# Operation manual

AIR HEATER

**AUTOTERM Air 4B**

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## Contents

## 1. Introduction

This Operation Manual is intended to familiarize the User with salient features, operation, assembly and operating procedures for air heater AUTOTERM AIR 4B (hereinafter called «the heater») intended for heating a vehicle driver workplace and various compartments of a motorized vehicle at atmospheric temperatures as low as -45°C (-113°F).

Minor changes performed on the heater structure by the Manufacturer may not be documented in this Operation Manual.

## 2. Basic Parameters & Specifications

The basic heater specifications are quoted in Table 1.

The basic parameters are quoted to a margin of ±10% tolerance at a temperature of 20°C (68°F) at a nominal voltage (table 1).

| | |
|---|---|
| Nominal Supply Voltage, V | 12 |
| Fuel Type | Petrol<br>EN 228 |
| Heating Efficiency:<br>max, kW,<br>min, kW, | <br>4<br>1 |
| Heated Air Volume:<br>Max, $m^3$ /h<br>Min, $m^3$ /h | <br>168<br>70 |
| Fuel Consumption at:<br>Max power, l/h (gal/h)<br>Min power, l/h (gal/h) | <br>0,53(0,12)<br>0,15(0,03) |
| Heater power consumption, W<br>Doesn't exceed while heating mode<br>Max, W<br>Min, W | <br><br>60<br>10 |
| Start/Stop Mode | Manual |
| Maximum Weight, kg (lb) | 10(22) |

## 3. Safety Measures

3.1 The installation of the heater and its fittings shall be performed by authorized organizations only.

3.2 The heater may only be used for the purposes specified herein.

3.3 The fuel supply line shall not be installed inside the passenger compartment or cabin of a motor vehicle.

3.4 A vehicle that uses the heater shall be equipped with a fire extinguisher.

3.5 The environment where the heater is to be used shall be free of highly inflammable vapors and a large quantity of dust.

3.6 To prevent the possibility of exhaust gas poisoning, the heater shall not be used when the vehicle is in an enclosed area (garage, workshop, etc.).

3.7 When refueling the vehicle, the heater shall be switched off.

3.8 When performing welding operations on the vehicle or repairs on the heater, disconnect the heater from the vehicle battery.

3.9 When assembling or dismantling the heater, observe the safety measures specified by electric work regulations for the fuel supply system and the vehicle's wiring system.

3.10 The heater shall not be connected to the vehicle electric circuit while the engine is running or the battery is switched off.

3.11 The heater is powered from the accumulator battery regardless of the availability of the vehicle frame connection

3.12 **The heater's electric power supply must not be disconnected before the end of the purge cycle.**

3.13 The heater's connectors must not be connected or disconnected while the heater's electric power supply is turned on.

3.14 It is forbidden to step on a heater and to put on it subjects.

3.15 It is forbidden to cover a heater with articles of clothing, pieces of fabric, etc. and as to place them before its entrance or an exit of heated air.

3.16 Wait 5 to 10 seconds before switching the heater back on.

3.17 In the event of two subsequent ignition failures, contact the maintenance department to report a malfunction.

3.18 In the event of a failure in heater operation, contact a designated repair organization authorized by the Manufacturer.

3.19 Manufacturer warranty shall not apply if the above requirements are not adequately met.

## 4. Description of Heater Structure and Operation

The heater operates independently from the vehicle engine.

The fuel and electric power supply is provided by the vehicle. See Figure 4.1 for the heater wiring diagram.

The heater is a self-contained heating device comprising the following:

- Heating device (See Figure 4.2 for basic components thereof);
- Fuel supply pump providing fuel for the combustion chamber;
- Ignition and indicator device (control panel);
- Wiring harness connecting heater fittings to the vehicle battery.

The heater's operating principle is based on heating air driven through the heater's heat exchange system.

The heat sources are fuel combustion gases from the combustion chamber. The resulting heat warms the walls of the heat exchanger, which is air-blown from the outside. Air passes through the ribbing of the heat exchanger and enters the passenger compartment or other compartments of the vehicle.

Upon ignition, control unit of heater checks the heater to ascertain whether fittings such as the flame indicator (the indicator of a flame combines in itself functions of the sensor of temperature of the heat exchanger and the overheat sensor), air pump motor, plugs, fuel supply pump and the electric circuits thereof are working properly.

If no problem is detected, the ignition process starts.

In accordance with the preset sequence, the combustion chamber is fore-purged and the heating plug warms up to the required temperature. Air and fuel starts to enter the combustion chamber under the same procedure, whereupon the ignition process is initiated. Once stable combustion is achieved, the heating plug switches off. Flame control is provided by the flame indicator. All processes involved in heater operation are monitored by the control unit.

The control unit controls heat exchanger temperature and halts the combustion process as soon as the temperature exceeds the specified limit. The heater may be switched off at any time.

Pressing the heater deactivation command stops the fuel entering and the combustion chamber is purged with air.

During automated operation control of the heater in emergency situations, bear in mind the following:

1) In the event of ignition failure, the process will be repeated. The heater will switch off following two consecutive ignition failures;

2) If combustion stops during heater operation, the heater switches off.

3) If the heat exchanger is overheated (maybe as a result of closure of the heater inlet/outlet vents), the heater will switch off automatically;

4) If voltage drops below 10V or exceeds 16V the heater will switch off.

5) Malfunctions occurring during heater operation are coded and automatically displayed on the control panel by blinking of the red LED (with pause). For malfunction reset, press any key.

## 5. Control Unit

The control unit and the control panel control the heater.
The control unit performs the following functions:
a) initial diagnostics (serviceability check) of heater fittings during ignition,
b) diagnostic of heater elements throughout operation,
c) heater activation/deactivation by command from control panel;
d) combustion process control;
e) automated switching of ventilation after the combustion process stopped;
f) automated deactivation of the heater occurs:

- in the event of failure of one of the controlled elements,
- when any parameter exceeds the specified limit (heat exchanger temperature, supply voltage, combustion chamber flame failure)
- at flame failure in the combustion chamber

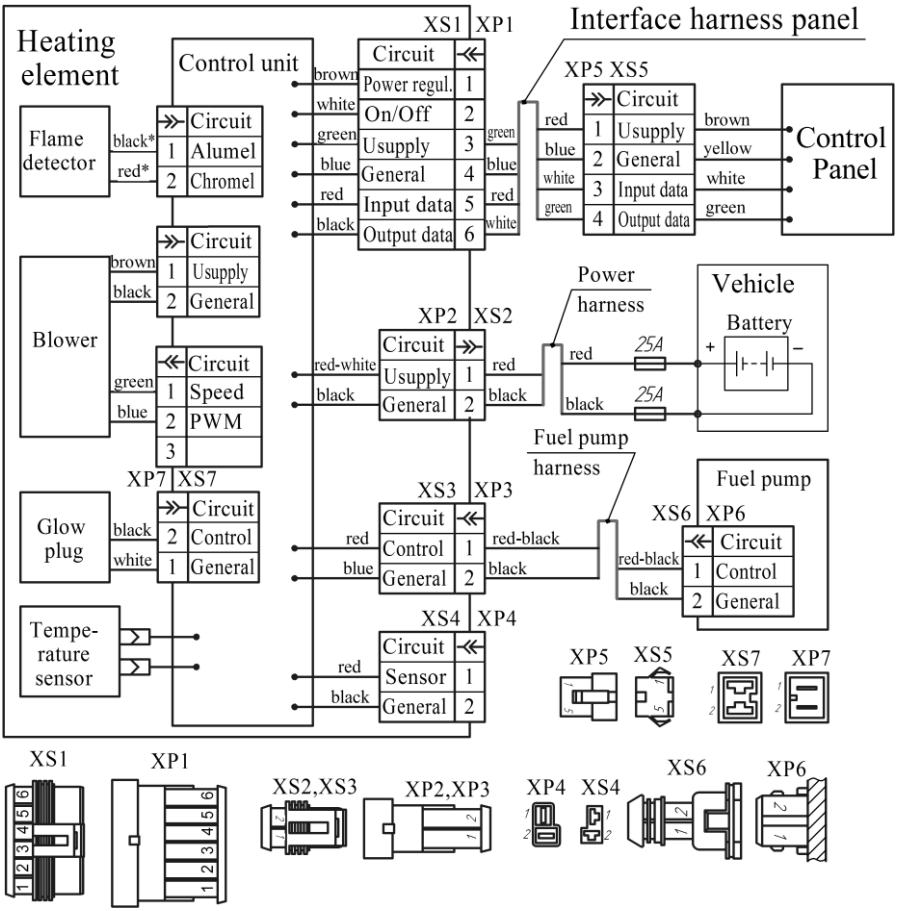



Figure 4.1- Wiring Diagram

1. View of connector show from contact side;
2. * - Color of tags on wires.

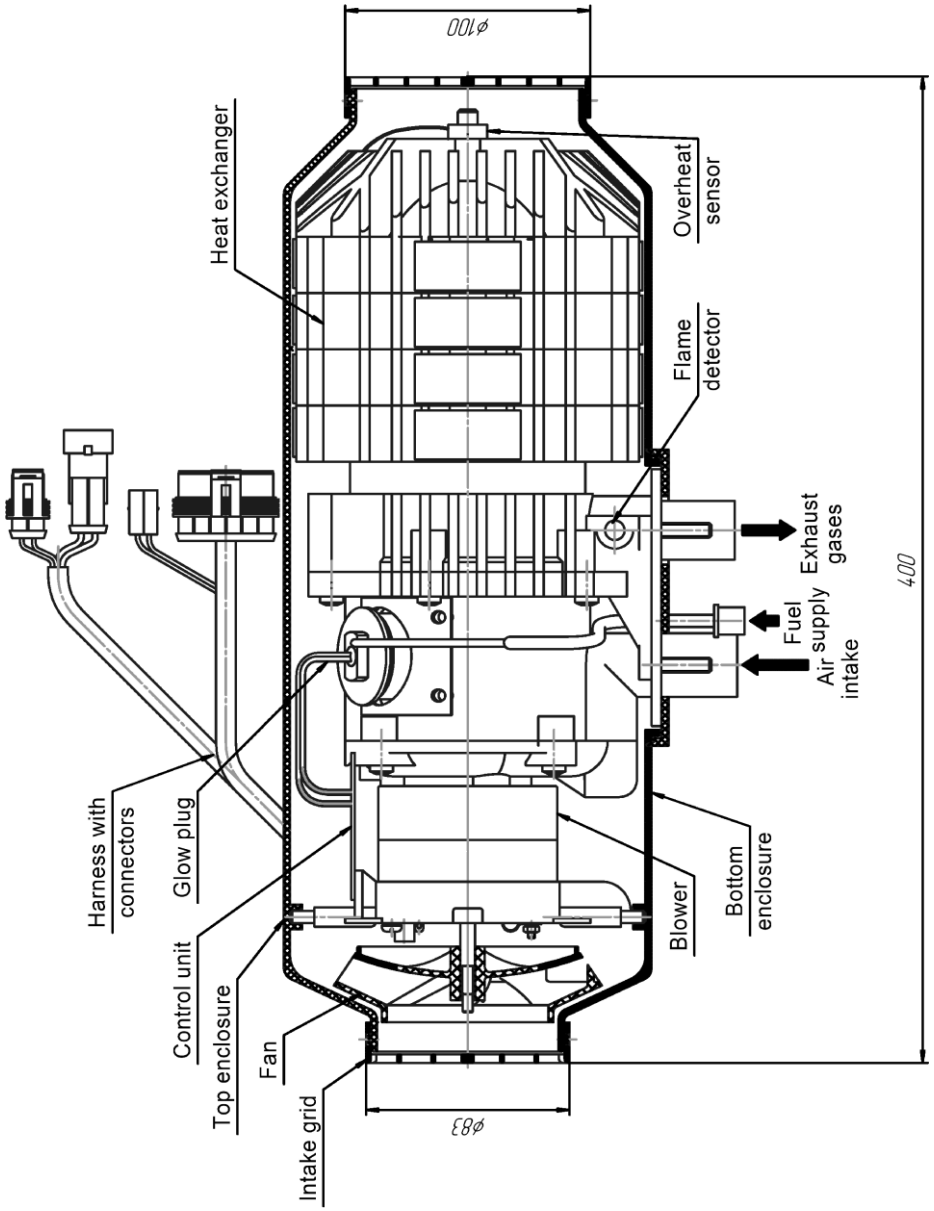



Figure 4.2 – Basic Heater Components

## 6. Scope of Supply

Main parts of the heaters are connected as shown in Fig. 6.1.

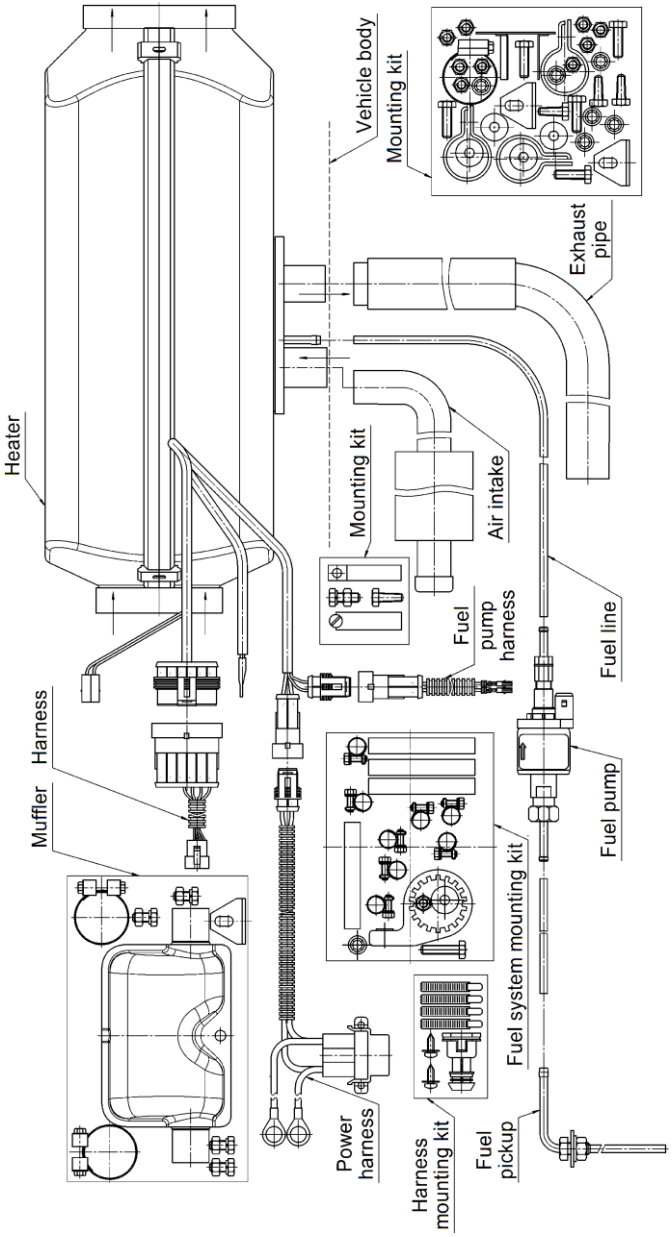



Figure 6.1 – Connection Diagram of Basic Heater Components

## 7. Installation Requirements

7.1 Heater Installation

Installed the heater indoors while bearing in mind the permissible operating positions shown in Figure 7.1 and 7.1a. The figure 7.1 shows the two maximum assembly positions of the heater. Positioned the heater's inlet vent in such a way to prevent absorption of vehicle/heater exhaust gas in normal operating conditions. The gap between the walls/partitions and the edge of the inlet vent shall be at least 50 mm (see Figure 7.1). The distance between the walls/partitions and the edge of the outlet vent shall be at least 150mm. When assembling or operating the heater, ensure that no foreign objects enter the inlet/outlet vents. Prior to assembly, ensure availability of spare heating plug and bear in mind dismantlement requirements, as this will permit easier maintenance in future. At installation of the heater check that its case had no contact both with a floor and with other parts of a cabin or a manned compartment. See Figure 7.2 for how to position mounting holes to install the heater into the motor vehicle casing.

At installation to the heater of air ducts, they shouldn't have the deformations reducing the section through passage of an air duct. The maximum length of an output air duct shouldn't exceed 5 meters of total length. In case the heating element is located on the side, the fuel pipe must be installed above the product axis.

**ATTENTION!! To ensure reliable performance, follow the above recommendations carefully. Install the heater horizontally as shown in Figure 7.1.**

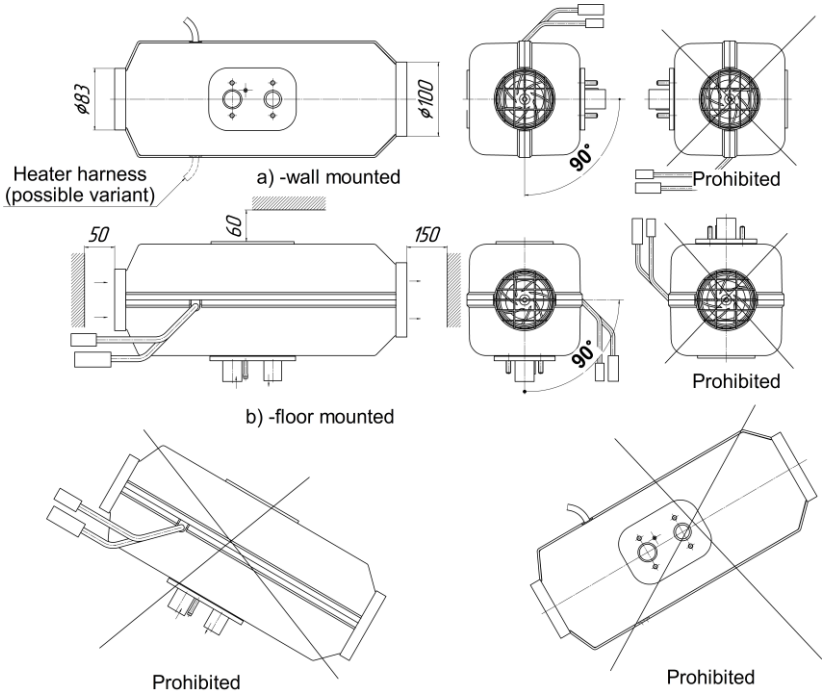



Figure 7.1 – Variants of installation of a heater.

At installation of the heater check that its case had no contact both with a floor and with other parts of a cabin or a manned compartment. Non-performance of this requirement can lead to deformation of the heater case, jamming of the air fan and a possible overheat.

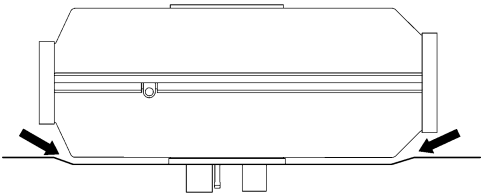


Fig. 7.1a - reserve free space

7.2 Air Inlet Installation

Air necessary for burning, should not be soaked up from salon or a cabin and a car luggage space. Position the pipe's air inlet vent to prevent snow entering or choking the pipe and to allow incoming water to run off. **The entrance aperture of an air inlet is forbidden to have against a running air stream at car movement.**

7.3 Exhaust Pipe Installation

When installing the exhaust pipe, be mindful of its high operating temperature. Cut the exhaust pipe (a flexible corrugated metal hose) to size. Fix the exhaust pipe in place using clamps and position it at a slight angle following the trajectory of gas flow. To protect some parts of the vehicle (electric wiring and other harness) from high temperatures, there must be heat insulation installed.

To achieve a tight fit, prior to connecting the exhaust pipe to the heater pipe, make a saw-cut of about 15mm along the length of the exhaust pipe without going beyond the gripped part of the pipe. Ensure that the end of the exhaust pipe does not come into contact with the rubber seal of the heater. Direct exhaust gas outside. Position the gas outlet vent and the air inlet vent in such a way as to prevent exhaust gas from entering the combustion chamber. Ensure that exhaust gas does not enter the passenger compartment of the vehicle and that it does not get sucked in through the vehicle fan.

Do not allow exhaust gas to affect the performance of vehicle components.

Position the exhaust pipe outlet vent so as to prevent snow entering or choking the pipe and to al-low incoming water to run off. At the vent of the exhaust pipe the screen is installed, this necessary for stable operation of the heater while working low idle.

**The exhaust outlet of an exhaust pipe is forbidden to have against a running air stream at car movement.**

The correct installation of the exhaust and air intake pipes is when they are on the same side (Fig.7.3a/b). The distance between them should exclude re-suction of exhaust gases through the air intake (at least 20 cm).

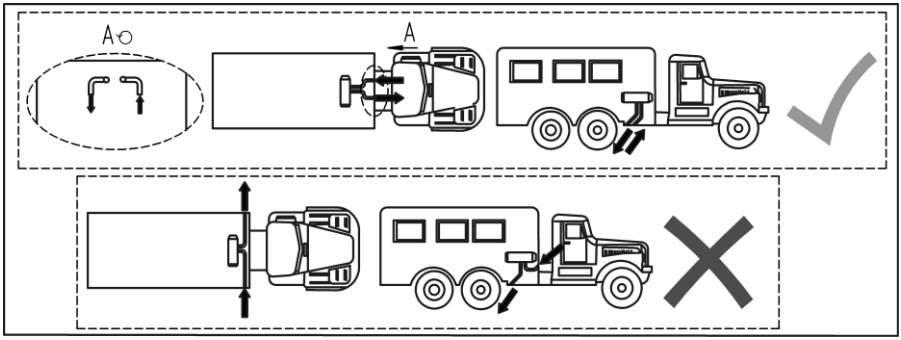



**Fig. 6a – Location of intake and exhaust pipe on land vehicles**

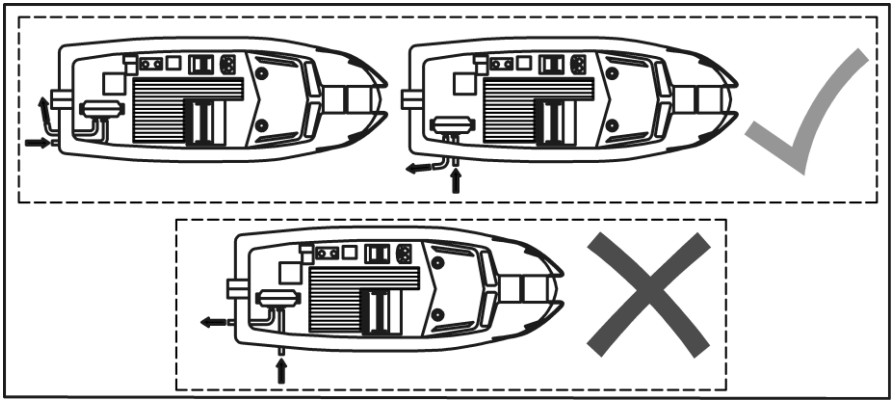


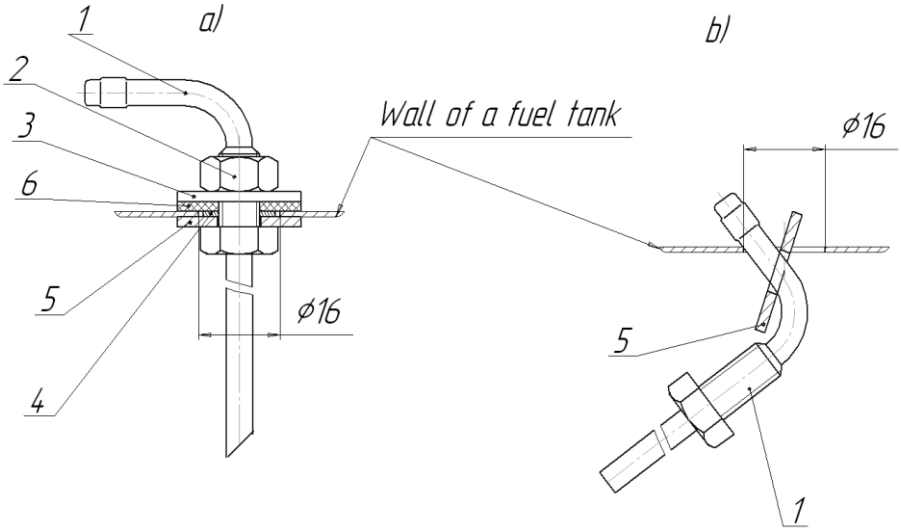
**Fig. 6b - Location of intake and exhaust pipes on maritime**

7.4 Installation a fuel supply intake in a regular tank of the car

Fuel can enter the heater through a fuel supply intake from the regular fuel tank of the car. Fuel supply intake must be installed into regular fuel tank of the car according to fig. 7.4.

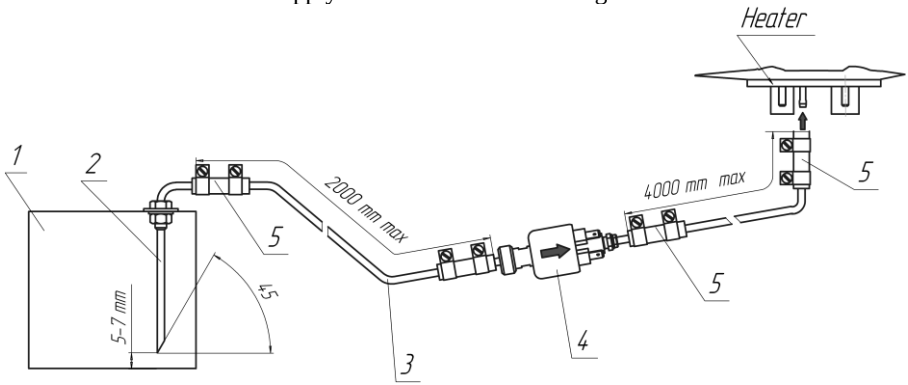
a). Perform installation of special washer with fuel supply intake to the tank inlet according to fig.7.4;

b). Perform installation of the fuel supply line from fuel supply intake to the heater according to fig.7.5.




1 - fuel supply intake
2- nut M8
3- washer 8
4-washer 8
5- special washer
6-gasket

Рис. 7.4 – Fuel supply intake installation in a regular tank of the car




1- regular fuel tank of car
2- fuel supply intake
3- fuel supply line
4- fuel pump
5- sleeve

Figure 7.5 – Installation Diagram for Heater Fuel Supply System Using a fuel supply intake

7.5 Installation of Heater Fuel Supply System

To prevent emergency situations, follow these instructions carefully.

7.5.1 Installation of Heater fuel pump

The fuel supply pump should be mounted as close to the fuel tank as possible and positioned below the tank's lower fuel level.

The fuel supply pump should be mounted as close to the fuel tank as possible and positioned below the tank's lower fuel level.

The scope of supply heaters enters fuel pump manufacturing Thomas Magnete company. The spatial position of the fuel supply pump must comply with figure 8.6, ± 5 ° from the horizontal.

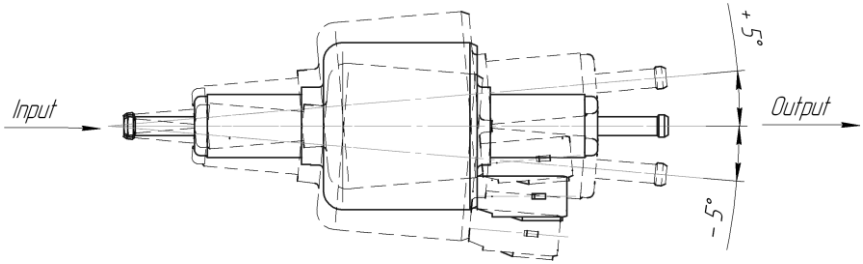



Figure 7.6- Permissible mounting position of fuel pump

7.5.2 When installing the fuel supply line, do not allow connecting sleeves to bend. Use a sharp knife to cut the fuel tube as in Figure 7.7. The cutting location shall be free of indentations, hairs and must not restrict flow through the tube.

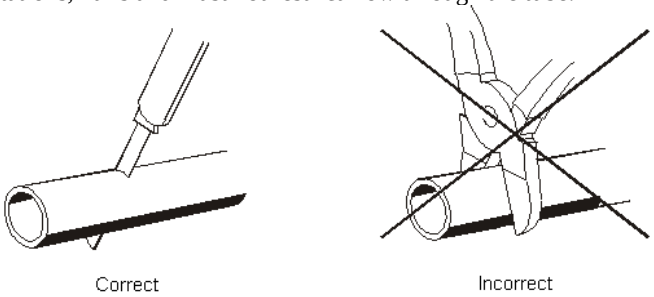



Figure 7.7 – Tube Cutting Prior to Installation

**ATTENTION** 1. Do not allow the fuel supply line or fuel supply pump to overheat. Do not install the fuel supply line and fuel supply pump near the exhaust pipe or on top of the engine.

2 The fuel supply line connecting the fuel supply pump to the heater should be installed at the same lifting angle.

7.6 Installation of Heater Electric Harness

Heater wire harnesses shall be installed in compliance with the heater wiring system as shown in Figure 4.1. During installing, ensure the harness is protected from overheating, kinking, and pinching. Secure the harness with cable nylon zip ties.

If it is necessary to shorten the fuel pump harness, cut out unnecessary portion from the middle of a harness. The junction needs to be insulated with a heat shrink tubing.

**Attention!** We recommend to cut a harness 500-700 mm from the cable ends. Splice the cut wires following color code and insulate splices with a heat shrink tubing. Put the splices back into split loom conduit and wrap it with an electrical insulation tape.

**Attention! Remove fuse before installation.**

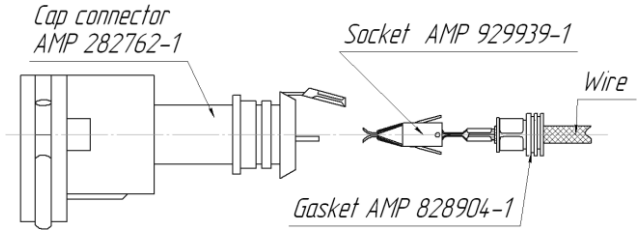



Figure 7.8 – Wire pins installation: push all the way in until click.

## 8. Post-installation Testing

8.1 When installing, ensure that:

- the fuel supply lines of the fuel supply system are leak-proof and all clamps are securely tightened,
- the electric contacts of the harnesses and heater elements are securely installed,
- the shift knob located on the control panel is turned to the far left position by being turned anti-clockwise as far as it will go following the click.

8.2 Install fuse 25A.

8.3 Fill the fuel pipe system with fuel with the help of fuel pumping device (fuel pumping device UPT-1 can be ordered at manufacturer). After filling the system check that the fuel pump system is not leaking.

8.4 Check that the heater is working:

- in ventilating mode,
- in heating mode.

The process of activation begins with purging of the combustion chamber. After purging the process of combustion begins and the heater goes on working in operation mode.

8.5 Deactivate the heater. While switching off the heater the fuel stops entering and the process of ventilation of the combustion chamber and heat exchanger starts.

8.6 Activate the heater while the vehicle engine is running and ensure that the heater is operational.

**ATTENTION! 1 When performing initial ignition following installation, the fuel supply line should be filled with fuel using a fuel pumping device until the fuel level reaches the inlet plug of the heater. If there is no pumping device, restart the heater as many times as necessary to fill the fuel supply line.**

**2 Remember that each time the heater fails to start at the first attempt, the heater will be restarted automatically by the control unit. If the heater is not activated after 2 attempts, there will be malfunction code on the Control panel.**

## 9. Recommendations

9.1 To ensure consistent performance, the heater should be switched on for up to 20-25 minutes each month throughout the year (warm seasons included). This will prevent the moving parts of the fuel supply pump from sticking, (which may be caused by leaving the heater movable fittings in low-quality fuel for a long period of time).

9.2 Reliable performance depends on the type of fuel used depending on the atmospheric temperature.

9.3 Check **the battery charge level** on a regular basis.

9.4 While long storage of the vehicle it is recommended to switch off the heater from the vehicle battery to avoid its discharging (current consumption in non operation mode 30-40 mA).

## 10. Remedial Procedure for Heater Ignition Problems

10.1 Certain problems may be solved without contacting a maintenance station. If the heater does not operate when switched on, proceed to the following steps:

1) Check the fuel level in the tank and in the fuel supply line beyond the fuel supply pump;
2) Check fuse 25A;
3) Check to see that all the contacts of the connectors and the fuse block are securely joined (contact corrosion is possible);
4) disconnect blocks XP2 and XS2 of the power supply harness connector (fig 4.1) for 1-2 min and then connect them.

10.2 Any other faults can be identified by the number of times the LED blinks.

10.3 If there are malfunctions except those specified in 11.1 does not remedy any of the problems that you may be having, please contact an authorized maintenance station.

## 11. Transportation & Storage

11.1 The heaters are safe to transport and may be transported by any means of transport, including air and rail transport providing the packed products are protected from atmospheric precipitations and climatic factors as per requirements specified in Section 5 of GOST 15150-69 and mechanical effects as per requirements specified in Category C of GOST 23216-78.

11.2 As far as climatic factors are concerned, transportation and storage conditions shall comply with storage requirements set out in Section 2 of GOST 15150-69.

11.3 Heater period of storage in packing of the enterprise of the manufacturer - 24 months.

## 12. Warranty terms Petrol AIR heaters

12.1 For autonomous heaters manufactured by LLC ADVERS and accessories provided by LLC Autoterm we provide a 24-month manufacturer's warranty.

All replacement parts are warranted to be free from defects in material and / or workmanship for six months from the date of sale or the remainder of the original warranty period on the heater, whichever is longer, proof of purchase need to be submitted together

with the warranty claim. The warranty terms of exploitation of heater outflows under reaching one of the following terms:

- the terms of exploitation attained 24 months from the date of purchase of the heater.
- the warranty resource to all air heaters 1000 working hours.

If not reported within 14 days from the time of purchase, manufacturer does not accept any claims on incompleteness and mechanical damages after sale of heater.

Warranty is valid from the moment a certified service or specialist by Autoterm has Installed and Registered heater online at www.autoterm.com/warranty and or has filled in warranty certificate with sales date, with company detils responsible for installation and company stamp in warranty certificate.

The intent of the Autoterm warranty is to protect the original end-user of the heater from defects and provide free repair and replacement of defective parts in the manner provided herein.

During the warranty period, the exclusive remedy will be for Autoterm, at their discretion, to repair or replace those parts if they are defective in material or workmanship.

The warranty does not apply to defects resulting from:

- improper installation, which is not in accordance with valid, supplied installation instructions or approved OEM applications.
- force majeure: lightning strike, fire, flood, voltage fluctuations, accident;
- transport damages;
- exploitation, storage and transporting;
- repair or adjusting, if they are conducted by the organizations, not authorized by AUTOTERM on installation of the heater and warranty repairing;
- independent repair of heater or use of spare parts not approved by original manufacturer; use of wrong voltage;
- Failure of the heater due to combustion chamber impurity.

While warranty is provided to the “original end-user”, it is to be administered and serviced through an authorized Autoterm dealer in accordance with the heaters warranty terms.

Normal wear of service parts: (filters, gaskets, glow plug screens and fuses are not covered by warranty).