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1. Introduction

This Operation Manual is intended to familiarize the User with salient features, operation, assembly and operating procedures for air heater PLANAR–2D–24 and PLANAR–2D–12 (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).

PLANAR-2D-24/12 heater has two types of configuration:

- 1) standard (see paragraph 7);
- 2) increased (Optional accessory):
 - Modem (heater control via SMS-messages);
 - Cabin temperature sensor;
 - Electromagnetic locking valve;
 - Fuel tank (with installation kit).

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 $\pm 10\%$ tolerance at a temperature of 20°C (68°F) at a nominal voltage (table 1).

Table 1

Parameter Code	Version	
	PLANAR–2D–12	PLANAR–2D–24
Nominal Supply Voltage, V	12	24
Fuel Type	Diesel Oil in compliance with GOST 305, atmospheric temperature-dependent	
Heating Efficiency: max, kW, min, kW,	1,8 0,8	
Heated Air Volume: Max , m ³ /h Min, m ³ /h	75 34	
Fuel Consumption at: Max power, l/h (gal/h) Min power, l/h (gal/h)	0.24 (0.06) 0.1 (0.03)	
Heater power consumption, W Doesn't exceed while heating mode		
Max, W Min, W	29 10	29 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's electric power supply must not be disconnected before the end of the purge cycle.

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

3.13 Heater food by the electric power has to is carried out from **the storage battery** irrespective of the **mass** of the vehicle.

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.

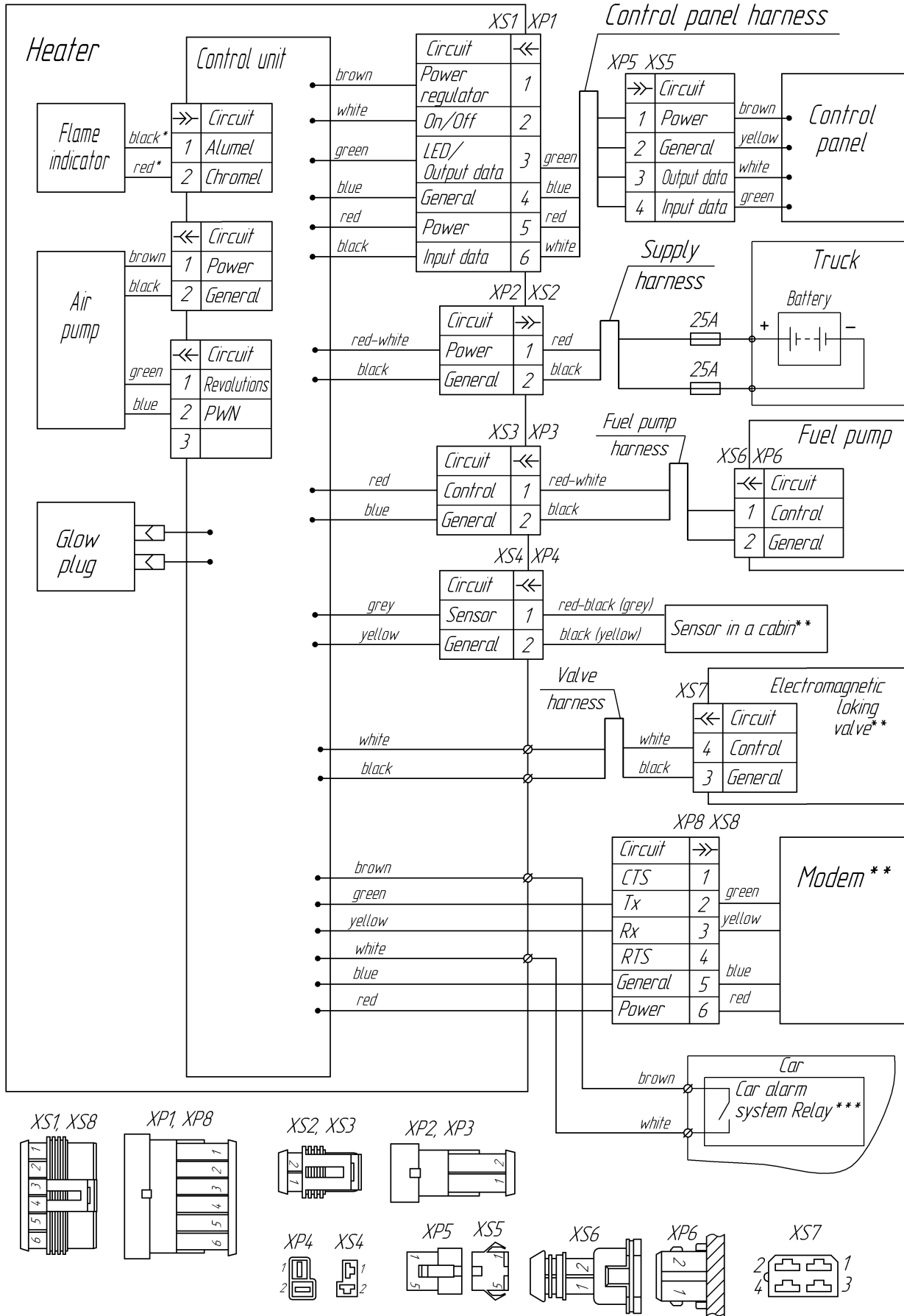
In accordance with the preset sequence, the combustion chamber is fore-purged and the heating plug warms up to the required temperature. Air and fuel starts to enter the combustion chamber under the same procedure, whereupon the ignition process is initiated. Once stable combustion is achieved, the heating 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 a combustion failure occurs while the heater is in operation, the heater will start repeated ignition. The maximum number of starts for this reason – no more than 3 times;
- 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 (20V) or exceeds 16V (30V) the heater will switch off.
- 5) In the event of emergency shutdown, the indicator will show the information according to the code of malfunction see table 6.1;



1. View of connector show from contact side;
2. * - Color of tags on wires;
3. ** - At the additional order.
4. *** - Example of connection of a heater to the car

Figure 4.1- Wiring Diagram

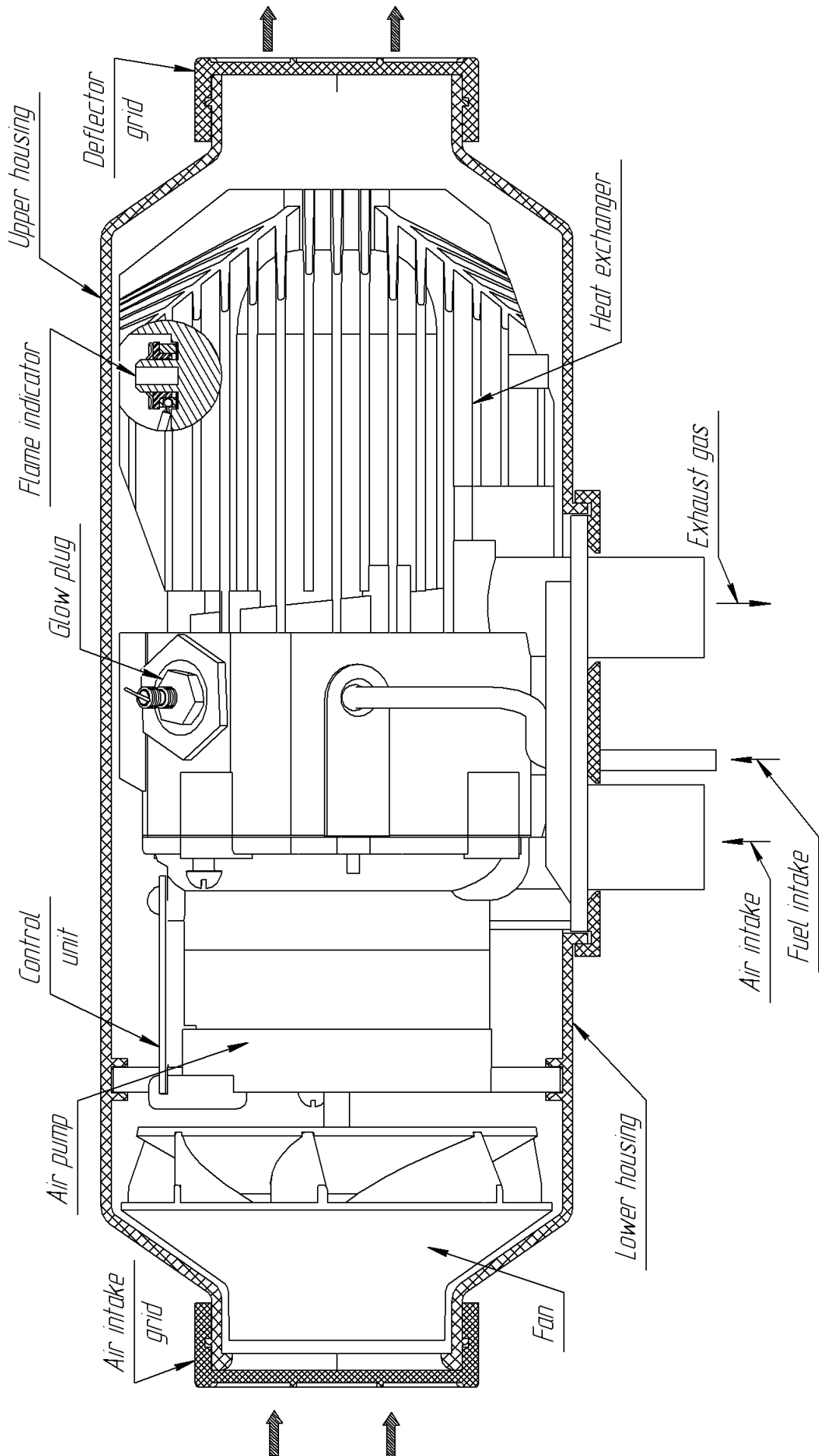


Figure 4.2 – Basic Heater Components

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

6. Control Panel Functions

6.1 Control panel «IIY-10M».

The IIY-10M control panel is delivered under the additional order, it is intended for management of heater work.

The panel is intended for:

- a) start and stop a heater in a manual mode;
- b) changes in a manual operating mode of a heating capacity (heating temperature);
- c) indications of a condition of a heater on a light-emitting diode.

On the front panel of the control panel are located (see fig. 6.1):

- 1) keyboard switch (pos.1);
- 2) potentiometer (pos.2);
- 3) light-emitting diode (pos.3).

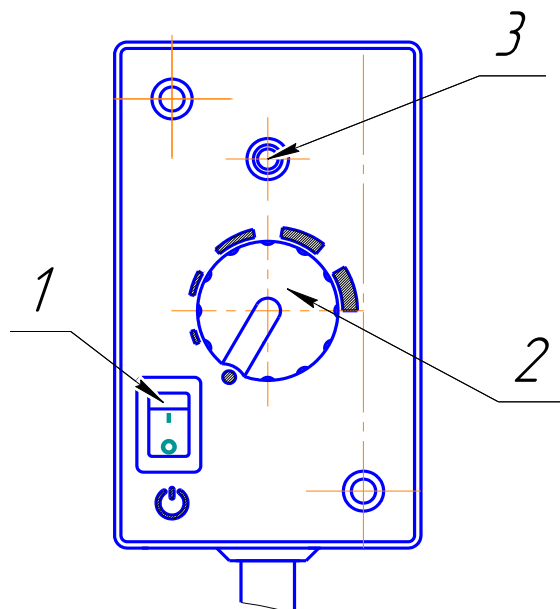


Fig. 6.1 - IIY-10M Control panel

The keyboard switch is intended for switching on/off the heater.

The potentiometer at turn changes heating capacity from 0,8 to 1,8 kW, and at established remote cabine temperature sensor changes temperature from 15°C to 30°C.

Light-emitting diode of pos. 3 shows a mode of a heater:

- shines red color – a mode of heating or a ventilation mode at the beginning and at the end of heater work;
- blinks red color - at malfunction (faulty). The quantity of blinkings after a pause corresponds to a type of malfunction (see table 6.1);
- doesn't shine - at an idle heater.

6.2 The control panel «IIY-8M» is intended for:

- heater activation and deactivation in manual mode;
- choice of a way of management «on power» or «on temperature»;
- activation of "waiting" mode
- indication of the established temperature or power;
- indications of temperature of one of 3x sensors (built in the heater, built in the control panel or remote – cabin temperature sensor, if it is connected);
- failure code indication in case of heater failure while operation.

6.2.1 The front board of the panel contains: four-digit light emitting diode (LED) indicator, three LEDs and three knobs. Functionality of the knobs and LEDs. (fig.6.2)

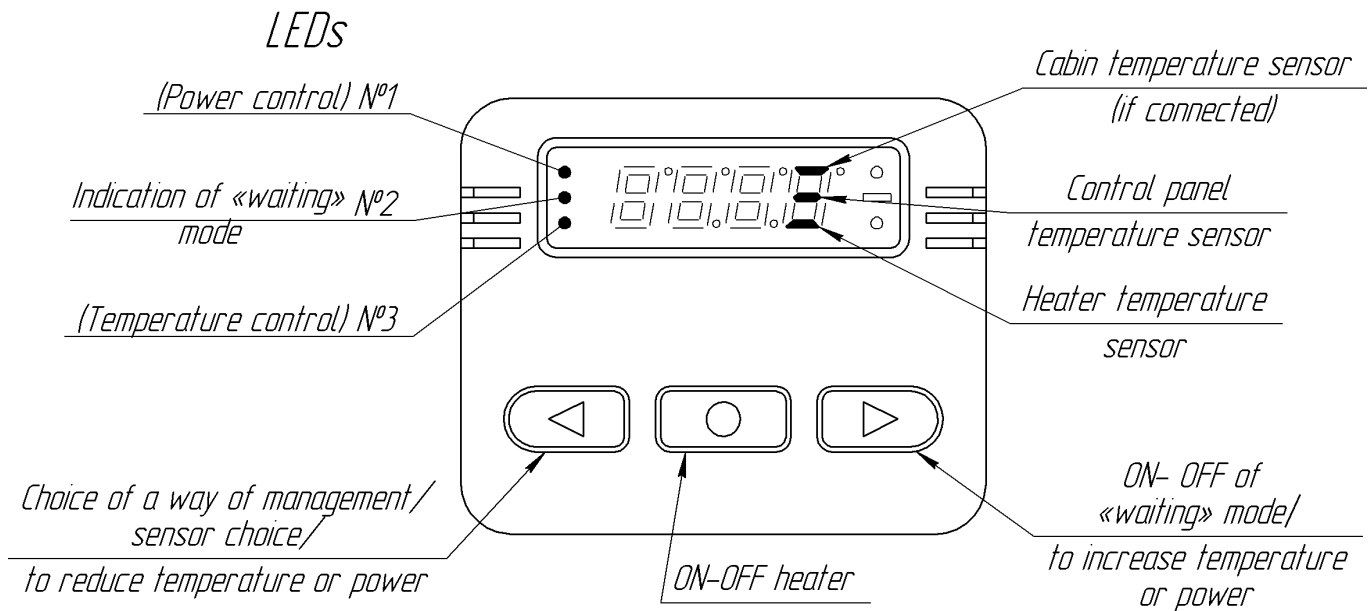


Fig. 6.2- Control panel «IIY-8M»

The way of management "on power" is intended for the fastest heating of the room. If to establish "max" power, the heater will constantly work with the maximum heating capacity. In operating time of a heater it is possible to set it's power (8 steps of power).

The way of management "on temperature" is intended for maintenance in necessary temperature. If the measured temperature is less established, the heater will work at "max" power. When indoors temperature will come nearer to the established value, heating capacity of a heater will start decreasing. And, the less difference of temperatures, the is less heater heating capacity.

Waiting mode is a mode on which process of burning stops and air ventilation indoors begins. Ventilation is necessary for maintenance of identical temperature in all room. During ventilation temperature in the room is constantly measured and if it becomes lower than established, the heater will be started again.

Features of work of a heater:

1) "Waiting" mode is compatible to way of management "on temperature" and isn't compatible to way of management "on power". The heater won't stop burning during the work "on power" irrespective of light-emitting diode No. 2 indication.

2) After each switching off of a heater there is a dumping of activation of "waiting" mode.

3) At a choice of a way of management "on power" the heater constantly works at the chosen thermal power. At achievement of comfortable temperature we recommend to reduce power or to make air ventilation of the room.

4) On the mode "on temperature" the heater will work for maintenance of the established temperature, thus its thermal power will change from max to min depending on air temperature. The air temperature is higher, the less heat makes a heater.

At achievement of the established temperature:

- if the waiting mode isn't activated, the heater will pass a mode to "min". Further work of a heater depends on temperature indoors:

1) if temperature continues to increase, the heater will continue to work at power "min". It is possible to switch off a heater manually;

2) if temperature starts going down, the heater will smoothly increase the developed thermal power, trying to maintain indoors established temperature. It is possible to switch off a heater manually.

- if the waiting mode is activated, on reaching the set temperature the heater will pass into waiting mode. On the waiting mode burning stops and air ventilation indoors begins. When temperature indoors will fall on 5°C below the established there will be the next ignition of a heater. It is possible to switch off a heater manually.

6.2.2 Control Panel installation and connection

Control Panel is installed in cabin or passengers compartment on the dashboard or any other comfortable for the driver place.

The control Panel is fixed with double-faced adhesive tape, which is stuck to the back side of the Control Panel. You can take out wires of the unit from its back or side cover. It is necessary to degrease the surface used for Control panel installation. Take off protective film from the tape and install the Control Panel on the prepared surface.

If installation of the control panel is made by means of a holder, it is necessary to fix two self-tapping screws a holder on the dashboard, and then to latch in it the control panel.

The connection of the Control panel to the heater is performed according wiring diagram (fig. 4.1)

6.2.3 Complex checkup of the Control Panel after installation

After installation and connection of the Control panel to the heater the checkup is performed in following way:

-set up the necessary operation mode on the Control panel;

-check activation and deactivation of the heater;

-check deactivation of the heater while artificial failure (take off the connector from the fuel pump during operation mode of the heater), while this the malfunction code appears on the indicator.

6.2.4 Succession of work with the control panel

While first time the heater is connected to electric circuit of the car or after breaks of power supply, according to environmental temperature there will be following information on the panel (for example)- the temperature in the area of the sensor installed in the heater is -12°C, if the temperature in the area of the sensor is above zero, there will be no “mines” before the figure. Movement according to the main menus is carried out by the button «←» (fig.6.2)

- I Way of management – on power;
 Temperature of the sensor which has been built in control panel is equal -12 °C;
 «O» - heater start;
 «←» - transition to the following menu;
 «⇒» - activation/deactivation of "waiting" mode;

- II Way of management – on temperature;
 Temperature of the sensor which has been built in control panel is equal -12°C;
 Control of work of a heater is exercised according to indications of the sensor of temperature installed in the control panel.
 «O» - heater start;
 «←» - transition to the following menu;
 «⇒» - activation/deactivation of "waiting" mode;

- III Way of management – on temperature;
 Temperature of the sensor which has been built in the heater -13°C;
 Control of work of a heater is exercised according to indications of the sensor of temperature installed in the heater.
 «O» - heater start;
 «←» - transition to the following menu;
 «⇒» - activation/deactivation of "waiting" mode;

- IV Way of management – on temperature;
 Temperature of the sensor which has been built in control panel is equal -12 °C;
 Control of work of a heater is exercised according to indications of the sensor of temperature installed in the control panel.
 «O» - heater start;
 «←» - transition to the following menu;
 «⇒» - activation/deactivation of "waiting" mode;

- V If the remote cabin sensor is connected.
 Way of management – on temperature;
 Temperature of the remote cabin sensor is equal -10 °C;
 Control of work of a heater is exercised according to indications of the remote cabin sensor of temperature.
 «O» - heater start;
 «←» - transition to the following menu;
 «⇒» - activation/deactivation of "waiting" mode;

- VI Way of management – on power;
 Temperature of the remote cabin sensor is equal -10 °C;
 «O» - heater start;
 «←» - transition to the following menu;
 «⇒» - activation/deactivation of "waiting" mode;

- VII Way of management – on temperature;
 Control of work of a heater is exercised according to indications of the remote cabin sensor of temperature.
 «O» - heater start;
 «←» - transition to the following menu;
 «⇒» - activation/deactivation of "waiting" mode;

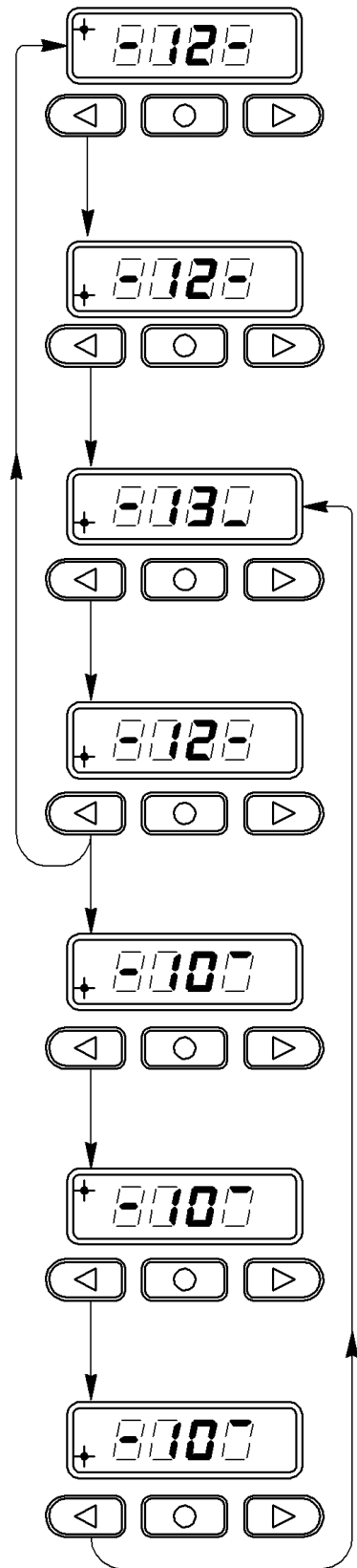


Fig.6.3.- The menus switched by the left button

Activation - deactivation of "waiting" mode is carried out by the button «⇔» (fig.6.4).

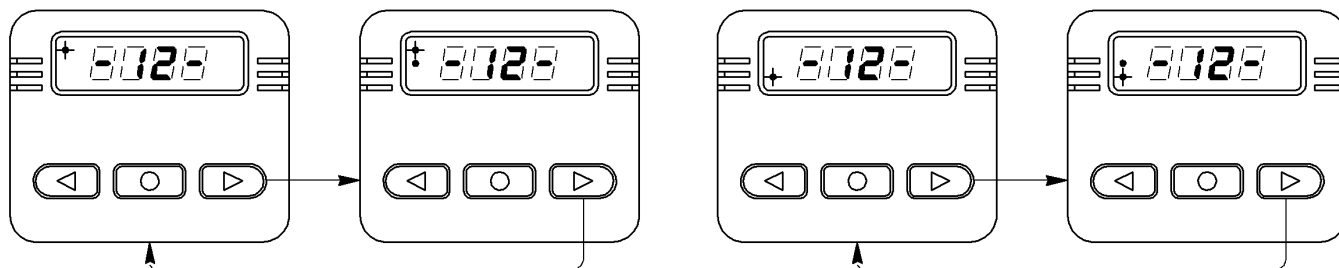


Fig.6.4 - The menus switched by the right button

После запуска отопителя, в зависимости от выбранного способа управления необходимо установить величину мощности или температуры.

If power control is selected, pressing knobs with arrows «⇐» (decreasing), « ⇨ » (increasing) – you can set up the necessary power. The indicator shows the scale according which the power is set up (fig. 6.5).

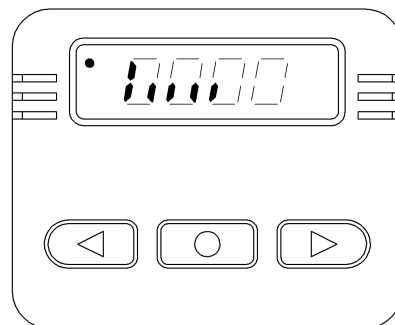


Fig.6.5 – Management on power

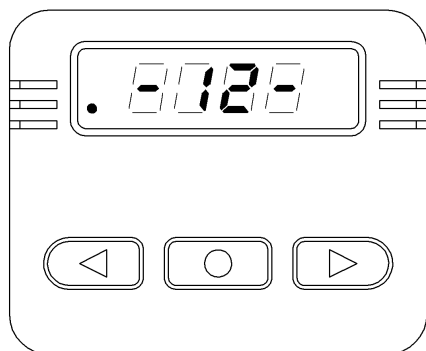


Fig.6.5.a – Management on temperature

If temperature control is selected, pressing knobs with arrows «⇐» (decreasing), « ⇨ » (increasing) – you can set up the necessary temperature (fig. 6.5a). The temperature is set within 1°C (33.8°F) to 30°C (86°F) in a zone of the installed sensor.

With the view to energy saving, the indicator stops glowing 20 seconds after last pressing of any knob, while this LED№1 or LED№3 is:

- lightning constantly if the heater is activated;
- blinking rarely (1 time per 1,5 second) if the heater is not activated; (+).
- blinking while fault (1 time per second);
- blinking frequently (5 times per second) while deactivation of the heater (while purging) (*).

To restart the indication there's need to press any knob.

Attention!

1. If cabin temperature sensor circuits are disconnected heater will go working on middle power Operation mode.

2. While heater activation without setting operation modes it is necessary to press the knob «O» one time if the indicator is lightning, and 2 times if the indicator is not lightning.

6.2.5 Heater deactivation.

For switching off of a heater it is necessary to press the O button. Thus supply of fuel stops, the combustion chamber purge within 3-5 minutes is made, the light-emitting diode No. 1 or No. 3 will often blink until the termination of a purge (fig 6.6)

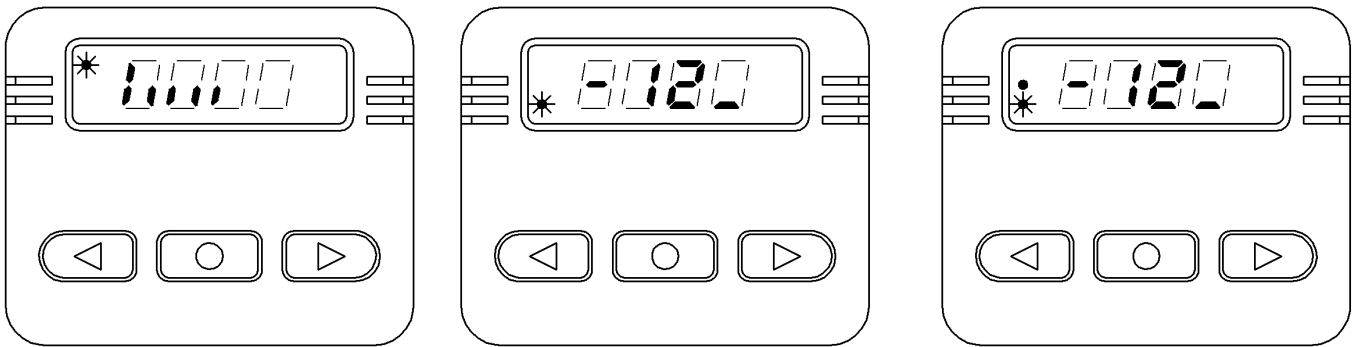


Fig 6.6-Purge

Attention!

It is forbidden to switch off electric power supply before purge cycle is finished.

6.2.6 Indication of malfunction code while failures in heater operation

While heater activation and operation there can be malfunctions. In case of malfunction the control unit deactivates the heater automatically. Every malfunction is coded and automatically appears on the indicator (Fig 6.7). While this, malfunction's code and the LED showing the operation mode of the heater will blink rarely. The heater's malfunction codes are described in table 6.1. Pressing of any knob of the control panel will switch off indication of the malfunction code and bring the control panel in initial state.

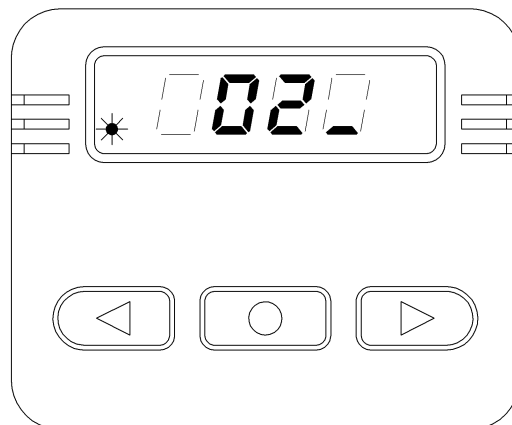


Fig 6.7 The panel the indicator at heater malfunction

6.2.7 Possible malfunctions

If after pressing any knob of the Control Panel the indicator is not lighting, there should be checked:

- fuses-25A;
- connectors and wires.

The Control Panel is not subjected to repair, it should be replaced for a new one.

Table 6.1- Malfunction codes

Quantity of blinkings	Malfunction code	Problem description	Commentary Problem solution
1	1	Overheat on the upper bound of temperature. Overheat on the growth rate of temperature of the case.	Check the inlet/outlet pipe of the heater for unpumped heated air flow. Check the flame indicator (overheating sensor) on the heat exchanger, replace if necessary.
12	2	Overheat in a control unit zone.	Check the inlet/outlet pipe of the heater for unpumped heated air flow.
5	5	Break of the flame indicator (overheating sensor of the housing)	Check the flame indicator (overheating sensor) on the heat exchanger, replace if necessary.
6	6	Built-in temperature sensor on control unit failure.	Replace the control unit
4	9	Heating plug failure	Check the plug and replace if necessary
11	10	Air pump motor malfunction	Check the electric wiring of the air pump motor, replace the air pump, if necessary.
9	12	Shutdown, voltage boost	Check the battery, regulator and power supply wiring. The voltage between 1 contact and 2 contact of connector XS2 (see connection layout fig. 4.1) should not exceed 16V (30V)
2	13	No further activation attempt is possible	If possible quantity of activation attempts is used, check the heating plug, fuel level and fuel supply system. Check combustion air system and exhaust pipe line
9	15	Shutdown, low voltage	Check the battery, regulator and power supply wiring. The voltage between 1 contact and 2 contact of connector XS2 (see fig. 4.1) should be not less 10V (20V)
10	16	During a purge, the flame indicator (overheating sensor of the housing) didn't cool down	Check the inlet/outlet pipe of the heater for unpumped heated air flow. Check the flame indicator (overheating sensor) on the heat exchanger, replace if necessary.

7	17	Fuel pump failure	Check fuel pump wiring for short-circuit fault or disconnection fault. Replace the pump if necessary.
8	20	No connection between Control panel and the heater	Check wiring, connectors.
11	27	Air pump failure. Motor won't rotate	Check the wiring of the air pump, control unit, replace if necessary.
11	28	Air pump failure. The motor rotates without control	
3	29	The admissible number of breakdowns of a flame in operating time is exceeded	Check the fuel level and fuel supply system. Check combustion air system and the exhaust pipe line. If the heater can be started, check fuel pump and replace if necessary.
---	78	Fixed the flame failure when the time of pre-heater work.	It is shown for your information. Check Check tightness of clamp on the fuel line, fuel line leaks, tightness of the fitting on the fuel pump.

6.3 Use and connection to the vehicle remote alarm system for activation and switching off the heater with the help of transmitter.

You can use vehicle remote alarm system to control the heater operation if there is an additional channel.

The relay having normally opened contacts is connected to an exit of this channel (the relay isn't included in the delivery package). Contacts of the relay should be connected to wires of the modem harness before XP8 connector (see fig. 4.1).

The ends of wires are closed by a thermoshrinkable tube. For connection of a heater it is necessary to strip out the ends of wires and to connect them (to solder) to the car relay (if necessary to extend wires).

Control of the heater can be done in two ways: short-circuit contacts of relay (time of the closed state 0.5 to 3 seconds), and long-circuit closure (more than 3 seconds). Short first impulse will starts the heater, next short impulse stops the heater.

With long impulse of the contacts of relay a command "Start" will be formed. When contacts will be open - the command "Stop" will be formed.

After start the heater will start working at "max" mode on power.

It is possible to stop the operation of the pre-heater with the help of the transmitter of vehicle remote alarm system and from the control panel.

Type of the transmitter has no significant meaning, the only requirement is that the relay current consumption must not exceed current capacity of the remote alarm system channel.

The harness of XP8 connector to which vehicle remote alarm system is connected, is used also for connection of the modem. Thus work of a heater can be operated from all connected devices (the control panel, the modem, an vehicle remote alarm system).


6.4 The use and installation of the modem to run the heater.

Operation of the heater can be controlled over the phone using a modem and a special application. For remote control operation of the heater is possible to connect the control unit to the GSM modem, which is designed for use in harsh conditions (cold, vibration, etc.). In modem as in your phone, the SIM card can be installed. On account of this SIM card should be a small amount to make the modem work correctly.

Just do not forget to replenish the account. For simplicity of control of balance and payment (provided that the SIM card of the modem and your cell phone are served at one mobile operator) the SIM card of the modem can be transferred to personal account of your cell phone, having written the corresponding application in salon of mobile operator.

Set the modem at any convenient, clean place. Connect the antenna to the modem and bring antenna to the open space (for example, on the windshield) . Connect the modem to the heater (according to fig. 4.1 and fig. 7.1) and test it .

Heater control is carried out using an application installed on the mobile phone (refer to the modem).

From the main desktop, or from the application menu, run the application «TeplostarSMS" logo  .

If it is the first application launch on this device, it is necessary to enter phone number of the SIM card inserted into the modem (further this input isn't required).

If it is the first application launch on this device, it is necessary to enter phone number of the SIM card inserted into the modem (further this input isn't required).

For start of a heater it is necessary to press "START", for a stop - "STOP".

For change of application controls it is necessary to use the side menu: to press the button in the right top corner or make "slide to the left".

The following settings are available:

SMS delivery notification – the notice of receiving the SMS by the modem.

Faults notification – the notice of malfunctions in product work.

For obtaining information on a status of a heater it is necessary to press "CHECK STATUS", in reply information on product operating time will come (if it works), a malfunction code (if it is), the air temperature and value of supply voltage.

For obtaining information on the product it is necessary to press "About device", the SMS with a serial number of a heater and the version of the software established on a heater in reply will come..

You can see the detailed instruction on work in «The instruction of the user for the TeplostarSMS appendix» (in a modem set).

* Appearance of the appendix can differ from presented in fig. 6.8.



Fig.6.8 – appendix screen*

7. Scope of Supply

See Figure 7.1 for scope of supply and connection diagram of basic heater components. For list of basic heater components, see Table 7.1.

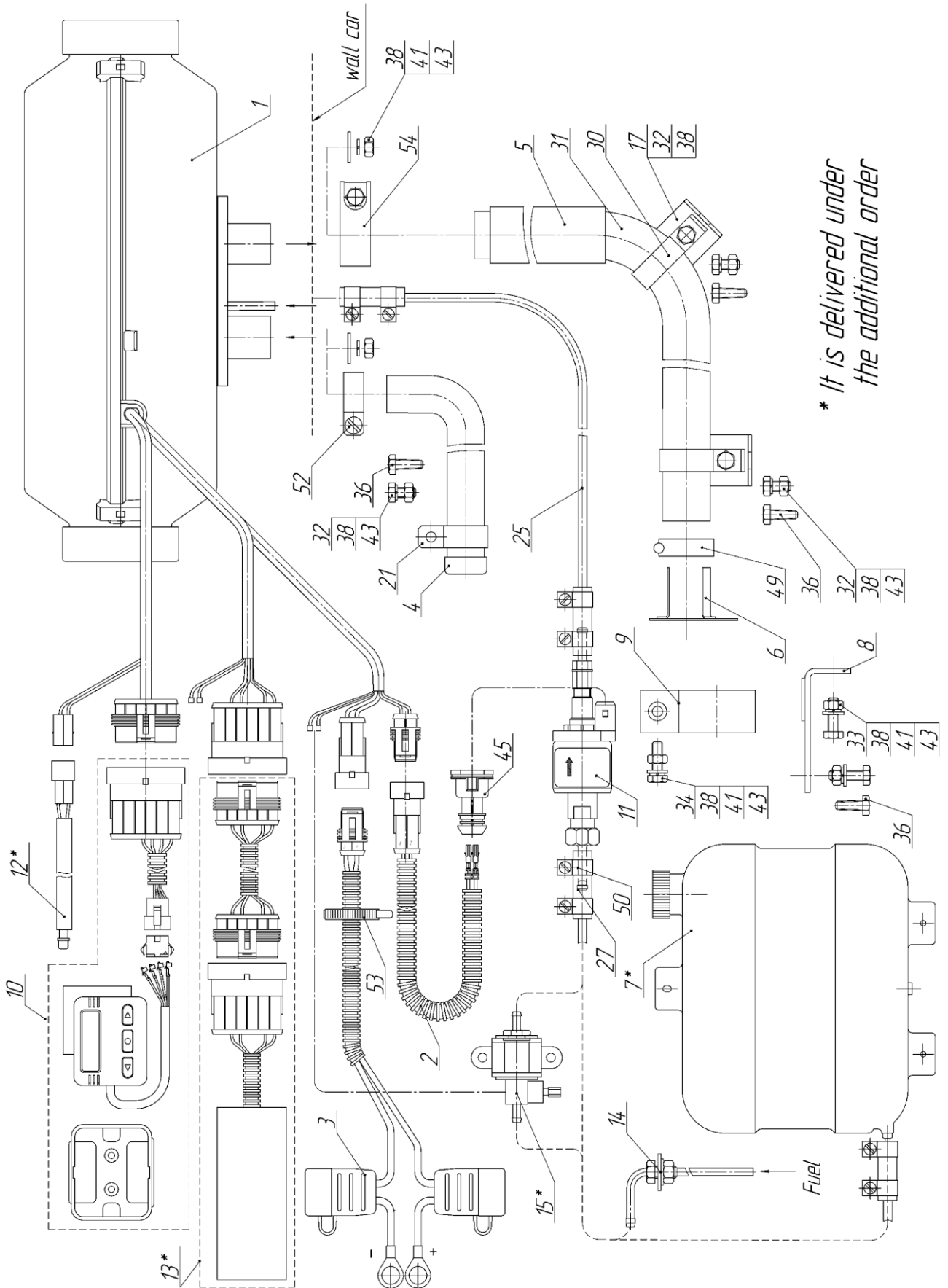


Figure 7.1 – Connection Diagram of Basic Heater Components

Table 7.1

No.	Designation	Pieces Per Set
1	Heater (12V or 24V)	1
2	Fuel Supply Pump Harness	1
3	Power Supply Harness	1
4	Air Intake	1
5	Heat insulation	1
6	Screen	1
7*	Fuel tank	1
8*	Holder with gasket	3
9	Clamp	1
10	Control panel «ПГУ-8М» with harness or «ПГУ-10М»	1
11	Fuel pump 24V or 12V	1
12*	The sensor in a cabin	1
13*	Modem	1
14	Fuel supply intake	1
15*	Electromagnetic locking valve	1
17	Holder	2
21	Air Inlet Clamp	1
25	Connecting Tube (polyamide) L = 5500 mm	1
27	Sleeve L= at least 70 mm (or one hose L= 4 x 70 = 280 mm)	4
30	Clamp	2
31**	Exhaust Pipe L=1000mm	1
32	Bolt M6x16	5
33*	Bolt M6x20	6
34	Bolt M6x25	1
36*	Screw 6.4x14	6
38	Nut M6	16*
41	Enlarged Flat Washer Ø6	11*
43	Split Washer Ø6	14*
45	Cap connector AMP 282762-1	1
49	Clamp Mikalor 20x32/9 W1	1
50	Clamp ABA min 10/9	8
52	Clamp Mikalor 25x40/9 W1	1
53	Plastic Clamp 200x3.6	15
54	Exhaust Pipe Clamp 26-28 Vaper	1

* It is delivered under the additional order.

**Delivery of an exhaust pipe 31 with not established screen 6 is possible.
Screen installation to make according to fig. 7.1.

8. Installation Requirements

8.1 Heater Installation

Installed the heater indoors while bearing in mind the permissible operating positions shown in Figure 8.1. The figure 8.1 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 8.1). 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 8.2 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.

ATTENTION ! To ensure reliable performance, follow the above recommendations carefully. Install the heater horizontally as shown in Figure 8.1.

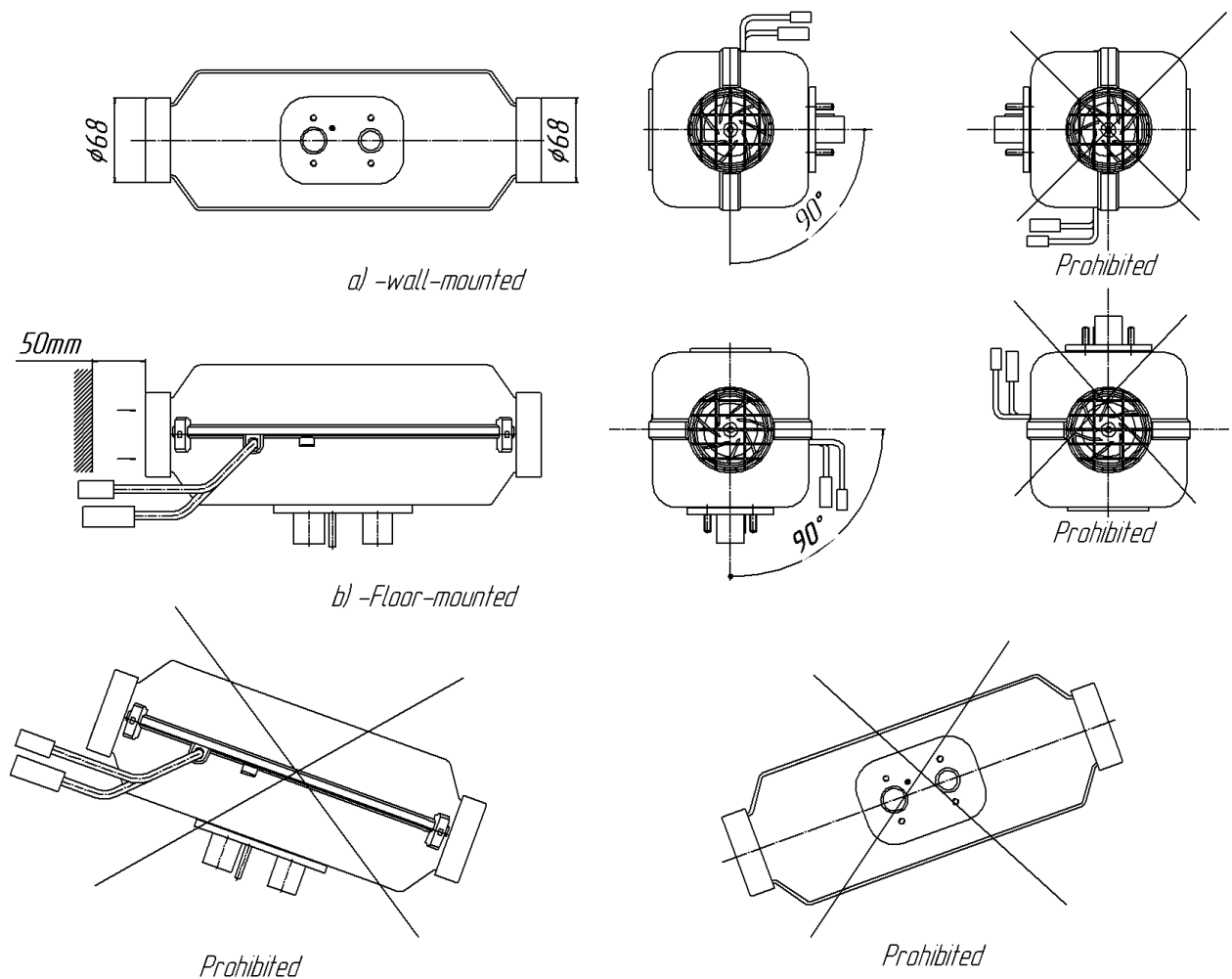


Figure 8.1 – Variants of installation of a heater.

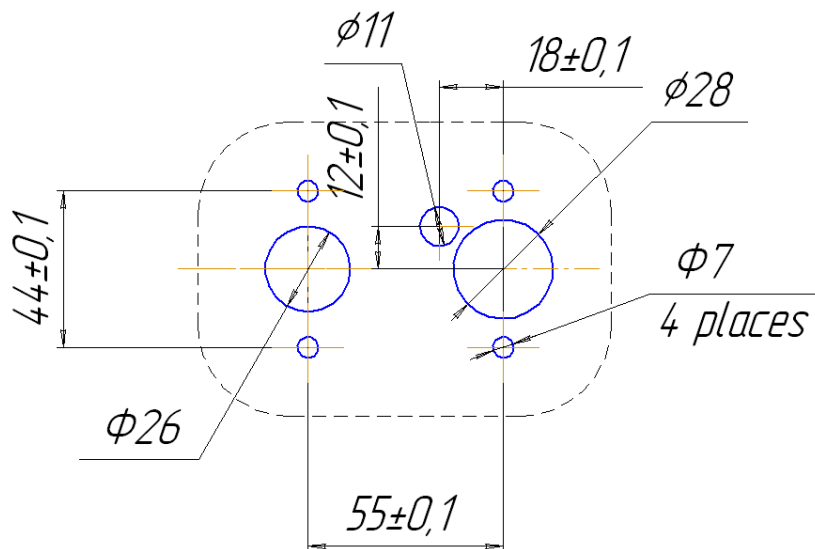


Figure 8.2– Mounting Holes Used for Heater Installation

8.2 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.**

8.3 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.(pos.3, fig.7.1)

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 allow 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. If this screen is not installed, install it according fig.7.1

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

8.4 Installation of a fuel tank on the car

The fuel tank is established according to figure 8.3. A fuel tank it is necessary to have so that the exit of fuel which can flow out from its bulk mouth, on the earth was provided.

The bulk mouth of a fuel tank should not be in salon, a luggage carrier, in a motor compartment. If the bulk mouth is located on a vehicle lateral face the filler cap in the closed position should not support car's body dimensions. Fuel which can spill at filling of a fuel tank, should not get on exhaust systems and electro wires. It should be taken away on a ground.

For the purpose of an exception of leak of fuel from a fuel tank by gravity at infringement of tightness of the fuel pump, a fuel tank it is preferable to have so that the fuel maximum level was below a cut of a fuel tube of a heater.

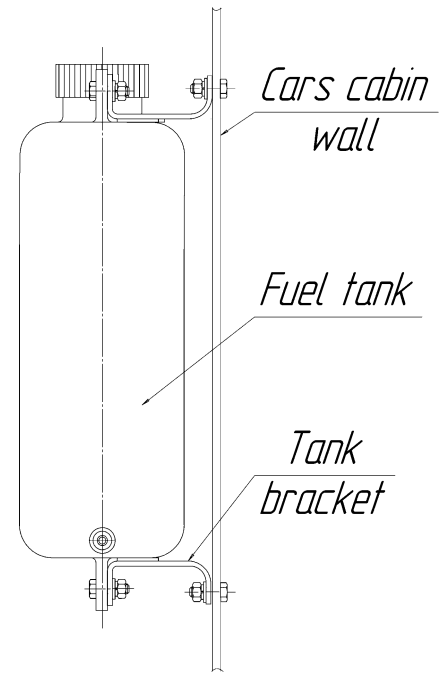


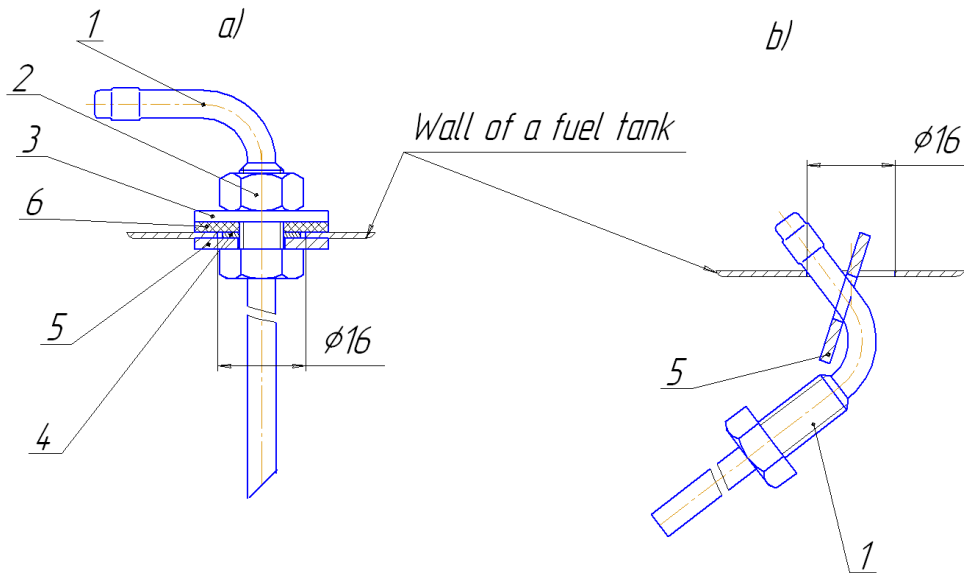
Figure 8.3 - Installation of a fuel tank on the car

ATTENTION!

Before a heating season it is necessary to check a fuel tank. If the fuel was stored long time in a tank (for example from last heating season), it needs to be removed! To wash out a tank with gasoline or kerosene and to fill in new diesel fuel. This procedure is intended for removal of a deposit in fuel at long storage. Not performance of this procedure can lead to a contamination or failure of the fuel pump and the raised sooting in the combustion chamber.

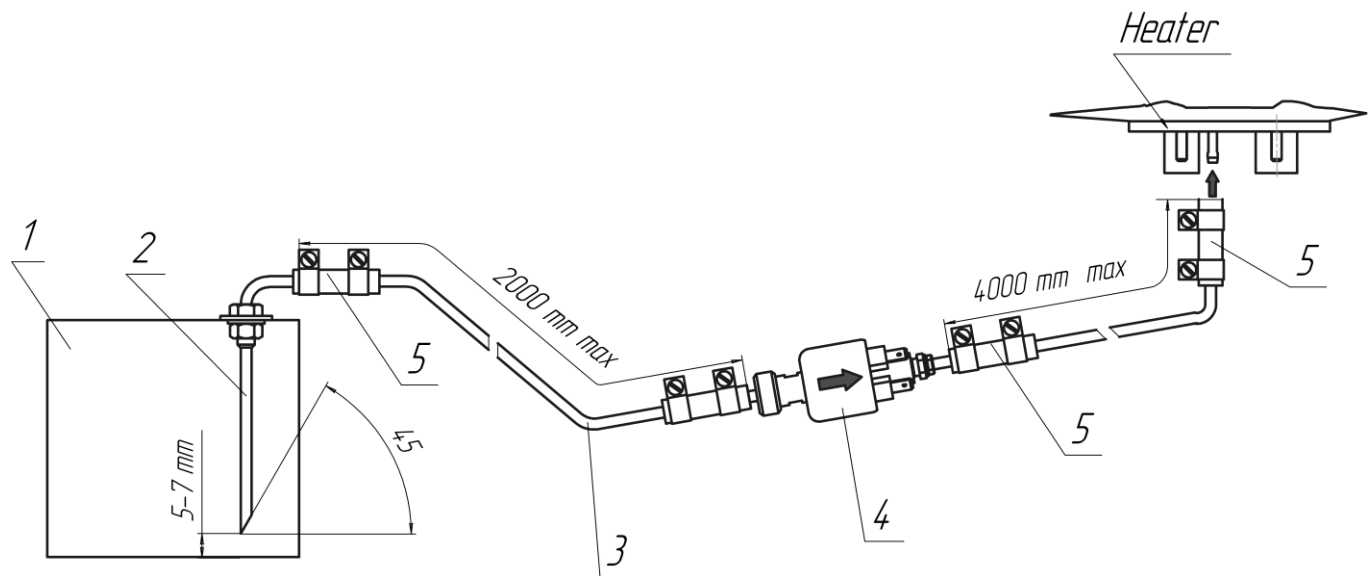
8.5 Installation a fuel supply intake in a regular tank of the car

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. 8.4,a). Perform installation of special washer with fuel supply intake to the tank inlet according to fig.8.4,b) Perform installation of the fuel supply line from fuel supply intake to the heater according to fig.8.5.



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

Fig 8.4 – 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 d=2 mm
- 4 – fuel pump
- 5 – sleeve

Figure 8.5 – Installation Diagram for Heater Fuel Supply System Using a fuel supply intake

8.6 Installation of Heater Fuel Supply System

8.6.1 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 scope of supply heaters enters fuel pump manufacturing ADVERS company. The spatial position of the fuel supply pump must comply with figure 8.6 (preferably in a vertical position).

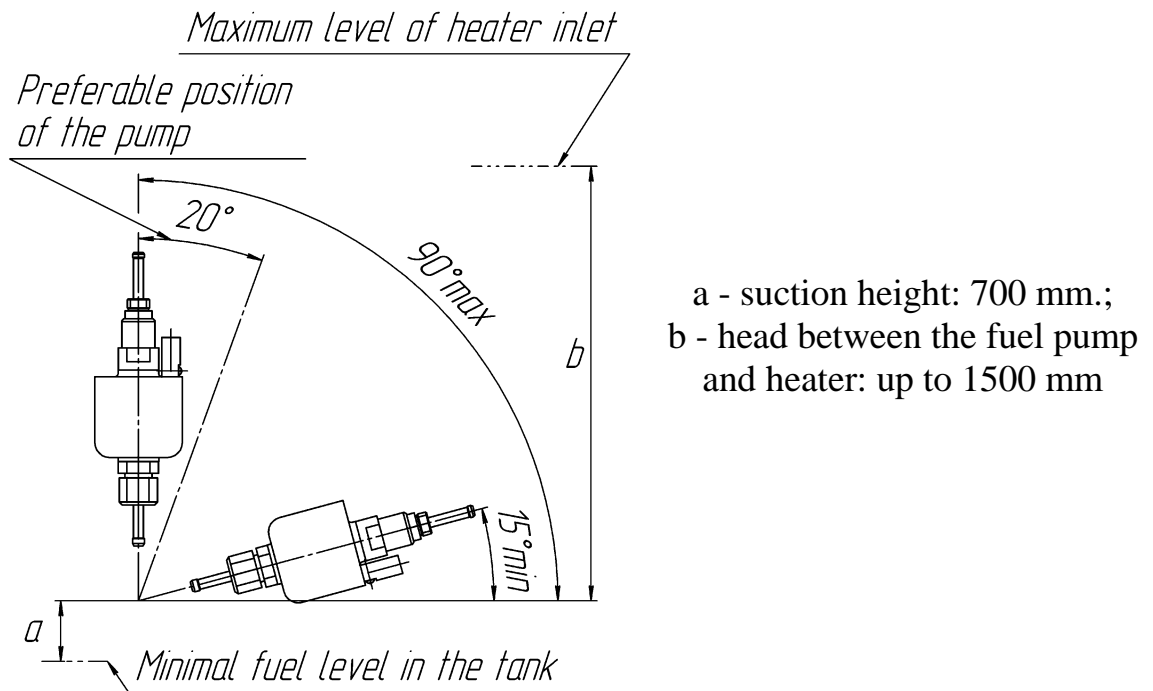


Figure 8.6- Permissible mounting position of fuel pump

8.6.2 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 8.7. The cutting location shall be free of indentations, hairs and must not restrict flow through the tube.

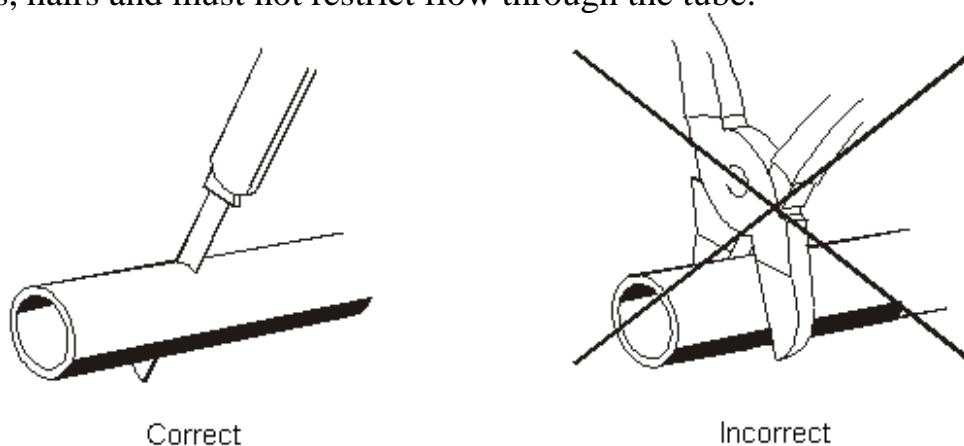


Figure 8.7 – Tube Cutting Prior to Installation

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.

8.7 Installation of Heater Electric Circuit

Heater wire harnesses shall be installed in compliance with the heater wiring system as shown in Figure 4.1. When installing, do not allow the wire harnesses to become overheated, deformed or dislodged during vehicle use. Attach the harnesses to the vehicle fittings using plastic clamps.

Attention! Remove the fuse prior to installation.

8.8 Installation the sensor in a cabin.

The sensor in a cabin (fig. 8.8) is intended for air temperature measurement in a zone of its installation and allows to work in a mode of maintenance of the set temperature within $15 \div 30^{\circ}\text{C}$.

The sensor is installed in a cabin (or the manned volume of vehicle) in a place convenient for the driver (personnel). The maximum length of a cable of the sensor is 5000mm. After installation the of the sensor it must be connected to the XS4 socket of the heater.

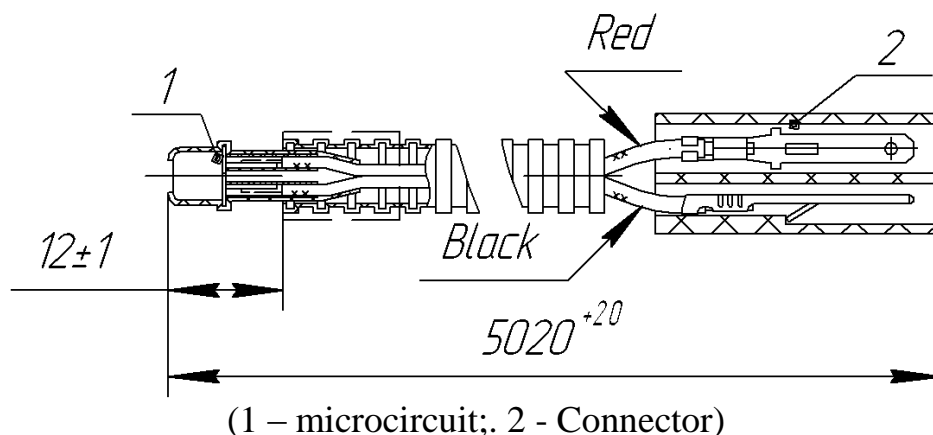


Figure 8.8 – The sensor in a cabin.

8.9 Installation the electromagnetic locking valve.

The electromagnetic locking valve serves for giving or overlapping of supply of fuel in a heater. The valve is installed in front of the fuel pump and prevents supply of fuel in idle at present a heater. Normally the valve — is closed. When giving on valve the supply voltage the coil of an electromagnet takes away a rod with a locking element from a saddle of the valve and opens the pass for a fuel. At removal of supply voltage from the valve the returnable spring presses a rod with a locking element to a saddle of the valve blocks the pass for a fuel.

9. Post-installation Testing

9.1 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,

9.2 Install fuse 25A .

9.3 Fill the fuel pipe system with fuel with the help of fuel pumping device (fuel pumping device VIIT-1 can be ordered at manufacturer) or repeated inclusion of a heater. After filling the system check that the fuel pump system is not leaking.

9.4 Check that the heater is working on min and max modes:

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.

9.5 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.

9.6 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.

10. Recommendations

10.1 To ensure consistent performance, the heater should be switched on for up to 5 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).

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

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

10.4 Reliable operation of heater depends on the type of fuel used. Type of fuel should be in accordance with GOST 305-82, depending on the ambient temperature (see Table 10.1). May be used and the mixture of fuel according to Figure 10.

10.5 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).

Table 10.1

Ambient temperature, °C	Fuel type or blend
0°C and above 0°C	Diesel JI-0, 2-40 Or JI-02-62 ГOCT 305-82
0°C – -5°C (32°F – 23°F)	Diesel 3-0,2 mines 35 ГOCT 305-82
-5°C - - 20°C (23°F - -4°F)	Diesel 3-0,2 mines 35 ГOCT305-82 or Diesel 3-0,2 mines 45 ГOCT305-82
Lower then -20°C (-4°F)	Diesel A-0.4 ГOCT 305-82

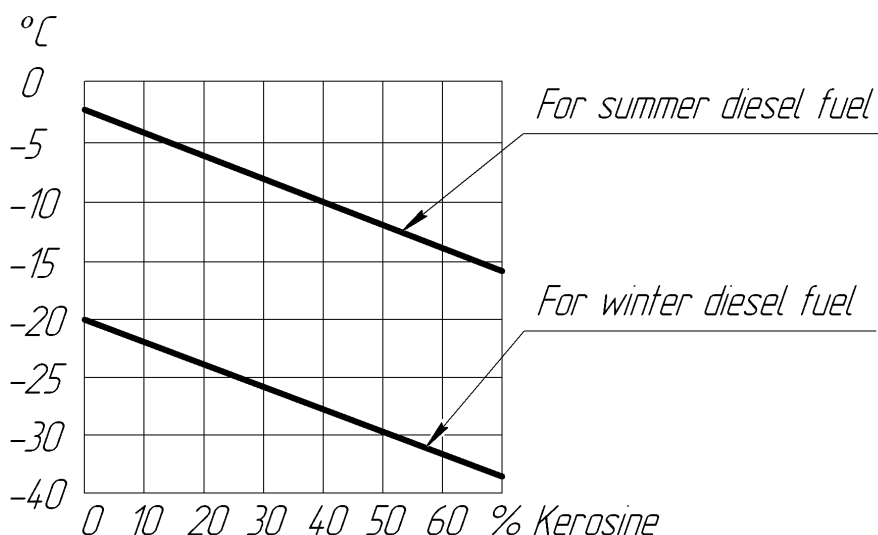


Figure 10 - Amount of kerosene mixed with diesel fuel, depending on the ambient temperature.

11. Remedial Procedure for Heater Ignition Problems

11.1 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.

11.2 All other types of heater malfunction will be indicated automatically on the control panel according to the malfunction code.

11.3 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.

ATTENTION! The heaters completed with glow plug with a glow pin of production of Japan. This glow plug need to be checked for working capacity giving on it voltage 9V (for heaters with voltage 12V) or 18V (for heaters with voltage 24V).

12. Transportation & Storage

12.1 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.

12.2 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.

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

13. Warranty

13.1 The warranty term of exploitation of heater outflows under reaching one of next terms:

- the term of exploitation attained 18 months after the sale of good;
- good worked a warranty resource - 1000 hours;
- mileage with established heater exceeds 50,000 km.

13.2 Appointed tenure of employment of heater - 3000 hours.

13.3 In default of stamp of organization with naming the date of sale a warranty term is calculated from the date of making of heater.

13.4 A manufacturer does not accept claim on incompleteness and mechanical damages after sale of heater.

13.5 A producer guarantees normal work of the heater on condition of observance by the consumer of all rules of exploitation, transportage and storage, indicated in this guidance. If a malfunction was found out during a warranty term, then she will be set free of charge. Installation of heater the organizations authorized by a producer must conduct. In this case, the warranty card is filled column «Information on installation.»

Warranty obligations do not spread to the defects arising up as a result :

- force-majeure circumstances: shots of lightning, fire, flood, impermissible violations of supply voltage,
- road a transport incident;
- failures to observe of rules of exploitation, storage and transporting;
- repair or adjusting, if they are conducted by the organizations, not authorized by a producer on installation of the heater and warranty repairing;
- refuse of work of heater by reason of contamination of combustion chamber;
- violations of work of electrical equipment of car;
- independent repair of heater or the use of unoriginal spare parts.

Заметки / Notes