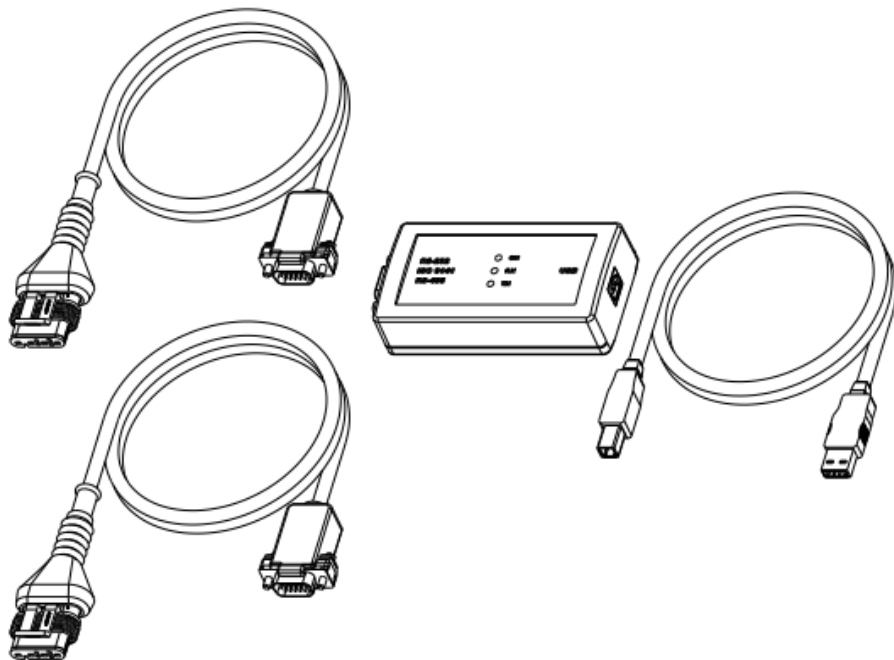




TECHNOTON

Service kit SK DUT-E



OPERATION MANUAL

(incl. User guide for software "Service DUT-E")

Version 1.0

ISO
9001:2008
REGISTERED

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Introduction

Recommendations and regulations given in the operation manual are related to service kit SK DUT-E (hereinafter SK DUT-E), developed by JV Technoton, Minsk, Belarus. This document defines the procedure for connection and use of SK DUT-E, as well as provides info for installation and use of software Service kit SK DUT-E, version 3.5 which is included in the delivery set.

SK DUT-E is used to connect the fuel level sensors DUT-E 232 and DUT-E 485 to the computer for their setting up, output data viewing, and for calibration of the fuel tank.

It is necessary strictly to follow the manufacturer's recommendations mentioned in this manual when using SK DUT-E.

The manual is for the professional users who are familiar with the rules for repair and mounting works on vehicles and who have professional knowledge in the field of electrical and electronic equipment of various transport vehicles.

Current version of the software "Service DUT-E" can be found at the manufacturer's website in the "Document Center": <http://www.jv-technoton.com/documents/>

1. Main data

1.1 Purpose of use

SK DUT-E is used to connect the fuel level sensors DUT-E RS-232 and DUT-E RS-485 to computer.

Software "Service DUT-E" is the development of JV Technoton company and is designed for operation together with SK DUT-E.

"Service DUT-E" allows you to:

- view and change DUT-E settings;
- view output data of the sensor;
- calibrate the sensor;
- calibrate the tank;
- make diagnostics of DUT-E.

1.2 Requirements to the computer

USB-port is used to connect the SK DUT-E to your computer.

For proper operation of the program "Service DUT-E" you need a computer with the installed operating system Windows XP or Windows 7.

CD-ROM or DVD-ROM on your computer is required.

1.3 Exterior view and delivery set

Delivery set for SK DUT-E includes:

- 1) adaptor;
- 2) cable USB A-B;
- 3) cable RS-232;
- 4) cable RS-485;
- 5) CD with USB driver;
- 6) CD with software "Service DUT-E";
- 7) license to use the software "Service DUT-E";
- 8) specification

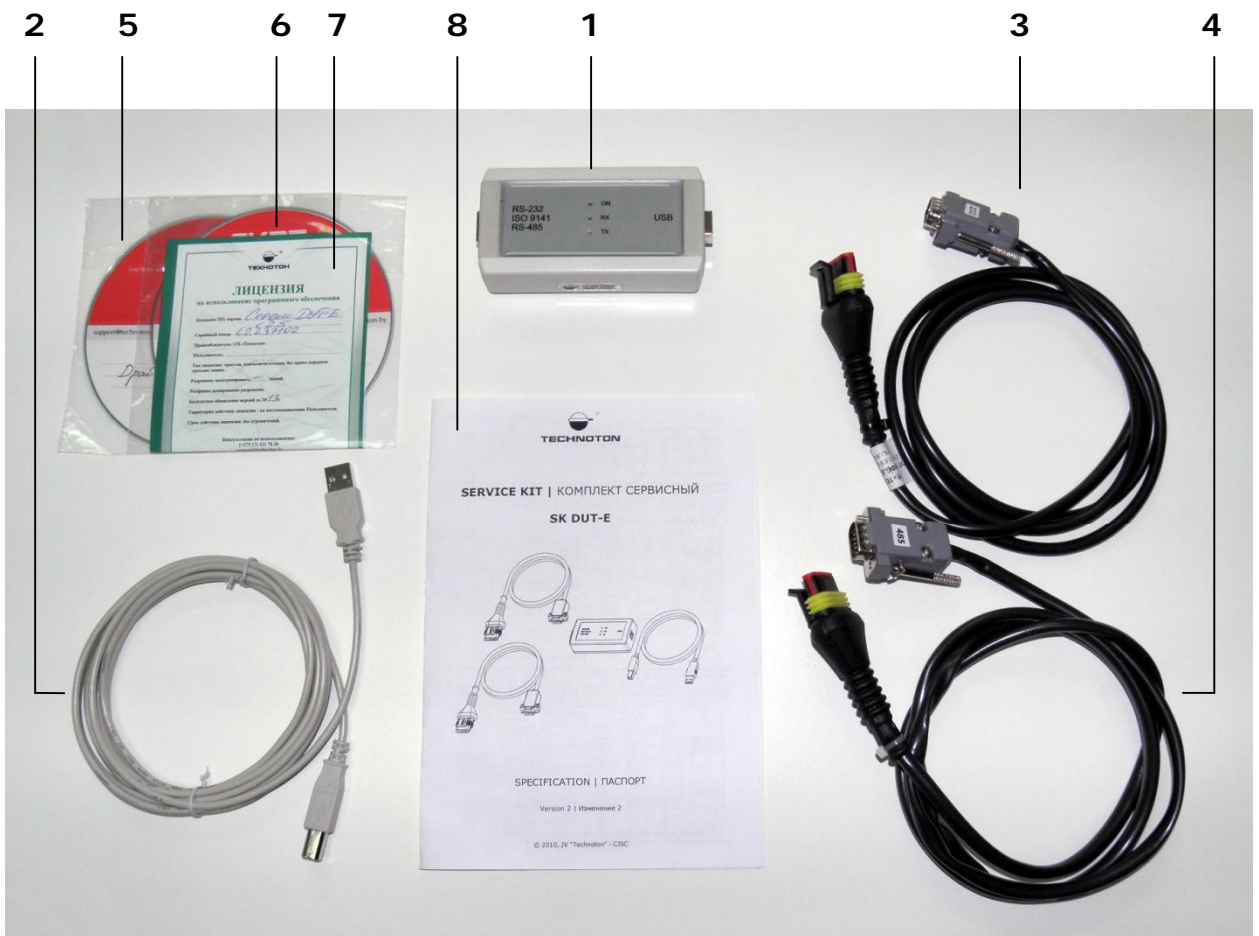


Fig.1. Delivery set SK DUT-E

Connectors and indicators of adapter SK DUT-E:

- 1) socket for the connection of DUT-E sensor with RS-232 cable or RS-485;
- 2) socket for connection to PC with a USB cable;
- 3) indicator of power supply;
- 4) indicator of data receiving from the sensor;
- 5) indicator of data transfer to the sensor.

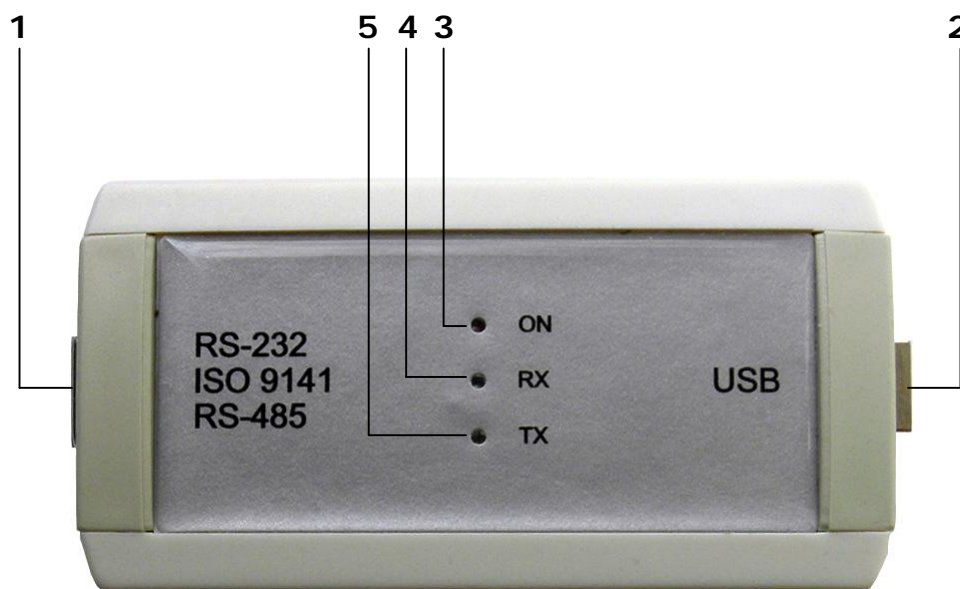


Fig.2. Exterior view of adaptor SK DUT-E

1.4 Packing

SK DUT-E is delivered in the carton box.



Fig.3. Carton box SK DUT-E

On one side of the box there is a sticker with information about the product, production date and factory control marks.*



Fig.4. Sticker on the box

* Exterior view and data on the sticker can be changed by the manufacturer and is given in this manual just for information.

2. Connection and setup of SK DUT-E

ATTENTION! SK DUT-E operation is not possible without installation of USB driver

For SK DUT-E operation you need to install USB driver and software "Service DUT-E" (included in the delivery set) on your computer.

In order to install the USB driver, first you need to connect the adapter SK DUT-E to your computer (see item 2.1), and then install the driver (see item 2.2).

After the driver installation you need to install software "Service DUT-E" (see item 3.1).

2.1 Connection of SK DUT-E to the computer

To connect the SK DUT-E to computer use the USB cable which is supplied in delivery set.

Connect the USB cable from one side to the adapter SK DUT-E, and connect the other end of the cable to an available USB-port.

If SK DUT-E is connected in a proper way, there will be a confirmation message on your computer screen that new device is found (see Fig.5), indicators on the adapter SK DUT-E will remain inactive.

2.2 Installation of USB driver

Insert the CD with USB driver into CD-ROM.

Select (see Fig. 5) item "No, not this time" and click "Next."



Fig.5. Window for driver installation

In the next window select "Install from a list or specific location" and click "Next" (see Fig.6).



Fig.6. Selection of installation method

In the next window select "Search removable media" and click "Next" (see Fig.7).

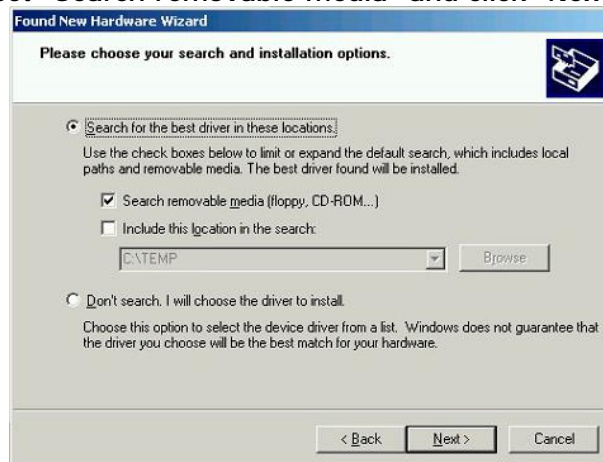


Fig.7. Selection of search area of the driver

In the next window the indication of the driver installation shall appear (see Fig.8).



Fig.8. Indication of the driver installation

As soon as the installation process is complete, the window with information about the installed driver will be displayed, and then press "Finish" and the window will be closed (see Fig. 9).



Fig.9. Driver installation is complete

ATTENTION! After installation of the first driver is finished, the system will display a new window for the driver installation. Repeat all the steps described in this chapter for the second time!

After installation of the second driver is complete, the kit SK DUT-E is ready to work with the program "Service DUT-E", and the indicator "ON" will light on the adapter SK DUT-E.

3. Installation of program "Service DUT-E"

Program "Service DUT-E" will work with DUT-E connected to the computer only when the USB driver is installed (see item 2.2).

Program "Service DUT-E" is available on CD as a part of the Service Kit SK DUT-E.

To install the program, please, run the file *Setup Service DUT-E vX.X.exe* from the CD.

The installation process will start on your computer (see Fig.10).



Fig.10. Program Setup Wizard

You should follow all program requirements during the installation process, after that the program will be installed on your computer.

After installation is complete, "Service DUT-E" will run automatically.

4. Operation with the program "Service DUT-E"

Software "Service DUT-E" is designed to work with profiles of settings (further "profiles") of the sensors DUT-E. Profile is a collection of all sensor settings and it can be saved into a file or a sensor DUT-E.

Profile that is stored in the sensor DUT-E at the manufacturing plant is given in Appendix B of this Guide.

Software "Service DUT-E" allows you to work with the profiles both with connected sensor DUT-E and in autonomous mode. In autonomous mode you can change earlier saved profiles and further save them to disk.

ATTENTION! The operation of the program "Service DUT-E" is described when sensor DUT-E is connected! In the autonomous mode some parameters and functions of the program will not be available!

ATTENTION! When you save a profile into the sensor or carry out its calibration, the password (listed in the Appendix to the DUT-E specification on the pink sheet) is requested automatically.

If you lose your DUT-E password, you need to contact technical support team (see page 26).

Requirements to the request for the password recovery on e-mail of technical support team (see item Technical Support):

- request should be a scanned letter stamped and signed by the director of the company;
- there should be a serial number and date of issue of the sensor DUT-E in the letter;
- together with the letter there should be a password recovery code given in electronic form (important: not a screenshot!)*;
- in the letter there should be first and last name and contact e-mail of the person to whom a new password should be sent.

* to receive a password recovery code, please, press the key combination Ctrl + F10 when program "Service DUT-E" will request the password.

5. Interface of "Service DUT-E"

Interface of "Service DUT-E" software consists of upper level menu and tree menu on the left part of the window (see Fig. 12).

The upper level menu is to select operations with the profile: download, save and print, as well as firmware update of DUT-E. In addition, wire connection state, firmware version and serial number of the connected DUT-E are displayed at the top part of the window.

To change the interface language, please, click on the corresponding language sign at the upper part of the window.

5.1 Profile download

To start working with the program, you need to download the profile. You can choose from the following download options:

- from disk;
- default;
- from sensor.



Fig.11. Profile download

The function of download from the disk is used to download the profile which was previously saved to your hard drive or removable media. When you select the function, explorer window appears which should be used to find and choose the profile file (*. dpf).

The function download on default creates a profile with standard settings of DUT-E and is used to learn how to use the program without connecting the sensor.

5.2 Passport of DUT-E

When you download the profile from the sensor, information about the model of the connected sensor DUT-E, its serial number and firmware version will be displayed on the bookmark named "Passport" (see Fig. 12).

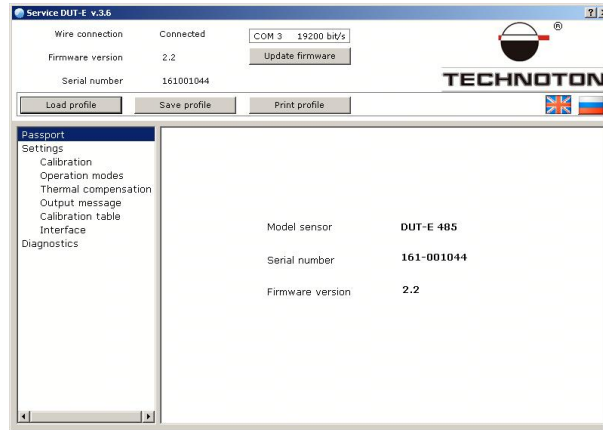


Fig.12. Passport DUT-E

5.3 DUT-E settings

5.3.1 Sensor calibration

Calibration of DUT-E is needed to determine the minimum and maximum range of the fuel level measurement.

All DUT-E are delivered calibrated.

ATTENTION! All DUT-E sensors are calibrated at the manufacturing plant! Recalibration of DUT-E is required only when the length of the sensor is changed by cutting or attaching the additional sections.

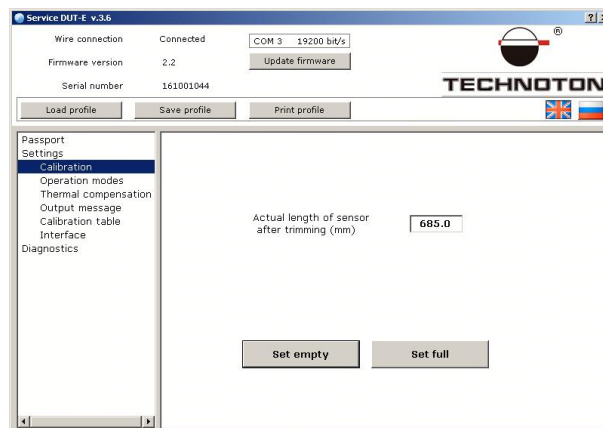


Fig.13. Calibration of DUT-E

Calibration of DUT-E:

- 1) remove the sensor measuring part out of fuel;
- 2) make a pause of 30 ... 60 s so that fuel residues could flow out of the tubes of the DUT-E measuring part;
- 3) measure the length of the sensor measuring part L in mm;
- 4) deduct the length of the dead zone of the measuring part (12 mm) from the length L;
- 5) put the obtained value into the field "actual length of the sensor (after cutting), mm";
- 6) make a pause of 3-5 s to stabilize the sensor readings;
- 7) calibrate the readings for the empty tank by pressing the button "Set empty";
- 8) make a pause of 3-5 s to stabilize the sensor readings;
- 9) put the sensor measuring part completely into the fuel;
- 10) calibrate the readings for the full tank by pressing the button "Set full";
- 11) make a pause of 3-5 s to stabilize the sensor readings;
- 12) calibration is completed.

5.3.2 Operation mode

It is possible to set up DUT-E operation modes, thus you can adjust the sensor operation to the working conditions and to the requirements of registration and display devices to which the sensor is connected.

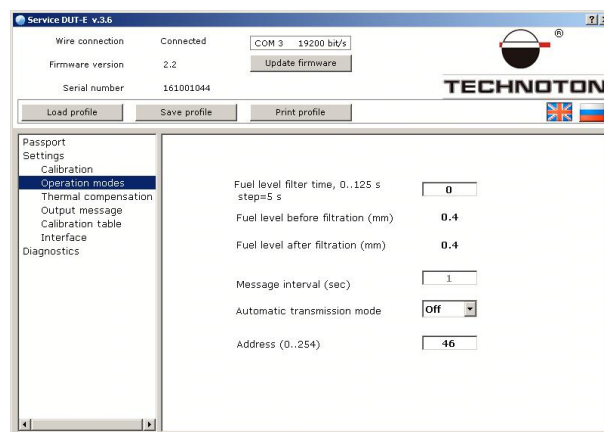


Fig.14. Setting the DUT-E operation mode

Fuel level filter time is the time interval that precede the data transmission and which is used to calculate the average fuel level in the tank. Thus, information about the fuel level in the tank which is transmitted by the sensor to the recording and display device is not the instant value, but the averaged value over the set period of time.

The setting value varies from 0 to 125. The default value is 10 seconds. Discreteness is 5 s.

ATTENTION! If you install the filter time which is not multiple of five, then the input value will be rounded to the closest value which is multiple of 5 s.

Setting this function is important when you use the DUT-E sensor on the vehicle which is applied in the conditions with lack of roads.

Message interval is the period of time which is used by the DUT-E to transmit the data about the fuel level in the tank to the connected recording and display device.

Message interval varies from 1 to 60 s. The default value is 1 s. Discreteness is 1 s.

Automatic transmission mode defines the data transmission mode:

- 1) **OFF** - automatic data output is switched off (data transmission works only on-demand of the recording device);
- 2) **HEX** - binary format of automatic data output;
- 3) **ASCII** - text format of automatic data output.

Network address* specifies the DUT-E address in case it works in RS-485 network. Default address is the last two digits of sensor serial number.

* *Only for DUT-E 485.*

5.3.3 Thermo correction

Due to thermal expansion and contraction of fuel there is a possible change of fuel volume in the tank with the change of fuel temperature.

Thus, because of fuel heating and cooling in the tank the sensor can transfer information about reducing or increasing of fuel level to the registration and display devices.

In order to compensate the temperature changes in the fuel, the electronic board of DUT-E will recalculate the fuel level. As a result of such recalculation, the output values of fuel level are translated to a normal temperature of 20° C and will not change with temperature fluctuations and with the corresponding change of the fuel volume.

By default, function of the automatic thermo correction is included with the value of the coefficient of 0,084%/°C. Mostly, the coefficient change is not required. If you want to disable the automatic thermo correction, you need to set the value of the coefficient to 0.0.

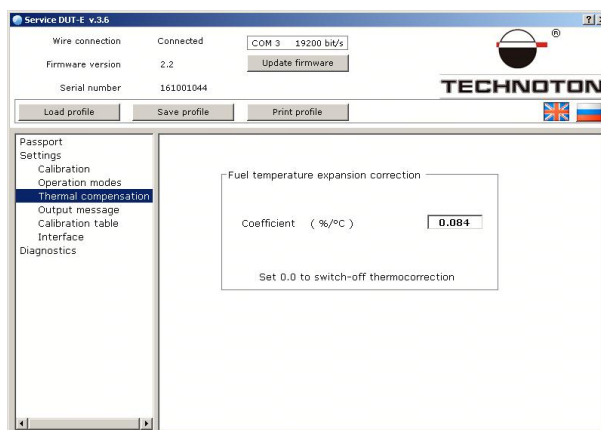


Fig.15. Setting of the function "DUT-E thermo correction"

5.3.4 Output message

You can select the parameter which is transferred by the sensor DUT-E in the output message:

- 1) fuel level in the tank in standard units (further s.u.) (0..1000);
- 2) the height of the fuel level in the tank (mm), resolution 0.1 mm;
- 3) fuel volume in the tank (l), resolution 0.1 l;
- 4) fuel volume in the tank (%) – acc. to the standard J1939 SPN96.

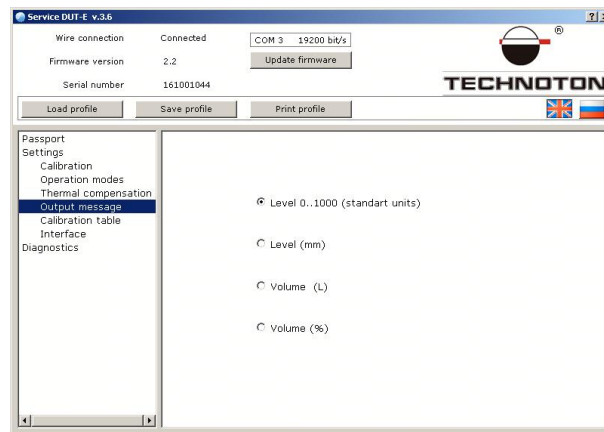


Fig.16. Selection of the transferred parameter

5.3.5 Calibration table

This setting allows you to save into DUT-E the calibration table for the fuel tank of the vehicle on which the sensor is installed.

The necessary data should be obtained during calibration of the tank (see *DUT-E Operation Manual*) and recorded into the table of correspondence "Fuel level" (mm) to "Fuel volume in the tank" (L).

The recommended number of calibration points is 15. You can add up to 30 calibration points into the table.

To add a new line into the calibration table, you need to press "Add" button, then enter the data. After the new line has been entered, the table will be sorted out and the edited line will automatically move to the right place of the table. To remove the line, you need to select a line with mouse and click "Delete".

ATTENTION! Conformity of one fuel level value in mm to several fuel volume values is not allowed! This situation can occur when the fuel tanks of complex geometry are calibrated. If such situation occurs, you should correct the required calibration points.

Linear dependence is built up at the intervals between the points.

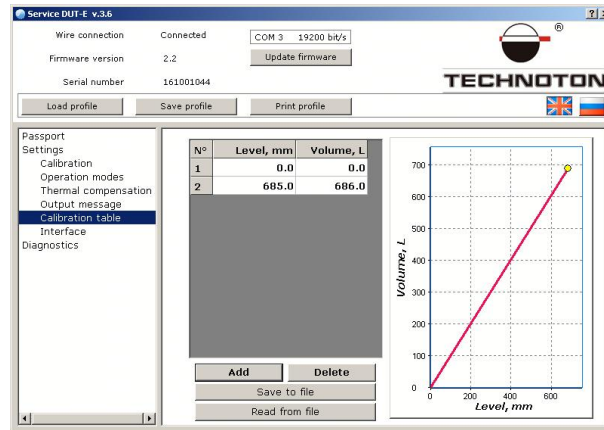


Fig.17. Calibration table

5.3.6 Interface speed

Data transfer speed via digital interface can be chosen from the following values:

- 4800 bit/s;
- 9600 bit/s;
- 19200 bits/s.

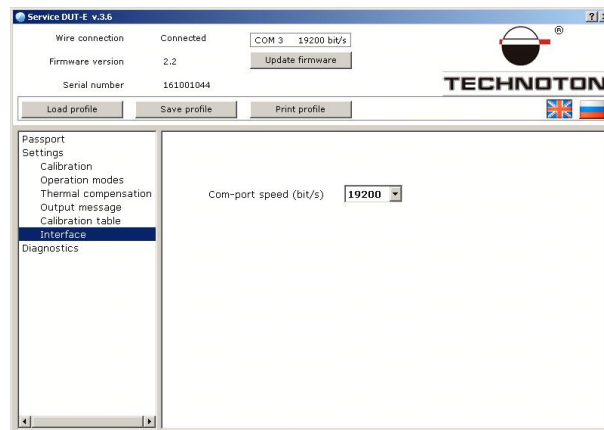


Fig.18. Setting the interface speed

5.4 Diagnostics and current parameters

Diagnostics screen displays the current parameters, as well as information about possible malfunctions of the sensor.

Information displayed in the field "Fuel Level (mm)" can be used during calibration of the tank (see *DUT-E Operation Manual*).

Also, by making an analyses of the parameter values (fuel level in mm, s.u., l), you can check if sensor is set up and calibrated in a proper way.

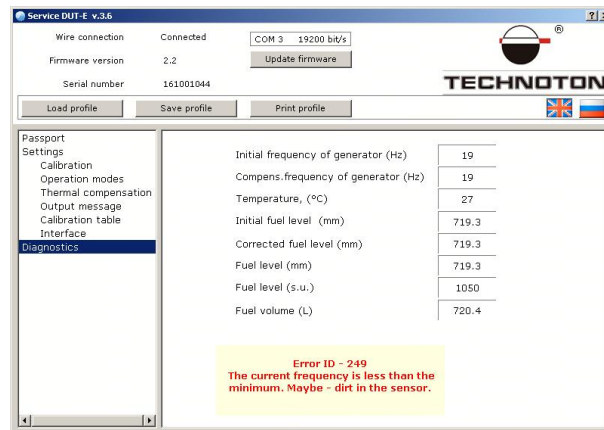


Fig.19. Diagnostics window

The diagnostics window can display the following warnings about DUT-E malfunctions:

- **sensor is not calibrated for minimum and maximum** - error may occur if there were errors during calibration of the sensor, for example, calibration for minimum and maximum was mixed up.

Solution: re-calibrate (see item 5.3.1);

- **sensor is not calibrated for maximum** - error may occur if the sensor is calibrated wrong at the maximum, for example, maximum level is set to 0.

Solution: re-calibrate (see item 5.3.1);

sensor is faulty. Possible short circuit or dirt in the sensor - error may occur if there is short circuit between the tubes of the measuring part, for example, if there is conductive mud or water between the tubes of the measuring part

Solution: wash the tubes of the DUT-E measuring part in the fuel; clean the fuel tank from the garbage;

- **calibration for minimum and maximum coincides** - error may occur if errors were made during calibration of the sensor.

Solution: re-calibrate (see item 5.3.1)

- **Error EEPROM. Hardware failure of the sensor** - error occurs by the hardware failure of the sensor.

Solution: contact you supplier of DUT-E;

- **current frequency is more than the maximum. Possible dirt in the sensor** - error occurs if the frequency value of the measurement oscillator exceeds its frequency by the calibration at minimum.

Solution: wash the tubes of the DUT-E measuring part in the fuel; clean the fuel tank from the garbage;

- **current frequency is less than the minimum** - error may occur if errors were made during the sensor calibration, or the sensor was not calibrated after cutting.

Solution: re-calibrate (see item 5.3.1)

5.5 Firmware update

The internal software (firmware) of DUT-E can be updated. To get a new firmware version, please, contact the technical support team of the manufacturer (see chapter Technical support).

ATTENTION! The firmware updating should be done only if you believe that you have more updated version than the installed one in your DUT-E, and the hardware of the sensor is compatible with the new version of the firmware!

The process of DUT-E firmware updating:

- 1) connect the sensor DUT-E to your computer using a service kit SK DUT-E;
- 2) run the program "Service DUT-E";
- 3) remember or make a note of COM-port number (displayed at the upper part of the window);
- 4) click the mouse to run the function "firmware update" in the upper level menu. After that the screen with the firmware update will appear:



Fig.20. Firmware update

- 5) select the function "Specify file" in the window "Firmware Update", specify location of the file with resolution *.cod with firmware;
- 6) after you have selected the firmware file, the program will request for a password of the DUT-E sensor which is connected to the computer. Enter 4-digit password. The password is given in the Appendix to the specification (on the pink sheet);

in case you lost your DUT-E password, follow the instructions given in chapter 4 of this Guide.

- 7) after you have entered the password, the process of the firmware updating will start. It may take a few minutes. As soon as the update process is complete, the last significant window of "Service DUT-E" will appear;
- 8) if the firmware update is successful, a new version of firmware will be displayed in the field "Firmware Version" which is located at the upper part of the window.

If during the firmware update errors occurred, the connection with the sensor DUT-E will fail.

ATTENTION! If during the firmware update there was a power supply failure, you need to repeat the procedure of the firmware update!

Firmware update procedure after unsuccessful try of firmware update:

- 1) connect the sensor DUT-E to your computer using a service kit SK DUT-E;
- 2) run the program "Service DUT-E";
- 3) don't try to make connection to the sensor. Select the function "firmware update" at the upper level menu. Then the firmware update window will appear (see Fig. 22);
- 4) specify the number of COM-port which you recorded during the previous attempt of firmware update in the window "Firmware Update". After that, select the function "Specify file" and specify the location of the file with resolution *.cod;
- 5) after you have selected the firmware file, the program will request for a password of the DUT-E sensor which is connected to the computer. Enter the 4-digit password. The password is given in the Appendix of the specification (on the pink sheet);
In case you lost your DUT-E password, follow the instructions given in chapter 4 of this Guide.
- 6) after you have entered the password, the process of the firmware updating will start. It may take a few minutes. As soon as the update process is complete, the last significant window of "Service DUT-E" will appear;
- 7) If the firmware update is successful a new version of firmware will be displayed in the field "Firmware Version" which is located at the upper part of the window.

ATTENTION! If you strictly followed all the above requirements, but you didn't succeed to update the firmware, then contact technical support (see chapter Technical support).

6. "Service DUT-E" software uninstall

To uninstall the program from your computer, please, run the file unins000.exe, located in the program folder "Technoton\Service DUT-E\uninstall" or go to "Start-Programs-Technoton-Service DUT-E-Uninstall Service DUT-E".

After the start, follow all instructions on the screen. After uninstall process is complete, all the program files of "Service DUT-E" will be deleted from your computer.

7. Storage

SK DUT-E is recommended to be stored in dry areas.

SK DUT-E storage is allowed only in original packaging at temperature range from -50 to +40 ° C and relative humidity up to 100% at 25 °C.

Do not store SK DUT-E in the same room with substances that cause metal corrosion and / or contain aggressive impurities.

Storage life for SK DUT-E should not exceed 24 months.

8. Transportation

Transportation of SK DUT-E is recommended in closed transport that provides protection for DUT-E from mechanical damage and no access of precipitation.

During transportation by air the SK DUT-E must be placed in heated sealed compartments.

Air environment in vehicles should not contain acid, alkaline and other aggressive impurities.

Shipping containers with packed SK DUT-E sensors should be sealed.

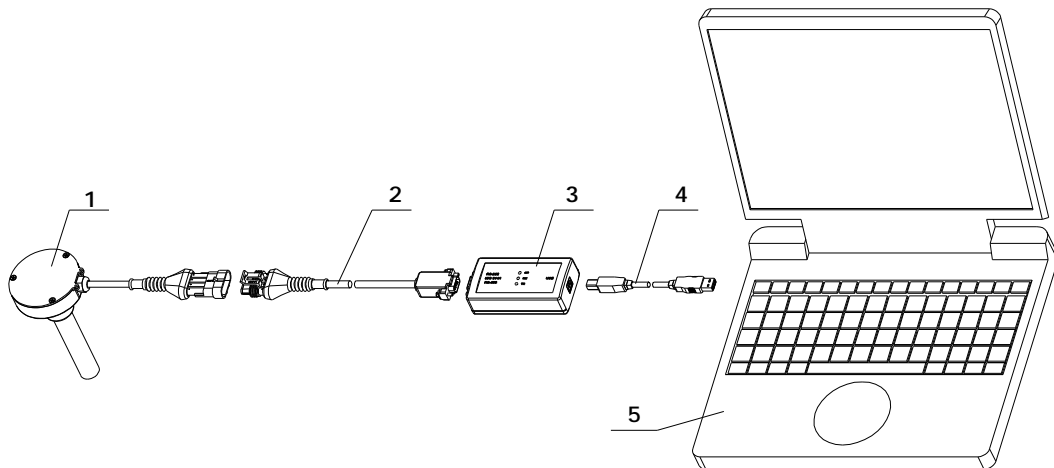
9. Utilization/re-cycling

SK DUT-E does not contain harmful substances and ingredients that are dangerous to human health and environment during and after the end of life and recycling.

SK DUT-E does not contain precious metals in amount that should be recorded.

Appendix A. Connection diagram of DUT-E to PC

Connection diagram of DUT-E to PC using a service kit SK DUT-E



- 1 - DUT-E sensor;
- 2 - RS-282 or RS-485 cable;
- 3 - SK DUT-E adapter;
- 4 - USB cable;
- 5 - PC

Appendix B. DUT-E factory settings

Table B1. Factory settings

Setting name	Factory meaning
Fuel level filter time, s	10
Periodic data output mode	HEX
Periodic parameter output interval, s	1
Thermo correction	OFF
Thermo correction coefficient , %/°C	0.084
Output message	Fuel level, s.u.
Calibration table	See table B2
Output parameter values for -normalized height minimal maximum -length of the sensor, mm minimal maximum	0 1000 0 L
Network address (RS-485)	The last two digits of serial number

Table B2. Factory settings of calibration table

Length of the DUT-E measuring part, mm	Calibration table	
700	Height , mm	Volume , l
	0,0	0,0
	685,0	686,0
1000	Height , mm	Volume , l
	0,0	0,0
	985,0	2000,0
1400	Height , mm	Volume , l
	0,0	0,0
	1385,0	3000,0

Technical support

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