

Installation Instructions

Thermo Top Pro 150



English



- ALWAYS carefully follow Webasto installation and repair instructions and heed all WARNINGS.
- 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.
- Only genuine Webasto parts may be used. See also Webasto air and water heaters accessories catalogue.
- Product produces temperatures high enough to ignite surrounding combustible materials such as flammable liquids, gases, vapor, and other combustible matter. The heater must be switched off when loading or unloading flammable materials to prevent the risk of explosion.
- Webasto heating and cooling systems require qualified and/or professional installation and repair technicians. Warranty shall be void if not installed by a certified or trained installer/repair technician who has successfully completed the factory training course for installation and repair of Webasto heating and cooling systems, and has been provided with the technical information, tools and equipment required to properly complete the necessary installation/repairs.
- When heater is in use, the surface of the hot air outlet may become hot to the touch. Contact with skin may cause burns.



WARNING: Cancer and Reproductive Harm
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1. About This Document

1.1 Purpose of this Document

These installation instructions are an integral part of the product and contain all the information required to ensure correct and safe installation.

1.2 Warranty and Liability

Webasto shall not assume liability for defects or damage resulting from the failure to observe the installation and operating instructions and the information provided therein.

This liability exclusion particularly applies to:

- Installation by untrained personnel
- Improper use
- Repairs not carried out by a Webasto service workshop
- Use of non-original spare parts
- Conversion of the heater without permission from Webasto

1.3 Using This Document

Read and understand these Installation Instructions before installing the heater.



WARNING

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



CAUTION

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.



NOTE

This signal word is used to highlight operating instructions or procedures, which if not followed or followed correctly, may cause damage to this product or the vehicle/vessel it is installed in.

2. Scope

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

2.1 Scope

- 2.1.1 Subject to the provisions of paragraph 3.1.2, internal combustion heaters must be installed in accordance with the requirements contained in this Annex.
- 2.1.2 In the case of class O 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

Improper Handling

Protect the heater against mechanical stress (e.g. dropping, impacts, or knocks).

Do not place any objects on top of the heater.

Do not stand on the heater.

Avoid shutting the heater down incorrectly during the after-running period or while the heater is running.

The heater fan will continue to run for several minutes after being shut off.

Always switch the heater off using the control panel.

Do not disconnect from the power supply until the after-running period has elapsed.

Only switch the heater off using the battery disconnect in the case of danger or emergency.

Cables damaged from sharp edges can cause short-circuits.

- 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



WARNING

Do not operate the heater in environments with combustible vapor, flammable dust and hazardous goods (such as gas stations, tank facilities, fuel store, coal bunkers, timber yard, or grain warehouses).

The fuel filler neck must not be located in the passenger compartment and must have a tightly fitting cap to prevent any fuel leaks.

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.

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



WARNING

Do not operate the heater in an enclosed space, or one that does not have an exhaust extraction unit. Poisoning or suffocation can result.

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

2.5 Combustion Air Inlet

The air for the combustion chamber of the heater must not be extracted from the passenger cabin of the vehicle.

The air inlet must be positioned in such a way that it cannot be obstructed by other objects.

2.6 Water Inlet

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.

The inlet hose must be protected from damage.

2.7 Hot Water Outlet



NOTE

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.

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.

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



2.8 Purpose of the Coolant Heater

Webasto coolant heaters are used in connection with the vehicle's own heating system

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

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

2.9 Versions

2.9.1 Thermo Top Pro 150

Thermo Top Pro 150 12V / 24V diesel.

Water heater for diesel fuel.

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

3 Intended Use

3.1 Intended use

If installed in special-purpose vehicles, the applicable regulations must be observed. Consult with Webasto for alternative application options. Meets FMCSA Motor Vehicle Requirements when installed in accordance with 49 CFR 393.77. For more information visit https://www.govinfo.gov/content/pkg/CFR-2012-title49-vol5/pdf/CFR-2012-title49-vol5-sec393-77.pdf?_sm_byp=iVVH7mFk84IjpmmN.

Parking heater

The heater works independently of the vehicle's engine and is integrated into the coolant system, the fuel system, and the electrical systems of the vehicle.

Auxiliary heater

Operation of the heater depends on the vehicle's engine and is integrated into the coolant system, the fuel system, and the electrical systems of the vehicle. When the engine is switched off, the heater is automatically switched off and the fuel supply is interrupted.

3.2 Qualifications of Installation Personnel

The installation personnel must have the following qualifications:

The repair, installation, and/or commissioning of the unit may only be carried by trained experts in accordance with the workshop manual and the installation instructions.

The year of initial start-up must be permanently marked on the type label by removing the inapplicable year(s).

3.3 Safety During Operation



WARNING

In environments with combustible vapor, flammable dust and hazardous goods (such as fuel stations, tank facilities, fuel store, coal bunkers, timber yard or grain warehouses). Do not switch on or operate the heater.



WARNING

Do not operate the heater in an enclosed space, or one that does not have an exhaust extraction unit. Poisoning or suffocation can result.

3.4 Avoiding Damage to Property



NOTE

Protect the heater against mechanical stress (e.g. dropping, impacts). Do not place any objects on the heater or stand on the heater.

Avoid shutting down the heater incorrectly during the cool-down period. After switching off using the control panel, the fan of the heater will continue to for a short time. The heater must always be shut off using the control panel except the in the case of an emergency. Do not disconnect the heater from the power supply until after the cool-down cycle is complete, including the cool-down period.

Use edge protection on the edges of metal panels that can come into contact with the wiring harness. Failure to do so can cause a short-circuit and fire.

4 Installation Example

4.1 Installation Location and Position



NOTE

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

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.

4.2 Exhaust System

The exhaust-temperature sensor cable is designed for high temperature (heat resistant). The material is resistant to continuous effects of temperatures of up to 365 °F (185 °C), however it can be damaged by external mechanical influences. Before the final installation location has been set, it is recommended that you conduct an analysis for the possible risk of damage to the cable due to stone impact or similar. 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 (pulling of the cable) 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.

During installation, the proper condition of the mica disc (insulation) on the sensor, and the loose routing of the exhaust temperature sensor cable must be ensured. Do not force the cable or sensor into position.

4.3 Enclosure Box Dimensions

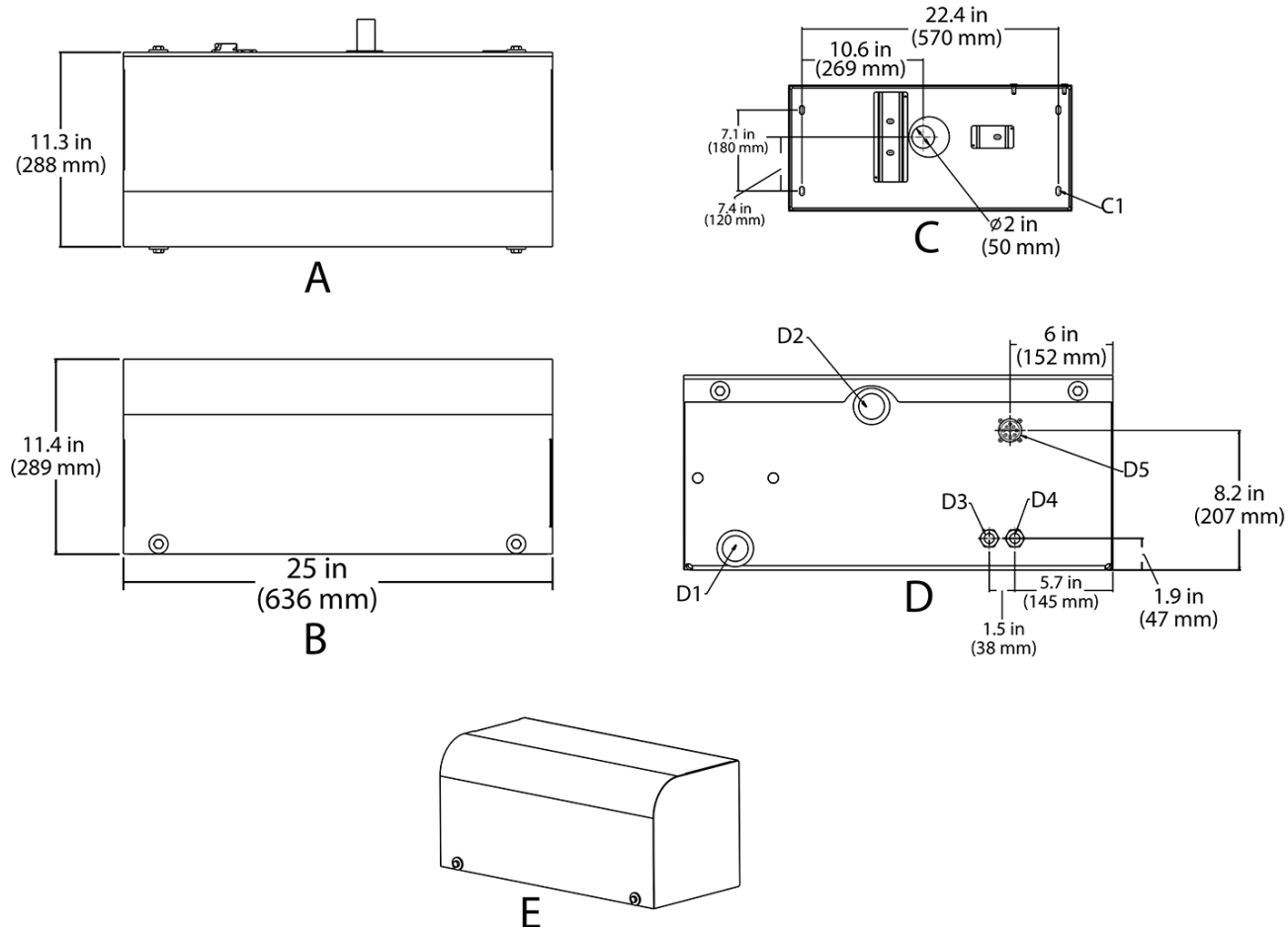


Fig. 1: Enclosure Dimensions

A	Top View	D2	Coolant Out
B	Front View	D3	Fuel Return
C	Mounting View	D4	Fuel Supply
C1	Mounting Slots – M8 bolts	D5	Wire Harness Connection
D	Rear View	E	Isometric View
D1	Coolant In		

4.4 Integration with the Vehicle

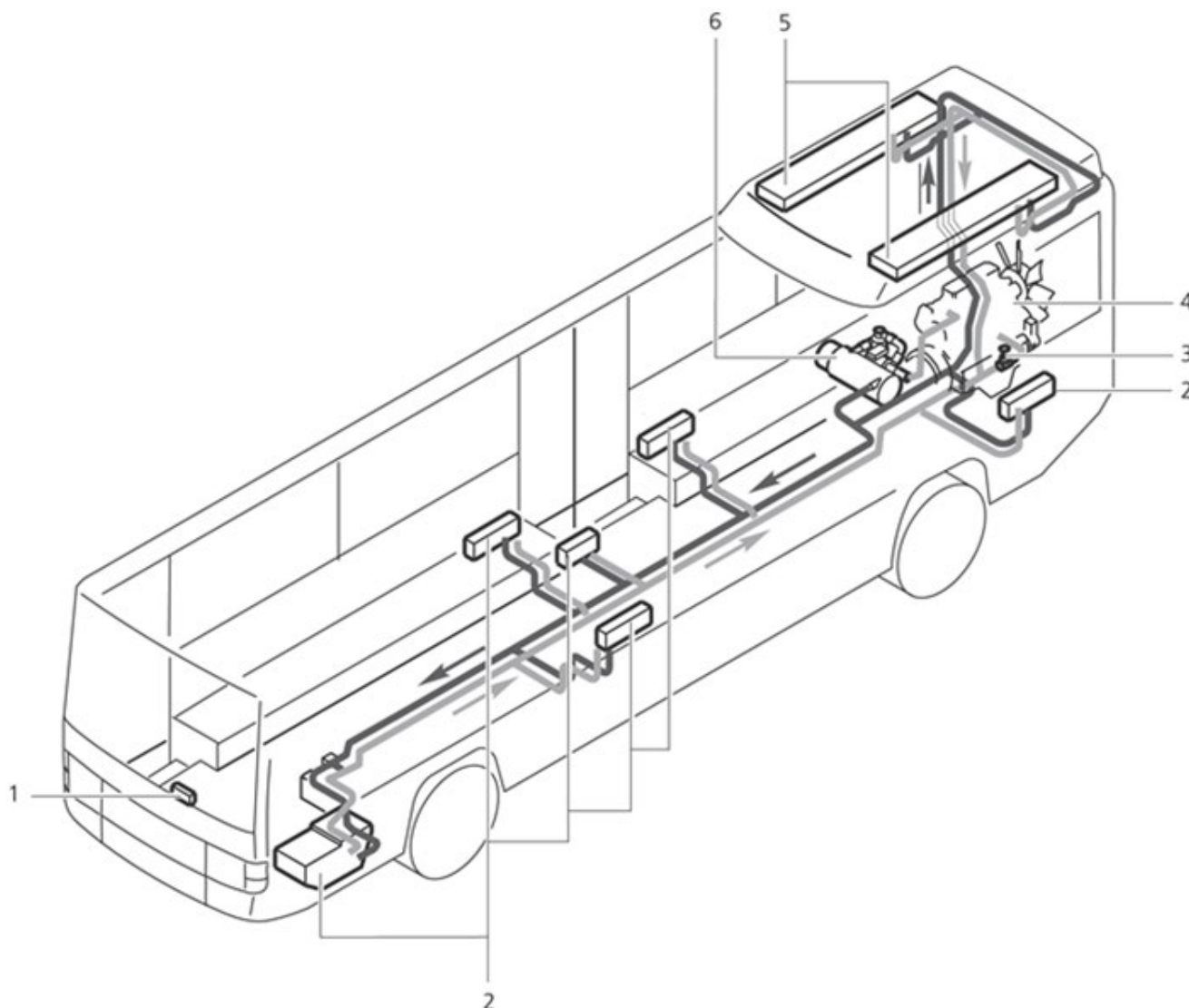


Fig. 2: Installation Example

- | | |
|--------------------------|--------------------------------|
| 1 - Control panel | 2 - Heat Exchanger(s) |
| 3 - Vehicle Coolant Pump | 4 - Vehicle Engine |
| 5 - Roof Heat Exchanger | 6 - Heater (with coolant pump) |

4.5 Connections to the Heater

4.5.1 Enclosure Box

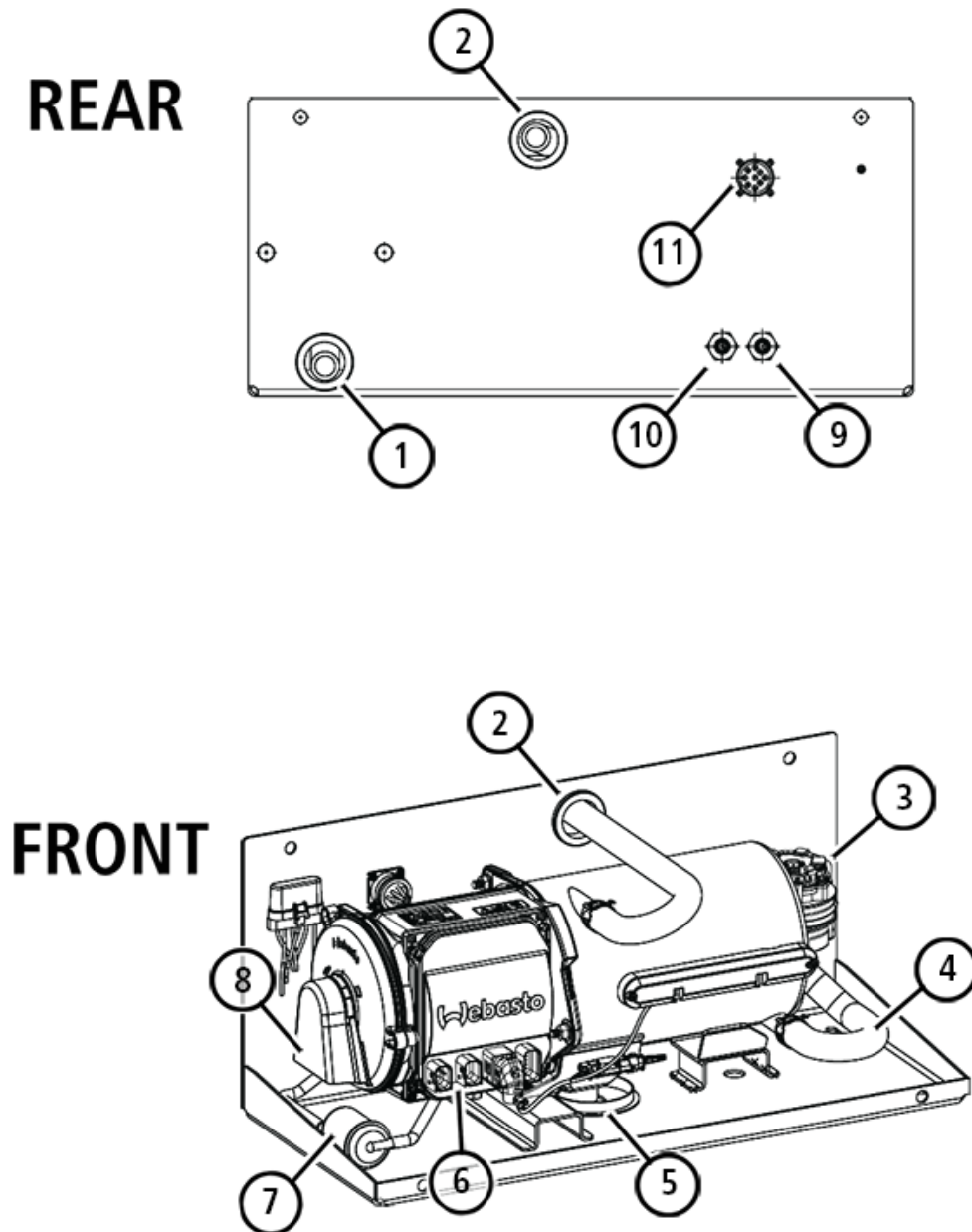


Fig. 3: Connections – with enclosure box

- | | |
|--------------------------------------|----------------------------------|
| 1 – Water inlet | 7 – Fuel filter |
| 2 – Water outlet | 8 – Combustion air intake shield |
| 3 – Coolant pump | 9 – Fuel supply port |
| 4 – Coolant hose (to heat exchanger) | 10 – Fuel return port |
| 5 – Exhaust port | 11 – Wiring connection |
| 6 – Control unit | |

4.5.2 No Enclosure Box

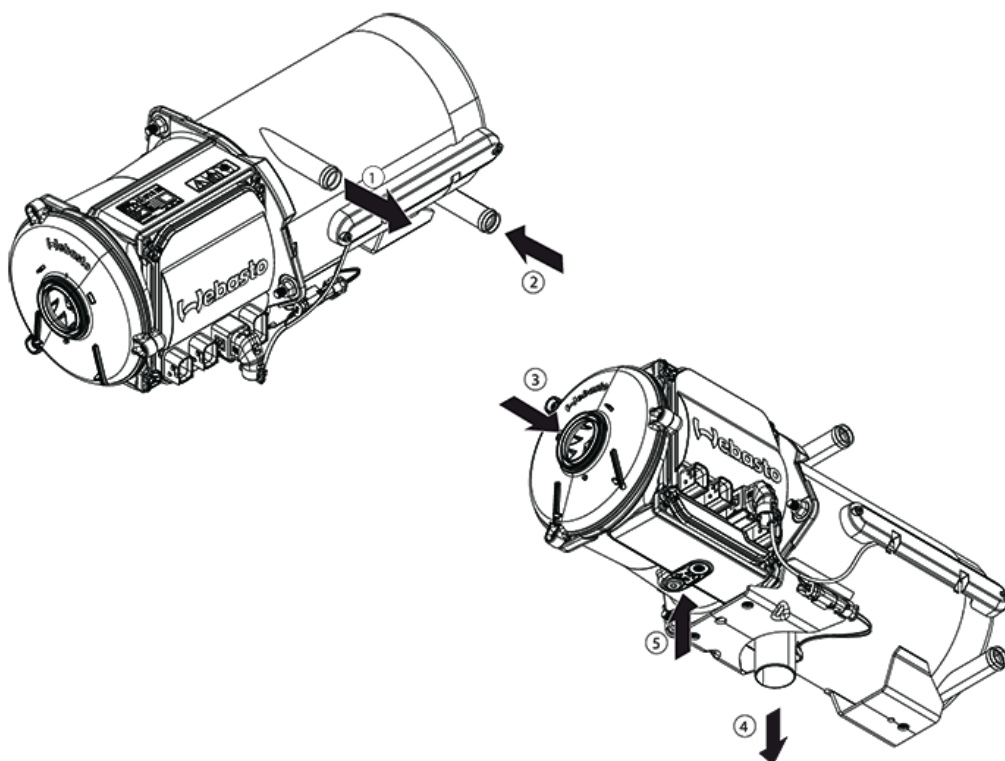


Fig.4. Connections – no enclosure box

1 – Coolant outlet
3 – Combustion air inlet
5 – Fuel connections

2 – Coolant inlet
4 – Exhaust

5 Heater Installation Specifications



WARNING

If the heater is installed on a base plate (lowest point) and fuel leaks out, fuel may drip onto the exhaust pipe.

Install a guard ring around the passage of the exhaust pipe through the base plate.



WARNING

The heater must not be installed in the direct radiated heat range of exhaust systems or below the maximum permitted fording level of the vehicle



CAUTION

Before drilling holes in the frame, consult the manufacturer for guidelines and restrictions! Do not weld vehicle frame or flanges!

5.1 Dimensions

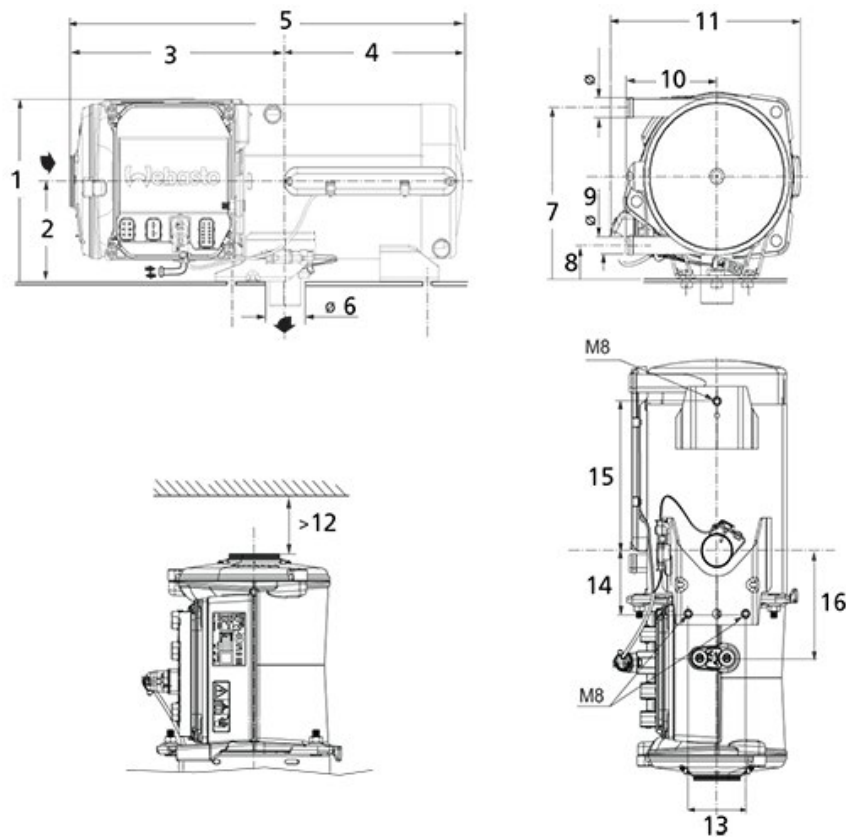


Fig. 5. Thermo Top Pro 150 Dimensions

1 - 7.9 in (200 mm)	2 - 4.3 in (110 mm)
3 - 10.2 in (258 mm)	4 - 8.3 in (212 mm)
5 - 18.5 in (470 mm)	6 - 1.7 in (42 mm)
7 - 7.2 in (184 mm)	8 - 1.4 in (36 mm)
9 - 0.8 in (20 mm)	10 - 4.2 in (107 mm)
11 - 8.8 in (224 mm)	12 - 2 in (50 mm)
13 - 2.75 in (70 mm)	14 - 2.8 in (71 mm)
15 - 6.6 in (167 mm)	16 - 4.8 in (121 mm)

5.2 Orientation

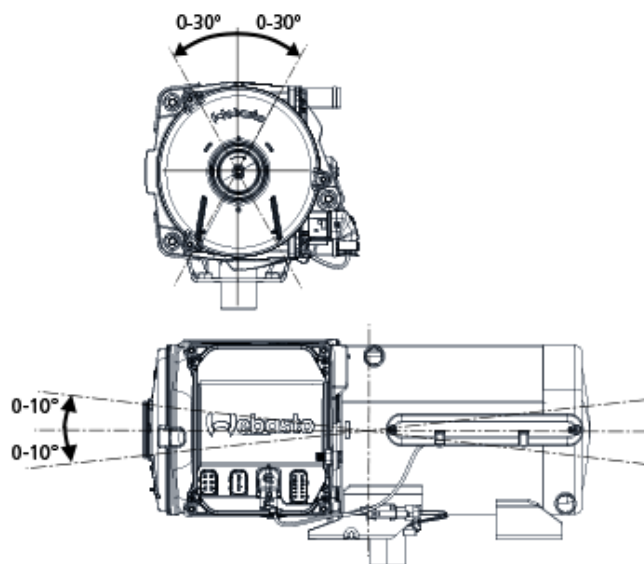


Fig. 6: Installation Orientation

NOTE

Where there are specifications from the vehicle manufacturer concerning fuel-fired heater installations, these must be complied with.

5.3 Ring Guard (optional)

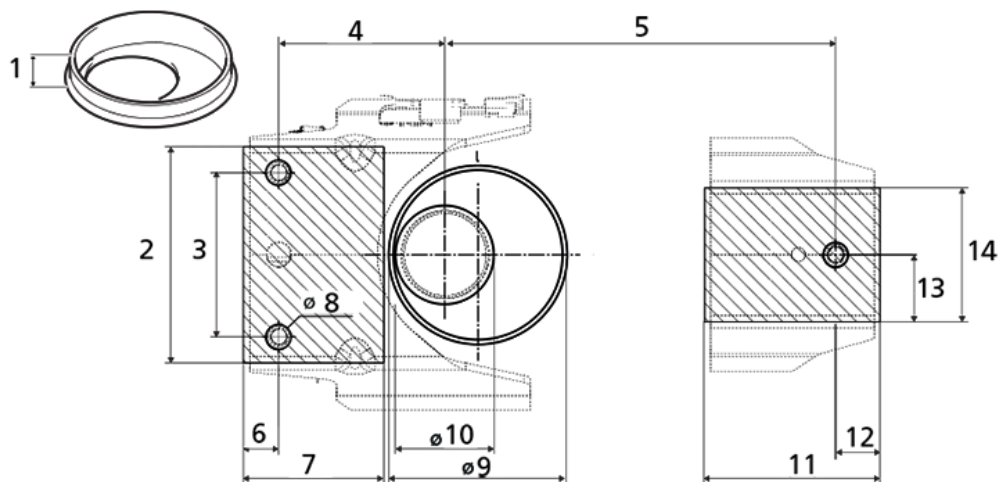


Fig. 7: Optional Guard Ring

1 - 0.4 in (10 mm)	2 - 3.6 in (92 mm)
3 - 2.75 in (70 mm)	4 - 2.8 in (71 mm)
5 - 6.6 in (167 mm)	6 - 0.6 in (15 mm)
7 - 3.0 in (75 mm)	8 - 0.4 in (10.5 mm)
9 - 3.0 in (76 mm)	10 - 1.7 in (42 mm)
11 - 3.0 in (75 mm)	12 - 0.75 in (19 mm)
13 - 1.1 in (28.5 mm)	14 - 2.2 in (57 mm)

5.4 Data Tag

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 to indicate the year of installation.

Webasto			
Thermo & Comfort SE		XXXXXXX	
Made in Germany	CE		
Model Type	XXXXXXXXXX		
Operating Voltage	XX V		
Rated Output	X.X kW		
Fuel Type	XXXXXX		
Working Pressure	max. X.X bar		
Part No. XXXXXX	Serial No. XAJJXXXXXXX		
Year of Manufacture XXX	YYY	YYY	YYY

✂ ↑ ↑ ↑

Fig. 8: Data Tag

6 Coolant System



WARNING

The vehicle's cooling system is pressurized. Allow the system to cool before working on the cooling system. Failure to do so can cause burns.

The cooling system must be bled carefully before using the heater for the first time or after the cooling system has been serviced. Improper bleeding may cause the heater to fault due to an overheat condition. Refer to the workshop manual for fault codes and diagnosis. Noisy coolant pump operation can indicate an improperly bled coolant system.

6.1 Coolant System Connections



NOTE

The hose clamps must be tightened with a torque of 40 lb. in. (4.5 Nm). The use of silicone hose requires special hose clamps.

The quantity of coolant in the coolant circuit corresponds to the minimum volume specified in Technical Data.

The heater should be integrated into the coolant system close to the inlet of the vehicle's heat exchanger. Connect the heater to the vehicle coolant system as shown in Coolant System.

Route coolant hoses in such a way to avoid kinks and pinches. Be sure the hoses run uphill from the heater to help in bleeding the coolant system. Secure hose connections using hose clamps.



NOTE

When integrating the coolant hoses in the coolant circuit, the correct direction of flow of the coolant must be ensured. Use the coolant flow arrows on the heater when installing coolant hoses.

Heater and lines should be installed in such a way as to ensure static bleeding.

Insufficiently bleeding the coolant circuit can lead to a malfunction due to overheating or to frequent switch-on/switch-off cycles of the heater.

Separate the heater supply and return connections at the engine as far apart as possible for optimum engine heating and heater performance.

6.2 Installing the Coolant Pump



NOTE

The coolant pump is not self-priming. The coolant pump must be filled with coolant before operating the pump.



NOTE

Permissible coolant pump installation positions:

- The coolant pump outlet must be plumbed directly into the heater in the correct direction.
- Any air that enters the pump must be able to escape via the inlet or the outlet.

6.2.1 Installing the coolant pump (U4850)

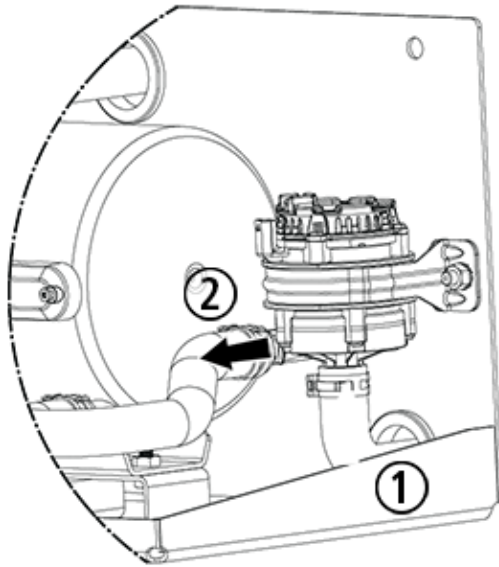


Fig. 9: U4850 Connections

- 1 – Coolant pump inlet
- 2 – Coolant pump outlet

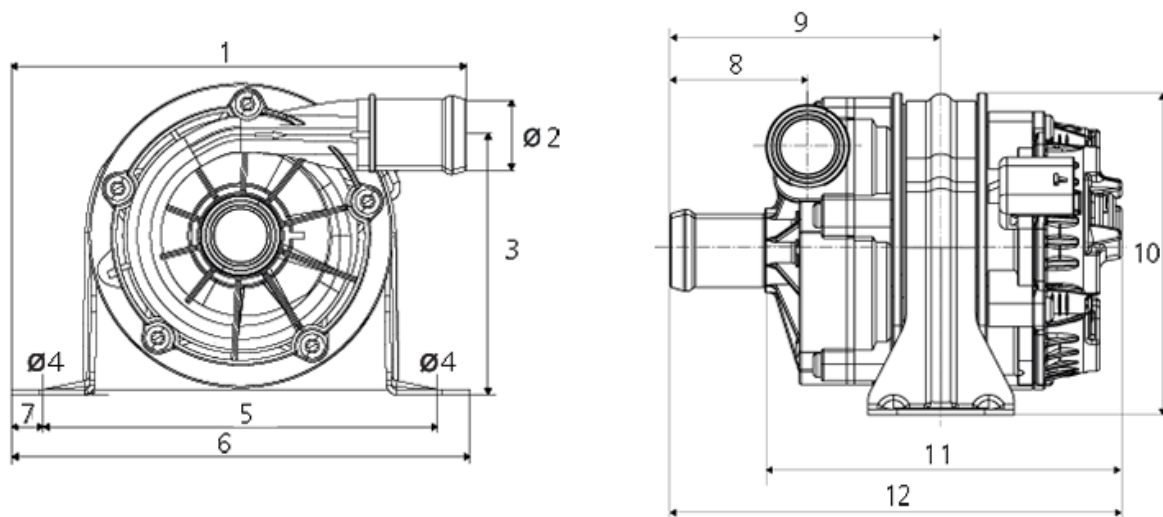


Fig. 10: U4850 dimensions

- | | |
|---------------------|----------------------|
| 1 - 3.8 in (97 mm) | 2 - .78 in (20 mm) |
| 3 - 2.9 in (73 mm) | 4 - .35 in (9 mm) |
| 5 - 4.4 in (112 mm) | 6 - 5.1 in (130 mm) |
| 7 - .35 in (9 mm) | 8 - 1.5 in (38 mm) |
| 9 - 2.9 in (74 mm) | 10 - 3.5 in (88 mm) |
| 11 - 3.9 in (98 mm) | 12 - 4.6 in (118 mm) |

6.3 Bleeding the Coolant System

**CAUTION**

Insufficient bleeding of the coolant system can lead to a malfunction resulting from overheating in heating mode.

Take care when bleeding the coolant system. Always bleed the coolant system:

- ✓ Before the heater is started after installation
- ✓ After servicing any part of the coolant system

**NOTE**

When the coolant system is properly bled, the coolant pump will make very little noise. If you hear evidence of cavitation, continue to bleed the system.

Collect any coolant running out of the system in an appropriate container.

6.4 Inspecting the Coolant System

After the heater and all coolant-carrying components have been installed, the entire coolant system must be checked for leaks with the system pressure specified by the vehicle manufacturer. To do this, start the engine and heater. Allow system to heat until the radiator thermostat opens.

7 Fuel System

7.1 Fuel Supply Information



NOTE

Observe all safety measures specified by the vehicle manufacturer.



NOTE

When installing a fuel filter watch for additional pressure loss.

The Thermo Top Pro 150 has an integrated fuel pump. Depending on the application, it may be a return less (one fuel line), or a return-style (two fuel lines) fuel system. The maximum allowable suction pressure is -5.8 psi (-0.4 bar) for both systems.

For reference, the permissible line lengths and height differences for specific installations are summarized in the Fuel System tables below. These are selected examples. Alternative parameters (e.g. diameter or length of the fuel line) are possible but minimum fuel suction pressure must be maintained.

Observe the safety measures specified by the vehicle manufacturer.

Make sure that the swirl pot is not completely emptied while the heater is in operation.

Fuel may be extracted at the following points:

- Separate Fuel Tank
- Vehicle Fuel Tank

Refer to the tables below for permissible fuel line lengths and height differences. These tables are for reference. The parameters can be suited to specific installations as long as the maximum allowable suction pressure is not exceeded.

Fuel System – With Return Line (return to filter) – Refer to figure 11

Parameter		Value
D	Inside diameter of the fuel line	0.25 in (6 mm)
S	Suction head (distance of the heater above the fuel tank)	6 ft 6 in (2 M)
L1	Maximum length of the fuel line (intake side)	33 ft (10 M)
L3	Maximum length of the fuel line (return side)	33 ft (10 M)
Pump head (distance of the heater below the fuel tank)		9 ft (3 M)

Table 3: Fuel System Specifications – Return to the Filter

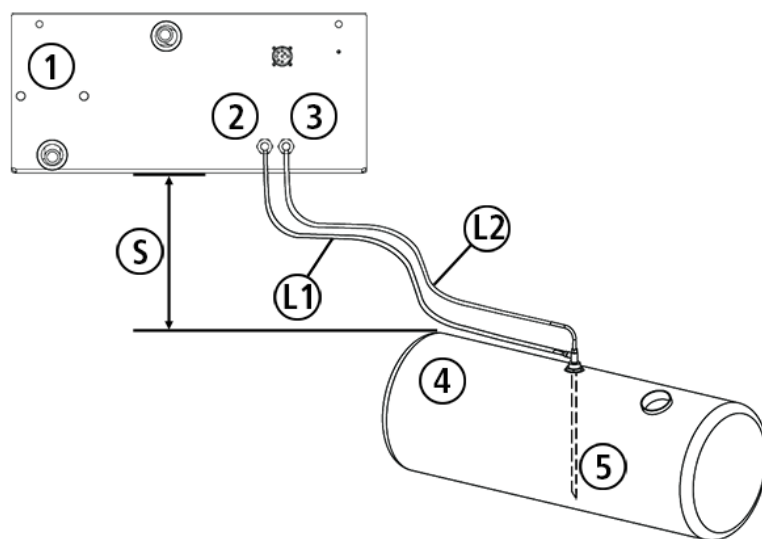


Fig. 11: Fuel system

- | | |
|---|-----------------------------|
| 1 – Heater | 2 – Fuel line – intake (L1) |
| 3 – Fuel line – return (L3, return to tank) | 4 – Fuel tank |
| 5 – Fuel standpipe | |

7.2 Extracting Fuel from a Fuel Tank

This separate fuel pickup precludes any effect of pressure.

Where available, a spare NPT threaded port can be used for the standpipe. If a spare port is not present, follow the instructions.

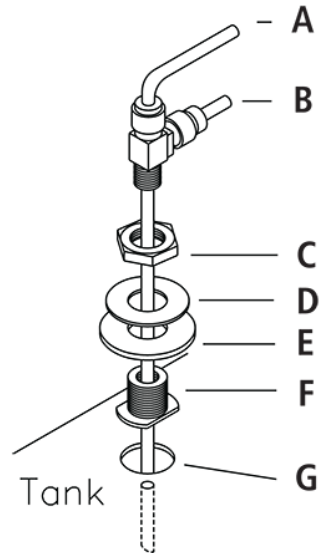


Fig. 12: Typical fuel system

- | | |
|-----------------------|-----------------|
| A – Fuel supply | B – Fuel return |
| C – Nut | D – Washer |
| E – Rubber Washer | F – Tank boss |
| G – 1 in (25 mm) hole | |

7.2.1 Separate Fuel Tank

A plastic or metal fuel tank may be installed. If the use of a separate fuel tank is required, the fuel filler cannot be installed in the passenger compartment and must have a filler cap to prevent fuel spillage. Follow the proceeding section for fuel extraction installation.

Install an appropriate tank-extracting device based on the fuel tank material.

7.2.2 All Fuel Tanks

The fuel system will build positive pressure in high-ambient-temperature conditions. Relieve pressure by removing the fuel filler cap or waiting for the fuel tank to cool down.

- Only drill a hole in the top of the fuel tank if installing a fuel standpipe.
- After any drilling or cutting is performed, clean and deburr the hole to eliminate potential leak paths.
- Clean the installation surface of the tank-extracting device.
- In installed position, maintain a minimum distance of 1 in (25 mm) between the standpipe and base of the fuel tank / fuel delivery unit.
- Position the tank-extracting device vertically.
- Use the specific tank extracting device (standpipe) approved by the manufacturer.
- Make sure that the standpipe of the tank-extracting device does not impair the operation of the vehicle's fuel delivery unit or fuel gauge in any operating mode.

7.3 Fuel Line

Minimum suction pressure must be maintained regardless of fuel line size. Refer to Fuel Supply Information on page 21.

- The nominal value of the fuel line (inside diameter) is 0.24 in (6 mm).
Alternative fuel line diameters available on request.
- Use only steel or plastic fuel lines made from light and temperature-resistant PA12/ETFE, PA12/EFEP, PA9T/PA12 in accordance with DIN 73378.

Installing the Fuel Line

- Fasten fuel hoses with hose clips at intervals of approx. 1 in (25 cm).
- Do not kink or twist fuel hoses.
 - Protect fuel hoses against damage:
 - Install stone impact guard.
- Fit protectors on sharp edges.
- Check connection points for tightness.

7.4 Fuel Connections at Heater



CAUTION: The sealing gaskets (item 3, fig. 13) must be replaced any time the fuel banjo bolts (item 5, fig. 13) are serviced or re-oriented. Two (2) gaskets per banjo bolt. Failure to follow this instruction may result in fuel leaks, possibly resulting in a fire.



NOTE: Torque the banjo bolts to 141 in. lbs +/- 8 in. lbs (16 Nm +/- 1 Nm)

After servicing, tighten the banjo bolt on the heater to 12 ft. lbs. (15 Nm).

It is important to install and orient the fuel fittings on the heater before the heater is installed.

Tighten the hollow screw to 12 ft. lbs (15 Nm).

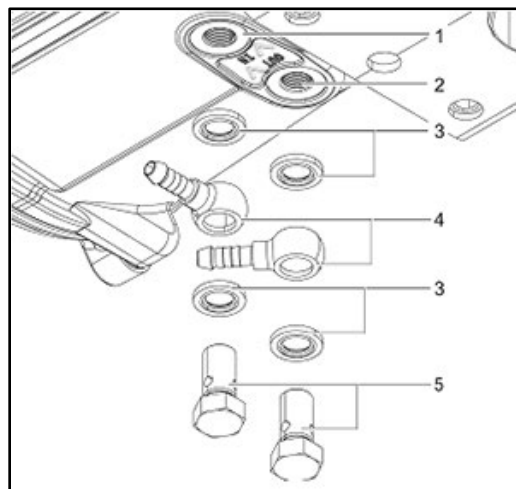


Fig. 13: Fuel connections at heater

- 1 – Fuel line connection (intake)
- 2 – Fuel line connection (return)
- 3 – Gasket -X2 per bolt P/N 5012745)

- 4 – Banjo fitting
- 5 – Hollow screw

7.5 Fuel Filter

Your heater is equipped with a fuel filter. Fuel filters must be changed annually or more often when dirty or contaminated fuel is encountered.

When installing the fuel filter, pay attention to the following points:

- Be sure there is sufficient space to service the filter element
- Install the filter close to the heater
- Check the flow arrows on the filter base to ensure proper fuel flow through the filter element

7.6 Fuel Lines

Since the lines normally cannot be routed with a constant rising gradient, the internal diameter must not be allowed to exceed a specific size. Air or gas bubbles will accumulate in lines with an internal diameter that is larger than is provided. These will cause malfunctions while the heater is operating if the lines sag or are routed downwards. 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. The fuel line must be installed in such a way that it cannot be damaged by flying road debris and high temperatures, i.e. close to the exhaust pipe. The fuel line must be secure at the connections using hose clamps to prevent slipping.

7.7 Refuelling Sticker



Fig. 14: Refuelling Sticker

Attach the refuelling warning sticker in area of fuel filler neck.

8 Combustion Air

8.1 General



NOTE

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.



NOTE

If the combustion-air intake tube cannot be installed so that it slopes downwards, a 5/32 in (4 mm) drain hole is to be made at its lowest point(s).

The combustion air intake opening must not point in the direction of travel. It must be located so that it cannot become clogged with dirt or snow and cannot suck in splashing water.

- There is no pressure difference (positive or negative) between the exhaust gas outlet and the combustion air inlet.
- Combustion air is not extracted from enclosed areas used by people.
- The combustion air intake must be routed in such a way that the intake will not terminate in the vicinity of the heater's or vehicle's exhaust pipe.
- The combustion air intake opening has the following requirements:
 - It must be positioned in a cool place above the maximum permissible fording level of the vehicle, in a location protected from spray.
 - It must not be possible for it to become clogged with dirt.
 - It must not be possible for it to draw in exhaust gases.
 - The combustion air intake opening does not face in the direction of travel.
- When installing the heater in the same compartment as the vehicle's fuel tank:
 - Combustion air must be drawn in from outside.
 - Exhaust gas must be routed to outside.
 - Through holes must be splash proof.

8.2 Combustion Air Intake Hose

For more information, refer to 8.1 General. Install the combustion-air intake on an upward slope to the heater. This allows condensate to drain away from the heater.

If combustion air intake lines cannot be installed so that they are continually rising: Make a 5/32 in (4 mm) condensation drain hole at the lowest point(s) of the tube. For more information, refer to figure 15.

Parameter	Value
Combustion air tube maximum length	16.5 ft (5 M)
Inside diameter	2.2 in (55 mm)
Minimum bend radius	4.7 in (120 mm)
Maximum sum of all bends	360°

Table 4: Combustion Air Intake Specifications

9 Exhaust System

The exhaust-temperature sensor cable is designed for high temperatures (heat resistant). The material is resistant to continuous effects of temperatures of up to 365 °F (185 °C), however it can be damaged by external mechanical influences. Before the final installation location has been set, it is recommended that you conduct an analysis for the possible risk of damage to the cable due to stone impact or similar. If stone impact is possible then precautionary measures must be taken. e.g. protective shielding.

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

Never pull on the exhaust temperature sensor cable. 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.

During installation, the proper condition of the mica disc (insulation) on the sensor, and the loose routing of the exhaust temperature sensor cable must be ensured. Do not force the cable or sensor into position.

9.1 Exhaust System Safety Information



WARNING

Exhaust pipes must not be routed through the interior of the vehicle. Exhaust has must be routed outside of, and beyond the edge of the vehicle. Failure to do so can cause exhaust gas to leak inside of the vehicle causing illness and death.



WARNING

Do not direct the exhaust outlet toward highly-flammable or heat-sensitive parts. Failure to do so can cause a fire.



WARNING

Protect vehicle components in the vicinity of the exhaust system from overheating by implementing the following measures:

- Maintain minimum safety distances.
- Ensure adequate ventilation.
- Use fire-resistant materials or heat shields.
- Always comply with any applicable legal requirements.

9.2 Exhaust Pipe

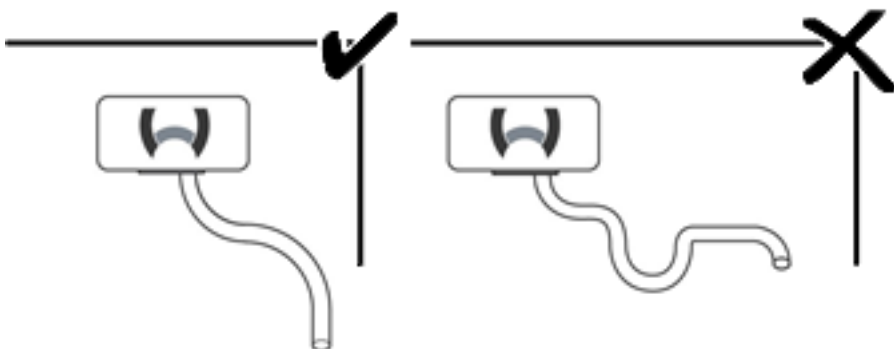


Fig. 15: Prevent Water Accumulation in Combustion and Exhaust Pipes



Parameter	Value
Maximum length of the exhaust pipe	16.5 ft (5 M)
Inside diameter	1.5 in (38 mm)
Minimum bend radius	3.3 in (85 mm)
Maximum sum of all bends	360°

Table 5: Exhaust Pipe Specifications

- Do not secure the exhaust pipe to heat-sensitive parts (e.g. brake lines, electrical cables).
- Route the exhaust pipe in such a way that it is running downhill from the heater to allow condensate to drain.
- If the exhaust pipe cannot be installed so that it consistently runs downhill:
 - Make a condensation drain hole 5/32 in (4 mm) at the lowest point(s).
 - Make sure that the condensation drain hole does not point towards parts that are sensitive to water or heat.
- Insulate the exhaust pipe to prevent condensation. Use suitable insulation material.

9.3 Exhaust Pipe Outlet



WARNING

Do not direct the exhaust outlet toward highly-flammable or heat-sensitive parts.

Failure to do so can cause a fire.

The exhaust gas outlet must be oriented in line with the following specifications:

- The exhaust gas must flow unobstructed.
- The exhaust gas outlet must not be blocked by debris.

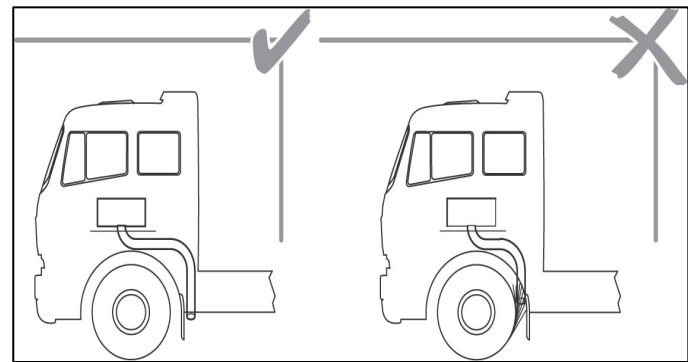


Fig. 16: Do Not Obstruct Exhaust Outlet

- Exhaust gas outlet must not face in the direction of travel.

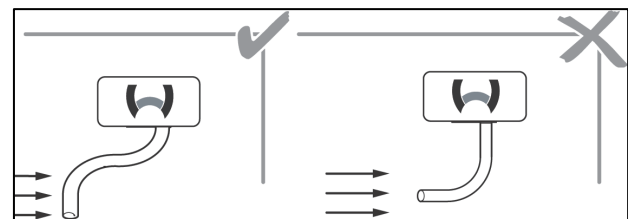


Fig. 17: Exhaust Pipe Orientation

- Exhaust gas must not enter the vehicle interior (e.g. through openings, ventilation for

equipment).

- The exhaust gas must not be drawn in as combustion air.
- The exhaust gas outlet is not too close to the ground.
- The exhaust pipe must continue for at least 3/8 in (10 mm) after passing through the underbody cover or skirt.
- Secure the exhaust pipe maximum 6 in. (150 mm) from the exhaust gas outlet so that the exhaust gas emerges at an angle of $90^\circ \pm 10^\circ$ to the ground.

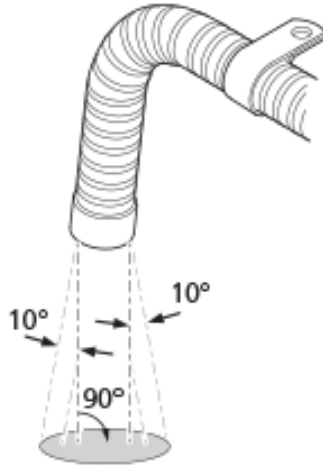


Fig. 18: Exhaust Outlet Angle

9.4 Exhaust Silencer

Webasto recommends installing an exhaust silencer to reduce noise.

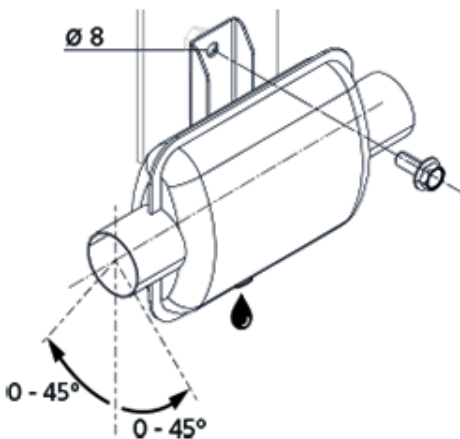


Fig. 19: Exhaust Silencer Mounting angle

The installation location of the exhaust silencer should be as close as possible to the heater and cannot be secured to heat-sensitive parts (e.g. brake lines, electrical cables).

To allow for condensate drainage, be sure to install the silencer with the drain hole on the bottom.

Maintain an adequate distance from heat-sensitive parts. A heat shield can be fitted.

10 Electrical Connections

**WARNING**

The size (gauge) of the wire must be sufficient for the expected current flow. The supplied wiring harness is sized for maximum length and must not be lengthened. Failure to follow this direction can result in fire.

**WARNING**

All wiring must be insulated against cuts and abrasions. Failure to follow this instruction may result in fire, or inoperative components.

**WARNING**

All electrical circuits must be protected with fuses or automatic circuit breakers.

**WARNING**

Electrical cables and harnesses must be routed and firmly secured in such a way as to prevent against mechanical and thermal stresses. Failure to follow this instruction can result in a fire and / or the heater or its components becoming inoperative.

Electrical components, such as relays, fuses, switches, etc., must be installed so that they are protected. i.e. (water, high-pressure cleaners, etc.).

- Check the data on nameplate to verify 12- or 24-volt rating.
- Disconnect the vehicle's battery/batteries before installing the heater.
- Make sure the electrical system is grounded correctly.
- Always comply with legal requirements.

**CAUTION**

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

10.1 Connecting the Heater

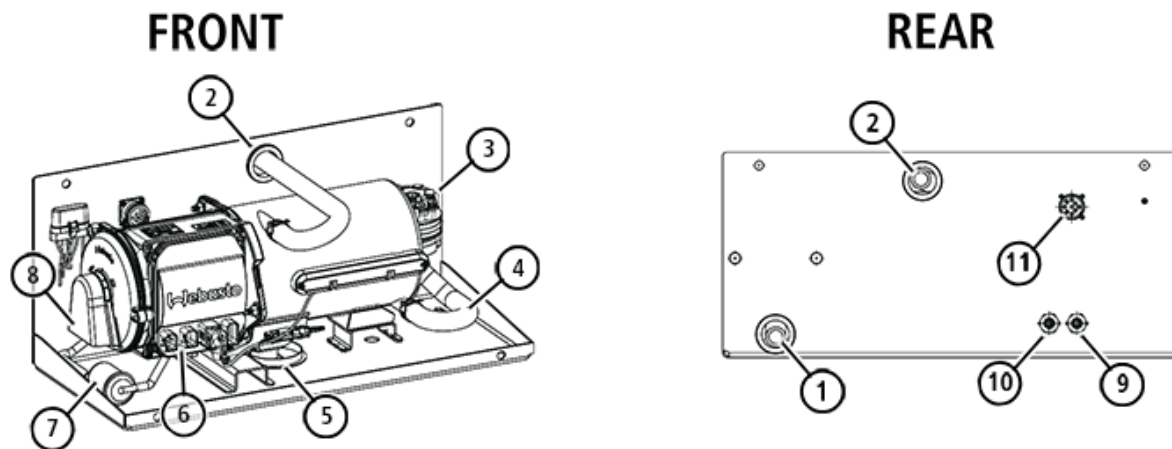


Fig. 20: Connections – with enclosure box

- | | |
|--------------------------------------|----------------------------------|
| 1 – Water inlet | 7 – Fuel filter |
| 2 – Water outlet | 8 – Combustion air intake shield |
| 3 – Coolant pump | 9 – Fuel supply port |
| 4 – Coolant hose (to heat exchanger) | 10 – Fuel return port |
| 5 – Exhaust port | 11 – Wiring connection |
| 6 – Control unit | |

10.2 Switch and Timer Connections

Install and connect the control panel (SmarTemp or rocker switch) per the instructions below and the Wiring Diagrams on page 35.



NOTE

Always make sure there are no obstacles behind the mounting location prior to drilling.



NOTE

Ensure good readability when selecting installation location.



NOTE

Observe information on adhesive labels and colored markings when connecting the control element to vehicles wiring harness.



Analog Rocker Switch

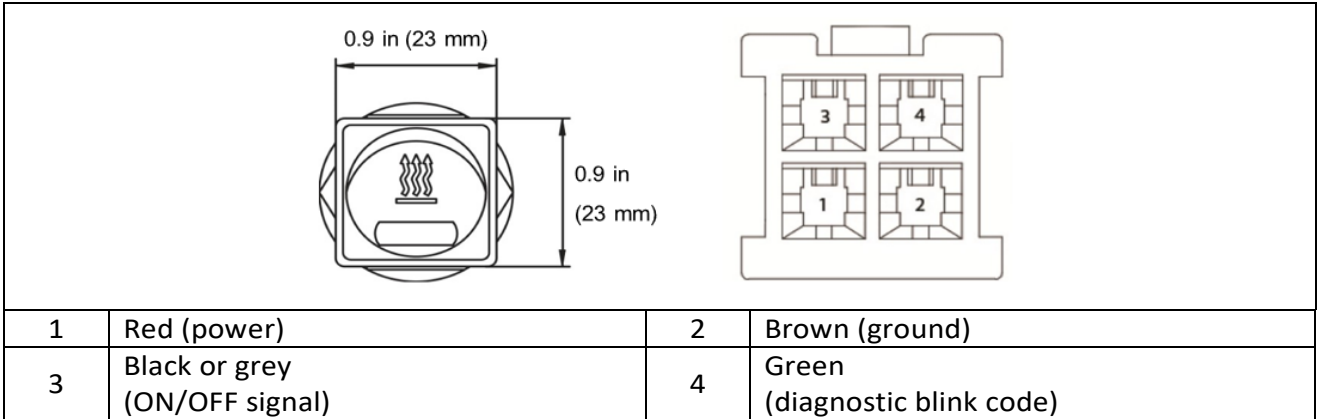
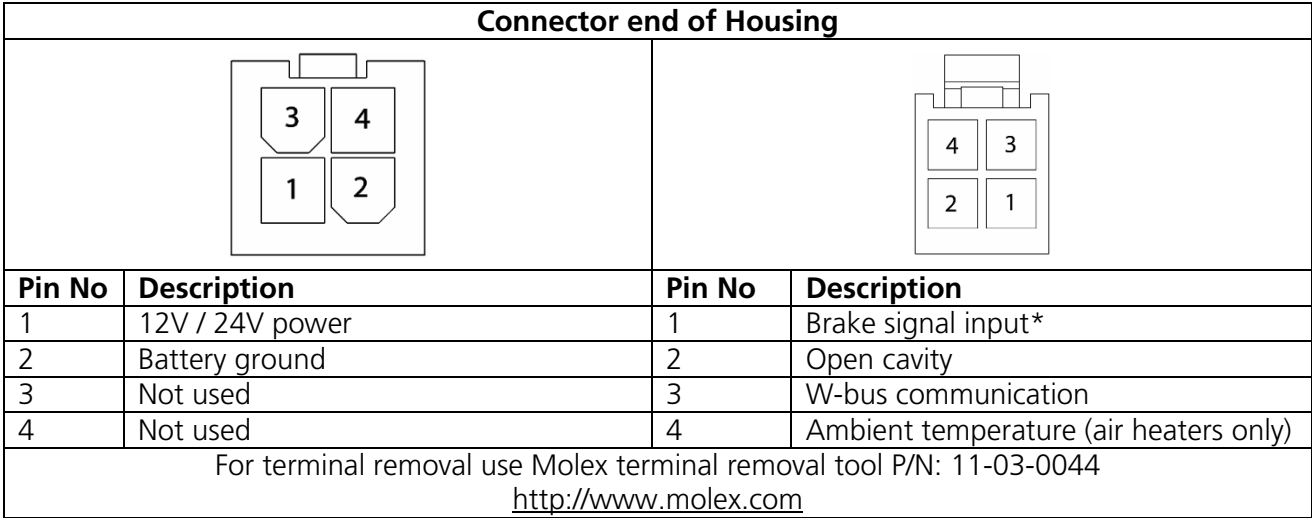


Fig. 21: Analog Switch Connections

- 1. Select a suitable location in the vehicle for the ON/OFF rocker switch to mount.
- 2. Drill a 3⁄4 in (19 mm) hole for the switch.
- 3. Route the harness between the heater and the switch, secure the harness along its length with wire ties. If possible, use an existing hole in the bulkhead or drill a hole in a suitable location. Protect the harness with a grommet at the bulkhead.
- 4. Connect the electrical connector to the switch.

SmarTemp Digital Timer



* Only used in original-equipment installations



10.3 Control Temperature

The heater stops heating mode when a pre-set coolant temperature is reached. The heater will go into a control-pause (stand-by) mode where the coolant will continue to be circulated and monitored.

The following table shows an example of one possible pre-set:

	Engine off	Engine off
Temperature at which the heater goes into a control pause state:	> 176 °F (80 °C)	> 167 °F (75 °C)
Temperature at which the heater switches on from a control pause state:	> 149 °F (65 °C)	> 140 °F (60 °C)

Table 6: Control Pause Conditions

11 Initial Operation

11.1 Initial Operation Information


WARNING

Never operate the heater in closed rooms such as garages or workshops that do not have an exhaust extraction unit.

In workshops with exhaust extraction units, make sure that the exhaust extractor is operational. Carefully read the heater-operating manual, follow the procedures and safety information found therein.

11.2 Initial Start-Up Checklist

Heater Mounting		Complete (Yes/No/Comments)
1	Is the heater assembly safely secured and rigid? (Ensure all bracket fasteners are right)	
2	Is there a safe clearance from heat-generating components? (Exhaust, etc.)	
3	Is there sufficient clearance between the heater and any vehicle moving components under all operating conditions? (Steering at full lock, torqued driveline, loaded or unloaded suspension, etc.)	
4	Is the heater mounted in an acceptable position according to the limitations noted in this installation manual?	
5	Is the heater installed in a location that is protected from road debris and splash water, or items stored in the same compartment?	
6	Is there sufficient clearance between the heater and the ground?	
Coolant System		Complete (Yes/No/Comments)
1	Is there adequate clearance (min. 4 in.) from heat-generating components? (Exhaust, heater body, ducts, etc.)	
2	Is there adequate clearance from sharp edges/objects? (Ensure adequate cut-protection has been installed)	
3	Are there any kinks, sharp bends, or the possibility of pinched hoses or harnesses, cuts and/or rub-through?	
4	Have all the hose clamps been properly positioned and tightened?	
5	Has the coolant system been topped off and bled per the vehicle manufacturer's specifications for proper mixture and type?	
6	Has a pressure test been performed on the coolant system under all operating conditions?	
7	Have the coolant hoses been installed so that they are below the filler cap?	
8	Has the coolant flow been verified?	

Electrical		Complete (Yes/No/Comments)
1	Has all wiring been safely secured away from moving components and/or heat sources?	
2	Check for proper power and ground connections.	
3	Has the blower motor functionality been tested (if applicable)?	
4	Check for proper fuse tap connection (if applicable).	
5	Verify that the correct fuses are in the specified locations per the installation manual.	
6	Ensure heater and vehicle fuse boxes are closed and secure. Was the Webasto-supplied fuse block installed in a location that is protected from water and/or moisture?	
7	Ensure the battery is mounted securely and connections are properly tightened.	
8	Ensure the battery has a full charge.	
Fuel Systems		Complete (Yes/No/Comments)
1	Is the standpipe properly mounted in the fuel tank? (sealed, structural integrity maintained)	
2	Validate that the standpipe does not interfere with the function of the fuel sending-unit by checking the fuel gauge for proper operation before completing installation of the fuel tank.	
3	Verify that all fuel lines are properly secured and are a safe distance (min. 4 in.) from exhaust systems and/or components.	
4	Check all fuel lines for leaks or kinks.	
5	Check fuel line clamps for proper positioning and tightness. Ensure the fuel system is free of leaks.	
6	Ensure the fuel pump is securely mounted in a cool location. NOTE: The vehicle fuel tank area is generally a location with minimal sound transfer paths to the vehicle interior.	

Table 7: Initial Start Checklist

11.3 Checking Initial Operation with Thermo Test Software

Correct operation of the heater can be checked with the Webasto Thermo Test PC Diagnostics. Check the heater while in stable operation for approximately 20 minutes while monitoring the various functions.

11.4 Operating the Heater



NOTE

When filling the fuel line and purging air only activate the fuel pump using the ThermoTest software. Using a different type of switching device can damage the fuel pump.

After the heater is completely installed:

Install the combustion air intake guard to prevent damage to the combustion air fan.

Connect the heater to Webasto Thermo Test PC Diagnostics.

Bleed the coolant circuit using Webasto Thermo Test PC Diagnostics.

Check the coolant system for leaks at the system pressure and / or temperature that is specified by the vehicle manufacturer.

Filling the fuel lines:

Generally, the fuel lines are primed automatically on initial start-up of the heater.

For the heater model with a return-style fuel system, there is also an option to fill manually. Select the fuel prime function in the Webasto Thermo Test PC Diagnostics.

Prime the fuel line(s) until all of the air has been purged from the fuel lines.

Ensure that the fuel filter has been bled. See Fuel Filter for more information.



NOTE

The standard duration stored in the Webasto Thermo Test software for fuel prime is sufficient for most vehicle models and heater applications.

If the lines cannot be successfully primed using Webasto Thermo Test software, it may be necessary to perform repeated start-up attempts to prime the fuel line.

Once initial start-up is complete, fuel line should be free of air bubbles.

- Make sure that the coolant is less than 122 °F (50°C).
- Switch the heater ON via the control panel (refer to the control panel operating instructions).
- Check all connections for leaks.
- CO2 settings are preset at the factory.
- If the heater switches to fault lock-out condition during operation, perform the troubleshooting procedure. Refer to the service manual for more information.



WARNING

WEBASTO HEATERS MUST BE SWITCHED "OFF" WHEN RE-FUELING AT FILLING STATIONS AND/OR WHILE LOADING OR UNLOADING FLAMMABLE MATERIALS FOR TRANSPORT, TO PREVENT THE RISK OF EXPLOSION. PLEASE REVIEW OWNER'S MANUAL FOR SAFETY AND USE INSTRUCTIONS.



NOTE

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

12 Technical Data

Heater Model	Thermo Top Pro 150	
	12V	24V
Type	Water heater	
Fuel	Diesel / B20 biodiesel / paraffinic fuel Biodiesel not approved for marine application	
Heater output Btu/h (kW)	51,182 (15)	
Fuel consumption gal/h us (l/h)	0.38 (1.45)	
Rated voltage (V)	12	24
Operating voltage range (V)	10.5 – 15	20 - 31
Rated power consumption over the rated control range (W)	100	
Permissible ambient temperature (operation) F° (C°)	-40 – 176 (-40 - 80)	
Permissible ambient temperature (storage) F° (C°)	-40 – 248 (-40 – 120)	
Permissible working pressure - psi (bar)	<36 (<2.5)	
Capacity of heat exchanger – gal (l)	0.3 (1.2)	
Minimum fill volume of the coolant circuit – gal (l)	2.6 (10)	
CO2 in exhaust gas (heating capacity @ full load) – vol%	10.0	
Heater length – in (mm)	18.5 (470)	
Heater width – in (mm)	7.9 (200)	
Heater height – in (mm)	7.9 (200)	
Heater weight – lbs (kg)	25.25 (11)	
Table 8: Technical Data		

Coolant Pump	U 4850	
	12V	24V
Flow volume - gal/h (l/h) against 0.56 bar	396 (1500)	
Rated voltage – V	12	24
Rated power consumption – W	70	
Length – in (mm)	4.6 (118)	
Diameter – in (mm)	3.2 (80)	
Weight – in (mm)	1.5 (0.7)	

13 Wiring Diagrams

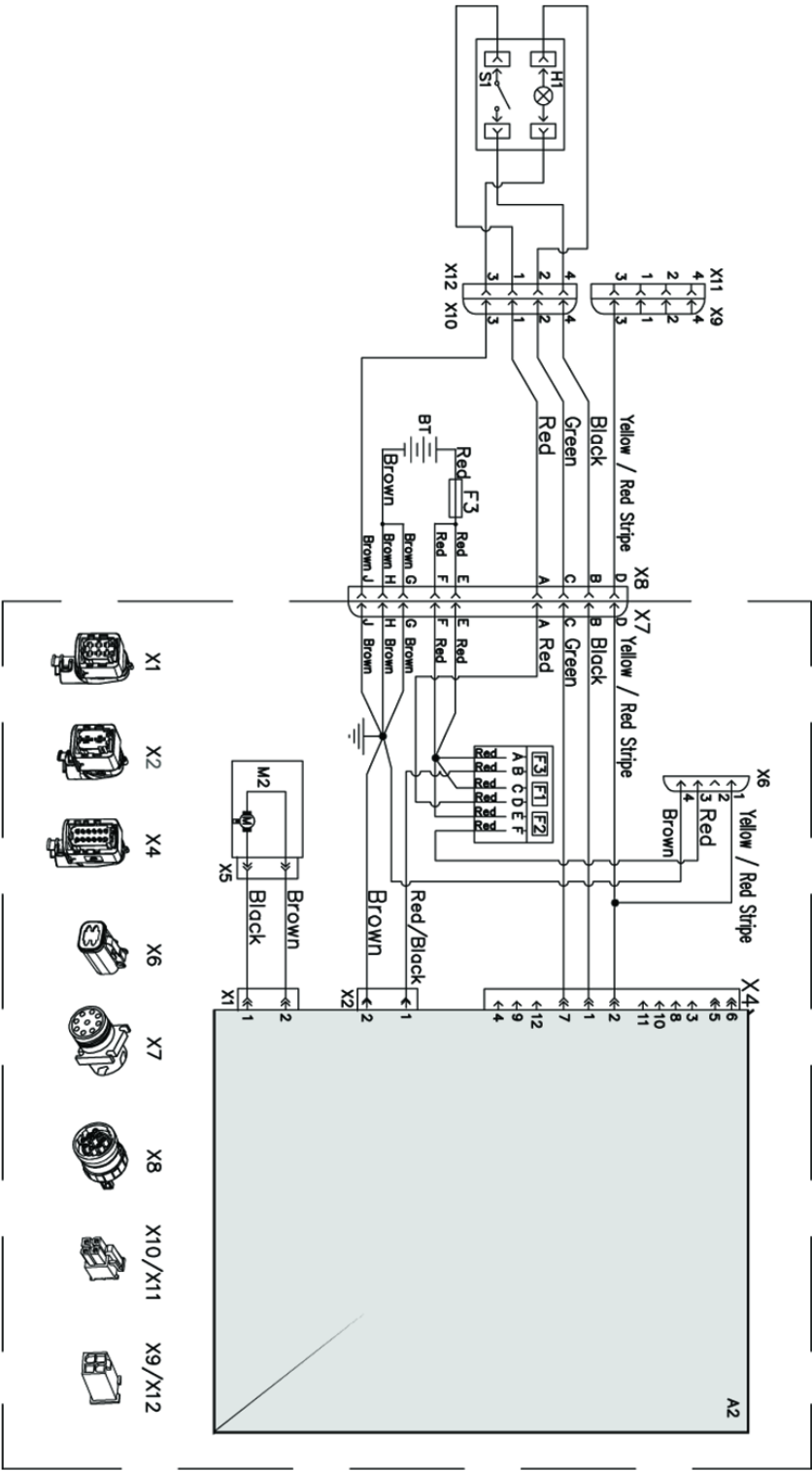


Fig. 21: Wiring Diagram – with on / off switch

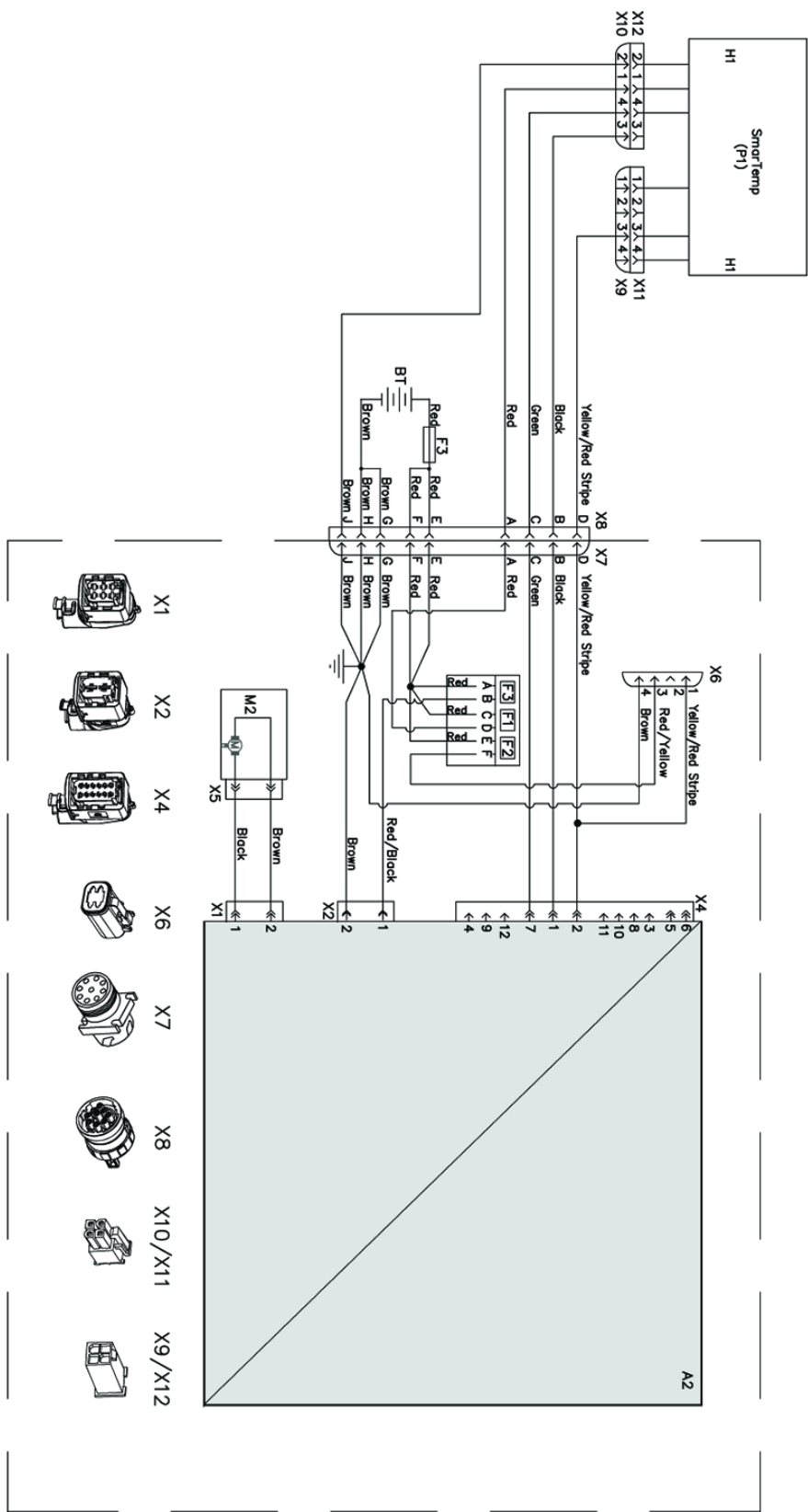


Fig. 22: Wiring Diagram – with SmarTemp Control 3.0 and 3.0 Bluetooth

14 General Information

This section describes basic troubleshooting procedures. Troubleshooting is normally limited to the isolation of defective components.



CAUTION

Troubleshooting requires expert knowledge about structure and theory of operation of the heater components and may only be performed by Webasto authorized personnel.

Before troubleshooting, check for and eliminate these defects:

- Blown fuses
- Fuel supply (plugged fuel filter)
- Corrosion on battery terminals, electrical wiring, connections and fuses
- Loose contact on connections



NOTE

After any correction of a defect a functional test must be performed.

14.1 General Failure Symptoms

The following table lists possible failure symptoms.

Failure Symptom	Possible Cause	Remedy
Heater switches off automatically (fault lock-out)	No combustion after start or automatic restart	Switch off heater momentarily and switch on again Check coolant lines for obstructions, closed valve, kinks Check coolant level, bleed the coolant circuit if necessary. Allow heater to cool down
	Flame extinguishes during operation	Check for failure codes and remedy the cause. Repeat as necessary. Charge / replace batteries
Heater expels black smoke from the exhaust	Depleted batteries	Switch off heater momentarily and switch on again
	Combustion air and / or exhaust tube blocked	Check combustion air intake and / or exhaust tube for obstructions / kinks / damage

Table 10: General failure symptoms

15 Troubleshooting

This section is intended to troubleshoot issues that might occur during the installation of the Webasto heating system. For that reason, the fault code list below is abbreviated. For more information regarding fault codes, refer to the service information published on www.techwebasto.com.

15.1 Fault Code Output (flash code)

Fault code output: Flashing / FXX	Fault message	Recommended measures
F00	No component fault	1) Check fuse(s) 2) Check wiring
F01	No start	1) Check for fault in air intake and exhaust systems 2) Check for fault in fuel system 3) Check fuel pump
F02	Flame failure	See error F01
F03	Undervoltage / Overvoltage	Check system voltage and charging system.
F04	Flame was detected prior to combustion	1) Check for the failure occurs again 2) Check the fuel system 3) Check/replace the overheating sensor (diesel) 4) Check/replace the flame sensor (gasoline)
F05	Flame monitor	Check flame monitor - refer to service manual
F06	Temperature sensor short circuit	Check air temperature sensor - refer to service manual
F07	Fuel pump solenoid short-circuit	Electrical check of fuel system Refer to service manual
F08	Drive fan motor short- or open-circuit	Rectify cause of blockage
		Check wiring and connector for integrity Refer to service manual
		Check operation of drive motor Refer to service manual
F09	Defective ignition circuit	Check wiring and connector Check ignition spart generator - refer to service manual
F10	Heating unit overheated	1) Check wiring for coolant temperature sensors - refer to service manual 2) Check for fault in coolant temperature sensors - refer to service manual 3) Check coolant level / bleed air from the system - refer to service manual 4) Check coolant pump and wiring - refer to service manual
F11	Coolant pump short-circuit or break	Check coolant level and flow Bleed the cooling circuit Check wiring for damage - refer to service manual Check coolant pump - refer to service manual



F14	Coolant temperature sensor short- or open-circuit	Check coolant temperature sensor wiring - refer to service manual Check coolant temperature sensors for operation - refer to service manual
F16	Exhaust gas temperature too high	Check wiring and connectors - refer to service manual Check exhaust temperature sensor - refer to service manual Inspect and clean the heat exchanger internally - refer to service manual Allow heater to cool down, check temperature and ventilation of installation space - refer to installation manual
F17	Exhaust gas temperature sensor	Check wiring and connectors - refer to service manual Check exhaust temperature sensor - refer to service manual Inspect and clean the heat exchanger internally - refer to service manual
F20	No fuel preheating	Check wiring and connectors - refer to service manual Check operation of heater cartridge - refer to service manual

15.2 Heater Lockout Reset Procedure

Procedure in the event of a heater lock-out (inter-lock) condition 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 may be shut down and without the ability to restart.

Heater Lock out Reset Procedure:

1. Switch the heater ON
2. Within 10 seconds disconnect power from the heater (unplug the wiring harness, disconnect the battery, remove the fuse)
3. Wait 10 seconds
4. Switch the heater OFF
5. Reconnect power
6. Switch the heater ON
7. Rectify the cause of the fault.

IMPORTANT: Heater fault codes can be read using PC Diagnostics, however, the heater lockout reset must be manually performed using the procedure stated above.

If you have any questions, contact our technical support team at:
(800) 860-7866 or via email at: technical@webasto.com.

15.3 PC Diagnostic Kit



CAUTION

Diagnostic equipment is intended for use by Webasto-trained personnel at authorized Webasto Distributor, Dealer and End User service facilities.

It is possible to read and reset stored fault codes from the Thermo Top Pro 150's memory. This is achieved through the use of a diagnostic interface kit connected to the heaters diagnostic connector and a computer with a windows operating system having the necessary software installed.

The PC Diagnostic Interface Kit comes complete with connecting hardware, software and instructions. Also available are several interface connectors for use with Webasto heaters equipped with internal diagnostics capabilities such as the Thermo Top Pro 150.

In addition to working with stored fault codes, the PC Diagnostics Kit allows you to do several other functions such as reading values while the heater is in operation or testing individual components. Printing out of fault codes is also available (User supplied printer required).

For further capabilities and instructions for use with the Thermo Top Pro 150 heater, see instruction manual supplied with the PC Diagnostics Kit.

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