shall be controlled throughout the turndown range resulting in low oxygen levels at all firing rates.

2.0 PROCESS COIL:

- 2.1 The process coil shall be fabricated from standard pipe with wall thickness and material selection compatible with the design pressure, design temperature and corrosion allowance.
- 2.2 The process coil shall be designed, fabricated, tested and stamped in accordance with ASME Boiler and Pressure Vessel Code Section VIII, Division I. Radiographic inspection shall be 100% of 100% of the pipe welds.
- 2.3 Tube supports: Process coils shall be adequately supported to prevent sagging and undue stress on the piping at any operating condition. Pipe supports shall support both the process coils and the firetube, and shall transfer loads to the vessel shell. Process pipe support shall be from below only. Pipe supports shall not impede thermal expansion of process coils.

3.0 INSULATION:

- 3.1 Recommended vessel insulation system is 1-1/2" Rigid Fiberglass jacketed with 0.020" aluminum sheet secured with 1/2" 304 stainless steel straps. Jacketing shall be lapped by 2" at all seams, and seams shall be positioned to shed rather than catch water.

4.0 BURNERS:

- 4.1 Type: The burner shall be a gas-fired, forced-draft, firetube type burner. The burner shall be a low emissions burner.
- 4.2 Excess Air: 10-15%
- 4.3 Emissions:
 - 4.3.1 NO_x levels shall be a maximum of 30 ppm, corrected to 3% O₂.
 - 4.3.2 CO levels shall be a maximum of 400 ppm, corrected to 3% O₂.
- 4.4 Burners shall be capable of rapid transition from maximum fire to minimum fire to accommodate sudden process demand changes. Burner shall be designed to operate at minimum capacity or pilot capacity for long periods of time, to keep the heater at operating temperatures, even when not in use.



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- 4.5 A separate pilot and main burner is acceptable. No provision shall be made for manual ignition of the burner with torches, matches, etc. Ignition of pilot shall utilize an automatic, electronic spark igniter, controlled by the burner management system.
- 4.6 The burner shall have a turndown capability of 3:1 or better.
- 4.7 The burner firing rate shall be controlled as follows: The temperature indicating controller (TIC) will receive a thermocouple input from the process outlet. This temperature will be compared with the outlet setpoint. The TIC has a 4-20 mA output which is the heater demand signal. This signal is sent to the Maxon Smartlink Control Interface. The Maxon Smartlink system includes a fuel gas control valve and a combustion air control valve. Each valve has an electronic actuator. These actuators are suitable for use in a Class 1, Division 2 location. The actuators position the valves using stepper motors, and therefore can reliably position the valve to within 0.1°. The Smartlink Control interface converts the TIC's 4-20 mA signal to a digital position signal which is sent to the valve actuators. Position feedback helps confirm the correct position of the valves. The valves will be tuned at the factory prior to shipment.

5.0 BLOWER:

- 5.1 Combustion air blower shall be a heavy duty type sized for (10%) ten percent excess volume over operation requirements at maximum capacity. The blower shall be direct drive arrangement 4 or arrangement 8.
- 5.2 Blower outlet pressure shall be sufficient to maintain a positive pressure throughout the combustion air line, burner, firetube, and stack. All portions of the heater shall be forced-draft. No natural- or induced-draft is acceptable.

6.0 SAFETY CONTROLS:

Safety controls and installation shall be per NFPA 85, latest edition, and shall include the following:

- 6.1 Internal spark ignition system.
- 6.2 Micro processor based preprogrammed burner control with continuously supervised ultraviolet flame sensing device which is designed to shut off fuel gas in the event of flame failure.
- 6.3 Electrical controls to pre-purge the combustion chamber and heat exchanger portion with eight air changes prior to any flame ignition attempt.
- 6.4 Combustion air pressure switch that is designed to shut off fuel gas in the event of blower failure.
- 6.5 High and low fuel gas pressure switches that are designed to shut off fuel gas in the event of fuel supply pressure malfunction.
- 6.6 Safety double block and bleed valves on the main fuel line and on the pilot gas line.
- 6.7 An indicating high stack temperature monitor to shut down unit.
- 6.8 A first-out annunciator shall be included for troubleshooting purposes.

7.0 MATERIAL OF CONSTRUCTION:

All materials shall be new and of the highest quality.

- 7.1 Vessel Shell: Carbon steel SA516-70, thickness to be determined by ASME Boiler and Pressure Vessel Code. In areas in which the vessel shell is subjected to extremely low temperatures, 304 Stainless Steel shall be used.
- 7.2 Process Coil: ASTM Certified pipe. Due to low process inlet temperature, coil material shall be 304 Stainless Steel.



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7.3 Coil Supports: Type 304 stainless steel.

7.4 Inlet and Outlet Connections: ANSI B16.1 flanges, SA182TP304L.

7.5 Combustion Air and Fuel Gas Piping: A106-B. Fuel gas piping shall be 150# flanged construction, and shall be hydrotested per ASME B31.3.

7.6 Structural Steel: A-36.

7.7 Exhaust stack: A-53. If stack is readily accessible to personnel, it shall be externally insulated with jacketed ceramic fiber for personnel protection.

8.0 FABRICATION:

8.1 Heater burner and shell be of fabricated welded steel construction of air tight design.

8.2 Stack shall be a stub stack and not be less than 4 ft. above top of heater. It shall be fabricated from carbon steel material.

8.3 Electrical: The control panel, electrical enclosures and conduit shall meet NFPA-70, NEC requirements for the operating environment of the heater. The electrical assembly and wiring shall be factory installed and shall be complete.

8.4 Piping: Fuel gas and air piping shall be completely shop assembled with control and safety valves.

9.0 TESTING:

Testing shall include, but not be limited to:

9.1 Process coil: Hydrostatic test per ASME VIII at 1.5 times the design pressure.

9.2 Fuel gas Piping: Hydrostatic test per ASME B31.3.

9.3 Vessel: Hydrostatic test per ASME VIII at 1.5 times the design pressure.

9.4 Combustion Controls: Functional test firing at low fire conditions and simulation of all safety devices.

10.0 FACTORY PAINTING:

10.1 If uninsulated, the heater shall be cleaned in accordance with SSPC-SP 10 and given one coat of an inorganic zinc primer (approximately 2 mils DFT) and one coat of an engineered siloxane (approximately 5 mils DFT). This provides a coating system which has substantial resistance to chalking due to exposure to sun light.

10.2 If the heater is to be insulated, it shall be cleaned in accordance with SSPC-10 and given one coat of an inorganic zinc primer or a zinc rich epoxy, based on the preference of the Customer.

11.0 STRUCTURAL STEEL:

The supporting structure on the heater shall be designed in accordance with the latest edition of AISC Manual for a 120 MPH wind (Minimum).

12.0 CONTROL PANEL:

The control panel shall be free standing type with terminal strips for final connections between controls and heating unit. Panel shall meet NEMA construction standards. Control panel shall have exterior indicating lights and switches for local control.

13.0 OPERATING & MAINTENANCE MANUALS:

Two sets of operating and maintenance shall be provided per heater. Manuals shall include detailed installation and start-up procedures. The manuals shall include an explanation of the controls system, an



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instrument settings guide, a recommended spare parts list, as well as heater specifications and other information.

14.0 GUARDS:

Equipment shall be provided with guards when necessary to comply with OSHA requirements.

15.0 ENGINEERING DRAWINGS:

Two sets of approval drawings shall be provided. Drawings shall include dimensional drawings, flow sheet with instrument bill of material, and electrical schematic diagrams. No fabrication of equipment shall be commenced until the approval drawings have been approved by the Owner's Engineers. Fabrication and shop detail drawings are available for review at the shop by Customer's inspector, but they will not be submitted for review.

16.0 WARRANTY:

Company warrants title to the product(s) and, except as noted below with respect to items not of Company's manufacture, also warrants the product(s) on date of shipment to Purchaser, to be of the kind and quality described herein merchantable, and free of defects in workmanship and material.

THIS WARRANTY IS EXPRESSLY IN LIEU OF ALL OTHER WARRANTIES, INCLUDING BUT NOT LIMITED TO IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS, AND CONSTITUTES THE ONLY WARRANTY OF COMPANY WITH RESPECT TO THE PRODUCTS(S).

If within one year from date of initial operation, but not more than eighteen months from date of shipment by Company of any item of product(s), Purchaser discovers that such item was not as warranted above and promptly notifies Company in writing thereof, Company shall remedy such nonconformance by, at Company's option, adjustment or repair or replacement of the item and any affected part of the product(s). Purchaser shall assume all responsibility and expense for removal, reinstallation, and freight in connection with the foregoing remedies. The same obligations and conditions shall extend to replacement parts furnished by Company hereunder. Company shall have the right of disposal of parts replaced by it.

ANY ITEM OF THE PRODUCT(S) WHICH IS NOT MANUFACTURED BY COMPANY (such as valves, instrumentation and electrical devices) IS NOT WARRANTED BY COMPANY, and shall be covered only by the express warranty, if any, of the manufacturer thereof.

THIS STATES PURCHASER'S EXCLUSIVE REMEDY AGAINST COMPANY AND ITS SUPPLIERS RELATING TO THE PRODUCT(S), WHETHER IN CONTRACT OR IN TORT OR UNDER ANY OTHER LEGAL THEORY, AND WHETHER ARISING OUT OF WARRANTIES, REPRESENTATIONS, INSTRUCTIONS, INSTALLATIONS OR DEFECTS FROM ANY CAUSE. Company and its supplier shall have no obligation as to any product which has been improperly stored or handled, or which has not been operated or maintained according to instructions in Company or supplier furnished manuals.