"RESEARCH AND PRODUCTION COMPANY "RADIO-SERVICE" JSC

RCP 422160

INSULATION RESISTANCE TESTERS / MEGOHMMETERS

E6-32, E6-31 and E6-31/1

OPERATION MANUAL

RAPM.411218.002OM

Revision No. 2

This Operation Manual is intended for studying of structure and operating principle of the digital Insulation resistance testers / megohmmeters E6-32, E6-31 and E6-31/1 (hereinafter referred to as instrument) and contains the data relevant for proper operation, safety precautions, verification and passport.

Megohmmeter E6-32 belongs to group 4, megohmmeters E6-31 and E6-31/1 belong to group 5 as per GOST 22261.

Operation conditions of instrument are as follows:

temperature range from minus 15 to plus 50 ºC for E6-32, from minus 30 to plus 50 ºC for E6-31 and E6-31/1;

upper limit of relative humidity is 90 % at temperature of +30 ºC; Standard conditions as per item 4.3.1 of GOST 22261:

ambient air temperature of +15 to +25 ºC;

relative air humidity of 30 to 80%;

atmospheric pressure of 84 to 106 kPa (630 to 795 mm Hg); Protection grade of the casing IP54 in accordance with GOST 14254.

Electrical safety as per GOST IEC 61010-1-2014.

The instrument satisfy the EMC compatibility requirements complies with GOST R IEC 61326-1-2014.

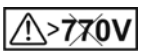
Due to permanent upgrade of instruments, the items produced and the design described in this Operation Manual may differ to some extent.

Attention! Please read this Operation Manual before switching the megohmmeter on.

Attention! At measurement sockets of megohmmeter the dangerous voltage up to 3 kV is generated.

This device is protected by a reinforced insulation.

CAT III 1000V CAT IV 600V Measurement category



AC voltage at sockets "+" and "-" shall not exceed 770 V.

1. DESCRIPTION AND OPERATION

1.1. Designation of instrument

Instrument is intended for electric resistance measurement of insulation resistance of circuits that are not under voltage. Instrument measure AC voltage in case of its presence at measuring object. Megohmmeter E6-32 additionally measures the following:

continuity of earth connections and equipotential bonding (hereinafter referred to as continuity);

parameters of overvoltage protective devices (varistor voltage of overvoltage suppressors at by direct-current flow 1 mA, static breakdown voltage discharge arresters at DC).

1.2. Basic metrological characteristics are given in Table 1.

Table 1 – Basic metrological characteristics

<table>
<tr><td colspan="4">1 Electric resistance measurement of insulation to direct current</td></tr>
<tr><td colspan="2">Resistance measurement range</td><td colspan="2">Maximum permissible reference absolute accuracy</td></tr>
<tr><td rowspan="3">E6-31,
E6-31/1
E6-32</td><td>1 kΩ to 999 MΩ</td><td colspan="2">± (0.03×R+ 3 digits)</td></tr>
<tr><td rowspan="2">1.00 to 9.99 GΩ</td><td colspan="2">± (0.03×R+ 3 digits)
(test voltages are not less than 250 V)</td></tr>
<tr><td colspan="2">± (0.05×R+ 5 digits)*
(test voltages are less than 250 V)</td></tr>
<tr><td rowspan="2">E6-31,
E6-32</td><td>10.0 to 99.9 GΩ</td><td colspan="2">± (0.05×R+ 5 digits)*
(test voltages are not less than 500 V)</td></tr>
<tr><td>100 to 300 GΩ</td><td colspan="2">± (0.15×R+ 10 digits)*
(test voltages are not less than 500 V)</td></tr>
<tr><td colspan="2">Resistance measurement range, as per IEC 61557-2</td><td colspan="2">from R= Utest /1 mA to 10 GΩ
(at test voltage 500 V max)
from R= Utest /1 mA to 300 GΩ
(at test voltage over 500 V)</td></tr>
<tr><td colspan="2">Time of response at object capacity not more than 1 μF and resistance max 100 MΩ maximum, sec</td><td colspan="2">20</td></tr>
<tr><td colspan="4">2 Test voltages</td></tr>
<tr><td colspan="2" rowspan="3">Values of test voltage at open sockets, V</td><td>E6-31</td><td>500, 1000 and 2500</td></tr>
<tr><td>E6-31/1</td><td>100, 250, 500 and 1000</td></tr>
<tr><td>E6-32</td><td>50 to 2500
(setting increment is 10 V)</td></tr>
<tr><td colspan="3">Maximum permissible reference absolute accuracy of test voltage setting, %</td><td>0 to plus 15</td></tr>
<tr><td colspan="3">Current in measuring circuit at short-circuit, maximum, mA</td><td>2</td></tr>
</table>

Table 1 – Basic metrological characteristics (Table continuation)

3 Voltage measurement	
Measurement range of effective voltage value of AC with frequency 50 Hz, V	40 to 700
Maximum permissible reference absolute accuracy of measurement of AC voltage with frequency 50 Hz, V	± (0.05×U+ 3 digits)
4 Measurement of varistor voltage (classification voltage) (E6-32 only)	
Maximum permissible absolute error of “1 mA” test current generation, mA	± 0.025
Voltage measurement range, V	100 - 1500
Maximum permissible reference absolute error of voltage measurement	± (0.03×U+ 5 digits)
5 Measurement of spark-gap breakdown voltage at DC (E6-32 only)	
Voltage measurement range, V	100- 3000
Maximum permissible reference absolute error of voltage measurement	± (0.05×U+ 10 digits)
6 DC resistance measurement (continuity) (E6-32 only)	
Resistance measurement range	0. 01 Ω to 9.99 kΩ
Resistance measurement range as per IEC 61557-4	0.13 Ω to 10 kΩ
Maximum permissible reference absolute accuracy	± (0.03×R+ 3 digits)
Current in measurement circuit for resistances max 10 Ω, not less than, mA	200
Measurement voltage at open sockets, V	11 to 14
7 Complementary errors	
Maximum permissible complementary error of measurement of AC voltage, insulation resistance, continuity, varistor voltage and spark-gap breakdown voltage due to temperature change within the operating range, 1.5%	
Maximum permissible complementary error of measurement of AC voltage, insulation resistance, continuity, varistor voltage and spark-gap breakdown voltage due to ambient air relative humidity change within the operating range, 5 %	

Notes:

digits – means least significant digit

R, U – values of measured resistance and voltage, respectively;

* – error rated by the use of measurement cable RLPA.685551.001 or RAPM.685631.001.

1.3. General technical specifications

1.3.1. Nominal current of an instrument at measurement of insulation resistance as per IEC 61557-2 is not less than 1 mA.

1.3.2. Instrument ensure automatic switching of measurement ranges and measurement units determining.

1.3.3. Upon switching off, the megohmmeters save the last measurement settings, and restore them when switched on.

1.3.4. Instrument record results of the last measurement and display it in the mode “Memory View”. Additionally megohmmeter E6-32 stores up to 10000 measurement results with the possibility of data exchange with external device (computer).

1.3.5. Instrument use measurement results of insulation resistance at the moments 15±1 s and 60±1 s (from beginning of measurement) for calculation of Dielectric Absorption Ratio. Additionally megohmmeter E6-32 uses value of insulation resistance at the moment 600±1 s (from beginning of measurement) for calculation of Polarization Index.

1.3.6. Supply voltage range is from 7.5 to 5.2 V. Power supply is from nickel-metal-hydride (Ni-Mh) storage battery with “6 V” rated voltage, “2000 mA/h” capacity or from five replaceable AA power components placed in a battery compartment. It is allowed to use five AA batteries of 1.2 V rated voltage.

1.3.7. Instrument provides self-check of supply voltage. When the voltage drops from 5.2 V to 5.0 V the megohmmeters are switched off.

1.3.8. Instrument has a storage battery charging mode, which is automatically switched on when the power supply is connected. Charging process is shown on the display. Instrument provides protection from incorrect connection of storage battery and overcharge.

1.3.9. Readiness time of instrument after power supply switching on is not more than 3 sec.

1.3.10. Instrument’s continuous operating time at resistance measurement during cycle operation: measurement – 1 minute, pause – 2 minutes, is minimum 5 hours.

1.3.11. In case of instrument’s non-use during 2 - 3 minutes it is automatically switched off.

1.3.12. Software protection level against unintentional and intentional alterations is “high”.

1.3.13. Consumption power is 6,5 W max.

1.3.14. Weight is 0.8 kg max.

1.3.15. Overall dimensions are 88x105x245 mm max.

1.3.16. Service life is at least 10 years.

1.4. Completeness

Components of megohmmeter delivery set are given in Table

2. Table 2 – Delivery set

Description and designation	Quantity
1 Megohmmeter E6-32 (E6-31, E6-31/1)	1
2 Operation Manual RAPM.411218.002OM	1
3 Power unit	1
4 Cable set, including:	
measuring cable RLPA.685551.002 – red, 1.5 m long;	1
measuring cable RLPA.685551.002-03 – blue, 1.5 m long;	1
connective cable RLPA.685641.002 – 1.5 m long;	1
shielded measuring cable RAPM.685631.001 – 1.5 m long	0/1 *
5 Battery compartment RAPM.436244.007	1
6 Crocodile clip: for E6-32; for E6-31(E6-31/1)	 2 1
7 Bluetooth-USB adapter (only for E6-32)	1*
8 Carry bag	1
9 Shipping package	1
* – delivered as per separate order	

1.5. Design and Operation

Controls, indicators and signal connectors are arranged on the front panel. In E6-32 indications are shown on a LCD display, in E6-31 and E6-31/1 – on LEDs (selection of test voltage) and segmental LED indicators. Movable protective plate covers display and control buttons. "Jack" type socket connector in the bottom of the instrument is intended for power unit connection during battery charging (central pin is power “minus”).

Insulation resistance measurement is based on measurement of circuit current while applying test voltage. Calculated resistance value is shown on the display and stored. Switching of measurement range and determining of measurement units is automatic.

Measurement of continuity (E6-32 only) is based on the measurement of the load voltage during flow of test current via it. Calculated resistance value is shown on the display and stored. Changing of test current value, switching of measurement ranges and determining of measurement units is automatic.

Measurement of varistor voltage (E6-32 only) of overvoltage suppressors (varistors) is based on stepwise increase of current via load up to 1 mA. At achieving the maximum current value voltage at load is measured, stored and shown on the display.

Spark-gap breakdown voltage measurement (E6-32 only) is based on gradual increase of voltage delivered to discharge arrester under testing and its recording at achieving the specified current strength via discharge arrester.

General view of E6-32, E6-31 и E6-31/1 is given in Figure 1.1.

Figure 1.1 – General view of E6-32 (on the left), E6-31 (in center) and E6-31/1 (on the right)

1 – jack ⊖—⊙—⊕ for connection of the power unit (central pin – “minus”);

2 – protective plate (protective cover);

3 – front panel;

4 – handle (hook).

Arrangement of controls E6-32 and connectors of measuring cables is given in Figure 1.2.

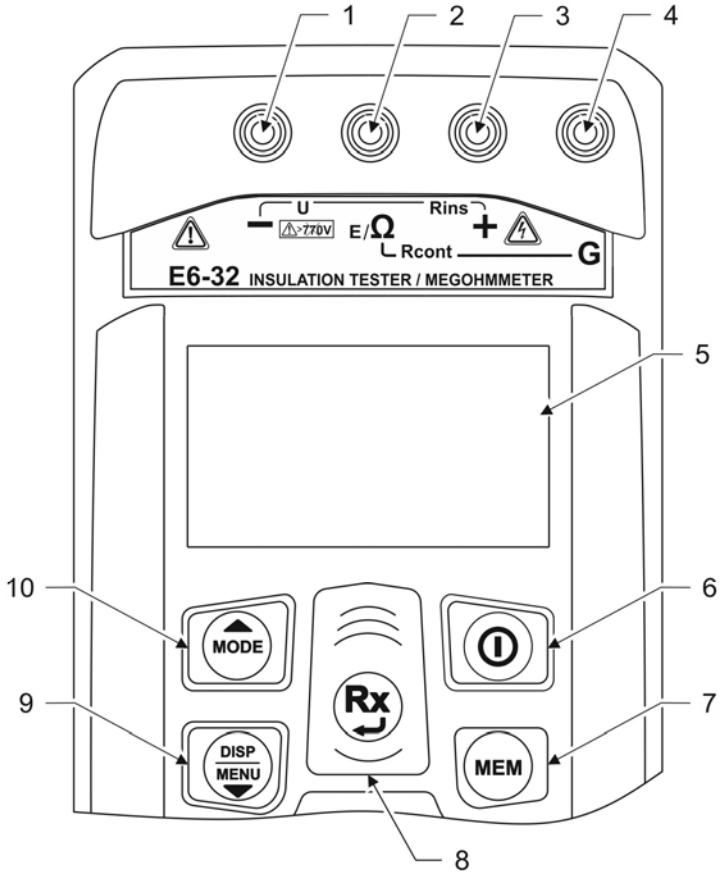


Figure 1.2 – Layout of connectors and control of instrument E6-32

1…4 – jacks for cables connection;

5 – LCD display;

6 – button ⏻ switches megohmmeter on and off;

7 – button MEM calls a memory function (writing, reading, deletion, transmission of measured values to a computer);

8 – button Rx starts and stops measurements. In the menu mode, the button is used to confirm the selected option or to return to the main mode.

9 – button DISP MENU switches between types and scopes of the displayed information during insulation test (see item 2.3.4): value of insulation resistance, Dielectric Absorption Ratio, Polarization Index. After the active measurement is finished, holding this button returns to the main menu. In the menu mode, the button allows scrolling down the menu.

10 – button MODE is intended for modes switching: selection of test voltage during insulation resistance measurement, measuring of metallic bonding resistance and classification voltage. In the menu mode, the button allows scrolling up the menu.

Arrangement of E6-31, E6-31/1 controls and connectors of measuring cables is given in Figure 1.3.

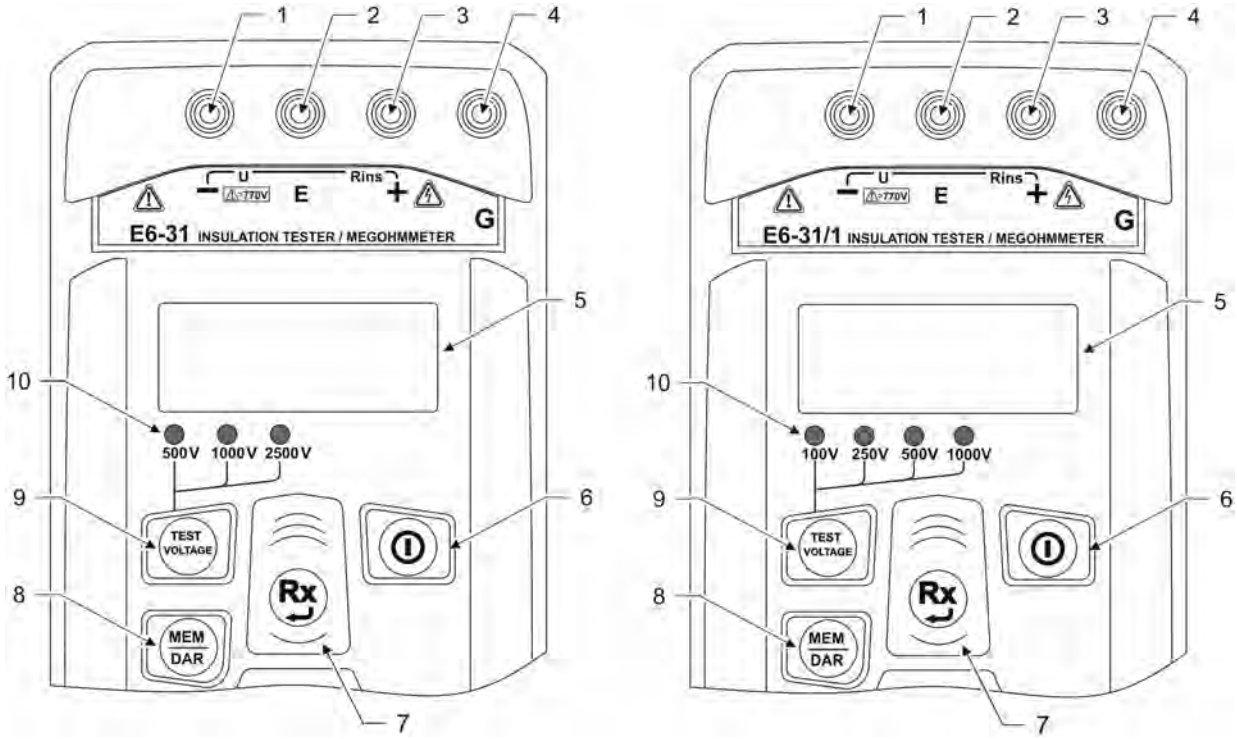


Figure 1.3 – Layout of connectors and controls of instrument E6-31 and E6-31/1

1…4 – jacks for cables connection;

5 – segment indicator of measured value and measurement units (“V” – Volt, “K” – kΩ, “M” – MΩ, “G” – GΩ);

6 – button ⏻ switches megohmmeter on and off;

7 – button Rx starts and stops measurements;

8 – button MRx/Kabs outputs for indication of last measurement results and Dielectric Absorption Ratio from megohmmeter memory (see item 2.4.4);

9 – button TEST VOLTAGE sets the test voltage;

10 – indicators of test voltages, in volts (from left to right, respectively, – “500”, “1000” and “2500” for E6-31 and “100”, “250”, “500” and “1000” for E6-31/1).

Appearance of shielded measuring cable is given in Figure 1.4.

Figure 1.4 – Appearance of shielded measuring cable RAPM.685631.001

1.6. Marking and packing

Instrument marking corresponds to GOST 22261, GOST IEC 61010-1-2014 and design documentation set (DD). Instrument package corresponds to GOST 9181 and DD set.

2. INTENDED USE

2.1 Precautionary measure

Operation shall be performed by electrotechnical personnel trained and certified for operation in electrical installations and studied this Operation Manual.

During operation with the instrument, observe the requirements of "Occupational safety rules during operation of electrical installations" and use the means of protection against electric shock as per "Instruction on use and testing of protection means used in electrical installations".

ATTENTION! It is prohibited to operate a faulty, damaged and non- tested instrument and to deviate from its operating procedure.

ATTENTION! During measurement, high voltage is generated at the socket "+" and object under test. After measurement completion, monitor decrease of residual voltage to safe level by voltmeter readings on the instrument display.

2.2. Preliminary Procedures

2.2.1. If the instrument was exposed to a temperature differing from the operating one, first it shall be held under the operating temperature for two hours.

Check instrument for mechanical damages and dirt. Check operability of protective covers and fasteners, integrity of insulation and cleanness of cables. Check the power unit for mechanical damages and dirt. Check the date of last verification of megohmmeter. The verification period shall not be expired.

Prior to instrument operation, clean measurement sockets and areas around them. Avoiding of this recommendation can lead to significant error of measurement caused by surface leakage current.

In case of shielded measuring cable use it is required to check electric resistance between signal and shield circuits from time to time. Resistance shall be 3 GΩ minimum at test voltage of 2500 V.

2.2.2. Charging the Storage Battery

The power supply of instrument is provided with a nickel metal hydride storage battery “5H-AA2000B-1” of 2000 mA/h rated capacity.

Note. Before charging, make sure that storage batteries (not the batteries) are installed in the battery compartment. Failure to comply with this rule may lead to damage of battery compartment and battery.

Note. Storage battery is charged at ambient air temperature of + 10 to + 30 ºC. Failure to comply with this rule may reduce the storage battery life.

To charge the storage battery, connect the output plug of power unit from the delivery set to the instrument jack socket. Plug in the power unit to the 220 V mains.

On instrument E6-32 the storage battery charging process is displayed by filling the miniature battery symbol on the display. Upon charging completion the miniature battery symbol is full.

On instruments E6-31 and E6-31/1 the storage battery charging process is displayed in the form of bar running bottom-upwards under symbol " ⊣⊢" on the front panel of instrument. Upon completion of charging process the running bar is replaced by three horizontal illuminating bars.

To charge fully discharged storage battery, 7-8 hours are required.

If instrument is not used for a long period, it is recommended to recharge the storage battery once in three months.

Note. Standard storage battery is charged with 400 mA to 500 mA current. When charging a storage battery with other rated capacity, check its temperature regularly, for example, by touch. If the temperature grows fast, stop charging.

2.3. Operating the megohmmeter E6-32

To switch the instrument on / off press button .

After the instrument is switched on and self-tested, its software version is first shown on the display, then the instrument switches over to mode of measurement that preceded switching-off.

Supply voltage level is shown as miniature battery symbol in the top right corner: shaded area is proportional to the supply voltage. If the display shows a caption "Battery is dead. Switching off", and the instrument switches off (supply voltage is lower than 5.2...5.0 V), charge the storage battery according to item 2.2.2, replace the storage battery or batteries according to item 2.5.

2.3.1. Control and Service Options (Menu) of the Instrument

To enter the display menu press and hold button DISP MENU. The menu is context-sensitive and depends on the current measurement mode. To scroll the menu, use buttons MODE and DISP MENU, to edit the selected option (selected options are shown in inverted form) and to confirm use button Rx.

Option "GENERAL SETTINGS" allows to changes the contrast level of the display, to select the interface language and to switch on/off the audio warnings. Example of setting is given in Figure 2.1.

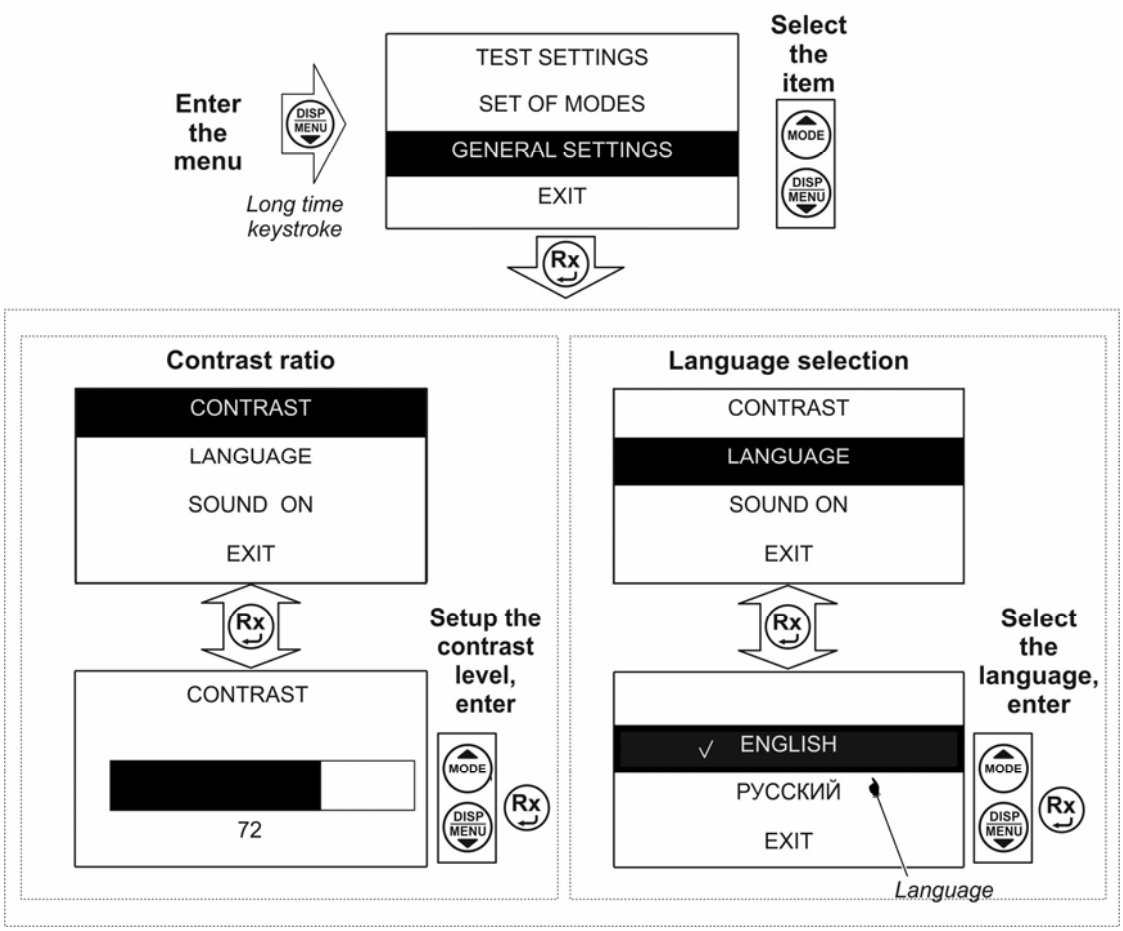


Figure 2.1 – Menu. Instrument settings

Option “SET OF MODES” allows to remove or add to the set of available test types: fixed test voltages (50, 100, 250, 500, 1000 and 2500 V), measurement of continuity (Rcont), measurement of varistor voltage (Uvar), measurement of spark-gap breakdown voltage (Udis), as well as to change the values of user test voltages (Us1, Us2).

Active modes available at selection by button MODE is marked by "V" sign (see Figure 2.2). To add or remove the mode in the list of available ones select the corresponding item and press button Rx, except for Us1 and Us2.

Example of user test voltages Us1 and Us2 change is given in Figure 2.2.

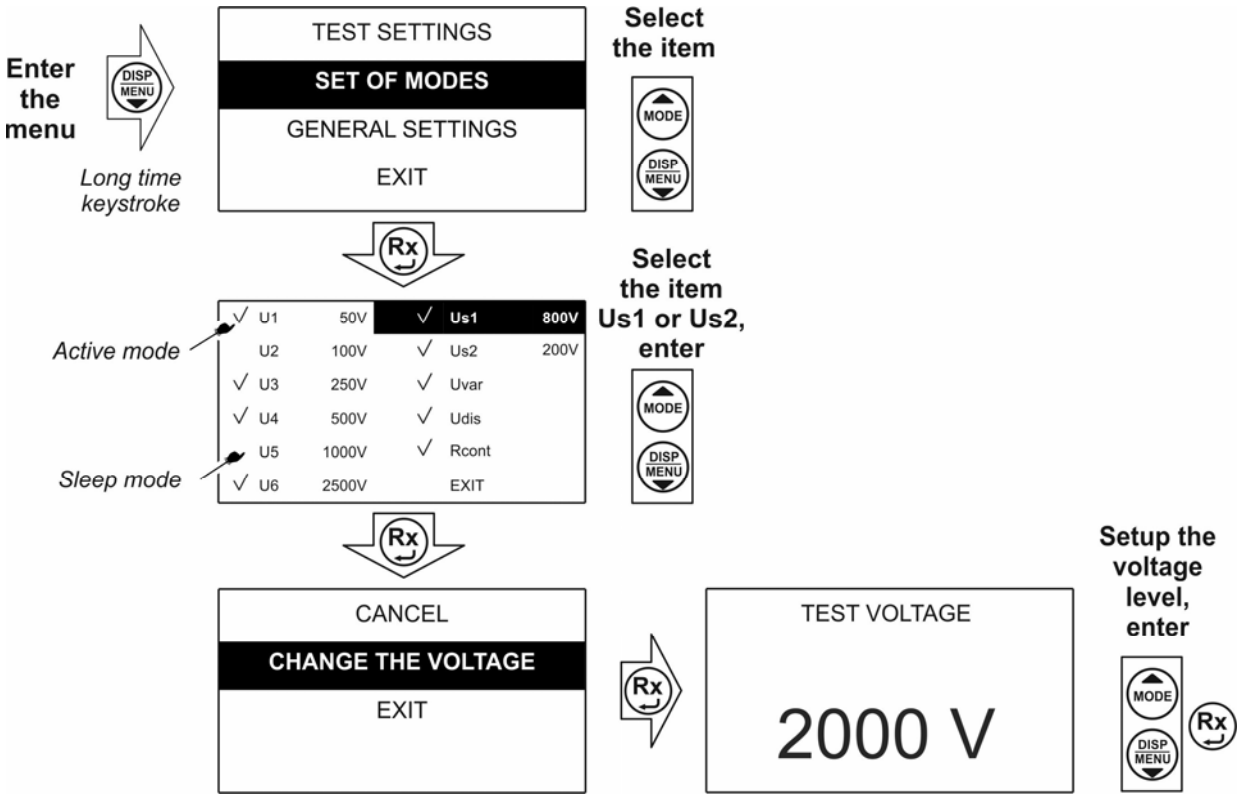


Figure 2.2 – Menu. Modes

Voltages Us1 and Us2 can be also added to the list or removed from it at selection of “Add” or “Delete” options respectively.

Option “TEST SETTINGS” (available only in the mode of insulation resistance measurement, see item 2.3.5) the following is allowed:

- setting of insulation test duration from 1 to 10 minutes;

- selection of calculation formula for Dielectric Absorption Ratio: DAR =R60/ R15 or DAR =R60/ R30;

- switching on/off of Polarization Index calculation.

2.3.2. Memory

In megohmmeter E6-32, the memory is arranged as a set of 100 numbered objects, each one consisting of 100 numbered cells. Additionally, the objects and the cells can be assigned with their own names by means of RS-terminal program (see item 2.3.3).

After the measurement is finished, the display shows the last measurement result for 20 seconds. To save data, press button MEM, the result can be recorded to the selected cell of selected object according to Figure 2.3.

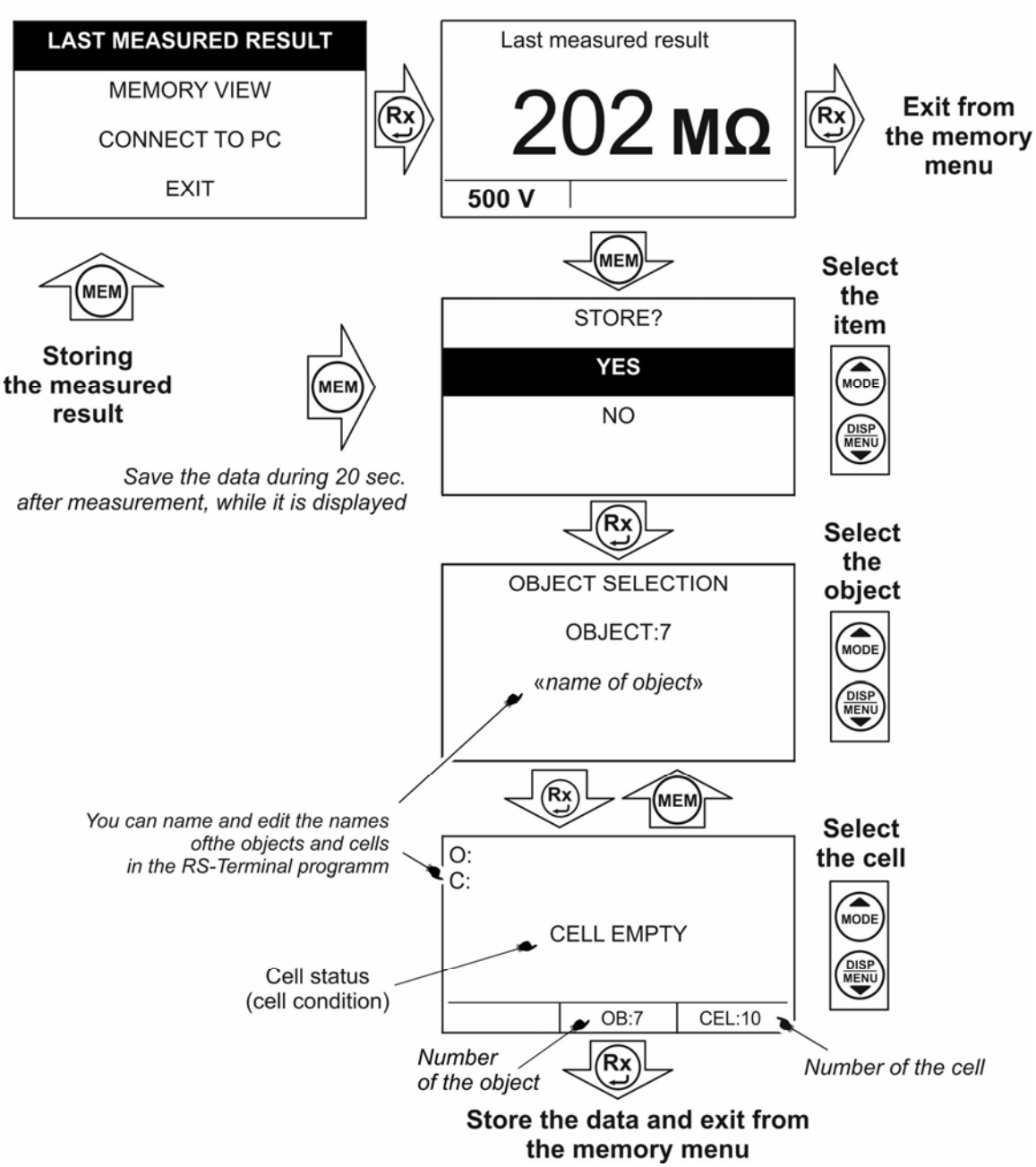


Figure 2.3 – Memory menu. Recording of result

If the measurement is finished more than 20 seconds ago or the instrument is switched off, then to view the last measured value and to record it to the memory of instrument, press button MEM, select "LAST MEASURED RESULT" option and save it in the selected cell of selected object according to Figure 2.3.

To view the saved measurement results, in the menu of instrument select "MEMORY VIEW" option – the display shows the object selection window. After selection, the display shows information recorded to the current cell of the current object. If there is no record in

the selected cell, then "CELL EMPTY" information appears. To scroll between memory cells, use buttons MODE and DISP MENU to escape the memory menu press button Rx or MEM. To delete the content of the selected cell or object (all cells in the object) press and hold button MEM for two seconds.

2.3.3. Operating with computer (PC)

Megohmmeter E6-32 allows wireless data exchange with an external device (PC). To ensure data transmission to PC, a Bluetooth device is required. When it is not built-in, an external Bluetooth-USB adapter is required.

Reception and transmission are performed by operating system tools of the PC. Data are transmitted and saved in PC as text files containing the information stored in the instrument memory. To make data handling easier, a specialized program “RS-terminal” is used; it allows assigning the proper names to objects and cells (name lengths is up to ten digits), generating the reports, etc. The program and its detailed description can be downloaded from the company's site www.radio-service.ru.

For data exchange with a computer it is required:

- turn on PC and run RS-terminal program;

- on the instrument, which shall be switched on, enter the mode “Память” (Memory), select option “CONNECTION TO PC”;

- in the RS-terminal window, select all the necessary objects and cells. A file with measurement results can be copied and edited by any text editor.

Note. Computer shall be located within the sight at a distance of not more than 8 meters from the megohmmeter.

2.3.4. Voltage measurement

After the instrument is switched on and the mode of insulation resistance measurement is selected by button MODE, the instrument sets to the voltmeter mode, it measures and shows on display the actual voltage value between sockets "+" and "-" and its type (DC or AC voltage).

Example of indication is shown in Figure 2.7.

Note. Actual voltage value between sockets "+" and "-" shall be maximum 770 V, between other sockets – maximum 300 V. Failure to comply with this rule can cause the instrument breakdown.

2.3.5. Insulation resistance measurement

Before insulation resistance measurement, the following settings are possible in "TEST SETTINGS" option of the instrument menu:

- test duration setting – time of test voltage generation – 1 to 10 minutes;

- selection of calculation method for Dielectric Absorption Ratio: DAR=R60/ R15 or DAR=R60/ R30, see item 2.3.6;

- switching on/off of Polarization Index calculation, see item 2.3.6. Example of parameters measurement is shown in Figure 2.4.

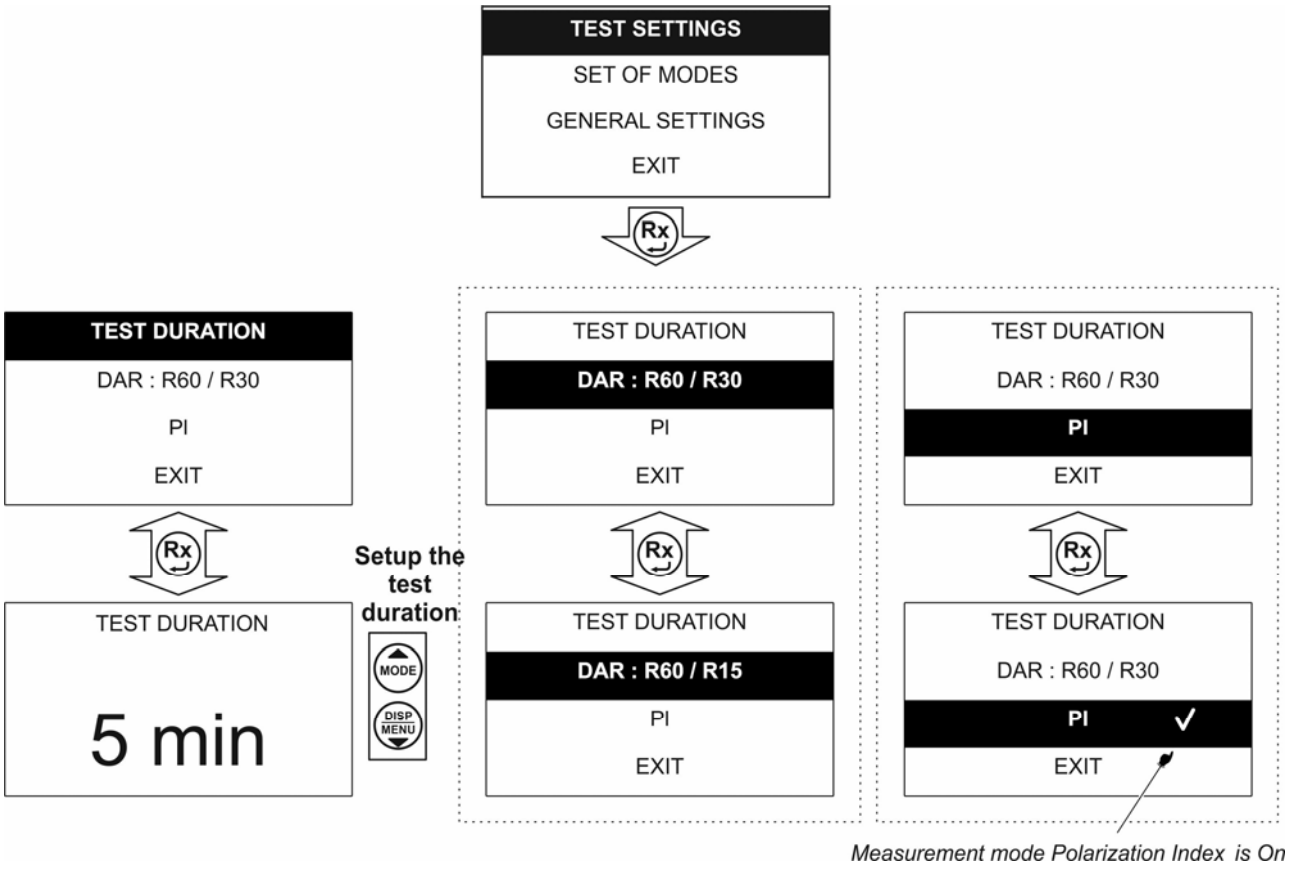


Figure 2.4 – Menu. Measurement parameters

Connection of megohmmeter E6-32 for cable insulation resistance measurement is shown in Figures 2.5 and 2.6 a. Measurement of resistances more than 10 GΩ and more than 1 GΩ at a voltage less than 250 V with normalized accuracy should be made by using RAPM.685631.001 or RLPA.685551.001 shielded measuring cable as shown in Figure 2.5b.

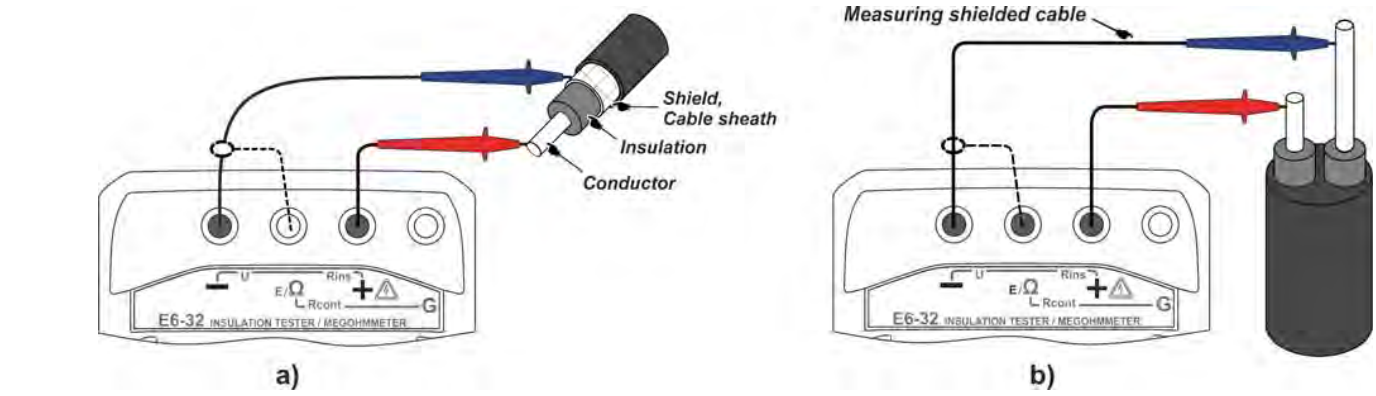


Figure 2.5 – Measurement of cable insulation resistance

To avoid the influence of surface leakage currents (e.g. caused by contamination of the measured object surface) use connection diagrams with three measuring cables. In case of insulation resistance measurement between cable wires, the protective ring shall be used (piece of foil mounted on the insulator of one of the wires and connected to the socket "G" of megohmmeter (see Figure 2.6 a). In case of insulation test between transformer coils, connect transformer case to the socket "G", see Figure 2.6 b.

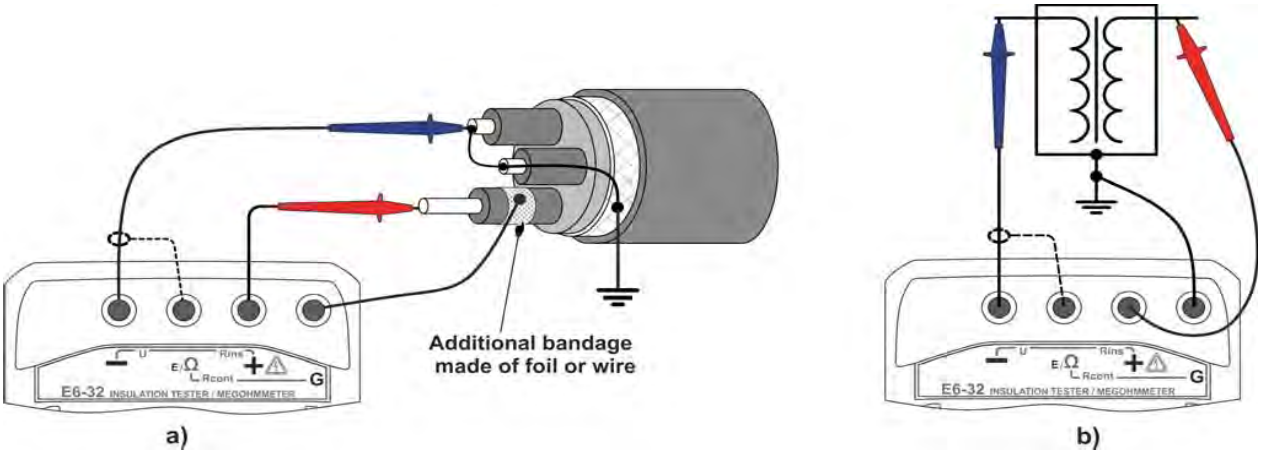


Figure 2.6 – Reduction of surface leakage currents influence

Then use button MODE to select the test voltage value. By voltmeter readings, check absence of residual or induced voltage at the object under test. To start measurement press Rx button twice. Voltage generation is accompanied with occasional intermittent audio signal, and the measured values of insulation resistance and actual voltage at the object are shown on the display, see Figure 2.7. Please note that the steady readings are considered to be valid.

To view additional information on Dielectric Absorption Ratio (DAR) and Polarization Index (PI) (see item 2.3.6) press button DISP MENU .To stop measurements press button Rx.

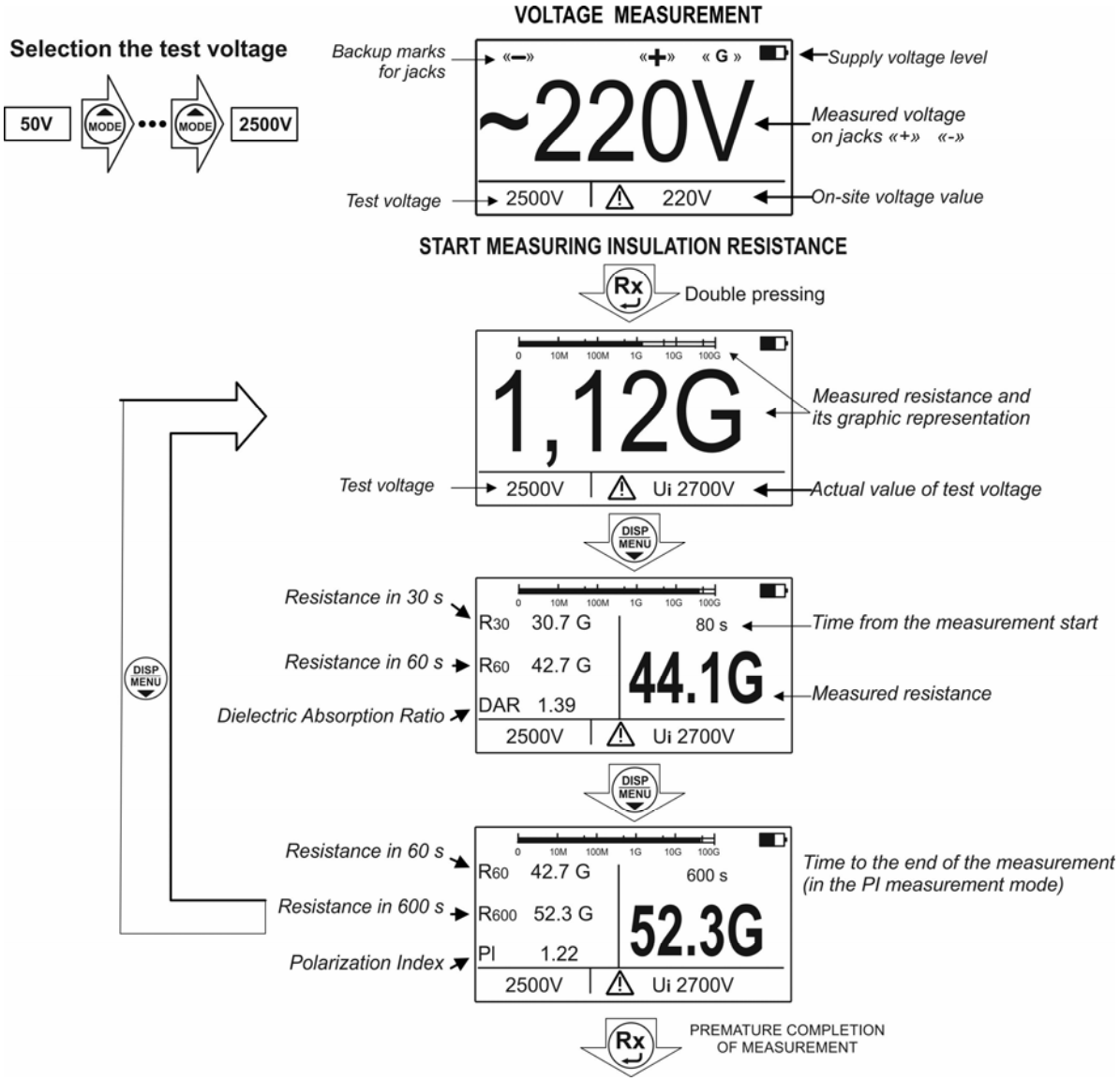


Figure 2.7 – Measurement of insulation resistance

After measurement completion, the residual voltage is removed automatically from the object, its value "Ui" is displayed on the display and accompanied with frequent intermittent audio signal until safe level of 50 V is reached.

After measurement completion, the results are shown on the display during 20 seconds and can be recorded to the memory (see item 2.3.2). After that, instrument sets to the mode of voltage measurement.

Note. During measurements on some grounded objects consider the following:

- normally, if one of the contacts of the measured resistance is grounded (Figure 2.6.а), it is recommended to connect "-" of the instrument to it. However, in case of unstable readings the change of connection polarity can provide more stable readings.

- On some objects, it is required to determine the permissible polarity of test voltage applying in advance to prevent actuation of safety devices. Polarity of the test voltage is specified at the megohmmeter sockets.

- Induced DC voltage can be present on the object. In this case it is recommended to perform measurements twice – with change of applied test voltage polarity. This allows to determine the true value of insulation resistance as an average value of two measurements.

For short-time measurements of the insulation resistance press and hold button 

, the measurement is stopped after the button is released.

2.3.6. Calculation of Dielectric Absorption Ratio and Polarization Index

Dielectric Absorption Ratio (DAR) is used to evaluate the wetting degree of the insulation on cable lines, transformers, electric motors, etc.: charge rate of the absorption capacity is evaluated (capacity due to non-homogenity and contamination of material, inclusions of air and moisture) for insulation at test voltage applying. Dielectric Absorption Ratio is automatically calculated by the results of insulation resistance measurement by one of the following formulas:

DAR=R60/ R30 (default) (1a)

DAR =R60/ R15 (1b),

where R15, R30, R60 – value of insulation resistance after 15, 30 and 60 seconds from the beginning of measurement, respectively. On default, Dielectric Absorption Ratio calculation is set to formula 1a and can be changed by the user during the measurement parameters setting (see item 2.3.5).

Insulation condition is considered to be perfect, if DAR>1.6 (long-term process of the absorption capacity charging by low currents took place), satisfactory – if 1.3 ≤ DAR ≤ 1.6, danger – if DAR<1.3 (short-term process of the absorption capacity charging by high currents took place) within the temperature limits from 10 ºC to 30 ºC. In the latter case, as well as if Dielectric Absorption Ratio is 20% more than the factory data, insulation drying is recommended. For indication of the Dielectric Absorption Ratio during or after measurement press button 

.

Polarization Index (PI) is used to evaluate the ageing degree of the insulation on cable lines, transformers and electric motors. It considers the change of dielectric structure and therefore the increase of charged particles ability to move under action of electric field. PI index is automatically calculated by the results of insulation resistance measurement by the following formula:

PI =R600/ R60 (2),

where R60, R600 – value of insulation resistance after 60 s and 600 s from the beginning of measurement, respectively. Polarization Index calculation is OFF on default, it

can be set to ON by the user during the measurement parameters setting (see item 2.3.5).

It is recommended to use the following factors KPOL to evaluate the insulation quality:

PI <1 – service life of insulation is exhausted, the process of insulation resistance decrease begins (possibly, to unacceptable level);

1≤ PI <2 – service life of insulation is decreased, but further operation is possible;

2≤ PI <4 – service life of insulation is sufficient, no operation limitations;

PI ≥4 – service life of insulation is not decreased, no operation limitations.

Note. Decision on operation of insulator with PI <1 shall be taken based on the additional investigations: more frequent checks of insulation condition, forecasting of a moment of resistance decrease to unacceptable level.

For indication of the Polarization Index during or after measurement press button DISP MENU.

Note. If measurement time is not enough to calculate the Dielectric Absorption Ratio or Polarization Index, then put the dashes in the corresponding items.

2.3.7. Measurement of continuity

Use button MODE to select the mode of continuity "Rcont". Connect measuring cables according to Figure 2.8.

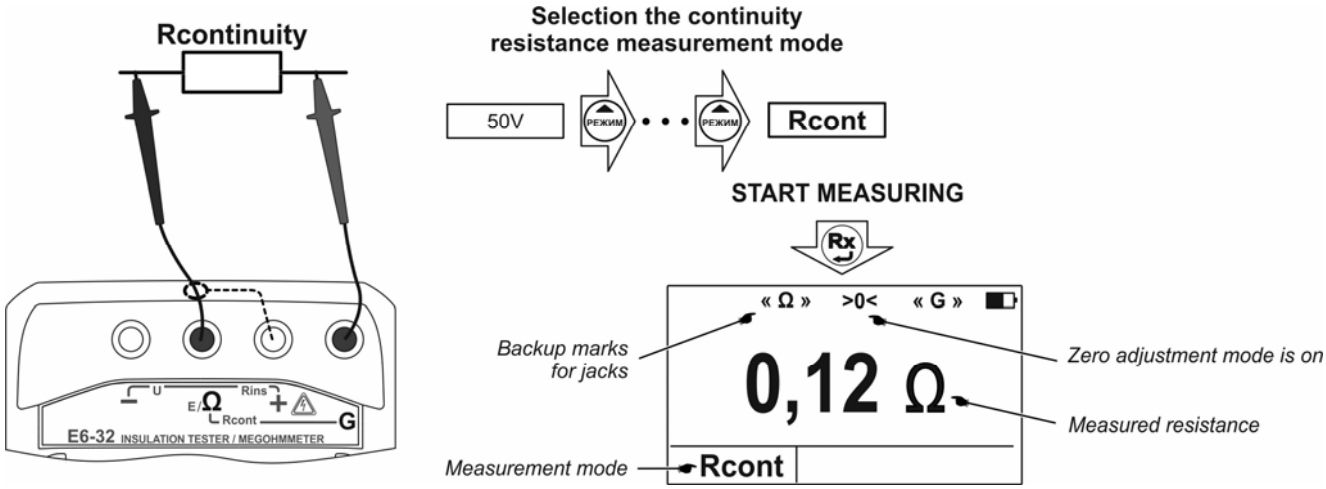


Figure 2.8 – Measurement of continuity

If external noise level at the measurement object allows to perform measurements with the specified accuracy, then display in standby mode shows the symbol 

. Otherwise the display shows the symbol 

accompanied by audio signal, and the measurements are interlocked.

Attention! The instrument is provided with the protection against damages in case of unintentional connection to live-line conductors. However, the voltage value between sockets "Ω" and "G" shall not exceed 300 V. Failure to comply with this rule can cause the instrument breakdown.

To start measurement press button 

. The measurement results are shown on the display during 20 seconds and can be recorded to the instrument memory (see item 2.3.2).

Note that the true resistance of measurement object is lower than the instrument readings by the value of measuring cables resistance and transient resistances in point of their connection. Influence of the measuring cables resistance of 1 Ω maximum on the measurement result can be corrected by subtraction of their resistance value from the overall result, however such correction can`t substitute four-wire measurement method, when it comes to accuracy of low resistance measurements. If necessary, the instrument allows to enable zero-point correction mode ">0<". For this enter the menu (see Fig. 2.9), select option “Correct >0<" and press button 

. After setting to correction menu select option “Correct”, close the ends of the measuring cables (short the probes) and press button 

. The instrument measures resistances of the measuring cables, saves the result in the memory and enables the zero-point correction mode. After that the display shows “>0<”, and the difference between the measured resistance and that of the measuring cables is shown as a result. It is recommended to perform zero-point correction procedure from time to time, as well as in case of measuring cables replacement.

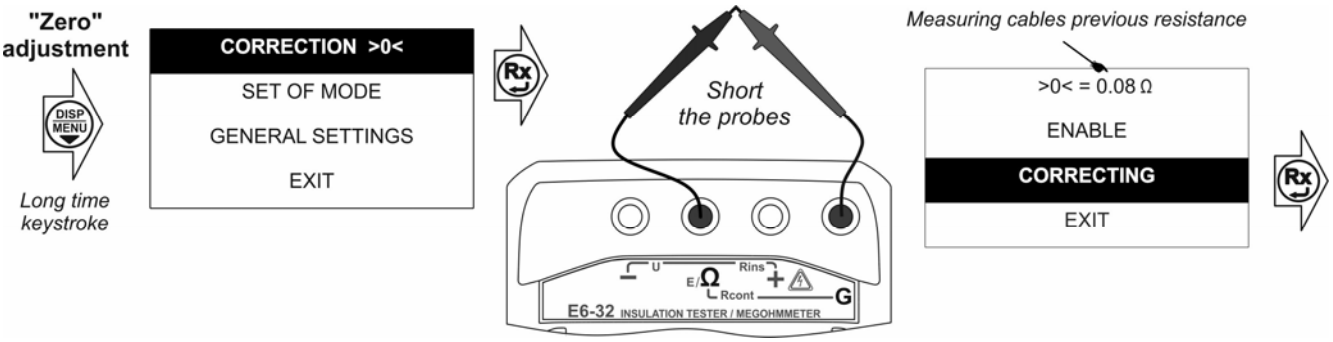


Figure 2.9 – Correction of measuring cables resistance

To disable zero-point correction mode enter the correction menu, select option «Disable» and press button Rx.

Note. If the resistance of the measurement object is much lower than that of the measuring cables, results with a negative sign can be displayed because of measurement errors with enabled zero-point correction.

2.3.8. Measurement of varistor voltage, discharge arresters breakdown voltage

The modes are intended to check the compliance of overvoltage limiters with the certificate specifications:

- varistor voltage is a voltage value at non-linear overvoltage limiter (varistor) at passing of 1 mA direct current through it;

- static breakdown voltage of the discharge arrester is a voltage value, at which arc ignition of the discharge occurs due to slow voltage increase.

Connect cables according to Figure 2.10.

Attention! During measurements, high voltage is generated at sockets and cables.

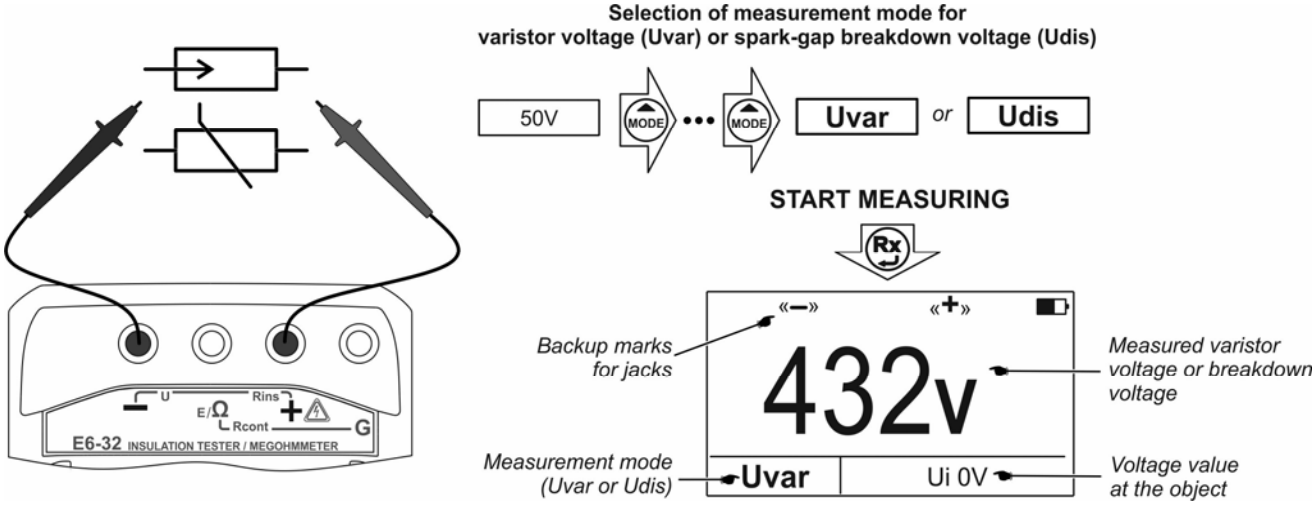


Figure 2.10 – Measurement of varistor voltage or spark-gap breakdown voltage

Use button MODE to select the mode of varistor voltage Uvar or spark-gap breakdown voltage Udis. To start measurement press button Rx. The measurement results are shown on the display during 20 seconds and can be recorded to the instrument memory (see item 2.3.2).

2.4. Operation with instruments E6-31 and E6-31/1

To switch the instrument on / off press button ⏻.

After instrument switching on and self-test, the number of software version is displayed for a short time, then message “Eb” (battery energy) appears and one to three horizontal lines characterizing the storage battery (battery) state are shown under the symbol “⊣⊢”:

- three lines – storage battery is fully charged;
- two lines – storage battery is partially discharged;
- one line – storage battery is discharged.

Then the instrument sets to the mode of voltage measurement.

If during operation the supply voltage drops below 5.0..5.2 V (blinking of indicator “Measurement units” and LED of test voltage selection, after that the instrument is switched off) or during switching on one line is displayed, then it is necessary to charge storage battery according to item 2.2.2), replace storage battery or power battery according to item 2.5.

2.4.1. Operating megohmmeter E6-31 and E6-31/1

2.4.1.1. Measurement time setting

On default, in instruments E6-31 and E6-31/1 the duration of insulation resistance measurement is set to 3 minutes. To change this period within the range from 1 to 10 minutes with increment of 1 minute it is required to:

- with the instrument switched off press and hold button Rx, then switch on the megohmmeter;

- use buttons TEST VOLTAGE or MEM DAR respectively to increase or decrease the measurement time (current settings are shown on the display);

- press button Rx, after that the megohmmeter sets to standard operation mode.

2.4.1.2. Mode “K” (“cable lines” mode)

Mode “K” is used to measure the insulation resistance of long cable lines, objects with high electric capacity. To start mode "K" press and hold button TEST VOLTAGE for more than 2 seconds. After that the indicator of the current test voltage illuminates intermittently. In this mode the measurement process is displayed by movement of horizontal lines, and

indication of the result appears upon achieving of the specified value (resistance values taken with interval of 0.1 second differ by less than 7%).

To cancel mode "K" press and hold button TEST VOLTAGE more than 2 seconds. After that the indicator of the current test voltage illuminates continuously.

2.4.2. Voltage measurement

After switching on the megohmmeter sets to the mode of voltage measurement. The instrument automatically measures and displays the actual voltage value between sockets "+" and "-" and its type: continuous indication corresponds to AC voltage, blinking indication corresponds to DC voltage.

Attention! Actual voltage value at the measurement object shall not exceed 770 V. Failure to comply with this rule can cause the instrument breakdown.

2.4.3. Insulation resistance measurement

Connection of megohmmeters E6-31 and E6-31/1 for cable insulation resistance measurement is shown in Figures 2.11 and 2.12 a. Measurement of resistances of more than 10 GΩ and more than 1 GΩ at a 100V test voltage with normalized accuracy should be made by using RAPM.685631.001 or RLPA.685551.001 shielded measuring cable as shown in Figure 2.11b.

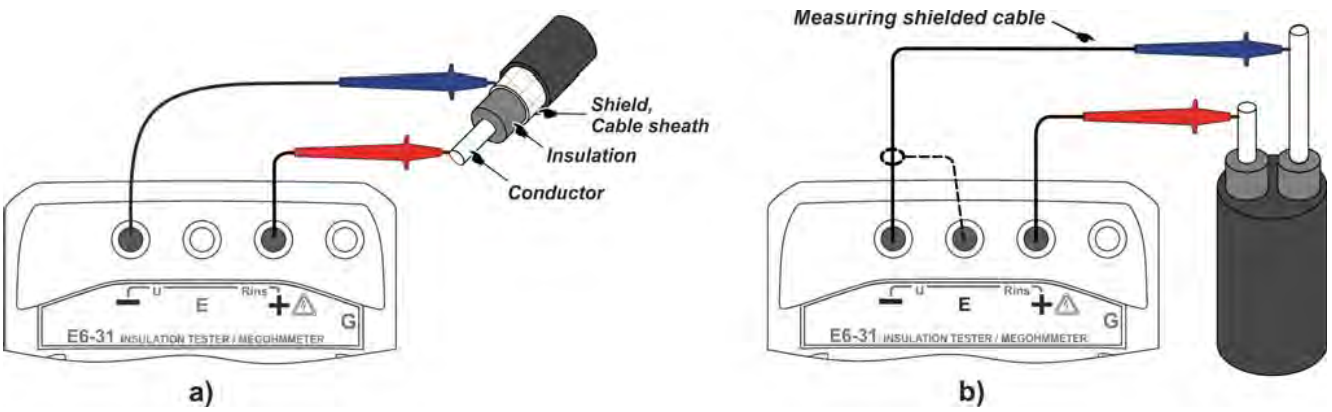


Figure 2.11 – Measurement of insulation resistance

To avoid the influence of surface leakage currents (e.g. caused by contamination of the measured object surface) use connection diagrams with three measuring cables. In case of insulation resistance measurement between cable wires, the protective ring shall be used (piece of foil mounted on the insulator of one of the wires and connected to the socket "G" of megohmmeter (see Figure 2.12 a). In case of insulation test between transformer coils, connect transformer case to the socket "G", see Figure 2.12 b.

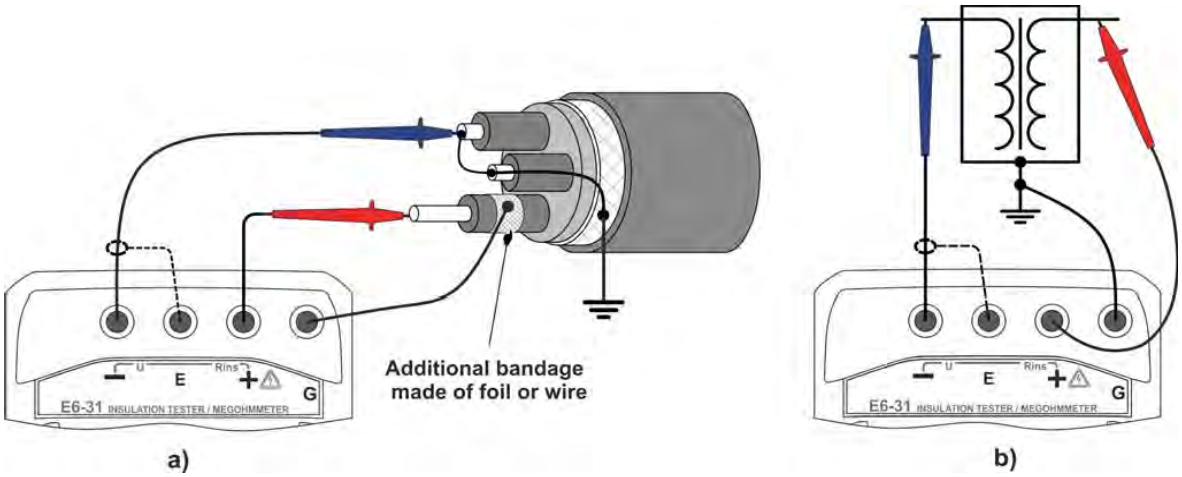


Figure 2.12 – Reduction of surface leakage currents influence

Note. During measurements on some grounded objects consider the following:

- normally, if one of the contacts of the measured resistance is grounded (Figure 2.12.a), it is recommended to connect "-" of the megohmmeter to it. However, in case of unstable readings the change of connection polarity can provide more stable readings.

- on some objects, it is required to determine the permissible polarity of test voltage applying in advance to prevent actuation of safety devices. Polarity of the test voltage is specified at the megohmmeter sockets.

- induced DC voltage can be present on the object. In this case it is recommended to perform measurements twice - with change of applied test voltage polarity. This allows to determine the true value of insulation resistance as an average value of two measurements.

Press button TEST VOLTAGE sequentially to set the required test voltage: 500, 1000 or 2500 V for E6-31; 100, 250, 500 or 1000 V for E6-31/1. Illumination of the test voltage indicator corresponds to the selected value. To start measurement press button Rx twice.

Attention! During measurements of insulation resistance, high voltage is generated at sockets and cables.

Then the measurement is performed during the assigned period (see item 2.4.1.1), the measured resistance is shown on the display. If intermittent indication “999 G” appears for E6-31 or “30.0 G” at test voltages of 100, 250 V and “999 G” at 500, 1000 V for E6-31/1, then the resistance exceeds the allowable reading range.

To stop measurement prematurely press button Rx. After measurement completion the residual voltage is automatically removed from the object, its current value is indicated intermittently until 40 V value is reached or any button is pressed. After that, instrument sets to the voltmeter mode.

For short-time measurements of insulation resistance press and hold button 

. After button 

is released, the measurement stops.

2.4.4. Calculation of Dielectric Absorption Ratio

Dielectric Absorption Ratio (DAR) is used to evaluate the wetting degree of the insulation on cable lines, transformers, electric motors, etc.: charge rate of the absorption capacity is evaluated (capacity due to non-homogenity and contamination of material,

inclusions of air and moisture) for insulation at test voltage applying. Dielectric Absorption Ratio is automatically calculated by the results of insulation resistance measurement in 15 seconds (R15) and 60 seconds (R60) after beginning of measurement:

DAR = R60/ R15 (3).

Insulation condition is considered to be perfect, if DAR>1.6 (long-term process of the absorption capacity charging by low currents took place), danger - if DAR<1.3 (short-term process of the absorption capacity charging by high currents took place) within the temperature limits from 10 ºC to 30 ºC. In the latter case, as well as if Dielectric Absorption Ratio is 20% more than the factory data, insulation drying is recommended.

At sequential pressing of button 

the cycle of values is shown:

last measured value;

- R15 (caption "C15" appears before indication for 2 seconds);
- R60 (caption "C60" appears before indication for 2 seconds);
- DAR (caption "Ab" appears before indication for 2 seconds). After pressing of button 

of after down time for 20 seconds, the instrument sets back to the voltage measurement mode.

2.5. Replacement of Storage Battery or Power Components

Proceed as follows to replace the power components:

- take out the screws that attach storage battery cover;
- remove the cover and take the storage battery (battery compartment) out;
- decouple the connector running to the storage battery (battery compartment);
- replace the storage battery or power components, restore the connection;
- assemble the megohmmeter in reverse order;
- charge the storage battery.

3. MAINTENANCE AND TROUBLESHOOTING

3.1. General instructions

Maintenance includes meeting the rules of operation and storage.

Repair of megohmmeter is only allowed at the manufacturer's site or in special repair agencies.

3.2. Possible failures and troubleshooting procedures

Possible failures and troubleshooting procedure are provided in Table 3. Table 3 – Possible failures and troubleshooting procedures

Failure symptoms	Possible cause	Troubleshooting procedure
Instrument fails to switch on	Storage battery (battery) is discharged	Check the storage battery (battery) voltage, charge (see item 2.2.2) or replace (see item 2.5), if necessary.
On E6-32 there is no image with illumination switched on	Failure of display contrast setting for this temperature	Set the required display contrast (see item 3.2.1).
Storage battery does not charge	Failure of power unit or storage battery	Check battery charger, if necessary, replace storage battery (see item 2.5)
The instrument does not respond to buttons pressing	Microprocessor failure	Switch off the instrument for 5 seconds and switch it on again. Disconnect and then connect the storage battery, if necessary (see item 2.5).

Megohmmeter E6-32 allows to change image contrast on the display without entering the menu. For this press button 

when the instrument is switched off, hold it and switch the instrument on. Use buttons 

and 

to increase and decrease the contrast, respectively. To finish the contrast setting press button 

.

4. TRANSPORTATION AND STORAGE

The instrument packed in a standard package allows transportation by all types of transport without any distance limitation. When transported by an aircraft, megohmmeter shall be arranged in a pressurized compartment.

Climatic conditions of transportation and storage shall be within the ambient air temperature range from -50 ºC to +70 ºC at relative air humidity of 90% maximum at temperature of + 30 ºC. Exposure to atmospheric precipitations is not allowed.

5. DISPOSAL

Instrument disposal shall be performed by operating organization in compliance with standards and rules applicable in the country.

Megohmmeter does not include any environmentally hazardous elements.

6. Verification

Megohmmeters E6-31, E6-31/1 and E6-32

Verification Procedure

6.1. General instructions

The instrument is subject to verification when it is used in the fields covered by state metrological control and supervision. Otherwise the calibration can be performed.

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Primary verification is performed during manufacturing of the instrument and after its repair. Periodic verification shall be performed at least every two years.

Primary sample-based verification of produced not commissioned instruments is allowed in accordance with GOST R ISO 2859-10-2008,

In Russian Federation periodic verification of measuring instruments, in case their use in measurements of fewer units or with fewer number of measuring subranges than ones, which are described in paragraph “Metrological specifications”, is allowed on the basis of written owner’s application in any form. An appropriate record shall be made in certificate of verification of measuring instruments.

(Revised edition, Rev. No.2)

6.2. Verifications operations in accordance with Table 4.

Table 4 – Verification operations

Operation	Item number
Visual inspection	6.6.1
Testing	6.6.2
Check of insulation resistance of the shielded measuring cable	6.6.3
Check of the reference error at voltage measurement	6.7.1
Check of the error of test voltage setting	6.7.2
Check of the reference error at insulation resistance measurement	6.7.3
Check of short-circuit current at “+” and “-” jacks	6.7.4*
Check of the reference error at varistor voltage measurement (for E6-32)	6.7.5
Check of the reference error at spark-gap breakdown voltage measurement (for E6-32)	6.7.6
Check of the reference error at direct current resistance measurement (for continuity) (for E6-32)	6.7.7
Notes 1) * - operation is obligatory only for primary verification; 2) it is allowed to combine checks of accuracy of test voltage setting and accuracy of discharge arrester voltage measurement	

(Revised edition, Rev. No.1), (Revised edition, Rev. No.2)

6.3. Verification means

Verification means shall be serviceable and verified. List of verification means is given in Table 5.

Table 5 – Verification means

Description and type of main or auxiliary verification means	Required technical specifications of verification means	
	Measurement range	Error
Measure-simulator P40116 ZAF.452.008TU	resistance range from 10 kΩ to 1000 GΩ	Accuracy class 0,02
Resistance box P4834, TU 25-7762.020-87	resistance range from 0.01 to 105 Ω	Accuracy class 0,02
Voltmeter C511, TU25-7516.013-86	up to 3.0 kV	Accuracy class 0,5
Voltmeter C510, TU25-7516.013-86	up to 1.5 kV	Accuracy class 0,5
Voltmeter C508, TU25-7516.013-86	up to 600 V	Accuracy class 0,5
Voltmeter C505, TU25-7516.013-86	up to 150 V	Accuracy class 0,5
Multipurpose voltmeter GDM-8246	up to 1200 V (DC voltage)	±(0.02%+2 LSB)
	up to 1200 V (AC voltage)	±(0.2%+30 LSB)
	up to 20 A (DC)	±(0.02%+2 LSB)
	up to 20 A (AC)	±(0.5%+15 LSB)
Measuring shielded cable RLPA.685551.001 or RAPM.685631.001.	For measurement of resistance above 10 GΩ and above 1 GΩ with voltage less than 250V.	
Unit U300, TU25-04-3304-77	up to 1000 V (DC and AC voltage)	—
Note. Other verification means are allowed if they estimate (control) the metrological characteristics with the required accuracy.		

(Revised edition, Rev. No.1), (Revised edition, Rev. No.2)

6.4. Verification conditions

Verification shall be performed provide that the following conditions are met:

- ambient air temperature of +15 to +25 ºC;
- relative air humidity of 30 to 80%;
- atmospheric pressure of 84 to 106 kPa (630 to 795 mm Hg);

6.5. Preparation for Verification

Prior to verification, the measurement means shall be verified and prepared for operation according to their operating documentation.

6.6. Verification Procedure

6.6.1. Visual inspection

Ensure the following by visual inspection of megohmmeter:

- compliance with the complete set;
- good visibility of all captions (marking);
- absence of the following faults and defects: unreliable fastening of parts, electric connectors, measurement sockets, loose fixing of glass, cracks, scratches, dirt interfering with taking the readings, major mechanical damages of megohmmeter outer parts.

6.6.2. Testing of instrument

The testing is intended to check the instrument performance, with only instruments meeting the visual inspection requirements involved in testing.

Switch the instrument on. For two seconds the instrument display (for E6-32 – in the right bottom corner of display) shows the software version number. The result is considered to be positive, if software version is at least "1.00".

After that megohmmeter E6-32 sets to one of the measurement modes (voltmeter, measurement of continuity or varistor voltage), megohmmeters E6-31 and E6-31/1 set to mode “Voltage Measurement” (the display shows value “0 V”).

Result is considered to be satisfactory if operational faults of instrument are not found. After that the instrument is admitted for verification.

6.6.3. Check of insulation resistance of the shielded measuring cable (if included in instrument’s delivery set)

Connect plugs of shield «E» and signal circuits of cable to the “+” and “-“ jacks of megohmmeter E6-32 (E6-31 or E6-31/1). Insulation resistance shall be 3 GΩ minimum at test voltage of 2500 V.

6.7. Verification of the main metrological characteristics

The measurement error is checked by the method of direct measurements and comparison of the instrument readings with the design value in the point to be checked that is decreased or increased by the value of the instrument error limit.

Result is considered to be positive if the instrument readings in i-th check point Ni meet the following condition:

$$(N_{ref\,i} - N_{ref\,i} \cdot \delta/100 - K_{digits}) \le N_i \le (N_{ref\,i} + N_{ref\,i} \cdot \delta/100 + K_{digits}) \quad (3),$$

where $N_{ref\,i}$ – value of i-th reference measured value;

δ - permissible relative error, %.

Kdigits – permitted correction in least significant digits.

6.7.1. Check of error during voltage measurement

Assemble the test setup in accordance with Figure 6.1.

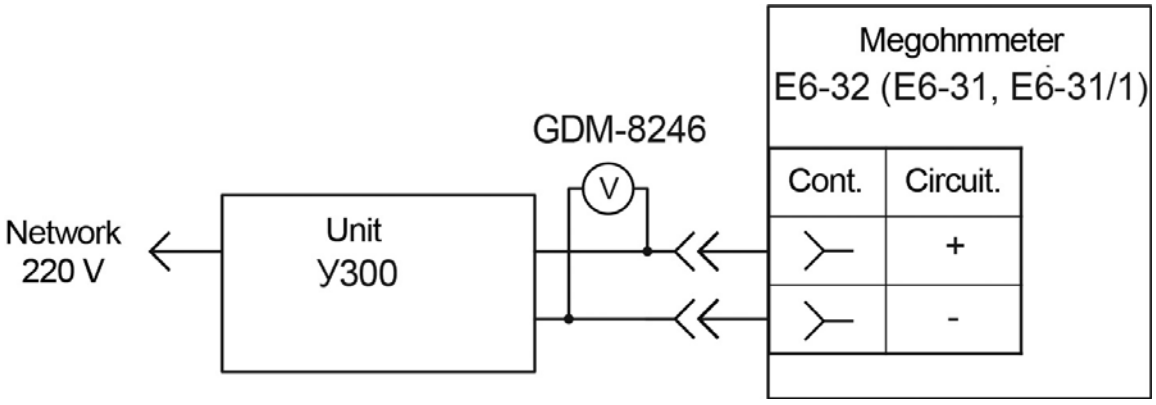

Figure 6.1 – Diagram for check of voltage measurement error

Use unit U300 to sequentially set AC voltage at test voltmeter equal to 40 and 700 V.

Check of voltage measurement mode is considered to be satisfactory if the readings are within the limits of the reference error in accordance with Table 6.

Table 6 – Limits of permissible reference error of voltage measurement

Check point, V	Minimum permissible readings, V	Maximum permissible readings, V
40	35	45
700	662	738

The test voltage value shall be checked by means of connection of voltmeter of C505 (C508, C510, C511) type to sockets “+” and “-“ of the megohmmeter.

Check of the test voltage value is considered to be positive, if voltage setting error complies with the Table 7.

Table 7 – Limits of permissible test voltage setting error

Test voltage, V	50	100	250	500	1000	2500
Measured voltage (upper limit), V	57.5	115	287.5	575	1150	2875
Measured voltage (lower limit), V	50	100	250	500	1000	2500

6.7.3. Check of the reference error at insulation resistance measurement

Check insulation resistance measurement error at all combinations “test voltage – reference resistance” according to Table 8:

- assemble the test setup in accordance with Figure 6.2. Shielded measuring cable РАПМ.685631.001 or РЛПА.685551.001 is used for measurement of resistance over 10 GΩ and over 1 GΩ with voltage less than 250 V.

(Revised edition, Rev. No.2)

- at measure-simulator, set the reference resistance and in megohmmeter settings set the test voltage. Perform measurement.

Note. For measurement of resistance above 10 GΩ with the specified accuracy it is necessary to use capture mode of button “Rx”, use shielded measuring cable, measuring cables shall be fixed rigidly at maximum distance from each other.

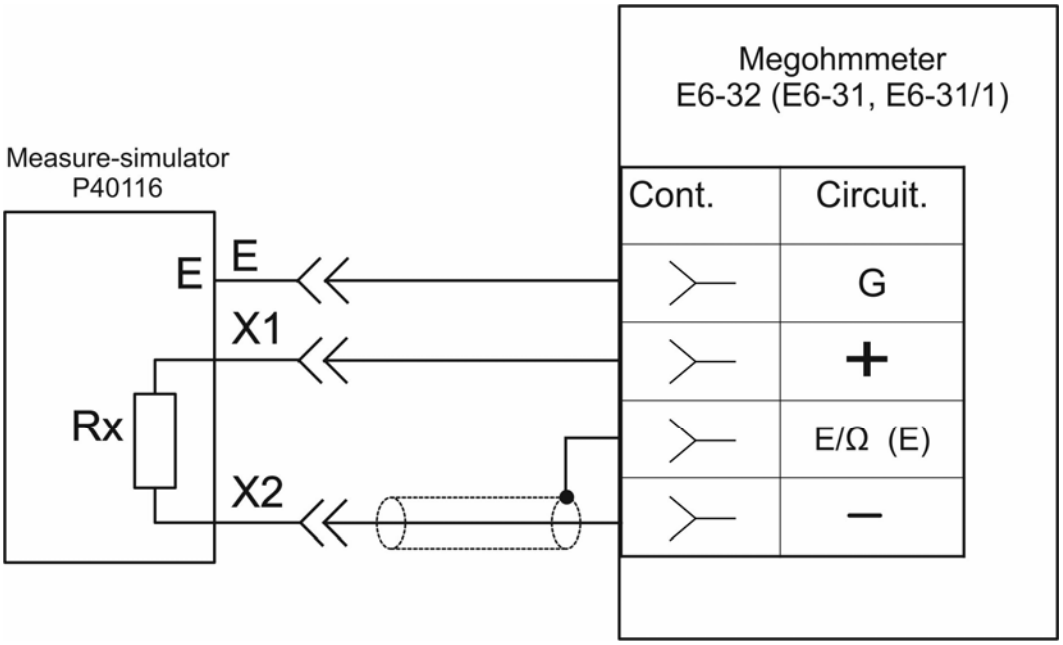

Figure 6.2 - Diagram for check of insulation resistance measurement error

(Revised edition, Rev. No.1)

Check of insulation resistance measurement mode is considered to be satisfactory if the readings are within the limits of the permissible reference error in accordance with Table 8.

Table 8 – Limits of permissible reference error of insulation resistance measurement

Test voltages	Reference resistance	Measured resistance (lower limit)	Measured resistance (upper limit)
for E6-32: 50, 100, 250,500,1000, 2500 V for E6-31: 500, 1000, 2500 V for E6-31/1: 100, 250, 500, 1000 V	110 kΩ	104 kΩ	116 kΩ
	950 kΩ	919 kΩ	982 kΩ
	1.10 MΩ	1.04 MΩ	1.16 MΩ
	9.50 MΩ	9.19 MΩ	9.82 MΩ
	11.0 MΩ	10.4 MΩ	11.6 MΩ
	95.0 MΩ	91.9 MΩ	98.2 MΩ
	110 MΩ	104 MΩ	116 MΩ
	950 MΩ	919 MΩ	982 MΩ
for E6-32: 50, 100 V for E6-31/1: 100 V	1.10 GΩ	995 MΩ	1.21 GΩ
	9.50 GΩ	8.98 GΩ	10.0 GΩ
for E6-32: 250, 500, 1000, 2500 V for E6-31: 500, 1000, 2500 V for E6-31/1: 250, 500, 1000 V	1.10 GΩ	1.04 GΩ	1.16 GΩ
	9.50 GΩ	9.19 GΩ	9.82 GΩ
for E6-32, E6-31: 500, 1000, 2500 V	11.0 GΩ	9.95 GΩ	12.1 GΩ
	95.0 GΩ	89.8 GΩ	100 GΩ
	110 GΩ	83.5 GΩ	137 GΩ
	285 GΩ	232 GΩ	338 GΩ

(Revised edition, Rev. No.2)

6.7.4. Check of short-circuit current between “+” and “-” jacks

To measure the short-circuit current, connect device GDM-8246 in milliammeter mode to the “+” and “-“ jacks of the megohmmeter. Check steady readings (5 – 10 seconds after measurement beginning) of milliammeter during measurement of insulation resistance at maximum test voltage.

Check of test current value is considered to be satisfactory if the measured current is not more than 2 mA.

6.7.5. Check of the reference error at varistor voltage measurement (for E6-32) To check the reference error at varistor voltage measurement:

- assemble the test setup in accordance with Figure 6.3;
- select mode of varistor voltage measurement;
- at measure-simulator, set the resistances of 100 kΩ and 1.3 MΩ;
- while performing measurements check the readings of voltmeter and milliammeter.

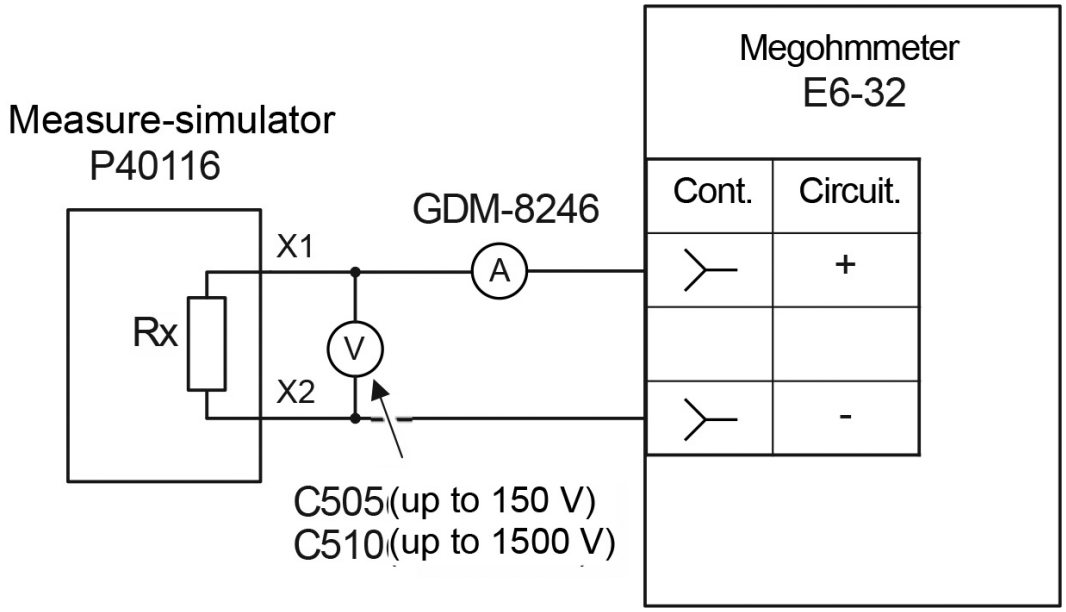

Figure 6.3 – Diagram for check of varistor voltage measurement error

Megohmmeter E6-32 is considered passed the check, if ammeter readings are within the range from 0.975 to 1.025 mA, and readings of voltmeter and megohmmeter differ maximum by ± (3%+5 LSB).

Note. At resistance of 100 kΩ use voltmeter C507, at resistance of 1.3 MΩ use C510.

6.7.6. Check of the reference error at spark-gap breakdown voltage measurement (for E6-32)

For check the following is required:

- connect voltmeter of C505 (C508, C510, C511) type to the sockets “+” and “-“ of megohmmeter;

- select mode of insulation resistance measurement;

- by setting the test voltages of 100 V, 500 V, 1000 V, 2500 V, compare readings of external voltmeter Uext and megohmmeter UE6-32.

Check of breakdown voltage measurement error is considered to be satisfactory if the following relation is met:

0.95*Uext -10 ≤ UE6-32 ≤ 1.05*Uext +10.

6.7.7. Check of the reference error at direct current resistance measurement (for continuity) (for E6-32)

To check measurement error of continuity it is required to:

connect resistance box P4834 to the sockets “э/Ω” and “G”;

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- select continuity measurement mode, set the reference resistance equal to zero, perform zero-point correction (see item 2.3.7);

- at resistance box set the reference resistances in accordance with Table 9 and perform measurement.

Check of DC resistance measurement error is considered to be satisfactory if readings of E6-32 are within the limits of permissible reference error in accordance with Table 9.

Table 9 – Limits of permissible reference error of DC resistance measurement

Reference resistance	Measured resistance (lower limit)	Measured resistance (upper limit)
0.20 Ω	0.16 Ω	0.24 Ω
0.95 Ω	0.89 Ω	1.01 Ω
1.10 Ω	1.04 Ω	1.16 Ω
9.50 Ω	9.19 Ω	9.82 Ω
11.0 Ω	10.4 Ω	11.6 Ω
95.0 Ω	91.9 Ω	98.2 Ω
110 Ω	104 Ω	116 Ω
950 Ω	919 Ω	982 Ω
1.10 kΩ	1.04 kΩ	1.16 kΩ
9.50 kΩ	9.19 kΩ	9.82 kΩ

6.8. Reflection of Verification Results

Instrument calibrated with a positive result is found to be fit for operation. The instrument is marked with a verification stamp, entry on fitness for use is made in the certificate, and/or verification certificate according to the form established by the Order of Ministry of Industry and Trade No. 1815 d/d 02.07.2015 is issued.

(Revised edition, Rev. No.1)

Instrument not complying at least one requirement of Sections 6.6 and 6.7 is found to be unfit and not allowed for operation. Unsatisfactory results of verification are reflected by issue of notice on unfitness.

7. PASSPORT

7.1 Acceptance Certificate

Megohmmeter E6-32 E6-31 E6-31/1 No. _____
delete as applicable serial No.

complies with the specifications RAPM.411218.002TR (technical requirements), and has been found fit for operation.

Head of QCD

Stamp here _____ _____
signature print full name

_____
day, month, year

7.2 Data on Primary Verification

Measurement device:

Insulation tester E6 -32 E6-31 E6-31/1 No. _____
delete as applicable serial No.

on the basis of primary calibration results, has been found compliant with the metrological requirements established in the type specification and fit for application in the field of measurement assurance state control.

Verification officer _____ _____
Signature print full name

Date of primary verification _____
day, month, year

Verification stamp

7.3. Manufacturer Warranty

The Manufacturer guarantees that megohmmeter meets the technical specifications RAPM.411218.002TS requirements provided that operation, transportation and storage rules are observed.

The warranty period for the megohmmeter is 24 months from the date of sale, but not more than 30 months from the date of manufacture (date of the quality control department stamp).

The guaranteed service life is prolonged through the period from claim presentation till elimination of failures.

The guaranteed service life does not cover the storage battery.

Details of the manufacturer:
JSC NPF Radio-Service
Address: 426008, Udmurt Republic, Izhevsk, st. Pushkinskaya, 268.
Postal address: 426000, Izhevsk, post office box 10047.
Tel. (3412) 43-91-44. Fax. (3412) 43-92-63.
E-mail: office@radio-service.ru. Internet: www.radio-service.ru

7.4. Main specification

Main metrological and technical specifications of the insulation tester are listed in items 1.2 and 1.3 of this operation manual RAPM.411218.002OM, respectively.

7.5. Certificates

The megohmmeter is added in the State Register of measuring instruments under the number 53668-13 and has a declaration of conformity to technical regulations.

7.6. Disposal

Disposal of the instrument shall be performed by the customer in accordance with the national law and standards. The insulation tester does not contain environmentally hazardous elements.

8. Instrument In-Service Transfer Record

8.1. The instrument in-service transfer record is given in Table 10.

Table 10 – Instrument In-Service Transfer Record

Date of installation	Place of installation	Date of removal	Operating time		Reason for removal	Signature of person in charge of installation (removal)
			since operation beginning	since last repair		

8.2 Data on instrument acceptance and handover is given in Table 11

Table 11 – Data on instrument acceptance and handover

Date	Instrument condition	Reason (title, number and date of the document)	Company, position and signature of person in charge of		Note
			handover	acceptance	