

HOTflow® Heating System CSM



CSM Style B shown with flange pump.



CSM Style A shown with union pump.



HEAVY DUTY HEATING

The CSM features the most powerful pump (10 gpm flow) and most powerful heating element options (up to 12 kW) in the HOTflow lineup. The CSM's heating power in an energy efficient system is ideal for replacing costly convection-based heaters in large-engine installations up to 100 L displacement.



MULTIPLE CONFIGURATIONS

The CSM lineup is equipped to meet a wide array of conditions, including power source requirements and agency certifications. Whatever your power or heating needs, there's a CSM to meet your specific heating system application.



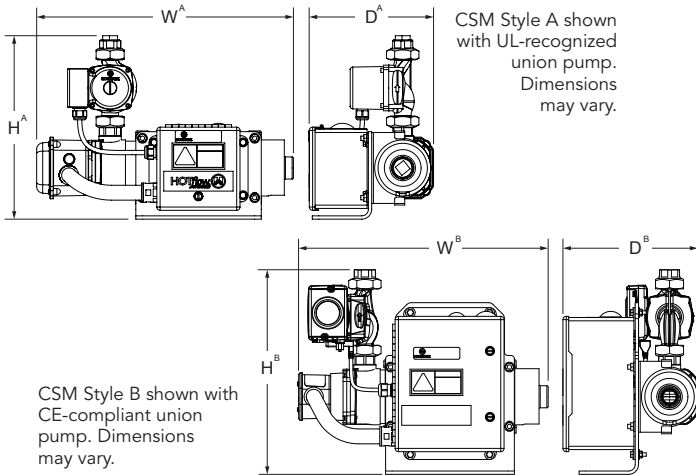
CONTROLS & AUTOMATION OPERATION

The CSM's control box allows for easy power connections and enables automatic heater operation, eliminating the need for additional customer-supplied control components.



SINGLE HEATER SOLUTION

The CSM's power and pump-driven forced circulation provides superior heat distribution, making the CSM a viable option to replace paired or multiple convection-based heaters – improving heating performance while reducing maintenance costs.



Style A			
Height* (H ^A)	Width (W ^A)	Depth (D ^A)	Weight
15.0"	19.4"	9.5"	37 lbs
383 mm	493 mm	242 mm	16.8 kg

Style B			
Height* (H ^B)	Width (W ^B)	Depth (D ^B)	Weight
17.0"	19.4"	9.5"	54 lbs
434 mm	493 mm	242 mm	24.5 kg

* Height values are stated for flange connection pump. If union pump is installed, the model's height will decrease by approximately 1.5" (38 mm).

System	
Phase	single-phase (1 Ø) three-phase (3 Ø)
Voltage (60Hz)	120V 208V 240V 440V 480V 575V
Voltage (50Hz)	230V 400V
Control Box Ingress	NEMA 4/IP66
Motor Ingress	NEMA 2 (UL-listed)/IP44 (CE-compliant)
Min./Max. Ambient Temp.	-4 - 104°F (-20 - 40°C)
Certification	UL/C-US listed models available (E250789) CE-compliant models available

Coolant	
Fluid Type	Water Coolant mix (50% water/50% glycol)
Heat Power	3 kW 6 kW 9 kW 10.5 kW 12 kW
Temp. Control	Fixed, 100 - 120°F (38 - 49°C)
Pump Power	97 W (60 Hz) / 70 W (50 Hz)
Flow	10 gpm @ 10 ft WC (37.9 L/min @ 3 m WC)
Max. Pressure	125 psi (860 kPa)
Pressure Loss	0.2 psi (1.5 kPa)
Inlet/Outlet	1" NPT

Ordering Information

CSM

Engine Displacement	Power Supply			Heating System			
	V	Ø	Hz	kW	Amps	Style	Model Number
1000 - 1500 CID 15 - 25 L	120	1	60	3	26.3	A	CSM10301-000
	208	1	60	3	15.1	A	CSM10308-000
	208	3	60	3	8.7	B	CSM30308-000
	230	1	50	3	13.7	A	**CSM1030J-5A0
	240	1	60	3	13.1	A	CSM10302-000
	400	3	50	3	4.9	B	**CSM3030A-5A0
	480	1	60	3	3.8	B	CSM10304-000
	480	3	60	3	4.4	B	CSM30304-000
1500 - 3000 CID 25 - 50 L	208	1	60	6	29.6	A	CSM10608-000
	208	3	60	6	17.1	B	CSM30608-000
	230	1	50	6	26.7	A	**CSM1060J-5A0
	240	1	60	6	25.6	A	CSM10602-000
	400	3	50	6	8.9	B	**CSM3060A-5A0
	440	3	60	6	8.1	B	**CSM3060F-5A1
	480	1	60	6	12.8	B	CSM10604-000
	480	3	60	6	7.4	B	CSM30604-000
3000 - 4500 CID 50 - 75 L	575	3	60	6	6.2	B	CSM30605-000
	208	1	60	9	44.0	A	CSM10908-000
	208	3	60	9	25.4	B	CSM30908-000
	230	1	50	9	39.8	A	**CSM1090J-5A0
	240	1	60	9	38.1	A	CSM10902-000
	400	3	50	9	13.2	B	**CSM3090A-5A0
	440	3	60	9	12.2	B	**CSM3090F-5A1
	480	1	60	9	19.1	B	CSM10904-000
4500 - 6000 CID 75 - 100 L	480	3	60	9	11.0	B	CSM30904-000
	575	3	60	9	9.2	B	CSM30905-000
	208	1	60	10.5	51.2	B	CSM11058-000
	208	3	60	12	33.7	B	CSM31208-000
	230	1	50	12	52.8	B	**CSM1120J-5A0
	240	1	60	12	50.6	B	CSM11202-000
	400	3	50	12	17.5	B	**CSM3120A-5A0
	440	3	60	12	15.9	B	**CSM3120F-5A2
	480	1	60	12	25.3	B	CSM11204-000
	480	3	60	12	14.6	B	CSM31204-000
	575	3	60	12	12.2	B	CSM31205-000

** - CE-compliant/union pump configuration Other voltages available. Consult the factory.

Options shown represent typical tested or certified configurations. Additional options or configurations may be available. For assistance with your heating system application, contact HOTSTART at 509.536.8660 or sales@hotstart.com.



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.

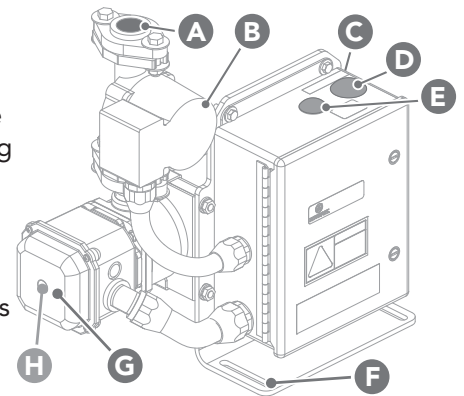
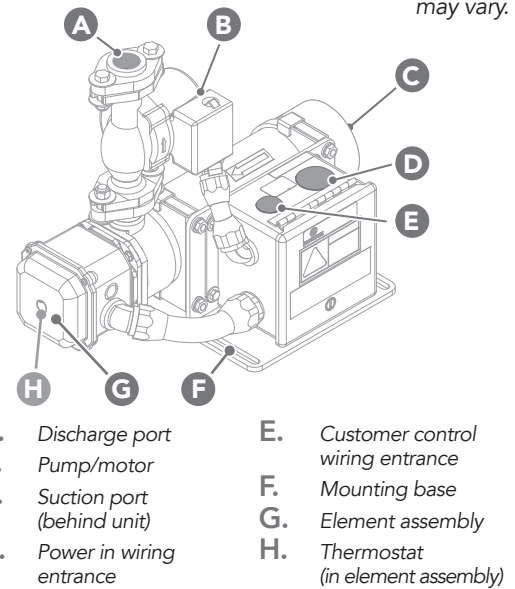
⚠ CAUTION

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.

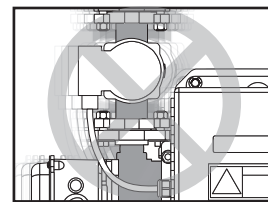
6. Select optional, user-supplied isolation valves.

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.



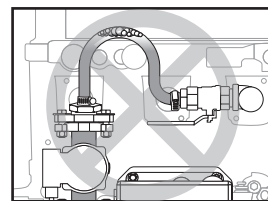
Heater orientation: CSM units must be installed with discharge port pointing directly upward. See Fig 2 on following page. Do not mount at an angle. An incorrectly oriented heater may cause heater failure.

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

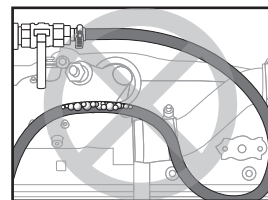
PLUMB HEATER

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.



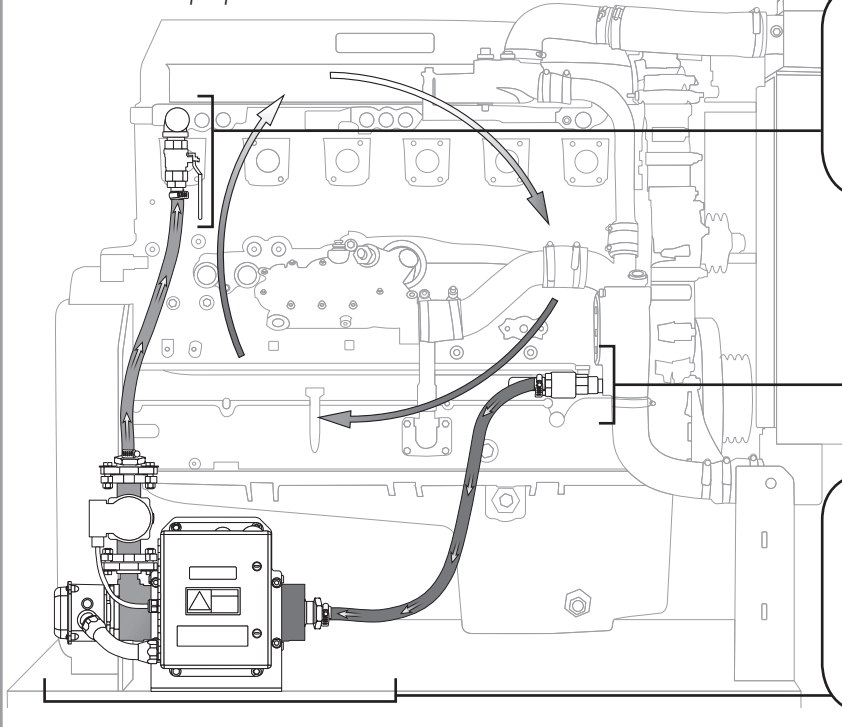
Dips and bends: Do not allow dips or bends along heater plumbing. Dips or bends will allow air pockets to form, restricting coolant flow and damaging heater.



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.

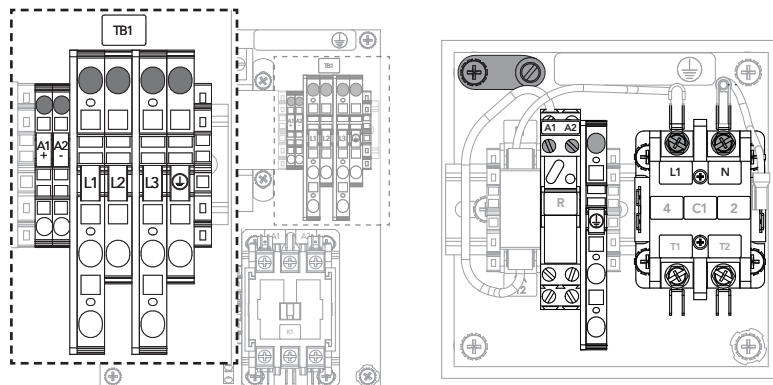
- Start engine. Allow engine to run until engine thermostat opens, purging air from cooling system. **NOTICE!** Engine must be run to eliminate air from heating system before energizing heater.
- When engine has reached operating temperature, shut engine off and check for coolant leaks.
- Allow engine 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.



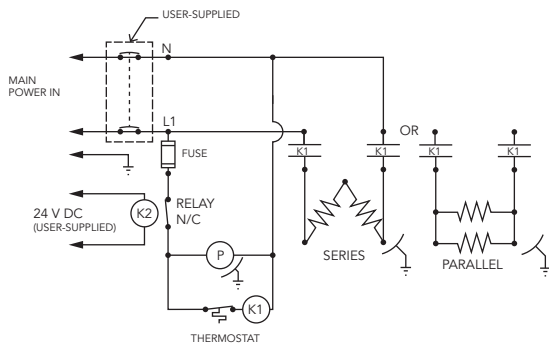
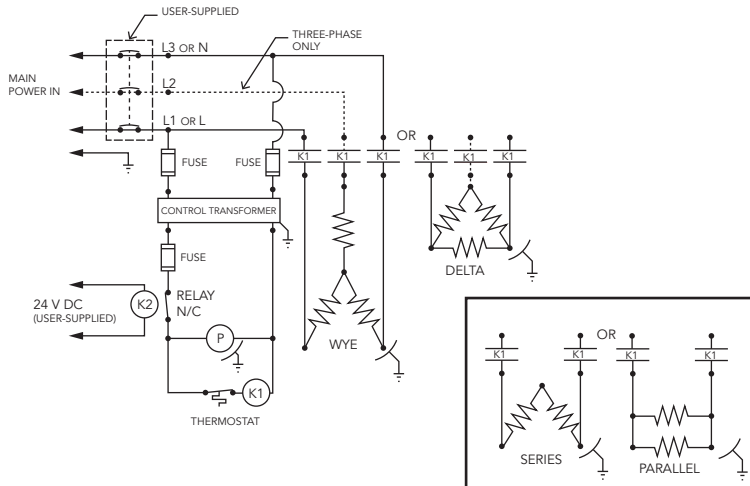


Figure 4. Typical CSM wiring schematic without control transformer (above) and with control transformer (below). See label attached to control box lid for your specific wiring schematic.



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.

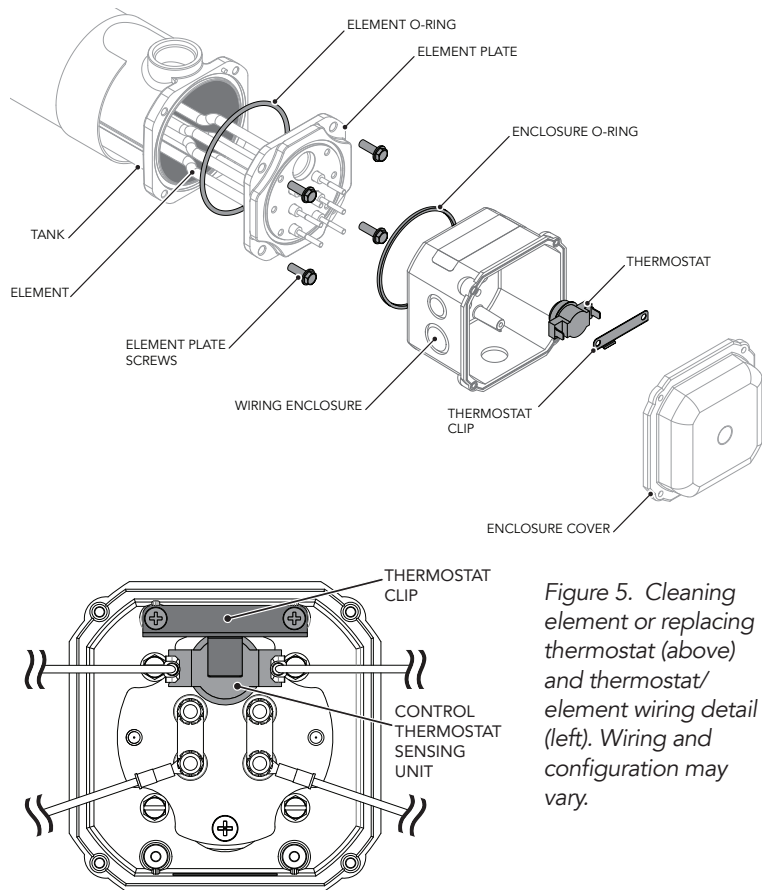


Figure 5. Cleaning element or replacing thermostat (above) and thermostat/element wiring detail (left). Wiring and configuration may vary.



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:

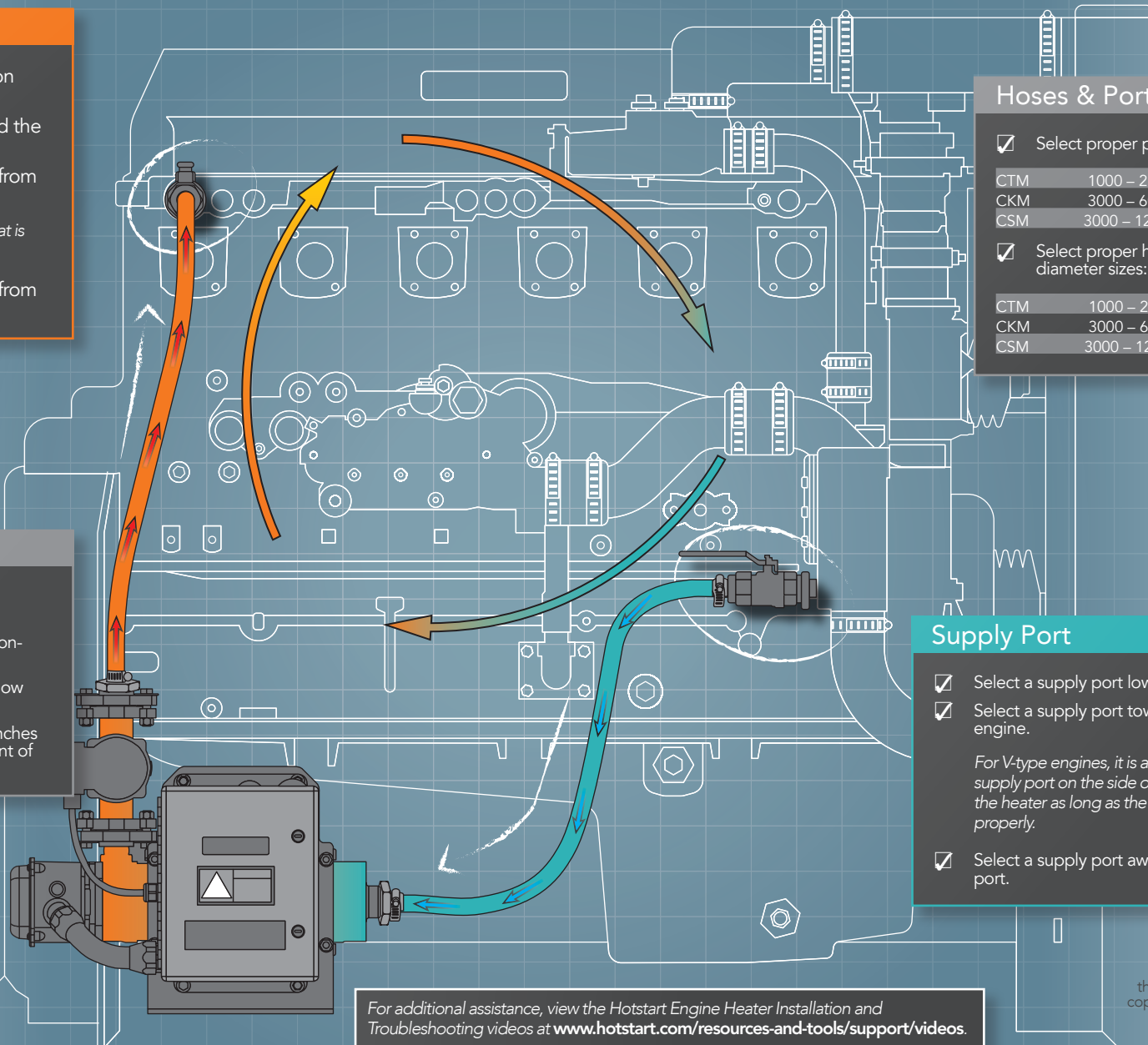
CTM	1000 – 2500 W	5/8 inch
CKM	3000 – 6000 W	1 inch
CSM	3000 – 12000 W	1 inch

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

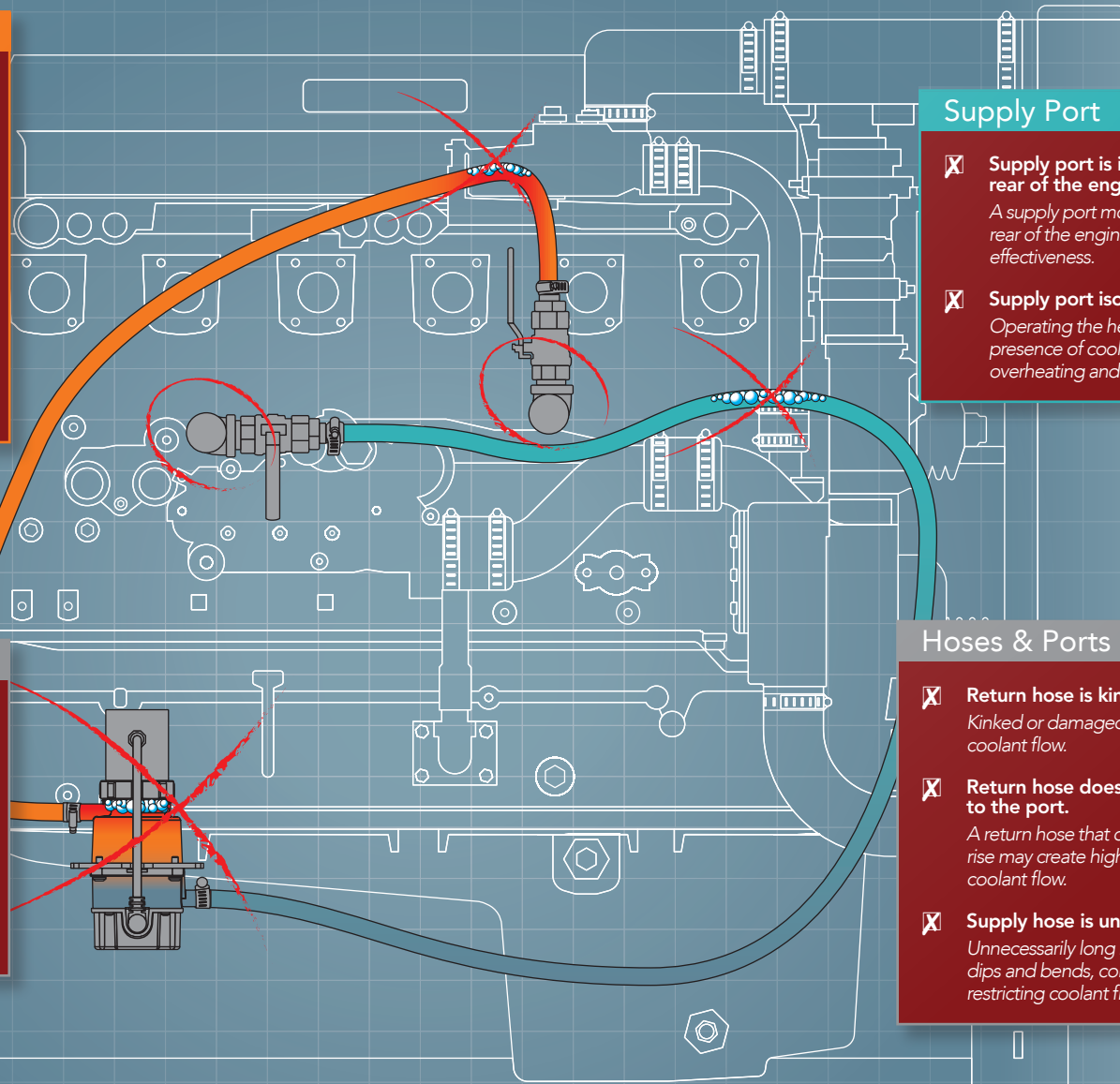
- ❌ **Supply port is installed toward the rear of the engine.**
A supply port mounted too close to the rear of the engine will reduce heating effectiveness.
- ❌ **Supply port isolation valve is closed.**
Operating the heater without the presence of coolant will cause overheating and damage the heater.

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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