

INSTALLATION INSTRUCTIONS

HOTflow[™] HEATER CSM MODEL

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BEFORE YOU INSTALL

HOTflow[™] engine heaters feature an integrated pump that circulates warm coolant throughout the entire engine at uniform temperatures. Constant circulation of the coolant eliminates hot spots that can deteriorate heater hoses, harm engine seals and diminish coolant life. However, initial installation of the heating system is critical; even seemingly minor adjustments to port location, hose routing or heater positioning may help ensure your HOTflow[™] CSM heater preheats your engine effectively.

⚠ DANGER

Personal injury: This product generates heat during operation. Operation of a heating system with closed isolation valves could result in high pressure and serious injury. It is the responsibility of the installer and operator to ensure that no unsafe condition can result from the generation of pressure. In EU countries, PED (97/23/EC) compliant pressure relief may be required (125 psi maximum).

Hazardous voltage: Before wiring, servicing or cleaning the heating system, turn off the power and follow your organization's lockout and tagout procedure. Failure to do so could allow others to turn on the power unexpectedly, resulting in harmful or fatal electrical shock.

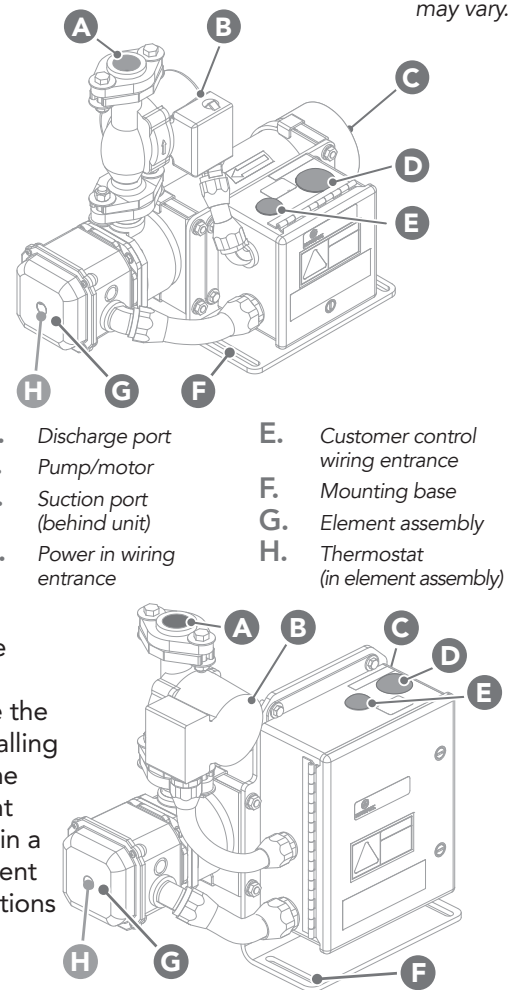
⚠ CAUTION

Electrical hazard: Power source must be properly grounded and in accordance with national and local electrical codes. A user-supplied circuit breaker (rated at the appropriate amperage) is required for use in the main power feed line. Do not connect heater prior to installation.

NOTICE

Read instructions carefully: The HOTSTART warranty does not cover any damage that a heating system may sustain from improper installation, improper operation, improper specification or corrosion. Before installing your heater, be sure you have the right heating system for your application. Carefully read all instructions before installing and energizing your heater. 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.)

Figure 1. Typical CSM model Style A (above) and Style B (below). Style and configuration may vary.



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INSTALLING THE HEATER

PREPARE COOLANT SYSTEM

1. Drain and flush cooling system to remove any debris present in the engine's cooling system.

SELECT PORTS

2. Select return port. The return port will allow heated coolant to return to the engine. See Fig 2 on following page. The return port should be located:
 - away from the engine thermostat
 - toward the rear (flywheel) of the engine
 - away from the supply port
 - on the same side of the engine as the intended heater mounting location
3. Select supply port. The supply port will allow coolant to flow from the engine to the heater. See Fig 2 on following page. The supply port should be located:
 - toward the front (radiator) of the engine
 - at the lowest point of the engine's water jacket
 - away from the return port

NOTE: For V-type engines, it is acceptable to select a supply port on the opposite side of the engine as long as the supply hose is routed properly. See **PLUMB HEATER**.

SELECT HOSE, FITTINGS & VALVES

4. Select fittings. CSM minimum port size fitting:
 - 3/4 inch NPT (20 mm)
5. Select hoses. CSM minimum hose inner diameter:
 - 1 inch (25 mm)

NOTE: Select hoses rated for 250 °F (121 °C) and 100 psi (690 kPa) minimum.

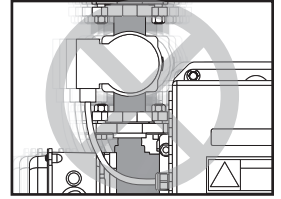
6. Select optional, user-supplied isolation valves.

NOTE: HOTSTART recommends installing valves to isolate the heating system in case of service. To minimize flow restriction, select full-flow (full-port) ball isolation valves.

MOUNT HEATER

NOTICE

Vibration damage: Do not mount heater directly to engine. Engine vibration will damage heater. If the heater is installed with rigid pipe, connect flexible hose to inlet and outlet to isolate from vibration.



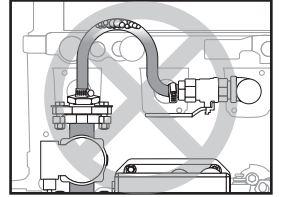
Heater orientation: CSM units must be installed with discharge port pointing directly upward. See Fig 2 on following page. Do not mount at an angle. An incorrectly oriented heater may cause heater failure.

7. Select a heater mounting position. The heater should be located:
 - low enough to allow the return hose to continuously rise to the return port
 - on the same side of the engine as the return port
 - in a position to ensure the discharge port points directly upward
 - in a location that allows a minimum of 17 inches (43 cm) clearance for heating element removal

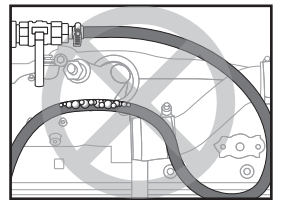
PLUMB HEATER

NOTICE

High points: Do not allow high points along heater plumbing. High points will restrict coolant flow and damage heater. To avoid high points, it may be necessary to change hose routing or lower heater mounting location.



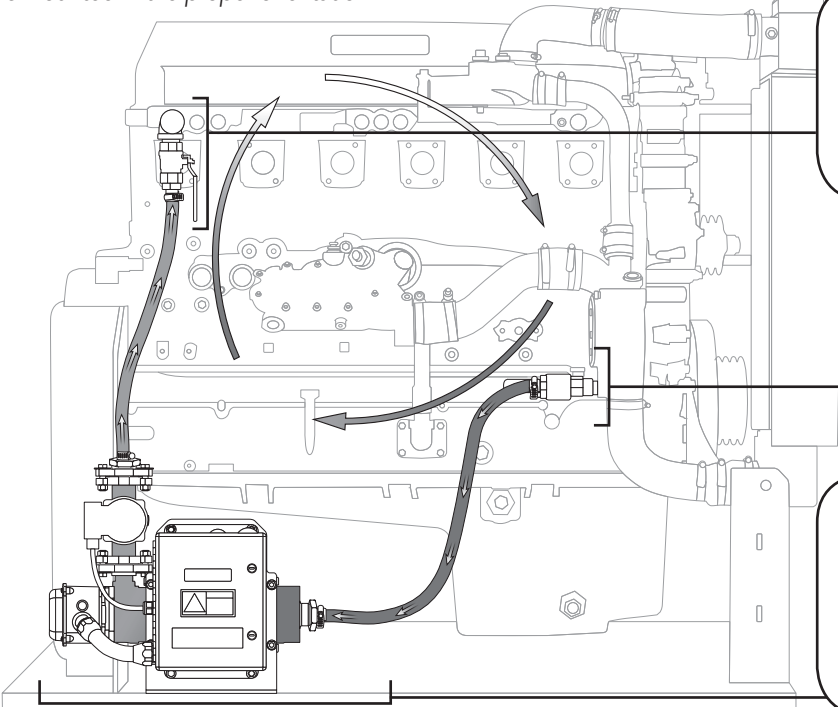
Dips and bends: Do not allow dips or bends along heater plumbing. Dips or bends will allow air pockets to form, restricting coolant flow and damaging heater.



90° Fittings: Elbows (90° fittings) along heater plumbing may restrict flow and damage heater. To minimize flow restriction, HOTSTART recommends sweeping bends or 45° fittings in place of 90° fittings.

8. Install isolation valves to port fittings.
9. Route and install return hose. The return hose should continuously rise from the heater to the return port.
10. Route and install supply hose. The supply hose should continuously descend from the supply port to the heater.

Figure 2. Example CSM installation (Style B shown). The return hose continuously rises to the engine and supply hose continuously descends to the heater; the hoses have no dips, bends or high points. The heater is isolated from engine vibration and is mounted in the proper orientation.



RETURN PORT

- Select a **return** port away from the engine thermostat.
- Select a **return** port toward the rear of the engine.
- Select a **return** port away from the **supply** port.

SUPPLY PORT

- Select a **supply** port low on the engine.
- Select a **supply** port toward the front of the engine.
- Select a **supply** port away from the **return** port.

HEATER MOUNTING

- Mount the heater in the proper orientation. Ensure discharge port is pointing directly upward.
- Mount the heater to a vibration-isolated surface.
- Mount the heater on the same side as the **return** port.

REFILL COOLANT

NOTICE

Heater damage: When mixing coolant, only use deionized or distilled water and low-silicate antifreeze. Refer to your engine’s manufacturer recommendations. Do not exceed 60% antifreeze to 40% water ratio. **Never** add unmixed water and antifreeze to an engine. Do not add anti-leak or other coolant additives.

- Mix coolant according to your engine manufacturer’s recommendations. Refill cooling system with coolant.

NOTE: HOTSTART recommends using a 50% deionized or distilled water to 50% low-silicate antifreeze mixture.

- Start engine. Allow engine to run until engine thermostat opens, purging air from cooling system. **NOTICE!** Engine must be run to eliminate air from heating system before energizing heater.

- When engine has reached operating temperature, shut engine off and check for coolant leaks.

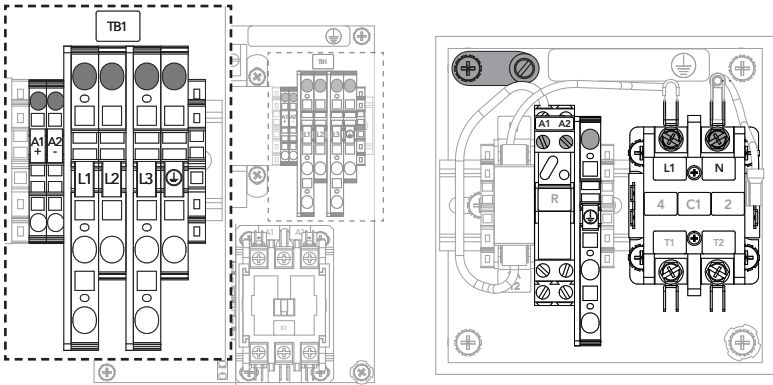
- Allow engine to cool. Check coolant level and top off as needed.

WIRE HEATER

- Connect heater to an appropriately rated power source. **NOTICE!** Terminations in all enclosures require that wire be rated at a minimum of 60 °C. Selected wire must be sized in accordance with heater amperage.
- Connect user-supplied 24 V DC control signal wire (typically to ignition system). **NOTICE!** The heating system must be activated only while the engine is not in operation. To enable automatic shutdown, the heating system requires a connected 24 V DC signal.

MAIN POWER	TB1		TORQUE	CUST. CONTROL	R OR TB1	TORQUE
	1-PHASE	3-PHASE				
Line 1 ➡	L1	L1	if binding screw: 15 to 20 lbf · in (1.7 to 2.3 N · m)	Signal ➡	A1 +	4.4 lbf · in (0.5 N · m)
Line 2 ➡	–	L2		Signal ➡	A2 –	
Line 3 or N ➡	N	L3	if box lug: 40 lbf · in (4.5 N · m)			
Ground ➡	ground terminal or lug		6.4 lbf · in (0.7 N · m)			

Figure 3. Typical CSM model Style B (left) and Style A (below), showing electrical connections.



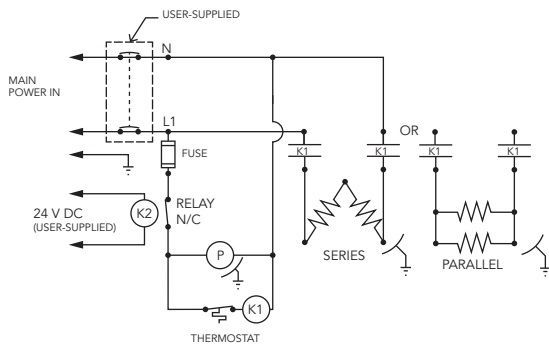
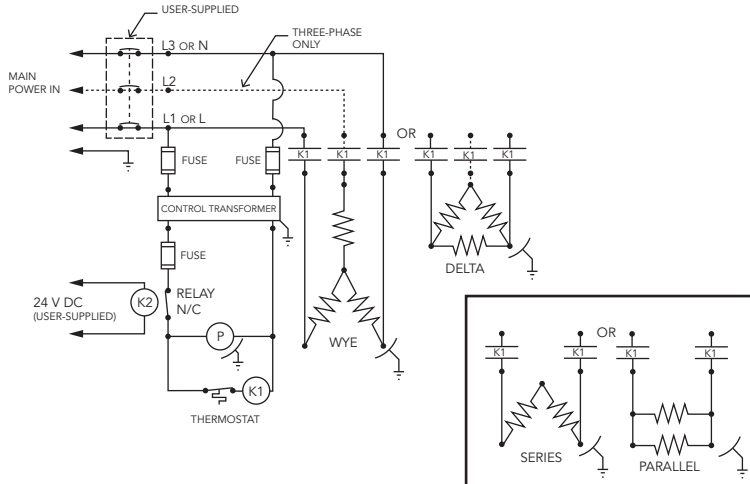


Figure 4. Typical CSM wiring schematic without control transformer (above) and with control transformer (below). See label attached to control box lid for your specific wiring schematic.



TROUBLESHOOTING

To ensure coolant is flowing, check the outlet temperature. If the coolant temperature along the return hose exceeds 140 °F (60 °C) or the pump produces a loud, rattling sound during operation, it may indicate:

- Air pockets are restricting flow. Air may collect due to loops in hose, routing hose over the top of the engine, excessive hose lengths, or kinks. Reroute hoses or change port locations.
- Contaminants in the coolant are restricting flow. Flush coolant system and refill.

MAINTENANCE & PARTS

⚠ CAUTION

Electrical hazard: Before wiring, servicing or cleaning the heating system, turn off the power and follow your organization's lockout and tagout procedure. Failure to do so could allow others to turn on the power unexpectedly, resulting in harmful or fatal electrical shock.

Personal injury: If equipped with isolation valves, ensure valves are open before energizing heater. Obstructed flow may result in an unexpected release of heated coolant, potentially causing serious injury.

PREVENTATIVE MAINTENANCE

Annually:

- Check and replace cracked or weakened hoses.
- Check electrical wiring for wear and excessive heat.
- Remove element and clean element and tank.

Every three years or 25,000 hours of operation:

- Replace control thermostat.
- Replace contactor.

THERMOSTAT & ELEMENT

To replace the thermostat or clean tank: (See Fig. 5)

1. Disconnect heater from power source. Allow heating system to cool.
2. Remove element assembly enclosure cover:
 - If cleaning tank, unscrew wiring enclosure screws to remove wiring enclosure. Unscrew element plate screws. Remove plate and element from tank.
 - If replacing thermostat, disconnect terminals from thermostat sensing unit spade connectors.
3. Replace thermostat unit or clean tank:
 - If replacing thermostat, loosen thermostat clip. Remove thermostat. Place new thermostat in recessed space. Tighten thermostat clip.
 - If cleaning tank, ensure element O-ring is in place.
4. Reconnect electrical connections. Reattach enclosure, element plate, O-rings and enclosure cover.
5. Reconnect heater to power source.

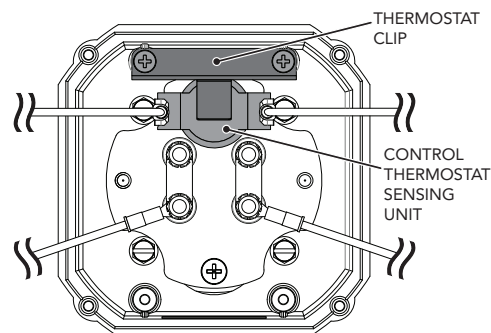
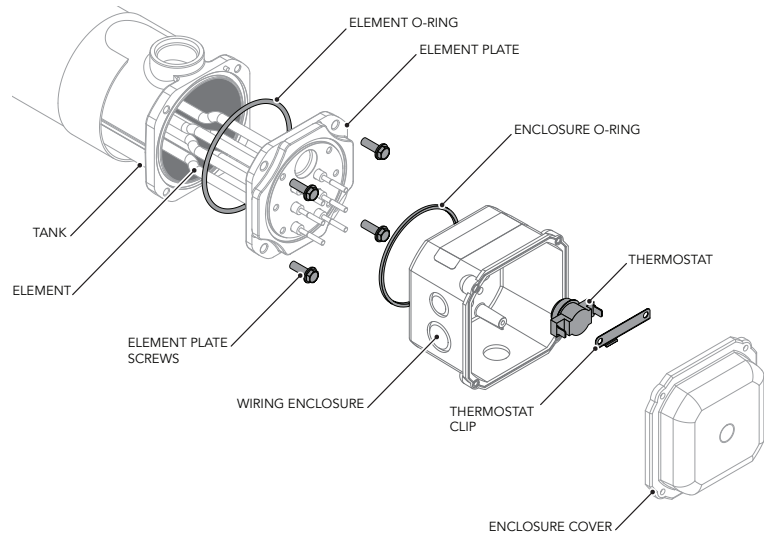


Figure 5. Cleaning element or replacing thermostat (above) and thermostat/element wiring detail (left). Wiring and configuration may vary.