



Lintel

Automated laboratory equipment for quality control

Rolling thin-film oven (RTFOT)

***Lintel*[®] PSB-10**

Operating manual

WIRELESS INTERFACE SUBSYSTEM

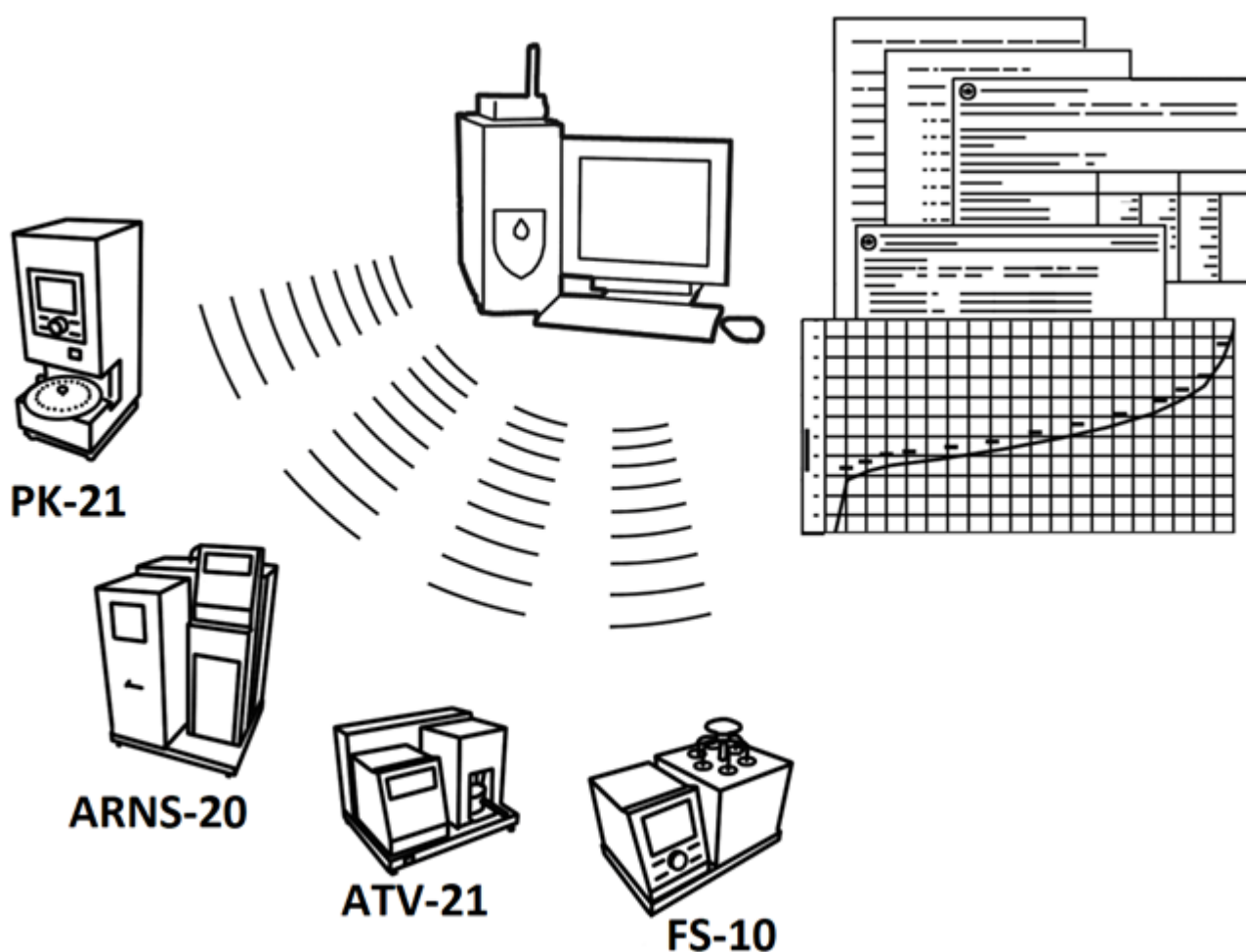
Wireless interface subsystem (further WIS) is designed for operation automation of petroleum product quality control laboratories.

Wireless interface subsystem has the following functions:

- automatic transfer of test results from the tester located in the laboratory to PC via wireless communications channel (IEEE 802.15.4/ZigBee standard);
- safe storage of information obtained from the tester in a common database;
- user-friendly, standardized representation of information to the user (in a table-oriented, graphical, printed view);
- providing tools for effective work with test results, tools for calculating accuracy characteristics using standard methods.

Wireless interface subsystem provides communication at the distance up to 100 m indoors, all *LinteL*[®] tester can be integrated in a common network.

LinteL[®] tester are equipped with hardware and software providing tester operation with the Wireless Interface Subsystem¹.



System operation requires purchase and installation of a radio modem with USB interface and PC software. The software includes data communication protocol driver and *LinteL*[®] - LINK software. Test results are automatically transferred to the database, which simplifies access to data and schedules, improves the quality of work, and eliminates most routine operations.

¹ For additional information, please, call + 7 (347) 284-44-36, 284-27-47.

Up-to-date devices for petroleum product quality control

Thank you for purchasing and usage of *LinteL*® PSB-10 –laboratory tester for the effect of high temperature and air on a moving thin film of bitumen.

Since 1959, BSDO Neftehimavtomatika JSC has been manufacturing and supplying tester for quality control of petroleum products in the laboratories of factories, airports, and fuel and energy complex enterprises.

Our tester implement STANDARD METHODS, have passed metrological certification, are included in MI 2418-97 "Classification and application of technical means of testing of petroleum products" and the corresponding GOSTs Standards as a means of implementing quality control methods.

The tester has special solutions that allow you to implement in addition to standard methods and methods for performing research, which is especially important when developing new types of products. LinteL uses the latest technologies and components to ensure consistently high quality of tester, convenience of their operation, in order to reduce the time spent on testing and increase the efficiency of your work.

The *LinteL*® PSB-10 tester you purchased uses the best achievements in the development of products of this type:

- modern control device with the primary use of imported components and components of high reliability;
- four-line character LCD display;
- the self-diagnosis system of the tester increases the reliability of the tester;
- set of measures to protect against operator errors;
- power supply module that allows the tester to remain operational in an extended range of network voltages: from 198 to 242 V AC with a frequency of 50 Hz.

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The operating manual contains information about the design, operating principle, characteristics of the automatic *LinteL*® PSB-10 and instructions necessary for its correct and safe operation.

1 LIST OF ABBREVIATIONS

Tester – oven *LinteL*® PSB-10.

PC – personal computer.

PSD –protective shutdown device.

2 DESCRIPTION AND OPERATION

2.1 Purpose

Tester for determining the aging of bitumen under the influence of high temperature and air *LinteL*® PSB-10 (further - the oven) manufactured according to NTVR.441336.058 TU. Is a test equipment of a desktop type and is intended for carrying out the effect of high temperature and air on the moving thin film of bitumen in accordance with standards GOST 33140, EN 12607-1.

2.2 Specifications

2.2.1 Performance data of the oven given in Table 1.

Table 1 – Performance data

Parameters	Unit of measurement	Value	
		GOST 33140	EN 12607-1
Oven temperature after stabilization	°C	from 162 to 164	from 162 to 164
Air flow through the flow sensor	liter/min	from 3,8 to 4,2	from 3,8 to 4,2
Drum speed after acceleration	rpm	from 14,8 to 15,2	from 14,8 to 15,2
Fan speed after acceleration	rpm	from 1625 to 1825	from 1650 to 1850
Test duration	min	from 84 to 86	from 74 to 76 ¹
Time of heating of the oven after placing samples in the oven ² , no more	min	15	15
Voltage	V	from 198 to 242	
Frequency	Hz	from 49 to 51	
Power consumption, no more than	Kilowatt (kW)	2,1	
Ambient temperature	°C	from 17 to 25	
Relative humidity, not more than	%	80	
Barometric pressure	mm Hg	from 680 to 800	

2.2.2 Weight and dimensions of the oven given in table 2.

Table 2 – The overall dimension

Parameter	Unit of measurement	Value
Weight of the oven	kg	120
Dimensions of the oven (width x height x depth)	mm	916,6x826x823

2.2.3 The accuracy parameters of the oven given in table 3.

¹ After reaching the test temperature

² At 220 V network voltage and correct initial temperature selection.

Table 3 – The accuracy characteristics

Parameter	Unit of measurement	Value
Accuracy of the fan rotation speed	min ⁻¹	±100
Accuracy of the drum rotation speed	min ⁻¹	±0,2
The accuracy of the feed rate of hot air	liter/min	±0,2
Accuracy of maintaining the temperature of the internal space	°C	±1

The manufacturer guarantees that the accuracy parameters confirmed during the initial certification after transportation remain unchanged.

2.2.4 Oven possibility

- 1) testing and notification of the end time;
- 2) automatic blocking and signaling in case of incorrect operator actions or malfunctions of individual nodes;
- 3) protection against starting the test when the door is open.

2.3 Arrangement and operation

2.3.1 Scope of delivery:

- 1) Tester LinteL® PSB-10 AIF 2.772.022.
- 2) Operational documents:
 - Operating manual AIF 2.772.022 RE;
 - Passport AIF 2.772.022 PS;
 - Certification program and procedure AIF 2.772.022 MA.
- 3) Attachment.

2.3.2 General information

The main function of the oven include:

- 1) ensuring stable test conditions (automatic maintenance of oven temperature, air flow, drum rotation speed and fan rotation speed);
- 2) warning the operator about the end of the test time with sound signal.

2.3.3 Oven desing

2.3.3.1 The general view of the oven is shown in Figure 1, page 4. The main elements of the oven are **door 1, door handle 2, drum 3, fan 4, coil 5, temperature sensor 6, front panel 7**. On the bottom right is the «**Network**» **switch 8**, intended to activate the oven's power supply. Using the **adjusting legs 9**, the horizontal position of the oven is adjusted. **The hole 10** is used to place an exemplary thermometer inside the oven.

2.3.3.2 On the rear wall of the oven (figure 2, page 4) are the **input of the power cord 1, the protective disconnection device 2, the grounding pin 3**.

2.3.3.3 The front panel (figure 3, page 4) contains **the display 1** and the oven controls: **the control knob 2, and the buttons 3**. The purpose of the controls is shown in table 4, page 5.

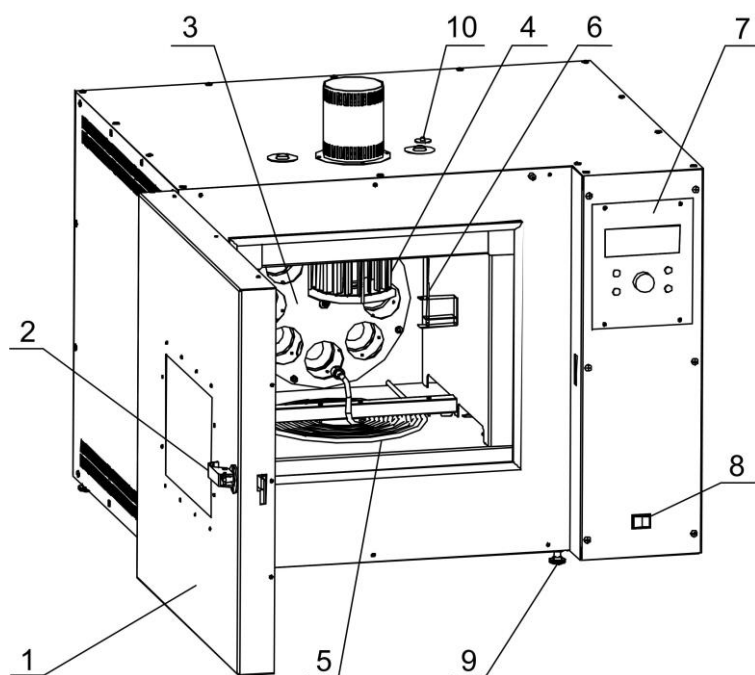


Figure 1 – General view of the oven (front view)

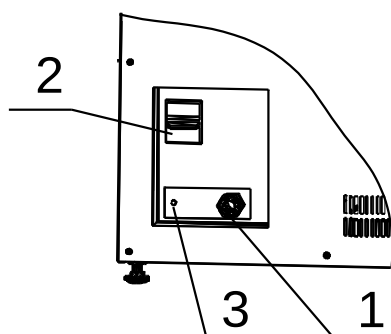


Figure 2 – Rear wall of the oven

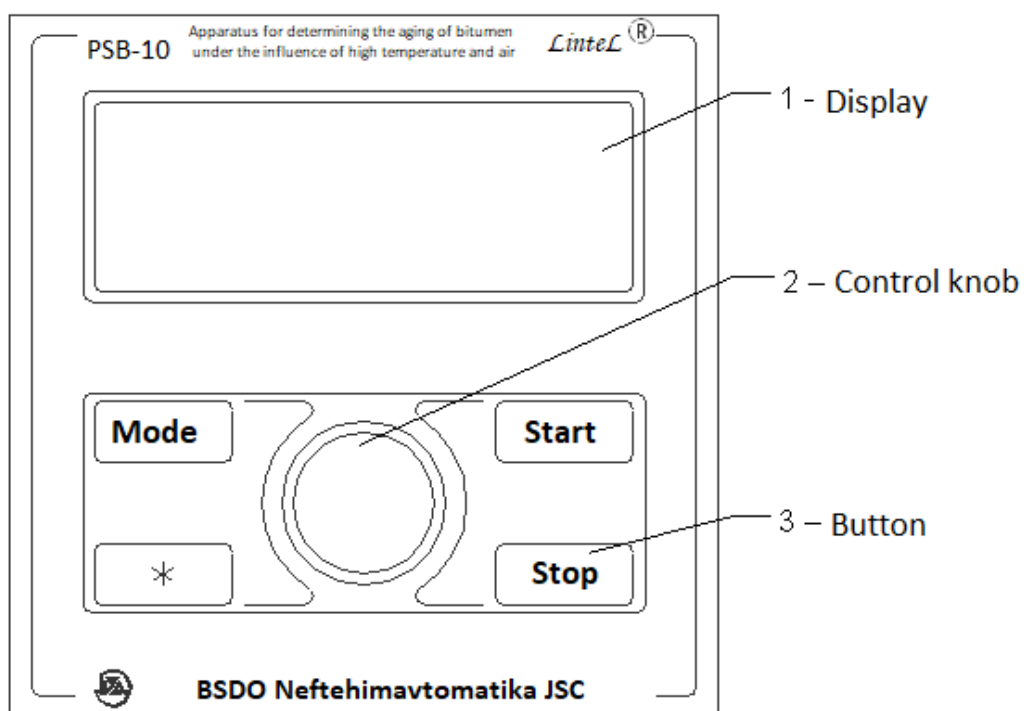


Figure 3 – The front panel

Table 1 – Designation of oven controls

Button	Modes of operation of the oven	Action
«Mode»	screen saver	entering the service menu
	waiting	entering the main menu
	editing numeric parameters	cycling cursor to the left – accordingly, edited number digits
«*»	test completed	display of maximum and minimum parameter values during the test
	editing numeric parameters	cycling cursor to the right – accordingly, edited number digits
«Stop»	menu, service	transition to standby mode
	printing parameters, printing errors, re-setting settings	transition to the service menu
	interface, operating time, sensors, calibration, «exit» item in the «equipment test» menu	transition to the main menu
	t° calibration, flow calibration, drum calibration	return to the «calibration» menu
	oven heating, stable	return to standby mode
	test	transition to «test completed»
	test completed	transition to «heating the oven»
	display of maximum and minimum parameters during the test, display of heating time	transition to «test completed»
	editing numeric parameters	exit editing mode without saving changes
	equipment test	finish testing the selected equipment
«Start»	waiting	starting the heating of the oven
	stably/unstably	running a test
	display of maximum and minimum parameters during the test, display of heating time	transition to «test completed»
	displaying any type of menu	selecting the current menu item
	editing numeric parameters	exit edit mode and save changes
	equipment test	start testing the selected equipment
Control knob (rotation)	being in any menu	navigate through the list items (move the pointer to the current item ►)
	editing numeric parameters	changing the number starting from the digit that the cursor points to _

3 PREPARATION FOR OPERATION

3.1 Requirements for installation place

3.1.1 The oven is a desktop -type laboratory tester.

3.1.2 The place of installation of the oven should exclude the impact of shaking, shocks, vibrations that affect the normal operation of the oven.

3.1.3 The oven should be installed horizontally using a level.

3.1.4 The European standard socket used for powering the oven should have a ground connection to «**ground**» bus that is not connected to the power equipment.

3.1.5 Connect the ground terminal (see figure 2, page 4) to an external ground bus that is not connected to the power equipment.

3.1.6 Switch the protective disconnection device (see figure 2, page 4) to the on state (toggle switch up).

3.1.7 Check the cup retainers inside the drum. In order to avoid falling out of glass test cup during operation, it is necessary that they securely fix the glass test cup.

ATTENTION

If the oven is not installed horizontally, the glass test cup may fall out of the drum during the test.

3.2 Visual control

Before using the oven:

- 1) unpack the oven;
- 2) check scope of supply;
- 3) perform visual control of the oven for damage;
- 4) check for supporting documentation.

An appropriate report is drawn up for all defects.

3.3 Test run

ATTENTION

After entering the heated room from a zone with a temperature below 10°C, keep the oven in the package for at least 4 hours.

3.3.1 Turn on the oven with the «**Network**» **toggle switch 8** (see figure 1, page 4). The display shows the download window (see figure 4), where X. XX is the software configuration.

PSB-1	CX.XX
BSDO "NHA" JSC	
Tel: (347) 284-44-36	
info@bashnxa.ru	

Figure 4 – Download window

3.3.2 After 10 seconds or by pressing the [**Start**] button on the front panel, the oven will switch to standby mode (see figure 5).

WAITING	GOST 33140
t oven, °C	25.3
Drum, rpm	0.0
Compressor	off

Figure 5 – Waiting window

Parameter	Value
Temp. oven, °C	oven temperature according to the built -in temperature sensor
Drum, rpm	the speed of the drum
Compressor	<u>off</u> – compressor is turned off

4 INTENDED USE

4.1 Operating limits

- 1) when connecting to a network of ~ 220 V 50 Hz, it is necessary use a socket that meets the European standard (with a ground terminal);
- 2) it is forbidden to perform maintenance of the oven included in the network;

- 3) the oven can be switched on again no earlier than 5 minutes after it is switched off;
- 4) do not turn on the oven when the cover is removed. When performing work related to removing the cover, it is necessary to disconnect the mains plug from the outlet;
- 5) the operating mode of the oven is continuous. After the operation is completed, the oven is turned off by the «**Network**» **toggle switch 8** (see figure 1, page 4);
- 6) when working with the oven, the service personal should follow the general safety rules during working with electrical installations with a voltage of up to 1000 V;
- 7) service personal should:
 - pass training to work with the oven and get admission;
 - know how the tester works;
 - know the rules for safe maintenance;
 - know the procedure for a failure;
- 8) It is forbidden to touch open parts of the body to the oven during operation to avoid burns;
- 9) the oven should be grounded via the ground terminal (see figure 2, page 4).

4.2 Sample preparation

4.2.1 Prepare a sample in accordance to GOST 33140, EN 12607-1.

4.3 Oven preparation for testing

4.3.1 Prepare samples in accordance with paragraph 4.2 of this operating manual.

4.3.2 If the oven door is not closed, it is necessary to close the door tightly.

ATTENTION

To activate the door lock and close the door tightly, turn the door handle counterclockwise until it stops and lock it by pressing the handle. To open the lock, remove the lock and turn the door handle clockwise.

4.3.3 Turn on the oven according to paragraph 3.3 of this operating manual.

4.3.4 To heat the oven, press the **[Start]** button on the front panel while in standby mode. After that, the oven will switch to the heating mode to the initial temperature (see figure 6, page 7), which is set in the menu («**t initial, °C**», paragraph 4.8.1.2 of this operating manual). The last entered value of the initial temperature is stored in the oven memory and is unloaded at subsequent starts. Past time since the oven was started should be displayed opposite the inscription «**HEATING OF OVEN**». If you want to exit heating mode to standby mode, you should press the **[Stop]** button on the front panel.

ATTENTION

The recommended starting temperature is 175 °C.

HEAT.OVEN	00:01:25
Temp.oven, °C	25.3
Drum, rpm	0.0
Compressor	off

Figure 6 – Heating mode

4.3.5 If the oven door is not closed, the oven heating process will not start and an appropriate warning will be issued (see Figure 7).

ATTENTION Close the oven door

Figure 7 – Warning

ATTENTION

It is forbidden to open the oven door during heating. When it is opened, a corresponding message will be issued and the heating process will stop.

4.3.6 When the heating process is completed, the oven will enter stabilization mode (see Figure 8) and the countdown will begin (the oven needs to be warmed up for 2 hours). If you need to exit the stabilization mode to standby mode, you should press the **[Stop]** button on the front panel.

STABLY	01:55:05
Temp.oven, °C	175.0
Drum, rpm	0.0
Compressor	off

Figure 8 – Stably mode

4.4 Testing

4.4.1 To start the test, perform the following steps while in the stabilization mode:

- 1) open the oven door;
- 2) install glass test cup with prepared bitumen in the oven in accordance to GOST 33140, EN 12607-1;
- 3) close the oven door;
- 4) click the **[Start]** button on the front panel.

ATTENTION

*The oven door can be kept open for no more than 40 seconds. If this time is exceeded and the oven door is open for more than three minutes, the heater will turn off and a warning will appear on the display (see figure 9). To enter standby mode, press **[Stop]**.*

ATTENTION Oven door is open for more than 3 min Press STOP

Figure 9 – Warning

4.4.2 After the bitumen samples are loaded into the oven and the test is started, the oven will heat up to 163° C, the oven drum will rotate at a speed of 14.8 to 15.2 rpm, and air will be delivered at a speed of 3.8 to 4.2 liter / min. If the test is carried out according to GOST 33140, the countdown, starting from 85 minutes, will start immediately after the test begins (see figure 10, page 8).

TEST	65:59
Temp.oven, °C	163.0
Drum, rpm	15.0
Flow, l/min	4.0

Figure 10 –Test Mode (Countdown)

If the test is performed in accordance to EN 12607-1, countdown will not be performed until the temperature reaches 162°C (figure 11). The countdown, starting from 75 minutes, is performed after the temperature reaches 162°C.

TEST STABLY t	
Temp.oven, °C	163.0
Drum, rpm	15.0
Flow, l/min	4.0

Figure 11 – Test mode (without countdown)

ATTENTION

To complete the test at any time, press the **[Stop]** button on the front panel.

4.4.3 After 85 minutes after starting the test for GOST 33140, or 75 minutes after reaching 162 degrees for EN12607-1, the oven will sound a signal. From this point on, you can remove samples. When the door is open, the drum stops, and when the door is closed, the drum starts moving again.

4.4.4 To complete the test, press the **[Stop]** button, after which the drum will stop completely and the air supply will stop. The oven will enter the «**TEST COMPLETED**» mode (see figure 12).

TEST COMPLETED		
Temp. oven, °C	162.1	
Drum, rpm	0.0	
Compressor	off	

Figure 12 – Test completion mode

4.4.5 If you press the **[*]** button on the front panel in the «**TEST COMPLETED**» mode, information about the maximum and minimum sensor readings during the test will be displayed (see figure 14). To exit the «**TEST COMPLETED**» mode or view the minimum and maximum sensor readings, press the **[Start]** button or the **[Stop]** button on the front panel and return to the oven heating mode.

4.4.6 If, for some reason, the oven cannot reach the test temperature in less than 15 minutes during the test (for example, if the oven door has been open for too long), a corresponding message will be displayed and the time taken for the oven to reach the test temperature will be shown (see figure 13). To close the message, click the **[Start]** button or the **[Stop]** button on the front panel.

Heating time up to
163±1°C is equal to:
16 min 2 sec

Figure 13 – Message about the heating time

4.4.7 If any of the parameters (oven temperature, drum speed, fan speed, air flow) exceeded the permissible limits during the test, data on the maximum and minimum sensor readings during the test will be displayed after the test (see figure 14). To close the message, click the **[Start]** button or the **[Stop]** button on the front panel.

t oven	162.9	164.0
Drum	14.9	15.0
Flow rate	3.9	4.1
Fan	1719.1	1735.5

Figure 14 – Minimum (left) and maximum (right) sensor readings

4.5 Work completion

4.5.1 Turn off the tester with the «**Network**» toggle switch **8**. Disconnect the tester from the network. (see figure 1, page 4).

4.6 List of potential failures

4.6.1 Possible malfunctions and methods of their elimination are given in the table 2.

Table 2 – Possible malfunctions and methods of their elimination

No	Name of the fault , external manifestation	Probable cause	Method of elimination
1	The oven is connected to the network, there is no indication	There is no voltage network	Check the voltage
2	The oven is turned on and the set temperature is not supported	Faulty heater	Contact the manufacturer
3	Characters displayed on the display are fuzzy (or excessively dark)	Display contrast is not set	To adjust the contrast
4	The oven does not support an air flow rate of 4 liter/min	The nozzle clogged	Clean the nozzle

4.6.1.1 If other faults occur or if the above occur again, contact the manufacturer.

4.7 Contingency actions

If liquids or foreign objects get inside the oven, you should:

- 1) turn off the oven by pressing the switch «**Network**» 8 (see figure 1, page 4);
- 2) unplug the power cord from the wall outlet;
- 3) remove the protective cover;
- 4) remove liquid or foreign objects;
- 5) install the cover in place.

ATTENTION

It is recommended to use compressed air to remove the liquid. The faster the liquid is removed, the more likely it is that the oven will remain operational. After removing the liquid, allow the oven to stand for at least 16 hours before turning it on again.

4.8 Additional function

4.8.1 Operating menu

4.8.1.1 If you press the **[Mode]** button on the front panel in standby mode , the operator menu opens (see figure 15, page 10).

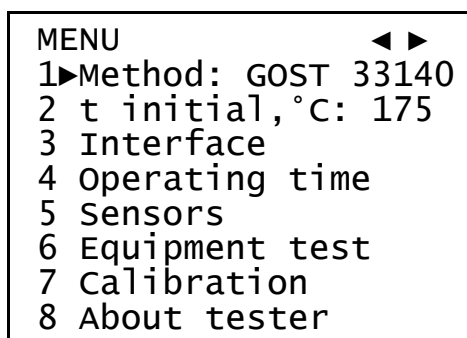


Figure 15 – Operating menu

To navigate the menu, use the control knob on the front panel. Turning the handle allows to move the pointer of the current menu item ►. Turning clockwise moves the menu pointer down and counter-clockwise moves it up.

In order to access the menu item opposite the pointer, it is necessary click the **[Start]** button. To exit the current menu item, press the **[Stop]** button. These rules apply to all menu items except «**t initial, °C**» (paragraph 4.8.1.3) and «**Equipment test**» (paragraph 4.8.1.7).

4.8.1.2 Submenu «Method»

If you go to the «**Method**» submenu, you can select the method by which the test will be conducted.

4.8.1.3 Item «t initial, °C»

In this menu item, you can change the initial temperature of the oven to which it is heated during pre-heating. To switch to the change mode, press the **[Mode]** button, then set the desired value with the

handle. To save your changes, click **[Start]**. To exit the initial temperature adjustment mode without saving the entered value, press the **[Stop]** button.

4.8.1.4 Submenu «Interface»

The items in the «**Interface**» submenu are shown in figure 16. Each item is described in table 6, page 12.

Interface	< >
1▶Volume:	4
2 Melody:	1
3 Contrast:	100

Figure 16 – Submenu «**Interface**»

4.8.1.5 Submenu «Operating time»

If you go to this menu item, you will see the number of inclusions and operating time of the oven (figure 17). To return to the menu, press the **[Stop]** button.

OPERATING TIME	
Operat.time, hr.	123
Inclusions	555

Figure 17 – Submenu «**Operating time**»

4.8.1.6 Submenu «Sensors»

In this submenu displays the readings from sensors of the oven.

4.8.1.7 Submenu «Equipment test»

In this submenu, you can test parts of the oven. The menu content is shown in figure 18, page 11. To run a test of the selected equipment, click the **[Start]** button. The test is stopped by pressing the **[Stop]** button. To exit this submenu, set the menu pointer to «**Exit**» and click the **[Start]** button.

EQUIPMENT TEST	◀ ▶
1▶Drum:	off
2 Fan:	off
3 Compressor:	off
4 Sound:	off
5 Exit	

Figure 18 – Submenu «**Equipment test**»

Table 3 – Submenu «Interface»

Item	Action
Volume	Volume of audio signals as a percentage of the maximum value. To correct, press the [Mode] button, and then make changes using the control knob. To save your changes, click the [Start] button. To exit the volume adjustment mode without saving, press the [Stop] button.
Melody	The number of the melody that will play after the test time has passed. To correct, press the [Mode] button, and then make a selection using the control knob. To save changes, click the [Start] button, and then the selected melody will start playing (you can stop playing by clicking the [Stop] button). To exit the adjustment mode without changes, press the [Stop] button.
Contrast	Display contrast as a percentage of the maximum value. The minimum value is limited. To correct, press the [Mode] button, and then make a selection using the control knob. To save changes, click the [Start] button. To exit contrast adjustment mode without saving, press the [Stop] button.

4.8.1.8 Submenu «Calibration»

To enter the «**Calibration**» submenu, enter the password «12041961». The password is set using the handle and the **[*]** and **[Mode]** buttons. The **[*]** button rotates the cursor to the right and the **[Mode]** button to the left. If the password is entered correctly, access to calibration is opened. This menu allows to calibrate the temperature sensor, the flow sensor, or view the drum calibration coefficients (figure 19).

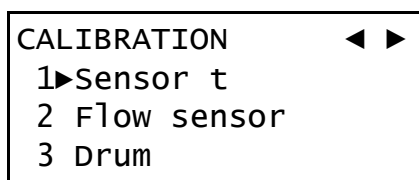


Figure 19 – Submenu «Calibration»

4.8.1.9 Submenu «About tester»

If you go to this menu item, then information about the software version and the checksum of the software will be displayed.

4.8.2 Service menu

4.8.3 In order to enter the service menu, it is necessary after turning on the oven during the display of the loading window (Figure 4, page 6), press the **[Mode]** button - the service menu will open (Figure 20).

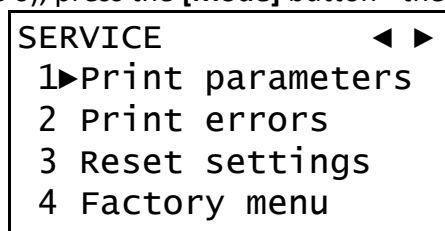


Figure 20 – Service menu

The description of each item in the service menu is given in table 7.

Table 4 - Description of service menu items

Item	Action
«1 Print parameters»	View the settings of the oven and transmit the values to RS-232 at a speed of 115200.
«2 Print errors»	View current errors and send a list of errors over RS-232 at 115200 speed.
«3 Reset settings»	Load the settings that were set at the manufacturer (this will change the calibration parameters that were made by the operator). This can help restore the oven's functionality after incorrect operator actions.
«4 Factory menu»	For specialists of the manufacturer.

5 MAINTENANCE

To increase the service life of the tester, it is necessary to carry out its maintenance. The frequency of maintenance depends on the intensity and operating conditions of the tester.

5.1 Additional equipment and materials

The list of additional materials for oven maintenance given in table 8.

Table 5 – List of additional materials

Material	Purpose
Ethyl alcohol, or alcohol-toluene mixture	cleaning the display and oven body from dirt
Cotton napkin	

The list of additional equipment for oven maintenance given in table 9.

Table 6 – List of additional equipment

Equipment	Purpose
Meter temperature TTSM 9410/M2 with sensor TTTS 01-180	Calibration of the oven temperature sensor
Flowmeter RM-A0,25GUZ	Calibration of the air flow sensor

5.2 List of operations

The list of maintenance operations given in table 10.

Table 7 – List of operations

Operation	Paragraph	Periodicity
Cleaning the display from dirt	5.3	as required, if any contamination is present
Cleaning the oven body from dirt	5.3	as required, if any contamination is present
Calibration of the oven temperature sensor	5.4	if the oven temperature sensor reading different from the exemplary thermometer, then the temperature sensor should be calibrated
Calibration of the air flow sensor	5.5	if the air flow sensor reading different from that of the exemplary flow meter, the flow sensor should be calibrated

5.3 Wiping the display surface

5.3.1 Wipe the display surface and the oven body as it becomes dirty with a napkin dipped in ethyl alcohol.

5.4 Calibration of the oven temperature sensor

5.4.1 If the oven temperature sensor reading different from the exemplary thermometer, it is necessary to calibrate the temperature sensor. The oven door should be closed during calibration.

5.4.2 Place the exemplary thermometer in a special hole.

5.4.3 In the standby mode, press the **[Mode]** button, then switch to «MENU» - «Calibration» - «Sensor temperature». When entering the «Calibration» submenu, enter the password (paragraph 4.8.1.8), then the sensor calibration menu will open (see figure 21).

CALIBRATION t		◀ ▶
1▶ t oven=	25.6	
2 Slope k:	1.0000	
3 Offset. b:	0.0000	
4 calibrate		

Figure 21 – Oven temperature sensor calibration menu

5.4.4 Record the values of the «Slope k» and «Offset b» parameters in case you need to return the previous settings.

5.4.5 Select «Calibrate» and click **[Start]**.

5.4.6 Wait until the temperature stabilizes at 145 °C (see figure 22).

ATTENTION

The time for stabilization can be more than 2 hours.

STABILIZATION 145 °C

Figure 22 – Stabilization 145°C

5.4.7 When stabilization occurs, enter the exemplary thermometer reading (see figure 23). You can change the entered numbers using the handle, and shift the cursor using the **[Mode]** and **[*]** buttons. After entering the value, click the **[Start]** button.

STABLY Enter thermometer reading 144.1

Figure 23 – Entering the first temperature sensor calibration point

5.4.8 Wait until the temperature stabilizes at 163 °C (see figure 24).

STABILIZATION 163 °C

Figure 24 – Stabilization 163°C

5.4.9 When stabilization occurs, enter the exemplary thermometer reading (see figure 25). You can change the entered numbers using the handle, and shift the cursor using the **[Mode]** and **[*]** buttons. After entering the value, click the **[Start]** button.

STABLY Enter thermometer reading 163.1

Figure 25 –Entering the second temperature sensor calibration point

5.4.10 Calibration is complete.

5.5 Calibration of the air flow sensor

5.5.1 If the readings of the air flow sensor differ from the readings of the exemplary flowmeter, it is necessary to calibrate the flow sensor.

5.5.2 Connect an exemplary flowmeter through the hose to the coil nozzle, and then fix the hose with a hose clamp.

5.5.3 In the standby mode, press the **[Mode]** button, then switch to «MENU» - «Calibration» - «Flow Sensor». When entering the «Calibration» submenu, enter the password (paragraph 4.8.1.8), then the flow sensor calibration menu will open (see figure 26).

```
Flow calibration ◀ ▶
1▶ Flow l/min= 0.1
2 Slope k: 1.0000
3 Offset. b: 0.0000
4 Calibrate
```

Figure 26 – Air Flow Sensor Calibration Menu

5.5.4 Record the values of the parameters «Slope k» and «Offset b» in case you need to return the previous settings.

5.5.5 Select «Calibration» and press **[Start]**.

5.5.6 Turn the handle until the exemplary flowmeter shows 4 liter/min (see figure 27).

```
Rotate handle until
flowmeter won't show
4 l/min
35,7
```

Figure 27 –Calibration of the air flow sensor

5.5.7 Wait two minutes.

5.5.8 If the flowmeter reading differs from 4 liter/min, then return to perform of paragraph 5.5.6 of this operating manual.

5.5.9 Press **[Start]**.

5.5.10 Calibration is complete.

5.6 Viewing drum calibration coefficients

In the standby mode, press the **[Mode]** button, and then switch to «MENU» - «Calibration» - «Drum». When entering the «Calibration» submenu, enter the password (paragraph 4.8.1.8). A menu opens where you can compare the coefficient obtained at the factory and the coefficient automatically calculated during the rotation of the drum (see figure 28). If the difference is significant, it means that it is time to change the rubber between the engine pulley and the drum disk.

```
CALIBRATION DRUM ◀ ▶
1▶C.step mtr FTY=457
2 C.step mtr USR=457
```

Figure 28 –Calibration of the drum

6 STORAGE AND TRANSPORTATION

6.1 Storage

6.1.1 The storage conditions of the oven in terms of the impact of climatic factors should comply with the group «L» GOST 15150-69.

6.1.2 The oven should be stored in closed, heated rooms in the packaging on racks that are not subject to vibrations and shocks.

6.1.3 The oven should be stored at an air temperature of 5 °C to 40 °C and a relative humidity of no more than 80 %.

6.1.4 Storage of the oven without packaging is not allowed.

6.1.5 The shelf life of the oven is 6 years.

6.1.6 The oven is canned according to option B3-10 GOST 9.014-78, packaging option - VU-5.

6.1.7 If after unpacking the oven was not used for its intended purpose, then it should be stored in a case made of polyethylene GOST 10354-82.

6.2 Transportation

6.2.1 The conditions for transporting the oven in terms of the impact of climatic factors should correspond to the group of storage conditions 5 (OZH4) according to GOST 15150-69.

6.2.2 The oven is allowed to be transported by all means of transport in covered vehicles (by air transport in heated sealed compartments) for any distance.