

Installation Instructions Tank Style Engine Heater

READ CAREFULLY FOR PROPER INSTALLATION AND OPERATION

INSTRUCTIONAL VIDEO CAN BE FOUND AT WWW.HOTSTART.COM

⚠ WARNING

Hazardous voltage: All electrical work must be done by qualified personnel in accordance with all state and local codes.

System can start automatically and without warning. Before wiring, servicing, or cleaning the system turn off the power and install a lockout on the heater circuits at the service panel.

NOTICE

Please read carefully: The safety of any system incorporating this heater is the responsibility of the assembler. The safe and proper use of this heater is dependent upon the installer following sound engineering practices. If the equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired. All applicable electrical safety standards defined by local jurisdictions must be followed. (reference EU directive 2006/95/EC in EU countries). The heater must be connected to a suitable ground (protective earthing conductor). The power supply must be protected by a suitable overcurrent limiting device. If the heater is permanently connected, a switch or circuit-breaker must be included in the installation. It must be suitably located and easily reached and marked as the disconnecting device for the heater. Hotstart recommends the power switch or circuit breaker be located near the heater for safety and ease of use. Installers and operators of this equipment must be thoroughly familiar with the instructions in this manual before commencing work. Hotstart tank style heaters operate on the principle that heated fluid expands slightly and rises. Reliable and efficient operation of the heater is dependent on proper mounting location & installation.

EU Countries Only: Equipment rated for the conditions listed in EN 601010-1 1.4.1 Ingress protection rating IP44. (Special conditions for specific applications may apply)

⚠ CAUTION

Hot surfaces: avoid contact with the system while it is in service – some surfaces may remain hot even if the system is not energized.

Heater Damage: Do not connect unit to electricity until the following steps have been completed. Never operate heater unless coolant is present in the heating chamber.

OPERATING INFORMATION:

As coolant flows into the heater intake opening, it is warmed by the element and begins to rise. The heated coolant exits through the heater outlet opening creating continuous circulation. The heater thermostat senses the temperature of the coolant and cycles the heater on and off.

The desired circulation pattern of an external tank type heater is shown in Figure 2. Cold water is supplied from the bottom of the engine block, heated in the tank heater and returned back to the top rear area of the block.

⚠ CAUTION

Heater Damage: Prior to heater installation, inspect the coolant supply. Contaminated coolant will limit heater performance and cause premature element failure. Check your engine manufacturer's recommendations for the proper coolant. Only de-ionized or distilled water and a low-silicate antifreeze should be used in exceed a 60% antifreeze to 40% water ratio. The use of hard water or water softened with salts is one of the most common causes of failure to the heating element. A cooling system containing anti-leak additive will also result in element failure.

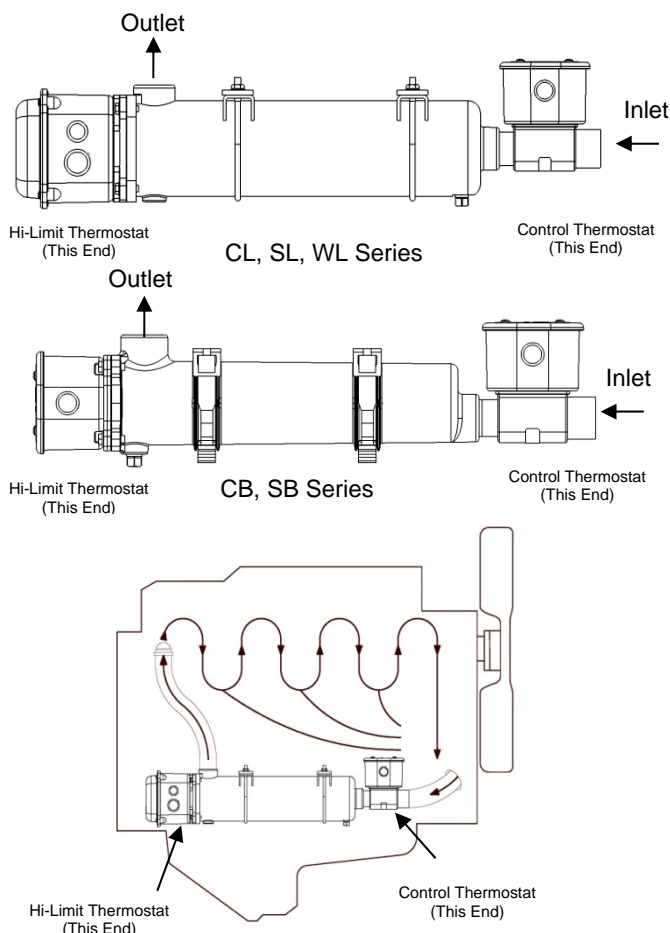


FIGURE 2

MOUNTING AND INSTALLATION:

Before mounting the heater, determine the locations for coolant supply and return ports on the engine. The supply hose to the heater and the return hose to the engine should be as far apart as possible. The coolant return port on the engine should be higher than the coolant supply port. On “V” engines – it is best to draw from one side of the engine and return to the opposite side of the engine. This allows for maximum heat distribution throughout the engine. See Figure 2.

NOTICE

Isolate heater from vibration. Do NOT mount heater directly to the engine or any components directly connected to the engine.

NOTICE

The heater must be mounted below the lowest level of the water jacket to assure adequate operation (See Figure 4).

Step 1

Mount the heater in a horizontal position with the outlet neck pointed up. Position the heater outlet directly under the engine port to which coolant returns. Proper positioning of the heater will eliminate horizontal sections or dips in the outlet hose which restricts circulation. See Figures 2 and 5.

Step 2.

Using supplied hardware (figure 3), mount heater to the engine frame or skid.

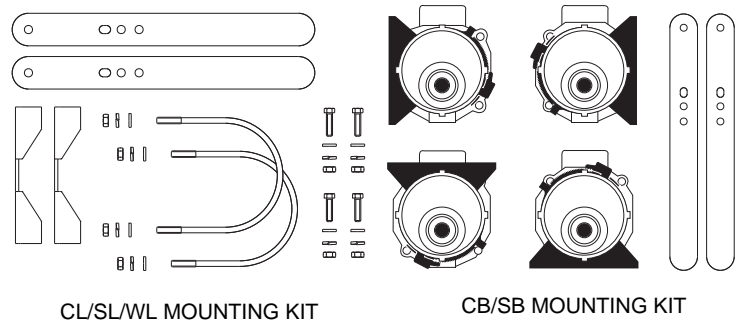


FIGURE 3

PLUMBING THE HOTSTART HEATER:

HOTSTART recommends that you follow the minimum plumbing sizes listed below. Smaller hose will reduce performance. If engine openings are smaller than the recommended minimum size, reduce the plumbing at the engine, not the heater. If the heater is installed with rigid pipe, use a section of flexible hose on the inlet and outlet to isolate the heater from engine vibration. Hose rated for high temperature applications should be used.

Minimum Plumbing Sizes

500-3000 Watt — 1/2” NPT Fittings, 3/4” ID Hose
3750-5000 Watt — 3/4” NPT Fittings, 1” ID Hose

Isolation Valves

HOTSTART recommends the use of isolation valves on tank style heaters to facilitate maintenance and servicing of the engine heater. Use only “full flow” type valves.

CAUTION

Personal Injury: Do not energize heater with closed isolation valves. Excessive pressure could result.

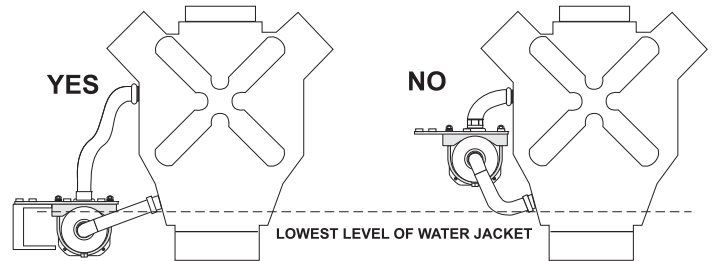


FIGURE 4

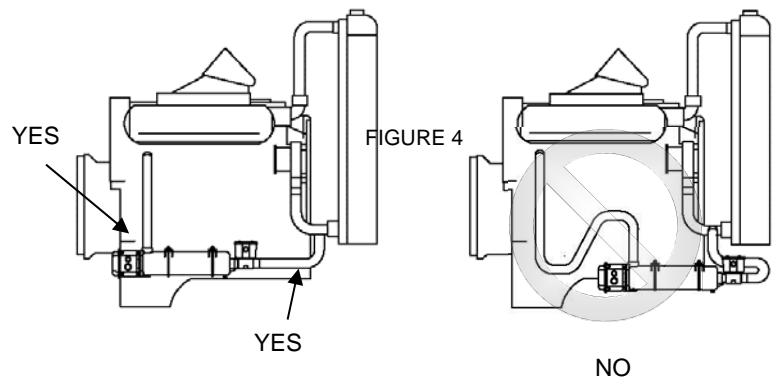


FIGURE 5

Step 1.

Drain and thoroughly flush the coolant system.

Step 2.

Heater Outlet: Install the hose between the outlet of the heater and the coolant return port on the engine. The hose must be routed to ensure a continuous rise from the heater to the engine. See Figure 5.

Step 3.

Heater Inlet: Connect hose from the inlet of the heater to where the coolant will be pulled out of the engine. There must be no high spots in the routing of the hose. See figure 5.

Step 4

Follow the engine manufacturer’s specifications for coolant. Refill the cooling system with the outlet hose disconnected to eliminate air pockets in the heater. Start engine and allow it to run until the engine thermostat opens. This will help purge the air out of the heater and plumbing. Once the engine has reached operating temperature, shut off and inspect for leaks and check coolant level. Top off the coolant if necessary.

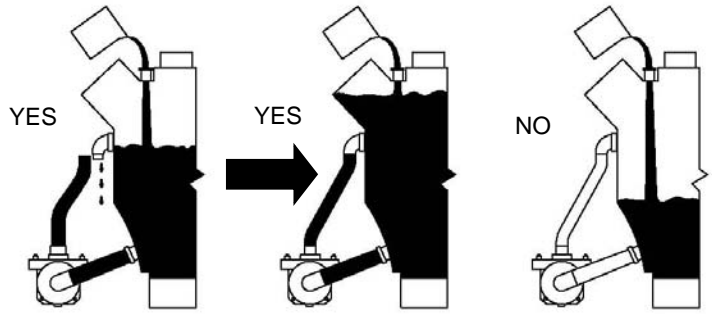


FIGURE 6

WIRING:



Personal Injury: All wiring must be performed by a trained technician and in accordance with national and local electrical codes.



Personal Injury: The high-limit thermostat installed in the heater functions as a safety device. This thermostat must be kept in the circuit even if the control sensing unit in the thermostat assembly is used.

1 PHASE UP TO 480VAC:

Single phase heaters rated up to 480V may be powered directly without the use of a control relay or contactor. See figure 7.

OVER 480VAC OR 3 PHASE:

If the power to the heater is greater than 480V or is 3 phase, the heater thermostats must be used in a control circuit with a contactor for switching the main power to the heating elements. See figures 8 & 9. Contact HOTSTART for recommended control boxes.

Automatic start engines:

An automatic shutoff device is recommended and will de-energize the heater during engine start up. The engine heater should not operate during engine operation. Consult HOTSTART for recommendations on your specific applications.

Step 1:

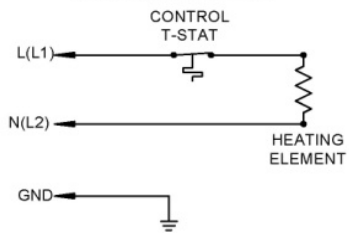
Reference product label for wattage and voltage of the heater. Evaluate supply conductors to handle the amperage draw of the heater. Supply conductors must be rated for 125°C or equivalent.

Step 2:

Use appropriate conduit, cord connection, or cable gland to bring supply conductors into enclosure. Either 1/2" (all models) or 3/4" (CL, WL model) openings are available. Some heater models may also be purchased with power supply cord included.

WIRING SCHEMATICS

STANDARD HEATER



HEATER WITH REMOTE THERMOSTAT

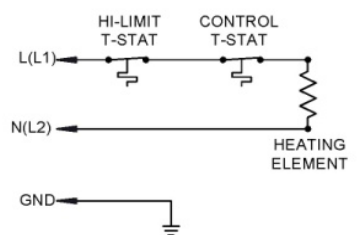


FIGURE 7

WIRING SCHEMATIC FOR USE WITH CONTACTOR

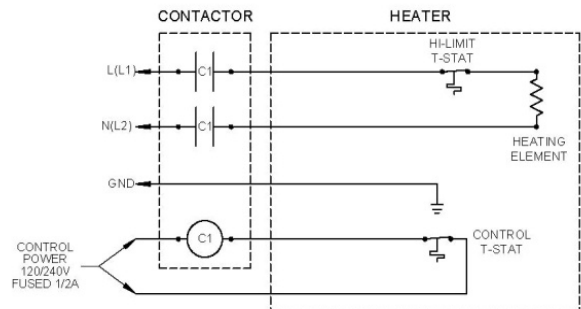


FIGURE 8

Step 3:

Connect the heater to properly grounded power source.

EVALUATING HEATER PERFORMANCE:

To ensure the heater has been installed correctly, the coolant temperature going into the engine should be well below 200°F (93°C). A heater outlet temperature higher than 200°F or an inlet hose that is hotter than the outlet hose indicates limited or no circulation. See figure 10. High outlet temperatures result in decreased heater/hose life and poor engine heating. If equipped with a control thermostat (See Figure 2) – the heater should cycle on and off a maximum of 4 times per hour.

If poor circulation is suspected, it could be due to one or more of the following:

1. Airlocks may be present. Airlocks can form in hoses due to loops, routing over the top of the engine, excessive hose lengths, or kinks in hose. See Figure 5.
2. Heater is mounted too high. See Figure 4.
3. Heater is not mounted properly. Outlet neck must be pointed up. In some cases, adjusting the heater mount so that the outlet is slightly elevated by about ½" to 1" will help eliminate the possibility of an air pocket forming.
4. Contaminates in coolant restricting flow.

RECOMMENDED WIRING DIAGRAM

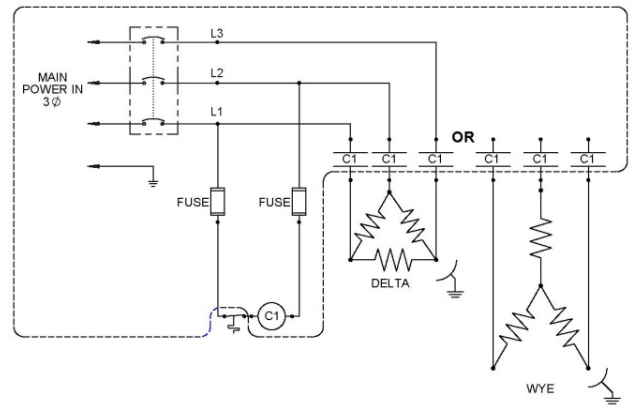


FIGURE 9

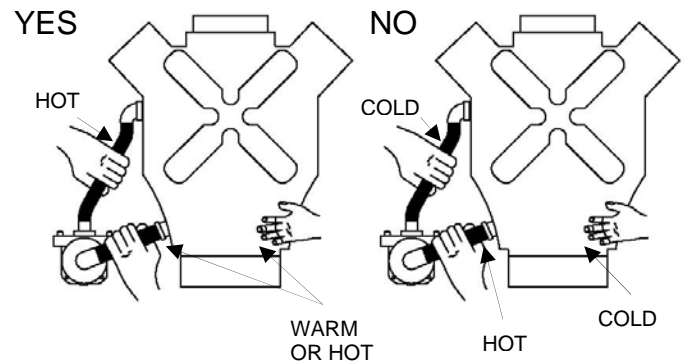


FIGURE 10

Heater with control thermostat

The control thermostat is designed to measure the coolant as it enters the heater. This is the coolest fluid in the circuit. For example, if a heater has a control thermostat rated for **ON** at 100°F (38°C) and **OFF** at 120°F (49°C), the average engine temperature should be approximately 130°F (55°C).

MAINTENANCE AND SERVICE:



Personal Injury: Disconnect and lockout electrical supply to heater before servicing the heater or any part of the installation.

Every two years:

1. Drain, clean, and flush cooling system
2. Check for cracked and/or weakened hoses and replace if necessary
3. Check electrical wiring and connections for wear and excessive heat
4. Remove element and clean element and tank



Personal Injury: Do not energize heater with closed isolation valves. Excessive pressure could result.

Thermostat Replacement:

Thermostats have a finite life. HOTSTART recommends thermostats be replaced every 3 years or 25,000 hours of operation. If the thermostat controls a contactor, periodically inspect and replace contactor if needed. The thermostat is rated for 100,000 cycles.