

# INSTALLATION INSTRUCTIONS

## HOTflow™ HEATER CKM 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™ CKM 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**

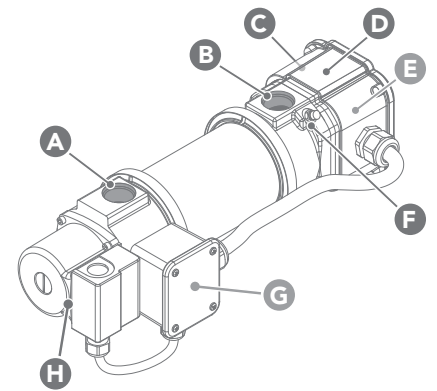
**Electrical hazard:** Power source must be properly grounded and in accordance with national and local electrical codes. A user-supplied circuit breaker (rated at the appropriate amperage) is required for use in the main power feed line. Do not connect heater prior to installation.

#### **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.)

**Check valve:** HOTSTART recommends installing a customer-supplied swing-type or full-flow check (non-return) valve to prevent coolant from flowing backward through the heating tank during engine operation. Allowing coolant to flow backward may result in pump damage.

Figure 1. Typical CKM model. Style and configuration may vary.



- |    |                          |    |   |
|----|--------------------------|----|---|
| A. | Suction port             | E. | High-limit thermostat with manual reset (in element assembly) |
| B. | Discharge port           | F. | Air release valve   |
| C. | Power in wiring entrance | G. | Control thermostat (in enclosure)                             |
| D. | Element assembly         | H. | Pump/motor  |

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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. Select the return port using the following guidelines:
  - return port must be located on the same side of the engine as the intended heater mounting location
  - return port must be located away from the engine thermostat
  - return port should be located toward the rear (flywheel) of the engine
  - return port should be located away from the supply port
3. Select supply port. The supply port will allow coolant to flow from the engine to the heater. See Fig 2 on following page. Select the supply port using the following guidelines:
  - Supply port may be located on the same side or opposite side of the engine as the intended heater location

**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**.

  - Supply port must be located at the lowest point of the engine's water jacket
  - Supply port should be located toward the front (radiator) of the engine
  - Supply port should be located away from the return port

## SELECT HOSE, FITTINGS & VALVES

4. Select fittings. CKM minimum port size fitting:
  - 3/4 inch NPT (20 mm)
5. Select hoses. CKM 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

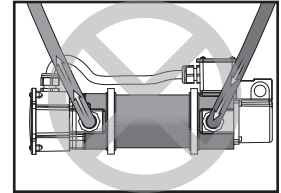
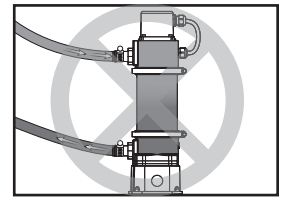
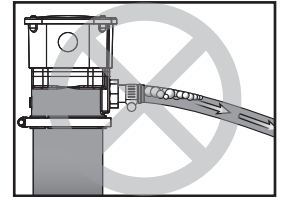
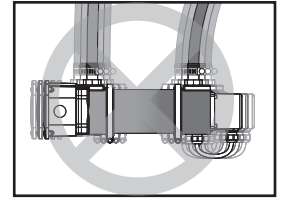
**Vibration damage:** Do not mount heater directly to engine. Engine vibration may damage heater. If the heater is installed with rigid pipe, connect flexible hose to inlet and outlet to isolate from vibration.

**Heater orientation:** CKM heaters may be mounted straight horizontally or vertically; do not mount at an angle. If mounted vertically, all dips and horizontal hose routing **must** be eliminated. An incorrectly oriented heater may cause heater failure.

**Outlet orientation:** If mounting heater horizontally, inlet and outlet must face upward. If mounting heater vertically, ensure outlet is at top of heater. Do not attempt to mount heater at an angle or in any other orientation. An incorrectly oriented outlet may cause heater failure.

7. Select a heater mounting position using the following guidelines:

- Heater must be low enough to allow the return hose to continuously rise to the return port.
- Heater must be on the same side of the engine as the return port.
- Heater must be in a location that allows a minimum of 10 inches (26 cm) clearance for 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.

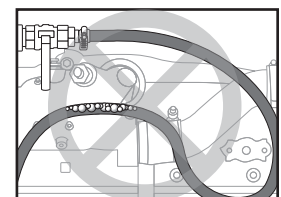
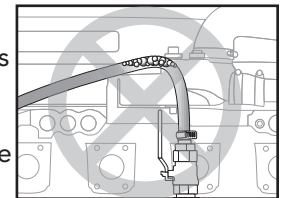
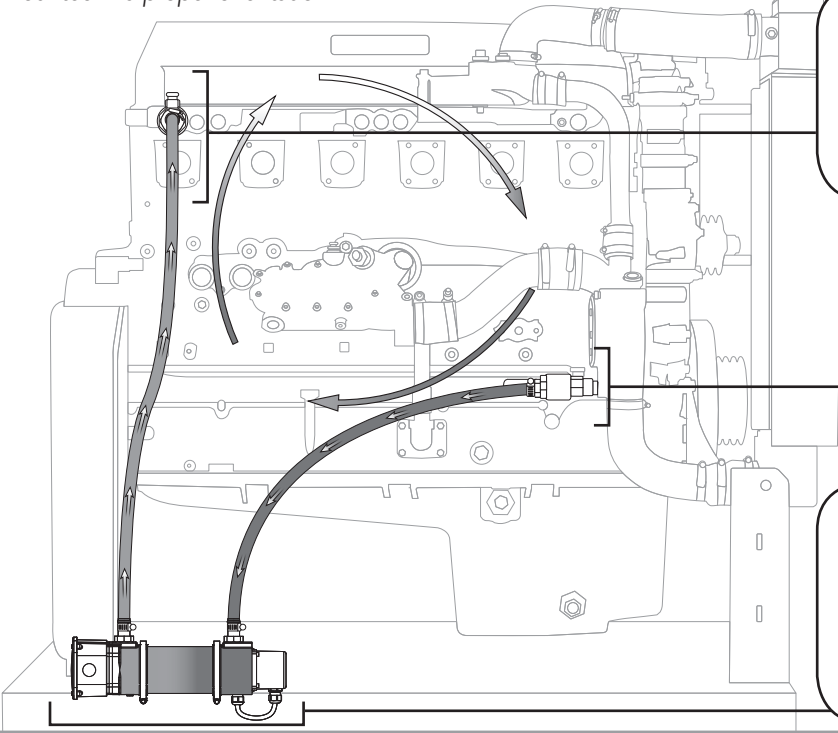


Figure 2. Example CKM installation. The return hose continuously rises to the engine and supply hose continuously descends to the heater; the hoses have no dips, bends or high points. The heater is isolated from engine vibration and is mounted in a proper orientation.



### 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

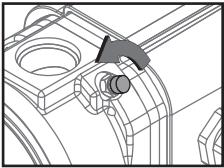
- Select a **supply** port low on the engine.
- Select a **supply** port toward the front of the engine.
- Select a **supply** port away from the **return** port.

### HEATER MOUNTING

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

8. Install isolation valves to port fittings.
9. Route and install return hose. **NOTICE!** The return hose must continuously rise from the heater to the return port.
10. Route and install supply hose. **NOTICE!** The supply hose must continuously descend from the supply port to the heater.
11. If installed, open supply port isolation valve and return port isolation valve. **WARNING!** Operation of a heating system with closed isolation valves could result in high pressure and serious injury.

13. Start engine. Allow engine to run until engine thermostat opens, purging air from engine cooling system. **NOTICE!** Engine must be run to eliminate air from heating system before energizing heater.
14. 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.
15. To ensure all air has been purged, open heater air release valve. Allow air to vent from heater. Close valve as coolant begins venting. Wipe excess coolant from heater.



### 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.

12. Mix coolant according to your engine manufacturer's recommendations. Refill cooling system with coolant.

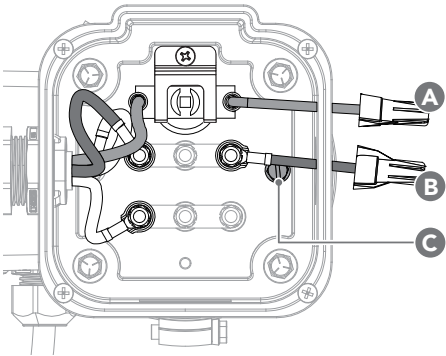
**NOTE:** HOTSTART recommends using a 50% deionized or distilled water to 50% low-silicate antifreeze mixture.

### WIRE HEATER

16. Connect heater to an appropriately rated power source. **NOTICE!** Terminations in all enclosures require that wire be rated at a minimum of 90 °C. Selected wire must be sized in accordance with heater amperage.

MAIN POWER	CONNECTION
Line 1 →	A black wire
Line 2 →	B black wire
Ground →	C green ground screw

Figure 3. Typical CKM model, showing main power electrical connections.



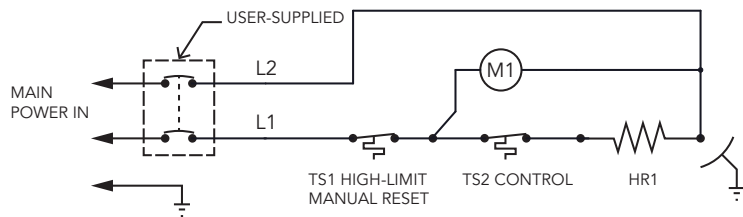
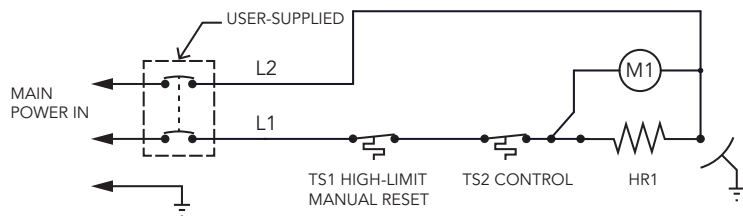


Figure 4. Typical CKM wiring schematic with continuous pump operation (above) and with temperature-controlled pump operation (below). See part drawings for your specific wiring schematic.



## 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.

If the heater is inoperative, check power source. If problem persists, the high-limit thermostat may need to be reset. To reset the high-limit thermostat: (See Fig. 5.)

1. Disconnect heater from power source. Allow heating system to cool.
2. Remove enclosure cover.
3. Locate the high-limit thermostat. Press thermostat reset button (A).
4. Reattach enclosure cover.  
**NOTICE!** Before energizing heater, check for flow restrictions along hose routing or bleed air from tank. If high-limit persists, check control thermostat.

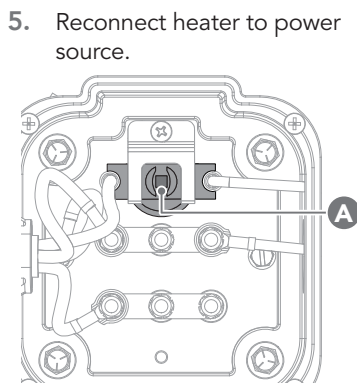


Figure 5. High-limit thermostat reset button.

## 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 sensing unit.

## THERMOSTAT REPLACEMENT

To replace the control or high-limit thermostat: (See Fig. 6.)

1. Disconnect heater from power source. Allow heating system to cool.
2. Remove enclosure cover:
  - If replacing control thermostat (B), remove control thermostat enclosure (C) cover (A).
  - If replacing high-limit thermostat (E), remove element enclosure cover.
3. Unscrew and remove sensing unit and flange assembly.
  - If removing control thermostat, disconnect terminals from thermostat sensing unit spade connectors.
  - If removing high-limit thermostat, disconnect terminals from thermostat sensing unit spade connectors.
4. Insert new sensing unit and flange assembly.
  - If replacing control thermostat, reconnect terminals to thermostat sensing unit spade connectors. Screw thermostat flange in place to secure.
  - If replacing high-limit thermostat, insert thermostat in recessed space. Screw mounting clip in place to secure. Reconnect wire leads.
5. Reattach enclosure cover. Reconnect heater to power source.

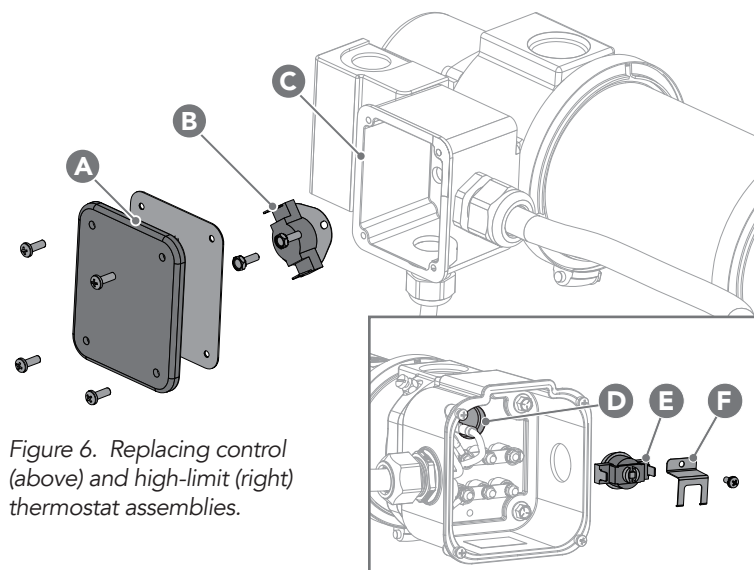


Figure 6. Replacing control (above) and high-limit (right) thermostat assemblies.