OPERATING MANUAL

FAULT LOOP IMPEDANCE METER MZC-305

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The MZC-305 meter is a modern, easy and safe measuring device. Please acquaint yourself with the present manual in order to avoid measuring errors and prevent possible problems related to operation of the meter.

CONTENTS

1 Safety

The MZC-305 meter is designed for testing the protection against electric shock in the mains systems. The meter is used to make measurements which results determine the electrical installation safety level. Consequently, in order to ensure safe operation and correct measurement results, observe the following recommendations:

- Before you proceed to operate the meter, acquaint yourself thoroughly with the present manual and observe the safety regulations and recommendations of the manufacturer.
- Any application that differs from those specified in the present manual may cause damage of the instrument and a serious hazard to its user.
- The MZC-305 meters must be operated solely by appropriately qualified personnel with relevant certificates to perform measurements of electric installation. Operation of the instrument by unauthorized personnel may result in damage to the device and constitute a hazard to the user.
- The instrument must not be used for the mains and equipment in rooms with special conditions, such as fire or explosion hazard.
- It is unacceptable to operate the following:
  - ⇒ a damaged meter which is completely or partially out of order,
  - ⇒ leads with damaged insulation,
  - ⇒ a meter which ahs been stored to long in unsuitable conditions (for example is wet). When the meter is transferred from cold environment to warm and humid one, do not make measurements until the meter warms up to the ambient temperature (about 30 minutes).
- Remember that the bAt message on the display means that the power supply voltage is too low and indicates the need to replace/ charge the batteries. The measurements performed with the meter with insufficient supply voltage have additional measuring errors which are impossible to be evaluated by the user and cannot be the basis to determine the correct protection of the tested installation.
- Do not leave the discharged batteries in the meter as they can leak and damage the instrument.
- Before starting the measurement, check if the leads are connected to correct measuring terminals.
- Never use the meters with open or only partially closed battery compartment cover and use only the power supplies specified in this manual.
- Repairs may be performed solely by an authorized service outlet.

NOTE

Use only standard and optional accessories intended for a given instrument which are listed in the "Equipment" section. Using other accessories may cause damage of the measuring terminal and additional measuring errors.

Note:

Due to continuous development of the meter software, the display view for some functions may be a bit different from the view shown in this manual.

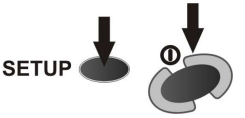
2 Measurements

WARNING:
During measurements, the earthed parts and parts accessible in the electrical installation being tested must not be touched.

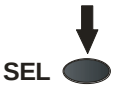
WARNING:
During a measurement, switching of the range switch is forbidden because it may damage the meter and pose a threat to the user.

2.1 Selection of general measurement parameters

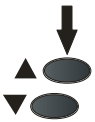
1



Keeping the **SETUP** button depressed, turn on the meter and wait for the parameter selection screen.

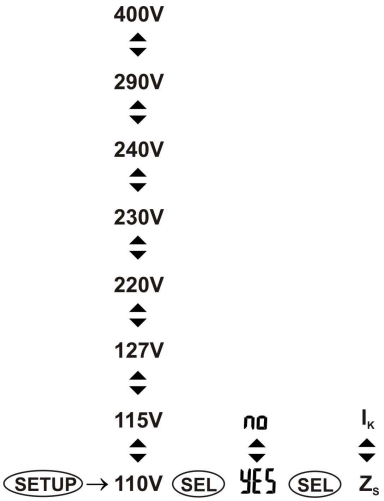


The **SEL** button is used to go to the next parameter and to confirm the changes in the currently displayed parameter.



Use the ▲ and ▼ buttons to change the parameter value. The value or symbol to be changed is flashing.
The YES symbol indicates an active parameter, the no symbol indicates an inactive one.

2 Set the parameters according to the following algorithm:



Parameter	Mains voltage	Auto-OFF	Main result of fault loop impedance measurement
Symbol(s)	L-N! Un	AoFF	dISP

Press **ENTER** to validate the last change and go to the measurement function.

or

Press **ESC** to go the measurement function without validating the last change.

Note:

- Before the first measurements, select the mains rated voltage U_n (110/190V, 115/200V, 127/220V, 220/380V, 230/400V, 240/415V, 290/500V or 400/690V) used in the area where measurements are made. This voltage value is used for calculating the values of prospective short-circuit current.
- After switching the gauge on and displaying a software version, a current nominal voltage of the network is shown: in the main field – the phase voltage, in the auxiliary field – the inter-phase voltage.

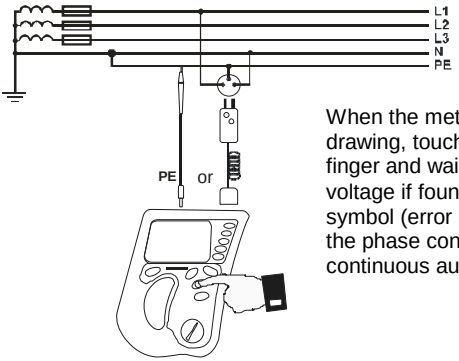
2.2 Remembering the last measurement result

Result of the latest measurement is remembered by the meter until a next measurement is started or measurement settings are changed or the measuring function is changed by means of the rotary switch or the meter is switched off. When you go to the voltage measurement screen with the **ESC** button, you can recall this result by pressing **ENTER**. Use the same button to recall the last result after powering the meter off and on (if the position of function selector has not been changed)

2.3 Measurement of alternating voltage

The meter measures and displays alternating mains voltage before the measurement. This voltage is measured for the frequencies within the range of 45..65 Hz. The test leads should be connected as for a given measuring function.

2.4 Checking correctness of PE (protective earth) connections



When the meter is connected as in the the drawing, touch the contact electrode with your finger and wait for about 1 second. When voltage if found on **PE**, the meter displays the PE symbol (error in the installation; PE connected to the phase conductor) and generates a continuous audio signal. This option is available

Note:

WARNING:
When a dangerous voltage is detected on PE conductor, measurements must be immediately stopped and a fault in the installation must be removed.

- The person making a measurement must ensure that he/she is standing on a non-insulated floor during the measurement; otherwise the result of the measurement may be incorrect.
- In the Z_{L-PE} and$_{L-PE}$ RCD functions, when only the phase conductor is connected to one of the measuring terminals of the meter (L,N,PE), the "PE" alarm will be generated when the contact electrode is touched.

When in the Z_{L-PE} and Z_{L-PE} RCD functions only L and N conductors are connected (respectively to the meter's L and N terminals), the "PE" alarm may be triggered when the contact electrode is touched, but sometimes this does not happen (this depends, among other things, on the floor resistance, mains voltage, footwear, etc.).

2.5 Measurement of fault loop parameters

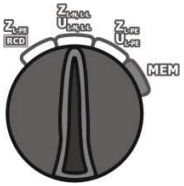
⚠

If there are residual current devices in the tested network, they should be bypassed by bridging for the period of impedance measurement. However, it should be remembered that the tested circuit is modified in this way and the obtained results may slightly differ from the actual results.
Each time after completion of measurements, modifications introduced to the installation for the period of measurements should be removed and operation of the residual current device should be checked.

The above remark does not apply to measurements of short circuit loop impedance with the use of the Z_{L-PE} RCD function.

2.5.1 Selection of measurement parameters

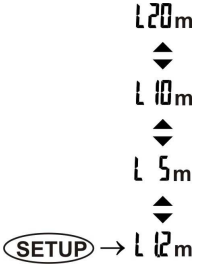
(1)



Turn the rotary switch to one of the loop impedance measurement ranges.

(2)

Set the phase conductor length according to the following algorithm, and according to the rules described in general parameters setting.
NOTE: The Uni-Schuko lead is detected by the meter and it is then impossible to select the cable length (the --E symbol is displayed). Using cables terminated with banana plugs, before starting to measure, select the appropriate length of the phase conductor, compatible with the length of cable used for measurement.



Parameter	Phase conductor length

Note:

Using cables from known manufacturers and selecting the correct length guarantees the declared measurement accuracy.

The leads with Uni-Schuko plugs can be used only in mains below 250V.

2.5.2 Prospective short-circuit current

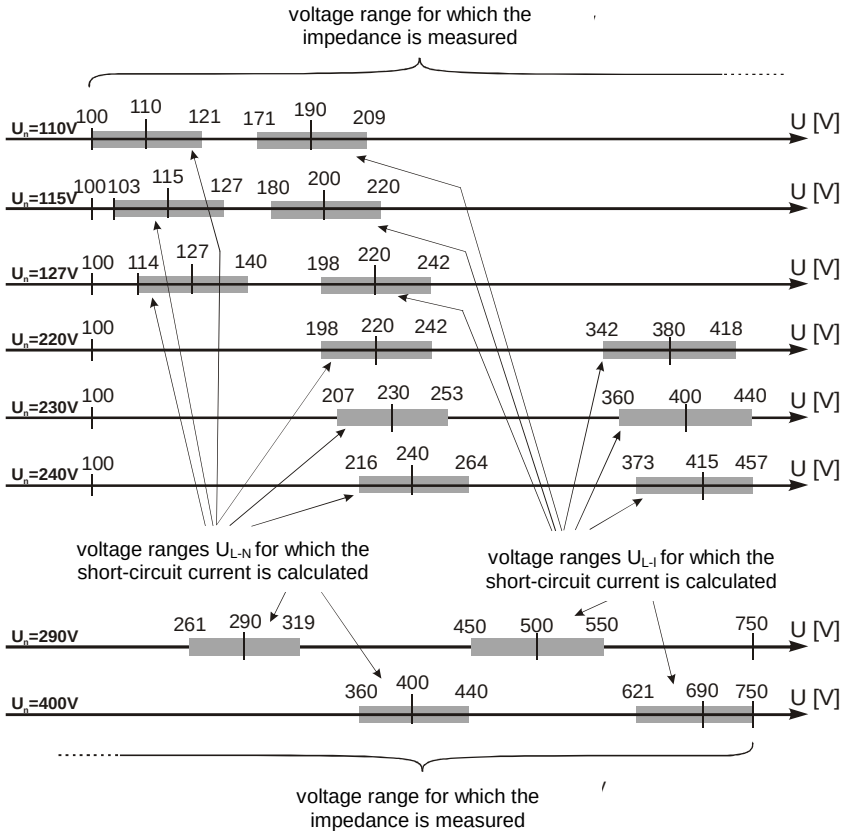
The meter always measures impedance. The short-circuit current is calculated according to the following formula:

$$I_k = \frac{U_n}{Z_S}$$

where: U_n - mains rated voltage, Z_S - measured impedance.

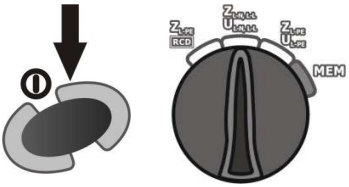
On the basis of U_n rated voltage selected (section 2.1), the meter automatically recognizes the measurement at phase-to-neutral or phase-to-phase voltage and takes it into account in the calculations.

If the voltage of the network being tested is outside the tolerance range, the meter will not be able to determine a proper rated voltage for the short-circuit current calculation. In such a case, horizontal dashes will be displayed instead a short-circuit current value. The following diagram shows voltage ranges for which short-circuit current value is calculated.



2.5.3 Measurement of fault loop parameters in the L-N and L-L circuits

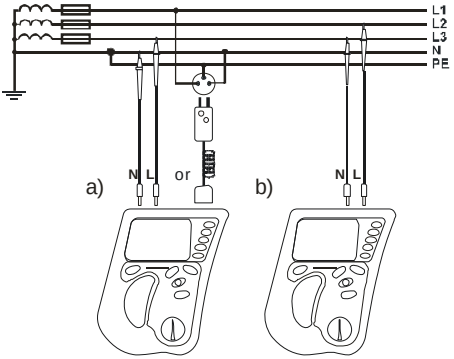
1



Turn on the meter.
Turn the rotary switch to the **Z/U$_{L-N,L-L}$** position.

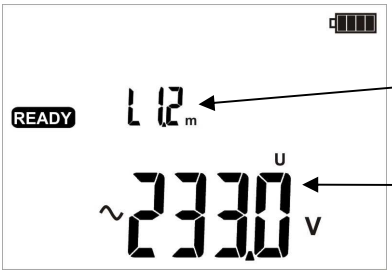
2 Depending on the needs, select the measurement parameters according to section 2.5.1.

3



Connect test leads according to the drawing
a) for measurement in the L-N circuit
or
b) for measurement in the L-L circuit

4

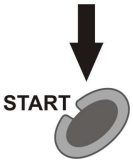


The meter is ready for measurement.

Phase conductor length or the --E symbol.

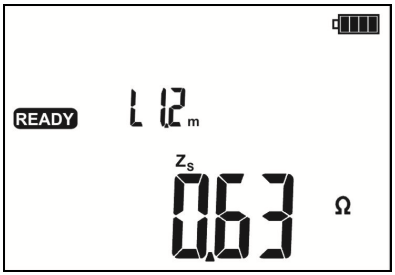
U_{L-N} voltage

5



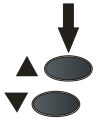
Make the measurement by pressing the **START** button.

6

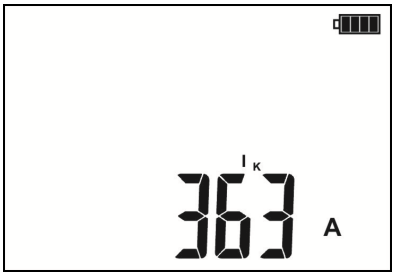


Read the main measurement result: fault loop impedance Z_S or short-circuit current I_K.

7

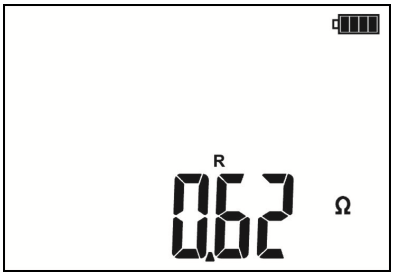


To read additional results, press the ▲ and ▼ buttons.



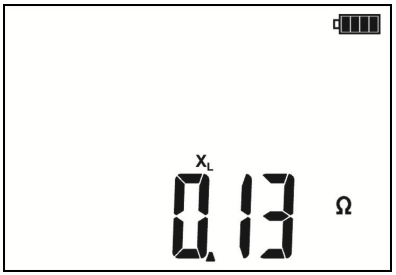
I_K
short-circuit current or
Z_S
fault loop impedance

8



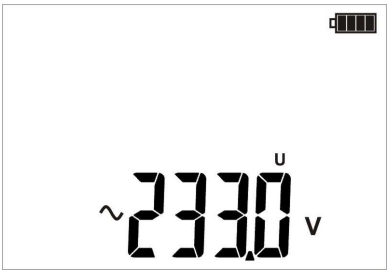
R
fault loop resistance

9



X_L
fault loop reactance

10



Mains voltage at the time of measurement

Note:

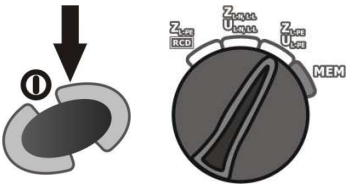
- Enter the result into memory (see section 3.2) or press **ESC** to return to the voltage measurement.
- When many measurements are made in short time intervals, the meter may emit a large amount of heat. As a result of this, the enclosure of the device may become hot. This is normal and the meter is equipped with the protection against excessive temperature.
- Minimum interval between successive measurements is 5 seconds. This is controlled by the meter which displays the message **READY** informing that the measurement can be made.

Additional information displayed by the meter

READY	The meter is ready for measurement.
L-N!	Voltage on terminals **L** and **N** is within the measurable range.
Err	Error during the measurement.
ErrU	Error during the measurement – voltage dip after the measurement
E00	Short circuit malfunction!

2.5.4 Measurement of fault loop parameters in the L-PE circuit

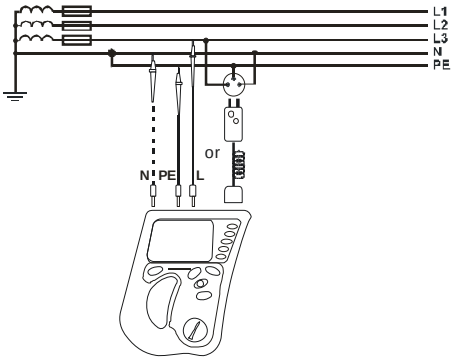
1



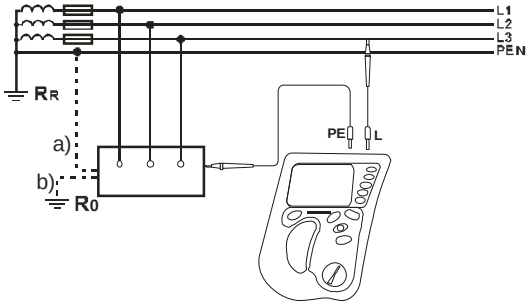
Turn on the meter.
Turn the rotary switch to the **Z/U$_{L-PE}$** position.

2 Depending on the needs, select the measurement parameters according to section 2.5.1.

3

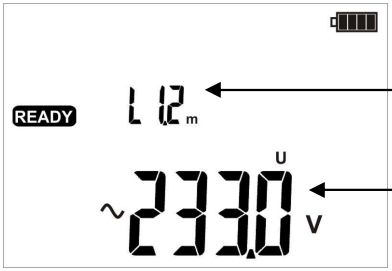


Connect test leads according to one of the drawings.



Checking effectiveness of protection against electric shock of the enclosure in case of: a) TN b) TT.

4

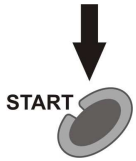


The meter is ready for measurement.

Phase conductor length or the --E symbol.

U_{L-PE} voltage

5



Make measurement by pressing **START** push-button.

Remaining issues connected with the measurements are the same as those described for measurements in L-N circuit or L-L circuit.

Note:

- Double lead measurement is possible when a test lead other that the lead with a mains socket is selected.

Additional information displayed by the meter

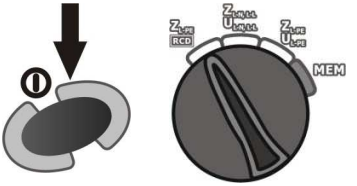
READY	The meter is ready for measurement.
L-N!	For The lead with the plug - voltage on terminals **L** and **N** is within the measurable range.
L-PE!	Voltage on terminals **L** and **PE** is not within the measurable range.

Error messages - as for the L-N and L-L measurement.

2.5.5 Measurement of short circuit loop impedance in L-PE circuit protected with a residual current device (RCD)

The MZC-305 enables the fault loop impedance measurements without altering the mains with RCD's with the rated current of at least 30mA.

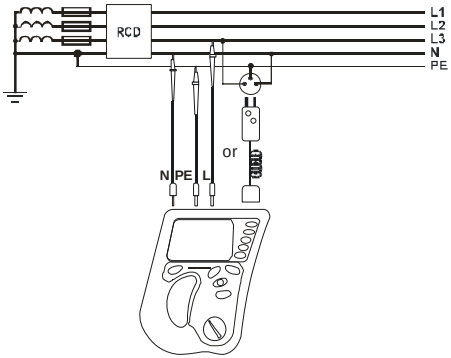
1



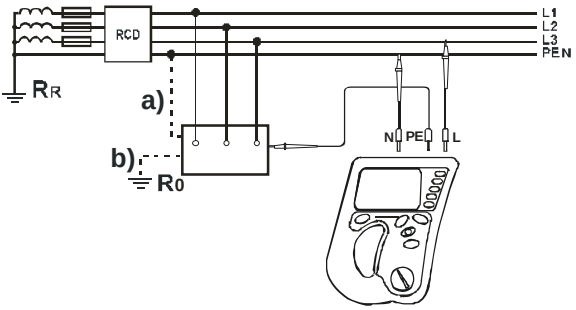
Turn on the meter.
Turn the rotary switch to the Z_{L-PE}^{RCD} position.

2 Depending on the needs, select the measurement parameters according to section 2.5.1.

3



Connect test leads according to one of the drawings.



Checking effectiveness of protection against electric shock of the enclosure in case of: a) TN b) TT.

Remaining issues connected with the measurements are the same as those described for measurements of the L-PE circuit.

Note:

- Maximum measurement time is about 32 seconds. The measurement can be interrupted by pressing the **ESC** button.
- In the electrical installations with 30 mA RCD's the sum of leakage currents of the installation and the test current may trigger the RCD. If this happens, try to reduce the leakage current in the tested mains (for example by disconnecting loads).

Additional informations displayed by the meter

READY	The meter is ready for measurement.
L-N!	Voltage on terminals **L** and **N** is within the measurable range.
L-PE!	Voltage on terminals **L** and **PE** is not within the measurable range.
ULn	Conductor N is not connected.
NOISE!	Huge noise in the system during the measurement. The measurement result may be affected by a large, unspecified error.

Error messages - as for the L-N and L-L measurement.

3 Memory of measurement results

MZC-305 meters are equipped with the memory that can store 3500 single measurement results. The whole memory is divided into 10 memory banks, each of them containing 99 memory cells. Thanks to dynamic memory allocation, each of the memory cells can contain different quantity of single measurement results, depending on the needs. Optimal use of the memory can be ensured in this way. Each measurement result can be stored in a memory cell marked with a selected number and in a selected memory bank. Thanks to this, the user of the meter can, at his/her discretion, assign memory cell numbers to individual measurement points and the memory bank numbers to individual facilities. The user can also perform measurements in any sequence and repeat them without losing other data.

Memory of measurement result data **is not deleted** when the meter is switched off. Thanks to this, the data can be later read or sent to a computer. The number of a current memory cell or memory bank is not changed either.

Note:

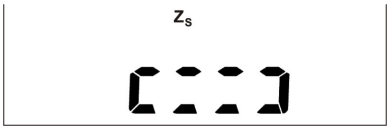
- Results of measurements performed for all measuring functions can be stored in one memory cell.
- After each entry of the measurement result to the cell, its number is automatically incremented. Set the appropriate cell number to allow entering to a single cell of successive measurement results relating to a given measuring point (facility).
- Only the results of measurements activated by pressing the **START** button can be stored in the memory (except autozeroing in low-voltage resistance measurement).
- It is recommended to delete the memory after reading the data or before performing a new series of measurements that may be stored in the same memory cells as the previous ones.

3.1 Storing the measurement result data in the memory

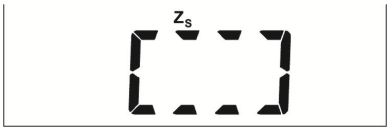
Press **ENTER** after completion of the measurement.
The meter is in the memory storing mode.

Cell is empty.

The cell contains the result of the same type which is to be entered.



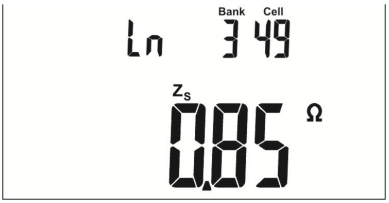
The cell contains the result of a different type than is to be entered.

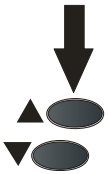


The cell is completely full.

② 

Press **SEL** to view the result types...

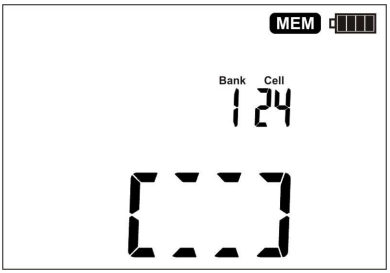




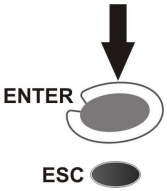
...and the ▲ buttons ▼ to view individual components of the results (if the bank or cell number does not flash - see section 3.2).

③ 

Select the bank and cell number (see section 3.2) or leave the current number. Then press **ENTER** again. The following screen appears for a moment, accompanied by three short beeps, and then the meter returns to display the last result of the measurement.



④ An attempt to overwrite a result causes the warning symbol to appear.

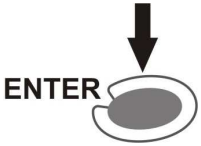
⑤ 

Press **ENTER** to overwrite the result, or **ESC** to abort.

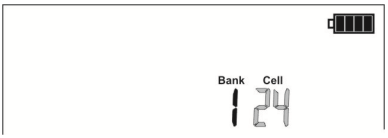
Note:

- Complete set of results (main result and supplementary results) for a given measuring function and preset measurement settings are stored in the memory.

3.2 Changing the cell and bank number

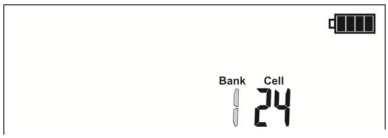
① 

Press **ENTER** after completion of the measurement.
The meter is in the memory storing mode.



The cell number is flashing.
To change use the ▲ and ▼ buttons.

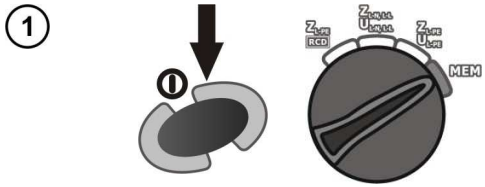
Press **SETUP**.



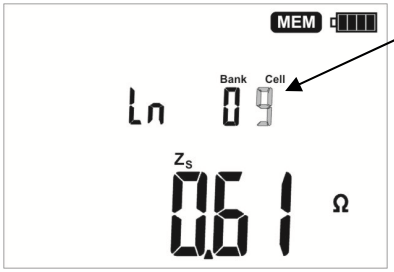
The bank number is flashing.
To change use the ▲ and ▼ buttons.

Press **SETUP**. The bank or cell number is not flashing.
The meter is in the memory storing or memory viewing mode.

3.3 Viewing memory data



Turn on the meter.
Turn the rotary switch to the **MEM** position.



The content of the last saved cell appears.

The cell number is flashing.

Use the **SETUP** buttons and then the▲ and ▼buttons to change the number of the bank and cell which you intend to view.
If the bank or cell number is flashing, its number can be changed.

Note:

- When viewing the memory, the **ESC** button has the same function as **SETUP** but with reverse order.

Additional information displayed by the meter

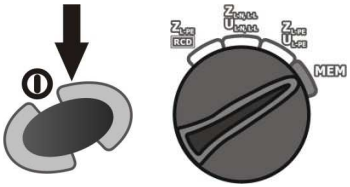
Ln	Measurement made in the L-N loop for the $\mathbf{Z_{L\text{-}N}}$, $\mathbf{Z_{L\text{-}L}}$ function.
LL	Measurement made in the L-L loop for the $\mathbf{Z_{L\text{-}N}}$, $\mathbf{Z_{L\text{-}L}}$ function.
LPE	Measurement made for the $\mathbf{Z_{L\text{-}PE}}$ function.

LPE alternating with rcd	Measurement made for the $Z_{L\text{-}PE}$ RCD function.

3.4 Deleting memory data

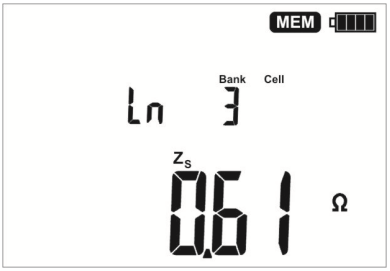
3.4.1 Deleting bank data

1

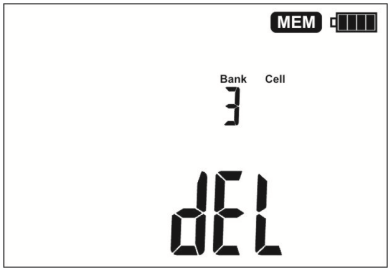


Turn on the meter.
Turn the rotary switch to the **MEM** position.

2



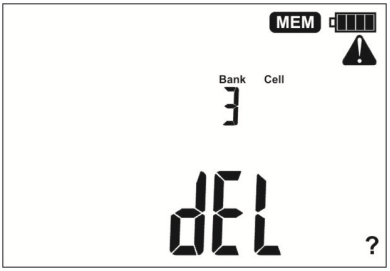
Set the bank number to be deleted acc. to section 3.2.
Set the cell number before “1”...



...the cell number disappears, and appears the dEL symbol indicating the readiness to delete.

3

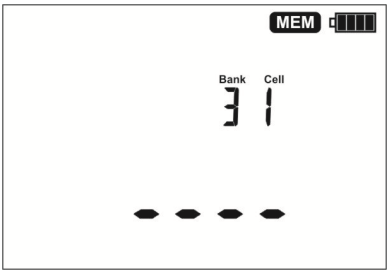
Press **ENTER** .



The “?” and ⚠ symbols appear, asking you to confirm deletion

4

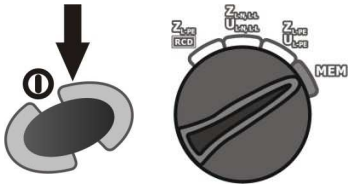
Press **ENTER** to start deleting or **ESC** to abort.



The deletion progress is shown on the display in %. When deletion is complete, the meter generates three short beeps and sets the cell number to 1.

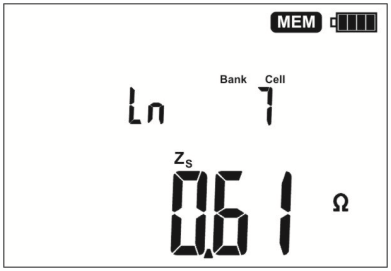
3.4.2 Deleting the whole memory

1

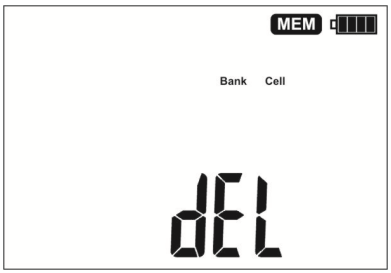


Turn on the meter. Turn the rotary switch to the **MEM** position.

2

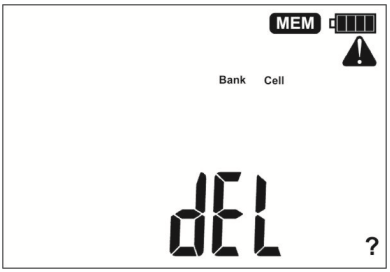


Set the bank number between “0” and “9”...



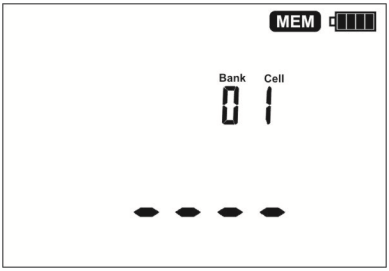
...the bank number disappears, and the dEL symbol appears, indicating the readiness to delete.

Press **ENTER** .



The "?" and ⚠ symbols appear, asking you to confirm deletion .

Press **ENTER** to start deleting or **ESC** to abort.



The deletion progress is shown on the display in %. When deletion is complete, the meter generates three short beeps and sets the cell number to 1.

3.5 Communication with a computer

3.5.1 Computer connection accessories

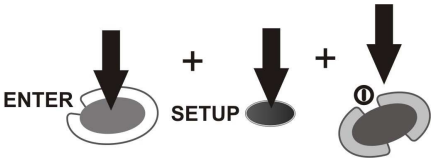
What is necessary in order to operate the meter with a computer is additional accessories, namely a cable for serial transmission and appropriate software. If this package has not been purchased along with the meter, it can be bought from the manufacturer or an authorized distributor where detailed software information is also available.

3.5.2 Data transmission

If the switch is in the **MEM** position, after detecting the USB connection with the computer the meter automatically goes to the data transmission mode and displays the following screen.

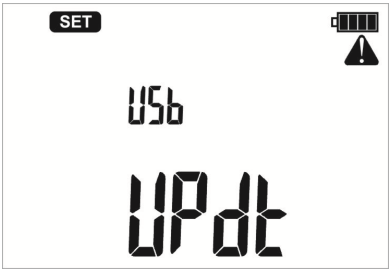
To transmit data, follow the instructions of the software.

3.5.3 Software update



Turn on the meter, holding the **ENTER** and **SETUP** buttons depressed.

The meter displays the following screen.



When the meter detects a USB connection with computer, follow the instructions of the software.

4 Troubleshooting

Before returning the instrument for repair, call the service, perhaps the meter is not damaged and the problem has occurred for another reason.

The meter repairs should be carried out only in the outlets authorized by the manufacturer.

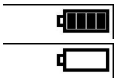
The following table describes the recommended procedure in certain situations that occur when using the meter.

Measuring function	Symptom	Cause	Action
All	The meter will not start after pressing the ⏻ button. The bAt symbol is displayed during the voltage measurement. Meter turns off during the initial test.	Discharged or incorrectly placed batteries/ rechargeable batteries	Check if the batteris are placed correctly, replace and/or recharge the batteries. If this does not help, sent the meter for servicing.
	Measurement errors after moving the meter from cold environment to warm and humid environment.	No acclimatization	Do not perform the measurements until the meter reaches the ambient temperature (about 30 minutes) and dries.
Fault loop	Sucessive results obtained in the same measuring point are significantly different from each other	Incorrect connections in the tested mains.	Check the connections and remove defects
		Mains with high noise or unstable voltage	Perform a larger number of measurements, average the results
	The meter indicates the values close to zero or zero irrespective of the location of the measurement and these values are significantly different than expected.	Incorrectly selected test leads in the meter settings.	
	The PE symbol does not appear, although the voltage between the contact electrode and the **PE** conductor exceeds the detector threshold (about 50V)	Contact electrode is not functioning correctly or the meter input circuits are damaged	Return the meter for servicing; he use of a malfunctioning meter is**unacceptable**
		Rotary switch in a wrong position.	Contact electrode is active for the measurements of the Z_{L-PE} fault loop parameters.

5 Meter power supply

5.1 Monitoring of the power supply voltage

The charge level of the batteries or rechargeable batteries is indicated by the symbol in the right upper corner of the display on a current basis:


Batteries charged

Batteries discharged

Replace or recharge the batteries!

Note:

- The bAt symbol in the display means that the supply voltage is too low and indicates that the batteries must be replaced or recharged,
- Measurements performed with an insufficient supply voltage feature additional errors which the user is unable to evaluate.

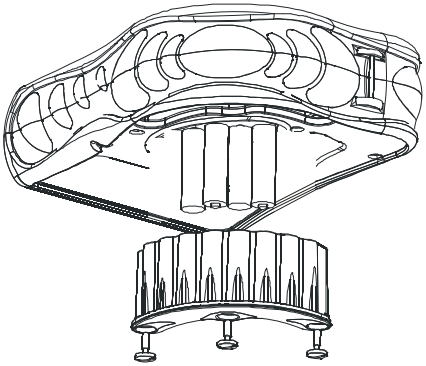
5.2 Replacement of batteries

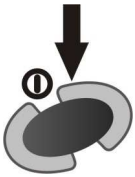
The MZC-3051 is powered by four R6 disposable or rechargeable batteries (alkaline batteries are recommended). The (rechargeable) batteries are placed in the compartment at the bottom of the enclosure.

WARNING:
Before replacing the batteries, disconnect the test leads from the meter.

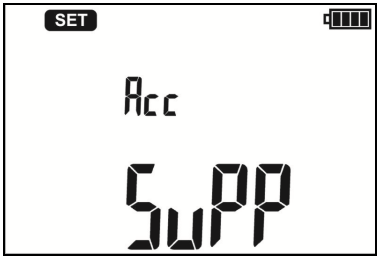
To replace the batteries:

1. Disconnect the leads from the measuring circuit and turn off the meter,
2. Unscrew the 3 screws and remove the battery compartment (in the bottom of the enclosure).
3. Replace all batteries. Observe the correct polarity when putting new batteries ("-" on the elastic part of the contact plate). Reverse polarity will not damage the meter or the batteries, but the meter will not work.
4. Place and bolt the battery compartment.

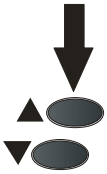




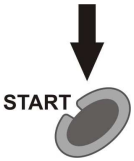
After replacement of batteries, the meter when turned on starts in the power supply selection mode.



Selected power supply:
rechargeable batteries:



Use the ▲ and ▼ to switch between disposable and rechargeable batteries.



Press **START** to confirm the choice and put the meter in the measurement readiness mode.

NOTE!
After replacing the batteries, always set the power supply type. The correct charge indication depends on this setting (the discharge characteristics of disposable and rechargeable batteries are different).

NOTE!
Have the meter serviced in case of battery leakage inside the compartment.

Batteries must be recharged in an external charger.

5.3 General rules of using the Nickel Metal Hydride (Ni-MH) batteries

- If you are not going to use the instrument for a longer time, remove the rechargeable batteries and store them separately.

- Store the rechargeable batteries in a dry, cool and well ventilated place and protect them from direct sunlight. The long storage temperature should be below 30 degrees C. If the batteries are stored long at high temperatures, the chemical processes may reduce their life.

- The NiMH rechargeable batteries usually withstand 500-1000 charging cycles. Such batteries achieve full capacity after forming (2-3 discharging and charging cycles). The most important factor which influences the battery life is the discharge level. The deeper the discharge level, the shorter the battery life.

- The memory effect appears in the NiMH batteries in a limited scope. These batteries can be recharged without more serious consequences. It is, however, recommended to discharge them completely every few cycles.

- During the storage of the Ni-MH rechargeable batteries, they are subject to self-discharge process at the rate of about 30% a month. Keeping the batteries at high temperatures may accelerate this process even two times. In order not to allow an excessive discharging of the batteries (after which the forming will be needed), recharge the batteries once in a while (even unused batteries).

- Modern, fast chargers detect too low and too high temperature of the batteries and respond accordingly. If the temperature is too low, the charging process should not start as it might irrevocably damage a rechargeable battery. The battery temperature increase is a signal to stop the charging and is typical. In addition to faster temperature increase of a battery which will not be fully charged, charging at high ambient temperatures results, however, in a reduced life.

- Remember that with fast charging, the batteries are charged to about 80% of their capacity; better results can be achieved by continuing the charging process: the charger then goes into the small current charging mode and after a few hours the batteries are fully charged.

- Do not charge and do not use the batteries at extreme temperatures as they reduce the life of batteries. Avoid using the battery-powered devices in very hot places. The rated operating temperature must be observed at all times.

6 Cleaning and maintenance

NOTE!
Use only the maintenance methods presented by the manufacturer in this manual.

Clean the meter casing and the case with a wet cloth, using generally available detergents. Do not use any solvents and cleaning media which could scratch the casing (powder, paste, etc.).

The probes can be cleaned with water and then wiped dry. Before longer storage, it is recommended to lubricate the probes with any machine grease.

Clean the spools and leads with water and detergents, then wipe dry.

The meter electronic system is maintenance free.

7 Storage

When storing the instrument, observe the following recommendations:

- disconnect all leads from the meter,
- thoroughly clean the meter and all accessories,
- wind long test leads onto the spools,
- if you are not going to use the instrument for a longer time, remove the batteries,
- during a prolonged storage recharge the batteries from time to time to prevent total discharging.

8 Dismantling and disposal

Used electric and electronic equipment should be collected selectively, i.e. not placed with other types of waste.

Used electronic equipment shall be sent to the collection point according to the Used Electric and Electronic Equipment Act.

Before sending the instrument to the collection point, do not dismantle any parts by yourself.

Observe local regulations on disposal of packagings and used batteries.

9 Technical specifications

9.1 Basic data

⇒ Abbreviation "m.v" used in the specification of measurement uncertainty means a standard measured value.

Voltage measurement

Range	Resolution	Measurement uncertainty
0.0 ... 249.9 V	0.1 V	±(2% m.v. + 4 digits)
250...750V	1V	±(2% m.v. + 2 digits)

- Frequency range: 45...65Hz

Measurement of fault loop impedance Z_{L-PE}, Z_{L-N}, Z_{L-L}

Measurement of fault loop impedance Z_S

Test range according to IEC 61557:

Test lead	Measurement range Z_S
1.2 m	0.13 ... 1999 Ω
5m	0.17 ... 1999 Ω
10m	0.21 ... 1999 Ω
20m	0.29 ... 1999 Ω
WS-01, -05	0.19 ... 1999 Ω

Display range:

Display range	Resolution	Measurement uncertainty
0 .. 19.99 Ω	0.01 Ω	±(5% m.v. + 3 digits)
20.0 ... 199.9 Ω	0.1 Ω	±(4% m.v. + 3 digits)
200...1999 Ω	1 Ω	±(4% m.v. + 3 digits)

- Rated operating voltage U_{nL-N}/ U_{nL-L}: 110/190V, 115/200V, 127/220V, 220/380V, 230/400V, 240/415V, 290/500V, 400/690V
- perating voltage range: 100…440V (for Z_{L-PE} and Z_{L-N}) and 100…750V (for Z_{L-L})
- Rated mains frequency f_n: 50Hz, 60Hz
- Operating frequency range: 45…65Hz
- Maximum test current: 36,7A (10ms) for 690V, 21,3A (10ms) for 400V, 24,5A (10ms) for 230V, 12,2A (10ms) for 115V
- Control of correctness of PE terminal connection by means of a contact electrode (applicable to Z_{L-PE})

Fault loop resistance R_S and fault loop reactance X_S

Display range	Resolution	Measurement uncertainty
0..19.99 Ω	0.01 Ω	±(5% + 5 digits) of Z_S value
20.0 .. 199.9 Ω	0.1 Ω	±(5% + 5 digits) of Z_S value

- Calculated and displayed for Z_S<200Ω

Short-circuit current I_K
Test range according to IEC 61557 can be calculated on the basis of test ranges Z_S and rated voltages.

Display range	Resolution	Measurement uncertainty
0.055 ... 1.999 A	0.001 A	Calculated on the basis of uncertainty for fault loop
2.00 ... 19.99 A	0.01 A	
20.0...199.9A	0.1 A	
200...1999A	1 A	
2.00 ... 19.99 kA	0,01 kA	
20.0 ... 69.0 kA	0,1 kA	

Measurement of fault loop impedance Z_{L-PE} RCD (without RCD tripping)

Measurement of fault loop impedance Z_S
Measuring range acc. to IEC 61557:

Test lead	Measurement range Z_S
1,2m	0,43...1999 Ω
5m	0,47...1999 Ω
10m	0,51...1999 Ω
20m	0,59...1999 Ω
WS-01, -05	0,49...1999 Ω

Display range	Resolution	Measurement uncertainty
0 .. 19.99 Ω	0.01 Ω	±(6% m.v. + 10 digits)
20.0 ... 199.9 Ω	0.1 Ω	±(6% m.v. + 5 digits)
200...1999 Ω	1 Ω	

- It will not trip RCD's of $I_{\Delta n} \geq 30$ mA
- Rated operating voltage U_n: 110V, 115V, 127V, 220V, 230V, 240V, 390V, 400V
- Operating voltage range: 100 ... 440V
- Rated mains frequency f_n: 50Hz, 60Hz
- Operating frequency range: 45…65Hz
- Control of correctness of PE terminal connection by means of a contact electrode

Fault loop resistance R_S and fault loop reactance X_S

Display range	Resolution	Measurement uncertainty
0..19.99 Ω	0.01 Ω	±(6% + 10 digits) of Z_S value
20.0 .. 199.9 Ω	0.1 Ω	±(6% + 5 digits) of Z_S value

- Calculated and displayed for Z_S<200Ω

Short-circuit current I_K
Test range according to IEC 61557 can be calculated on the basis of test ranges Z_S and rated voltages.

Display range	Resolution	Measurement uncertainty
0.055 ... 1.999 A	0.001 A	Calculated on the basis of uncertainty for fault loop
2.00 ... 19.99 A	0.01 A	
20.0...199.9A	0.1 A	
200...1999A	1 A	
2.00 ... 19.99 kA	0.01 kA	
20.0 ... 40.0 kA	0.1 kA	

Other technical specification

a) type of insulation ..... double, EN 61010-1 and IEC 61557 compliant
b) measurement category..... IV 600V (III 1000V) acc. to EN 61010-1
c) degree of protection of enclosure acc. to EN 60529 ..... IP54
d) meter power supply ..... alkaline batteries or NiMH rechargeable batteries, size AA (4 pcs)
e) dimensions..... 260x190x60 mm
f) meter weight..... about 2.2 kg
g) storage temperature ..... –20...+60°C
h) operating temperature ..... 0....+45°C
i) humidity..... 20...80%
j) reference temperature ..... +23 ± 2°C
k) reference humidity..... 40...60%
l) Time to Auto-OFF ..... 120 seconds
m) number of Z measurements (for alkaline batteries)..... >3000 (2 measurements per minute)
n) display ..... LCD segment
o) memory of measurement results ..... 990 cells, 3500 entries
p) data transmission ..... USB
q) quality standard ..... quality, design and manufacturing are ISO 9001 compliant
r) the device meets the requirements of the IEC 61557 standard
s) the product meets the EMC requirements (immunity for industrial environment) according to the following standards..... EN 61326-1:2006 and EN 61326-2-2:2006

9.2 Additional data

Data on additional uncertainties are useful mainly when the meter is used in non-standard conditions and for metrological laboratories for the purpose of calibration.

9.2.1 Additional uncertainties according to IEC 61557-3 (Z)

Significant parameter	Designation	Additional uncertainty
Position	E_1	0%
Supply voltage	E_2	0% (**BAT** is not lit)
Temperature 0...35℃	E_3	1,2 m lead – 0Ω 5 m lead – 0.011Ω 10 m lead – 0.019Ω 20 m lead – 0.035Ω WS-01, WS-05 lead – 0.015Ω
Phase angle 0..30° at the bottom of test range	$E_{6.2}$	0.6%
Frequency 99%..101%	E_7	0%
Mains voltage 85%..110%	E_8	0%
Harmonics	E_9	0%
DC component	E_{10}	0%

10 Equipment

10.1 Standard equipment

Standard set of equipment supplied by the manufacturer includes:

- MZC-305 meter – **WMPLMZC305**
- set of test leads:
  - leads 1,2m with banana plugs – 3 pcs (yellow **WAPRZ1X2YEBB**, red- **WAPRZ1X2REBB** and blue - **WAPRZ1X2BUBB**)
  - USB interface cable - **WAPRZUSB**
- accessories
  - crocodile clip – 2 pcs (blue– **WAKROBU20K02** and red – **WAKRORE20K02**)
  - test prod with banana socket – 3 pcs (yellow– **WASONYEOGB1**, red – **WASONREOGB1** and blue – **WASONBUOGB1**)
- carrying case L-4 – **WAFUTL4**
- meter harness – **WAPOZSZE2**
- operating manual
- warranty card
- calibration certificate
- 4 R6 batteries

10.2 Optional accessories

Additionally, the following items that are not included in the scope of standard equipment can be purchased from the manufacturer or the distributors:

WAPRZ005REBB

- *5m lead, red*

WAPRZ010REBB

- *10m lead, red*

WAPRZ020REBB

- *20m lead, red*

WAADAWS01

- *WS-01 adapter for triggering the measurement with the UNI-Schuko plug*

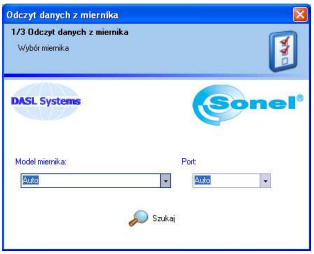
WAADAWS05

- *adapter WS-05 with UNI-SCHUKO angle plug*

WAADAAGT32P

- *AGT-32P adapter for three-phase sockets*

WAPROSONPE4



- *SONEL Electrical measurements software for measurement reports*

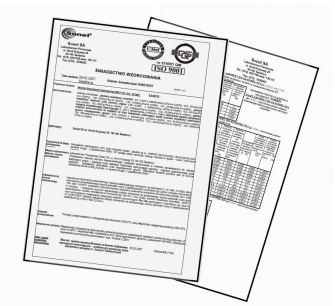
WAADAAGT16P

- *AGT-16P adapter for three-phase sockets*

WAADAAGT63P

- *AGT-63P adapter for three-phase sockets*

LSWPLMPI502



- *calibration certificate*

11 Manufacturer

The manufacturer of the device and provider of warranty and post-warranty service:

SONEL SA
ul. Wokulskiego 11
58-100 Świdnica, Poland
Tel: (+48 74) 858 38 78 (Sales)
Tel: (+48 74) 858 38 79 (Service)
Fax (+48 74) 858 38 08
e-mail: dh@sonel.pl
internet: www.sonel.pl

NOTE
Service repairs must be performed solely by the manufacturer.