

## Coolant Heater

# **Thermo Pro 90 D (Diesel) 12 / 24 Volt**

## Installation Manual



- Improper installation or repair of Webasto heating and cooling systems can cause fire or the leakage of deadly carbon monoxide leading to serious injury or death.
- Installation and repair of Webasto heating and cooling systems requires special Webasto training, technical information, special tools and special equipment.
- NEVER attempt to install or repair a Webasto heating or cooling system unless you have successfully completed the factory training course and have the technical skills, technical information, tools and equipment required to properly complete the necessary procedures.
- ALWAYS carefully follow Webasto installation and repair instructions and heed all WARNINGS.
- Webasto rejects any liability for problems and damage caused by the system being installed by untrained personnel.

| Contents                                                | Page      |
|---------------------------------------------------------|-----------|
| <b>1. Safety and General Information</b>                | <b>5</b>  |
| 1.1 Warning Symbols in this Installation Manual         | 5         |
| 1.2 General Information                                 | 5         |
| <b>2. Regulation for Installation in the Vehicle</b>    | <b>6</b>  |
| 2.1 Scope                                               | 6         |
| 2.2 Fuel Supply                                         | 6         |
| 2.3 Exhaust System                                      | 6         |
| 2.4 Combustion Air Inlet                                | 6         |
| 2.5 Water Inlet                                         | 6         |
| 2.6 Hot Water Outlet                                    | 6         |
| <b>3. Purpose / Version</b>                             | <b>8</b>  |
| 3.1 Purpose of the Coolant Heater                       | 8         |
| 3.2 Versions                                            | 8         |
| <b>4. Installation</b>                                  | <b>9</b>  |
| 4.1 Installation site / Installation position           | 9         |
| 4.2 To install the heater                               | 9         |
| 4.3 Model plate                                         | 9         |
| 4.4 CE mark                                             | 9         |
| 4.5 Compatibility                                       | 9         |
| <b>5. Installation Location Examples</b>                | <b>10</b> |
| <b>6. Mounting the Heater to the Vehicle</b>            | <b>11</b> |
| 6.1 Allowable Mounting Positions                        | 11        |
| <b>7. Connection to the Vehicle Cooling System</b>      | <b>14</b> |
| 7.1 General Information                                 | 14        |
| 7.2 Various Plumbing Configurations                     | 15        |
| <b>8. Fuel Supply</b>                                   | <b>18</b> |
| 8.1 General Information                                 | 18        |
| 8.2 Fuel Standpipe Installation                         | 19        |
| 8.3 Fuel Lines                                          | 21        |
| 8.4 Fuel Metering Pump                                  | 21        |
| 8.5 Fuel Filter                                         | 22        |
| <b>9. Combustion Air Supply</b>                         | <b>23</b> |
| <b>10. Exhaust System</b>                               | <b>24</b> |
| <b>11. Electrical Connections</b>                       | <b>26</b> |
| 11.1 Power / Control Harness Connections                | 26        |
| 11.2 Connecting the Controls                            | 27        |
| 11.3 Vehicle Fan                                        | 29        |
| 11.4 Setting Control Temperatures of Thermo Pro 90      | 29        |
| <b>12. Circuit Diagrams</b>                             | <b>30</b> |
| 12.1 Thermo Pro 90 Circuit Diagram Legend               | 31        |
| 12.2 Thermo Pro 90 with ON/OFF Switch                   | 32        |
| 12.3 Thermo Pro 90 with 7-day SmarTemp Control fx Timer | 33        |
| <b>13. Initial Start-up</b>                             | <b>34</b> |
| <b>14. Troubleshooting</b>                              | <b>35</b> |
| 14.1 General Information                                | 35        |

14.2 Heater Interlock .....35

    14.2.1 Interlock Reset Procedure .....35

14.3 Diagnostic after a Fault Lock-out for the Thermo Pro 90 .....36

**15. Technical Data .....37**

    15.1 Electrical Components: .....37

    15.2 Fuel for Thermo Pro 90 (Diesel): .....37

    15.3 Thermo Pro 90 Dimensions .....38

## 1. Safety and General Information

### 1.1 Warning Symbols in this Installation Manual

The purpose of safety symbols is to attract your attention to possible hazardous conditions. This manual uses a series of symbols and signal words which are intended to convey the level of importance of the safety messages. The progression of symbols is described below. Remember that safety messages by themselves do not eliminate danger and are not a substitute for proper accident prevention measures.



Indicates an imminently hazardous situation which, if not avoided, **WILL** result in death or serious injury.



Indicates a potentially hazardous situation which, if not avoided, **COULD** result in death or serious injury.



Indicates a potentially hazardous situation which, if not avoided, **MAY** result in minor or moderate injury or property damage. It may also be used to alert against unsafe practices.



These symbols are used to alert the installer to important or useful information about proper installation of the equipment.

### 1.2 General Information

Webasto Product North America, Inc. is pleased to provide this installation manual with the Thermo Pro 90 Heater. When used according to the guidelines stated in this manual, you can expect to provide years of trouble-free, enjoyable operation for your customer.

This manual represents our latest effort to produce the best technical documentation possible. In our efforts towards continuous, ongoing product improvement, we encourage our customers to write to us with their comments or criticisms concerning this manual and the Thermo Pro 90 Heater Installation.

Please write to us at:  
Webasto Thermo & Comfort North America, Inc.  
Technical Documentation Group  
15083 North Road  
Fenton, MI 48430

You are also invited to fill out our online questionnaire concerning our technical documentation and web site at:

[www.techwebasto.com](http://www.techwebasto.com)

If you have any immediate questions concerning this manual, the installation procedures within or the product itself, please call us at:

(800) 860-7866

or send a fax to:

(810) 593-6001

## 2. Regulation for Installation in the Vehicle

**Read this installation manual in its entirety before installing this equipment.**

### 2.1 Scope

- 2.1.1 Subject to the provisions of paragraph 2.1.2, internal combustion heaters must be installed in accordance with the requirements contained in this Annex.
- 2.1.2 In the case of vehicles and trailers with heaters for liquid fuel, it is presumed that these vehicles comply with the requirements in this Annex.

### 2.2 Position of the Heater

- 2.2.1 Parts of the vehicle body and other components in the immediate vicinity of the heater must be protected against excessive heat and the danger of contamination by fuel or oil.
- 2.2.2 The internal combustion heater must not pose a fire hazard even when overheated. This requirement is deemed to have been met if care is taken during installation to ensure an adequate distance from all parts, as well as adequate ventilation and if fire-resistant materials or heat shields are used.
- 2.2.3 For passenger carrying vehicles such as shuttle busses, transit busses, and coaches, the heater must not be installed in the passenger cabin. A device in a sealed cover, which also meets the requirements set out in paragraph 2.2.2, may be used, however.
- 2.2.4 The model/ Serial plate or a duplicate thereof (duplicate model/ Serial plate) must be fitted in such a way that it is still clearly legible when the heater has been installed in the vehicle.
- 2.2.5 When positioning the heater, all reasonable precautions must be taken to minimize the risk of personal injury or damage to items in the vehicle.
- 2.2.6 A clearly visible indicator within the user's field of vision must show when the heater is switched on or off.

### 2.3 Fuel Supply

- 2.3.1 The fuel filler neck must not be located in the passenger compartment and must have a tightly fitting cap to prevent any fuel leaks.
- 2.3.2 The type of fuel and the fuel filler neck must be clearly identified on heaters for liquid fuel, for which the fuel supply is separate from the fuel supply for the vehicle.
- 2.3.3 A sign must be affixed to the fuel filler neck warning that the heater must be switched off before refuelling. An identical warning must also be included in the manufacturer's operating instructions.

### 2.4 Exhaust System

- 2.4.1 The exhaust outlet must be positioned in such a way that exhaust fumes cannot enter the interior of the vehicle through ventilation devices, hot-air inlets or open windows.

### 2.5 Combustion Air Inlet

- 2.5.1 The air for the combustion chamber of the heater must not be extracted from the passenger cabin of the vehicle.
- 2.5.2 The air inlet must be positioned in such a way that it cannot be obstructed by other objects.

### 2.6 Water Inlet

- 2.6.1 The supply of water to be heated must be protected against freezing with a suitable antifreeze additive to the required strength as directed by the manufacturer. The supply of water to be heated must be uncontaminated by corrosive compounds and other impurities.
- 2.6.2 The inlet hose must be protected from damage.

### 2.7 Hot Water Outlet

- 2.7.1 Hot water hoses within the vehicle must be positioned or protected in such a way as to exclude all risk of injury or damage caused by direct contact.

- 2.7.2 The water outlet hose must be protected so that it cannot be obstructed by other objects or the flow of water through the hoses.

**IMPORTANT!**

***Failure to follow the installation instructions and the notes contained therein will lead to all liability being refused by Webasto. The same applies if repairs are carried out incorrectly or with the use of parts other than genuine Webasto service parts. This will result in the invalidation of the type approval for the heater and therefore of its homologation / type licence.***

### **3. Purpose / Version**

#### **3.1 Purpose of the Coolant Heater**

The Webasto Thermo Pro 90 coolant heaters are used in connection with the vehicle's own heating system

- to heat the cab,
- to defrost vehicle windows and
- to preheat water-cooled engines,
- to heat boats and motor-homes (recreational vehicles)

The water heater operates independently of the engine and is connected to the cooling system, the fuel system and the electrical system of the vehicle.

The Thermo Pro 90 heaters differ from each other in their component connection arrangement and in the fact that they have different control units.

#### **3.2 Versions**

##### **3.2.1 Thermo Pro 90 version**

###### **Thermo Pro 90 12V / 24V diesel**

Water heater for "diesel" fuel

The water heaters are designed for 12 V and 24 volts.

## 4. Installation



### IMPORTANT!

***The water heater must be installed outside the passenger cabin.***

***The requirements of the latest version of "Hazmat" must also be observed for the installation of the heater into vehicles used to transport hazardous substances.***

### 4.1 Installation site / Installation position

The heater must be installed in as low a position as possible to allow the heater and circulating pump to be bled automatically. This is particularly important as the circulating pump is not self-priming.

The installation must be performed in accordance with the installation instructions provided in this manual.

#### NOTE:

If the vehicle manufacturer has issued specific installation instructions, they must be followed.

### 4.2 To install the heater

The heater must be secured with at least three M8 screws. The screws must be tightened with a torque of 18 Nm. (13.3 lb-ft).

#### 4.2.1 Exhaust Temperature Sensor

The exhaust-temperature sensor cable is designed for high temperature (heat - resistant). The material is resistant to continuous effects of temperatures of up to 185 °C, however it is sensitive to external mechanical influences. Before the final installation location has been set, it is recommended conduct an analysis for the possible risk of damage to the cable due to stone impact. If stone impact is possible then precautionary measures must be taken. e.g. protective covering.

The exhaust temperature sensor must be handled carefully - it is a sensitive electronic ceramic component!

Tensile loading of the exhaust temperature sensor cable on the sensor head must always be avoided during installation and heater operation. Sharp bends in the cable at the sensor head are not permitted in order to prevent damage to the Teflon insulation of the cable.

Do not pull on the cable after the exhaust temperature sensor is installed!

Should a sensor be dropped during maintenance work, then a new sensor must be installed.

The proper condition of the mica disc (insulation) on the sensor, the force-free seating of the cable clips of the

exhaust temperature sensor and the loose routing of the exhaust temperature sensor cable to the control unit must be ensured during installation.

### 4.3 Model plate

The model plate must be positioned so that it cannot be damaged and must be clearly legible when the heater is installed (otherwise a duplicate model plate must be used).

Inapplicable years must be erased from the model plate.

### 4.4 CE mark

The Thermo Pro water heater carries the CE mark since it complies with the regulations in force. The heater satisfies the requirements of class A. As a result, the following supplement applies:



***This is a class A device. This device may induce radio interference in residential areas; in this case, the owner may be required to undertake appropriate measures.***

As a rule, installation in the engine compartment represents sufficient screening. Please contact the Webasto technical support team in the event that radio interference occurs nevertheless.

### 4.5 Compatibility

The heater is reverse compatibly with previous models regarding installation points on the vehicle.

The peripherals of the Thermo Pro 90 are also compatible with the previous model Thermo 90 ST. This makes it possible to retrofit a Thermo Pro 90.

When the Thermo 90 ST is replaced with a Thermo Pro 90, the metering pump of the Thermo 90 ST (DP2 or DP30) must also be replaced with the Thermo Pro 90 metering pump (DP42)!

When the metering pump is replaced (from DP2 or DP30 to DP42), a new metering pump wiring harness must be used for connecting the DP42 to the existing Thermo 90 ST wiring harness (5m metering pump harness - 5010871A).



5. Installation Location Examples

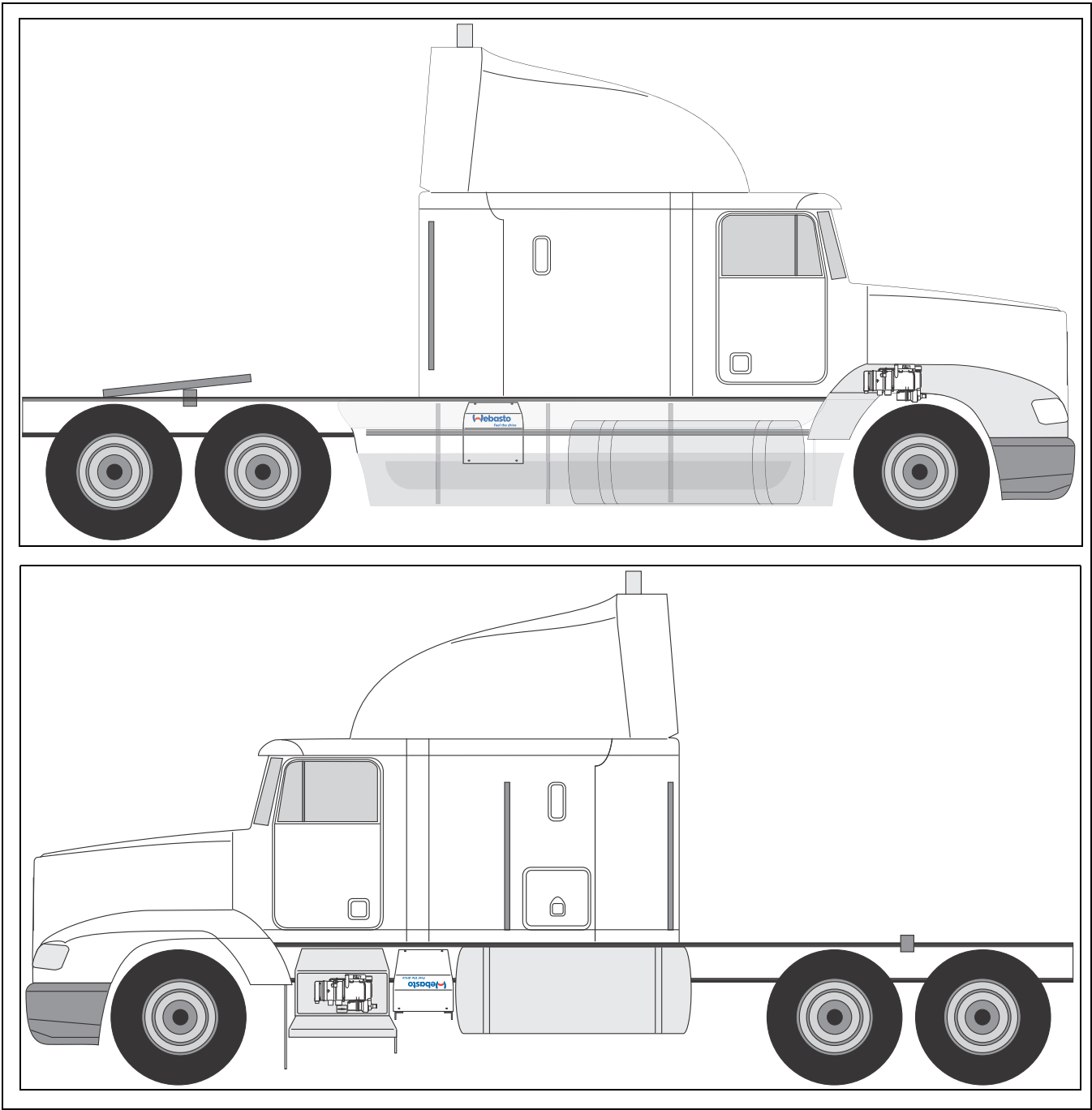


Figure 1: Installation locations

## 6. Mounting the Heater to the Vehicle

### 6.1 Allowable Mounting Positions

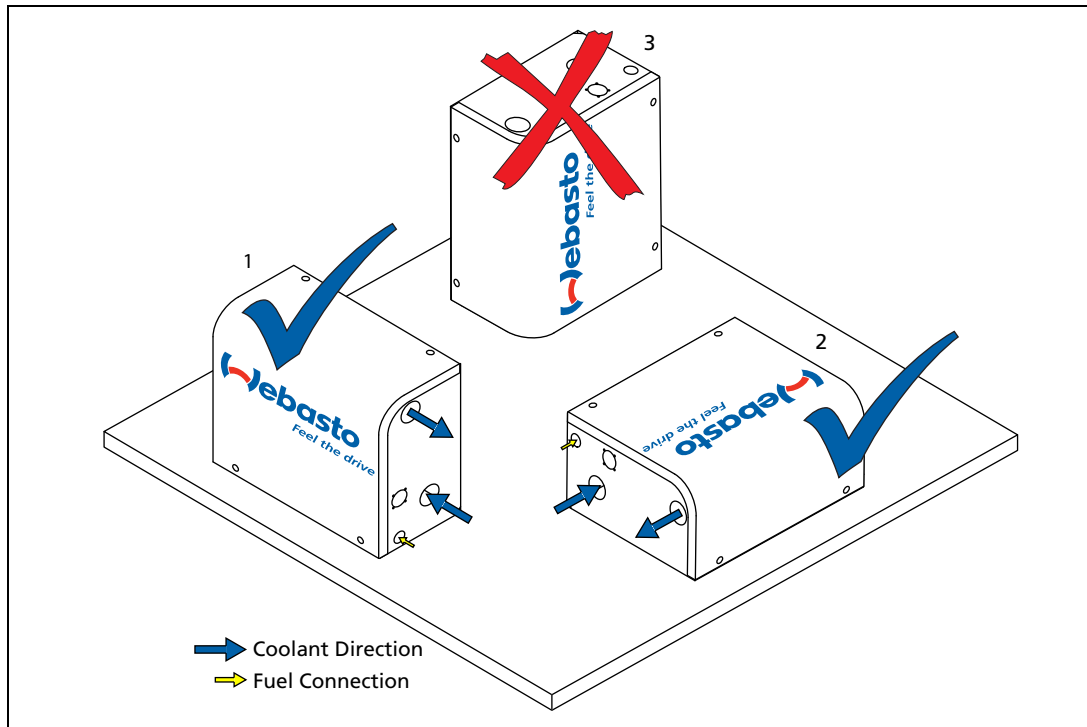


Figure 2: Allowable enclosure kit mounting positions, 1 and 2 only. Position 3 is not permissible.

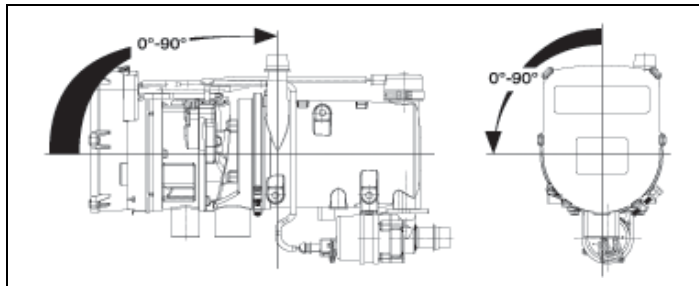


Figure 3: Permitted installation positions for the Thermo Pro 90 heaters

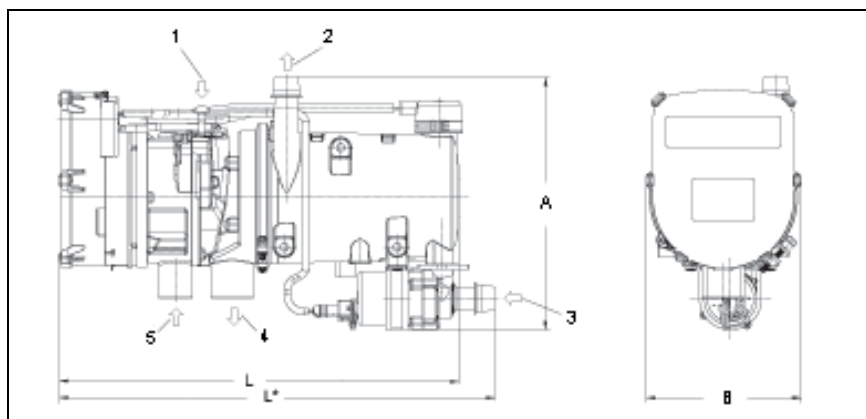
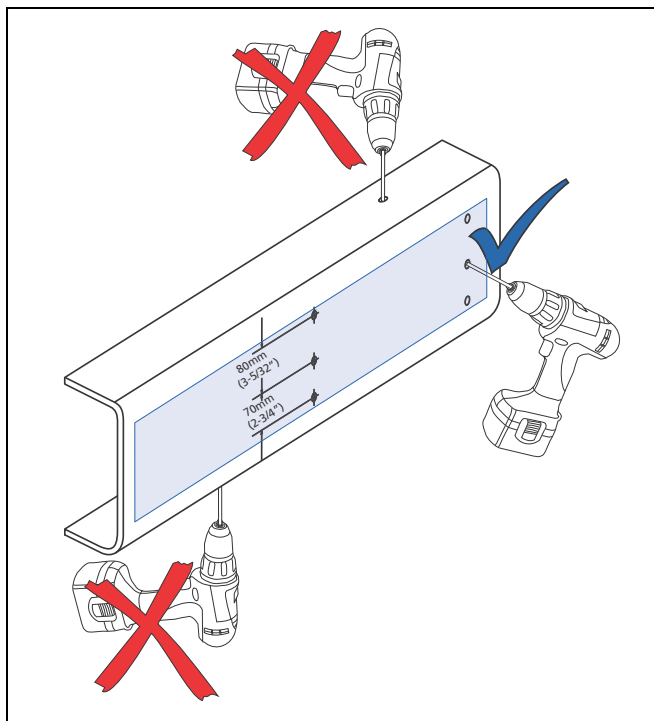


Figure 4: Thermo Pro 90 heater Inlets / Outlets / Dimensions

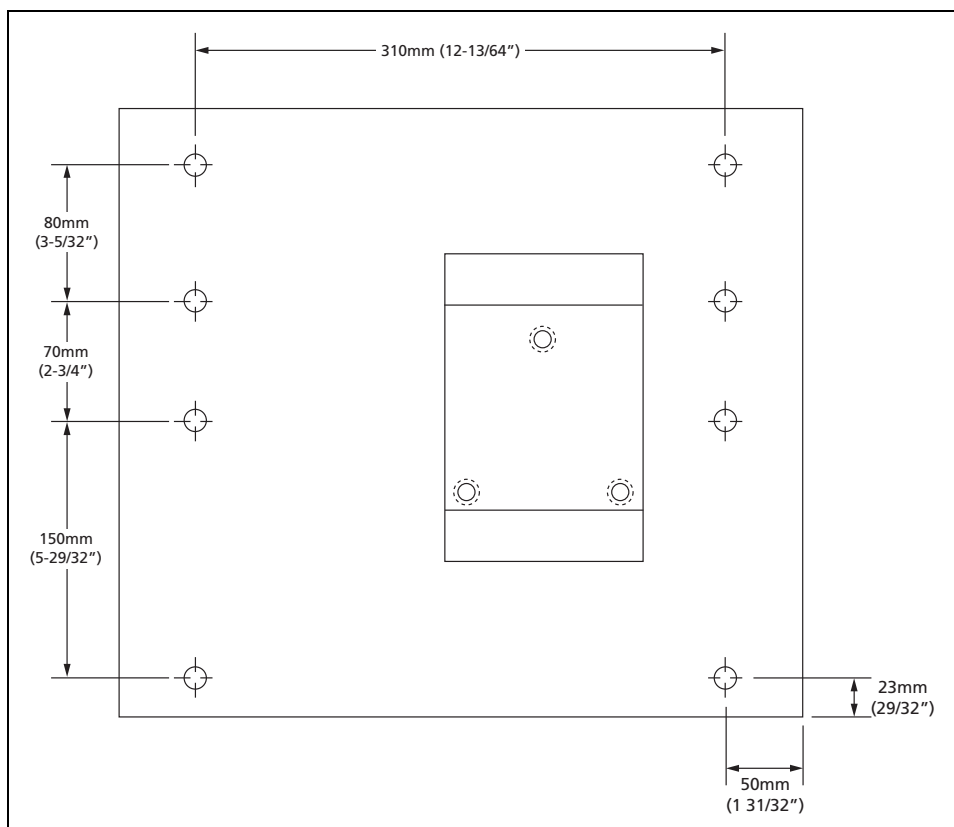
- 1 - Fuel inlet
- 2 - Heat exchanger outlet
- 3 - Heat exchanger inlet
- 4 - Exhaust outlet
- 5 - Combustion air inlet
- A - Height 232mm (9.13")
- B - Width 140mm (5.5")
- L - Length 355mm (14")
- L\* - Length from control unit to inlet connection piece of circulation pump 381mm (15")



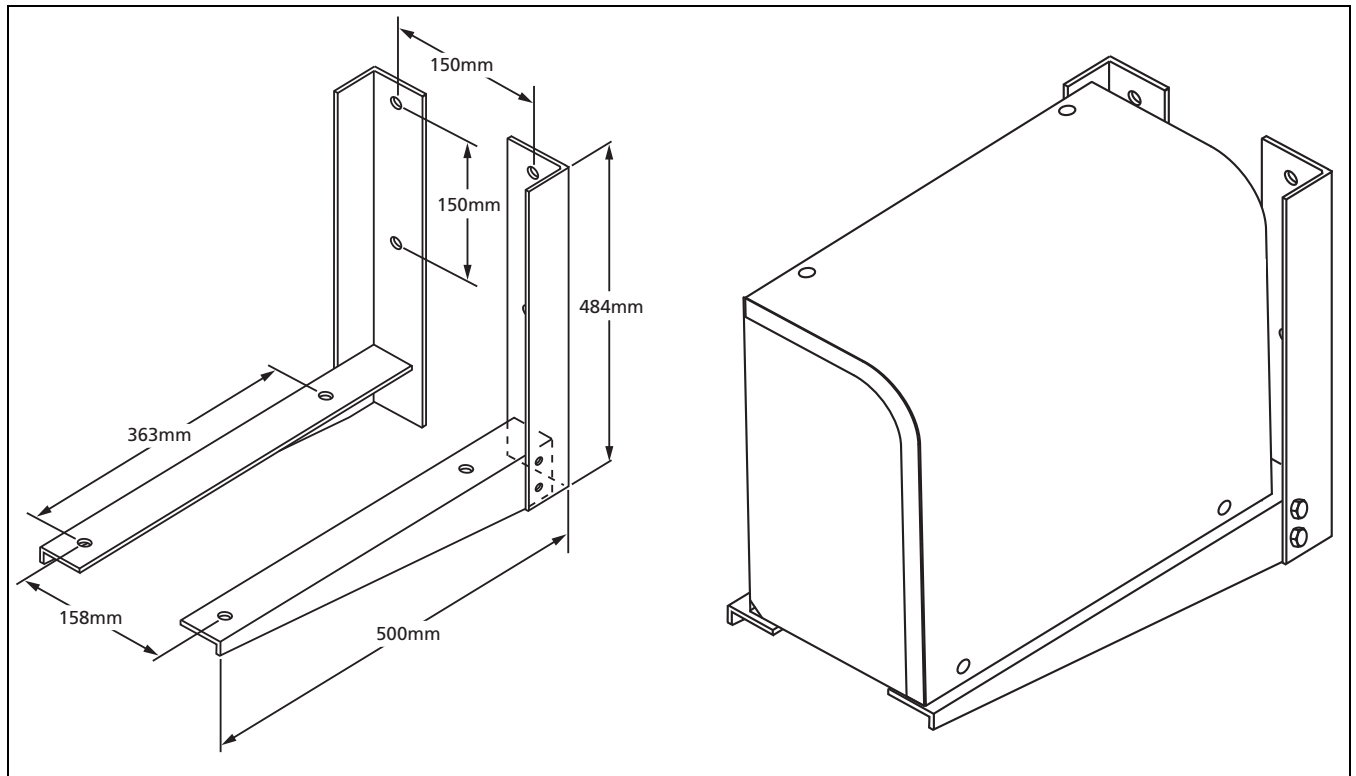
Do not drill holes through top or bottom of vehicle frame flanges!  
Do not weld vehicle frame or flanges!



**Figure 5: Drill frame within the shaded area only!**



**Figure 6: Mounting heater enclosure via back wall (Vertical or horizontal mounting)**



**Figure 7: Optional perpendicular mounting with bracket kit P/N 905838**

## 7. Connection to the Vehicle Cooling System

### 7.1 General Information

The heater is connected to the vehicle cooling system as shown in Figures 9 through 14, depending on the type of heating system the vehicle is equipped with. The system must contain at least 6 litres (1.6 US Gal.) of coolant. The system must be filled with an antifreeze and water mixture as recommended by the vehicle manufacturer. Coolant flow throughout the system must be maintained in all operating conditions.

If desired, shut-off valves can be installed at the engine inlet and outlet connections of the coolant heater circuit, although, shut-off valves are not mandatory. All valves should remain open throughout the year.

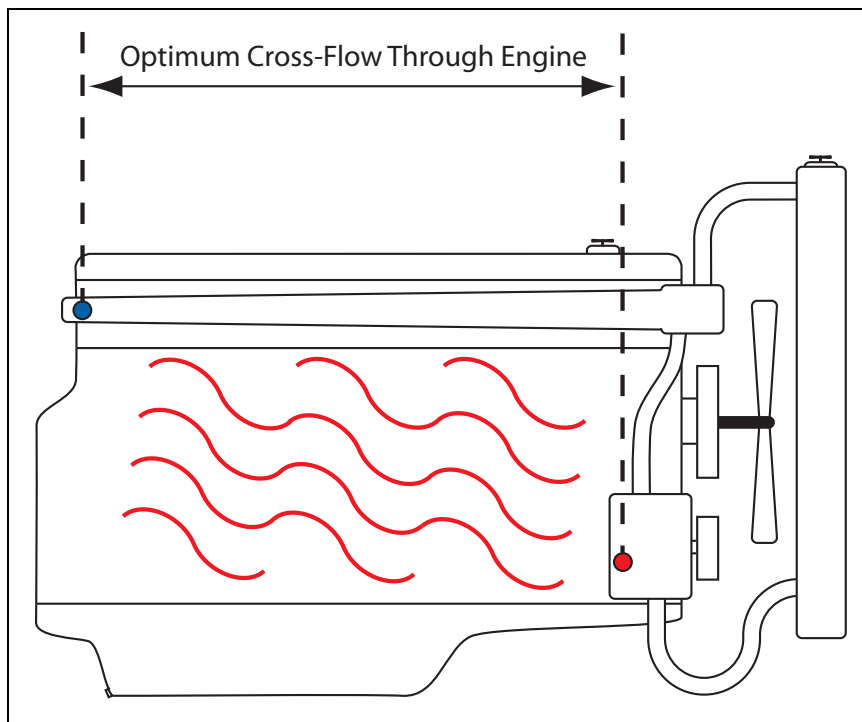
**IMPORTANT!**

***To maintain optimum heater condition, periodically run heater for 20 minutes monthly during the off-season. Ensure any shut-off valves are open before operating the coolant heater.***

- Use 1/2" or larger NPT pipe fittings for hose connections at engine.
- Use good quality, heavy duty 3/4" ID. coolant hose for the coolant heater circuit.
- Hoses must be installed without kinks and bends which may restrict coolant flow.
- To ensure proper bleeding of air, keep hoses rising if possible. Avoid "goose necks" to prevent trapping air.
- Hoses must be supported where required to prevent chaffing and damage from vehicle components.
- Hose connections must be secured by hose clamps to prevent them from slipping off.
- Coolant heater flow direction should match the flow direction of the engine's coolant circulation system.

**IMPORTANT!**

***The hose clamps must be tightened with a torque of 4 Nm. (35 lb.-in.)***  
***The use of silicone hose requires special hose clamps.***



Separate the heater supply and return connections at the engine as far apart as is practical for optimum engine heating and heater performance. See Figure 8.

**Figure 8: Ensure optimum cross-flow**

The cooling system must be bled carefully before using the heater for the first time or after replacing the coolant.

Proper venting of trapped air can be identified by the circulating pump operating almost silently. Poor bleeding may cause the resetting temperature limiter to trip while the heater is in operation.

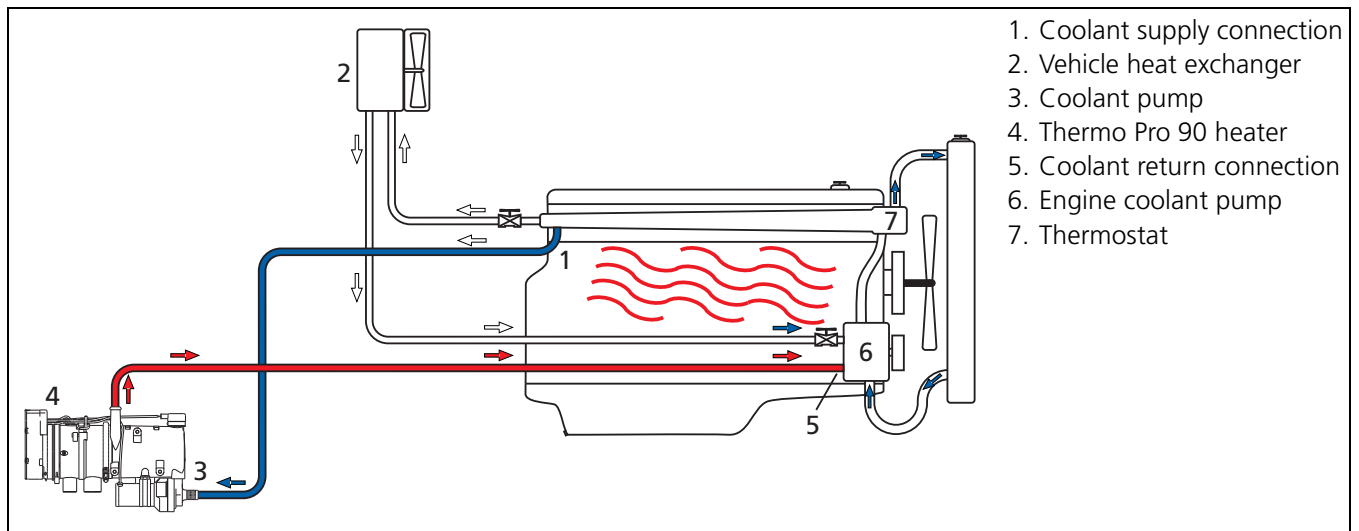
## 7.2 Various Plumbing Configurations

Select the appropriate plumbing configuration according to the customers requirements and the vehicle system type.

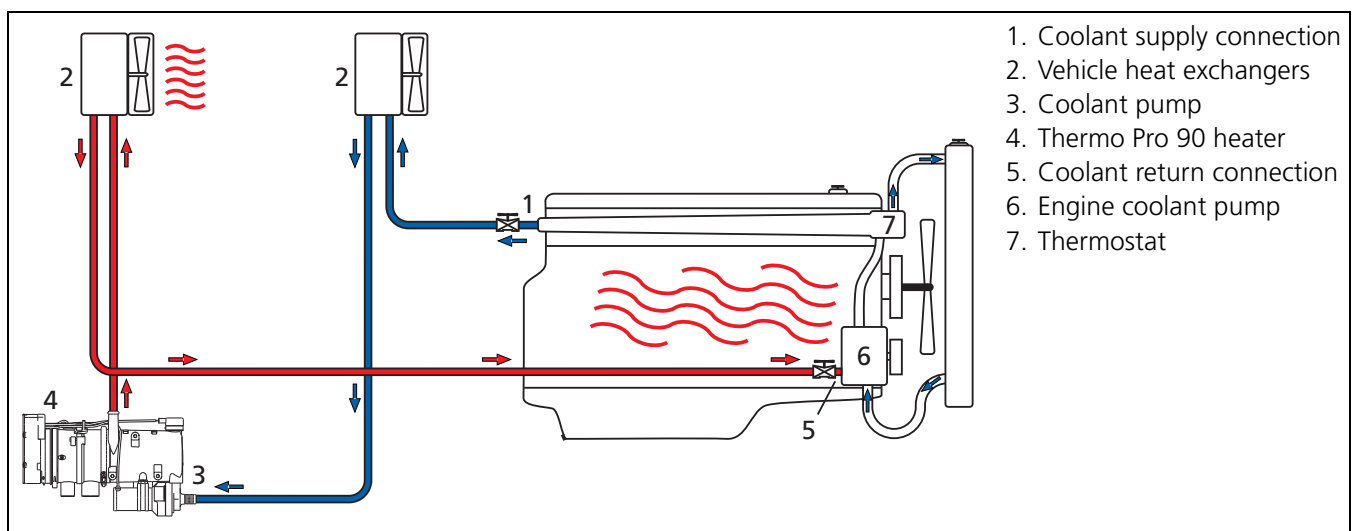
Figure 9 illustrates an engine preheat / boost heat configuration.

Figures 10 through 13 illustrate configurations for bunk heat and engine preheat / boost heat.

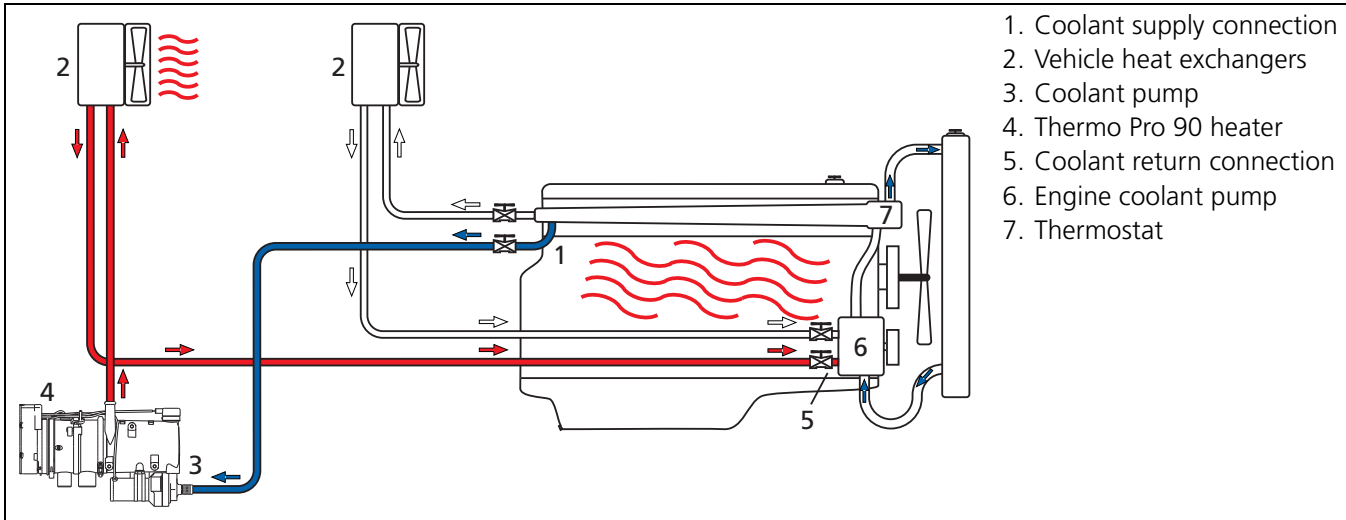
Figure 14 illustrates a system for vehicles with continuous fan operation or high amperage heat exchanger fan designs. In this case, the addition of a low amperage draw, auxiliary heat exchanger system is recommended.



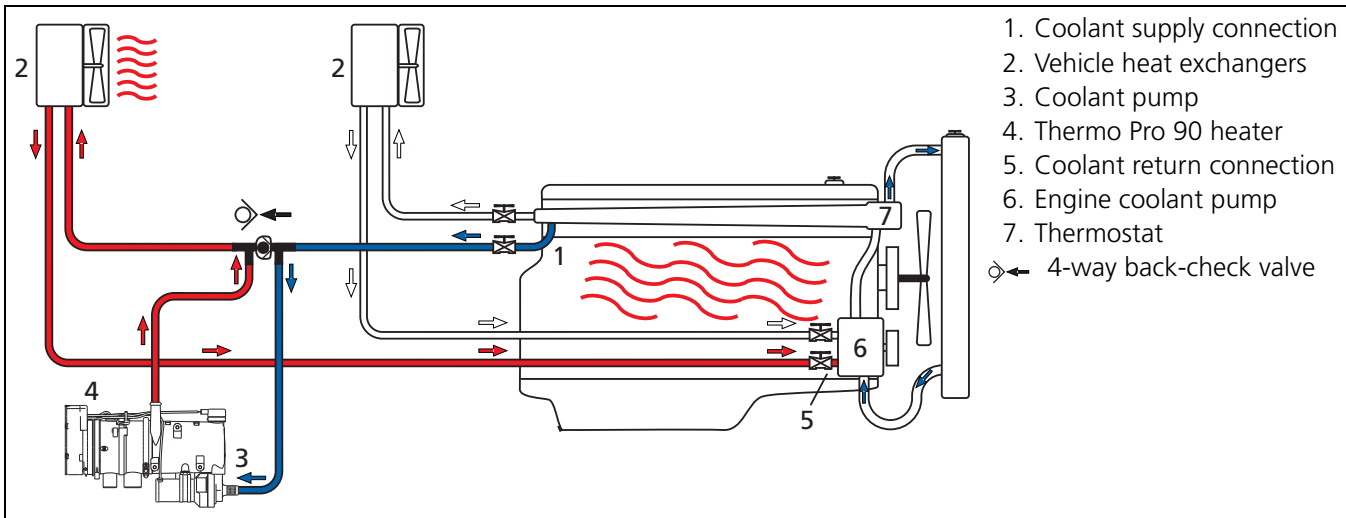
**Figure 9: System configured for engine pre-heating and boost heating.**



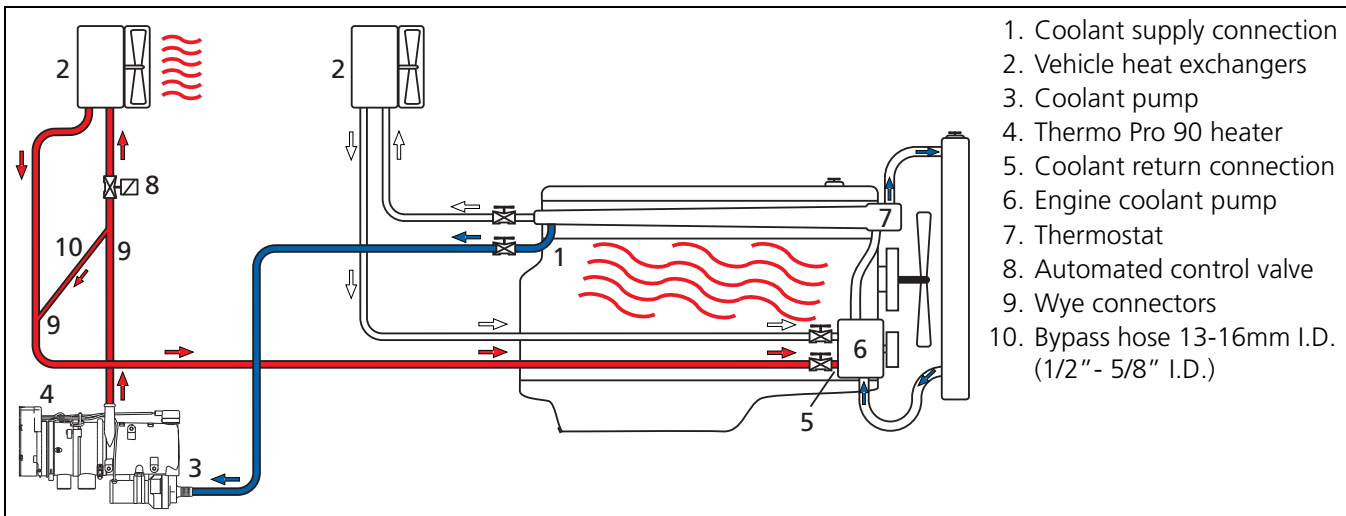
**Figure 10: System configured in a "series" fashion with both heat exchangers.**



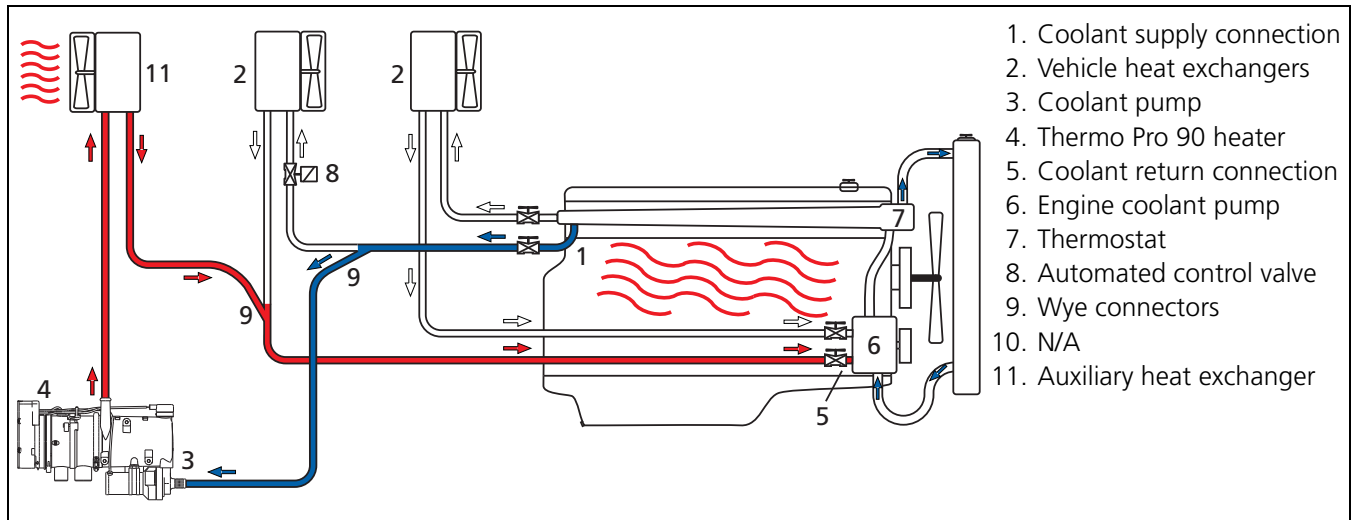
**Figure 11: System configured in series with rear heat exchanger in a “dual” circuit heating system.**



**Figure 12: System configured in the rear heat exchanger circuit using an optional 4-way back-check valve.**



**Figure 13: System configured with a bypass circuit within the rear heat exchanger circuit where an automated flow control valve is installed. Bypass is required in the event the valve is closed during heater operation.**



**Figure 14: System configured with an additional auxiliary heat exchanger connected in "series / parallel" with rear heat exchanger circuit.**



## 8. Fuel Supply

### 8.1 General Information

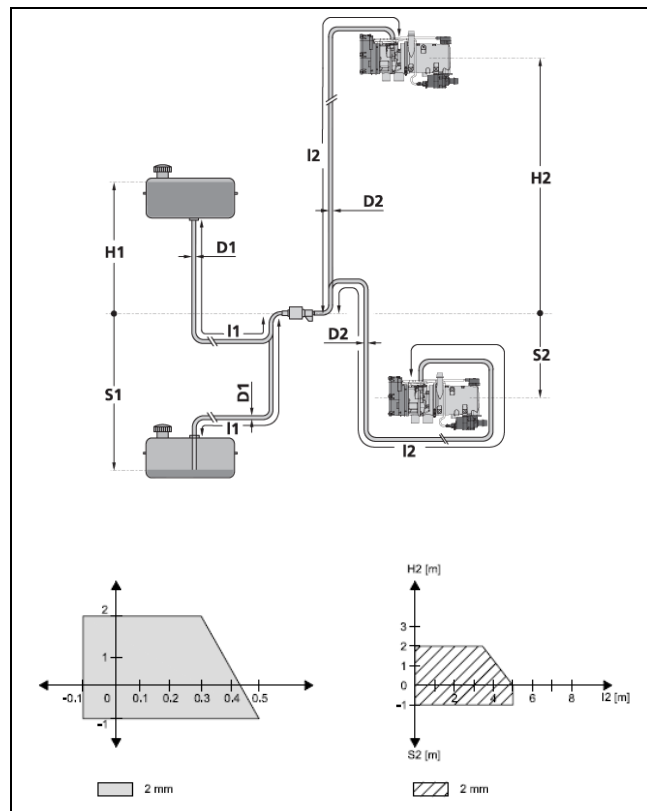
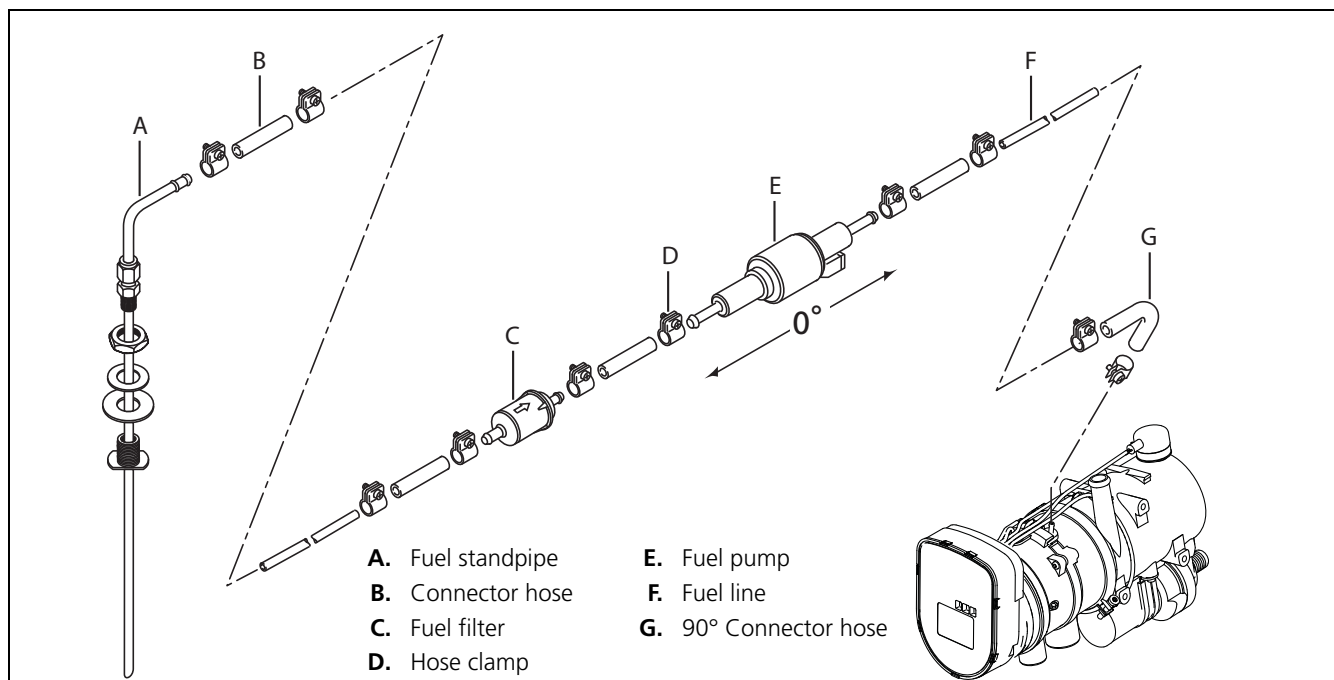
The values for the maximum pressure at the fuel extraction point are shown in the table below and in Figure 16.

| Intake Side                                                     | Pressure Side                                            |
|-----------------------------------------------------------------|----------------------------------------------------------|
| <b>D1</b> - Inside diameter of fuel line = 2 mm.                | <b>D2</b> : Inside diameter of fuel line = 2 mm.         |
| <b>H1</b> - Dimension for fuel tank over metering pump [m]      | <b>H2</b> : Dimension for heater over metering pump [m]  |
| <b>S1</b> - Dimension for fuel tank under metering pump [m]     | <b>S2</b> : Dimension for heater under metering pump [m] |
| <b>I1</b> - Length of fuel line with D1 = 2 mm => $I1 \leq 3$ m | <b>I2</b> : Length of fuel line                          |
| <b>P1</b> : Relative fuel pressure at removal point             |                                                          |

The fuel is taken from the vehicle fuel tank or from a separate fuel tank. The exploded view in Figure 15 illustrates the progression of fuel system components.

A sign must be affixed to the fuel tank's filler neck warning that the heater must be switched off before refuelling.

**Figure 15: Fuel system components**



**Figure 16: Fuel system parameters**

## 8.2 Fuel Standpipe Installation

This separate fuel pickup precludes any effect of pressure.

Where available, a spare NPT threaded port can be utilized for the standpipe. If a spare port is not present, proceed with the following instructions under "To install the standpipe".

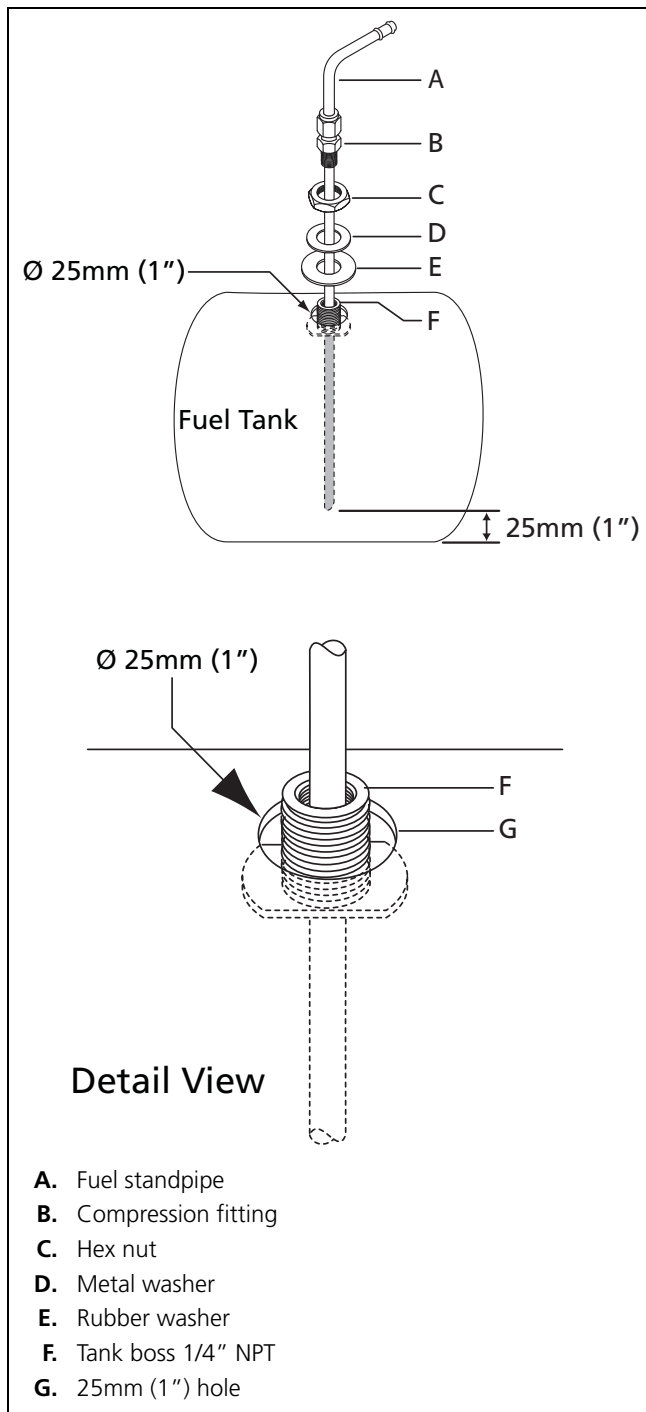


Figure 17: Webasto fuel standpipe

### To install the standpipe:

1. bore a 25mm (1") hole through top of fuel tank (item G, Figure 17).
2. remove sharp burrs and smooth edges with emery cloth.
3. determine length of standpipe when installed. End should sit at least 25mm (1") above tank bottom. Cut off excess standpipe at a 45 degree angle. Remove burrs.
4. loosely assemble items C, D, E, and F (Figure 17).
5. place sealing compound on threads of item B and thread into item F. Tighten item B completely.
6. slide standpipe into hole at angle. Slip one shoulder of item F, Figure 17 inside the hole as shown in Figure 18.

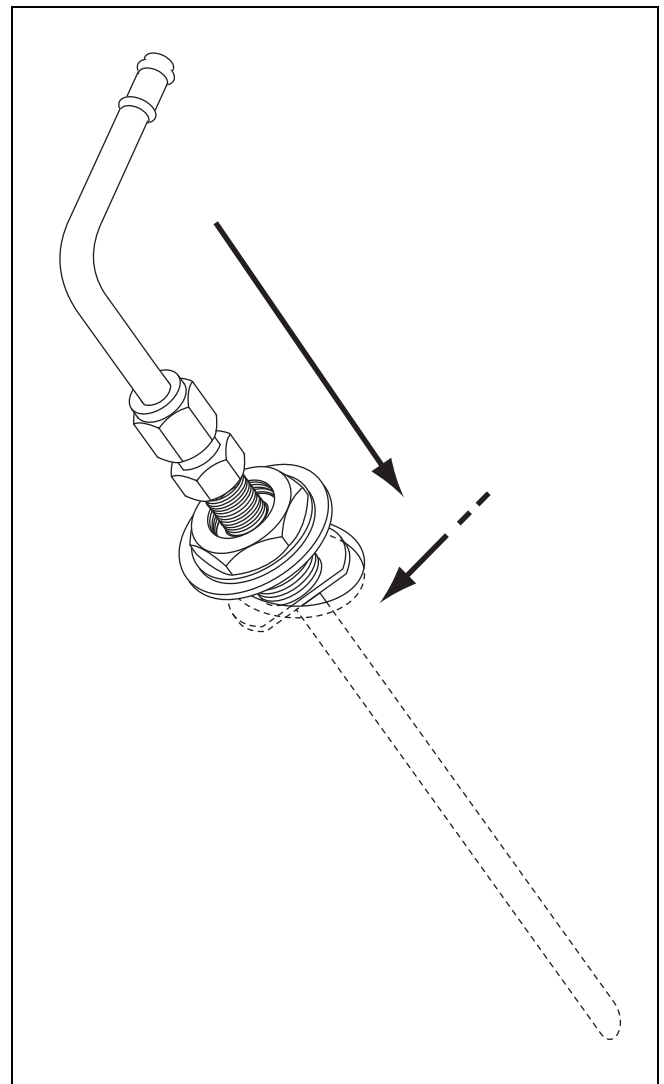
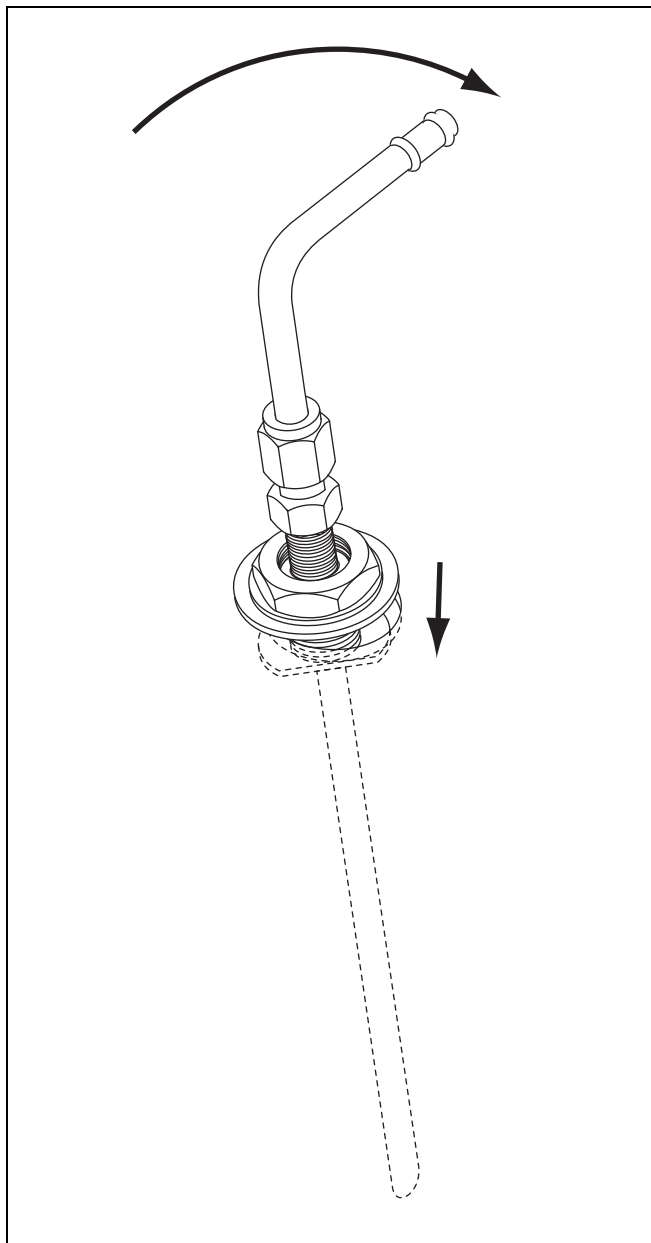


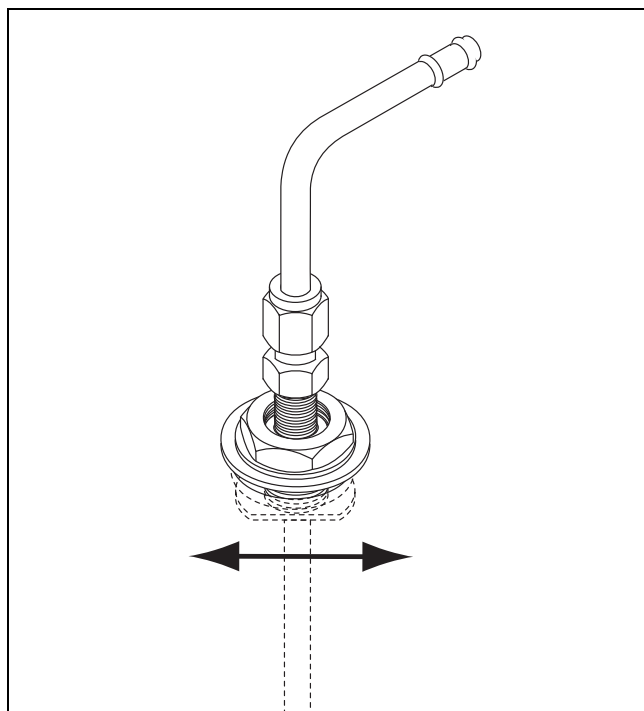
Figure 18: Standpipe installation - illustration 1

- bring standpipe up to horizontal and insert opposite shoulder under the tank hole. See Figure 19.



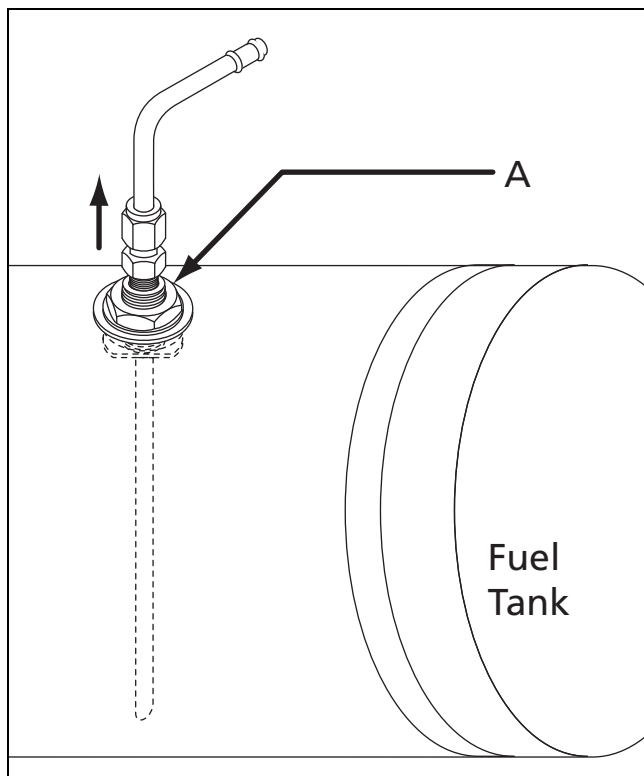
**Figure 19: Standpipe installation - illustration 2**

- center standpipe in tank hole. See Figure 20.



**Figure 20: Standpipe installation - illustration 3**

- pull up on standpipe and tighten in place with the clamping nut (item A in Figure 21). Do not over-tighten causing rubber washer to squeeze out!



**Figure 21: Standpipe installation - illustration 3**

### 8.3 Fuel Lines

Only steel and plastic lines made of plasticized, light and temperature-stabilized may be used for the fuel lines.

Since the lines normally cannot be routed with a constant rising gradient, the internal diameter must not be allowed to exceed a certain size. Air or gas bubbles will accumulate in lines with an internal diameter of more than 4 mm (5/32 in.) and these will cause malfunctions whilst the heater is operating if the lines sag or are routed downwards. The diameters specified in Figure 16 will ensure that bubbles do not form.

The lines should not be routed downwards from the metering pump to the heater.

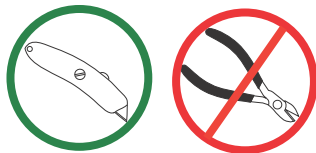
Unsupported fuel lines must be secured to prevent them from sagging. They must be installed in such a way that they cannot be damaged by flying road debris and high temperatures, i.e. close to the exhaust line.

The fuel lines must be secure at the connections using hose clips to prevent their slipping.



#### IMPORTANT!

**Cut lines without burr and do not crush them. Do not cut fuel line with side cutting pliers!**



#### 8.3.1 Connecting two fuel lines with a coupler hose

The correct procedure for connecting fuel lines with hosing is shown in Figure 22. Ensure that there are no leaks.

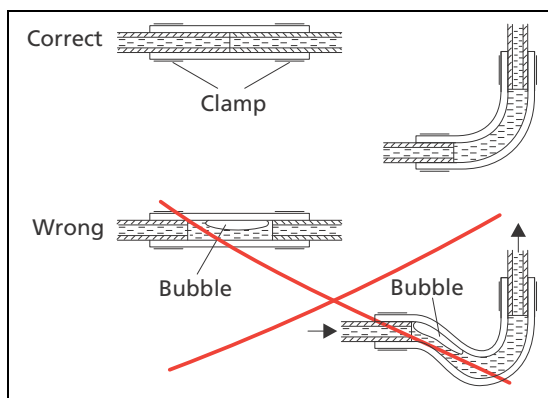


Figure 22: Fuel line / coupler hose connection

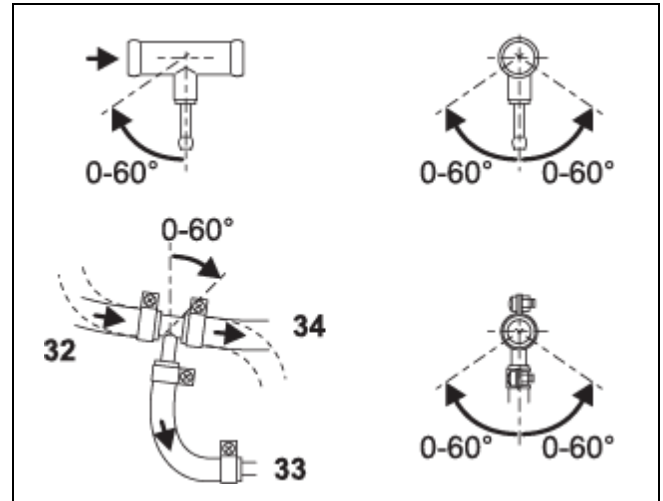


Figure 23: Fuel line / coupler hose connection

### 8.4 Fuel Metering Pump

The fuel metering pump is a combined delivery, metering and shut-off system and is subject to certain installation criteria (see Figures 24).

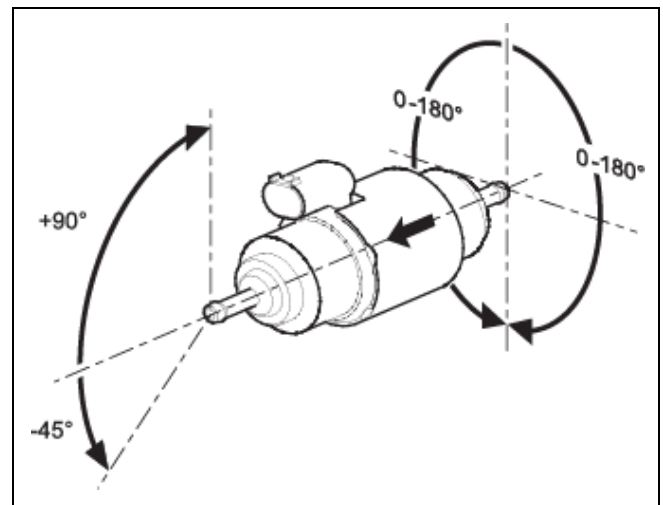


Figure 24: Metering pump DP42 - installation position

#### 8.4.1 Installation Location

It is advisable to install the metering pump in a cool place.

The metering pump and fuel lines must not be installed within range of the radiated heat from hot vehicle parts. A heat shield must be used if necessary.

## 8.4.2 Attachment

The metering pump must be secured with a vibration-damping mounting. Its installation position is limited as shown in Figure 24 in order to ensure effective automatic bleeding.

As a result of the risk of corrosion, only genuine Webasto parts may be used for the plug connections between the metering pump and the metering pump wiring harness.

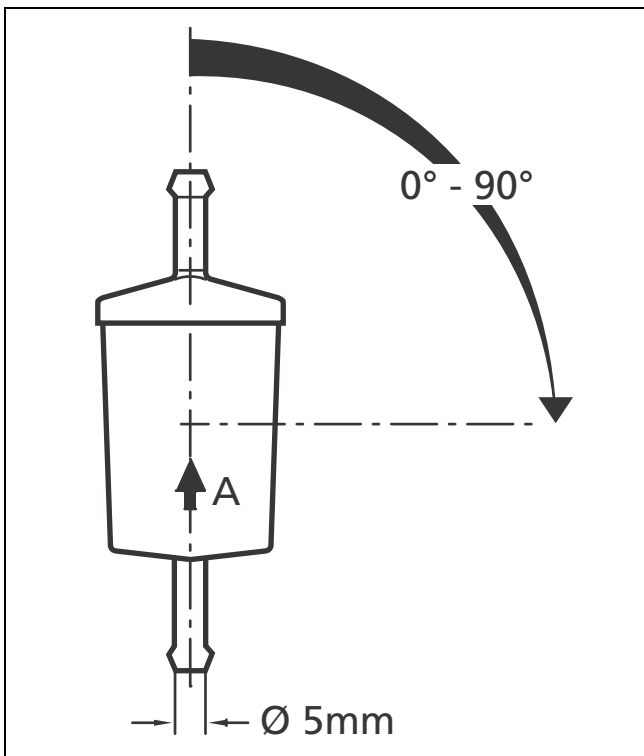
## 8.5 Fuel Filter

Only a Webasto filter is allowed to be used if the fuel is expected to be contaminated. Install vertically if possible, however at least horizontally (check flow direction).



### IMPORTANT!

***Do not substitute the Webasto supplied fuel filter with a non Webasto replacement. Irregular heater operation may result.***



**Figure 25: Fuel filter**

## 9. Combustion Air Supply

Under no circumstances may the combustion air be taken from areas occupied by people. The combustion air intake opening must not point in the direction of travel. It must be located in that it cannot become clogged with dirt or snow and cannot suck in splashing water.



**IMPORTANT!**

***The combustion air must be extracted using a combustion air tube from a position that is as cool as possible and protected from splashing water.***

The combustion air intake tube (internal diameter at least 30 mm) may be 0.5 m to 5 m (1.6 ft to 16 ft) long with several bends totalling 360°. The minimum bending radius is 45 mm (1.75 inches).

The combustion air intake must not be routed in the vicinity of the exhaust discharge.



**IMPORTANT!**

***A minimum of 0.5m of the combustion air tube must be installed on every application.***



**IMPORTANT!**

***If the combustion air intake tube cannot be installed so that it slopes downwards, a water drain hole with a diameter of 4 mm (5/32") is to be made at its lowest point.***

If the heater is installed in the vicinity of a fuel source, the combustion air tube must be routed in a way to prevent fumes from entering. The openings must be splash-proof.

A ventilation opening measuring at least 7 cm<sup>2</sup> is required if the heater is installed in an enclosed box. The size of the ventilation opening must be increased accordingly if the temperature in the box exceeds the permitted ambient temperature of the heater (see Technical data).

## 10. Exhaust System

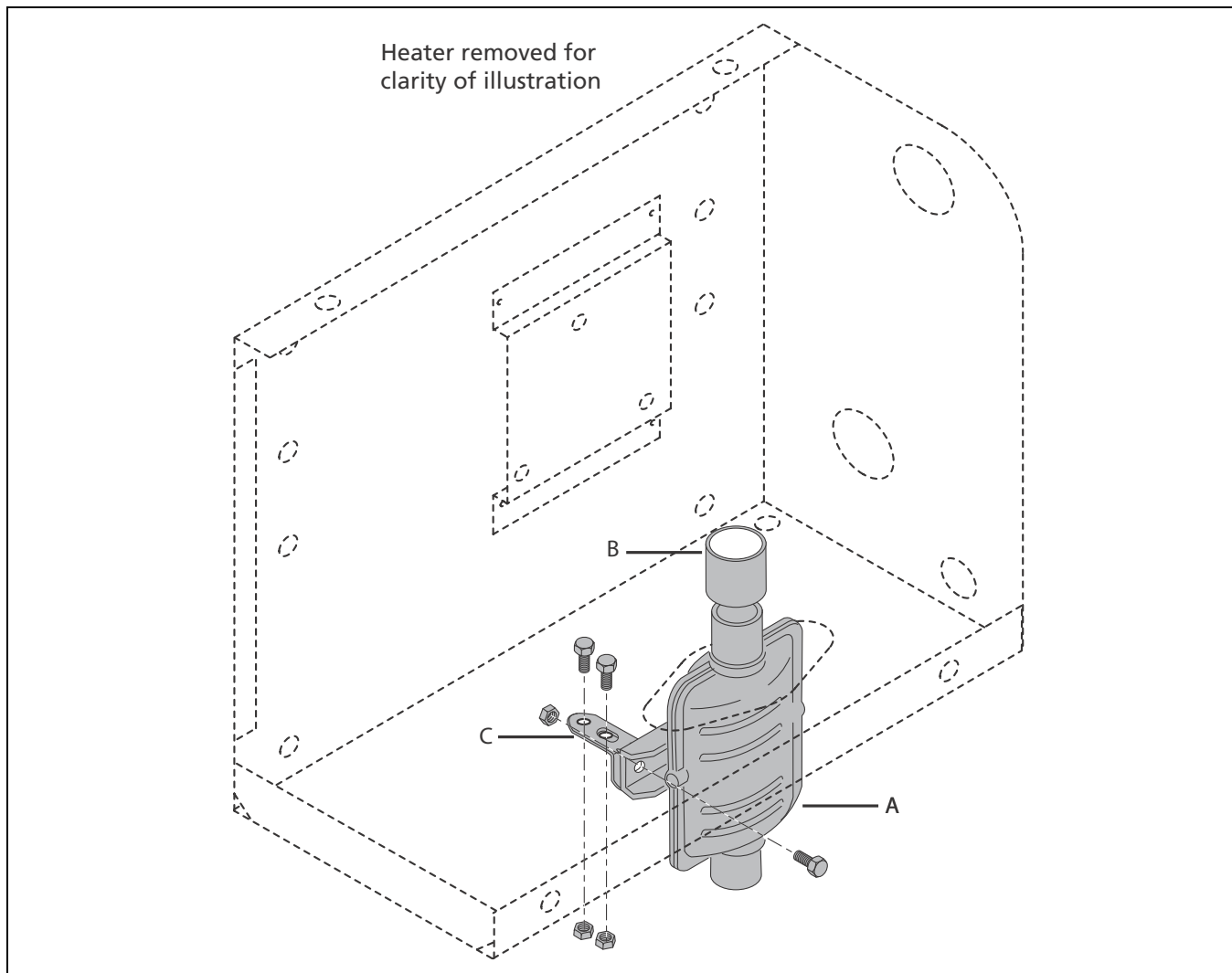
The exhaust pipe (internal diameter 38 mm) can be installed with a length of 0.5 m to 5 m (1.6 ft to 16 ft) and several bends totalling a maximum of 360° altogether. The minimum bending radius is 85 mm (3.35 inches).

The exhaust muffler is required and must be installed near the heater.

The opening of the exhaust pipe must not point towards the front of the vehicle (see Figure 27).

The exhaust pipe opening must be located so that it cannot become clogged with snow and mud.

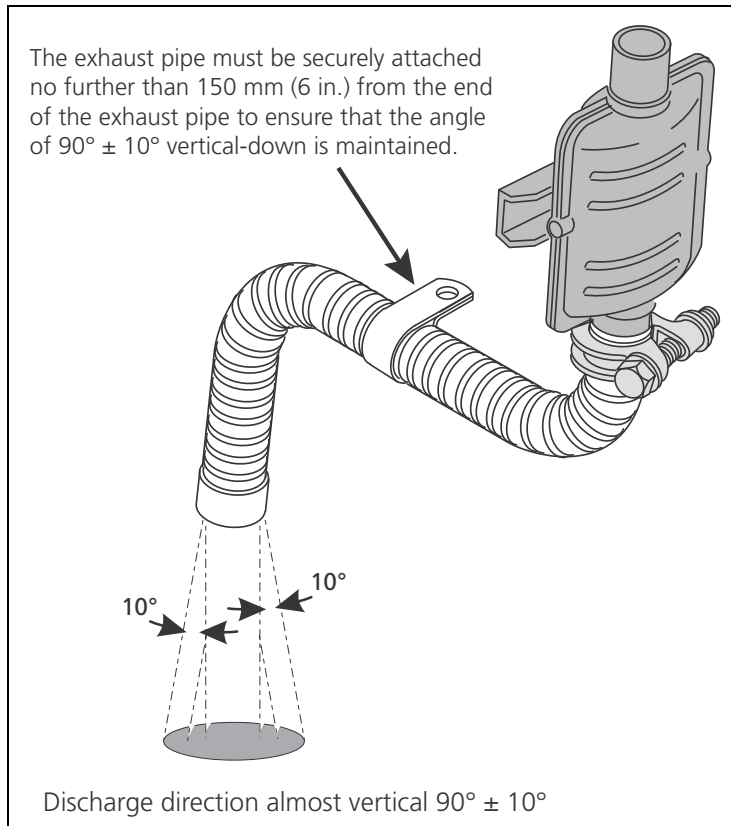
Rigid pipes of unalloyed or alloyed steel with a minimum wall thickness of 1.0 mm or flexible piping of alloyed steel only must be used as exhaust tube. The exhaust pipe is secured to the muffler using an approved muffler clamp. See Figure 27 for details. See the regulations section 2 for other requirements.



**Figure 26: Exhaust muffler installation - enclosure kit only**

- A.** Muffler
- B.** coupler (between heater and muffler)
- C.** "L" bracket

The exhaust muffler is secured to the heater using a coupler between the heater and muffler and a bracket fastened to the underside of the enclosure. See Figure 26 for details.



**Figure 27: Exhaust pipe termination**



**IMPORTANT!**

If the exhaust tube cannot be installed so that it slopes downwards at all points, a condensation drain hole with a diameter of 4 mm (5/32") is to be made at its lowest point to allow condensate to drain.



## 11. Electrical Connections

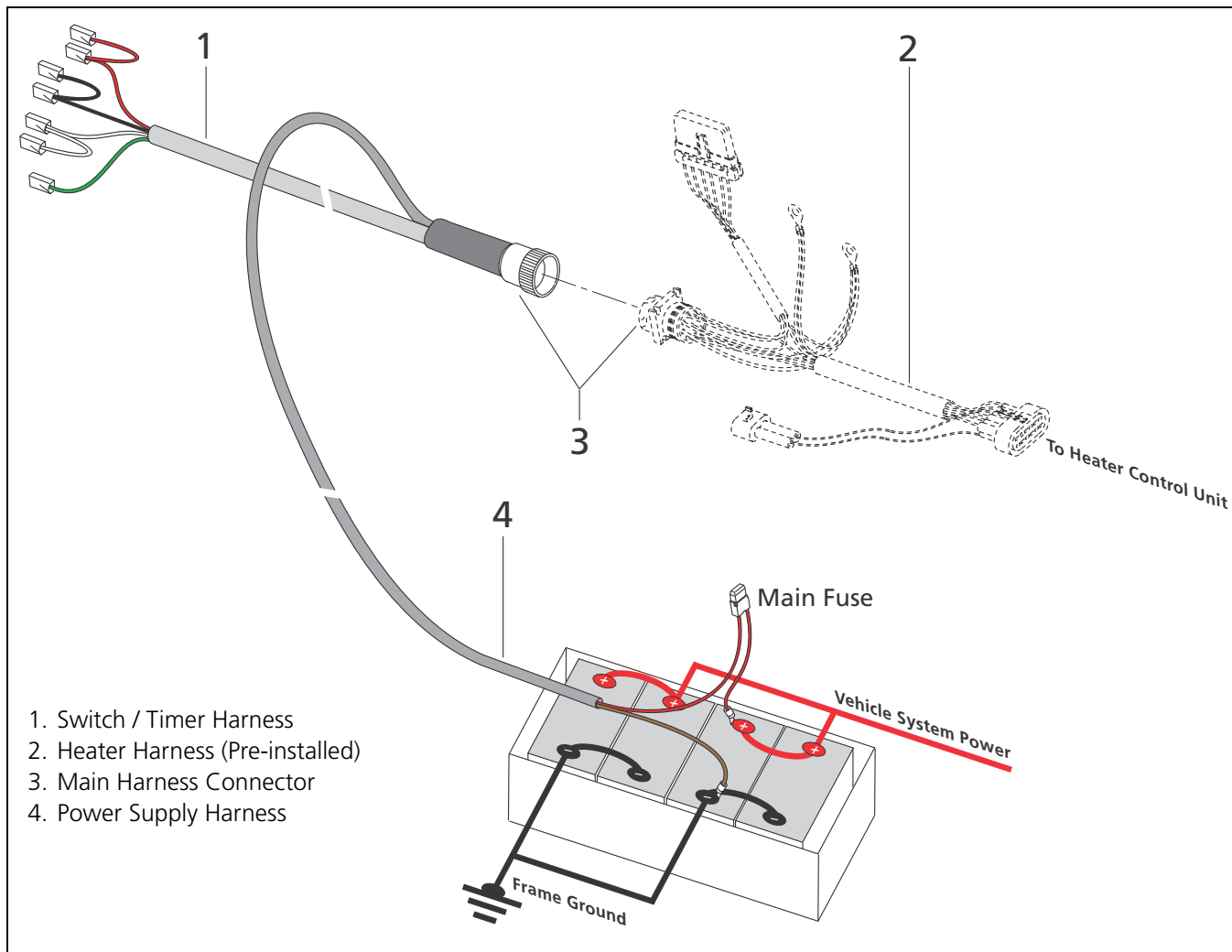
### 11.1 Power / Control Harness Connections

Ideally, the heater power supply should be directly from the vehicle's batteries or main buss-bar.

The heater control unit is equipped with low voltage protection. It is imperative that the vehicle batteries be kept in good condition for optimal heater operation.

For sleeper and engine heating applications, Webasto recommends a four battery system for best results.

**A weather sealed fuse holder is to be fitted to protect the heater (supplied with the power / control harness).**



**Figure 28: Power and control harness assembly**

- A. Route item 1 into the vehicle cab in the area where the switch or timer is to be installed.
- B. Route item 4 to vehicle battery box and connect to batteries as shown in Figure 28. Brown wire to ground, red wire with fuse holder to positive. Ensure battery connections are clean and protected with an anti-corrosive compound.
- C. Item 3 (main connector) should be left unconnected until all electrical components are installed and heater is ready for the initial start-up.

**IMPORTANT!** All power connections must be fused within 14" of the battery.

## 11.2 Connecting the Controls

The heater can be switched on and off using the following Webasto controls:

- Switch, see circuit diagrams in Figures 29 and 33.
- Timer, see circuit diagrams in Figures 30 and 34.

### 11.2.1 Toggle Switch

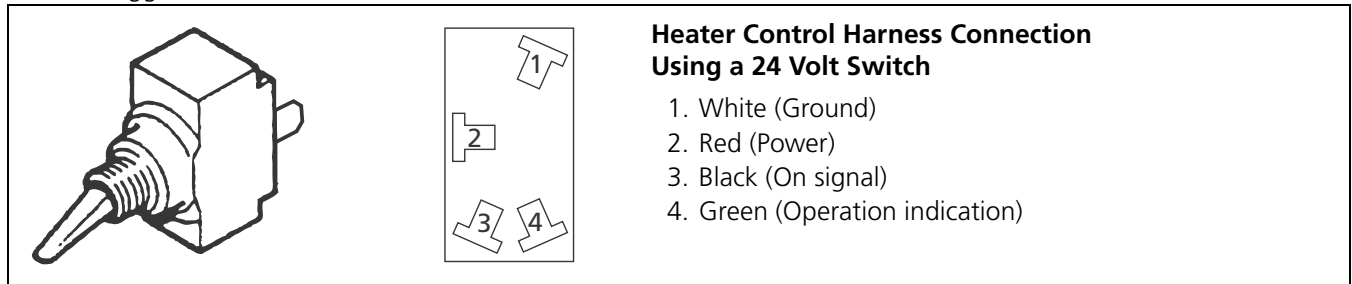


Figure 29: Toggle switch

### 11.2.2 Control Element (SmarTemp) Timer Connection

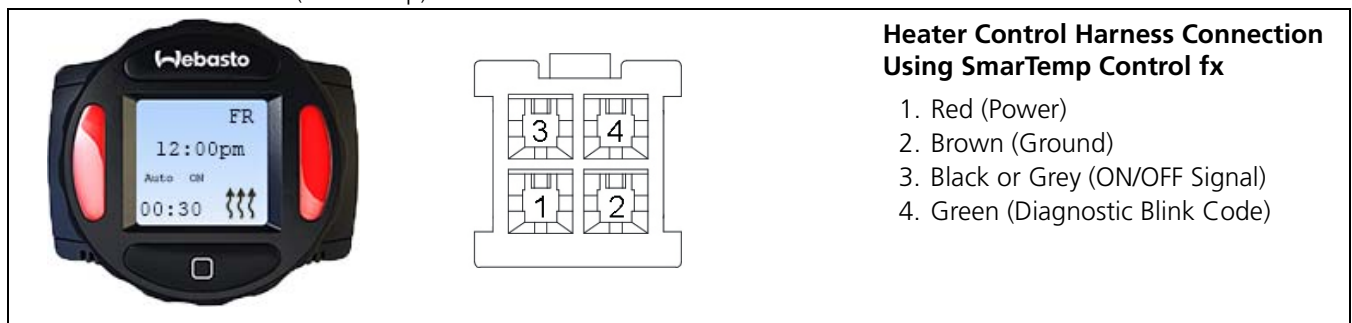


Figure 30: 7-Day, 4 Program SmarTemp Control fx Timer



**All the cables and wires that are not required must be insulated against accidental shorting or grounding.**

The Control Panel should be installed in a suitable location on a flat surface if possible in a visible area.

- Connect control panel to existing connectors on heater-unit wiring harness (see "Connections Diagrams Section")
- Use the drilling dimensions (fig. 32) to lightly mark the two mounting holes.
- **(Optional Step)** To route wire harness through the mounting surface, drill a 17mm (11/16") hole. Make sure to push harness through the hole before installing terminals into connector housing)
- Secure the SmarTemp Control using the two supplied #4 screws.
- Apply the supplied "Heater Off" warning sticker in a highly visible location to the drivers area.
- Observe the installation / operating manual supplied for proper menu setup.

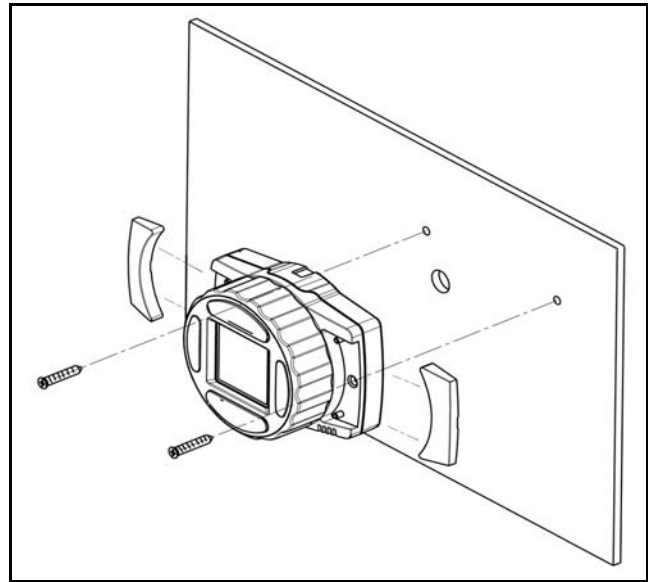


Figure 31. Control element (SmarTemp Control fx)

## NOTES:

- Always make sure there are no obstacles behind the mounting location prior to drilling.
- Ensure good readability when selecting installation location.
- Observe information on adhesive labels and colored markings when connecting the control element to vehicles wiring harness.

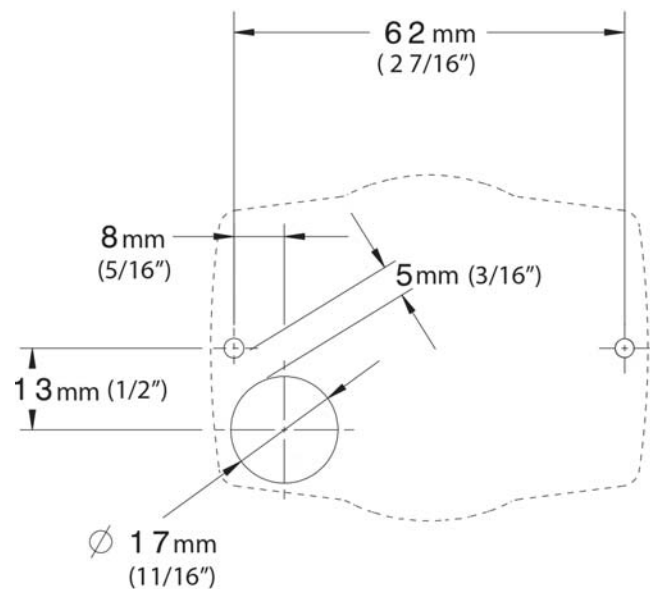


Figure 32. SmarTemp drilling dimensions

### 11.3 Vehicle Fan

The vehicle's own heater fan can be controlled using a relay, see circuit diagram Figs. 33 or 34 (connector X8 contact 2 Violet or contact D of X13).

### 11.4 Setting Control Temperatures of Thermo Pro 90

When the ignition signal is connected to the control unit connector X8, contact 7, different control thresholds are effective.

|                     | Nominal Temperature on Sensor | Regulation Temperature | Switch on Again After Regulation Temperature |
|---------------------|-------------------------------|------------------------|----------------------------------------------|
| <b>Engine "ON"</b>  | 65°C (149°F)                  | 75°C (167°F)           | 60°C (140°F)                                 |
| <b>Engine "OFF"</b> | 80°C (176°F)                  | 90°C (194°F)           | 75°C (167°F)                                 |

If the terminal D+ signal is not applied, the temperatures are the same as those at "Engine off".

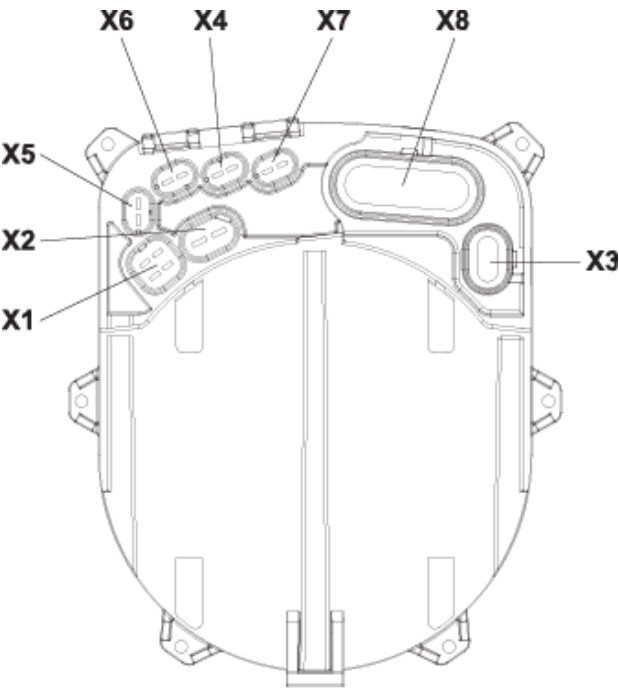
12. Circuit Diagrams

Cable Cross Sections

|                                                                                   | Length<br>< 7.5 m    | Length<br>7.5 - 15 m |
|-----------------------------------------------------------------------------------|----------------------|----------------------|
|  | 0.75 mm <sup>2</sup> | 1.0 mm <sup>2</sup>  |
|  | 1.0 mm <sup>2</sup>  | 1.5 mm <sup>2</sup>  |
|  | 1.5 mm <sup>2</sup>  | 2.5 mm <sup>2</sup>  |
|  | 2.5 mm <sup>2</sup>  | 4.0 mm <sup>2</sup>  |
|  | 4.0 mm <sup>2</sup>  | 6.0 mm <sup>2</sup>  |

Cable Colors Legend

|    |        |
|----|--------|
| bl | blue   |
| br | brown  |
| ge | yellow |
| gn | green  |
| gr | grey   |
| or | orange |
| rt | red    |
| sw | black  |
| vi | violet |
| ws | white  |



## 12.1 Thermo Pro 90 Circuit Diagram Legend

| Item | Designation                          | Comment                                                                             |
|------|--------------------------------------|-------------------------------------------------------------------------------------|
| A1   | Heater                               |                                                                                     |
| A2   | Control module                       |                                                                                     |
| B1   | Exhaust Temperature sensor           |                                                                                     |
| B2   | Coolant temperature sensor           |                                                                                     |
| B3   | Temperature limiter/ overheat sensor |                                                                                     |
| BT   | Battery                              | Vehicle battery                                                                     |
| H1   | Operation indicator light            |                                                                                     |
| 1    | Vehicle blower circuit               | Terminal needs to be added to X14<br>Webasto P/N: 901204 Deutsch P/N:0462-209-16141 |
| E    | Glow plug                            |                                                                                     |
| F1   | Fuse 5 A                             | ATM mini flat fuse                                                                  |
| F2   | Fuse 20 A                            | ATM mini flat fuse                                                                  |
| F3   | Fuse 30 A                            | ATO flat fuse                                                                       |
| H1   | "Heating" symbol in the display      | Operating indicator (in item P2)                                                    |
| H3   | Symbol light                         | Light (in item P2)                                                                  |
| M1   | Motor                                | Combustion air fan                                                                  |
| M2   | Motor                                | Circulating pump                                                                    |
| P1   | SmarTemp fx                          | For programmed operation                                                            |
| P2   | Digital timer 1531                   | For programmed operation                                                            |
| S1   | Toggle switch                        | ON/OFF                                                                              |
| X1   | 4-pin plug connector                 | To item M1 (Combustion air fan motor)                                               |
| X2   | Plug connector, 2-pin                | To item E (igniter)                                                                 |
| X3   | Plug connector, 2-pin                | To connector X11 (Fuel pump)                                                        |
| X4   | Plug connector, 2-pin                | To connector X12 (Circulating pump)                                                 |
| X5   | Plug connector, 2-pin                | To item B2 (Coolant temperature sensor)                                             |
| X6   | Plug connector, 2-pin                | To item B1 (Exhaust temperature sensor)                                             |
| X7   | Plug connector, 2-pin                | To item B3 (Temperature limiter)                                                    |
| X8   | 12-pin plug connection               | To item A1 (Control unit)                                                           |
| X10  | Plug connector, 2-pin                | Diagnostics                                                                         |
| X11  | Plug connector, 2-pin                | To item Y1 (Fuel pump)                                                              |
| X12  | Plug connector, 2-pin                | To item M2 (Circulating pump)                                                       |
| X13  | Plug connector, 9-pin                | To item X14                                                                         |
| X14  | Plug connector, 9-pin                | To item S1 or P1                                                                    |
| X15  | Plug connector, 4-pin                | To item X16                                                                         |
| X16  | Plug connector, 4-pin                | To item P1                                                                          |
| Y1   | Metering pump                        | Fuel pump for heater                                                                |

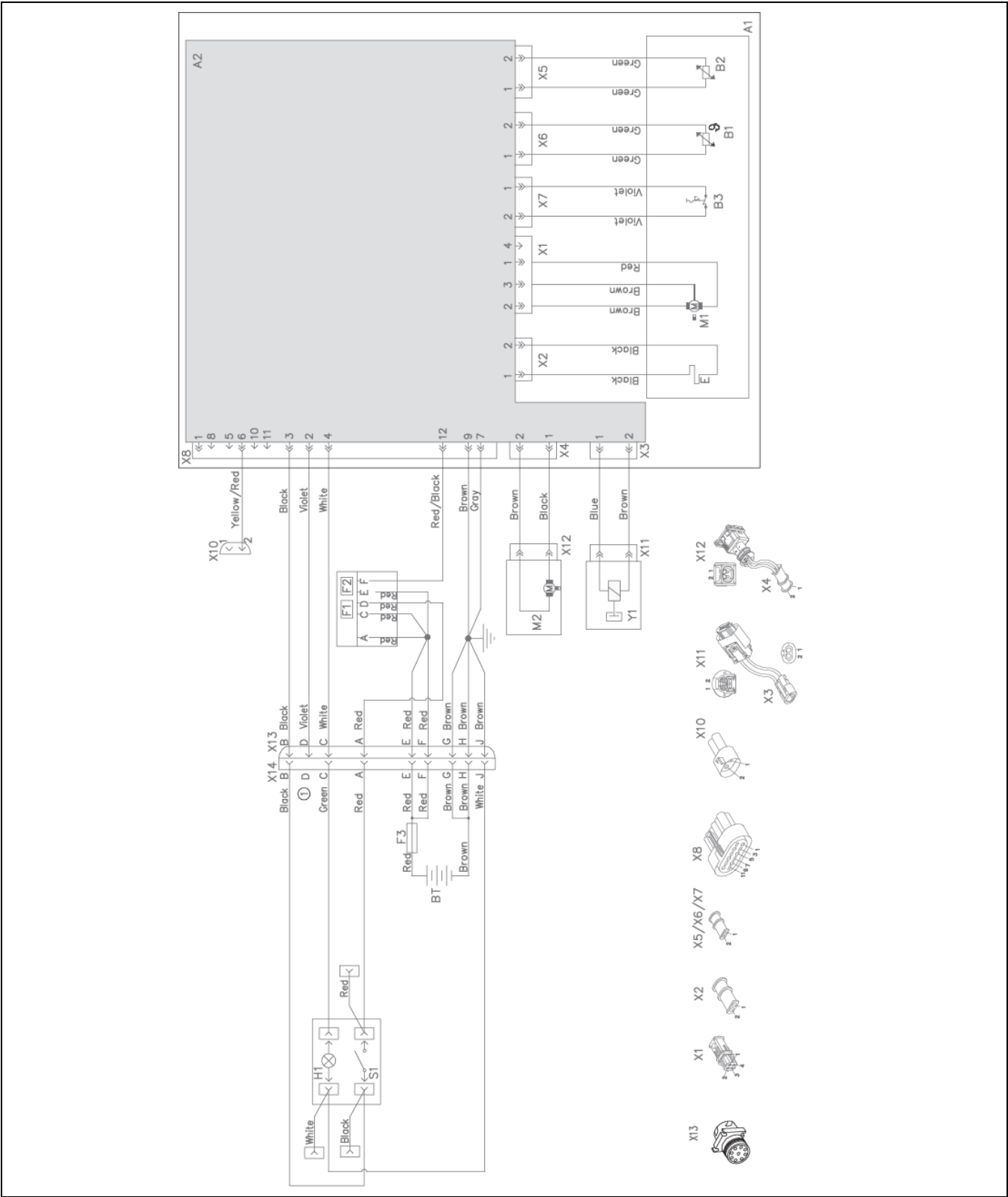


Figure 33: Thermo Pro 90 with ON/OFF Switch - Connection Diagram

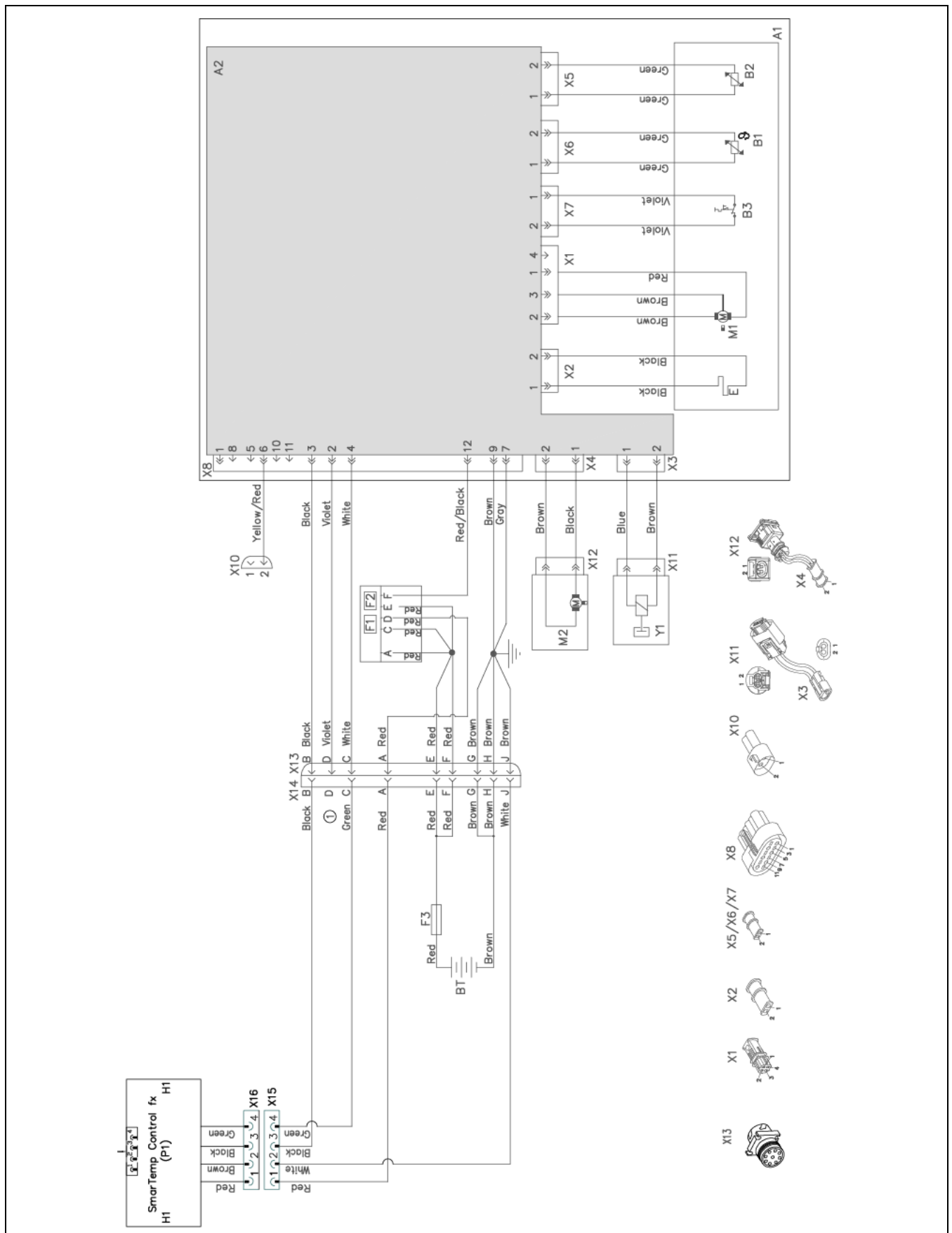


Figure 34: Thermo Pro 90 with 7-day SmarTemp Control fx Timer - Connection Diagram



## 13. Initial Start-up

**IMPORTANT!**

***Refer to the safety instructions in the operating and maintenance instructions.***

***The operating and maintenance instructions must be read thoroughly before starting the heater.***

**NOTE:**

As a result of the low fuel consumption the heater may require several start attempts to fill the fuel line and prime the system.

Before the heater is operated for the first time, the coolant temperature should be < 60 °C (140°F), as the heater does not go into combustion operation at high engine temperatures.

After you have installed the heater, bleed the water system and the fuel supply system carefully. Follow the instructions supplied by the vehicle manufacturer for this purpose.

Conduct a trial of the heater to check all the water and fuel connections for leaks and to ensure that they are secure. If the heater suffers a fault during operation, the fault must be located and remedied.

**Example:**

11 sec. filling time with 1m line length, 9 Hz metering pump frequency, 2 mm inside diameter of fuel line.

The CO<sub>2</sub> setting is not necessary as part of initial start-up, as the heater has been preset at the factory.

The detailed procedure for CO<sub>2</sub> setting is described in the workshop manual.

## 14. Troubleshooting

### 14.1 General Information

The control unit continuously monitors the heater operation. The control unit identifies errors on individual heater components and faults during operation. Should the control unit experience component errors and operational faults, the heater will be shut down.

### 14.2 Heater Interlock

Fuel is supplied for a max. of 240 seconds if the flame does not start.

Fuel is supplied for a max. of 240 seconds if the flame goes out during operation.

The fuel supply is shut off if the system overheats (temperature limiter is tripped). If the system overheats the temperature limiter will reset itself after a cool down period.

If the under-voltage protection switches the system off for longer than 20 seconds, the fuel supply is interrupted and the heater switches OFF.

#### NOTE:

The heater does not automatically switch back ON. The heater will need to be switched OFF and back ON to re-start after a fault.

|         | Thermo Pro 90 |
|---------|---------------|
| 12 Volt | 10.V – 0.5V   |
| 24 Volt | 21V – 1V      |

#### 14.2.1 Interlock Reset Procedure

Continue with this procedure if:

- there is **NO** heater function
- fault indicator light continuously flashes

1. With switch in the "ON" position, remove power source (Fuse, B+, B-)
2. Turn switch "OFF"
3. Reinstall power source (Fuse, B+, B-)
4. Reset procedure is now complete.
5. Validate heater operation. If fault codes persist refer to section **14.3** and repair as necessary.

### 14.3 Diagnostic after a Fault Lock-out for the Thermo Pro 90

Check the fuses and plug connectors.

#### 14.3.1 Version with switch

If the system is operated with a switch, the nature of the fault is indicated by a flashing code on an indicator light (toggle of switch) during the run-on time of the heater.

After five short signals, count the long flashes:

- 1x No start (after 2 attempts to start)
- 2x Flame failure
- 3x Under-voltage or over-voltage
- 4x Premature flame recognition

- 5x N/A
- 6x Coolant temperature sensor interrupt or temperature sensor short-circuit
- 7x Metering pump interrupt or metering pump short-circuit
- 8x Blower motor interrupt or blower motor short-circuit or blower motor incorrect speed
- 9x Glow plug interrupt or igniter short-circuit
- 10x Overheating
- 11x Circulating pump interrupt or circulating pump short-circuit
- 12x Battery main switch short circuit
- 13x Output vehicle fan short circuit
- 14x Overheating protection defective
- 15x Reference resistance not reached during start
- 16x Exhaust gas temperature too high
- 17x Exhaust temperature sensor defective

## 14.3.2 Version with timer

If the system is equipped with a digital timer, a fault message appears on the display of the timer after a fault occurs:

- F 01 No start (after 2 attempts to start)
- F 02 Flame failure
- F 03 Under-voltage or over-voltage
- F 04 Premature flame recognition
- F 05 N/A
- F 06 Coolant temperature sensor interrupt or temperature sensor short-circuit
- F 07 Metering pump interrupt or metering pump short-circuit
- F 08 Blower motor interrupt or blower motor short-circuit or blower motor incorrect speed
- F 09 Glow plug interrupt or igniter short-circuit
- F 10 Overheating
- F 11 Circulating pump interrupt or circulating pump short-circuit
- F 12 Battery main switch short circuit
- F 13 Output vehicle fan short circuit
- F 14 Overheating protection defective
- F 15 Reference resistance not reached during start
- F 16 Exhaust gas temperature too high
- F 17 Exhaust temperature sensor defective

## 15. Technical Data

Except where limit values are specified, the technical data refer to the usual heater tolerances of  $\pm 10\%$  at an ambient temperature of  $+20\text{ }^{\circ}\text{C}$  ( $68\text{ }^{\circ}\text{F}$ ) and at the nominal voltage and conditions.

### 15.1 Electrical Components:

The control module, motors for combustion air blower and circulating pump, ceramic glow pin, metering pump, switch and timer are available in 12 and 24 volt versions.

The temperature limiter, temperature sensor and flame sensor are identical on 12V and 24V heaters.

### 15.2 Fuel for Thermo Pro 90 (Diesel):

The diesel fuel specified by the vehicle manufacturer must be used. Heating oil may also be used as long as it complies to the normal quality available on the North American market.

We know of no negative influences due to additives.

If fuel is extracted from the vehicle's tank, follow the additive instructions issued by the vehicle manufacturer.

If you change to low-temperature fuel, the heater must be operated for approximately 15 minutes so that the fuel system is filled with the new fuel.

The Thermo Pro 90 heater is also approved for use with PME (bio-diesel), which complies with DIN EN 14214.

| Heater                                                                           | Operation                | Thermo Pro 90                                                                                                           |                  |
|----------------------------------------------------------------------------------|--------------------------|-------------------------------------------------------------------------------------------------------------------------|------------------|
| Approval symbol                                                                  |                          | E1 122R 00 0320 (Heater)<br>E1 10R 03 6196 (EMC)                                                                        |                  |
| Model                                                                            |                          | Water heater with evaporative-type burner                                                                               |                  |
| Heat output                                                                      | Max.<br>regulating range | 9.1 kW (31,000 BTU)<br>1.8 kW – 7.6 kW (6,000 BTU/hr - 26,000 BTU/hr)                                                   |                  |
| Fuel                                                                             |                          | Diesel<br>PME (Bio-diesel)                                                                                              |                  |
| Fuel consumption                                                                 | Max.<br>regulating range | 1.1 l/h (.29 Gal/hr)<br>> 0.21 – 0.92 l/h (0.05 Gal/hr - 0.24 Gal/hr)                                                   |                  |
| Rated voltage                                                                    |                          | 12 V                                                                                                                    | 24 V             |
| Operating voltage range                                                          |                          | 10.5... 15.5 V                                                                                                          | or 20 ... 31.5 V |
| Nominal power consumption with circulation pump (without vehicle fan)            | Max.<br>regulating range | ≤ 90 W<br>≤ 80 W ≤ 37 W                                                                                                 |                  |
| Perm. ambient temp.:<br>Heater control Unit:<br>- Operation<br>-Storage          | Max.                     | -40° ... +80° C (- 40°... + 176°F)<br>-40° .. +125 °C (- 40°.. +257°F) (heater off, operating voltage may be connected) |                  |
| Metering pump:<br>- Operation<br>-Storage                                        |                          | > -40 +30 °C (> -40 +86°F)<br>> -40 +85 °C (> -40 +185°F)                                                               |                  |
| Perm. operating pressure (heat medium)                                           |                          | 2.0 bar (29 PSI)                                                                                                        |                  |
| Capacity of the heat exchanger                                                   |                          | 0.15 l (.158 quart)                                                                                                     |                  |
| Max. combustion air intake temperature                                           |                          | +40 °C (104°F)                                                                                                          |                  |
| Minimum capacity of the system                                                   |                          | 6.00 l (6.34 quarts)                                                                                                    |                  |
| CO <sub>2</sub> in the exhaust gases (normal function range)                     | Max.                     | 9 ... 11.5% by volume                                                                                                   |                  |
| Heater dimensions (tolerance ± 3 mm)<br>* Control module installed on the heater |                          | L = Length: 355 (381*) mm W = Width: 131 mm H = Height: 232 mm                                                          |                  |
| Weight                                                                           |                          | 4,9 kg (10.8 lbs.)                                                                                                      |                  |
| U4840 Coolant Pump                                                               |                          |                                                                                                                         |                  |
| Volume Flow @ 0.3bar (4.35 PSI)                                                  |                          | 700 l/h (3.08 gal/min)                                                                                                  |                  |
| Dimensions                                                                       |                          | 134 x 53 x 90 (5.28" x 2.08" x 3.5")                                                                                    |                  |
| Weight                                                                           |                          | .36 kg (.8 lbs)                                                                                                         |                  |

**Table 1: Technical Data**

## 15.3 Thermo Pro 90 Dimensions

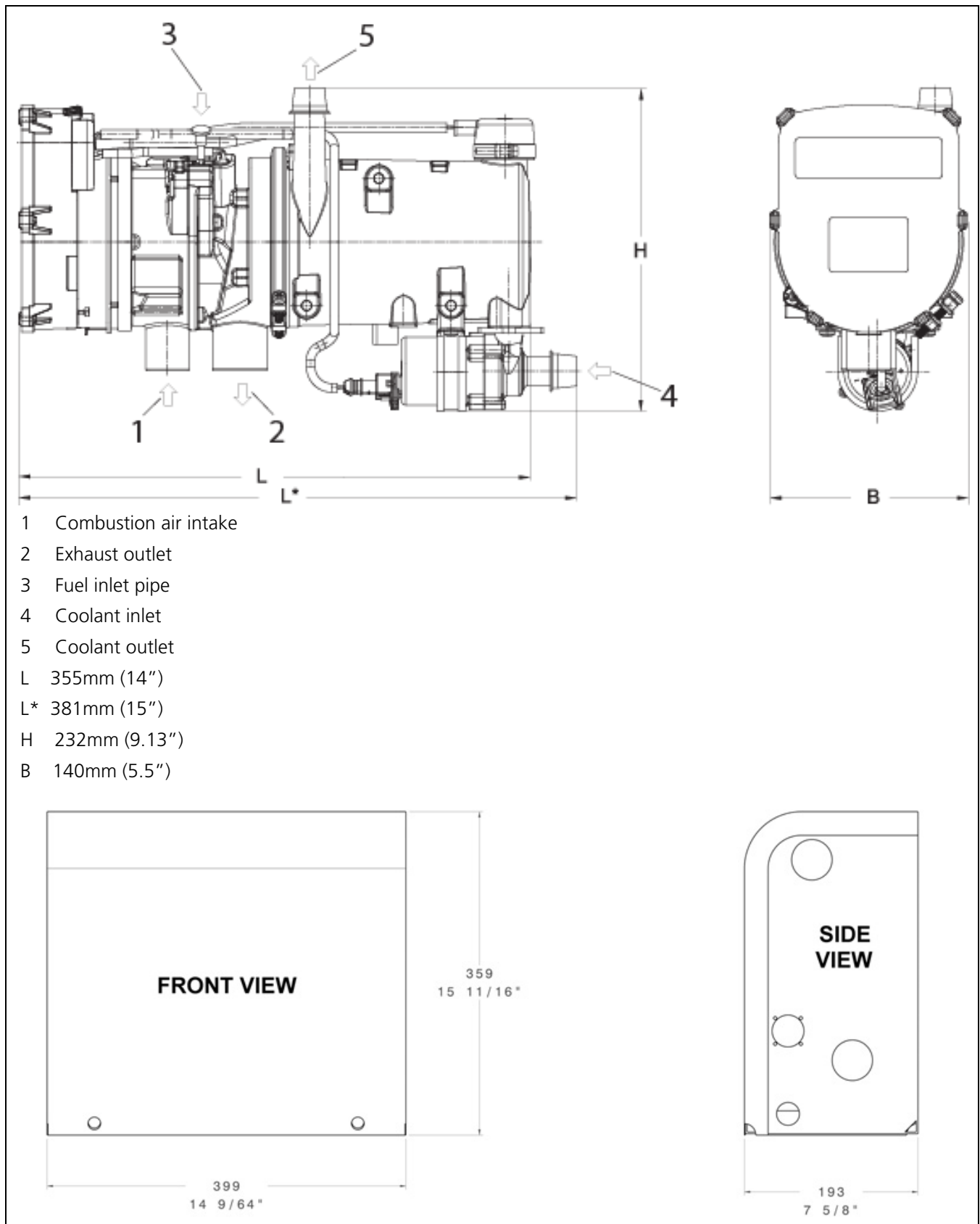


Figure 35: Dimensions of the Thermo Pro 90 Heater / Enclosure Box

NOTES



**Webasto Thermo & Comfort N.A., Inc.**

15083 North Road  
Fenton, MI 48430

Technical Assistance Hotline  
USA: (800) 860-7866  
Canada: (800) 667-8900

[www.techwebasto.com](http://www.techwebasto.com)