

# HIGH EFFICIENCY CONDENSING BOILERS



STAINLESS STEEL  
FIRE TUBE HEAT EXCHANGER



OPERATING CONTROL FEATURING  
A BUILT-IN CASCADING SEQUENCER

7 MODELS: 55,000 – 399,999 BTU/HR

FIRING RATE MODULATION TO 5:1

LESS THAN 20 ppm NO<sub>x</sub>

DIRECT VENT FLEXIBILITY TO 100 FEET



**95% AFUE  
EFFICIENCY**



[Lochinvar.com](http://Lochinvar.com)



## THE SMARTEST CHOICE FOR CONDENSING BOILER PERFORMANCE

The KNIGHT® Wall Mount, engineered with Lochinvar's exclusive SMART SYSTEM™ control and an array of other innovative features is far ahead of any heating boiler in its class. It promises and delivers ultimate ease of installation and maintenance. With up to 99% efficiency, low-NOx emissions and a fully modulating burner, it is the best "green choice" for today's environmentally focused market.

Seven modulating/condensing stainless steel KNIGHT Wall Mount boilers are available with 55,000–399,999 Btu/hr inputs in a space-saving wall-mounted design. All are equipped for direct-vent installation with air intake and exhaust runs up to 100 feet using PVC, CPVC, Polypropylene or AL29-4C vent materials. This range of choices is ideal for residential or light-duty applications such as small hotels, schools and office buildings. For higher-demand applications, up to eight KNIGHT Wall Mount units can be installed utilizing the built-in cascading sequencer to deliver up to 3.2 million Btu/hr heating capacity.

The new KNIGHT Wall Mount Boiler reflects Lochinvar's constant commitment to providing all the options you need to serve every application.

### ADVANCED NEGATIVE REGULATION TECHNOLOGY

KNIGHT safely and reliably operates with supply gas pressure as low as 4 inches water column. Negative Regulation (Neg/Reg) technology automatically adjusts fan speed to ensure the correct volume and mix of fuel and air throughout the firing range.

### FIRE TUBE DESIGN

This fully welded ASME Certified stainless steel heat exchanger uses oval shaped tubes to pass heat from the products of combustion into the water stored in the vessel. To facilitate heat transfer the tubes are manufactured with dimples to slow the flue products and extract available latent energy. With a fire tube design the flue products are inside tapered passage ways and the water is passed through the vessel. Since the flue products pass through tubes and the water is circulated through a larger diameter vessel a fire tube design allows for minimal head pressure loss through the boiler which allows the boiler to be installed easily into various hydronic applications.

### WATER-BACKED COMBUSTION CHAMBER

An outstanding feature of the fire tube design is a water backed combustion chamber. By having the combustion chamber surrounded by water the Knight Wall Mount has more heating surface area. This larger heating surface area allows for efficiencies up to 99%.

### FULLY MODULATING BURNER

The SMART SYSTEM allows fully modulating combustion with 5:1 turndown. The burner can fire as low as 20% of maximum input and modulates the firing rate up to 100% as demand increases. The burner is a single stainless steel assembly covered with woven steel mesh and fires in a 360° pattern along the entire length of the burner. This allows the compact KNIGHT to exceed the modulation capacities of units with larger multiple burners.

## DIRECT VENTING UP TO 100 FEET

KNIGHT offers 5 venting options and tremendous flexibility for placement of units within the building, because it permits direct-vent air intake and exhaust runs up to 100 equivalent feet using either PVC, CPVC, Polypropylene or AL29-4C stainless steel vent pipe. A sidewall vent termination kit is standard equipment with every KNIGHT boiler.

Optional Sidewall Vent Termination Kit Available



# Lochinvar SMART SYSTEM™

**REFINED DESIGN PUTS MORE CONTROL AND INFORMATION AT YOUR FINGERTIPS**

## Advanced features include:

- MULTI-COLOR GRAPHIC LCD DISPLAY
- NAVIGATION DIAL
- USB PORT
- ABILITY TO CONTROL UP TO THREE DIFFERENT SETPOINT TEMPERATURES
- COMPATIBILITY WITH COPPER-FIN II NON-CONDENSING BOILER TO CREATE A FRONT-END LOADING SYSTEM
- BOILERS WITH DIFFERENT INPUTS CAN BE CASCADED TOGETHER TO MAXIMIZE BOILER PLANT TURNDOWN
- MODBUS CAPABILITY (OPTIONAL)
- DHW MODULATION LIMITING
- DHW NIGHT SETBACK\*
- 0-10 V BOILER RATE OUTPUT
- 0-10 V SIGNAL TO CONTROL VARIABLE SPEED BOILER PUMP\*
- 0-10 V SYSTEM PUMP SIGNAL INPUT\*
- HEAT DEMAND FROM 0-10V INPUT
- INSTALLER CAN PROGRAM NAME AND NUMBER INTO THE BOILER
- INSTALLER ADJUSTABLE FREEZE PROTECTION PARAMETERS
- SEPARATELY ADJUSTABLE SH/DHW SWITCHING TIMES\*
- INSTALLER ACCESS TO BMS AND RAMP DELAY SETTINGS

*\*EXCLUSIVE TO LOCHINVAR SMART SYSTEM*



## AT-A-GLANCE COLOR CODING



### BLUE SCREEN

Normal system operation.



### YELLOW SCREEN

Maintenance due - shows the installer's name and number on the display.



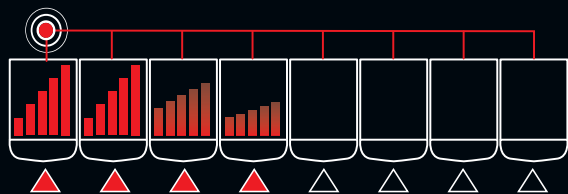
### RED SCREEN

Lockout mode.

## NEW SELECTABLE CASCADE OPTIONS

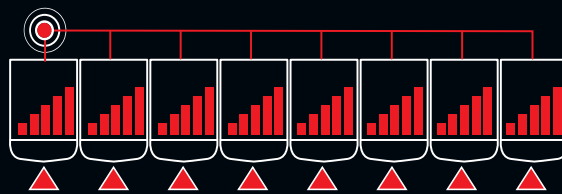
When multiple KNIGHT boilers are installed together, the SMART SYSTEM built-in sequencer can be set for "Lead-Lag" cascade or "Efficiency Optimized" cascade operation.

### LEAD-LAG CASCADE



The "lead" boiler modulates with demand to capacity. As demand increases, additional boilers fire and modulate to capacity. This continues, with additional boilers firing and modulating to capacity until all units are operating. Every 24 hours, the SMART SYSTEM automatically shifts the lead boiler role to the next in the sequence, distributing lead-lag runtimes equally.

### EFFICIENCY OPTIMIZED CASCADE



This feature optimizes the modulation capabilities of the Boiler Plant while evenly distributing run time across all cascaded boilers. Every 24 hours the SMART SYSTEM automatically shifts the 1st boiler on role to the next in the sequence, distributing run time equally.

*SMART SYSTEM Cascade allows 2 - 8 boilers to be sequenced.*

## 5 FLEXIBLE VENTING OPTIONS

Direct Vent Sidewall



Direct Vent Vertical



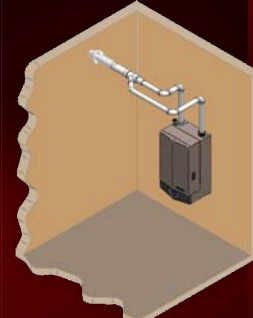
Vertical w/Sidewall Air



Concentric Direct Vent Vertical\*

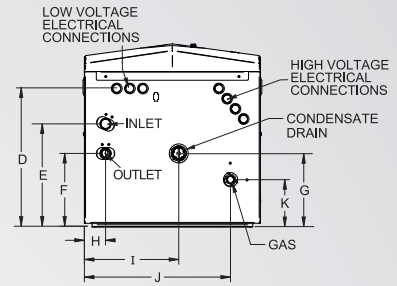
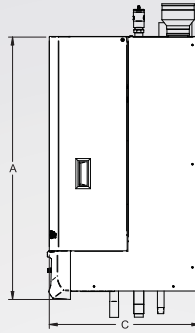
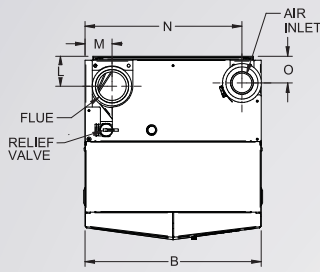


Concentric Direct Vent Sidewall\*



*\*Optional Vent Kit Sold Separately*

# KNIGHT® WALL-MOUNT BOILER DIMENSIONS AND SPECIFICATIONS



Model Number	Max. MBH	Min. MBH	*AFUE %	Heating Capacity MBH	NET I=B=R MBH
WHN055	55	11	95.0	51	44
WHN085	85	17	95.0	79	69
WHN110	110	22	95.0	102	89
WHN155	155	31	95.0	144	125
WHN199	199.9	40	95.0	184	160
WHN285	285	57	95.0	264	229
WHN399	400	80	94.4**	380	323

## DIMENSIONS AND SPECIFICATIONS

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	Gas Conn.	Water Conn.	Air Inlet	Vent Size	Shipping Wt. (lbs.)
33-1/4"	18-1/2"	16"	11-3/4"	10-1/2"	6-1/2"	4"	1-1/2"	3"	14-1/2"	5-3/4"	4"	3"	16-1/4"	5"	1/2"	1"	2"	2"	139
33-1/4"	18-1/2"	16"	11-3/4"	10-1/2"	6-1/2"	4"	1-1/2"	3"	14-1/2"	5-3/4"	4"	3"	16-1/4"	5"	1/2"	1"	2"	2"	142
33-1/4"	18-1/2"	19"	14-1/2"	10-3/4"	7-3/4"	7-3/4"	2-1/4"	10"	15-1/2"	5"	3-1/4"	3"	16-1/2"	2-3/4"	1/2"	1"	3"	3"	159
33-1/4"	18-1/2"	19"	14-1/2"	10-3/4"	7-3/4"	7-3/4"	2-1/4"	10"	15-1/2"	5"	3-1/4"	3"	16-1/2"	2-3/4"	1/2"	1"	3"	3"	166
33-1/4"	18-1/2"	19"	14-1/2"	11-3/4"	8"	8"	1-1/4"	10"	16-3/4"	4-3/4"	3-1/4"	2-3/4"	16-1/2"	3"	1/2"	1-1/4"	3"	3"	175
33-1/4"	18-1/2"	19"	14-1/2"	11-3/4"	8"	8"	1-1/4"	10"	16-3/4"	4-3/4"	3-1/4"	2-3/4"	16-1/2"	3"	1/2"	1-1/4"	3"	3"	184
35-1/2"	25"	21-3/4"	17-1/2"	12-1/2"	9-1/4"	9-1/2"	2-1/4"	13-1/4"	21-1/2"	9"	4-3/4"	4"	22-1/2"	3-3/4"	3/4"	1-1/2"	4"	4"	213

Notes: Indoor installation only. All information subject to change. Change "N" to "L" for LP gas models. \*WHN399 value is Thermal Efficiency

### SMART SYSTEM™ FEATURES

- ▶ **SMART SYSTEM Digital Operating Control**
  - ▶ Multi-Color Graphic LCD Display with Navigation Dial and Soft Keys
- ▶ **Three Boiler Setpoint Temperature Inputs**
  - ▶ Plus Domestic Hot Water Prioritization
- ▶ **Built-in Cascading Sequencer for up to 8 Boilers**
  - ▶ Multiple Size Boiler Cascade
  - ▶ Lead Lag
  - ▶ Efficiency Optimization
  - ▶ Front End Loading Capability with Copper Fin II
- ▶ **Outdoor Reset Control with Outdoor Air Sensor**
  - ▶ Programmable for Three Reset Temperature Inputs
- ▶ **Programmable System Efficiency Optimizers**
  - ▶ Night Setback
  - ▶ DHW Night Setback\*
  - ▶ Anti-Cycling
  - ▶ Outdoor Air Reset Curve
  - ▶ Ramp Delay
  - ▶ Boost Temperature & Time
- ▶ **Three Pump Control**
  - ▶ System Pump with Parameter for Continuous Operation
  - ▶ Boiler Pump with Variable Speed Pump Control\*
  - ▶ Domestic Hot Water Pump
- ▶ **Domestic Hot Water Prioritization**
  - ▶ DHW tank piped with priority in the boiler loop
  - ▶ DHW tank piped as a zone in the system with the pumps controlled by the Smart System
  - ▶ DHW Modulation Limiting
  - ▶ Separately Adjustable Space Heat/DHW Switching Times\*
- ▶ **Building Management System Integration**
  - ▶ 0-10 VDC Input to Control Modulation or Set Point
  - ▶ 0-10 VDC Modulation Rate Output
  - ▶ 0-10 VDC Input to Enable/Disable call for heat

- ▶ **Access to BMS Settings through Graphic LCD Display**
- ▶ **High-Voltage Terminal Strip**
  - ▶ 120 VAC / 60 Hertz / 1 Phase Power Supply
  - ▶ Three Sets of Pump Contacts
- ▶ **Low Voltage Terminal Strip**
  - ▶ 24 VAC Device Relay
  - ▶ Proving Switch Contacts
  - ▶ Flow Switch Contacts
  - ▶ Alarm on Any Failure Contacts
  - ▶ Runtime Contacts
  - ▶ DHW Thermostat Contacts
  - ▶ 3 Space Heat Thermostat Contacts
  - ▶ System Sensor Contacts
  - ▶ DHW Tank Sensor Contacts
  - ▶ Outdoor Air Sensor Contacts
  - ▶ Cascade Contacts
  - ▶ 0-10 VDC BMS External Control Contact
  - ▶ 0-10 VDC Boiler Rate Output Contacts
  - ▶ 0-10 VDC Variable Speed System Pump Signal Input\*
  - ▶ 0-10 VDC Signal to Control Variable Speed Boiler Pump\*
  - ▶ Modbus Contacts
- ▶ **Time Clock**
- ▶ **Data Logging**
  - ▶ Hours Running, Space Heating
  - ▶ Hours Running, Domestic Hot Water
  - ▶ Ignition Attempts
  - ▶ Last 10 Lockouts
- ▶ **Maintenance Reminder**
  - ▶ Custom Maintenance Reminder with Contractor Contact Information
  - ▶ Installer Ability to De-activate Service Reminder
- ▶ **Low-Water Flow Safety Control & Indication**
- ▶ **Password Security**
- ▶ **Customizable Freeze Protection Parameters**

### STANDARD FEATURES

- ▶ **ENERGY STAR Most Efficient Recognition<sup>5</sup>**
- ▶ **95% DOE AFUE Efficiency<sup>5</sup>**
- ▶ **Modulating Burner with 5:1 Turndown**
  - ▶ Direct-Spark Ignition
  - ▶ Low-NOx Operation
  - ▶ Field Convertible from Natural to LP Gas
- ▶ **ASME Stainless Steel Heat Exchanger**
  - ▶ 30 psi ASME Relief Valve
- ▶ **Vertical & Horizontal Direct-Vent**
  - ▶ PVC, CPVC, Polypropylene or SS Venting up to 100 feet
- ▶ **Smart System Control**
- ▶ **Condensate Trap**
- ▶ **Other Features**
  - ▶ Automatic Reset High Limit
  - ▶ Adjustable High Limit w/Manual Reset
  - ▶ Boiler Circulating Pump
  - ▶ Wall-Mount Bracket
  - ▶ Zero Clearances to Combustible Materials
  - ▶ 12-Year Limited Warranty (See Warranty for Details)

### OPTIONAL EQUIPMENT

- ▶ Modbus Communication
- ▶ Flow Switch
- ▶ Low-Water Cutoff w/Manual Reset & Test
- ▶ Alarm Bell
- ▶ Concentric Vent Kit
- ▶ SMART SYSTEM PC Software
- ▶ Condensate Neutralization Kit
- ▶ BMS Gateway to LON or BacNet
- ▶ Multi-Temperature Loop Control
- ▶ Sidewall Vent Termination

### FIRING CODES

- ▶ M9 Standard Construction
- ▶ M7 California Code

\* Exclusive feature, available only from Lochinvar  
 § WHN 55-285 only



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Patent Pending

