

HOTflow® Heating System CKM



Hotstart's CKM HOTflow® heating system is a coolant preheater, developed to maintain optimal temperatures for diesel and gas engines in stationary land power, marine, construction equipment and truck applications.



INTEGRATED DESIGN

The CKM's mechanically-driven pump is integrated directly into the stainless steel heating tank using a custom designed volute – maximizing coolant flow while minimizing the heater's footprint.



ENERGY EFFICIENT

Like all HOTflow® heaters, the CKM is an energy efficient alternative to legacy convection-based heaters for common genset and heavy equipment engine size applications. Pump-driven forced circulation allows for even, consistent heating while lowering overall operating costs.



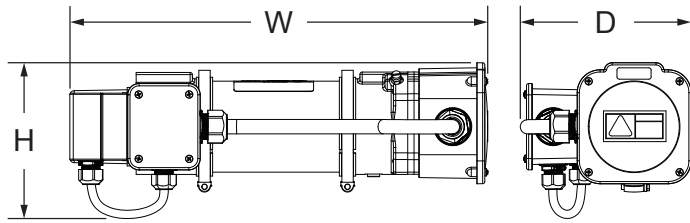
USER FRIENDLY

With the technician in mind, the CKM is constructed to provide easy access to all major components. A built in bleed screw allows installers to flush air from the heater before operation and an integrated high-limit thermostat can be manually reset without the need for expensive maintenance.



SIMPLE UPGRADE OPTION

Combined with its ability to be installed horizontally or vertically, the CKM's compact configuration makes it an easy drop-in replacement for traditional convection-based systems.



Height (H)	Width (W)	Depth (D)	Weight
6.9"	18.4"	8.5"	13.2 lbs
175 mm	467 mm	216 mm	6.0 kg

System	
Phase	single-phase (1 Ø)
Voltage (60 Hz)	120V 240V
Voltage (50 Hz)	230V
Terminal Box Ingress	IPX6
Motor Ingress (UL-recognized)	NEMA 2
Motor Ingress (CE-compliant)	IP44
Min./Max. Ambient Temp	-40°F / 104°F (-40°C / 40°C)
Vibration Specification	Meets IEC 60068-2-64
Shock Specification	Meets IEC 60068-2-27
Max Pressure	125 psi (860 kPa)
Certification	UL/C-US recognized models available (E250789) CE-compliant models available

Coolant	
Fluid Type	Water Coolant mix (50% water/50% glycol)
Heat Power	3 kW 4 kW 5 kW 6 kW
Temp. Control	Fixed, 100 – 120 °F (38–49°C)
Temp. High Limit	205 °F (96°C)
Pump Power	70 W (50 Hz) / 97 W (60 Hz)
Flow	9 gpm @ 10 ft H ₂ O (34.1 L/min @ 3 m H ₂ O)
Inlet/Outlet	SAE J1926/1:1 5/16-12 (SAE #16 STOR)

Ordering Information

CKM

Engine Displacement	Power Supply		Heating System		
	V	Hz	kW	Amps	Model Number
1000–1500 CID 15–23 L	120	60	3	25.0	CKM1030160-000
	230	50	3	13.0	*CKM1030250-000
	240	60	3	13.0	CKM1030260-000
1500–2000 CID 23–30 L	230	50	4	13.0	*CKM1040250-000
	240	60	4	16.7	CKM1040260-000
2000–2500 CID 30–38 L	230	50	5	21.7	*CKM1050250-000
	240	60	5	20.8	CKM1050260-000
2500–3000 CID 38–50 L	230	50	6	26.1	*CKM1060250-000
	240	60	6	25.0	CKM1060260-000

* – CE-compliant
(All other models – UL/C-US recognized)

Optional Inlet/Outlet Adapter Fittings (CKM Models only)			
From	To	Part Number	Part Description
SAE #16 STOR	0.75" hose barb	HB-16STORX3/4HB	#16 STOR to ¾" hose barb adapter. Installs in #16 STOR female inlet or outlet of heater.
SAE #16 STOR	1.0" hose barb	HB-16STORX1HB	#16 STOR to 1" hose barb adapter. Installs in #16 STOR female inlet or outlet of heater.



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.



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.



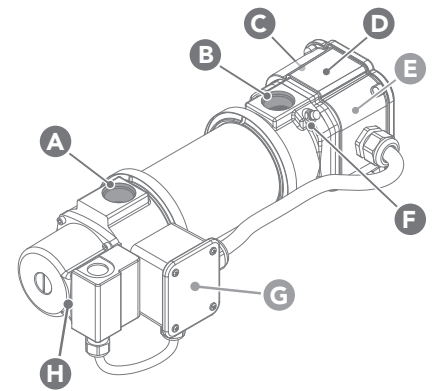
Electrical hazard: Power source must be properly grounded and in accordance with national and local electrical codes. A user-supplied circuit breaker (rated at the appropriate amperage) is required for use in the main power feed line. Do not connect heater prior to installation.



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 (SAE #16 STOR) | E. | High-limit thermostat with manual reset (in element assembly) |
| B. | Discharge port (SAE #16 STOR) | 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 engine port fitting size:

- 3/4 inch NPT (20 mm) **NOTICE!** CKM suction and discharge ports will only accept SAE #16 straight thread O-ring (STOR) connections.

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

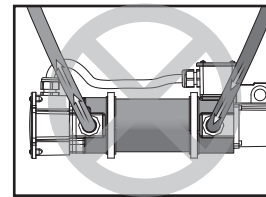
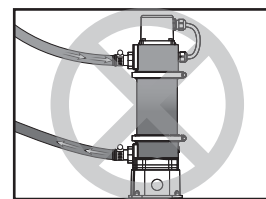
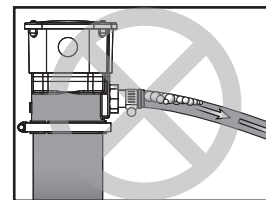
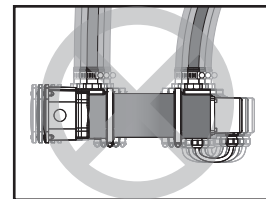
Vibration damage: Do not mount heater directly to engine. Engine vibration may damage heater. If the heater is installed with rigid pipe, connect flexible hose to inlet and outlet to isolate from vibration.

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.

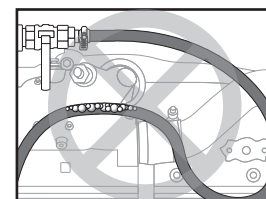
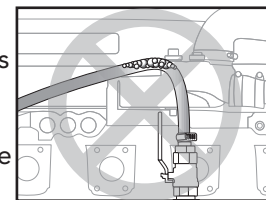
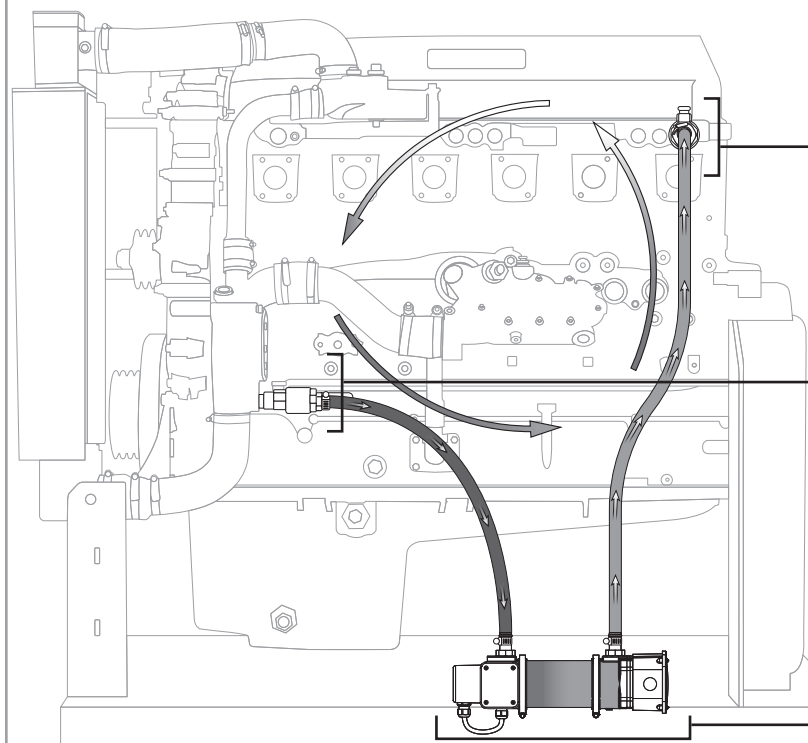


Figure 2. Example CKM installation. The return hose continuously rises to the engine and supply hose continuously descends to the heater; the hoses have no dips, bends or high points. The heater is isolated from engine vibration and is mounted in a proper orientation.



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

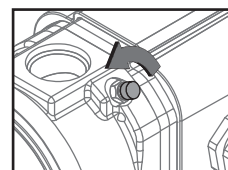
- Mount the heater in the proper orientation. Ensure outlet is pointing directly upward.
- Mount the heater to a vibration-isolated surface.
- Mount the heater on the same side as the **return** port.

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

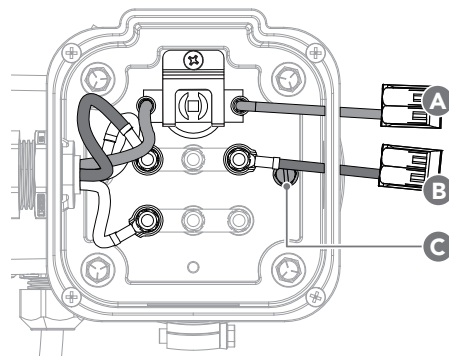


Figure 3. Typical CKM model, showing main power electrical connections.

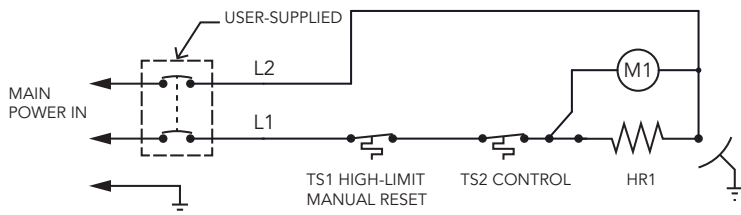
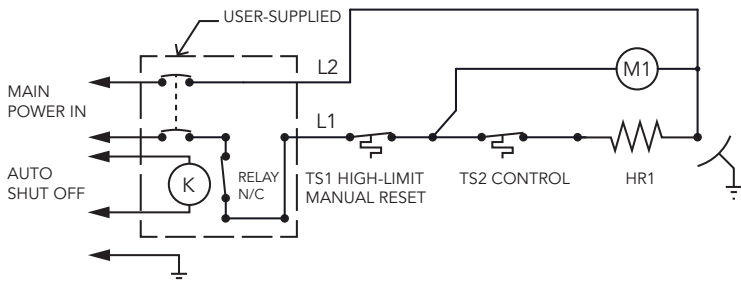


Figure 4. CKM wiring schematic with temperature-controlled pump operation (above) and continuous pump operation (below). See part drawings for your wiring schematic. If heater is configured for continuous pump operation, automatic disconnect is required during engine operation.



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.

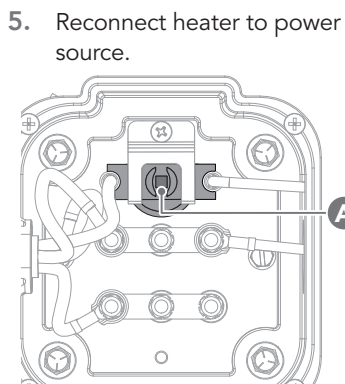


Figure 5. High-limit thermostat reset button.

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 high-limit thermostat, disconnect terminals from thermostat sensing unit spade connectors. Screw mounting clip in place to secure. Reconnect wire leads.
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.
5. Reattach enclosure cover. Reconnect heater to power source.

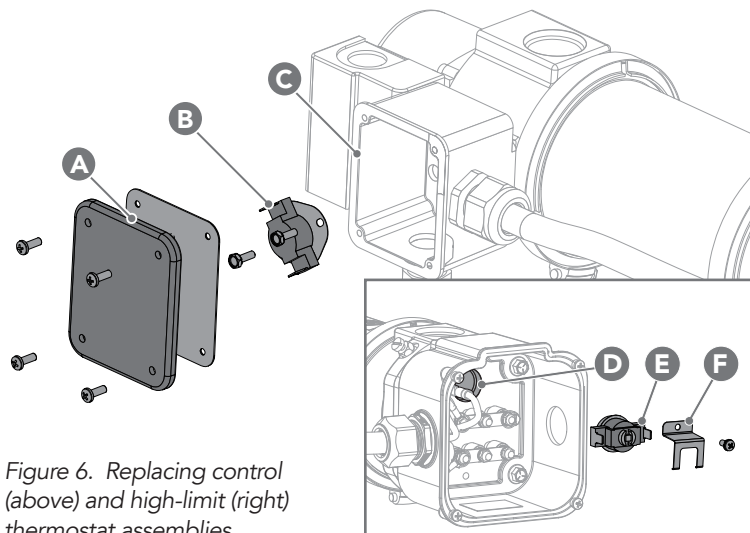


Figure 6. Replacing control (above) and high-limit (right) thermostat assemblies.



Return Port

- ✓ Select a return port high on the engine.
- ✓ Select a return port toward the rear of the engine.
- ✓ Select a return port away from the remote thermostat.
If an optional remote thermostat is installed.
- ✓ Select a return port away from the supply port.

Hoses & Ports

- ✓ Select proper port fittings:

CTM	1000 – 2500 W	3/8 inch NPT
CKM	3000 – 6000 W	3/4 inch NPT
CSM	3000 – 12000 W	3/4 inch NPT
- ✓ Select proper hose inner diameter sizes:

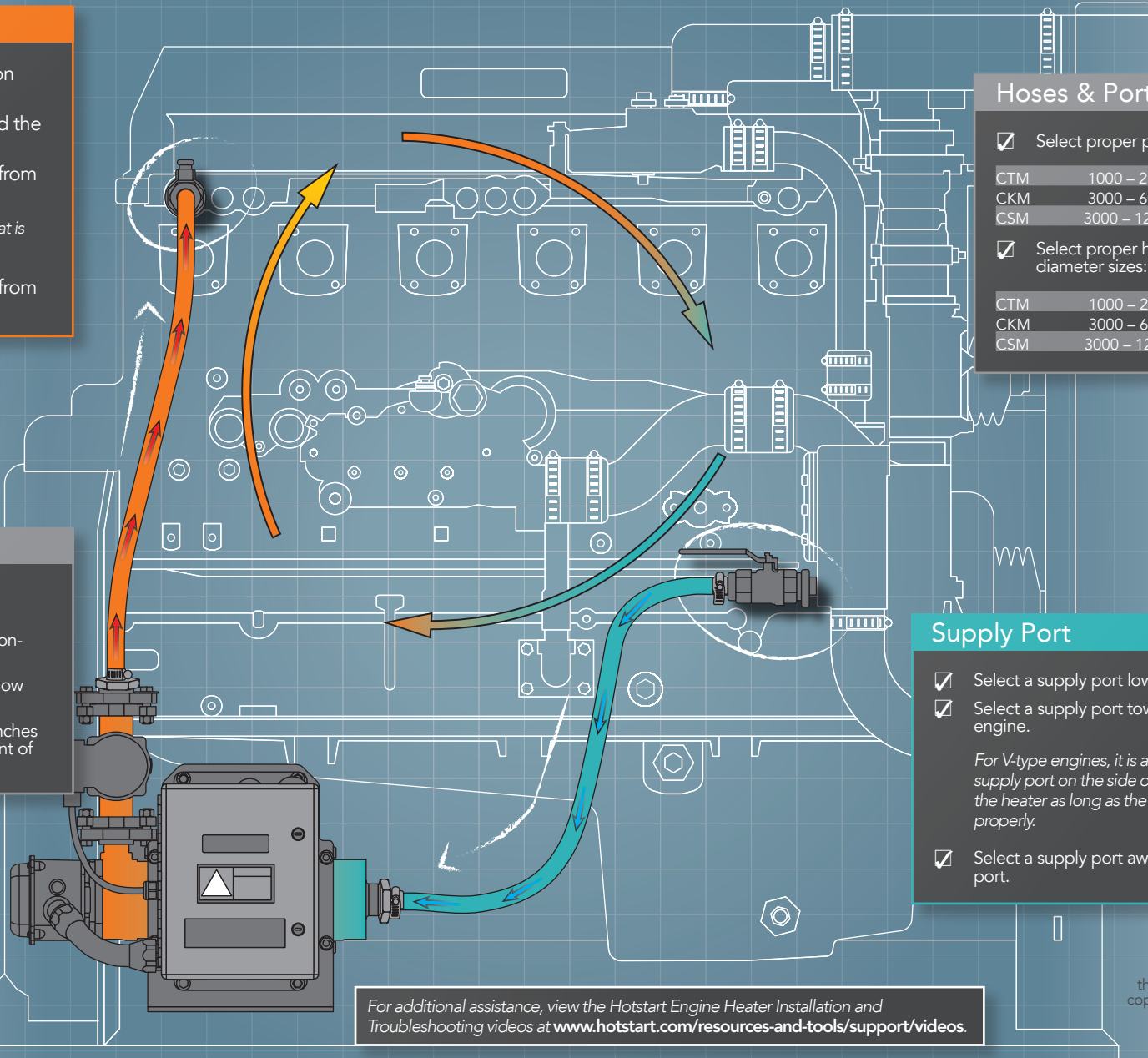
CTM	1000 – 2500 W	5/8 inch
CKM	3000 – 6000 W	1 inch
CSM	3000 – 12000 W	1 inch

Heater Mounting

- ✓ Mount the heater in the proper orientation.
- ✓ Mount the heater to a vibration-isolated surface.
- ✓ Mount the heater directly below the return port.
- ✓ Mount the heater at least 6 inches (15 cm) below the lowest point of the water jacket.

Supply Port

- ✓ Select a supply port low on the engine.
- ✓ Select a supply port toward the front of the engine.
For V-type engines, it is acceptable to select a supply port on the side of the engine opposite the heater as long as the supply hose is routed properly.
- ✓ Select a supply port away from the return port.



For additional assistance, view the Hotstart Engine Heater Installation and Troubleshooting videos at www.hotstart.com/resources-and-tools/support/videos.



Return Port

- ❌ **Return port is installed toward the front of the engine.**
A return port too close to the front of the engine will reduce heating effectiveness.
- ❌ **Return port is too close to the engine thermostat.**
A return port installed too close to the engine thermostat can cause heated coolant to flow to the radiator, reducing heating effectiveness.
- ❌ **Return port is too close to the supply port.**
A return port too close to the supply port will cause heated coolant to only flow through a small portion of the engine.

Supply Port

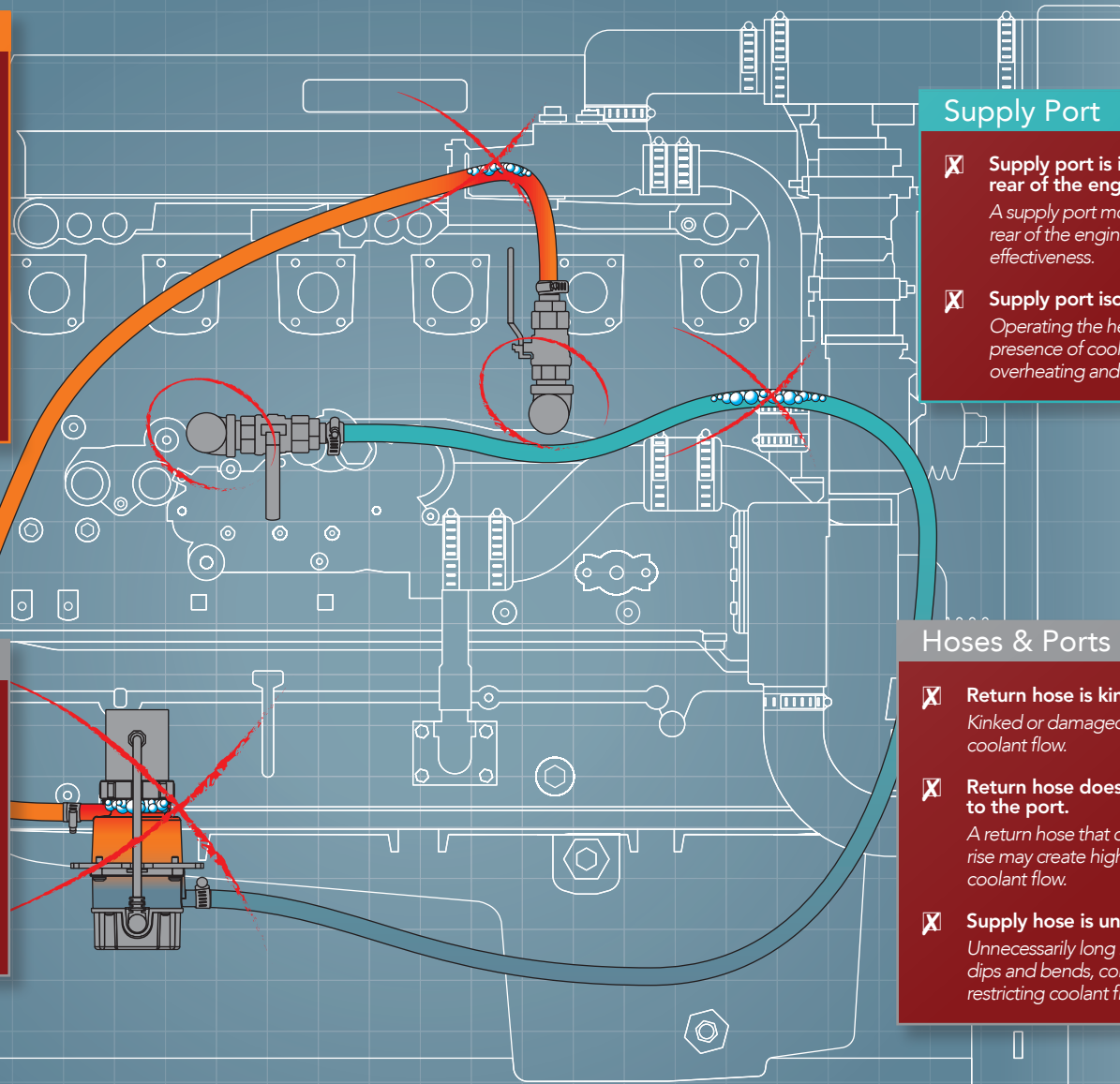
- ❌ **Supply port is installed toward the rear of the engine.**
A supply port mounted too close to the rear of the engine will reduce heating effectiveness.
- ❌ **Supply port isolation valve is closed.**
Operating the heater without the presence of coolant will cause overheating and damage the heater.

Heater Mounting

- ❌ **Heater is upside down.**
An incorrectly oriented heater will reduce coolant flow and heating effectiveness.
- ❌ **Heater is mounted directly to the engine.**
Engine vibration will damage the heater.
- ❌ **Heater is not mounted at least 6 inches (15 cm) below the water jacket.**
A heater mounted too high will restrict coolant flow and reduce heating effectiveness.

Hoses & Ports

- ❌ **Return hose is kinked or damaged.**
Kinked or damaged hoses will reduce coolant flow.
- ❌ **Return hose does not continually rise to the port.**
A return hose that does not continually rise may create high points, restricting coolant flow.
- ❌ **Supply hose is unnecessarily long.**
Unnecessarily long hoses may create dips and bends, collecting bubbles and restricting coolant flow.



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