

waukesha®



# Heat Source *ONE* Manual

Heat Source *ONE* MANUAL – 1.4

Read and understand this manual prior to operating or servicing the products.



Heat Source *ONE* heaters are distributed by  
Prolec-GE Waukesha, Inc., Service and Components Division



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## GENERAL INFORMATION:

Waukesha® Positive Temperature Coefficient (PTC) HEAT SOURCE *ONE* (HS1) heaters improve the reliability of electrical equipment by maintaining an enclosure temperature slightly higher than the outside ambient temperature. Heaters offer unparalleled reliability. In addition, standard HS1 forced air heaters utilize an integrated fan assembly that ensures even heat distribution throughout the enclosure.

## CONSTRUCTION:

HS1 heaters feature a heating exchanger constructed with a variable resistance material that automatically reacts to the cabinet (heater inlet air) temperature to reduce the heater output as the input temperature rises. A fan is used to provide constant airflow through the heat exchanger, which contains the PTC heating “stones”, as well as to cause uniform distribution of the airflow in the enclosure. DIN rail mounting brackets allow for easy installation. Twelve-foot wiring harness is also included to make installation as easy and flexible as possible. All construction materials are RoHS compliant.

## OPTIONS:

HS1 heaters are available in the following configurations:

- **200 W:** 120V or 240V forced air fan, DIN mount with temperature limiting thermostat
- **200/400 W:** 120V or 240V forced air fan, DIN mount with temperature limiting and high recovery thermostat

## SELECTION FACTORS:

Several factors should be considered when selecting the appropriate heater. Primary concerns should include the following:

- Ambient temperature extremes—affects which part of the wattage curve is used to select the heater.
- Rate of ambient temperature change—affects how much time a given wattage requires to return to steady state.
- Enclosure size, insulation rating and exposure to ambient conditions.

For anti-condensation purposes, heaters should be selected according to calculated power required (watts) to warm the enclosure to a *minimum* temperature difference of 5 degrees Celsius above the ambient temperature.

## SELECTION CALCULATOR:

### TO SELECT A HEATER:

1. Calculate the power (watts) needed for your particular enclosure size.  
For estimation of enclosure heat needed (based upon natural convection air moving less than 5 m/s), use this equation:

$$\text{Joules/Second} = \text{Watts} = h \times A \times T$$

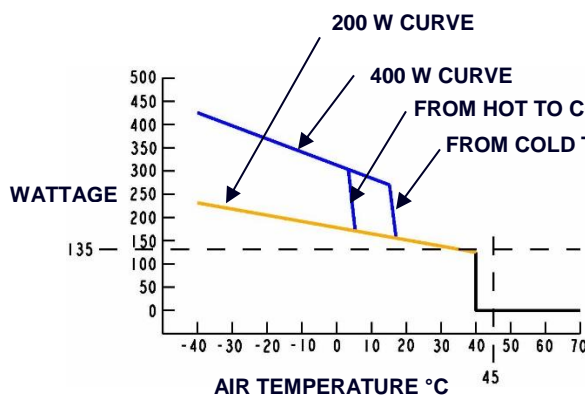
Where **h** = overall heat transfer coefficient **W/ (m<sup>2</sup>K)** – The value of **h** is difficult to calculate and is different for virtually every application; however, for rectangular outdoor enclosures with small amounts of venting & mounted to a vertical support, the typical value is between **5** and **10**. Using **10** will represent a “worst case” scenario in a windier environment.

**A** = Exposed surface area of enclosure (**m<sup>2</sup>**)

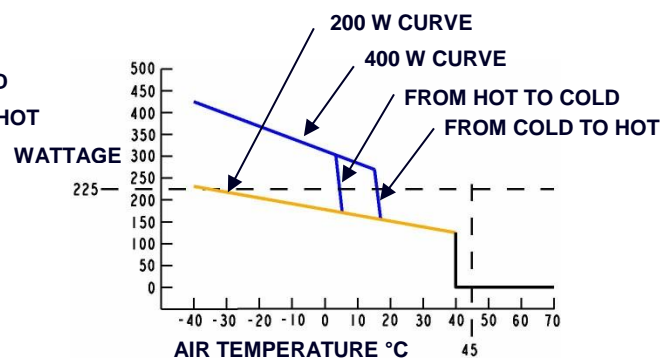
**T** = Temperature difference desired (**K**) – For anti-condensation purposes, typical value is equal to **5**. A higher value may be used for particularly humid applications.

**EXAMPLE:** A 3.5 foot wide, 4 foot tall and 1 foot deep cabinet mounted to a flat wall would have exposed surfaces equaling 29 ft<sup>2</sup> or 2.7 m<sup>2</sup>. **Watts = h x A x T = 10 x 2.7 x 5 = 135**

2. Draw a corresponding horizontal line on the selection chart (see Chart 1 below) based upon wattage calculated in Step 1 above.
3. Determine the highest ambient temperature condition for the enclosure application and draw a corresponding vertical line at the bottom of the chart.  
**EXAMPLE:** The same cabinet in the example above is in a location where the higher air temperatures often reach 45°C. The vertical line should be drawn at 45°C and intersect with the 135 watt horizontal line in Step 2.
4. Select the closest heater that intersects *above & to the right* of the drawn intersecting lines.  
**EXAMPLE:** The 200-watt heater would be selected for this application (see Chart 1 below).
5. If the calculated wattage were 225 watts then, referring to chart two, you would choose a 200/400W high recovery model.



**Chart 1 – 135W Calculated Heater Output Wattage at Corresponding Ambient Temperatures**



**Chart 2 – 225W Calculated Heater Output Wattage at Corresponding Ambient Temperatures**

## MODEL DESCRIPTIONS:

### HIGH RECOVERY MODELS:

High recovery heaters operate as standard HS1 heaters with the addition of a changeover to 400W operation at 5°C (41°F) and lower temperatures then revert to 200W operation once the temperature recovers above 15°C (59°F) (see Chart 4 on page 7).

### STANDARD MODELS:

All forced air heaters operate as standard HS1 heaters except the heater module deactivates at 40°C (104°F) and higher ambient conditions (see Chart 4 on page 7). The fan remains operational to ensure even temperature distribution in the cabinet.

## INSTALLATION:

Installation of the HS1 heater requires mounting of the heater body and connection of the power wiring harness. In all forced air heater systems, including the high recovery models, the final connection is two wire (no ground wire is required as all live metal surfaces are insulated).

## ELECTRICAL CONNECTIONS:

**⚠ CAUTION** Fan-forced heaters are NOT dual voltage devices and must be selected based upon operating voltage. Ensure that the voltage printed on the heater label matches the supply voltage before energizing the heater assembly.

The HS1 is provided as a pre-wired heater with a 12 foot, two-wire power harness. On 200W and 200/400W the heater mates to the power harness with a quick-connect plug (see Figure 1 below) which simplifies heater mounting and power wire installation. The two-wire harness is connected directly to the 120V or 240V power source. No ground wire is required with the forced air version.

Forced Air Heater Electrical Connections	
120 VAC 50 or 60 Hz HS1-B/C Series	White = Neutral
	Black = Live
240 VAC 50 or 60 Hz HS1-B/C Series	White = Live
	Black = Live

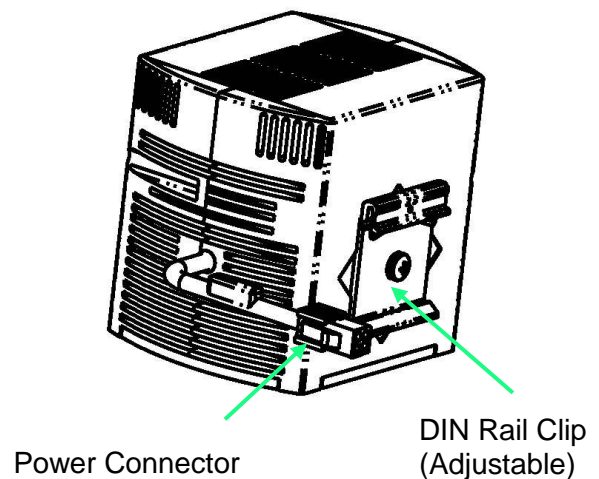


Figure 1 – HS1 Heater Mounting Clip and Power Plug

## FUSING REQUIREMENTS:

HS1 heaters do not include fuse protection and should have minimum fusing at the wiring supply source as follows:

- 120 VAC (Fuse Hot leg)
  - 200 W Forced Air Heater
    - MCB Rating: 4A type B
    - Fuse Rating: 4A, Type (T) Time Delay
  - 200-400 W High Recovery Forced Air Heater
    - MCB Rating: 6A type B
    - Fuse Rating: 6.3A Type (T) Time Delay
- 220 VAC (Fuse Each Leg)
  - 200 W Forced Air Heater
    - MCB Rating: 4A type B
    - Fuse Rating: 4A, Type (T) Time Delay
  - 200-400 W High Recovery Forced Air Heater
    - MCB Rating: 6A type B
    - Fuse Rating: 6.3A Type (T) Time Delay

## HEATER MOUNTING:

The heater is designed to mount directly to standard 35mm x 7.5mm or 15mm DIN rail. The DIN rail mounting clip or the rear of the heater can be securely rotated at 45° angles to facilitate various mounting situations. The heater comes standard with a 4" section of 15mm DIN rail for customer mounting.

## EXCLUSION ZONES FOR HEAT SENSITIVE MATERIALS:

- Material and equipment with a continuous operating temperature tolerance lower than 125°F should be excluded from the following areas:
  - Applies to the **200W and 200/400W forced air HS1 heaters:**
    - 6 inches [152 mm] directly above the heater
    - 2 inches [51 mm] from the left heater vent
    - 2 inches [51 mm] from the right heater vent
    - One [1] inch [25 mm] clearance is required below the bottom air intake for proper HS1 heater operation

## OPERATION:

Operation of the heater assembly is automatic and requires no adjustment. As the heat level in the enclosure increases, the resistance of the heater element also increases, resulting in a decrease of the output wattage. When the heater is fully limited, the output will be ~60% of the rated output.

For the forced air model, the heating module is off when the cabinet temperature reaches 104°F, but the fan will run constantly to ensure enclosure circulation in the cabinet.

## MAINTENANCE:

The HS1 heater is essentially maintenance-free with only a few necessary checks to ensure that the unit is operating normally.

## ANNUAL INSPECTION:

**⚠ CAUTION:** The heater element surface is extremely hot and can cause burns. *Never cut or remove any part of the heater protective casing.*

Visually inspect that the fan is running quietly and that no foreign material has entered the assembly. Verify heater plastic casing is warm to the touch.

## TROUBLESHOOTING:

### FAN OR HEATER IS NOT OPERATING:

- Confirm the voltage input to the HS1 assembly is the correct voltage.
- Check heater assembly terminals at the power harness quick-connect plug.
- Check wiring harness for cuts or bare insulation.
- Confirm fan assembly has not been clogged with debris; clean if necessary.

## APPENDIX:

### WATTAGE OUTPUT VS INLET TEMPERATURE:

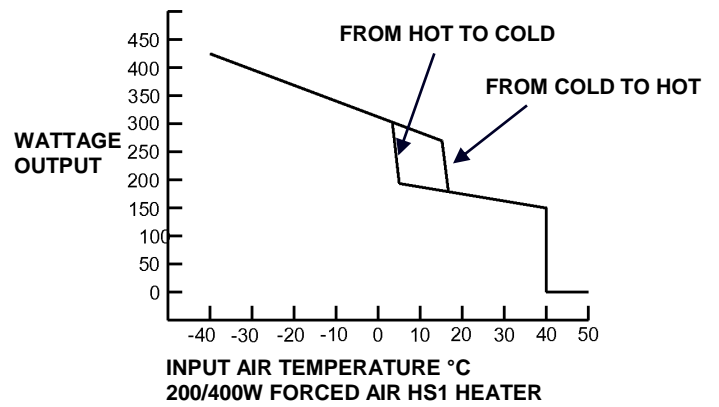
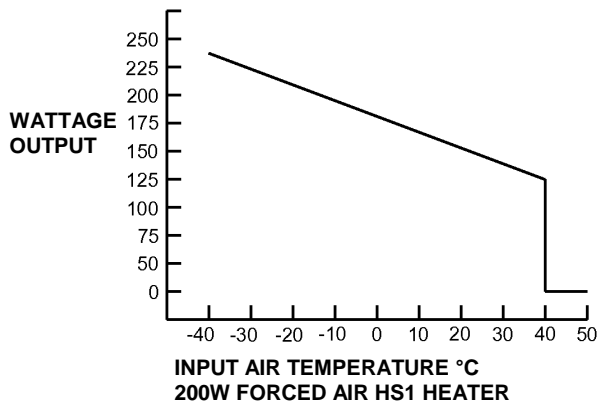
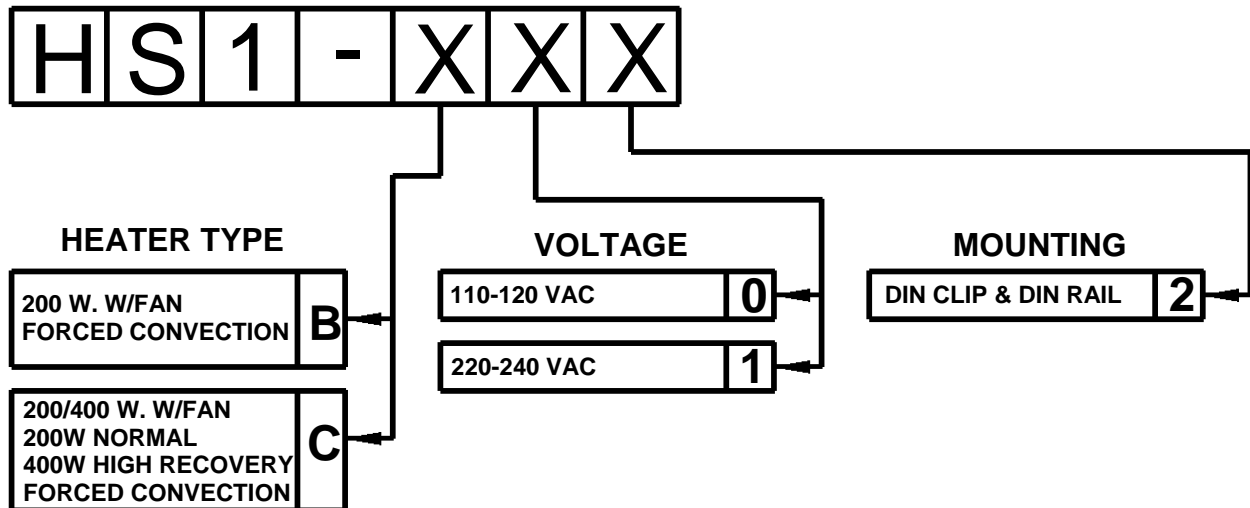


Chart 4 – HS1 Heater Inlet Temperature vs. Wattage Output



**APPENDIX (continued):**

**Heat Source ONE Heaters Configurator**



NOTE: High recovery HS1 heaters operate as a standard 200W HS1 heater with the 400W mode activated by an integral thermostat set to energize at 5°C ± 3°C (41°F ± 5°F). All forced air heaters are equipped with a high temperature heater shutoff at 40°C ± 3°C (104°F ± 5°F). Fan will remain on to ensure proper air circulation in the cabinet. Heater module will re-activate at 34.4°C ± 3°C (94°F ± 5°F) as the cabinet cools.

*Figure 2 – HS1 Part Number Configurator*

## APPENDIX (continued):

### FORCED AIR DIMENSIONS & FLOW DIRECTION:

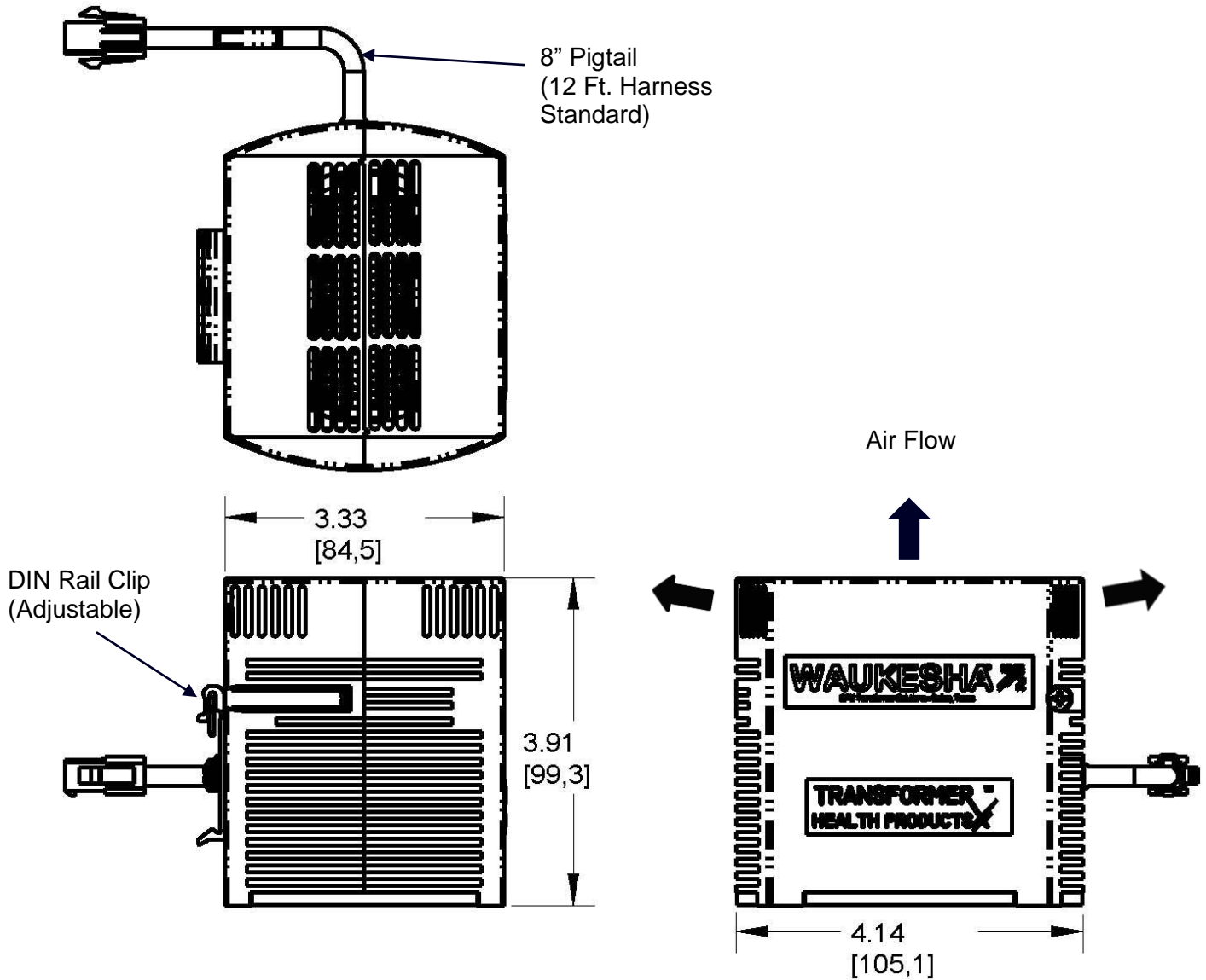


Figure 3 – HS1 Forced Air Diagrams  
Dimensions in inches [mm]

## REPLACEMENT PARTS AND SERVICE

Please contact your local sales representative or authorized distributor for replacement parts and/or service, or visit us online at [www.waukeshacomponents.com](http://www.waukeshacomponents.com).

For technical support, call us at **800-338-5526**.