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Wasserheizgerät
Water Heater
Appareil de chauffage

Einbauanweisung
Installation Instructions
Notice de montage

Thermo 50

Thermo 50	Diesel/diesel
Thermo 50	PME (Biodiesel)
	PME (biodegradable diesel)
	PME (biodiesel)

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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.

To install and repair Webasto heating and cooling systems you need to have completed a Webasto training course and have the appropriate technical documentation, special tools and special equipment.

Only genuine Webasto parts may be used. See also Webasto air and water heaters accessories catalogue.

NEVER try to install or repair Webasto heating or cooling systems if you have not completed a Webasto training course, you do not have the necessary technical skills and you do not have the technical documentation, tools and equipment available to ensure that you can complete the installation and repair work properly.

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.

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1 Statutory regulations governing installation

1.1 Statutory regulations governing installation

Type approvals according to ECE-R 10 (EMC) and ECE-R 122 (Heater) exist for the Thermo 50 heater.

See chapter 14, "Technical data" for the approval number.

NOTE:
The provisions of these Directives are binding within the territory governed by EU Directive 70/156/EEC and/or EC/2007/46 (binding for new vehicle types as of 29/04/2009) and should also be observed in countries in which there are no special regulations!

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 spare parts. This will result in the invalidation of the type approval for the heater and therefore of its homologation/ECE type approval.

1.2 Extract from directive ECE-R 122 Part I and Annex 7

Start of extract.

Part I

5.3 Vehicle Installation Requirements for Combustion Heaters and for Electric Heaters

5.3.1 Scope

5.3.1.1 Subject to paragraph 5.3.1.2, heaters shall be installed according to the requirements of paragraph 5.3.

5.3.1.2 Vehicles of category O having liquid fuel heaters are deemed to comply with the requirements of paragraph 5.3.

5.3.2 Positioning of heater

5.3.2.1 Body sections and any other components in the vicinity of the heater must be protected from excessive heat and the possibility of fuel or oil contamination.

5.3.2.2 The heater shall not constitute a risk of fire, even in the case of overheating. This requirement shall be deemed to be met if the installation ensures an adequate distance to all parts and suitable ventilation, by the use of fire resistant materials or by the use of heat shields.

5.3.2.3 In the case of M2 and M3 vehicles, the combustion heater must not be positioned in the passenger compartment. However, an installation in an effectively sealed envelope which also complies with the conditions in paragraph 5.3.2.2 may be used.

5.3.2.4 The label referred to in Annex 7, paragraph 4, or a duplicate, must be positioned so that it can be easily read when the combustion heater is installed in the vehicle.

5.3.2.5 Every reasonable precaution should be taken in positioning the heater to minimize the risk of injury and damage to personal property.

5.3.3 Fuel supply

5.3.3.1 The fuel filler must not be situated in the passenger compartment and must be provided with an effective cap to prevent fuel spillage.

5.3.3.2 In the case of liquid fuel heaters, where a supply separate from that of the vehicle is provided, the type of fuel and its filler point must be clearly labelled.

5.3.3.3 A notice, indicating that the heater must be shut down before refuelling, must be affixed to the fuelling point. In addition a suitable instruction must be included in the manufacturer's operating manual.

5.3.4 Exhaust system

5.3.4.1 The exhaust outlet must be located so as to prevent emissions from entering the vehicle through ventilators, heated air inlets or opening windows.

5.3.5 Combustion air inlet

5.3.5.1 The air for the combustion chamber of the heater must not be drawn from the passenger compartment of the vehicle.

5.3.5.2 The air inlet must be so positioned or guarded that blocking by rubbish or luggage is unlikely.

5.3.6 Heating air inlet

5.3.6.1 The heating air supply may be fresh or re-circulated air and must be drawn from a clean area not likely to be contaminated by exhaust fumes emitted either by the propulsion engine, the combustion heater or any other vehicle source.

5.3.6.2 The inlet duct must be protected by mesh or other suitable means.

5.3.7 Heating air outlet

5.3.7.1 Any ducting used to route the hot air through the vehicle must be so positioned or protected that no injury or damage could be caused if it were to be touched.

5.3.7.2 The air outlet must be so positioned or guarded that blocking by rubbish or luggage is unlikely.

5.3.8 Automatic control of the heating system

5.3.8.1 The heating system must be switched off automatically and the supply of fuel must be stopped within five seconds when the vehicle's engine stops running. If a manual device is already activated, the heating system can stay in operation.

ANNEX 7

ADDITIONAL REQUIREMENTS FOR COMBUSTION HEATERS

7 Warning light

7.1 A clearly visible tell-tale in the operator's field of view shall inform when the combustion heater is switched on or off.

End of extract.

NOTE:
Contrary to the provisions of para. 5.3.2.3, the heater may not be installed in the passenger compartment of vehicles of classes M1 and N. However, it is permissible to use a unit in a tightly sealed enclosure which also meets with the conditions in para. 5.3.2.2.

1.3 General requirements

1.3.1. Exhaust gas

Exhaust lines must be routed at a sufficient distance (at least 20 mm) from all heat-sensitive vehicle parts (underbody protection, plastic parts, etc.).

1.3.2. Fuel lines

Fuel lines must always be routed through cool areas in order to prevent the formation of bubbles due to heating up.

2 Use / version

2.1 Use of water heaters

The Webasto Thermo 50 water heater is used in connection with the vehicle's own heating system

- to heat the passenger compartment,
- to defrost the vehicle windows and
- to preheat water-cooled engines.

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.

2.2 Version

Thermo 50

Water heater for diesel or PME fuel.

The Thermo 50 water heater is designed for 24 volt operation.

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3 Installation position

The water heater must not be installed inside the passenger compartment.

The heaters are preferably installed in the engine compartment, in areas of the front fender where they are protected from splashing water or on the splashboard.

The heaters must be installed as low as possible to permit automatic bleeding of the heater and circulation pump. This is particularly important as the circulation pump is not self-priming.

IMPORTANT:
The openings of the water ports must not point downwards in any installation position.

IMPORTANT:
– The heaters must not be installed:
  • in the immediate vicinity of or above hot parts
  • in areas directly exposed to splashing water from the wheels
  • below the fording line of the vehicle.
– The statutory regulations governing installation must be adhered to (see page 29).
– If the Thermo 50 is installed in hazchem vehicles, then not only the requirements of the motor vehicle construction and use regulations but also the provisions of the ADR (Accord européen relatif au transport international des marchandises dangereuses par route) must be complied with.
– If the water heater is to be operated in a separately installed heating system, the system must be fitted with a max. 2.5 bar pressure relief valve and, prior to installation, an installation planning report must always be submitted to Webasto for approval.

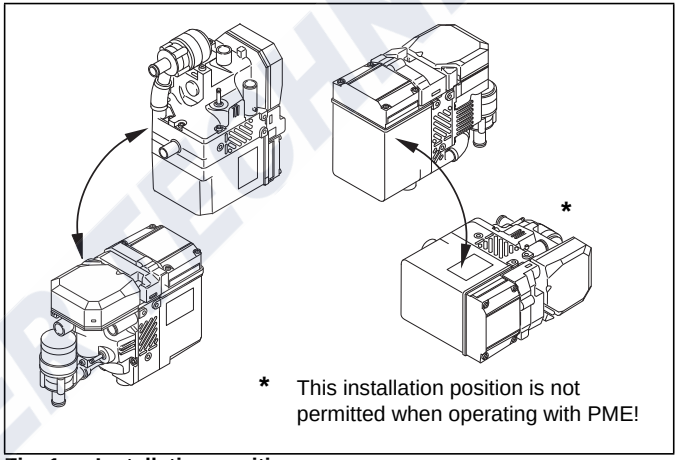


Fig. 1 Installation positions

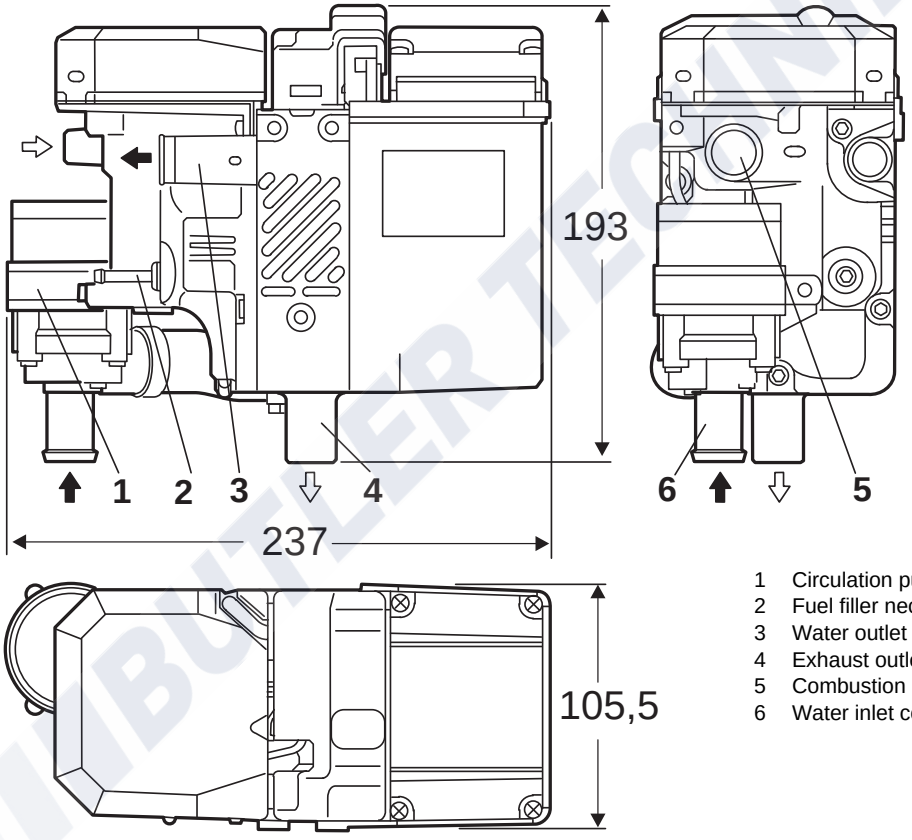


Fig. 2 Thermo 50 installation drawing

4 Rating plate

The rating plate must be positioned so that it cannot be damaged and must still be clearly legible when the heater is installed (otherwise a duplicate rating plate must be used).
Inapplicable years must be erased from the rating plate.

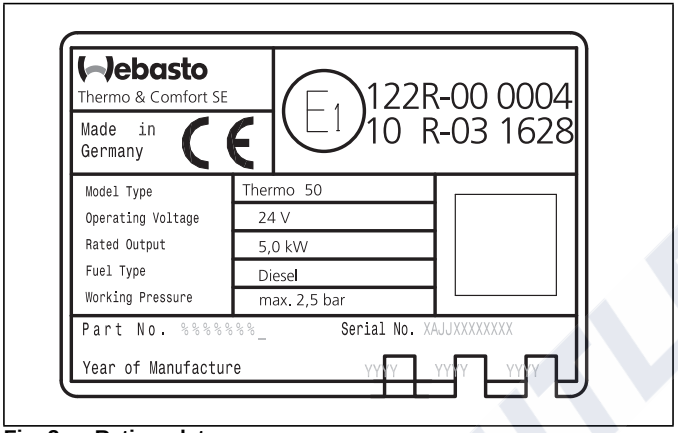
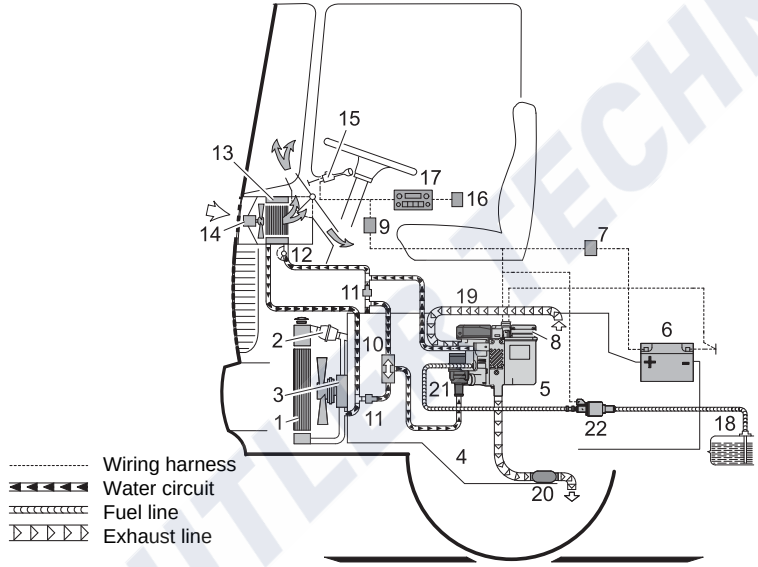


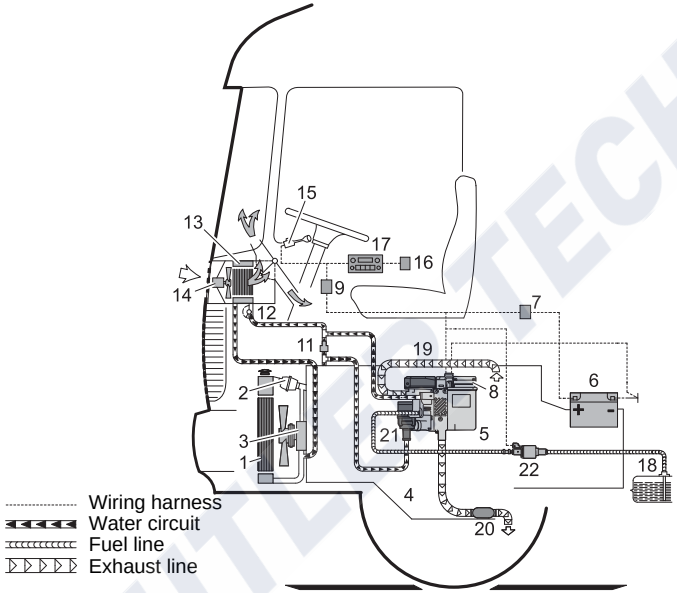
Fig. 3 Rating plate

5 Examples for installation



1 Radiator
2 Cooling water thermostat
3 Water pump (of the engine)
4 Engine with standard equipment
5 Water heater
6 Battery
7 Fuse holder
8 Control unit (in the heater)
9 Relay (for vehicle fan)
10 Thermostat
11 Non-return valve without leakage hole
12 Regulating valve for vehicle heating
13 Heat exchanger, vehicle heating
14 Vehicle heating fan
15 Switch for vehicle heating fan
16 Fuse bank in vehicle
17 Timer
18 Fuel pickup
19 Intake silencer, combustion air intake line
20 Exhaust muffler
21 Circulation pump
22 Fuel metering pump

Fig. 4 Example for installation of the Thermo 50 heater: Thermostat circuit



1 Radiator
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6 Battery
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8 Control unit (in the heater)
9 Relay (for vehicle fan)
10 Thermostat
11 Non-return valve without leakage hole
12 Regulating valve for vehicle heating
13 Heat exchanger, vehicle heating
14 Vehicle heating fan
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16 Fuse bank in vehicle
17 Timer
18 Fuel pickup
19 Intake silencer, combustion air intake line
20 Exhaust muffler
21 Circulation pump
22 Fuel metering pump

Fig. 5 Example for installation of the Thermo 50 heater: Bypass integration with non-return valve

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6 Connection to the vehicle cooling system

In thermostat circuits, only use thermostats which start to open at < 70 °C.

The heater is connected to the vehicle cooling system as shown in Figs. 4 and 5. At least 4 litres of coolant must be circulated.

NOTE:
Leaking coolant must be collected in a suitable container.

The water hoses supplied by Webasto must always be used. If other hoses are used, they must at least comply with DIN 73411. The hoses must be routed without kinking and preferably uphill to ensure perfect bleeding. Hose connections must be supported by hose clips so they cannot slip off.

NOTE:
The hose clips on the heater must be fitted between the flared neck and the heater.
The hose clips must be tightened with a torque of 2.0 + 0.5 Nm.

Care must be taken to bleed the cooling system before the heater is taken into service for the first time or after refilling with fresh coolant. Heater and lines should be installed in such a way as to ensure static bleeding.

Malfunctions due to overheating may occur during operation if the heater and lines have not been bled correctly.

6.1 Relocating the circulation pump

The circulation pump can be installed either in its intended position on the heater or separately from the heater, in the water circuit.
Care must be taken to ensure without fail that water flows through the heater in the right direction (water outlet at the top / water inlet at the bottom), otherwise the heater will malfunction.

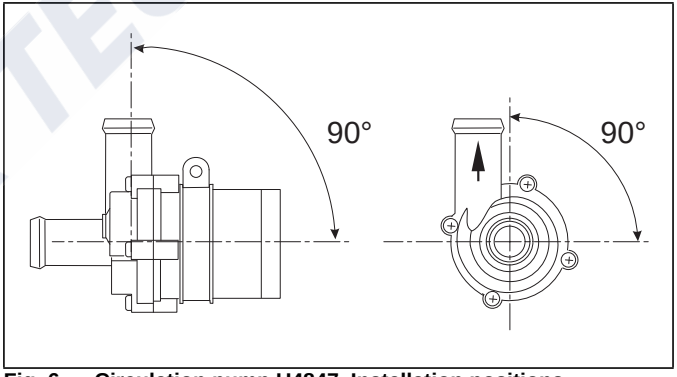

Fig. 6 Circulation pump U4847, Installation positions

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7 Fuel supply

The fuel is taken from the vehicle fuel tank or from a separate fuel tank.

The values for the permissible pressure at the fuel delivery point are listed in the following table.

Permissible fuel inflow height H [m]	Max. perm. excess pressure in the fuel line l_1 [bar]
0.00	0.2
1.00	0.11
2.00	0.03

Permissible fuel suction height S [m]	Max. perm. negative pressure in the fuel tank [bar]
0.00	-0.10
0.50	-0.06
1.00	-0.02

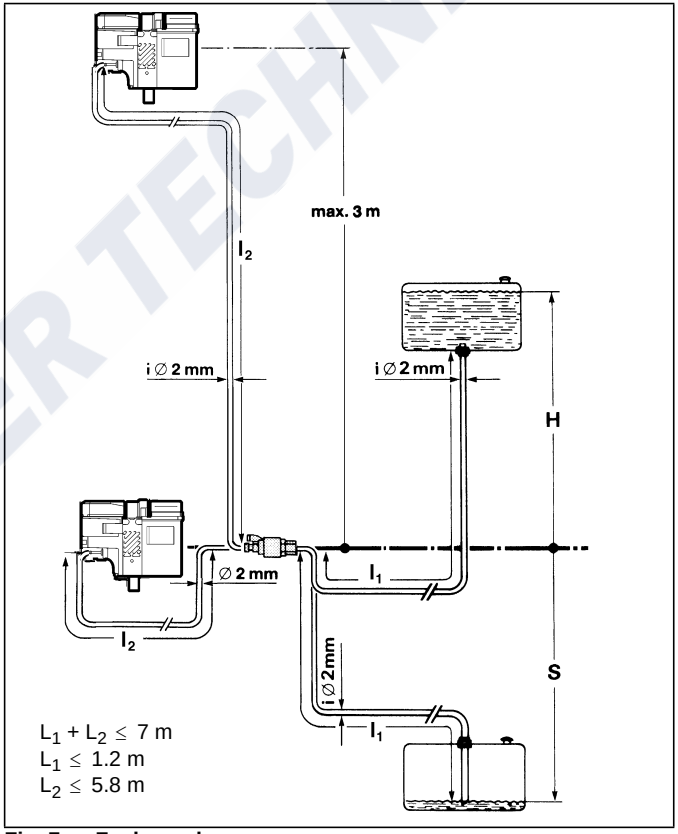


Fig. 7 Fuel supply

The fuel must be taken from the vehicle fuel tank or from a separate tank (see Figs. 8, 9 and 10). This separate fuel pickup precludes any effect of pressure.

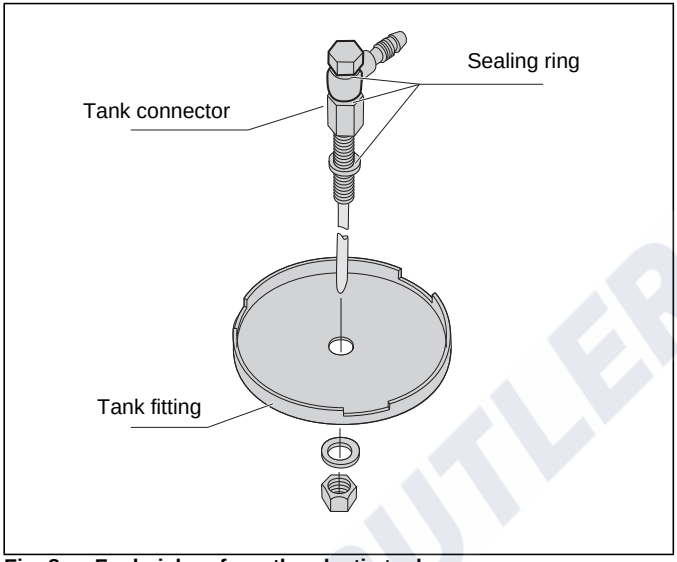


Fig. 8 Fuel pickup from the plastic tank
(Pickup via tank fitting)

NOTE:
Deburr the cut on the tank connector after sawing it off and remove any metal chips.

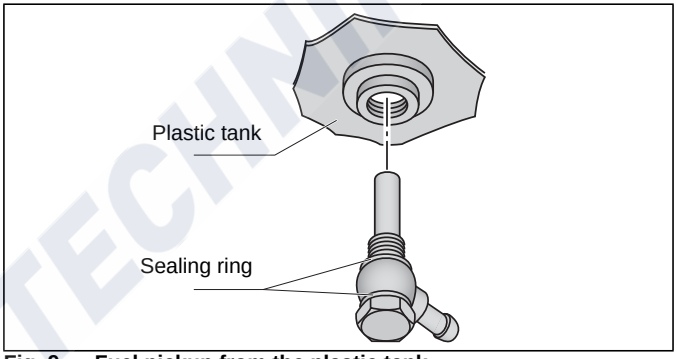


Fig. 9 Fuel pickup from the plastic tank
(Pickup via tank drain screw)

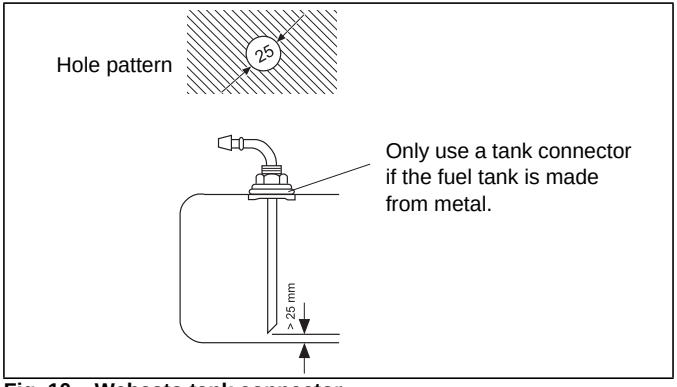


Fig. 10 Webasto tank connector

NOTE on Fig. 10:
The fitting must be made from metal!

7.1 Brennstoffleitungen

Only steel, copper and plastic lines of plasticised, light and temperaturestabilised PA 11 or PA 12 (e.g. Mecanyl RWTL) in accordance with DIN 73378 may be used for the fuel lines.

NOTE:
The hose clips must be tightened with a torque of 1.0 + 0.4 Nm.
Leaking fuel must be removed before starting the engine or heater.

IMPORTANT:
If PME (vegetable oil methyl ester) is used as fuel, care must be taken to ensure that the fuel lines and fuel filter are resistant to PME.

Do not use an angle cutter to cut a Mecanyl fuel line!

Since the lines normally cannot be routed with a constant uphill gradient, the inside diameter must not be allowed to exceed a certain size. Air or gas bubbles will accumulate in lines with an inside diameter of more than 4 mm and cause malfunctions if the lines sag or run downwards.
The diameters specified in Fig. 7 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 sagging. The lines must be installed in such a way that they cannot be damaged by flying chippings and high temperatures (exhaust line).

7.2 Connecting 2 pipes with a hose

The correct procedure for connecting fuel lines with a hose is illustrated in Fig. 11.

Ensure that there are no leaks!

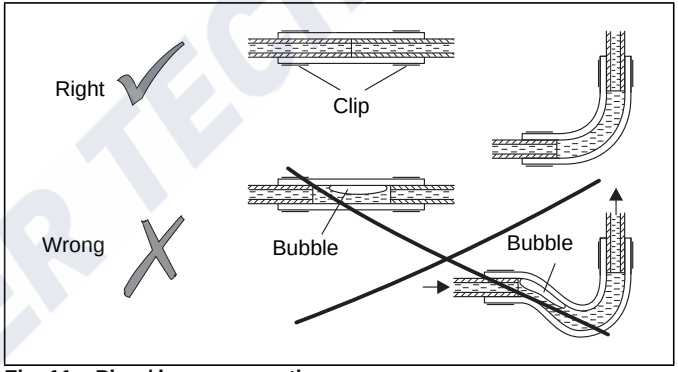


Fig. 11 Pipe / hose connection

7.3 Metering pump

The metering pump is a combined delivery, metering and shutoff system and is subject to specific installation criteria (see Figs. 7, 12 and 13).

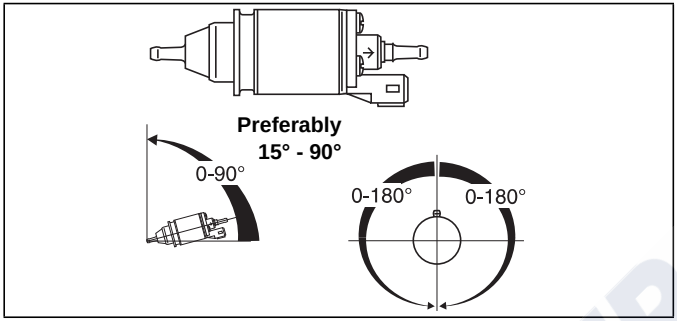


Fig. 12 Metering pump DP 2, Installation position

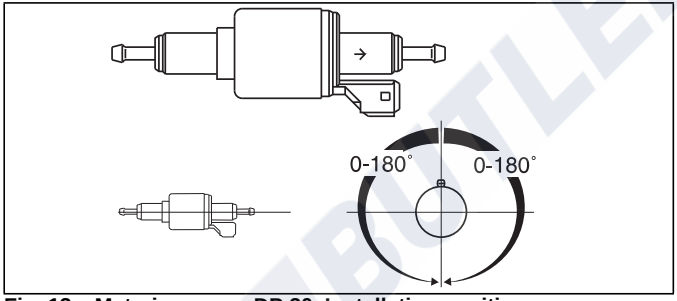


Fig. 13 Metering pump DP 30, Installation position

7.3.1. Installation position

Before installing the metering pump, ensure that the maximum pressure occurring at the pickup point is less than 0.2 bar.

It is advisable to install the metering pump in a cool place. The permissible ambient temperature must not exceed + 20 °C at any time during operation.

Metering pump and fuel lines must not be installed within range of radiated heat from hot vehicle parts. A heat shield must be used if applicable. The pump should preferably be installed near the tank.

7.3.2. Installation and attachment

The metering pump must be secured with a vibration-damping suspension. Its installation position is limited as shown in Figs. 12 and 13 in order to ensure effective auto-bleeding.

7.4 Sticker

The sticker "Switch off heater before refuelling" must be affixed at a suitable point.

7.5 Fuel filter

Only a Webasto filter, order no. 487 171, is allowed to be used if the fuel is expected to be contaminated. Install vertically if possible, however at least horizontally.

NOTE:

Note the installation position and direction of flow.

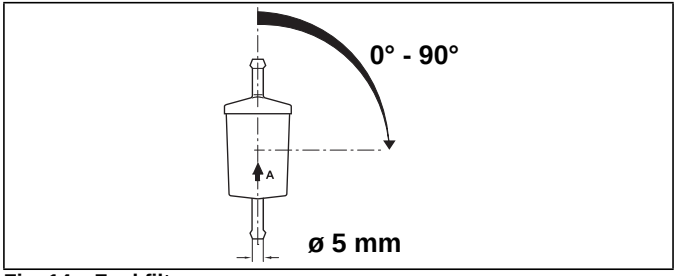


Fig. 14 Fuel filter

8 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 so that it cannot become clogged with dirt or snow and cannot suck in splashing water.

The combustion air intake line can be routed with several bends (270° altogether, minimum bending radius 50 mm).
The maximum line length equals 1000 mm.

A combustion air intake line is required.

The combustion air intake must not be routed above the exhaust outlet.

If the heater is installed in a common installation space near the vehicle tank, the combustion air must be taken in from the outside and the exhaust gas discharged into the atmosphere. The openings must be splash-proof.

A ventilation opening measuring at least 3 cm^2 is required if the heater is installed in an enclosed box. The size of the ventilation opening must be increased subject to consultation with Webasto if the temperature in the box exceeds the permitted ambient temperature of the heater (see Technical data).

9 Exhaust line

The exhaust line (inside diameter 22 mm) can be routed with several bends (270° altogether, minimum bending radius 50 mm).

The total length of the exhaust line must be not less than 500 mm. The maximum line length equals 1000 mm.

The exhaust muffler should preferably be installed near the heater, but at least 200 mm away from the heater.

The exhaust muffler must not be installed near the combustion air intake opening.

Do not operate the Thermo 50 heater without a muffler.

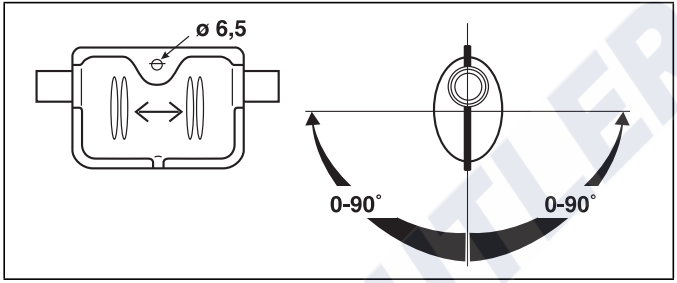


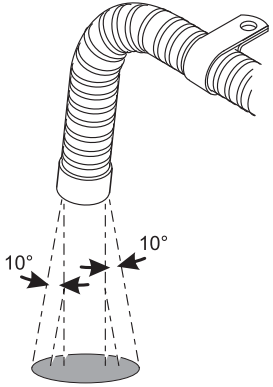
Fig. 15 Exhaust muffler, Direction of flow as desired

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 line. The exhaust pipe is secured to the heater using a clamping collar, for example. See the statutory regulations for other requirements.

Only for ADR: The statutory regulation of ADR (Accord européen relatif au transport international des marchandises dangereuses par route) governing the routing of the exhaust line, part 9 para. 9.2.4.7, must be adhered to.

An attachment is required no further than 150 mm from the end of the exhaust pipe to ensure that the angle of 90° ± 10° is achieved.



Discharge direction almost vertical 90° ± 10°

Fig. 16 Exhaust pipe opening, Installation position

10 Electrical connections

10.1 Connection of control unit / heater

The electrical connection of the heaters is made as shown in Figs. 17 to 22.

10.2 Connecting the controls

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

– Timer see circuit diagram Fig. 17.
– Switch see circuit diagram Fig. 18.

10.3 Connection when installing Thermo 50 in a hazchem vehicle (ADR)

The electrical connection is made as shown in the circuit diagram, Figs. 19 to 22.

NOTE:
The switch of the auxiliary power take-off must be installed in such a way that either a positive or a negative potential is connected to input X14 of the control unit when a pumping device is switched on.

IMPORTANT:
All ADR functions are ineffective if there is no earth at control unit input X14 when the system is switched on. The control unit continues to run briefly for 20 seconds and then switches to "fault lock-out" operating mode when a positive voltage is connected to control unit input X14 (auxiliary power take-off on).

In accordance with the technical specifications of the act governing the road haulage of hazardous materials, heaters are only allowed to be taken into service with a special manually operated switch fitted in the cab. If the system is equipped with a standard clock, ensure that contact 4 on the standard clock remains free. The heater can then only be taken into service using the immediate heat button (circuit diagram available on request).
The use of other timers in ADR vehicles is not permitted.

10.4 Vehicle fan

The vehicle's own heater fan is controlled using a relay, see circuit diagram Figs. 17 to 22, or using a relay with a cabin thermostat.

11 Circuit diagrams

11.1 Legend for circuit diagrams

(1) Vehicle fan fuse installed in vehicle

(2) with positive at connection 10 = Continuous operation with immediate heating

Connection 10 open = Variable heating duration can be programmed (10 min to 120 min); default setting 120 min

(3) This connection must remain open in ADR vehicles! (No timer function)

Cable cross-sections

	Length < 7.5 m	Length 7,5 - 15 m
———	0.75 mm^2	1.0 mm^2
- - - -	1.0 mm^2	1.5 mm^2
▬▬▬	1.5 mm^2	2.5 mm^2
═══	2.5 mm^2	4.0 mm^2
▬▬▬	4.0 mm^2	6.0 mm^2

Cable colours

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

Item	Designation	Comment
A1	Heater	Thermo 50
A2	Control unit	
B2	Temperature sensor	
E	Glow plug / flame monitor	
F1	Fuse 15 A	Flat fuse SAE J 1284
F2	Fuse 5 A	Flat fuse SAE J 1284
F3	Fuse	Fuse same as vehicle fan fuse (max. 20 A)
H1	LED (in item P)	Switch-on indicator
H2	LED (in item P)	Indicator
H3	Light (in item P)	Display light
H4	Light	Indicator
H5	Light min. 1.2 W	Switch-on indicator pumping device
K2	Relay	For pumping device
K3	Relay (in item A3)	Vehicle fan
M1	Motor	Combustion air fan
M2	Motor	Circulation pump
M3	Motor	Vehicle fan
P	Timer, digital	For programmed operation
S1	Switch for vehicle fan	S1 or S2 depending on vehicle
S2	Switch for vehicle fan	S1 or S2 depending on vehicle

Item	Designation	Comment
S3	Switch	Immediate heat button
S4	1 or 2-pin disconnecting switch	Emergency off switch, electric or pneumatic
S5	Switch	To pumping device 1
S6	Switch	To pumping device 2
S7	Momentary-contact switch	Immediate heat button / remote control
X1	6-pin plug connection	
X2	2-pin plug connection	
X3	2-pin plug connection	
X4	2-pin plug connection	
X5	2-pin plug connection	
X6	2-pin plug connection	
X8	2-pin plug connection	Diagnostics
X11	2-pin plug connection	
X12	12-pin plug connection	Timer
X13	1-pin plug connection	Battery isolation switch
X14	1-pin plug connection	Auxiliary power take-off
X15	4-pin plug connection	On / off switch
Y1	Metering pump	
Y2	Solenoid valve	for pumping device 1
Y3	Solenoid valve	for pumping device 2

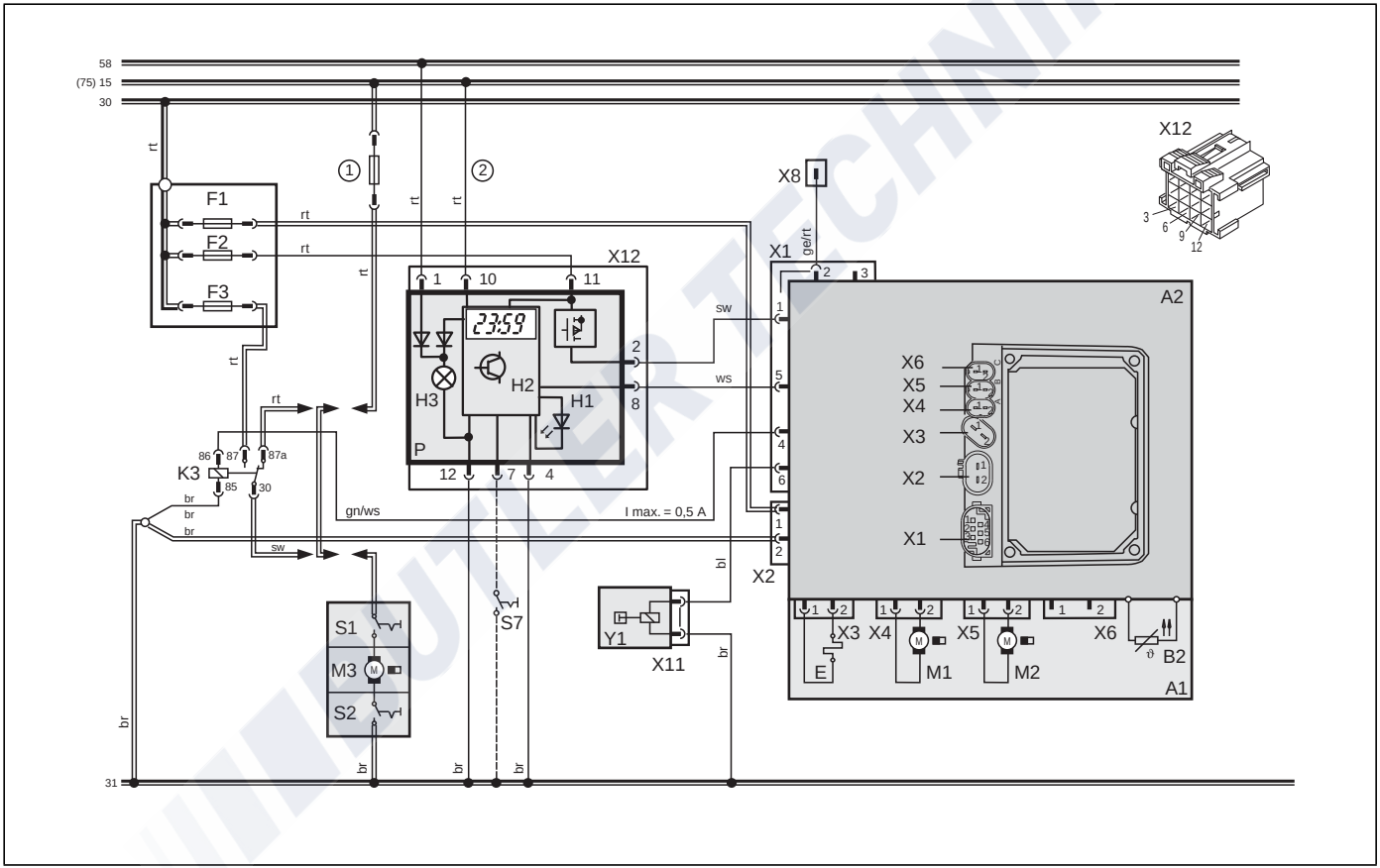


Fig. 17 Circuit diagram for Thermo 50, 24 V timer (legend see page 45)

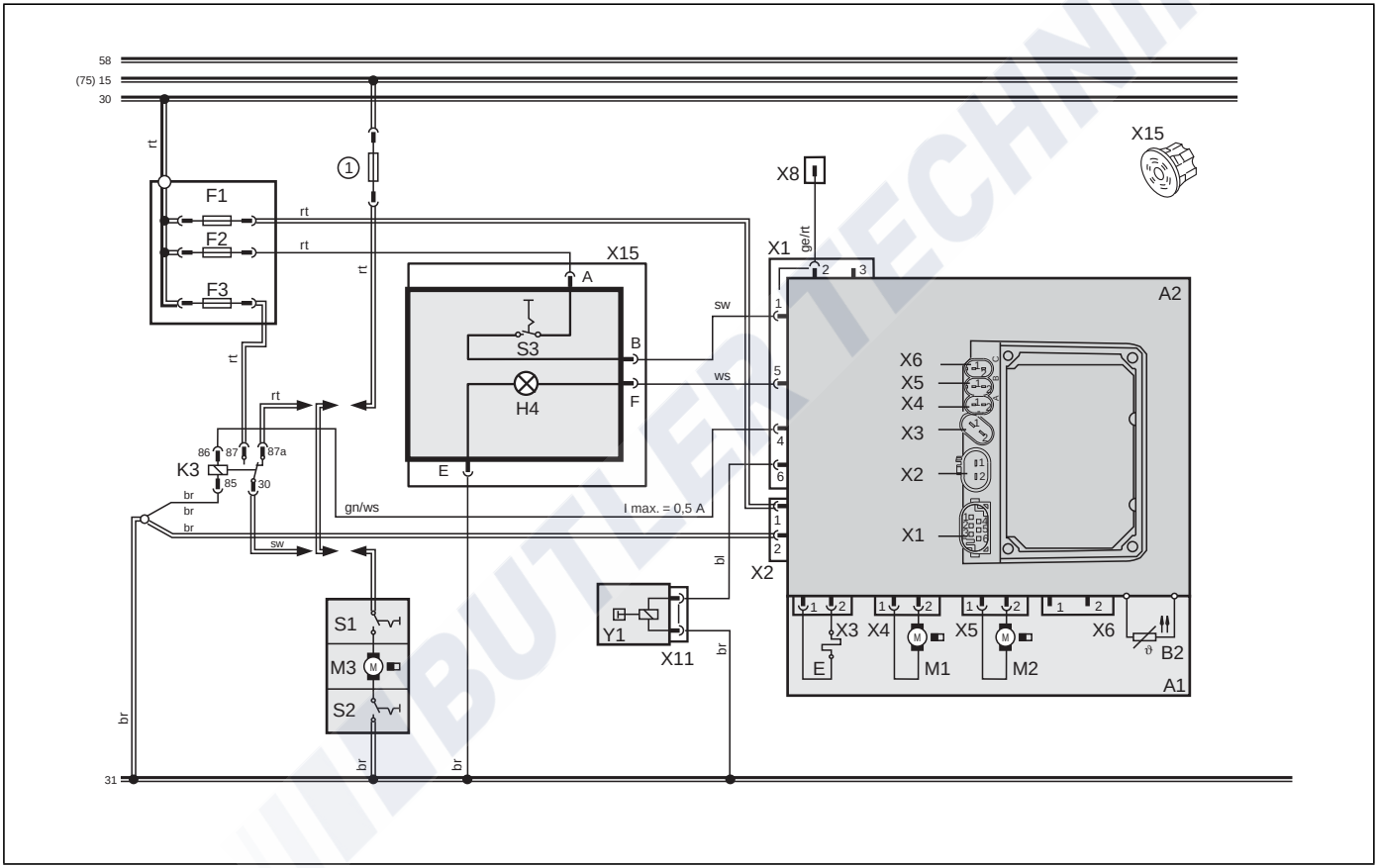


Fig. 18 Circuit diagram for Thermo 50, 24 V switch (legend see page 45)

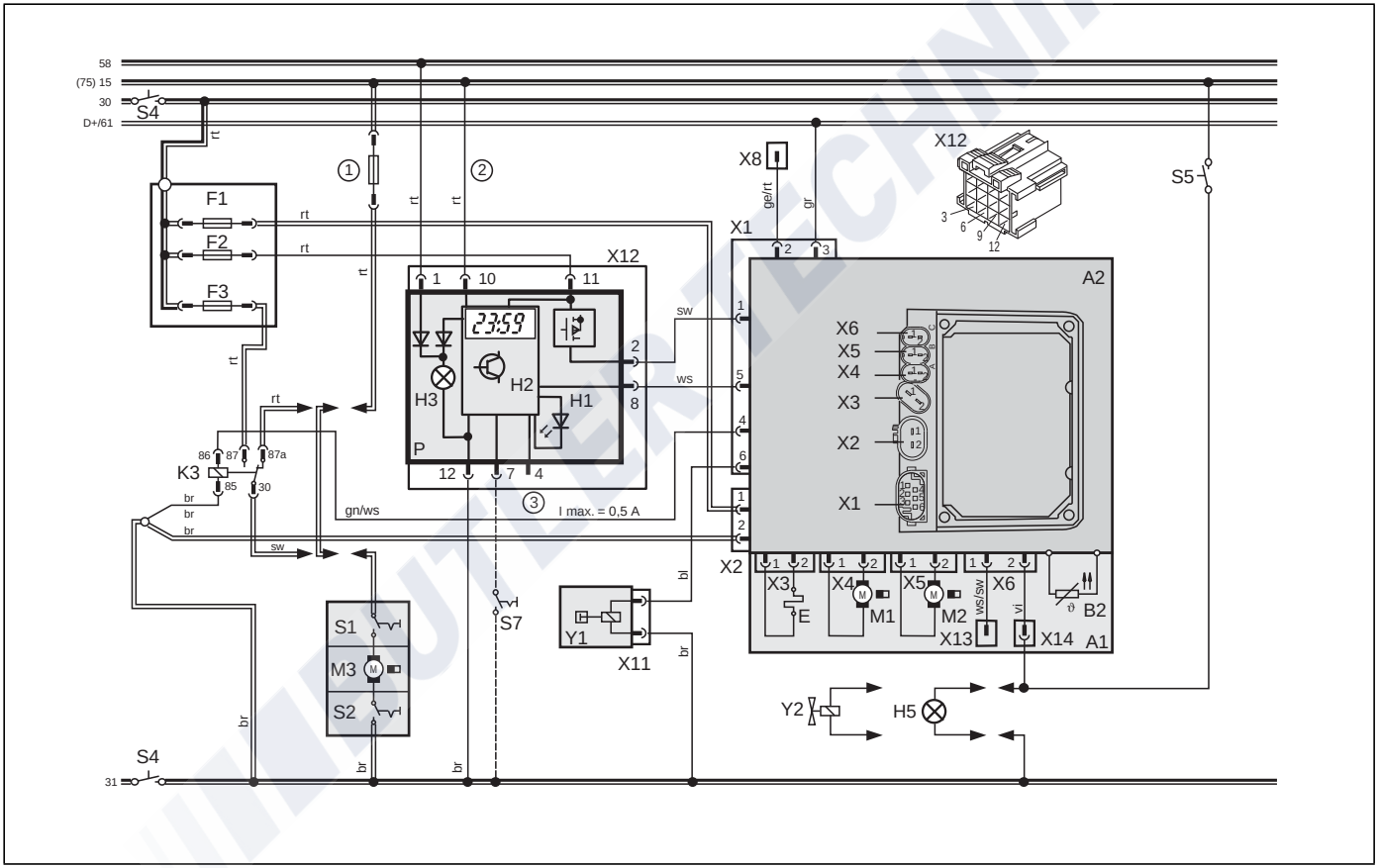


Fig. 19 Circuit diagram for Thermo 50, 24 V timer with one auxiliary power take-off (legend see page 45)

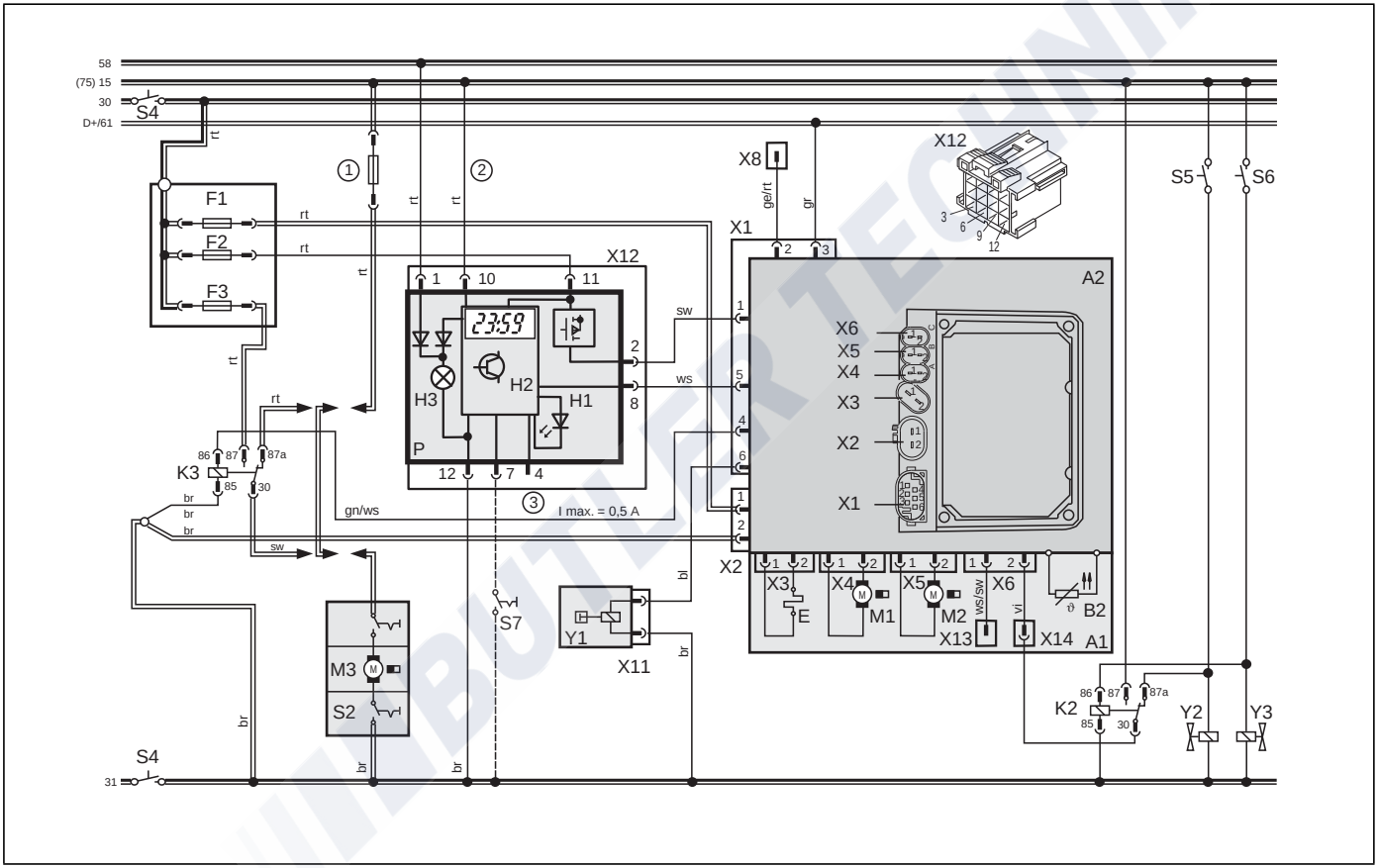


Fig. 20 Circuit diagram for Thermo 50, 24 V timer with two auxiliary power take-offs (legend see page 45)

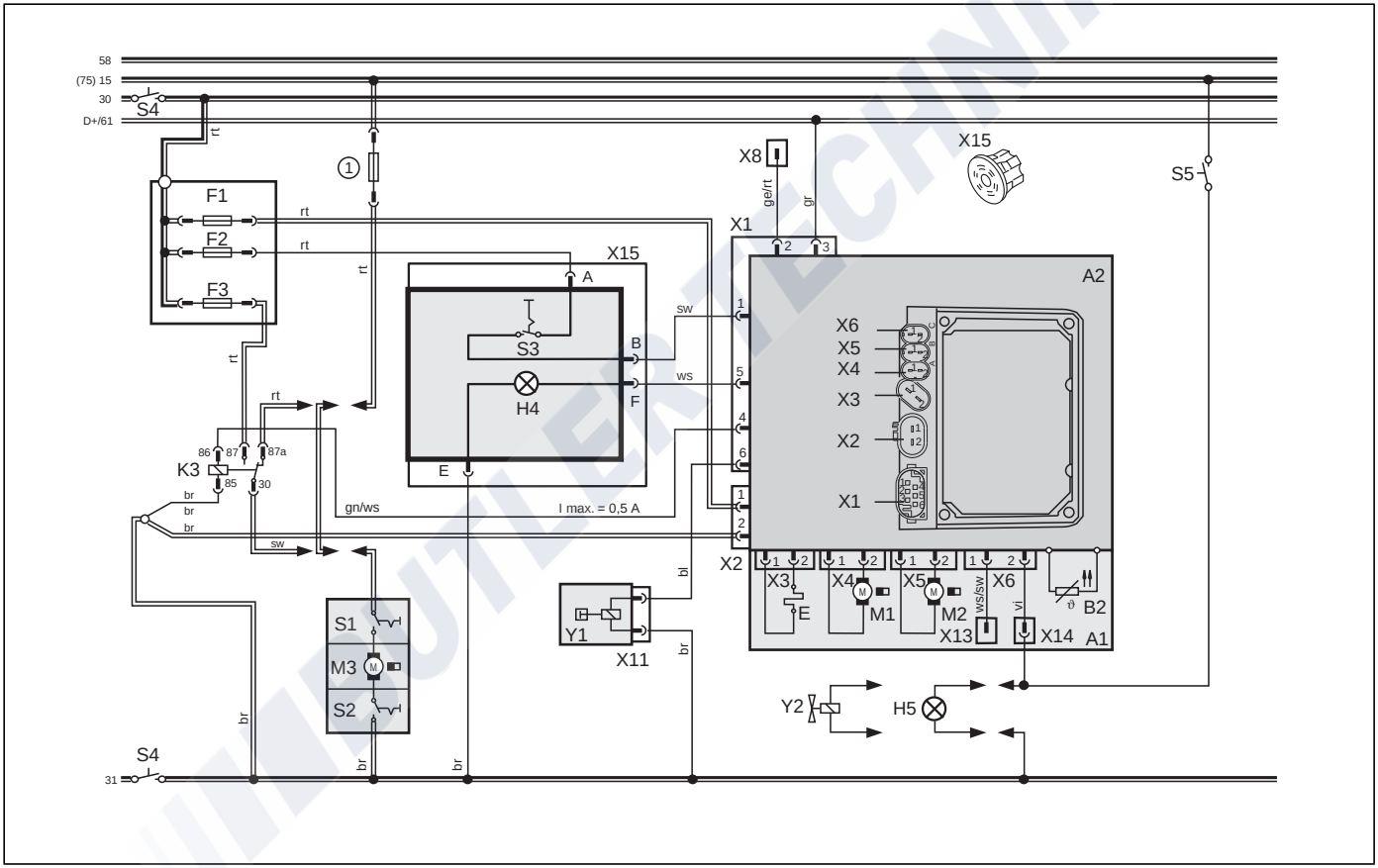


Fig. 21 ADR circuit diagram for Thermo 50, 24 V switch with one auxiliary power take-off (legend see page 45)

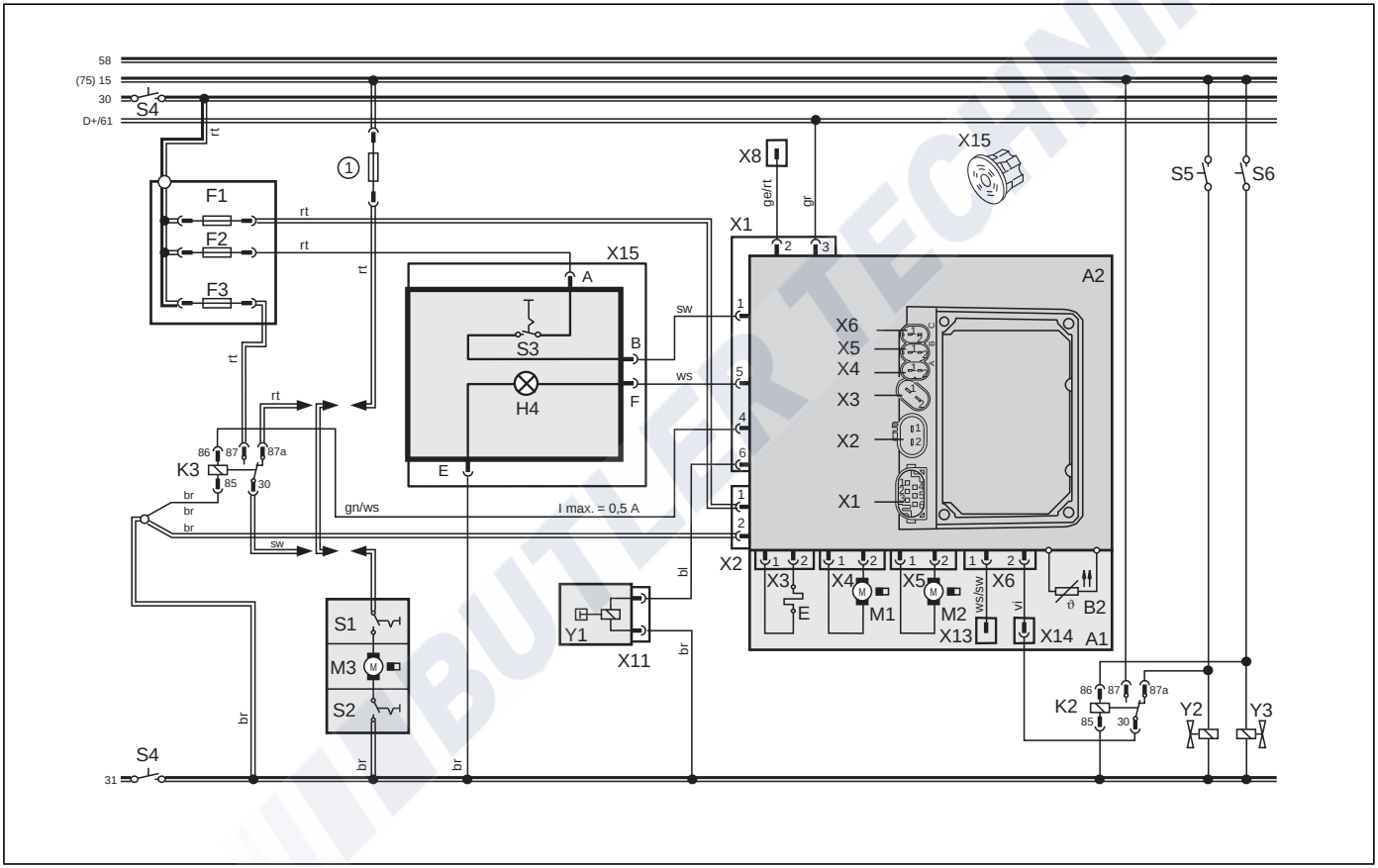


Fig. 22 ADR circuit diagram for Thermo 50, 24 V switch with two auxiliary power take-offs (legend see page 45)

12 Initial start-up

NOTE:
The safety instructions in the operating and maintenance instructions must be observed without fail.
The operating and maintenance instructions must be read through without fail before starting the heater.

After installation of the heater, carefully bleed the water circuit and the fuel supply system. Observe the regulations issued by the vehicle manufacturer when doing this.

All water and fuel connections must be checked for leaks and secure attachment during a trial run of the heater. If the heater switches to fault mode during operation, the fault must be located and remedied.

BUTLER TECHNIK

13 Faults

13.1 Fault lock-out due to faults in the heater

Fuel is supplied for max. 180 seconds if the flame does not start to burn.

The fuel supply is shut off immediately if the system overheats (temperature limiter is tripped).

In all cases (except a fault in the combustion air fan), the fan is interrupted for 5 seconds and the heater continues to run for 120 seconds after a fault lock-out. The run-on times may vary, depending on the software version in the control unit.

IMPORTANT:
If the system is equipped with a standard clock, a fault message appears on the display of the timer after a fault occurs.
If the system is operated with a switch, the nature of the fault is indicated by a flashing code on an indicator light during the run-on time of the heater.
See the fault code output in the operating and maintenance instructions for more information.

13.2 Fault lock-out in case of undervoltage or overvoltage

A fault lock-out with a regular switch-off procedure takes place if there is an undervoltage of < 21 volts (measured at the wiring harness input) for 20 ± 1 seconds.

A fault lock-out with a regular switch-off procedure also takes place if there is an overvoltage of > 32 volts (measured at the heater) for longer than 6 ± 0.5 seconds.

13.3 Cancelling the fault lock-out

Once the cause of the fault has been eliminated, the fault lock-out is cancelled by switching the heater off and on again.
After overheating, the fault lock-out is cancelled by removing fuse F1, 15 A for at least 10 seconds.
The fuse is not blown after overheating.

14 Technical data

Except where limit values are specified, the technical data on the right refer to the usual heater tolerances of ± 10 % at an ambient temperature of +20 °C and at nominal voltage.

14.1 Fuel for Thermo 50 (diesel / PME):

Diesel oil or PME fuel authorised by the vehicle manufacturer is suitable for use as fuel. When changing over to low-temperature fuels, the heater must be operated for approx. 15 minutes so that the fuel line and fuel pump are also filled with the new fuel.
Negative influences due to additives are not known.

Circulation pump	4847
Flow rate at 0.1 bar	900 l/h
Nominal voltage	24 volts
Operating voltage range	18 to 32 volts
Nominal power consumption	15 W
Dimensions, circulation pump	Length 95 mm Width 61 mm Height 61 mm
Weight	0.3 kg

Heater	Operation	Thermo 50 diesel/PME
ECE approval mark		E1 00 0004 (Heater) E1 03 1628 (EMC)
Type		Water heater with evaporator-type burner
Heat output	Full load Part load	5.0 kW 2.2 kW
Fuel		Diesel / PME
Fuel consumption	Full load Part load	0.63 l/h 0.27 l/h
Nominal voltage		24 volts
Operating voltage range		18 to 32 volts
Nominal power consumption with circulation pump (without vehicle fan)	Full load Part load	50 W 34 W
Perm. ambient temperature: Heater: - Operation - Storage Metering pump: - Operation		 -40 to +60 °C -40 to +120 °C -40 to +20 °C
Perm. operating pressure (heat carrier)		0.4 to 2.5 bar
Capacity of the heat exchanger		0.15 l
Minimum capacity of the circuit		4.00 l
Minimum flow rate for the heater		250 l/h
CO_2 in exhaust gas (perm. function range)		7.0 to 12.0 % by vol.
Heater dimensions (Tolerance ± 3 mm)		Length: 237 mm Width: 106 mm Height: 193 mm
Weight		2.9 kg

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