



*Hydronic** D5 (Chevy Duramax Application)

Espar Heater Systems

Technical Description
Installation Instructions
Operating Instructions
Maintenance Instructions
Troubleshooting and Repair Instructions
Parts Diagrams and List

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HYDRONIC D5 for Chevy Duramax Diesel Engines

Heater Model 12 V

Hydronic D5W SC	25 2219 05 - (Driver Side Mount)
Hydronic D5W SC FMP OUT	25 2325 05 - (Passenger Side Mount)



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Special Notes

Note: Highlight areas requiring special attention or clarification.

Caution. Indicates that personal injury or damage to equipment may occur unless specific guidelines are followed.



Warning: Indicates that serious or fatal injury may result if specific guidelines are not followed.



Introduction

Heater Warnings

Warning To Installer

- Correct installation of this heater is necessary to ensure safe and proper operation. Read and understand this manual before attempting to install the heater. Failure to follow all these instructions could cause serious or fatal injury.

Warning - Explosion Hazard

- Heater must be turned off while re-fueling.
- Do not install heater in enclosed areas where combustible fumes may be present.
- Do not install heaters in engine compartments of gasoline powered boats.

Warning - Fire Hazard

- Install the exhaust system so it will maintain a minimum distance of 50mm (2") from any flammable or heat sensitive material.
- Ensure that the fuel system is intact and there are no leaks.

Warning - Asphyxiation Hazard

- Route the heater exhaust so that exhaust fumes cannot enter any passenger compartments.
- If running exhaust components through an enclosed compartment, ensure that it is vented to the outside.

Warning - Safety Hazard on Coolant Heaters Used With Improper Antifreeze Mixtures

- The use of Espar coolant heaters requires that the coolant in the system to be heated contain a proper mixture of water and antifreeze to prevent coolant from freezing or slushing.
- If the coolant becomes slushy or frozen, the heater's coolant pump cannot move the coolant causing a blockage of the circulating system. Once this occurs, pressure will build up rapidly in the heater and the coolant hose will either burst or blow off at the connection point to the heater.
- This situation could cause engine damage and/or personal injury. Extreme care should be taken to ensure a proper mixture of water and antifreeze is used in the coolant system.
- Refer to the engine manufacturer's or coolant manufacturer's recommendations for your specific requirements.

Caution: *During electrical welding work on the vehicle disconnect the power to the heater in order to protect the control unit.*

Note: All measurements contained in this manual contain metric and approximate SAE equivalents in brackets eg 25mm (1").

Direct questions to Espar Heater Systems:

Canada & U.S.A.

1-800-387-4800

This publication was correct at the time of print. However, Espar has a policy of continuous improvement and reserves the right to amend any specifications without prior notice.

Introduction

Espar's Hydronic D5 Heater

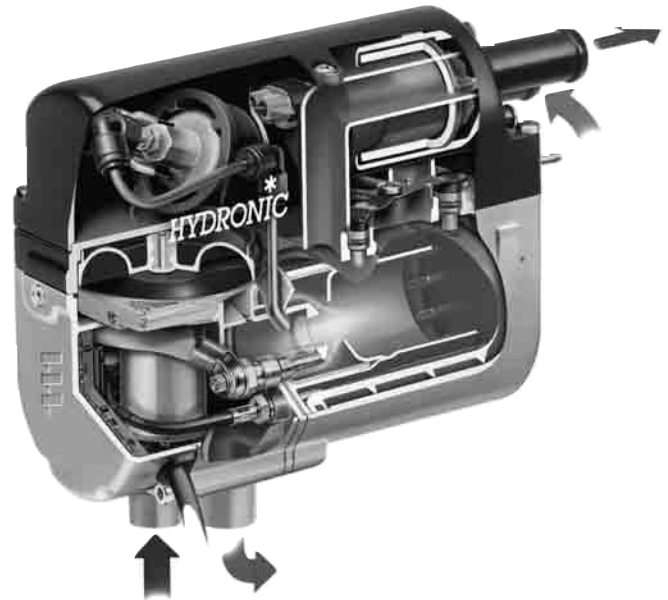
Quality engineered to provide a dependable means of heating, the Espar Hydronic 5 is a diesel fired coolant heater capable of between

Hydronic D5W SC - 2.4 kW to 5 kW/hr (8,200 to 17,100 BTU/hr).

This compact coolant heater offers an affordable heating solution to many applications. The Hydronic 5 is ideal for pre-heating the engines of trucks, cars, off-road equipment, small trucks and boats. It features automatic heat regulation while being fuel and power efficient. Since the heater runs on fuel and 12 volt power, it is able to perform this completely independently of the vehicle engine. The unit regulates the coolant temperature between a low of 65°C (149°F) and a high of 80°C (176°F) by automatically cycling the heater between heat levels.

The Hydronic D5W SC can be operated from the vehicle cab by an on/off switch, a pre-select timer or a combination of both.

A flame sensor, temperature regulating sensor and overheat sensor are among the safety features which makes the Hydronic D5 a safe and dependable heating system.



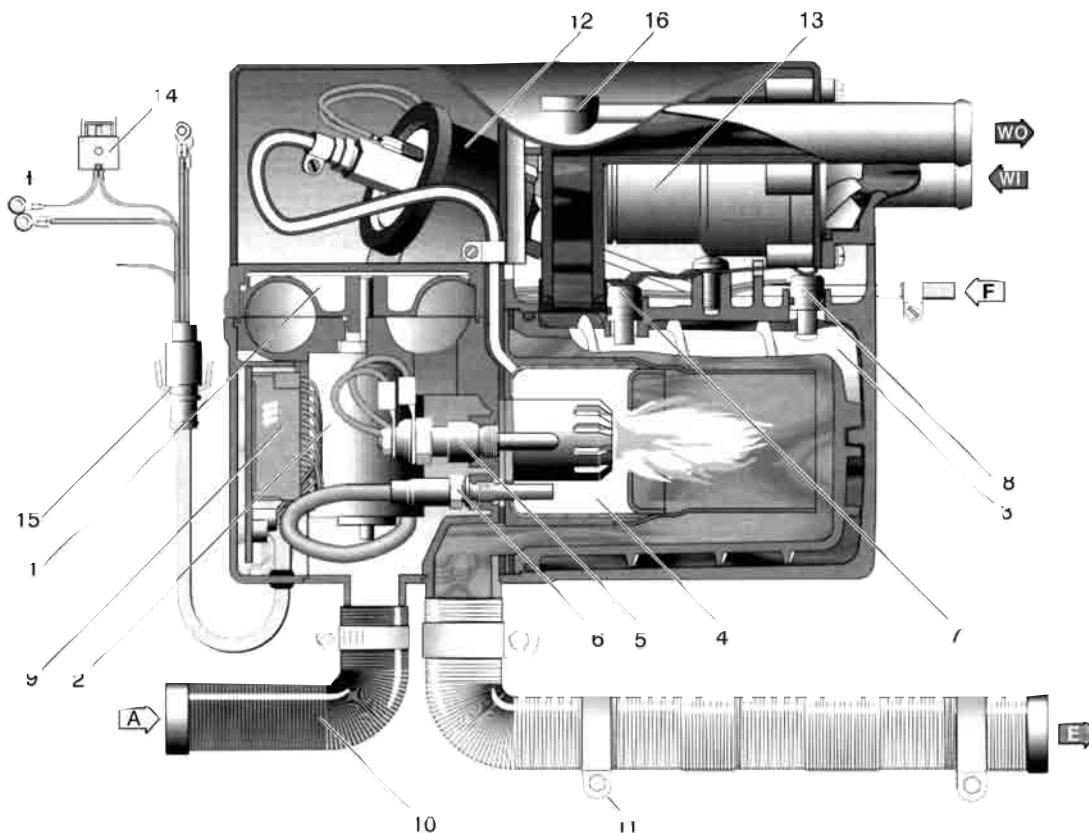
Specifications	Hydronic D5W SC
Heat output (±10%)	5 kW (17,000 BTU/hr) - High 2.4 kW (8,200 BTU/hr) - Low
Current draw (±10%)	12 volt 4.16 amps High 1.91 amps Low
Fuel consumption (±10%)	0.62 l/hr (0.16 US gal/hr) High 0.27 l/hr (0.08 US gal/hr) Low
Operating Voltage Range Minimum Voltage Maximum Voltage	10 V 16 V
Working pressure	2.5 bar (36 psi)
Ambient operating temperature	-40°C to +80°C (-40°F to 176°F)
Overheat temperature shutdown (±5%)	105°C (221°F)
Weight	2.9kg. (6.4lbs)
Controls available	On/Off switch or 7-day timer (Multi-Function Timer) Mini Timer

Note: The heater is equipped with a high-voltage cutout as well as a low-voltage cutout.

Introduction

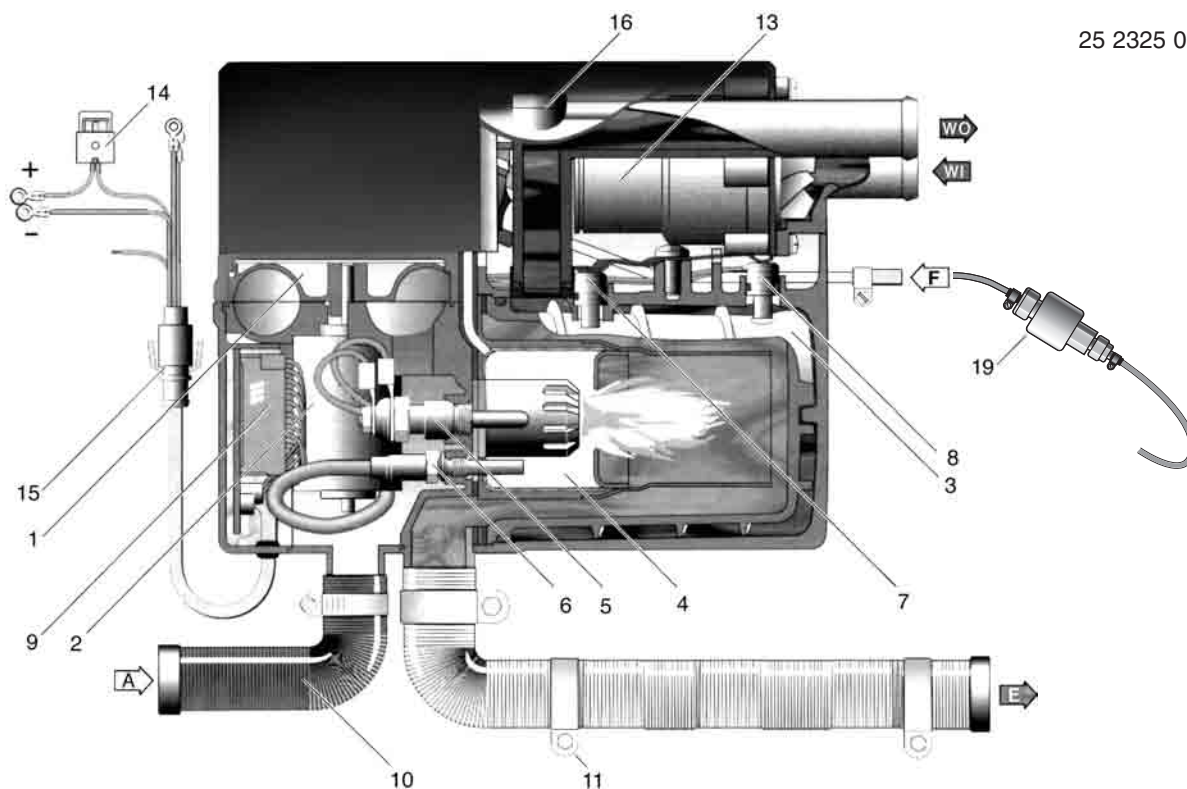
Heater Components - Hydronic D5W SC version - 12 Volt Version - Diesel

25 2219 05



Heater Components - Hydronic D5W SC - FMP OUT - 12 volt version - Diesel

25 2325 05



Introduction

Heater Components - Hydronic 5 SC - FMP IN and OUT - 12 volt version - Diesel



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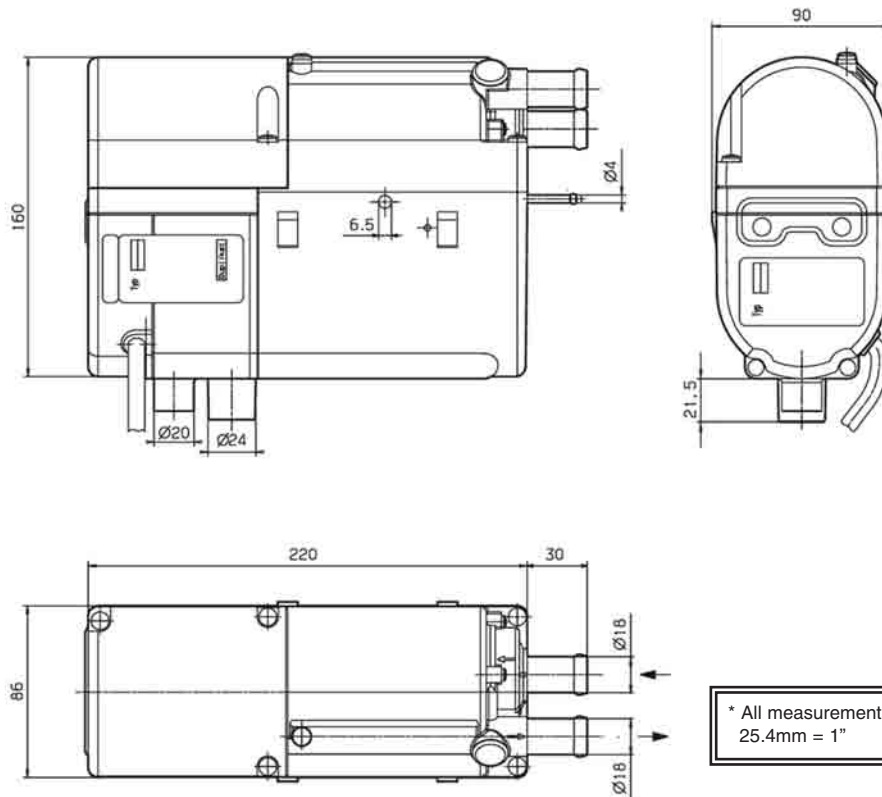


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A = Combustion air
E = Exhaust
F = Fuel supply line
WO = Water Outlet
WI = Water Inlet

- | | | | |
|----|-----------------------------|----|--|
| 1 | Combustion air blower wheel | 11 | Exhaust tube |
| 2 | Electric motor | 12 | Fuel-metering pump (<i>Internal</i>) |
| 3 | Heat exchanger | 13 | Coolant pump |
| 4 | Combustion chamber | 14 | Main fuse |
| 5 | Glow pin | 15 | Interface/8-pin connector |
| 6 | Flame sensor | 16 | Bleed screw |
| 7 | Temperature sensor | 17 | Mini timer |
| 8 | Overheat temperature sensor | 18 | 7-day timer |
| 9 | Control unit | 19 | Fuel-metering pump (<i>External</i>) |
| 10 | Combustion air tube | | |

Principal Dimensions - Hydronic D5 SC



* All measurements in millimeters
 25.4mm = 1"



Installation Procedures

Heater Location

Always mount the heater in a protected area. Eg: storage compartment, engine compartments, step box or battery box. Espar recommends you use the boxed unit. Boxed heaters can be mounted by utilizing one of the existing brackets. See following page.

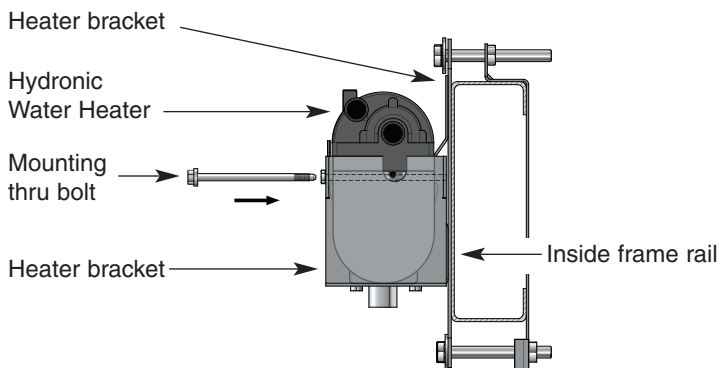
If mounting on frame rail use an optional Espar Inside frame bracket to mount to inside of frame rails. Heaters can also be mounted on a cross tray behind the cab and on top of the frame rails.

When mounting the heater adhere to the following conditions:

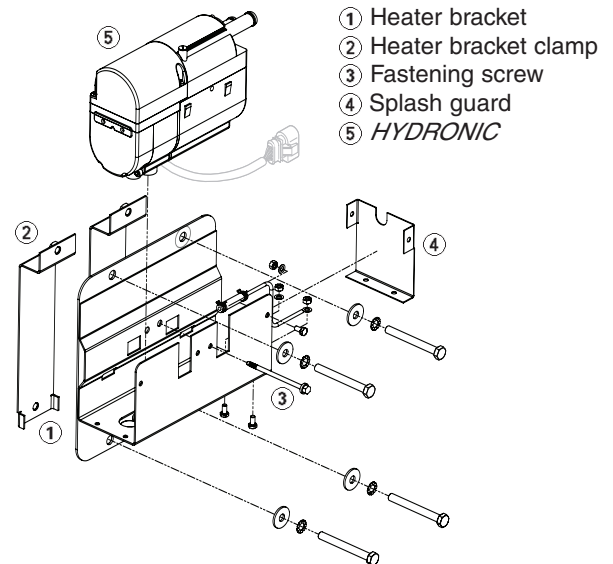
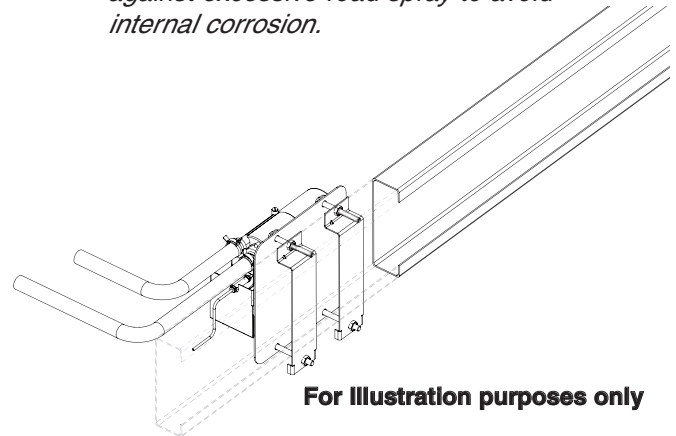
- Situate the heater below the normal coolant level of the engine.
- Install the splash guard to protect against excessive road spray.
- Keep coolant hoses, fuel lines and electrical wiring as short as possible.

Heater Mounting

Mount the heater in the heater bracket and secure with hardware provided. Mount on inside or outside of frame rail as shown.

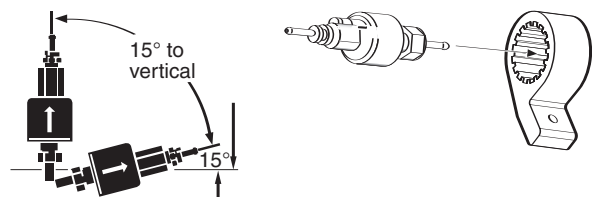


Caution: *Install splash guard to guard the heater against excessive road spray to avoid internal corrosion.*



For 25 2325 05 with the external fuel metering pump:

- Choose a protected mounting location close to the fuel pick-up pipe and heater.
- Using the bracket and rubber mount provided, install fuel pump as shown.



Note: Proper mounting angle of the fuel pump is necessary to allow any air or vapor in the fuel lines to pass through the pump rather than cause a blockage.



Installation Procedures

Heater Plumbing

The heater is incorporated into the engine's cooling system for engine preheating.

Engine Plumbing

Follow these guidelines and refer to engine plumbing diagram shown.

- Remove OEM hose connected from engine to vehicle heat Exchanger, see figure "a" for proper system installation.
- If possible, use 5/8 ball shut off valves minimum to ensure the system can be isolated from the engine when not in use.
- Provide (3/4") hose barbs for hose connections.
- Use (3/4") hoses to ensure adequate coolant flow.
- Keep the pick up and return points as far apart as possible to ensure good heat distribution.
- Take the coolant from a low point on the engine to reduce aeration in the system.
- Ensure proper direction of coolant flow by taking coolant from a high pressure point in the engine and returning it to a low pressure point. (ie. pickup from back of block and return to the suction side of the engine's water pump).
- Ensure adequate flow rate through the heater by comparing the incoming and outgoing coolant temperatures while the heater is running. If the rise in temperature exceeds 10°C (18°F), coolant flow must be increased by modifying the plumbing.
- Ensure the heater and water pump are installed as low as possible to allow the purging of air. Bleed system via radiator or bleed screw located on heater.

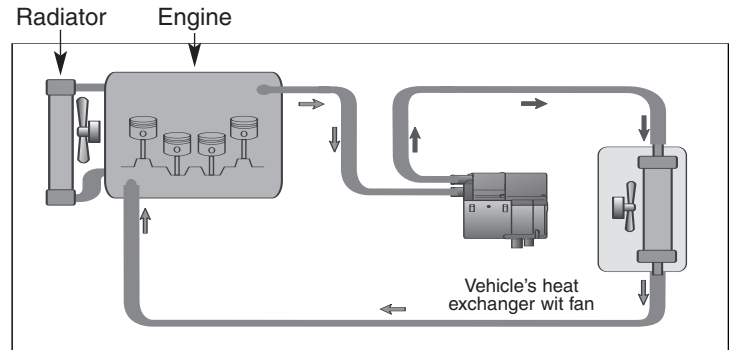
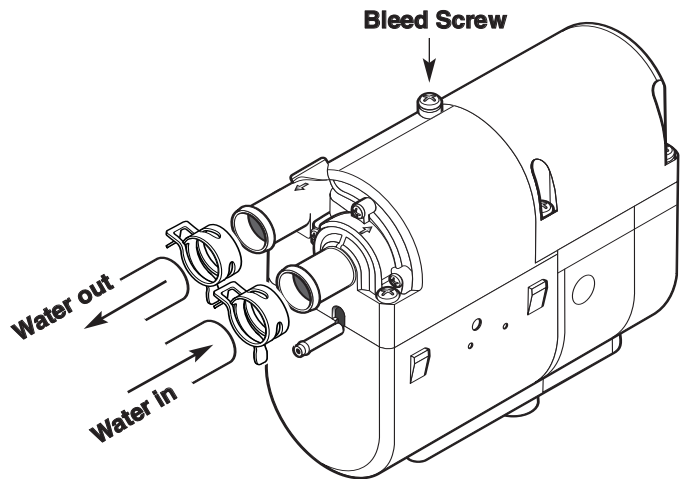


Figure "a"



Caution: The coolant must contain a minimum of 10% antifreeze at all times as a protection against corrosion. Fresh water will corrode internal heater parts.

Type Plate

The type plate must be clearly visible after the heater has been installed. If necessary, a second type plate (duplicate) with the same details as the original one can be mounted at a clearly visible point on the air heater or a cover in front of the air heater.

A second type plate is not necessary if the original type plate is clearly visible under a cover that can be removed without having to use tools. The type plate is mounted on the basic unit.





Installation Procedures

Fuel System

Some Hydronic water heaters (2219) typically have the fuel metering pump mounted inside the unit. This is to reduce installation time and to protect the pump from corrosion. Some versions have an external fuel metering pump. Refer to graphics for connections and specifications. All parts necessary to do the installation are included in the kit as shown.

Note: For 25 2219 05 Heater:

Fuel line limits must not be exceeded. Ensure that the following conditions are met. Hydronic heater must be within a height of 76cm (2'6") from the bottom of the fuel pick-up pipe. Fuel-metering pump must be within a total distance of 200 cm (6'6") from the fuel pick-up pipe. If the above conditions cannot be met, a heater with external fuel metering pump must be used.

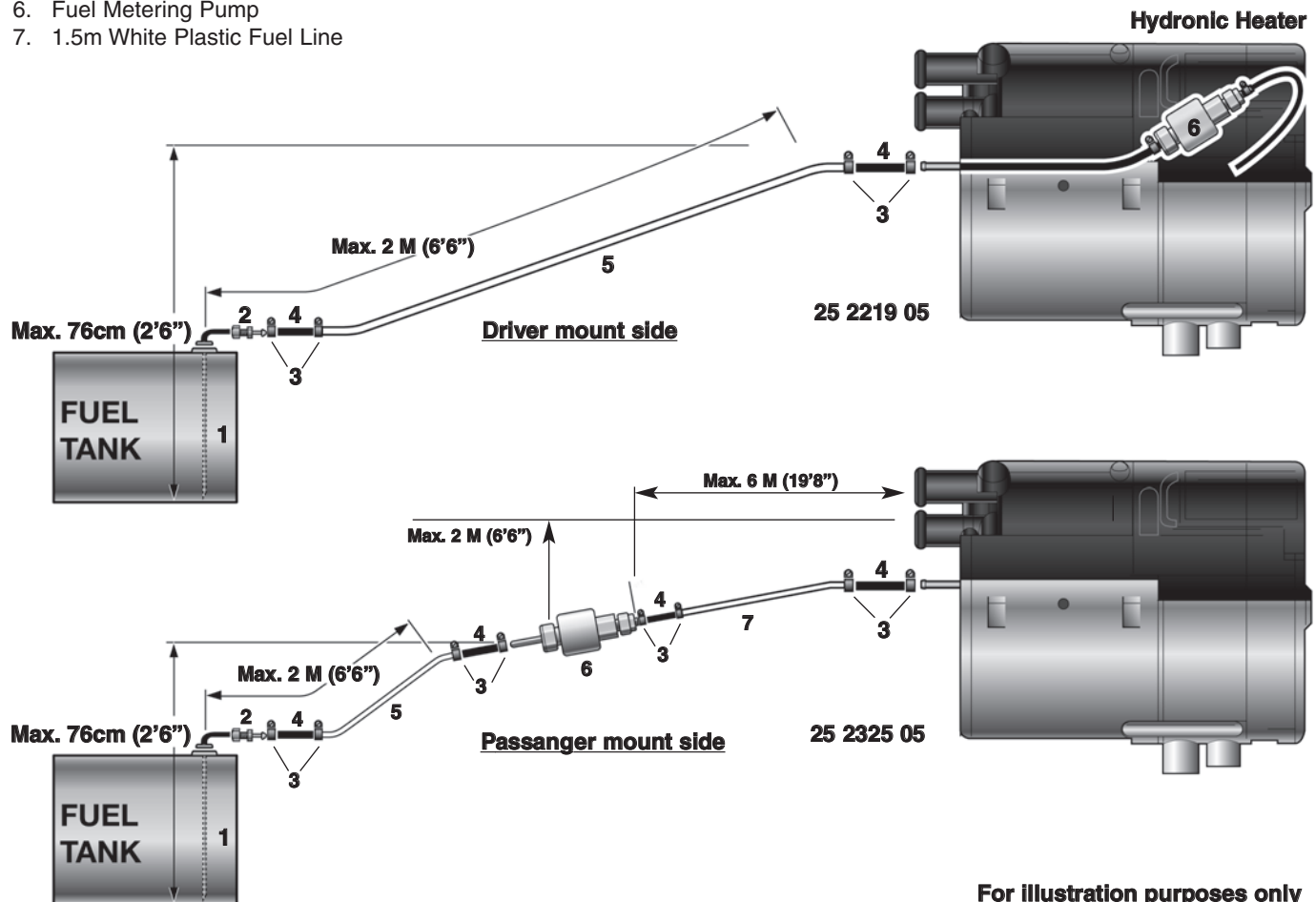
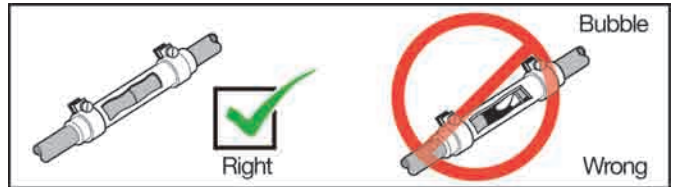
Fuel System Tolerances

1. Fuel Pick-Up Pipe
2. Fuel Pipe Reducer
3. 9mm Clamp
4. 3.5mm Rubber Connector
5. 2.0mm White Plastic Fuel Line
6. Fuel Metering Pump
7. 1.5m White Plastic Fuel Line

Fuel Line

- Route fuel lines from the fuel pick-up pipe to the heater.
- Use only fuel lines provided.
- Other sizes or types of fuel lines may inhibit proper fuel flow.
- Make proper butt joints using clamps and connector pieces as shown.
- Use a sharp utility knife to cut plastic fuel lines to avoid fuel line pinching.

Note: Butt joints and clamps on all connections.



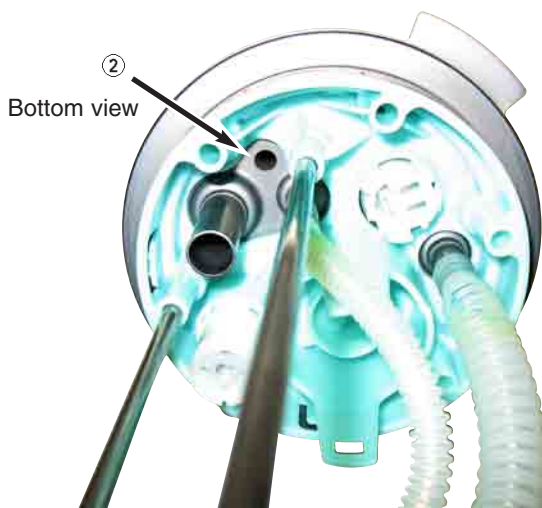
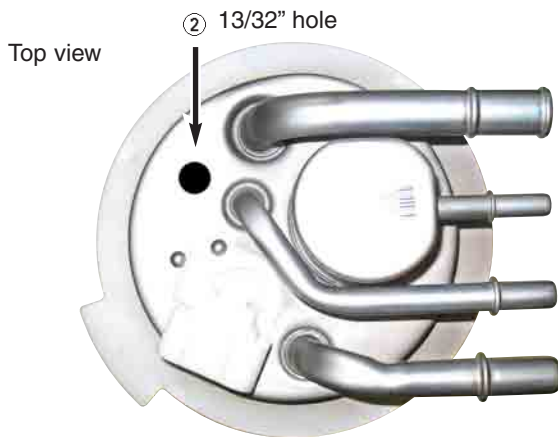
Installation Procedures

Fuel Pick-Up Pipe Installation (Standard Pick-Up)

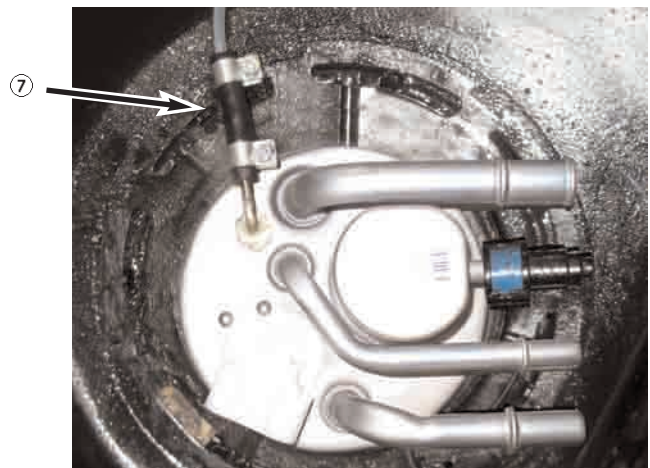
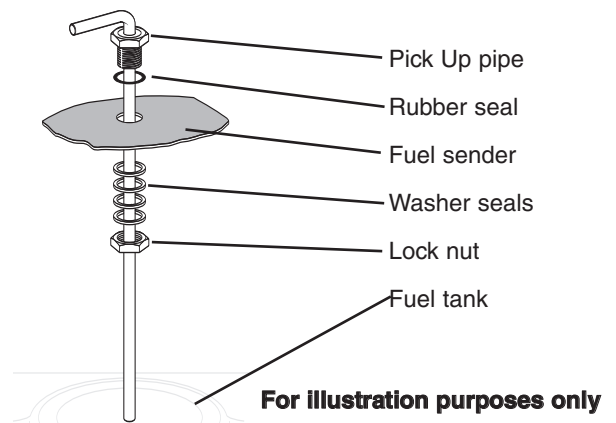
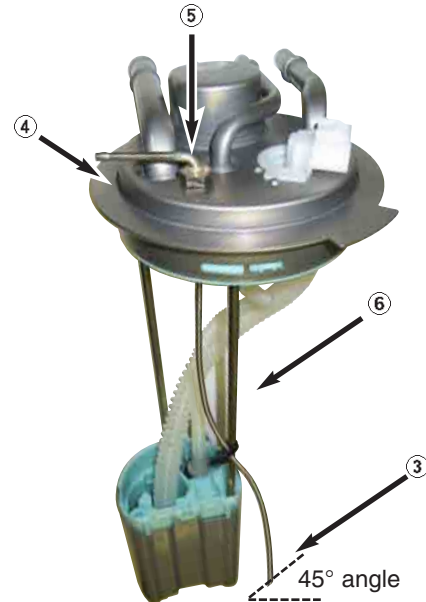
- ① Drop the fuel tank and remove the fuel sender...
- ② Drill a mounting hole in the fuel sender to accommodate pick-up pipe as shown. Begin with a 1/8" centre hole.
- ③ Cut the fuel pick-up pipe to length. Allow 2-2.5" from bottom of tank. Do not kink the pipe when bending.



①



- ④ Orientate the fuel pick-up pipe as shown.
- ⑤ Lower the fuel pick-up pipe with rubber seal into the tank using the slot created. Insert four washer seals (included in the kit) and tighten with included lock nut.
- ⑥ Secure fuel pick up pipe with nylon cable tie.
- ⑦ Assemble as shown.





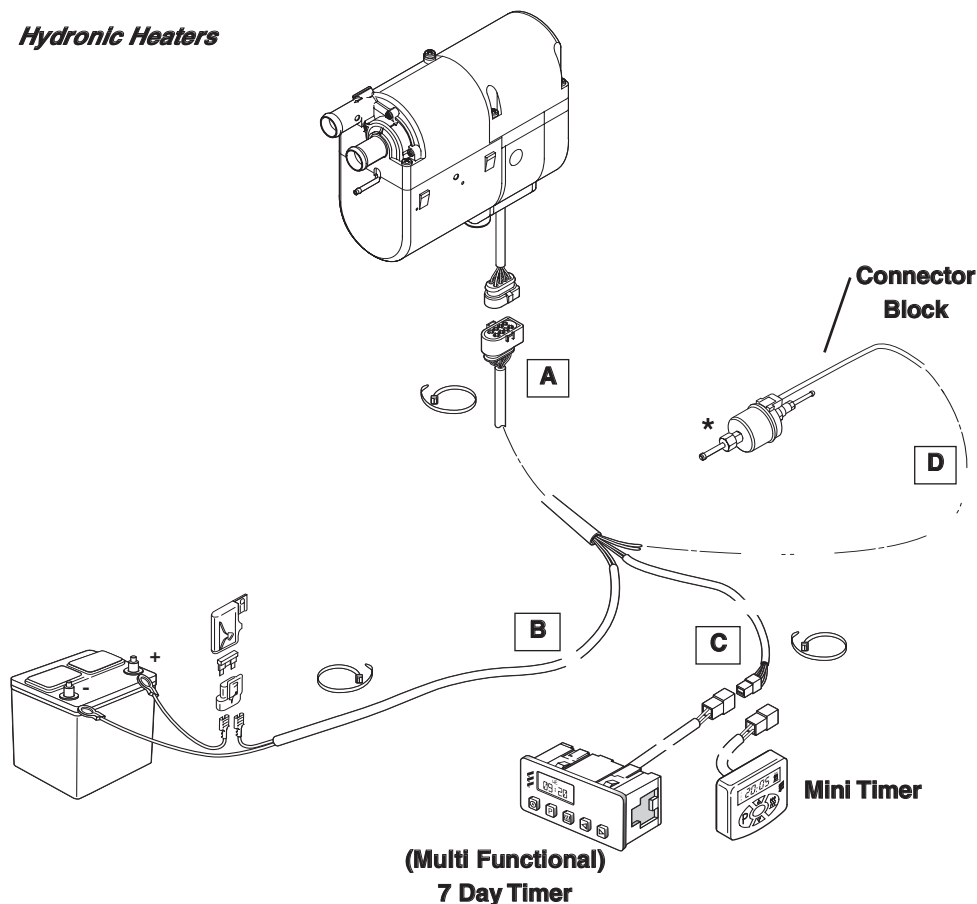
Installation Procedures

Electrical Connections

All parts needed are included with the kit. (*) indicates external mounted fuel pump versions of Hydronics. (25 2325 05)

- A. Main Heater Harness**
 - Connects switch and power harness to the heater harness. (* in some cases power to fuel metering pump).
- B. Power Harness**
 - 2 core harness (red, brown).
 - Connect red wire to fuse link and terminal.
 - Attach ring terminal to vehicle battery (+).
 - Connect brown wire to vehicle battery (-) using ring terminal provided.
 - 20 amp fuse - 12V.
- C. Switch Harness**
 - 4 core harness (red/yellow, brown, yellow, blue/white).
 - Run to location of control option. Make terminal connections at control option. Espar has 2 available switches see control option instructions on following pages.
- D. * Fuel Metering Pump Harness**
 - 2 core harness (green, green) or (green, brown).
 - Connect to fuel metering pump using terminals and protective seals + connector block (no polarity required).

Hydronic Heaters



Caution:

To avoid potential short circuit damage during installation, insert 20 amp fuse on power harness **after** all electrical connections are complete.

Caution:

To avoid a break in the fuse, tie back the blue/white (diagnostic) wire when using the mini timer.

For illustration purposes only

Note: All harnesses should be cut to length. All exposed electrical connections should be coated with protective grease.

Installation Note: Wire must be inserted into fuse holder prior to terminating.

Installation Procedures

Exhaust Connection

A 24mm flexible tube exhaust pipe is required for the exhaust. An exhaust clamp is used to secure the exhaust to the heater. Connect the exhaust as follows:

- Connect the exhaust pipe to the exhaust port on the heater and attach with clamp provided.
- Run exhaust to an open area to the rear or side of the vehicle so that fumes can not build up and enter the passenger compartment or the heater combustion air intake.
- Install exhaust pipe with a slight slope or drill a small hole in the lowest point to allow water to run out. Any restriction in exhaust will cause operational problems.
- Route the exhaust pipe from the heater using “p” clamps provided.

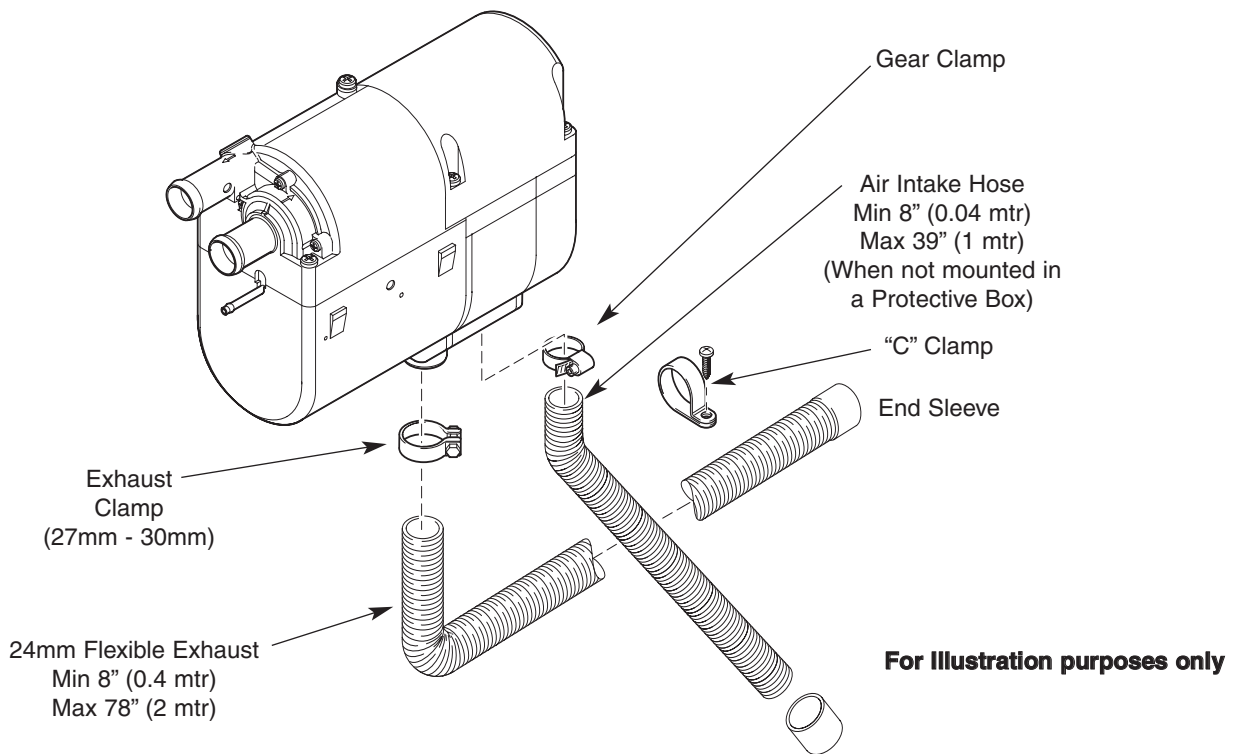
Caution: Run exhaust so that it cannot be plugged by dirt, water or snow. Ensure the outlet does not face into the vehicle slip stream.

Intake Connection

Combustion air must be drawn in from the outside. The combustion air opening must be kept free at all times.

- Connect the air intake pipe to the intake port on the heater and secure with clamp provided.

Caution: Do not install the intake opening facing the vehicle slipstream. Ensure that the opening cannot become clogged with dirt or snow and that any water entering the intake can drain away.



Warning - Fire Hazard

The exhaust is hot, keep a minimum of 5cm (2") clearance from any heat sensitive material. Route exhaust so that the exhaust fumes cannot enter the passenger compartment.



Warning - Asphyxiation Hazard

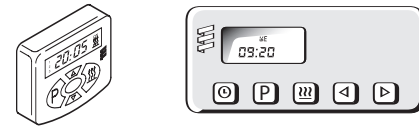
Route exhaust beyond the skirt of the cab and outside of the frame area. Failure to comply with this warning could result in Carbon Monoxide Poisoning.



Installation Procedures

Control Options

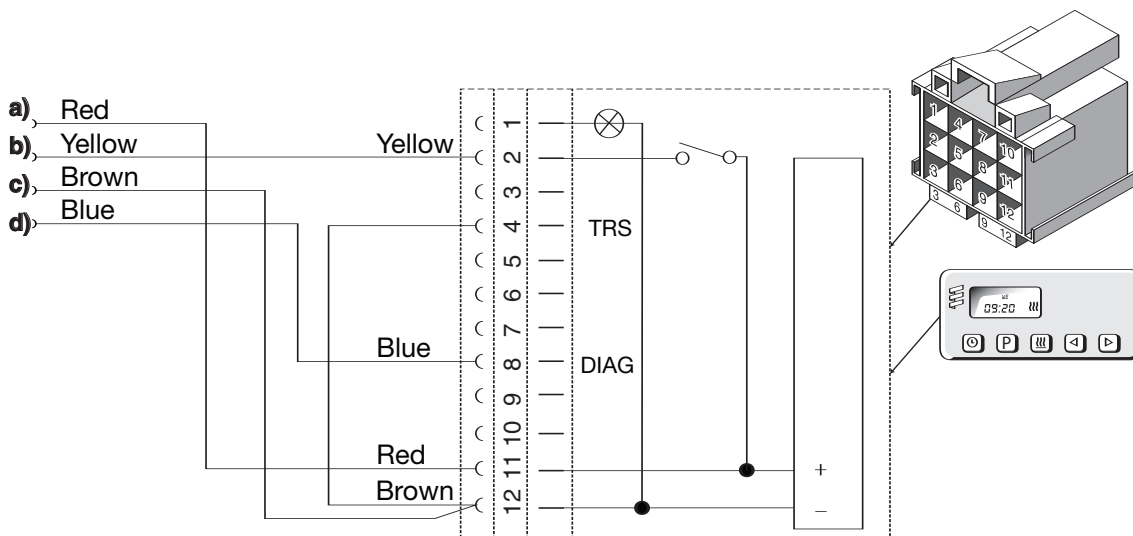
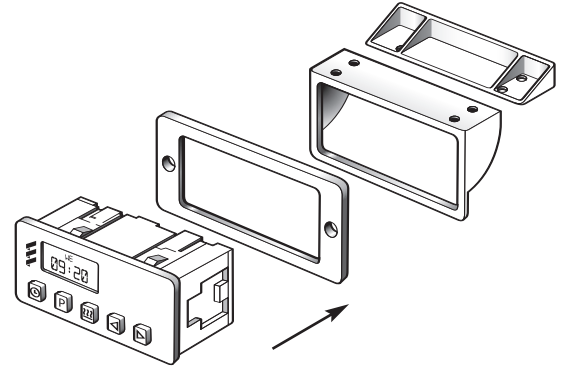
A Mini Timer or a Multifunction (7 Day Timer) is available.



Multifunction

The multifunction is capable of multiple start functions within a 7 day period. Other functions include current time display and AM automatic heater numeric fault code. Display refer to instructions provided with timer for setting options.

- Mount timer and bracket in a suitable location.
- Connect the switch harness to the connector at the heater and run the harness to the control location.
- Cut harness to length at the control and install terminals.
- Connect switch harness to timer as shown below.
- Refer to timer instructions for other wiring options.



- a)** Power from battery "+".
- b)** Switch control to the heater.
- c)** Power from battery "-".
- d)** Diagnostic from heater.

Option #1: Dash lights to timer - connect wire between dash lights circuit and timer at terminal #1.

Option #2: Operate heater continuously - connect wire from ignition circuit to terminal #10. See also multifunction (7 day) timer in instructions.

Heater Operation

Pre-Start Procedures

Upon completion of installation prepare the heater as follows:

- Check all fuel, electrical and plumbing connections.
- Refill the engine coolant.
- Bleed air from the coolant system by loosening the bleed screw on top of the heater to allow air to escape.
- Loosen rad cap and run engine to allow air to be purged.
- Top up engine coolant.

Start Up

Once switched on the following sequence occurs:

- Control unit does a systems check (flame sensor, glow pin, motors, temperature sensor, safety thermal sensor and various other control unit checks).
- Water pump starts circulating coolant fluid.
- Combustion air blower comes on.
- Glow pin begins to preheat 20-50 secs.
- Metering pump starts and combustion air blower speeds up gradually.
- Once ignition takes place the flame sensor alerts the control unit and the control unit shuts off the glow pin (ignition time: 1.5 - 2 minutes).

Note: If the heater fails to start the first time it will automatically attempt a second start. If unsuccessful, the heater will shut down completely.

Note: On initial start up the heater may require several start attempts to self prime the fuel system.

Running

Once ignition is successful the following operations take place:

- Heater runs in high heat mode and the temperature is monitored at the heat exchanger.
- Once coolant reaches 80°C (176°F) the heater automatically switches to low heat mode and continues to run.
- If coolant temperature drops to 75°C (167°F) the heater will automatically switch back to high heat mode.
- If the coolant temperature continues to rise, the heater will automatically switch off once temperature reaches 86°C (187°F).
- The water pump will continue to circulate coolant to allow the heater to monitor engine temperature.
- The heater will automatically re-start once coolant temperature reaches 75°C (167°F).
- The heater continues to run as described above until it is switched off, either manually, automatically by a timer or heater malfunction shutdown.

Note: If the heater should shut down due to flame out while in running mode, it will automatically attempt one restart. If successful, it will continue to run. If not, it will shut down completely with a cool-down cycle.

Note: During operation the heater continually senses the input voltage from the batteries. If the input voltage drops to approximately 10.5 volts or rises above 16 volts the heater will automatically shut down with a cool-down cycle, and display a fault code when using a multifunction timer.

Switching Off

- When the heater is switched off, manually or automatically, it starts a controlled cool down cycle.
- The fuel metering pump stops delivering fuel and the flame goes out.
- The combustion air blower and water pump continue to run for 3 minutes to cool down.
- The heater shuts off.

Safety Equipment

The control unit, temperature sensor, overheat sensor and flame sensor continually monitor heater functions and will shut down the heater in case of a malfunction.

- The control unit ensures electrical circuits (fuel pump, combustion air blower etc.) are complete prior to starting the heater.
- If the heater fails to ignite within 90 seconds of the fuel pump being started, the starting procedure will be repeated. If the heater again fails to ignite after 90 seconds of fuel being pumped, a “no start safety shutdown” follows. (Fault #52)
- If the heater flames out during operation, the heater automatically attempts to restart. If the heater fails to ignite within 90 seconds of fuel delivery, the heater will turn off the fuel pump and complete a cool down and display a F052 code. After troubleshooting the problem the heater can be started again by switching the heater off and then back on again.
- Overheating due to lack of water, a restriction or a poorly bled coolant system results in the overheat shutdown (F012). Fuel delivery will cease and an “overheat shut down” follows. If heater overheats 3 consecutive times, a lockout on the control unit will occur. To unlock the control unit you will need to use the Fault Code Retrieval Device. See following pages for self diagnostics.
- If at any time the voltage drops below 10.5V for 20 seconds, or rises above 16.0V for 20 seconds the heater will shut down and display the associated Fault Code.

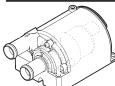
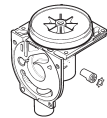


Warning:

The heater must be switched off while any fuel tank on the vehicle is being filled. The heater must not be operated in garages or enclosed areas.



Heater Operation

	STARTING PHASE					RUNNING PHASE	SHUT DOWN PHASE		
Operating Mode	System Check	Pre-heat	Ignition Attempt	Pre-heat 2nd. attempt	Ignition Attempt 2nd. attempt	Controlled Heating	After Glow	Cool Down	Off or Stand by
 Water Pump	Off	On	On	On	On	On	On	On	Off On: if in stand by
 Blower	On Momentarily	On	On	Off	On	On	On	On	Off
 Glow Pin	Off	On	On	On	On	Off	On	Off	Off
 Fuel Pump	Off	Off	On	Off	On	On	Off	Off	Off
Time 	1- 3 sec.	80 sec.	Up to 90 sec.	80 sec. If Required	Up to 90 sec.	High/Low Operation until switched off manually or automatically	20 sec.	2.5 min.	

Note: During the controlled heating cycle, if the coolant temperature exceeds 86°C(187°F) the heater will cycle off.
Heater will automatically restart in high mode once coolant temperature reaches 75°C(167°F)



Heater Diagnostics

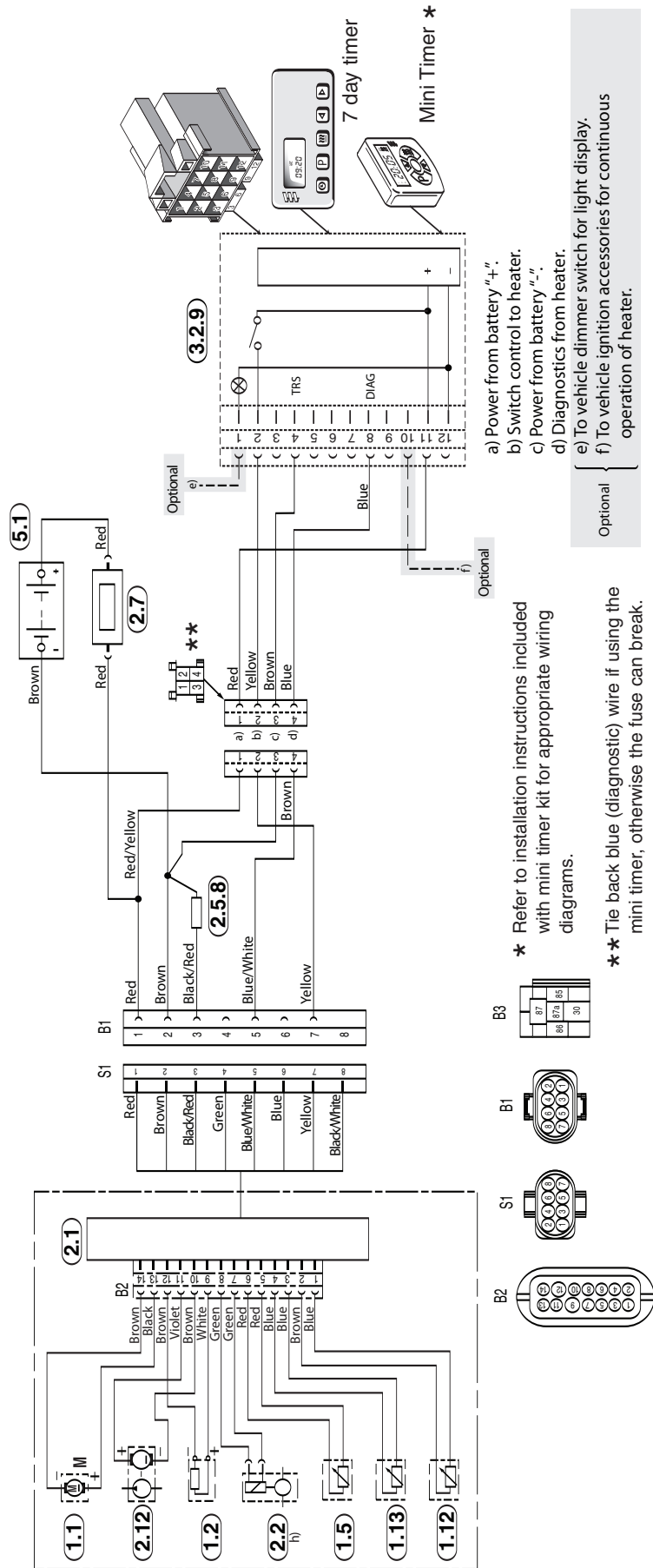
Model 25 2219 05

Wiring Harness P/N:

20 2900 70 05 03

Internal FMP
No Blower Relay

- 1.1 Blower motor
- 1.2 Glow pin
- 1.5 Overheat sensor
- 1.12 Flame sensor
- 1.13 Temperature sensor
- 2.1 Control unit
- 2.12 Water Pump
- 2.2 Fuel metering pump
- 2.7 20 amp/12V main fuse
- 2.7.1 5 amp fuse
- 3.12 Mini timer *
- 3.2.9 7 day timer
- 5.1 Battery



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Heater Diagnostics

Periodic Maintenance

- Check coolant hoses, clamps, and make sure all valves are open. Maintain the engine manufacturers recommended coolant level and ensure that the heater is properly bled after service on or involving the coolant system.
- Visual check of all fuel lines for leaks. Check and if necessary replace fuel filter inserts.
- Visual check of electrical lines and connections for corrosion.
- Run your heater at least once a month during the year (for a minimum of 15 minutes).
- Maintain your batteries and all electrical connections in good condition. With insufficient power the heater will not start. Low and high voltage cutouts will shut the heater down automatically.
- Use fuel suitable for the climate (see engine manufacturers recommendations). Blending used engine oil with diesel fuel is NOT permitted.
- Check the glow pin and replace if necessary.

Troubleshooting

Basic Troubleshooting

In the event of failure there are several items which should be checked first before any major troubleshooting is done. **Check:**

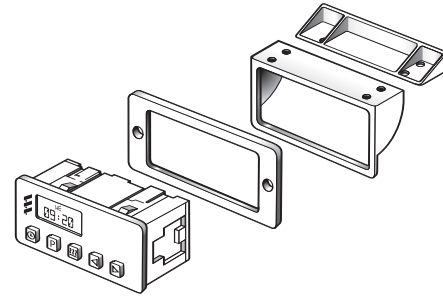
- Circuit breakers and fuses.
- Electrical lines and connections.
- For interference in combustion air and exhaust pipes.
- That there is fuel in the tank.
- Battery voltage.

Self Diagnostics

The heater is equipped with self diagnostic capability. You can retrieve information on the heaters last 5 faults using the Espar multifunction timer or Espar's Fault Code Retrieval Device.

Multifunction

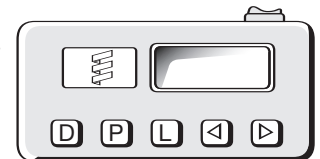
Espar's multifunction timer has a fault code retrieval device built into the unit. This function automatically activates if the heater is experiencing problems.



- Fault codes appear on the LCD display screen.
- Codes can then be translated from the charts on the following pages.

Fault Code Retrieval Device

Equipment Face and Controls



Symbols seen on the display face are as follows:

AF Actual fault.

F1-F5 Up to five stored faults can be accessed. The AF and F1 are the same number.



This sign is displayed when the heater is in operation.

DIAG The word (Diagnostic) will come on when the diagnostic number is requested.

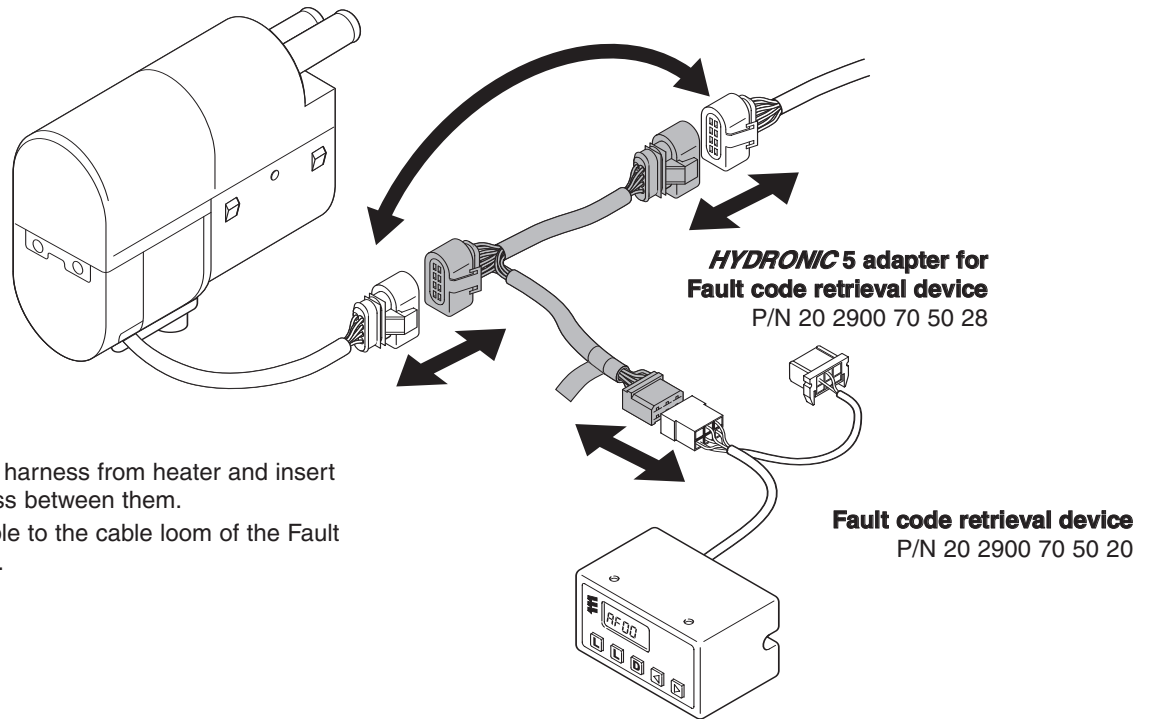
000 Three digit diagnostic fault code number.

Instructions:

- Connect as shown on following page.
- Switch the fault code retrieval device on and wait 10 seconds.
- Press the "D" button.
- Wait 3-5 seconds for the current fault code to appear (AF).
- To review the previous faults use the arrow buttons (F1= Most Recent, F5= Oldest).
- To erase the faults that are in memory press both "L" keys at the same time.
- See the fault code chart on following pages for code number descriptions.



Maintenance / Troubleshooting / Repair



Hook Up

- Disconnect the main harness from heater and insert adapter cable harness between them.
- Connect adapter cable to the cable loom of the Fault code retrieval device.

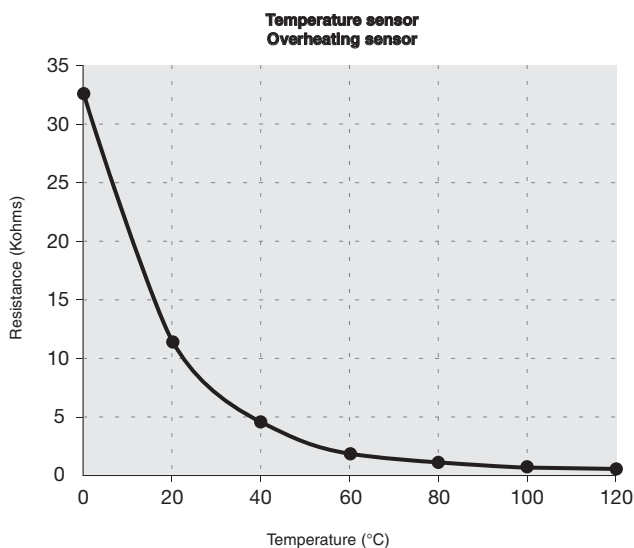
Test Values

Resistance

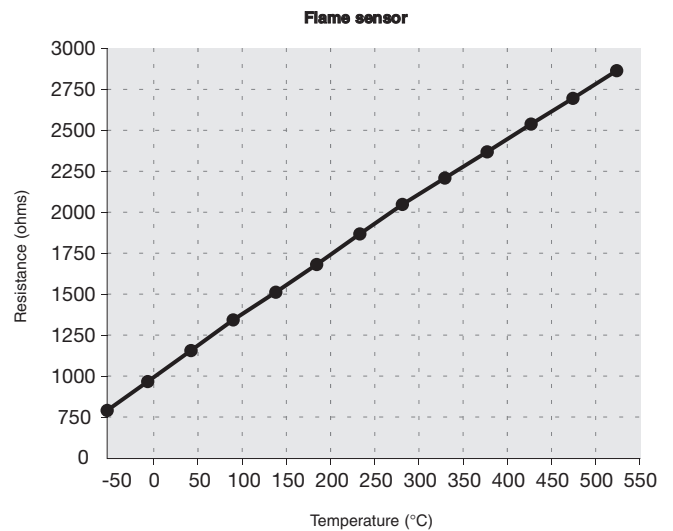
Metering pump	approx. 20 Ω
Glow Pin	approx. 0.9 Ω

Checking the sensors

To check the sensors, measure the resistance at current temperature, see following diagrams:



R > 2 Ω = open circuit
R < 50 Ω = short circuit



R > 3400 Ω = open circuit
R < 50 Ω = short circuit

Maintenance / Troubleshooting / Repair

Fault Code	Fault Description	Causes / Repair
000	Normal Operation	
010	Overvoltage	Check voltage between terminals 1(red) and 2(brown) at connector. (B1). This must be less than 16 volts. Check battery, electrical leads and vehicle charging system.
011	Under voltage shut down	Check voltage between terminals 1(red) and 2(brown) at connector (B1). This must be greater than 10.2 volts Check battery, electrical leads and vehicle charging system.
012	Overheating	Check for possible causes of overheat (water circuit), Sensor. Check overheat switch resistance values. Temperature at temperature sensor or overheat sensor is greater than 125°C.
014	Possible overheating detected (difference evaluation)	Difference of measured values at temperature sensor >15°C (min. 70°C water temperature and metering pump in operation); Check temperature sensor and overheating sensor, replace if necessary. Check values from previous page.
015	Too many overheats	Remove cause of over heat. Reset control unit using 7 day timer or fault code retrieval device to unlock control unit. Permanent overheating counter reading exceeded. Heating enable only possible by means of diagnostics system (press both "LL" keys simultaneously).
017	Overheating detected	Temperature at temperature or overheating sensor > 130 °C, emergency OFF if Fault Code 012 or 014 not applicable; check water circuit, check temperature sensor and overheating sensor; replace if necessary. See graph on previous page.
020	Open circuit - glow pin	Check glow pin and electrical leads for continuity, replace if necessary.
021	Short circuit - glow pin	Check glow pin and electrical leads for continuity, replace if necessary.
030	Combustion air blower motor	Blower impeller or electric motor may be jammed (frozen solid, dirty, etc.) Fix jam, replace electric motor if necessary.
031	Combustion air blower motor	Check lead to combustion air motor for continuity, replace motor if necessary.
032	Combustion air blower motor short-circuit	Check combustion air blower motor (electric motor); replace if necessary. Check power supply (chafed, corroded etc.)
038	Vehicle fan relay control break	Check electric lead to relay, fix break, replace relay if necessary For wiring harness without relay, replace harness.
039	Vehicle fan relay control short circuit	Check electric lead to relay, fix break, replace relay if necessary For wiring harness without relay, replace harness.
041	Water pump break	Check supply lead to water pump for continuity, remedy break, replace water pump if necessary.
042	Water pump short-circuit	Check supply lead to water pump for short circuit, check water pump, replace water pump if necessary.



Maintenance / Troubleshooting / Repair

Fault Code	Fault Description	Causes / Repair
047	Short circuit - fuel metering pump	Check for wires for short to fuel metering pump. Test fuel metering pump. Replace if necessary.
048	Open circuit - fuel metering pump	Check supply lead to metering pump for continuity, remedy break, replace if necessary.
050	Too many no start attempts	Safety time counter reading exceeded. Reset control unit using 7 day timer or fault code retrieval device to unlock control unit.
051	Faulty flame recognition	At start, if flame sensor is a above 70°C > 240 seconds; check exhaust gas and combustion air supply, check flame sensor, replace if necessary. For flame sensor values see graph on previous page.
052	No start safety time exceeded	No flame detected on start attempt. Check fuel delivery and fuel supply, Check exhaust gas and combustion air ducts.
053	Flame cutout in boost mode	Heater has started successfully the flame has extinguished. Check fuel supply. Check combustion air and exhaust flow. Check flame sensor resistance value. Replace flame sensor if necessary.
054	Flame cutout in high mode	Heater has started successfully the flame has extinguished. Check fuel supply. Check combustion air and exhaust flow.
056	Flame cutout in low mode	Check flame sensor resistance value.
060	Open circuit - temperature sensor	Temperature sensor detects a value beyond it's range. Check connections. Check sensor resistance values between 11 and 12 at connector B2 > 2 M Ω (if open circuit).
061	Short circuit - external temperature sensor	Check connections. Check sensor resistance values between 11 and 12 at connector B2 < 50 Ω (if short circuit). Temperature sensor values on previous pages.
064	Open circuit - flame sensor	Sensor is sensing value outside of range. Check connection leads. Resistance values between 13 and 14 at connector B2 > 3040 Ω (if open circuit).
065	Short circuit - flame sensor	Check connection leads. Resistance values between 13 and 14 at connector B2 > 780 Ω (if short circuit). Flame sensor values on page 17.
071	Open circuit - overheat sensor	Check connection leads. Resistance values between 9 and 10 at connector B2 > 2 M Ω (if open circuit).
072	Short circuit - overheat sensor	Check connection leads. Resistance values between 9 and 10 at connector B2 < 50 M Ω (if short circuit).
090	Control unit defect (internal fault)	Control unit malfunction due to interference voltage from vehicle electrical system; possible causes low batteries, charges, other sources of interference, eliminate interference voltages. Internal faults detected in microprocessor/ memory detected. Replace control unit.
092	Control unit defective(ROM error)	
093	Control unit defective(RAM error)	
097	Control unit defective (power failure)	Internal failure. Replace control unit.

Maintenance / Troubleshooting / Repair

Fault Code	Fault Description	Causes / Repair
099*	Too many resets in sequence	Voltage short-term < 5 - 6 volt (for 12 volt) or < 7 - 8 volt (for 24 volt). In case of a voltage drop, check the fuses, the supply cables, the negative connections and the positive support point on the battery for corrosion and correct contact.
	Transistor error in control box.	Test control box with testing device, if ok -> check lead harness of the external components has been correctly laid and check for damage, if ok -> check lead harness for continuity, if ok -> replace control box.

Fuel Quantity Test

The fuel Quantity should be tested if the heater has difficulty starting or maintaining a flame, using graduated cylinder part # 5520004 10ml.

Note: Measure the fuel quantity when the battery is sufficiently charged. At least 11V and at most 13V should be applied at the control unit during measurement.

Preparation

- Remove metering pump cover in the cases of SC versions.
- Pull the fuel line off the combustion chamber and insert into a graduated measuring glass.
- Switch the heater on, when fuel delivery is uniform (approximately 40 seconds after switching on), the fuel line is full and bled.
- Switch heater off.
- Empty measuring glass and replace.

Measurement

- Switch heater on.
- Fuel delivery starts automatically approximately 40 seconds after switching on.
- Hold the graduated measuring glass at the glow pin height during measurement.
- After 90 seconds of fuel delivery, it will shut off automatically.
- Switch heater off.
- Read off quantity of fuel delivery in the graduated measuring glass.

Evaluation

Nominal value

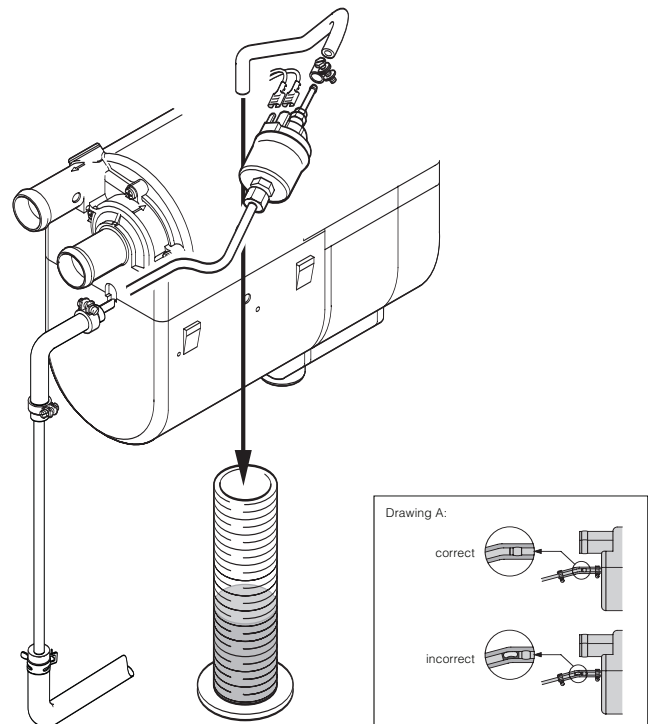
← Diesel

Hydronic D5W SC

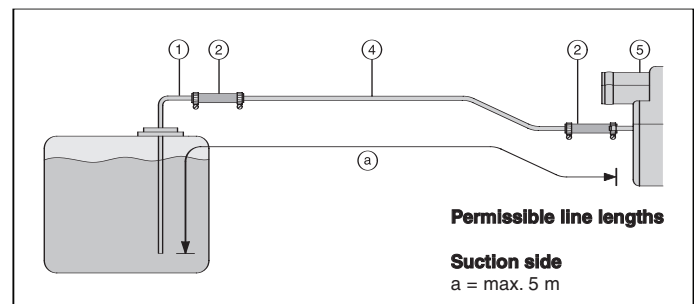
8.6 cm³ / 90 seconds

7.5 cm³ / 90 seconds

If measured quantity of fuel is over or under the nominal value, the metering pump must be replaced or fuel restriction eliminated.



For illustration purposes only



- 1 Tank connection for tank fitting.
inner diameter = Ø 2 mm,
external diameter = Ø 4 mm,
order no. 22 1000 20 07 00
- 2 Fuel hose, 3.5 x 3 (inner diameter = Ø 3.5 mm),
approx. 50 mm long.
- 4 Fuel pipe, 4 x 1 (inner diameter = Ø 2 mm)
- 5 *HYDRONIC*



Maintenance / Troubleshooting / Repair

Repair Steps covered are for the Hydronic D5W SC versions - other models are similar

Disassembly / Assembly

- 1 Cover, metering pump
- 2 Water pump, assembly
- 3 Metering pump and bracket
- 4 Cover, blower
- 5 Control unit and cover
- 6 Glow pin
- 7 Flame sensor
- 8 Cable harness
- 9 Electric motor, complete
- 10 Combustion chamber with flame tube
- 11 Heat exchanger and jacket

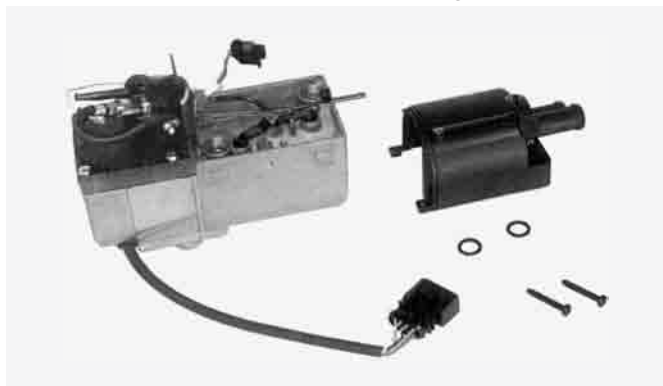
1 Cover, metering pump



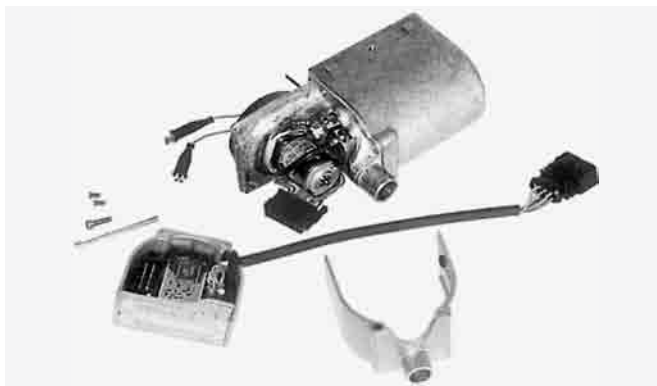
4 Cover, blower



2 Water pump assembly. When mounting, place O-rings on connection on water pump housing



5 Control unit and cover



3 Metering pump and bracket

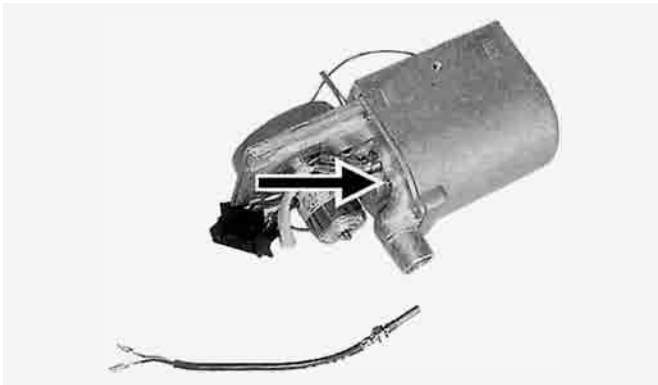


6 Glow pin



Maintenance / Troubleshooting / Repair

- 7** Flame sensor, For removal of tab receptacles, use AMP extractor tool



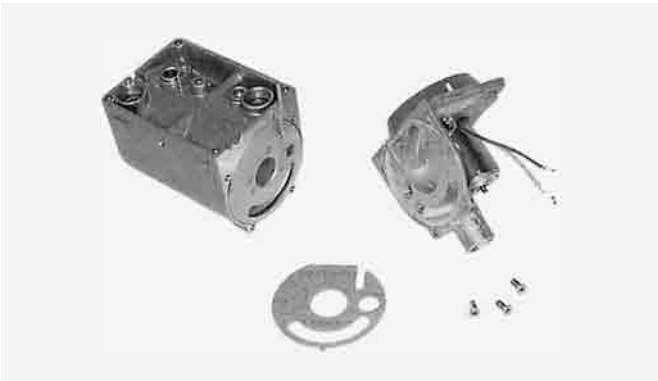
- 10** Combustion chamber with flame tube



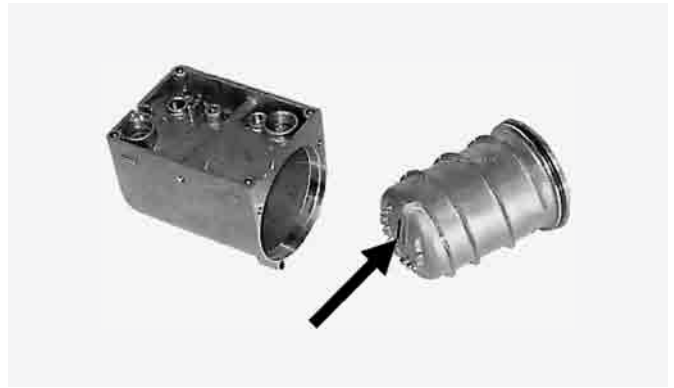
- 8** Cable Harness



- 9** Electric motor, complete



- 11** Heat exchanger and jacket, Align slot on heat exchanger (arrow) with lug in jacket

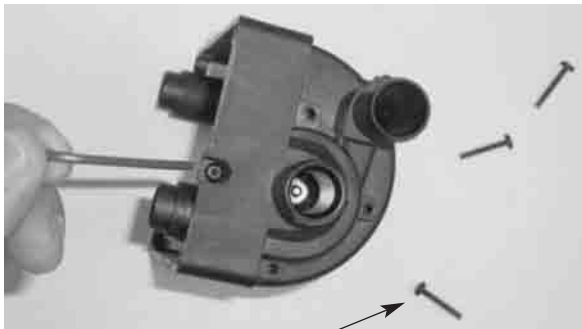




Maintenance / Troubleshooting / Repair

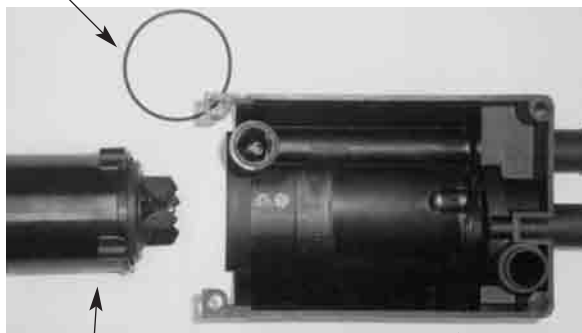
Magnetic Drive Coolant Pump Cleaning

It is advised to make this procedure part of an annual pre-season check up for this heater.



Remove the four screws holding the coolant pumps two halves together.

“O” Ring 45mm x 1 1/2 m, Part #: 556 00 06



Motor / Impeller Assembly

Pump Motor



Motor Assembly

Impeller with Magnet

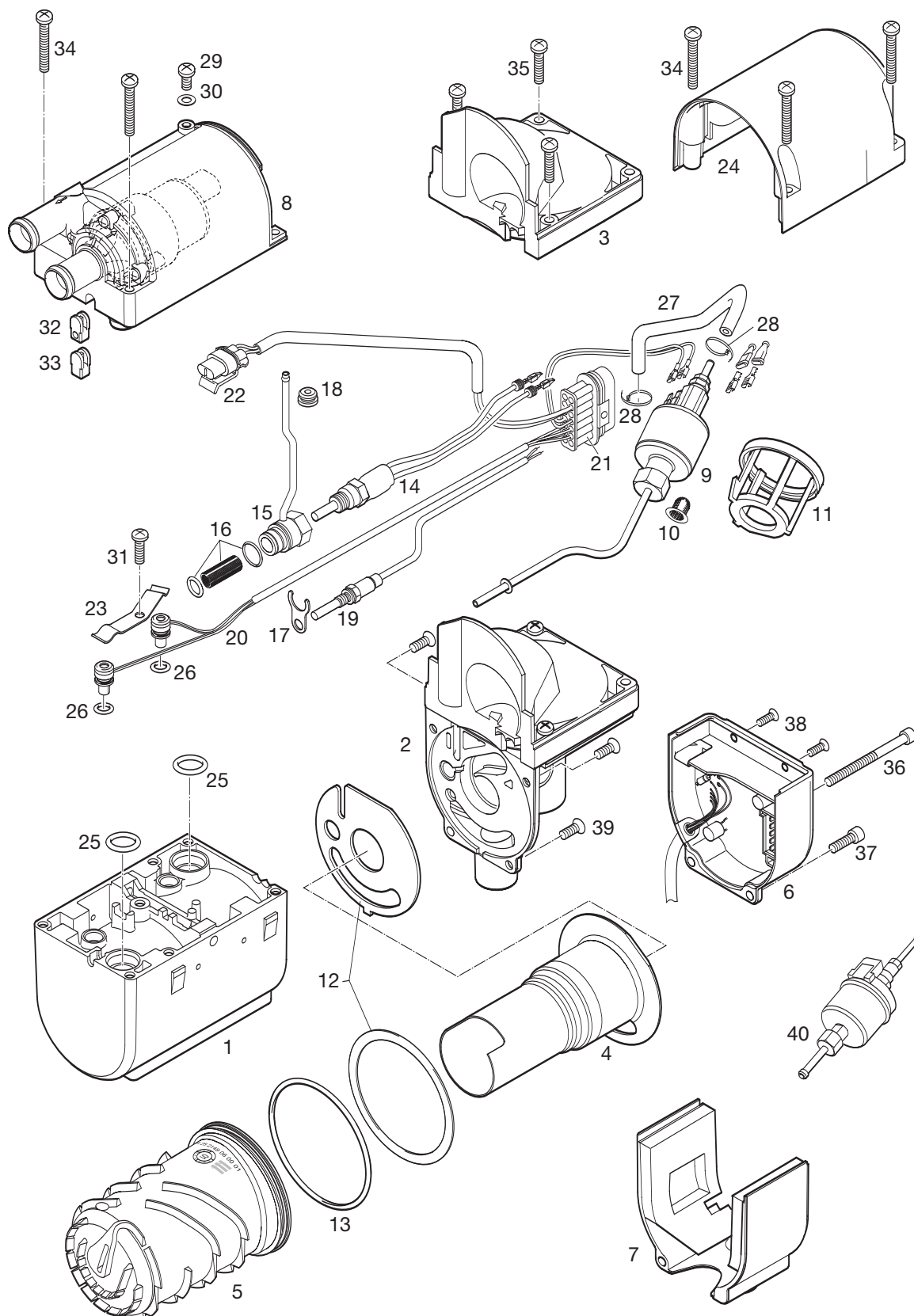


Heater Components

Parts Diagram - Hydronic D5W SC - 12 volt - Diesel versions

Model 25 22 19 05

Model 25 23 25 05 with external FMP





Heater Components

HYDRONIC D5W SC - 12 volt - Diesel version

Description & Part #'s

Ref. No.	Description	Part Number	Model #	25 2219 05 12v	25 2325 05 12v
1	Outer casing	25 2149 01 01 01		•	•
2	Combustion air blower with cover	20 1819 99 16 00		•	•
3	Cover	25 1917 01 00 02		•	•
4	Burner	20 1818 10 00 00 25 2216 10 00 00		•	•
5	Heat exchanger	25 2149 06 00 01		•	•
6	Control unit	22 5201 01 90 02		•	•
7	Cover	20 1752 99 01 03		•	•
8	Coolant Pump	25 2219 25 00 00		•	•
9	Fuel metering pump	25 2118 01 00 01		•	•
10	Integrated fuel filter	20 1312 00 00 06		•	•
11	Holder fuel metering pump	25 1917 01 00 07 25 2137 01 00 01		•	•
12	Seal	20 1820 99 00 01		•	•
13	O-Ring	320 75 104		•	•
14	Glow pin with cable section	25 2106 01 10 00		•	•
15	Plug connection	20 1752 01 10 00 25 2147 01 14 00		•	•
16	Atomizing Screen W/O rings	20 1752 99 01 02 25 2121 99 01 13		•	•
17	Holder				
18	Groomet				
19	Flame sensor	25 1920 35 00 00		•	•
20	Overheat sensor with cable section	25 2147 01 20 00		•	•
21	Plug kit 14 pin	22 1000 30 10 10		•	•
22	Cable section Waterpump	20 1753 01 18 00		•	•
23	Spring leaf	25 1922 01 00 05		•	•
24	Cover fuel metering pump	25 1752 01 00 03 25 1917 01 00 03		•	•
25	O-Ring 14 x 2.6	22 1000 70 00 06		•	•
26	O-Ring 7 x 2	22 1000 70 00 09		•	•
27	Hose	25 1917 01 00 11		•	•
28	Cable band	209 31 071		•	•
29	Screw	25 1917 25 00 12		•	•

Heater Components

HYDRONIC D5W SC - 12 volt - Diesel version

Description & Part #'s

Ref. No.	Description	Part Number	Model #	25 2219 05 12v	25 2325 05 12v
30	O-Ring	Hardware		•	
31	Tapite screw M5 x 12	109 10 153		•	•
32	Sleeve	25 1917 01 00 05		•	•
33	Sleeve	25 1752 01 00 06		•	•
34	Tapite screw M5 x 35 Torx	109 10 154		•	•
35	Tapite screw M5 x 25 Torx	109 10 152		•	•
36	Cheese-head screw M5 x 65 Torx	100 10 350		•	•
37	Tapite screw M5 x 16 Torx	109 10 151		•	•
38	Tapite screw M4 x 10 Torx	109 10 150		•	•
39	Counter sunk screw M5 x 12 Torx	102 10 302		•	•
40	External fuel pump	22 4517 04 00 00			•



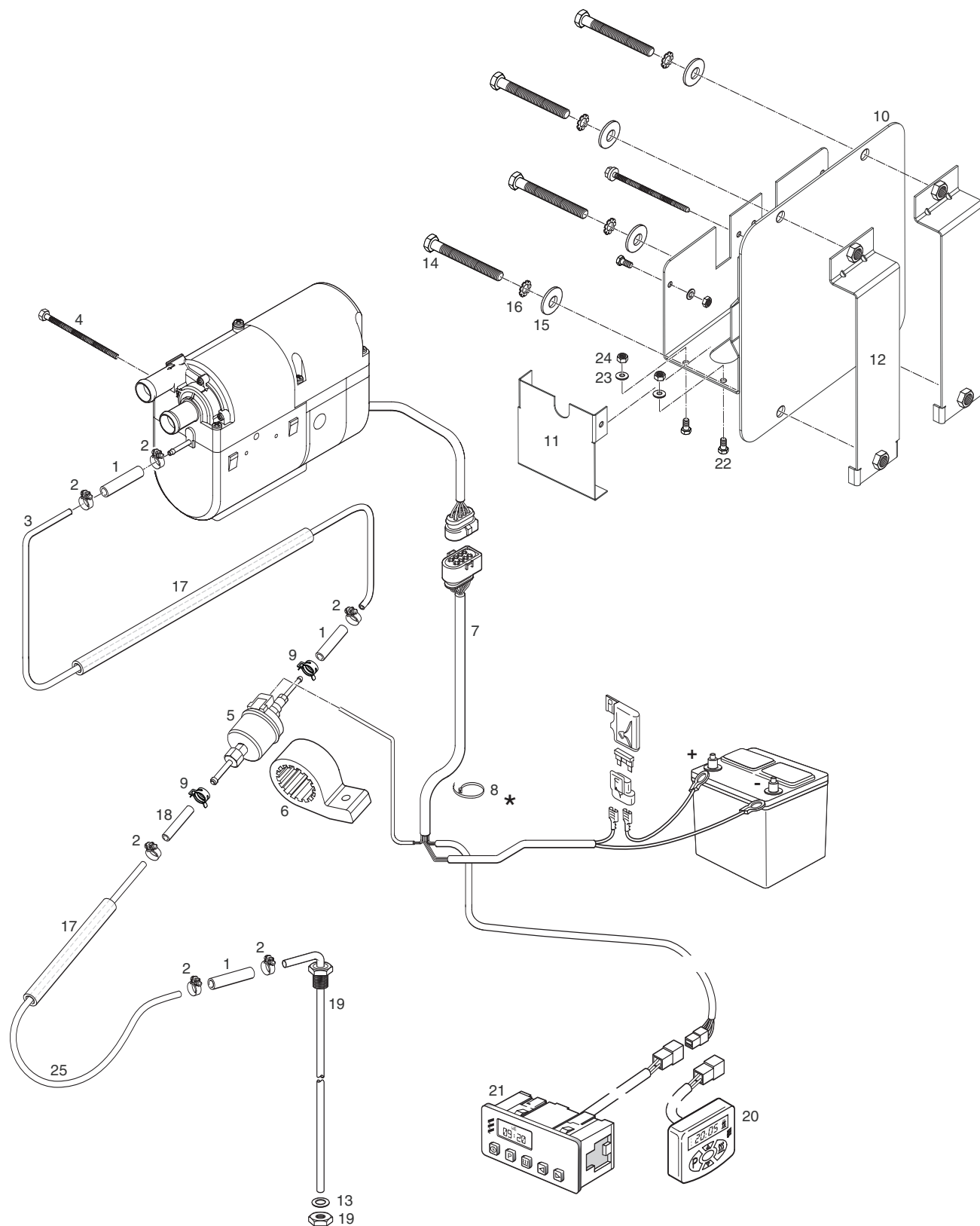
Notes:

Heater Components

Parts Diagram - Hydronic D5W SC - 12 volt - Diesel versions

Model 25 22 19 05

Model 25 23 25 05 with external FMP



* Use where needed



Heater Components

Hydronic D5W SC - 12 volt - Diesel version

Description & Part #'s

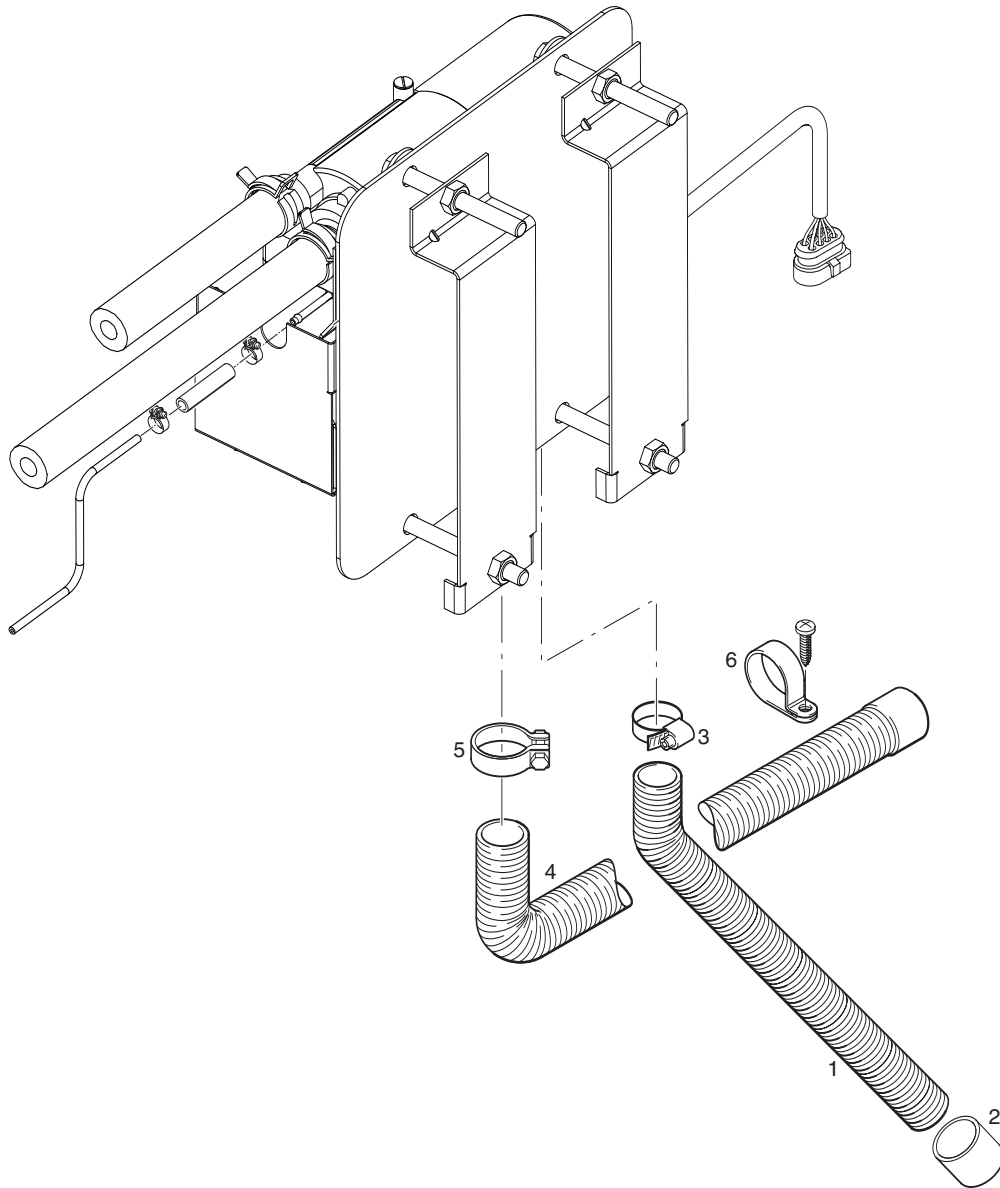
Ref. No. Description		Part Number		Model #	25 2219 05 12v	25 2325 05 12v
01	Fuel line adaptor	Qty 3	360 75 350		•	•
02	10.5 Clamp	Qty 6	5520034			•
03	Fuel line 1.5mm	2.5 meters	890 31 118			•
04	M6 x 100 Bolt	Qty 1	5590058	•		
05	Fuel metering pump	Qty 1	22 4517 04 00 00			•
06	Metering pump holder	Qty 1	22 1000 50 03 00			•
07	Main harness - Espar	Qty 1	20 2900 20 05 03	•		•
		Qty 1	20 2900 70 05 07			•
08	Cable band	Qty 20	25 1801 80 02 00	•	•	•
09	10.5 Spring clamp	Qty 2	5520034			•
10	Frame bracket	Qty 1	20 2800 40 05 10	•	•	
11	Frame bracket guard	Qty 1	20 2800 40 05 11	•	•	
12	Frame bracket clamp	Qty 2	20 2800 40 05 12	•	•	
13	Washer seal M10 x 14	Qty 4	5590145	•	•	
14	M10 x 90 bolt	Qty 4	5590142	•	•	
15	M10 fender washer	Qty 4	5590143	•	•	
16	M10 toothed lock washer	Qty 4	5590144	•	•	
17	1/4 convoluted tubing	Qty 3 meters	20 2900 70 59 19			•
18	Fuel line reducer	Qty 1	25 1888 80 01 02			•
19	Fuel pick up pipe w/nut	Qty 1	22 1000 20 11 00	•	•	
20	Mini timer	Qty 1	(Green Display) 22 1000 21 60 00	•	•	
			(Blue Display) 22 1000 32 18 00	•	•	
21	7 Day timer	Qty 1	22 1000 30 40 00	•	•	
22	Bolt M6 x 12	Qty 3	5590008	•	•	
23	Washer 6mm	Qty 3	5590084	•	•	
24	Nut hex 6mm	Qty 3	5590064	•	•	
25	Fuel line 2mm (Blue)	Qty 2 meters	890 31 117	•	•	

Heater Components

Parts Diagram - Hydronic D5W SC - 12 volt - Diesel version

Model 25 22 19 05

Model 25 23 25 05 with external FMP





Heater Components

Hydronic D5W SC - 12 volt - Diesel version Description & Part #'s

Ref. No. Description		Part Number	Model #	25 2219 05 12v	25 2325 05 12v
1	Combustion air hose - 20mm x 1mtr	360 00 099		•	•
	Double-pipe LW 19, sound damping	-----		•	•
2	End cap	25 1688 80 12 01		•	•
3	Clamp 16-25mm	10 2067 01 60 25		•	•
4	Exhaust pipe - 24mm x 1300mm / end cap	25 1729 80 10 00		•	•
5	Exhaust clamp 26mm	152 09 010		•	•
6	"P" clamp 28mm	152 10 051		•	•

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