OPEN SYSTEM

Common Rail fuel pump testing Controller "CP-Tester"

OS.25-02

Passport
Technical Description
User manual
Warranty Card

2019

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Introduction

This passport is a document certifying the main parameters and technical characteristics of the CP-Tester OS.25-02 device guaranteed by the manufacturer for testing and verifying the performance of diesel injection pumps (high pressure fuel pumps) of the Common Rail system. This passport allows you to get acquainted with the device, the procedure and rules for its operation, compliance with which will ensure the correct operation of the device.

1. General information

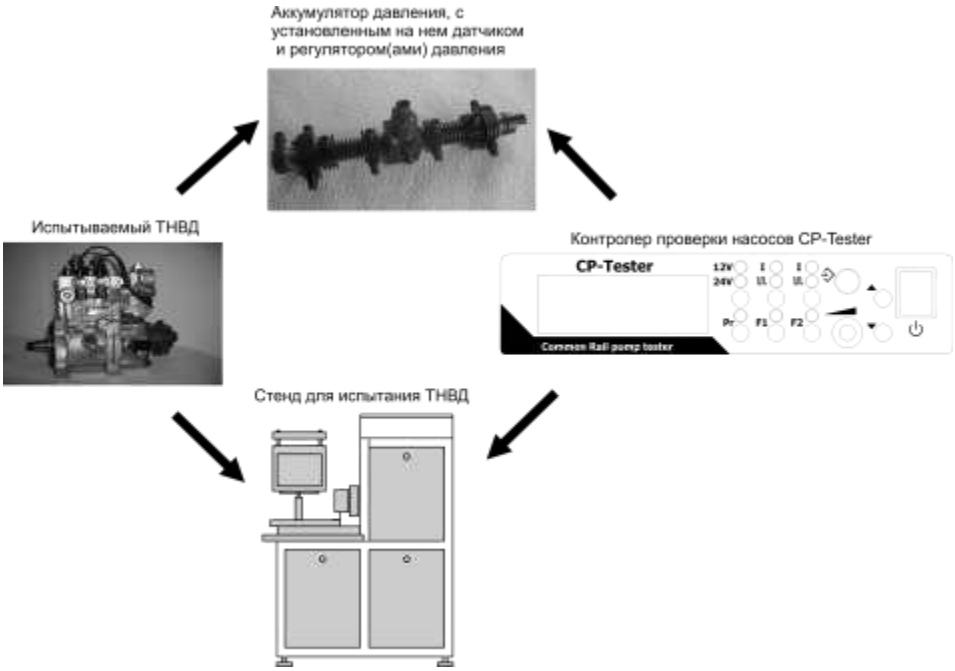

Figure 1. System block diagram

2. The purpose

The CP-Tester device is intended for supplying user-programmable control signals to the pressure regulators of the test system and the injection pump of the Common Rail system to check their operability (volumetric capacity, maximum pressure).

3. The basic technical data

- Supply voltage: ~ 220 V ± 15%;
- The switched load at the exit: to 5A;
- Pressure adjustment range - 0-max kgf / cm2;
- Pressure setting step - 1bar;
- Net weight of the device: 5.7 kg;
- Dimensions (length x width x height) - 320x285x80;
- Power consumption - up to 350 watts.

4. The construction of device

Figure 2. Appearance of the device

The CP-Tester device is structurally designed as a prefix, to a sensor, a rail pressure regulator (s) and a pump pressure regulator (s) using special adapter cables.

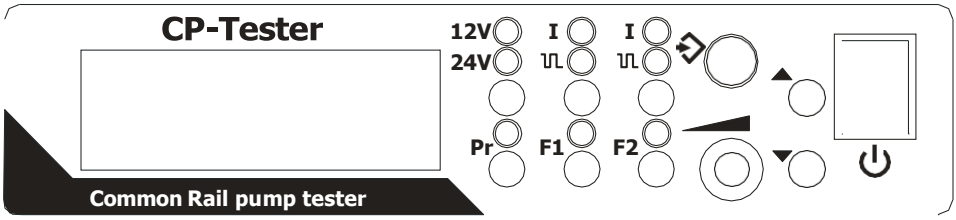

Figure 3. Front panel

On the front panel of the device there are: a liquid crystal indicator, control buttons, a multi-turn switch, an on / off switch (Fig. 3).

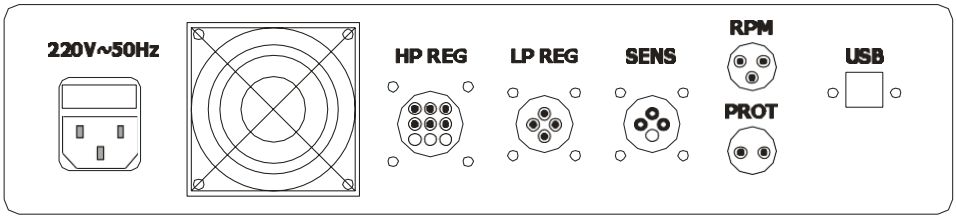

Figure 4. Back panel

On the back of the device are the connectors:

- "USB" for connecting to a personal computer;
- "RPM" for connecting the shaft position sensor;
- “PROT” for connecting end guards;
- "SENS" for connecting a pressure sensor;
- "HP REG" for connecting high pressure regulators;
- "LP REG" for connecting low pressure regulators;
- “NETWORK” for connecting the mains power ~ 220 V. The “NETWORK” connector is structurally made in one housing with a fuse (Fig. 4).

5. Instructions for use

Environmental Requirements:

- Operating temperature: +5 ºC to +40 ºC
- Temperature during transportation: -20 ºC to +60 ºC
- Relative humidity (non-condensing): working 8% - 80%, storage 5% - 95%.
- Dustiness of air: no more than 75 mcg / m3

Before turning on the device, it is necessary to check visually or with the help of devices, the condition of the connectors-adapters, the power cable 220 volts.

If the device was transferred from a cold to a warm room, it is strictly forbidden to turn it on within 1-1.5 hours.

After switching on, let the device run for 2-4 minutes, then proceed to work.

It is strictly forbidden:

- turn on the device with faulty power cables;
- connect and disconnect adapter sockets from the sensor or pressure regulators when the CP-Tester device is on.
- connect the device to a network that does not have a grounding loop;
- connect the device to the network with a cable that does not have a grounding contact;

• use the CP-Tester device in conjunction with electrical equipment not connected to the ground loop.

Failure to comply with the last three points may result in electric shock.

In addition to health risks, the lack of grounding, in most cases, leads to failure of the pressure sensor, since the device uses a switching power supply, according to the circuitry of which, in the absence of grounding, there will be a voltage equal to half the supply voltage of the device and is 110V.

6. Limitation of liability

The manufacturer is not liable to the buyer of this product or a third party for damage or loss suffered by customers or a third party as a result of improper use of the product, including inept or erroneous actions of personnel, as well as for losses caused by the action or inaction of this device.

Under no circumstances will the manufacturer be liable for lost profits, lost savings, losses caused by an accident, or other subsequent economic losses, even if the company was notified of the possibility of such losses. The manufacturer is not liable for losses incurred by you on the basis of claims of a third party, or caused by failure to fulfill your obligations.

The manufacturer is not responsible for any malfunctions and losses resulting from the use of additional devices recommended for use with this device, as well as its modification, repair or modification to its design, not provided for by the operating instructions, including when using a self-made adapter connector.

7. Preparation for work

Before working with the CP-Tester device, carefully read the operating instructions.

When preparing the device for operation, the following steps must be taken:

Perform an external inspection of the device and connecting cables. External inspection of the device and connecting cables is carried out with the power off and consists in identifying mechanical damage to the device and connecting cables.

8. Work with the device

The CP-Tester device allows testing diesel fuel injection pumps of the Common Rail system by supplying the user-specified necessary control signals to the pressure regulating valves of the injection pump and pressure regulators of the test system.

When testing the volumetric capacity of the CP1 pumps, the amount of fuel leaving the return from the rail is measured through the high pressure regulator (s) at various operating modes (pump speed and pressure).

The principle of checking CP3 pumps is as follows: as a load, a rail is used with a high pressure regulator (s) and a pressure sensor installed on it. As you know, in these

systems, with low pressure control, the pump will have maximum performance in the absence of voltage on the regulator, but since the high pressure regulator (s) are installed on the rail, all fuel will go to the return. Further, in the automatic mode, we set the load pressure with the HP high-pressure regulator (s) and blocking the LP low-pressure regulator with a current of various frequencies, the pump performance is measured (the amount of fuel going to the return from the rail through the high-pressure regulator (s) at various operating modes)

When testing CP2 pumps, the same principle is used as CP3. The rail is used as a load, blocking the low pressure regulators, we measure the pump performance. By sequentially closing the regulators, the uniformity of the pump sections is checked.

To test the CP2 pumps, the device has the ability to use three high-pressure regulators HP1-HP3, since these pumps have high performance and the flow area of one regulator is not enough to regulate the pressure in the test system.

To conduct the necessary tests of the injection pump, the device allows you to control the following parameters:

• In automatic mode, control the high-pressure regulator (s) HP1-HP3 (1-3 pieces, depending on the design of the test system), thereby maintaining the pressure in the system from minimum to maximum *;

• In manual mode, operate the LP1-LP2 low pressure regulator (s) (when testing CP2 cargo pumps, two regulators are used).

* The minimum pressure value is determined by the mechanical characteristics of the pressure regulator (stiffness and condition of the internal spring) and is usually 60-80 bar.

The maximum pressure is determined by the pressure sensor used (depending on the fuel system, the sensors have a different measuring range: 1500, 1800, 2500 bar).

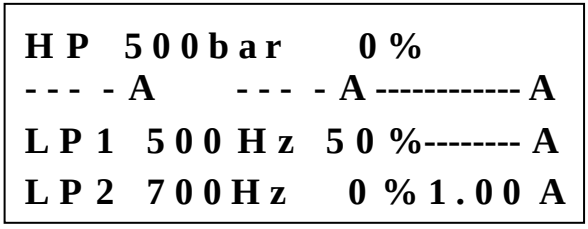

Figure 5. Display Information

In the initial state, the following information is displayed (see left to right, top to bottom):

• set pressure in the test system;

• PWM duty cycle of the control signal of the HP regulator (s);

• value of current flowing through the winding of the regulator (s) HP;

- PWM frequency of the LP1 control signal;
- duty cycle of the PWM control signal LP1;
- value of current flowing through the winding of the LP1 regulator;
- PWM frequency of the LP2 regulator control signal;
- PWM duty cycle of the LP2 control signal;
- the value of the current flowing through the winding of the LP2 regulator.

All control of the device is carried out using the control buttons and multi-turn switch (Fig. 6).

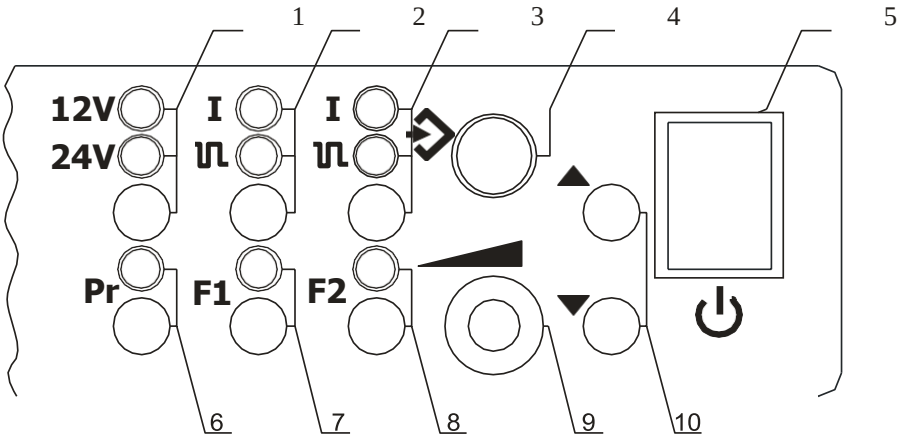

Figure 6. Device control panel

To change the value, briefly press the corresponding button (the LED will change from continuous to intermittent), turn the multi-turn switch (clockwise or counterclockwise) to enter a new value, and save it by briefly pressing the button again. For two-mode buttons “2” and “3”, to switch the mode, press and hold the button for 2-3 seconds (the selected mode is displayed by the LED opposite the corresponding signature).

Buttons have the following purposes:

1.- PWM voltage of the control signal LP1-LP2. To check the CP pumps, different voltages can be used - 12V or 24V (data taken from test plans for pumps, test plans are not attached to the device). The voltage value is displayed by the LED opposite the corresponding signature. To switch the voltage, press and hold the button for 2-3 seconds;

2.- current / duty cycle of the control signal LP1. To control the LP1 regulator, it is possible to maintain current through its winding or to supply a PWM signal

with a specific duty cycle;
3.- current / duty cycle of the LP2 control signal.
The functions of the “3” button are absolutely identical to the “2” button;
4.- "Start / stop" device control;
5.- turning on / off the device;
6.- pressure in the test system;
7.- PWM frequency of LP1 control signal;
8.- PWM frequency of LP2 control signal;
9.- multi-turn switch;
10. - navigation buttons on the settings menu (see the settings menu below).

Settings menu

To enter the menu, when the device is off, hold down the "Start" button and turn on the 220V power.
The hidden menu contains data whose change is extremely rare:

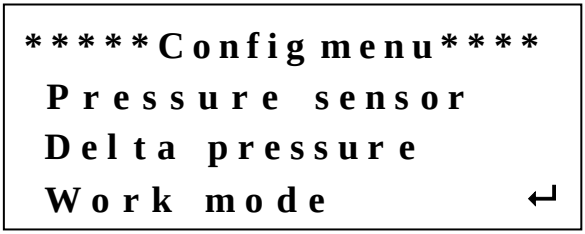

Figure 7. Settings menu

- Pressure sensor - measuring range of the pressure sensor. The device is designed to work with a common rail pressure sensor. The sensors of this system have a linear characteristic (the dependence of the output voltage on the applied pressure, see Fig. 8).

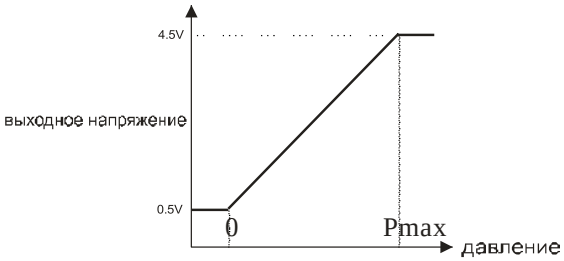

Figure 8. Pressure Sensor Feature

With an output voltage of 0.5V, the pressure is 0bar, with a voltage of 4.5V maximum. Sensors have different measuring ranges. Sensors from cars, as a rule, have a maximum measured pressure of 1500 bar, that is, with an output voltage of 4.5 V, the actual pressure is 1500 bar. For sensors from minibuses, trucks, the measurement range is higher, depending on the generation of injection systems.

There are sensors with a maximum pressure of 1800, 2200, 2500 bar. Enter the measuring range of the sensor you are using;

- Delta pressure - rate of change of pressure. This parameter is used for automatic control mode. In order to ensure the safety of operating personnel, a smooth increase and decrease in pressure should be used (at high pump speeds, a complete shutdown of the pressure regulator will lead to an instant pressure jump, which in turn can lead to a rupture of the fuel supply lines, and vice versa, at high pressure, a sharp opening the regulator will discharge a large amount of fuel into the return circuit, and this process is often accompanied by a breakdown of the fuel hoses of the return circuit). Normal is a pressure change of 100-150 bar in one second. But this parameter is not critical and the user determines its value.
- Work mode - Sdandart and Control pump. Sdandart - normal operation mode for checking CP pumps. Control pump - mode for checking Denso HP0 rotary pumps. A feature of the operation of these pumps is the adjustment of the fuel supply by turning on the regulators in a certain position of the pump shaft, at a given angle of rotation.

If the Control pump mode is selected, the device will switch to the low pressure valve control mode according to the specified angular parameters.

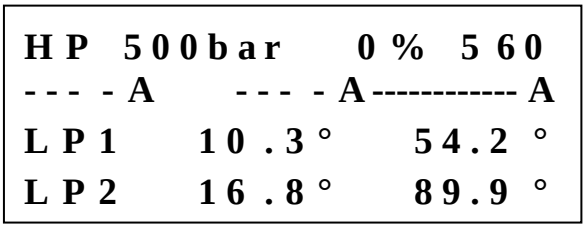

Figure 9. Mode Control pump

In the initial state, the following information is displayed (see left to right, top to bottom):

- set pressure in the test system;
- PWM duty cycle of the control signal of the HP regulator (s);
- revolutions of the pump shaft;
- value of current flowing through the winding of the regulator (s) HP;
- angle of inclusion of the LP1 regulator;
- angle of shutdown of the LP1 regulator;
- angle of inclusion of the LP2 regulator;
- angle of shutdown of the LP2 regulator

The following buttons are used to change the on and off angle (see Fig. 6):
2.- angle of turning on regulator LP1;
3.- angle off the regulator LP1;
7.- angle of turning on LP2 regulator;
8.- angle of shutdown of the LP2 regulator.

- *Polarity signal* – polarity of the shaft encoder signal (for Control pump mode). The device is designed to work with an inductive sensor. This type of sensor reacts to the presence of metal in front of its sensitive part. Depending on the design of the reading element for the sensor, choose Rising — the reaction of the sensor to the air / metal transition and Falling — the reaction of the sensor to the metal / air transition;
- *Zero point LP1* - zero point for LP1 (for Control pump mode). From this point, the on / off angle of the LP1 controller will be counted;
- *Zero point LP2* - zero point for LP2 (for Control pump mode). From this point, the on / off angle of the LP2 controller will be counted;
- *Auto calibration* - setting parameters. Calibration is carried out during the manufacture of the device and is not used during operation.

After setting the operating mode, the necessary parameters, the device is launched into operation. To do this, click the "Start" button. The device will go into pressure setting mode. In the process of setting the pressure, either the pressure does not lie within ± 5 bar from the set value, the button illumination blinks

"Start". When all the pressure is established, the backlight will light up constantly.

In the operating mode, instead of the set pressure, current, percentage of PWM, their current values are displayed.

Work is stopped by pressing the “Start” button again.

Attention: in the absence of a signal from the pressure sensor, a signal will not be sent to the control of the HP pressure regulator (s).

During startup or operation, the device may signal the following operational errors:

- **Please, shut down the cover**! - close the protective cover. In order to ensure the safety of working personnel, we strongly recommend the use of passive protection in the system (various protective covers that cover rotating parts, as well as close high-pressure lines). A convenient technical solution is the manufacture of a cabinet burying the rail from transparent plastic, by setting limit switches on the opening elements. The device has an additional input “PROT” (from English - protection). At this input, the device determines whether the guards are closed. The connection diagram of the limit switches is very simple and does not require special skills for its installation (see Appendix No. 2).
- **Short circuit in HPx/LPx regulator**! - Short circuit in the specified regulator. Check connecting cables or replace specified regulator.

Security

Attention: a known working pressure sensor should be used in the system. If there is none, you must use an additional means of pressure control (mechanical pressure gauge with a measuring range above the sensor of at least 100 bar) and check serviceability of the pressure sensor. Also, for safety reasons, it is recommended to use a mechanical pressure limiting valve with pressure operation corresponding to a maximum of 1500 or 2500 bar).

In case of breakage, unscrewing of threaded connections or other malfunctions of the fuel supply channels of high pressure, immediately turn off the stand, observing all safety precautions.

Remember:

A bursting fuel jet under a pressure of 700 kgf / cm2 or more acts like a needle, penetrating deep into the skin, which can lead to rupture of the upper layers of the skin, resulting in blood poisoning. In addition, at this pressure, the liquid is heated to temperature 110-135 ° C, which in turn is dangerous for the human body. When working with the device, observe the precautions necessary when working with the bench for testing and adjusting the high pressure fuel pump.

9. The set of delivery

Passport OS.25-01. (Trchnical description, instruction for use) 1 pc.
Controller OS.25-02..... 1 pc.
Adapter cable for regulators HP OS.25-03..... 1 pc.
Adapter cable for regulators LP OS.25-031 ..... 1 pc.
Adapter cable for pressure sensor OS.25-032..... 1 pc.
Power cable 220V..... 1 pc.
Safety fuse 3A ..... 1 pc.
Security Input Connector..... 1 pc.

The shaft position sensor is not included in the standard package and must be ordered separately.

10. Warranty

The manufacturer guarantees the stable operation of the CP-Tester device, subject to the owner observing the storage and operation rules set forth in this passport.

The warranty period is established by the manufacturer - 18 months from the date of receipt of the product, unless otherwise specified by the manufacturer and the buyer by an additional contract.

The manufacturer notes in the warranty card the year, month, day of sale, legal address, telephone number of the company performing the warranty repair (the warranty card is in the appendix to the passport for the CP-Tester device).

During the warranty period, the owner is entitled to free repair upon presentation of this passport and warranty card. After repairs are carried out, a list of troubleshooting steps is entered in the warranty card.

Not a ground for complaint: violation of the integrity of the connecting wires (adapter cables).

The manufacturer does not bear guarantees for the CP-Tester devices in the following cases: opening the case of the CP-Tester device, the presence of traces of damage on the case and the CP-Tester board, if the storage and operation rules of the device are not observed.

Without presenting a warranty card and in case of violation of the safety of seals on the product, claims to the quality of work and warranty repairs are not made.

During the warranty period of operation installed on the product, repairs are carried out at the expense of the owner if he does not use it in accordance with these operating instructions.

The manufacturer company provides further repair of the CP-Tester device, after the end of the warranty period under a separate agreement.

Appendix №1

1 2 3

1 – Common wire;

2 – Pressure Sensor Signal Output;

3 – Sensor power, +5 V.

Figure 10. Pressure sensor connector

An OS.16.005 adapter cable is used to connect the pressure sensor to the CP Tester device.

Recommended pressure sensors for use:

- Bosch 0 281 002 405 - range 1500bar;
- Bosch 0 281 002 534 - range 1800bar.

It is possible to use other, similar to the original pressure sensors for the required range, but it is necessary to check the sensor wiring.

The pinout data should be taken in the technical documentation for the sensor, or in the electrical circuits for the vehicle where it is installed.

Appendix №2

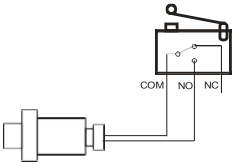

Figure 11. Connection diagram for protective limit switches

The operation of the circuit is designed to break the circuit. Depending on the mounting and execution method, it is necessary to take such terminal contacts so that when the protective guard is opened, the circuit connecting the two contacts of the PROT connector will disconnect.

On the limit switches, the contacts have the following designations:

• NC - normally closed contact;

• NO - normally open contact;

• COM - a common contact (it is connected to NC or NO, depending on whether the button is pressed or not).

For example: take the limit switch, the same as on the diagram (Fig. 6).

We install on the door of the protective cabinet, so that when the doors are closed, the button closes, opens when opened.

From the first contact of the PROT plug, we connect the wire to the terminal contact of the COM, from the second contact we connect to NO.

If there is a need to install two or more limit switches (on several mechanisms), then we connect them in series: from the PROT plug to the COM terminal of the first terminal, from its NO contact, to the COM terminal of the second terminal, from its NO terminal to the next terminal, the same pattern. From the last end, lead to the second contact of the PROT plug (see Fig. 7).

The limit switches must be isolated from the stand frame (do not connect a common contact with the housing) !!!

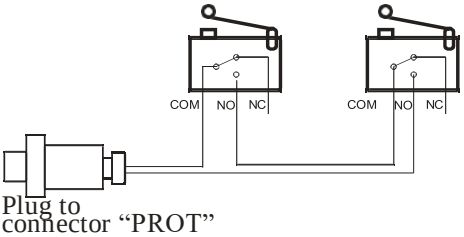

Figure 12. Multi-terminal wiring diagram

Appendix №3 Warranty card

Warranty card №_____

The CP-Tester OS.25-02 device for testing and checking the performance of Common Rail diesel fuel injection pumps.

Warranty repair and maintenance of the CP-Tester device is carried out by the enterprise_____.

Address _____

Phone _____

Date of sale "_____"_____

Notes