

Typical Specification for Lochinvar® KNIGHT XL™ Heating Boiler
Models 399,999 – 999,000 Btu/Hr

The **BOILER** shall be a **LOCHINVAR KNIGHT XL** Model **KBX**_____ (N,L) having a modulating input rating of _____ Btu/Hr, an output of _____ Btu/Hr and shall be operated on (Natural Gas) (L.P. Gas). The **BOILER** shall be capable of following performance:

Model	Turndown	Minimum Input	Maximum Input
KBX0400(N,L)	10:1	39,000	399,000
KBX0500(N,L)	10:1	50,000	500,000
KBX0650(N,L)	10:1	65,000	650,000
KBX0800(N,L)	10:1	80,000	800,000
KBX1000(N,L)	10:1	99,000	999,000

Maximum unit dimensions shall be: 50 inches Length, 24 inches Width and 45 inches Height. Maximum operating (wet) unit weight shall be no more than 567 pounds.

The **BOILER** shall bear the ASME "H" stamp for 160 psi working pressure and shall be National Board listed. The **BOILER** shall have a fully welded, stainless steel, water tube heat exchanger. Multiple pressure vessels in a single enclosure are not acceptable. There shall be no banding material, bolts, gaskets or "O" rings in the pressure vessel construction. The heat exchanger shall be designed for a single-pass water flow to limit the water side pressure drop. Pressure drop shall be no greater than 2.2 psi at 75 GPM. The condensate collection basin shall be constructed of welded stainless steel. The complete heat exchanger assembly shall carry a ten (10) year limited warranty.

The heat exchanger shall have a volume of water no less than:

Model	Water Content
KBX0400(N,L)	4.4 gallons
KBX0500(N,L)	4.9 gallons
KBX0650(N,L)	6.2 gallons
KBX0800(N,L)	7.3 gallons
KBX1000(N,L)	8.8 gallons

The **BOILER** shall be certified and listed by C.S.A. International under the latest edition of the harmonized ANSI Z21.13 test standard for the U.S. and Canada. The **BOILER** shall comply with the energy efficiency requirements of the latest edition of ASHRAE 90.1 and the minimum efficiency requirements of the latest edition of the AHRI BTS-2000 Standard as defined by the Department of Energy in 10 CFR Part 431. The **BOILER** shall operate at a minimum of 97% Combustion and Thermal Efficiency at full fire as registered with AHRI. The **BOILER** shall be certified for indoor installation.

The **BOILER** shall be constructed with a heavy gauge steel jacket assembly, primed and pre-painted on both sides. The combustion chamber shall be sealed and completely enclosed, independent of the outer jacket assembly, so that integrity of the outer jacket does not affect a proper seal. A burner/flame observation port shall be provided for observing the burner flame and combustion chamber. The burner shall be a premix design constructed of high temperature stainless steel with a woven FeCrAlloy outer covering to provide smooth operation at all modulating firing rates. The **BOILER** shall be supplied with a negative pressure regulation gas valve and be equipped with a

pulse width modulation blower system to precisely control the fuel/air mixture to the burner. The **BOILER** shall operate in a safe condition with gas supply pressures as low as 4 inches of water column. The burner flame shall be ignited by direct spark ignition with flame monitoring via a flame sensor.

The **BOILER** shall utilize a 24 VAC control circuit and components. The control system shall have a factory installed display for boiler set-up, boiler status, and boiler diagnostics. All components shall be easily accessed and serviceable from the front and top of the jacket. The **BOILER** shall be equipped with a temperature/pressure gauge; high limit temperature control with manual reset; ASME certified pressure relief valve set for 50 psi (standard); outlet water temperature sensor with a dual thermistor to verify accuracy; system supply water temperature sensor; outdoor air sensor, flue temperature sensor with dual thermistor to verify accuracy; low water cut off with manual reset, blocked drain switch and a condensate trap for the heat exchanger condensate drain.

The **BOILER** shall feature the “SMART TOUCH™” control with CON-X-US which is standard and factory installed with an 7” liquid crystal touch screen display, password security, outdoor air reset, pump delay with freeze protection, pump exercise, ramp delay featuring six steps, domestic hot water prioritization with limiting capabilities and PC port connection. A secondary control that is field mounted outside or inside the appliance is not acceptable. The **BOILER** shall have alarm contacts for any failure, runtime contacts and data logging of runtime at given modulation rates, ignition attempts and ignition failures. The **BOILER** shall have a built-in “Cascade” to sequence and rotate while maintaining modulation of up to eight boilers of different Btu inputs without utilization of an external controller. The internal “Cascade” function shall be capable of lead-lag, efficiency optimization, front-end loading, and rotation of lead boiler every 24 hours. The control must include cascade redundancy to allow a member boiler to become the temporary leader if the original lead boiler shall loose communication with the members. The **BOILER** shall be capable of controlling an isolation valve (valve shall be offered by manufacturer) during heating operation and rotation of open valves in standby operation for full flow applications. The control must be equipped with standard BACnet MSTP and Modbus communication protocol with a minimum 55 readable points. The **BOILER** shall have an optional gateway device which will allow integration with LON or BACnet (IP) protocols.

The “SMART TOUCH™” control shall include CON-X-US communication platform that will allow remote access via a smart phone or Tablet. This will allow the ability to monitor and manage multiple KNIGHT XL Boilers and send alerts via text or e-mail notifying of changes in system status. A user shall have the ability to check system status or re-program any boiler function remotely.

The “SMART TOUCH™” control shall increase fan speed to boost flame signal when a weak flame signal is detected during normal operation. A 0 -10 VDC output signal shall control a variable speed boiler pump (pump to be offered by manufacturer) to keep a fixed delta t across the boiler regardless of the modulation rate. The **BOILER** shall have the capability to receive a 0 – 10 VDC input signal from a variable speed system pump to anticipate changes in system heat load in order to prevent flow related issues and erratic temperature cycling.

The **BOILER** shall be equipped with two terminal strips for electrical connection. A low voltage connection board with 44 connection points for safety and operating controls, i.e., Alarm Contacts, Runtime Contacts, Louver Proving Switch, Tank Thermostat, Domestic Hot Water Building Recirculation Pump Contacts, Domestic Hot Water Building Recirculation Temperature Sensor Contacts, Remote Enable/Disable, System Supply Temperature Sensor, Outdoor Temperature Sensor, Tank Temperature Sensor, Modbus Building Management System Signal and Cascade Control Circuit. A high voltage terminal strip shall be provided for Supply voltage. Supply voltage shall be 120 volt / 60 hertz / single phase on all models. The high voltage terminal strip plus integral relays are provided for independent pump control of the System pump, the Boiler pump and the Domestic Hot Water pump.

The **BOILER** shall be installed and vented with a (select one):

(a) **Direct Vent system with horizontal sidewall termination** of both the exhaust vent and combustion air. The flue shall be Category IV approved material constructed of PVC, CPVC, Polypropylene or Stainless Steel. A separate pipe shall supply combustion air directly to the boiler from the outside. The boiler’s total combined air intake length shall not exceed 150 equivalent feet. The boiler’s total combined exhaust

venting length shall not exceed 150 equivalent feet.

(b) Direct Vent system with vertical roof top termination of both the exhaust vent and combustion air. The flue shall be Category IV approved material constructed of PVC, CPVC, Polypropylene or Stainless Steel. A separate pipe shall supply combustion air directly to the boiler from the outside. The boiler's total combined air intake length shall not exceed 150 equivalent feet. The boiler's total combined exhaust venting length shall not exceed 150 equivalent feet. The air inlet must terminate on the rooftop with the exhaust.

(c) Vent system with Vertical rooftop Exhaust and Horizontal sidewall Air Intake with the combustion air intake in a different pressure zone. The flue shall be Category IV approved material constructed of PVC, CPVC, Polypropylene or Stainless Steel. A separate pipe shall supply combustion air directly to the boiler from the outside in a different pressure zone from that of the exhaust vent. The boiler's total combined air intake length shall not exceed 150 equivalent feet. The boiler's total combined exhaust venting length shall not exceed 150 equivalent feet.

(d) Vertical rooftop or Horizontal sidewall exhaust with the combustion air drawn from the equipment room. The flue shall be Category IV approved material constructed of PVC, CPVC, Polypropylene or Stainless Steel. The boiler's total exhaust venting length shall not exceed 150 equivalent feet. Combustion air drawn from the equipment room shall be supplied with properly sized combustion and ventilation air openings based on NFPA requirements.

(e) Common Vented with multiple KNIGHT XL boilers. The flue shall be Category IV approved vent material. The exhaust and air intake venting must use the exact diameter, length, placement, and terminations as specified by the designer.

The **BOILER** shall have an independent laboratory rating for Oxides of Nitrogen (NO_x) to meet the requirements of South Coast Air Quality Management District in Southern California and the requirements of Texas Commission on Environmental Quality. The manufacturer shall verify proper operation of the burner, all controls and the integrity of the heat exchanger by connection to water and venting for a factory fire test prior to shipping.

The **BOILER** shall be suitable for use with polypropylene glycol up to a 50% concentration. The de-rate associated with the glycol will vary per glycol manufacturer.

STANDARD CONSTRUCTION

The **BOILER** shall be constructed in accordance with the following code requirements as standard equipment. Manufacturing of special models to meet the below code requirements is not acceptable.

California Code

Massachusetts Code

Kentucky Code

CRN Approval in Canada

Note: Due to the large disparity in CSD-1 interpretation from state to state, please confirm to the factory all controls required in your jurisdiction.