



USER MANUAL

RESISTANCE CALIBRATORS

SRP-50k0-10G0

SRP-50k0-100G0

SRP-50k0-5T0

SRP-10G0-10T0



**SONEL S.A.
Wokulskiego 11
58-100 Świdnica, Poland**

Version 1.05 27.02.2020

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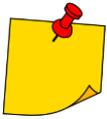
WARNING

Failure to comply with the instructions contained in this manual may result in electrocution, fire or serious damage of the instrument.



NOTE!

Before using, leave the calibrator in normal climatic conditions consistent with the instrument specifications for at least 12 hours.



- When connecting the calibrator to the mains make sure it can be easily disconnected.
- In connection with continuous product improvement and increase of its technical parameters and performance, there may be slight design changes, not reflected in this edition of the manual.

1 Introduction

This manual contains information on the design and use of the SRP resistance calibrators, their operating limitations and safety measures when using them. The manual is intended for the staff using the calibrators as well as the support personnel.

Symbols shown on the instrument:



Read the manual before using the instrument. Strictly comply with the safety rules and manufacturer's recommendations.



Alternating current



Operational earthing terminal



Warning, dangerous voltage

2 Safety



NOTE!

Read the manual carefully before using the instrument.

The instrument should be used only by the staff who have received adequate training in handling electrical equipment.

Connect the calibrator only to the sockets with earthing pins!



NOTE!

Always connect the instrument to the mains using the cable with earthing.

Observe the following rules to avoid accidents or instrument damage:

- use the calibrator solely for the purposes described in this manual,
- before connecting the calibrator to the mains, make sure the power cable is intact,
- store the unit in a dry place with the humidity not exceeding the value given in the manual,
- do not use the calibrator with visible mechanical damage,
- when replacing the fuse, make sure that the instrument is disconnected from the mains. The replacement fuse must conform to the description given in this manual,
- when working with the calibrator, use appropriate test probes,
- before measurement, make sure the leads are connected to respective measuring terminals,
- do not apply higher voltage to the terminals than specified in the manual.



NOTE!

The instrument may be repaired solely by the manufacturer. Tampering with the instrument may result in electrocution, fire or dangerous accident.

When performing the measurements, the following elements must be isolated from the workplace:

- live electrical equipment,
- metal structures,
- materials collecting static potential,
- moving people.

Resistance set by the calibrator can be electrically powered by an external direct voltage up to 10 000 V.

3 Intended use

The calibrator is a source of high resistance, used as a standard in tests of analogue and digital insulation resistance meters.

The resistance generated by the calibrator can be maintained for a long time under external direct voltage up to 10 000 V, provided that the current in the measuring circuit does not exceed 3 mA.

The required resistance is set by the user using the calibrator's touch keypad or via an external PC applications. The required value is set automatically thanks to the switching of a precise resistance matrix. The controlling processor calculates the required combination of resistors, ensuring adequate resistance precision.

4 Design and operating principle

The calibrator consists of a two-way matrix of standard resistors with the function of intelligent resistors' switching. A step-by-step method is used to obtain the required resistance value. The switching algorithm is controlled by a microprocessor and the current state of the matrix depends on the resistance value.

4.1 Terminals and buttons

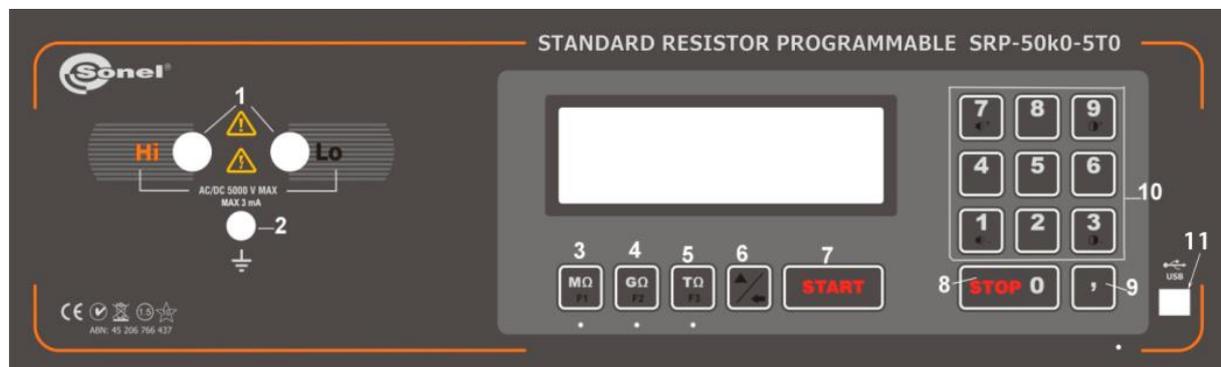


Fig. 1. Front panel of the SRP-50k0-5T0 calibrator

- 1 – terminals to connect an insulation resistance meter,
- 2 – operational earthing,
- 3 – resistance range selection – MΩ,
- 4 – resistance range selection – GΩ,
- 5 – resistance range selection – TΩ,
- 6 – programs switching or activating an additional keyboard,
- 7 – **START** the measurement,
- 8 – **STOP** the measurement,
- 9 – decimal comma,
- 10 – keyboard,
- 11 – USB port (does not apply to the SRP-10G0-10T0 model).

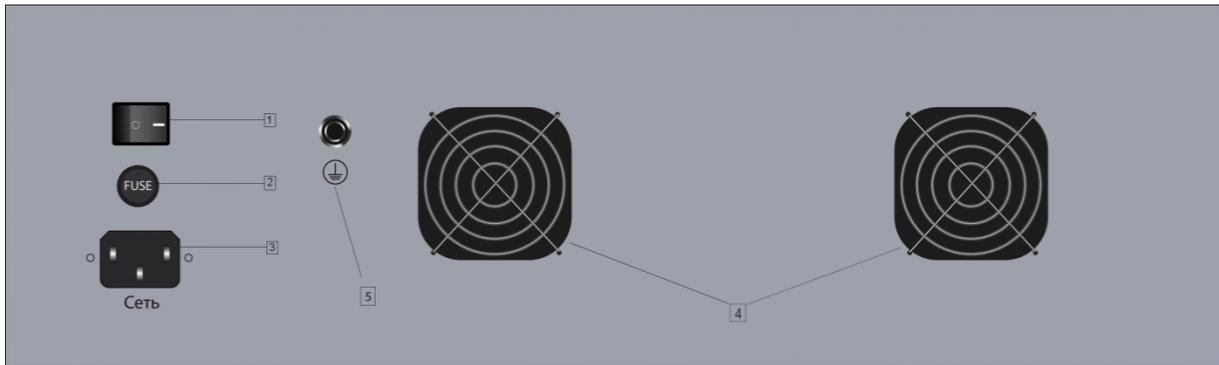


Fig. 2 Rear panel of the calibrator

- 1 – power ON/OFF switch
- 2 – fuse (F 3.15 A)
- 3 – socket for the power cable (230 V AC),
- 4 – cooling fans,
- 5 – earthing terminal.

4.2 Keypad backlight colours

Keyboard backlight is available in three colours:

- Green - calibrator is ready for operation and no resistance is set at the measuring terminals,
- Red - resistance is set at the terminals or a wrong button has been pressed during the operation (the backlight turns red for a brief moment),
- Blue - confirmation that a keyboard button has been pressed (in case of a correct function). This signalling can be disabled.

5 Operation of the calibrator

5.1 Switching on

- ① Connect the calibrator to the mains using the supplied cable.
- ② Turn on the calibrator using the switch 1 on the rear panel (see Figure 2).
- ③ Connect the tested meter to the measuring circuit (see Figure 3). The calibrator is in standby mode, no resistance values are set (see Figure 4).

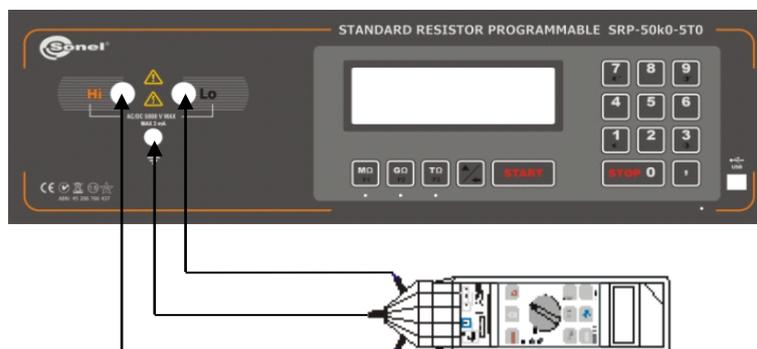


Figure 3 Connecting the meter to the calibrator

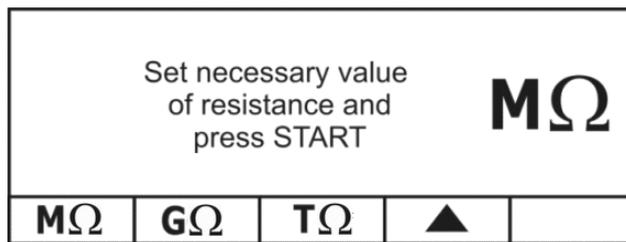


Figure 4 Calibrator display after turning on

5.2 Manual setting of the required resistance value

① Start the calibrator. The default range is MΩ.

② Select the appropriate range using the buttons 3  4  5 .

③ Enter the desired resistance value on the keypad 10 (take the selected range into account).

To delete the entered value, use the button 6 .

To erase the last digit, the display must show the  symbol (**BACKSPACE**). This symbol appears in the manual resistance setting mode.

④ Press the 7 **START** to set the required resistance values on the measuring terminals. The word **START** disappears from the display and the keypad turns from green to red.

⑤ Press the 8 **STOP** button to end the measurement. The keypad backlight colour changes from red to green.



- The resistance value on the measuring terminals (after pressing the **START** button) can be changed during the measurement procedure). Enter a new value from the keypad and press 7 **START**. If you do not press 7 **START** after entering a new value, the previous resistance value will remain at the calibrator's terminals.
- A new resistance value can be set on all ranges.
- In order to avoid additional unspecified measurement error:
 - avoid twisting electrical leads connecting the calibrator with the tested device,
 - the calibrator terminals and sockets must be clean,
 - ensure a reliable connection between the test probes of the tested device and the calibrator terminals.

5.3 Automatic measurements

- ① Start the calibrator. The default range is MΩ.
- ② Press the 6 button  to switch the calibrator into the program selection mode.
The ▲ sign will change to ▼.
- ③ Use the buttons 3  4  5  to select the required program.
After selecting the program, the display shows the name of the program and initial input voltage.
- ④ Press the button 6  to change the mode.
Keep pressing the button 6 to switch between modes as in the table below:

MODE NUMBER	MODE	F1 key	F2 key	F3 key
1	manual	MΩ	GΩ	TΩ
2	auto	PROGRAM 1	PROGRAM 2	PROGRAM 3
3	auto	PROGRAM 4	PROGRAM 5	PROGRAM 6
4	auto	PROGRAM 7	PROGRAM 8	PROGRAM 9
5	auto	PROGRAM 10	language selection	-
Back to MODE 1				

- ⑤ Press 7 **START** to activate the selected calibration program.
The calibrator generates a set of resistance values on output terminals 1.
- ⑥ During this procedure, after measuring a given resistance value, press 7 **START** to switch the calibrator to the next resistance value.
- ⑦ The END message is displayed when the program is completed.
Press 8 **STOP** to select another program
or
Press 7 **START** to repeat the same program
- ⑧ Pressing 8 **STOP** at any time during the program execution immediately interrupts the procedure and returns the calibrator to the program selection mode.



The calibrator can store up to 10 different calibration procedures. Programs are edited and installed by means of the included software. The calibrator programming is described later in this manual.

5.4 Additional functions

A set of additional functions may depend on the calibrator firmware. The firmware version can be read in the left-hand bottom corner of the display when the calibrator is on. Selecting the individual functions:

- ① Start the calibrator.
- ② Press the button   The ▲ sign will change to ▼.
- ③ Use the buttons to:
 -  Turn off the sound and button beep tones.
 -  Turn on the sound and button beep tones.
 -  Reduce the display brightness.
 -  Increase the display brightness.

5.5 Sleep mode

If for 10 minutes (this period is programmable) the keypad is not touched or the PC software does not send any commands, the calibrator goes into sleep mode and the display is off. Briefly pressing any button or a software command restores the calibrator to standby mode and the display turns on.

6 General recommendation

Calibrator technical maintenance is carried out to ensure its full effectiveness and readiness for use. The following shall be checked during the maintenance:

- integrity of seals,
- completeness of the calibrator
- absence of external mechanical damage,
- cleanliness of connectors, sockets and terminals,
- condition of test leads and contacts.



NOTE!

Never put the calibrator on the front or rear panel, as this can damage the control and power cable socket.

The users are allowed to perform the following calibrator maintenance activities:

- replacement of a blown fuse (F 3.15 A),
- calibrator cleaning.



WARNING

Before replacing the fuse disconnect the calibrator from the mains.

Any other maintenance activities must be performed solely by the SONEL S.A. Service Dept.

7 SRP Control Software



The SRP-10G0-10T0 calibrator does not support cooperation with the PC computer. Changing the calibrator's settings is possible only via the built-in keypad.

7.1 About the software

The SRP software is used to connect the SRP calibrator with a PC. The program is easy to use and is a useful tool in the process of testing the devices by means of the calibrator. The calibrator should be connected to a computer via the USB port (does not apply to the SRP-10G0-10T0 model).

7.2 Functions

- Remote control of the calibrator
- Create and save the automatic programs to check the tested devices
- Set the keypad lock and time to sleep mode
- Change the display brightness and keypad tones
- Software language selection
- Calibrator software update from the PC via the USB interface (does not apply to the SRP-10G0-10T0 model)

7.3 Installing and running the software

The SRP software does not need to be installed on your computer. Run the SRP.exe from the hard disk or other storage medium. Synchronization of the current calibration status with the software will begin immediately after running the program. After starting, the program is ready to work.

Minimum PC requirements:

- Windows XP or later,
- 1 GHz processor,
- 512 MB memory,
- free USB port (does not apply to the SRP-10G0-10T0 model), keyboard, mouse, monitor.

7.4 Manual mode

The program allows you to set the required resistance value, using the virtual keyboard or using a standard PC keyboard. To do this:

- ① Connect the calibrator to your computer via a USB cable (does not apply to the SRP-10G0-10T0 model).
- ② Start the calibrator and run the program.
- ③ Go to the **MANUAL** tab.

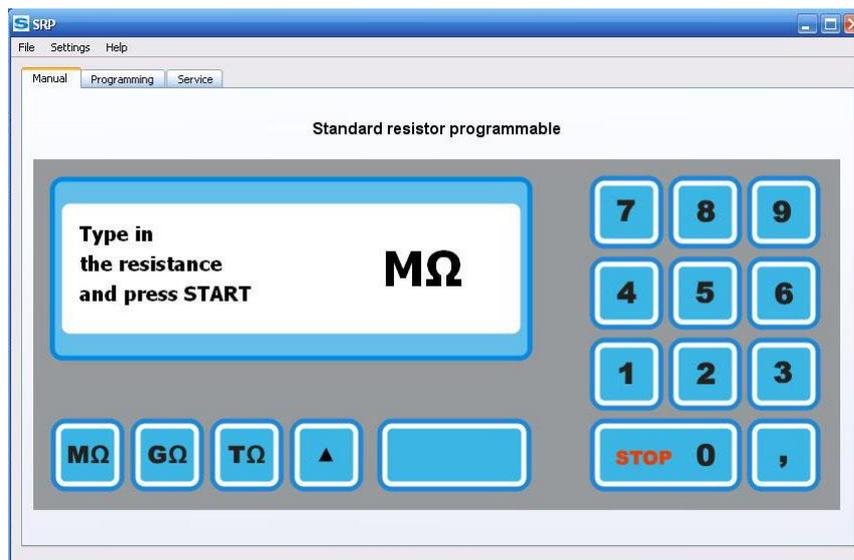


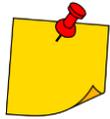
Figure 5 Manual mode screen

After turning on, the calibrator automatically goes to the MΩ range.

- ④ To set the required range, use the    buttons or the F1, F2, F3 keys on the PC keyboard.
- ⑤ Enter the resistance value using the numeric keypad or computer keyboard (take the appropriate range into account).

To delete the entered value, press the  button. The display information field shows the  (**BACKSPACE**) symbol.

- ⑥ Press **START** to set the typed resistance value.
Resistance at the terminals can be changed freely in all ranges.
Press **START** to set the newly entered resistance value.
- ⑦ Press **STOP** to disconnect the resistance value.



List of common buttons (PC / calibrator):

Calibrator keypad	Computer keyboard			
0 – 9, ", "	0 – 9, ", "			
<table border="1" style="display: inline-table; vertical-align: middle;"> <tr> <td>TΩ F3</td> <td>GΩ F2</td> <td>MΩ F1</td> </tr> </table>	TΩ F3	GΩ F2	MΩ F1	F1 F2 F3
TΩ F3	GΩ F2	MΩ F1		
	SHIFT			
START	ENTER			

7.5 TUNING function

This feature is designed to smoothly adjust a resistance up or down. The main objective of this function is the ability to verify the analog insulation testers in accordance to russian standard: GOST 8.409-81.

The TUNING function is available only when is an active connection with the calibrator. Firstly should be set the resistance in manual mode, before performing tuning of resistance.



Fine adjustment of resistance.



Coarse adjustment of resistance.



Saving result to the table of values.

X

Deleting a selected resistance value from a table of values.



Deleting an entire table of values.



Saving table to a CSV file.

7.6 Calibration programs

The **Programming** tab allows you to create, modify and save the calibration programs. The calibration program is a set of resistance values which, one after the other, are set at the calibrator terminals. Press **START** to activate each successive value.

Calibration programs can be stored in the calibrator memory and the computer's hard disk.

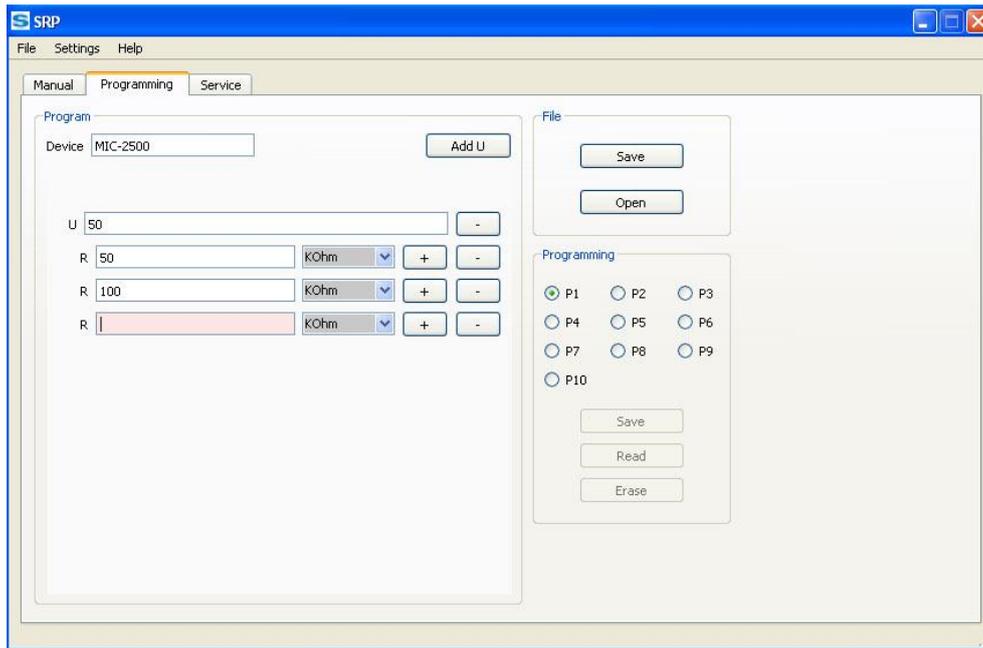


Figure 6 Calibration programs screen

Fields:

- Device** – text field (up to 10 characters) to enter the device name. It is also the name of the calibration program and is constantly displayed during the program operation. Required field.
- U** – numeric field (the value is limited to 5000) to enter and display the calibrator test voltage; the field is used to enter values by the user. The field is not required. If the field is blank, the **Add U** button is not active.
- R** – numeric field which specifies the value of resistance provided by the calibrator. Required field; at least one value.

Buttons:

- Add U** – in the **Program** menu: add extra value menus. You can add maximum of five **U** menus.
- +** – in the **Program** menu: add a line to enter the resistance; you can add maximum 59 lines for a single voltage value.
- – in the **Program** menu: remove the line to enter the resistance.
- Save** – in the **File** menu: save the calibration program to disk.
- Open** – in the **File** menu: open the calibration program file from the disk.
- Save** – in the **Programming** menu: upload the calibration program to the calibrator.
- Read** – in the **Programming** menu: read the calibration program from the calibrator.
- Erase** – in the **Programming** menu: erase the calibration program in the calibrator.

7.6.1 Save the calibration program to disk

To save the calibration program to your hard disk, click **Save** in the **File** menu or use the top menu in accordance with subsection [7.7.1](#). In the opened window, select the folder and file for saving.

7.6.2 Opening a calibration program file

Use the **Open** option to select and open to edit a calibration program previously saved to hard disk. You can also use a toolbar in accordance with [7.7.1](#).

7.6.3 Uploading the calibration program to the calibrator memory

In order to save the program in the calibrator memory, use the **P1...P10** options to select the program number. Then press **Save** in the **Programming** menu or use the top menu in accordance with [7.7.1](#). Uploading the program from the disk will cause the loss of the currently edited program on your computer.

7.6.4 Reading the calibration program from the calibrator memory

To read a program previously stored in the calibrator memory, select the program number **P1...P10** and then press **Read** in the **Programming** menu. Uploading the program from the calibrator memory will cause the loss of the currently edited program on your computer.

7.6.5 Erasing the calibration program in the calibrator memory

To erase the stored program, select its number **P1...P10**, and then press **Erase** in the **Programming** menu. Deletion of the program should be further confirmed in the confirmation window.

7.7 Service mode

The **Service** tab is used to enter the calibrator service mode. The service mode is password protected.



NOTE!

The service mode is solely for diagnostic purposes at the manufacturer's service department.

7.8 Top menu

7.8.1 "File" menu

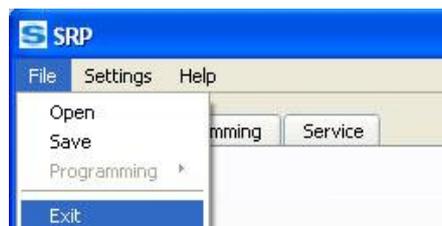


Figure 7 "File" menu

- Open** – open the calibration program file.
- Save** – save the calibration program to the computer disk

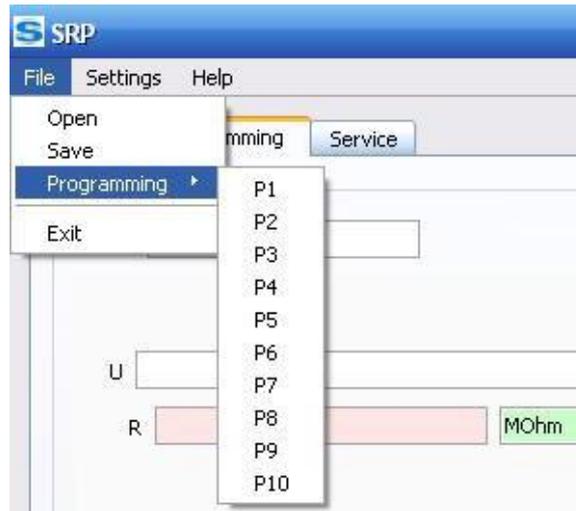


Figure 8 Uploading the calibration program to the calibrator

Programming – upload the program to the calibrator memory under a selected number. This option is available only if the **Programming** tab is active.

Exit – exit the SRP program.

7.8.2 "Settings" Menu

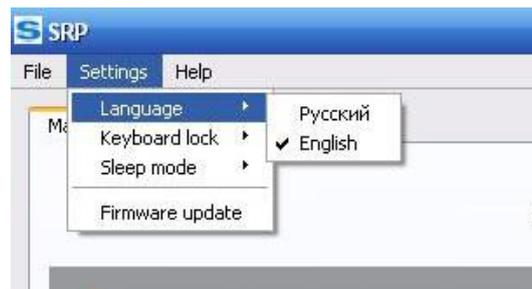


Figure 9 "Settings" menu

Language – software language selection. Available languages: Russian and English.

Keyboard lock – calibrator keypad lock. When the keypad is locked, the calibrator is controlled from the computer only.

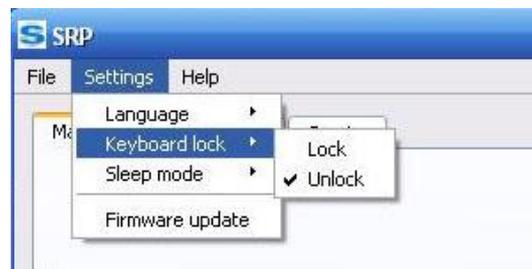


Figure 10 Locking the keypad

Sleep mode – setting the time to sleep mode. To exit the sleep mode, press any button on the calibrator keypad or in the SRP software.



Figure 11 Setting the time to sleep mode

Firmware update – updating the calibrator firmware. Updates can be downloaded from the manufacturer's website.

7.8.3 "Help" menu



Figure 12 "Help" menu

Version – displays: calibrator firmware version, computer software version, calibrator serial number and type.

Open help – display the SRP software help.

7.9 Calibrator software update



Figure 13 Calibrator firmware update

To update the firmware:

- ① Turn on the calibrator, run the software on your computer, connect the calibrator to the computer via the USB port (does not apply to the SRP-10G0-10T0 model).
- ② From the **Settings** menu, select **Firmware update**.
- ③ Click **Browse** in the opened window and then select the update file (*.sfw).
- ④ Click **Apply**; the calibrator goes to update readiness state.

- ⑤ **Disconnect** the USB cable from the calibrator (does not apply to the SRP-10G0-10T0 model).
- ⑥ Press **5** on the calibrator keypad.
The calibrator goes to the **UPDATE MODE** and the appropriate message is shown on the display.
- ⑦ Connect the USB cable and wait until the update process is complete (about 30 seconds) (does not apply to the SRP-10G0-10T0 model).
- ⑧ When the update is finished, turn off the calibrator with the main switch and disconnect the USB cable (does not apply to the SRP-10G0-10T0 model).

8 Cleaning and maintenance



NOTE!

Apply solely the maintenance methods specified by the manufacturer in this manual.

The calibrator enclosure may be cleaned with a soft, damp cloth using all-purpose detergents. Do not use any solvents or cleaning agents which might scratch the enclosure (powders, pastes, etc.). The test leads should be cleaned with water and detergents, and then wiped dry. The calibrator electronic system does not require maintenance.

9 Storage

Observe the following recommendations when storing the instrument:

- Disconnect all the leads from the calibrator.
- Clean thoroughly the calibrator and all its accessories.
- Wind the long test leads onto the reels.

10 Dismantling and Disposal

Used electrical and electronic equipment should be collected selectively, i.e. it must not be placed with another kinds of waste.

Used electronic equipment should be sent to a collection point in accordance with the Used Electrical and Electronic Equipment Act.

Do not dismantle any elements before the equipment is sent to a collection point.

Observe the local regulations concerning disposal of packagings and used batteries.

11 Transport

In its original packaging, the calibrator can be transported using all modes of transport. The transport distance is not limited.

During transport, the instrument must be protected against precipitation and ingress of dust. Handle with care.

12 Calibrator check

It is advised to check the calibrator every 12 months.

13 Technical specifications

13.1 Basic data

SRP-10G0-10T0 ($U_{max} = 10\,000\text{ V DC}$)

Range [Ω]	Resolution [Ω]	Accuracy
10 G...990 G	10 G	1 %
1.0 T...10.0 T	0.1 T	1.5 %

SRP-50k0-5T0 ($U_{max} = 5000\text{ V DC}$)

Range [Ω]	Resolution [Ω]	Accuracy
0.05 M...999.95 M	0.05 M	1.5 %
0.001 G...999.999 G	0.001 G	1.5 %
0.0001 T...5.0000 T	0.0001 T	1.5 %

SRP-50k0-100G0 ($U_{max} = 2500\text{ V DC}$)

Range [Ω]	Resolution [Ω]	Accuracy
50 k...950 k	50 k	0.05 %
1.00 M...99.95 M	0.05 M	0.1 %
100.0 M...999.9 M	0.1 M	0.5 %
1.00 G...100.00 G	0.01 G	0.5 %

SRP-50k0-10G0 ($U_{max} = 2500\text{ V DC}$)

Range [Ω]	Resolution [Ω]	Accuracy
50 k...950 k	50 k	0.1 %
1.00 M...99.95 M	0.05 M	0.2 %
100.0 M...999.9 M	0.1 M	1 %
1.00 G...10.00 G	0.01 G	1 %

13.2 Additional data

- supply voltage 100 ... 240 V AC (50/60 Hz)
- maximum power consumption: 75 VA
- maximum current in the measuring circuit: 3 mA
- maximum operating voltage:
 - SRP-10G0-10T0: 10 000 V DC
 - SRP-50k0-5T0: 5000 V DC
 - SRP-50k0-100G0: 2500 V DC
 - SRP-50k0-10G0: 2500 V DC
- long-term stability of resistors: <1%
- max. operating altitude: 2000 m
- dimensions 540 x 450 x 200 mm
- weight: approx. 15 kg
- operating temperature range: +10...+30°C
- relative humidity: 25...60%
- storage temperature range in the original packaging:
 - at relative humidity <80% -20...+31°C
 - at relative humidity from 50% to 80% -20...+40°C
 - at relative humidity <80% -20...+60°C
- storage temperature range without packaging:
 - at relative humidity <80% +10...+30°C

14 Accessories

The current list of accessories can be found on the manufacturer's website.

SRP-50k0-5T0 (WMXXSRP50K05T0)

SRP-50k0-100G0 (WMXXSRP50K0100G0)

SRP-50k-10G0 (WMXXSRP50K010G0)

- SRP calibrator - 1 pc
- power cable - 1 pc – **WAPRZ1X8BLIEC**
- 1.8 m test lead with banana plugs, 5 kV, blue – 1 pc – **WAPRZ1X8BUBB**
- 1.8 m test lead with banana plugs, 5 kV, red – 1 pc – **WAPRZ1X8REBB**
- 1.8 m shielded test lead with banana plugs, 5 kV, black – 1 pc – **WAPRZ1X8BLBB**
- user manual – 1 pc

SRP-10G0-10T0 (WMXXSRP10G010T0)

- SRP calibrator - 1 pc
- power cable - 1 pc – **WAPRZ1X8BLIEC**
- user manual – 1 pc

15 Manufacturer

Manufacturer and provider of warranty and post-warranty service:

SONEL S.A.

Wokulskiego 11

58-100 Świdnica, Poland

Tel: (+48 74) 858 38 60

fax (+48 74) 858 38 09

e-mail: export@sonel.pl

internet: www.sonel.pl



NOTE!

Service repairs must be performed solely by the manufacturer.

Made in Russia.

16 Laboratory services

SONEL Testing and Calibration Laboratory has been accredited by the Polish Center for Accreditation (PCA) - certificate no. AP 173.



AP 173

Laboratory offers calibration for the following instruments that are used for measuring electrical and non-electrical parameters.

● METERS FOR MEASUREMENTS OF ELECTRICAL PARAMETERS

- voltage meters,
- current meters (including clamp meters),
- resistance meters,
- insulation resistance meters,
- earth resistance and resistivity meters,
- RCD meters,
- short-circuit loop impedance meters,
- power quality analyzers,
- portable appliance testers (PAT),
- power meters,
- multimeters,
- multifunction meters covering the functions of the above-mentioned instruments,

● ELECTRICAL STANDARDS

- calibrators,
- resistance standards,

● METERS FOR MEASUREMENTS OF NON-ELECTRICAL PARAMETERS

- pyrometers,
- thermal imagers,
- luxmeters.

The **Calibration Certificate** is a document that presents a relation between the calibration standard of known accuracy and meter indications with associated measurement uncertainties. The calibration standards are normally traceable to the national standard held by the National Metrological Institute.

According to ILAC-G24 „Guidelines for determination of calibration intervals of measuring instruments”, SONEL S.A. recommends periodical metrological inspection of the instruments it manufactures no less frequently than once every **12 months**.

For new instruments provided with the Calibration Certificate or Validation Certificate at the factory, re-calibration should be performed within **12 months** from the date of purchase, however, no later than **24 months** from the date of purchase.



ATTENTION !

The person performing the measurements should be absolutely sure about the efficiency of the device being used. Measurements made with an inefficient meter can contribute to an incorrect assessment of the effectiveness of health protection and even human life.