



OPERATION MANUAL

FAULT LOOP IMPEDANCE METER










MZC-305

The MZC-305 digital meter is designed for measuring fault loop impedance.








The most important features of the MZC-305 include:

:

☐ Measurement of fault loop parameters:

-  impedance measurement with the 23A current at 230V, maximum 44A at 440V ($R^{\wedge} = 10$),
-  possibility of measuring in the phase-to-phase, phase-to-PE and phase-to-neutral short circuit,
-  automatic calculation of short circuit current,
-  distinguishing between phase-to-neutral and phase-to-phase voltage during the short circuit current calculations,
-  measurements in mains with rated voltage of 110V/190V, 115V/200V, 127V/220V, 220/380V, 230V/400V, 240V/415V, 290V/500V and 400V/690V, frequency range 45...65Hz (test voltage range: 100...750V),
-  selection of rated voltage,
-  Z_{L-PE} RCD- measurement of fault loop impedance in the systems protected by RCD's without tripping the RCD with the 0.01 Ω resolution,
-  measurement of AC voltages,
-  quick check of the correct connection of the PE conductor using the contact electrode.

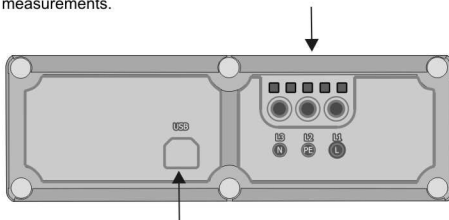
☐ Other:

-  automatic selection of measuring range,
-  memory of 3500 individual measurement results with the possibility sending to a PC via USB,
-  large, readable display with backlight,
-  monitoring of the battery charge status,
-  AUTO-OFF function,
-  ergonomic handling,
-  possibility of using rechargeable batteries.

VIEW FROM THE TERMINALS

Main measuring terminal

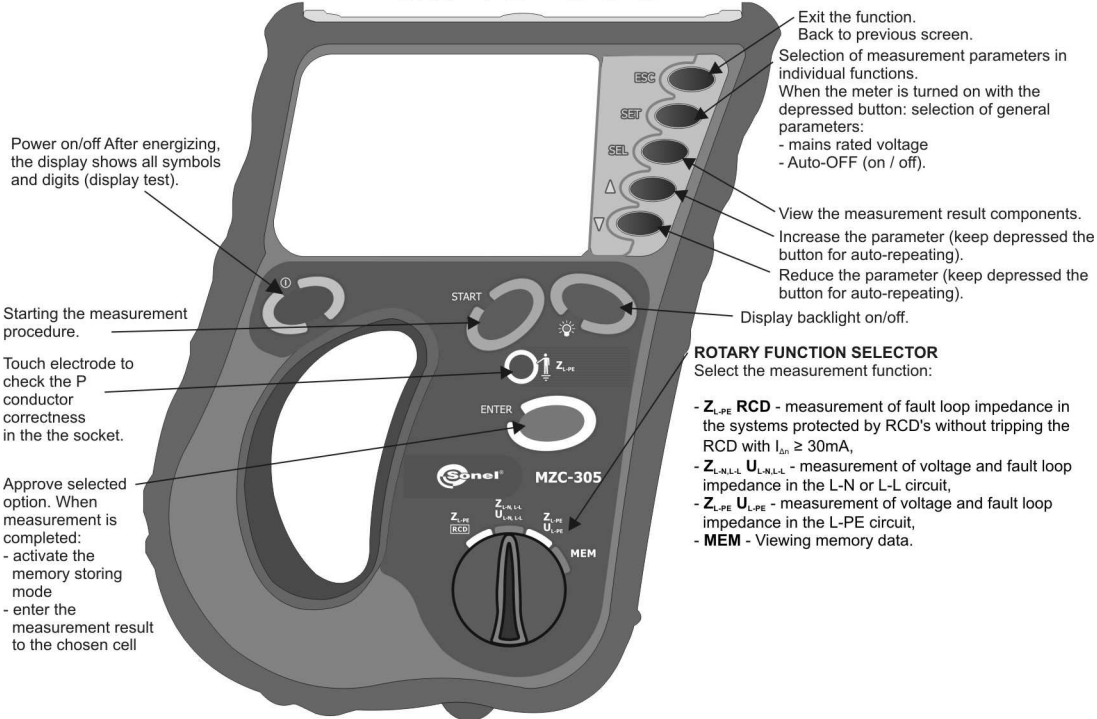
Terminal for connecting the test leads during the fault loop impedance measurements.



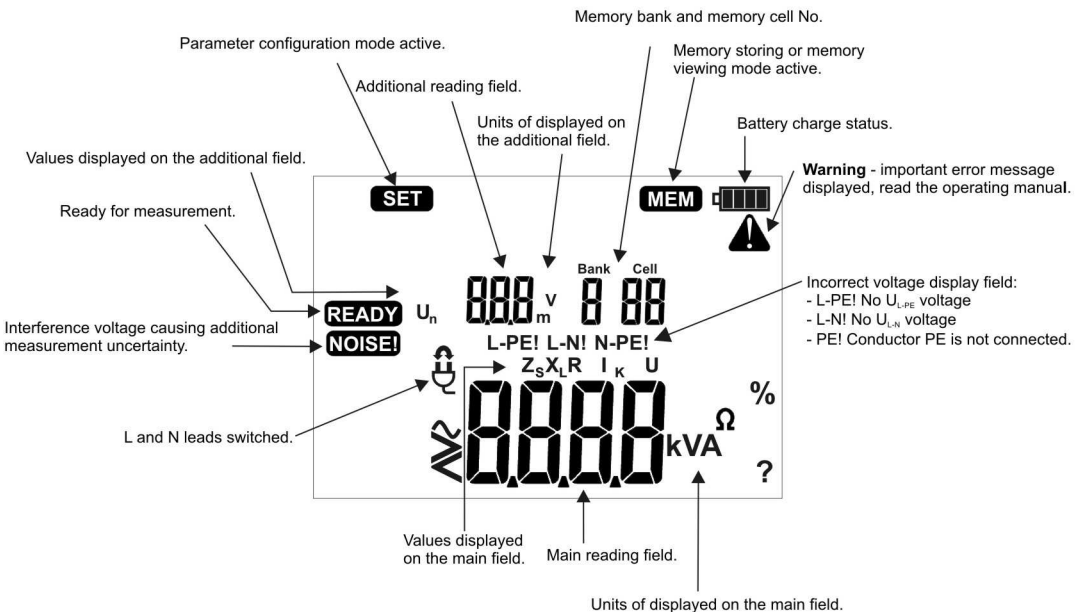
USB socket

Socket for connecting a data cable to your computer.

MZC-305



DISPLAY





OPERATING MANUAL

FAULT LOOP IMPEDANCE METER MZC-305



**SONEL SA
ul. Wokulskiego 11
58-100 Świdnica, Poland**

Version 1.08 25.01.2016

The MZC-305 meter is a modern, easy in use 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.

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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.
- Using this manual does not exclude the need to comply with occupational health and safety regulations and with other relevant fire regulations required during the performance of a particular type of work. Before starting the work with the device in special environments, e.g. potentially fire-risk/explosive environment, it is necessary to consult it with the person responsible for health and safety.
- 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 has been stored too 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:

An attempt to install drivers in 64-bit Windows 8 may result in displaying "Installation failed" message.

Cause: Windows 8 by default blocks drivers without a digital signature.

Solution: Disable the driver signature enforcement in Windows.

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:

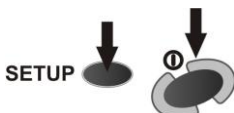
During measurements, the earthed parts and parts accessible in the electrical installation being tested must not be touched.

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

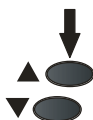
①



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.

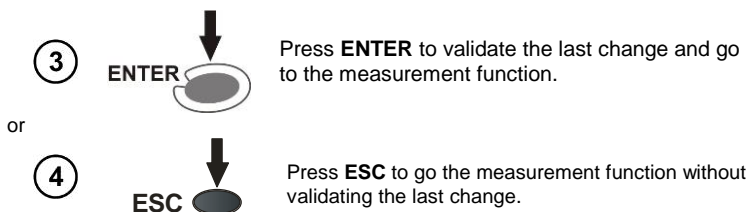
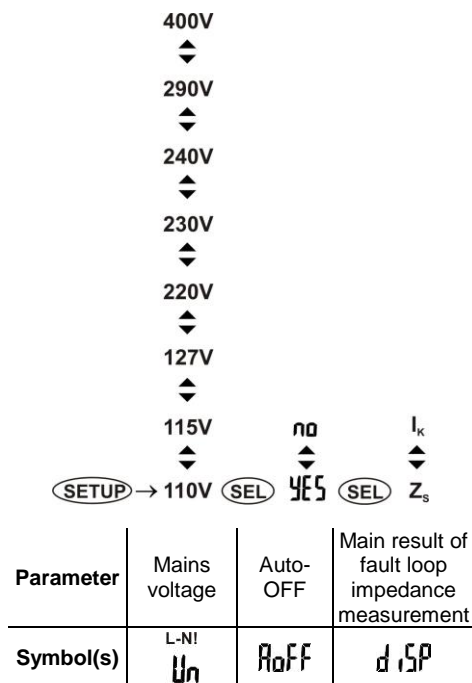


Use the ▲ and ▼ buttons to change the parameter value. The value or symbol to be changed is flashing.

The **YES** symbol indicates an active parameter, the **NO** symbol indicates an inactive one.

②

Set the parameters according to the following algorithm:



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.

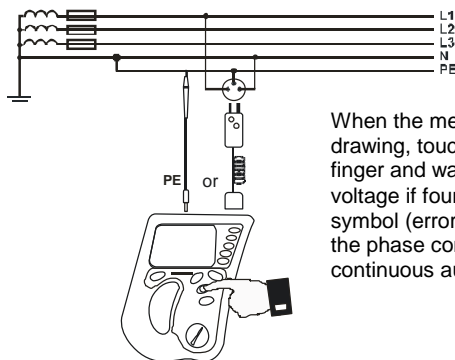
2.2 Remembering the last measurement result

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 drawing, touch the contact electrode with your finger and wait for about 1 second. When voltage is 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.
- The threshold value, which triggers the signal of exceeded allowable voltage on PE conduit, is approximately 50 V.
- In the Z_{L-PE} and Z_{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.

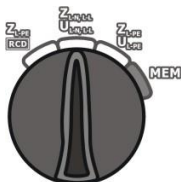
The above remark does not apply to measurements of short circuit loop impedance with the use of the Z_{L-PE} **RCD** function.



Measurements of fault loop impedance performed downstream of inverters are ineffective and their results are unreliable. This is due to the instability of internal impedance in inverter circuits during its operation. The measurements of fault loop impedance should not be performed directly downstream of inverters.

2.5.1 Selection of measurement parameters

①

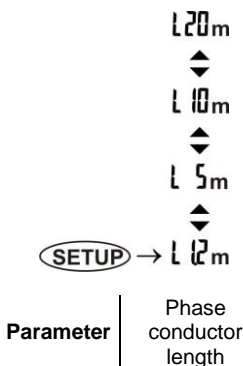


Turn the rotary switch to one of the loop impedance measurement ranges.

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.



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

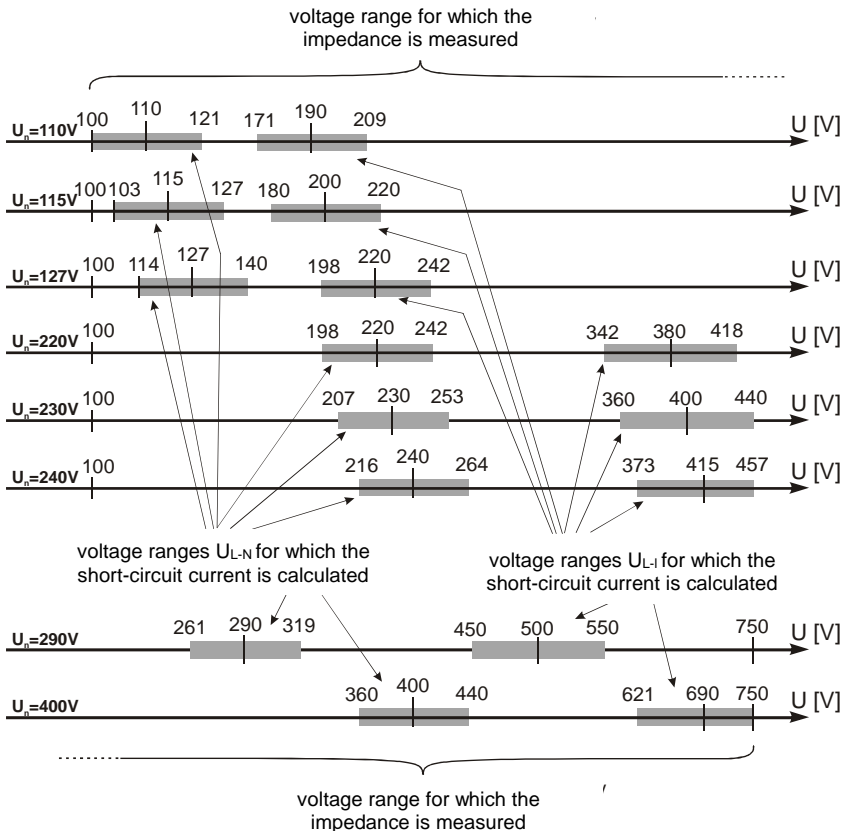
The meter always measures impedance. The short-circuit current is calculated according to the following formula:

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

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

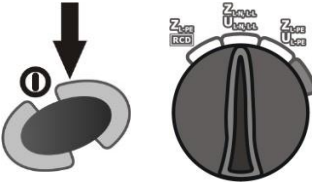
On the basis of U_n rated voltage selected (section 2.1), the meter automatically recognizes the measurement at phase-to-neutral or phase-to-phase voltage and takes it into account in the calculations.

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.



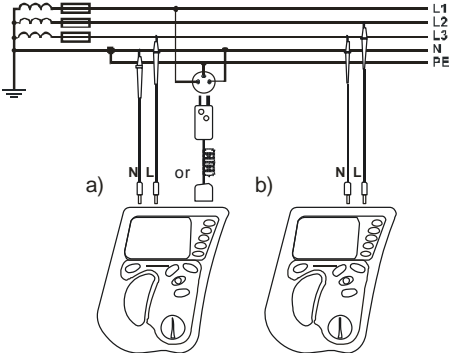
2.5.3 Measurement of fault loop parameters in the L-N and L-L circuits

- 1

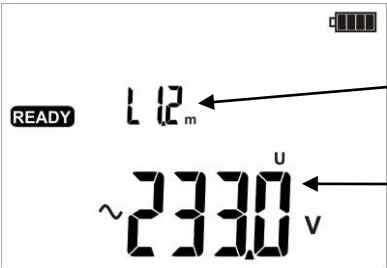


Turn on the meter.
Turn the rotary switch
to the $Z/U_{L-N,L-L}$ position.
- 2

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



READY

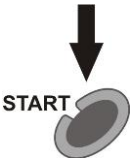
L 12_m

~ 233.0^u V

The meter is ready for
measurement.

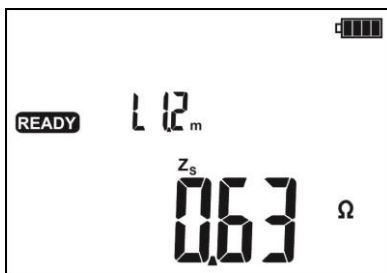
Phase conductor
length or the --E
symbol.

U_{L-N} voltage
- 5



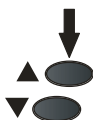
Make the measurement by pressing the
START button.

6

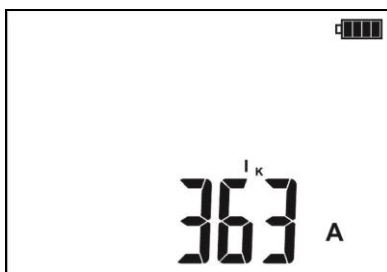


Read the main measurement result: fault loop impedance Z_s or short-circuit current I_k .

7

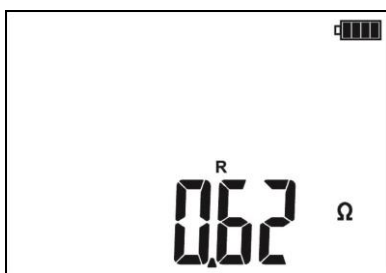


To read additional results, press the ▲ and ▼ buttons.



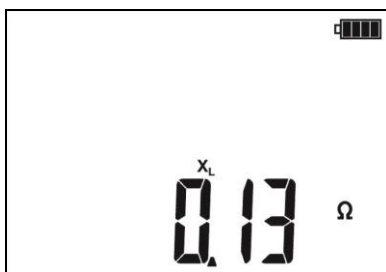
I_k short-circuit current or Z_s fault loop impedance

8



R fault loop resistance

9



X_L fault loop reactance

10





Mains voltage
at the time of
measurement

Note:

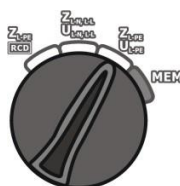
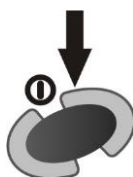
- Enter the result into memory (see section 3.2) or press **ESC** to return to the voltage measurement.
- When many measurements are made in short time intervals, the meter may emit a large amount of heat. As a result of this, the enclosure of the device may become hot. This is normal and the meter is 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
Err	Short circuit malfunction!

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

①

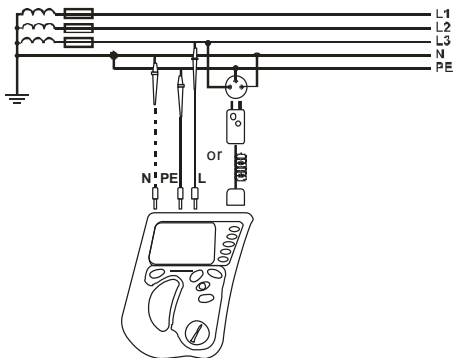


Turn on the meter.
Turn the rotary switch
to the **Z/U_{L-PE}** position.

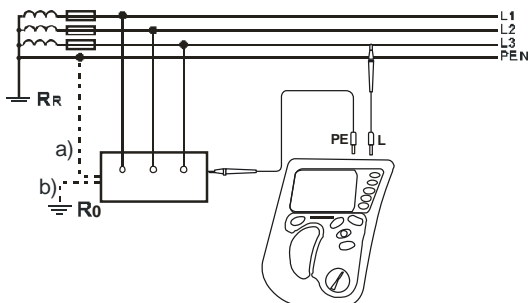
②

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

3

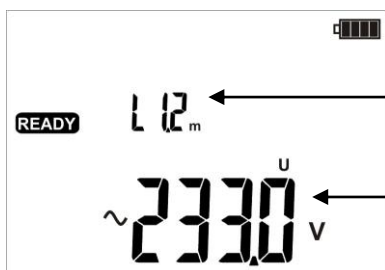


Connect test leads according to one of the drawings.



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

4

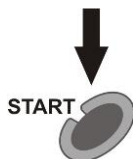


The meter is ready for measurement.

Phase conductor length or the \sim 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 than the lead with a mains socket is selected.

Additional information displayed by the meter

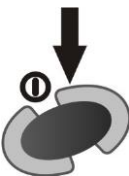
READY	The meter is ready for measurement.
L-N!	For The lead with the plug - voltage on terminals L and N is within the measurable range.
L-PE!	Voltage on terminals L and PE is not within the measurable range.

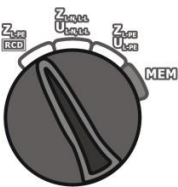
Error messages - as for the L-N and L-L measurement.

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.

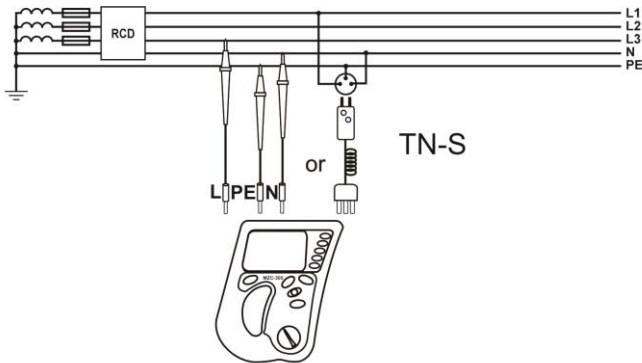
1

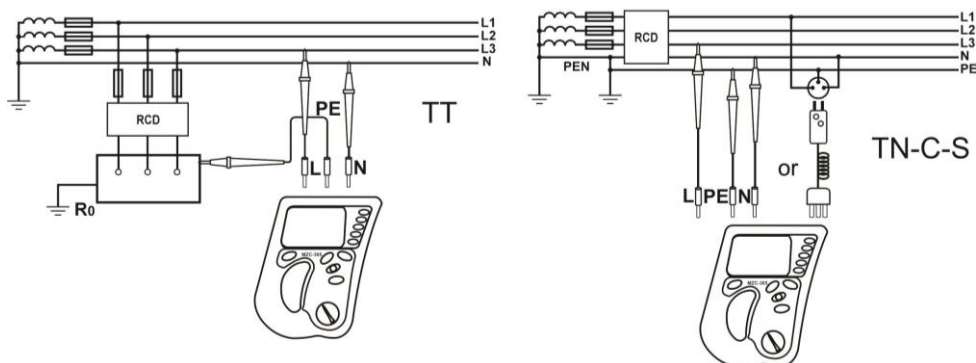




Turn on the meter.
Turn the rotary switch to the Z_{L-PE}^{RCD} position.

- 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.





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.
⏏ n	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:

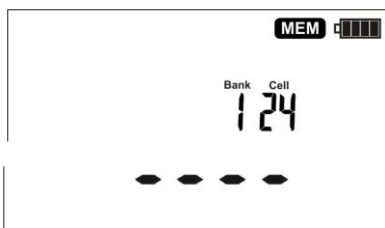
- Results of measurements performed for all measuring functions can be stored in one memory cell.
- After each entry of the measurement result to the cell, its number is automatically incremented. Set the appropriate cell number to allow entering to a single cell of successive measurement results relating 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

①



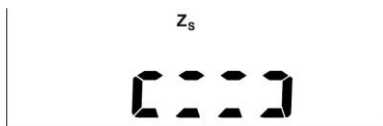
Press **ENTER** after completion of the measurement.
The meter is in the memory storing mode.



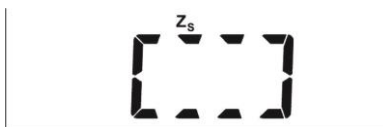
Cell is empty.



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.

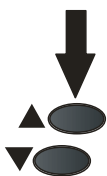


The cell is completely full.

②



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



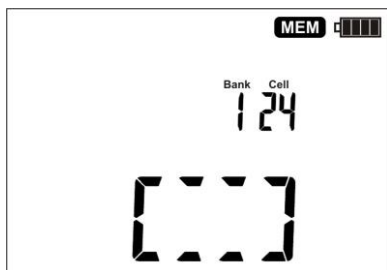
...and the \blacktriangle buttons \blacktriangledown to view individual components of the results (if the bank or cell number does not flash - see section 3.2).



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.

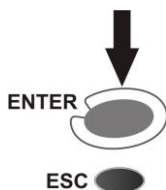


④

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



⑤



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

Note:

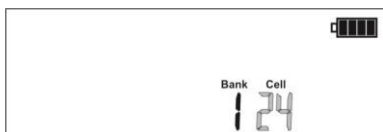
- Complete set of results (main result and supplementary results) for a given measuring function and preset measurement settings are stored in the memory.

3.2 Changing the cell and bank number

①



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

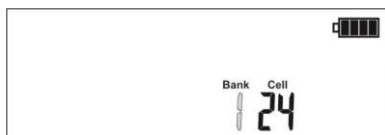


The cell number is flashing.
To change use the ▲ and ▼ buttons.

②



Press **SETUP**.



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

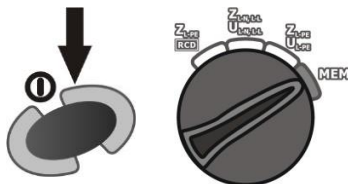
③



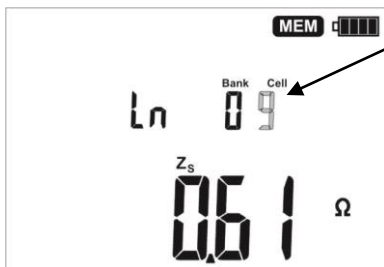
Press **SETUP**. The bank or cell number is not flashing.
The meter is in the memory storing or memory viewing mode.

3.3 Viewing memory data

①



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 Z_{L-N} , Z_{L-L} function.
LL	Measurement made in the L-L loop for the Z_{L-N} , Z_{L-L} function.
LPE	Measurement made for the Z_{L-PE} function.

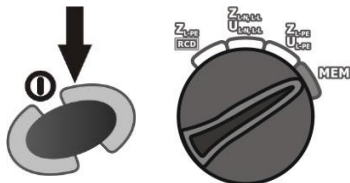
LPE alternating with
r_{cd}

Measurement made for the Z_{L-PE} RCD function.

3.4 Deleting memory data

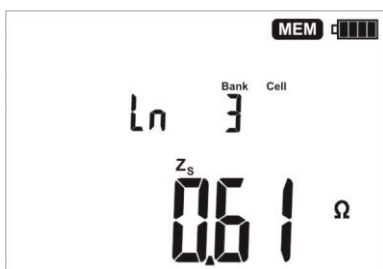
3.4.1 Deleting bank data

①

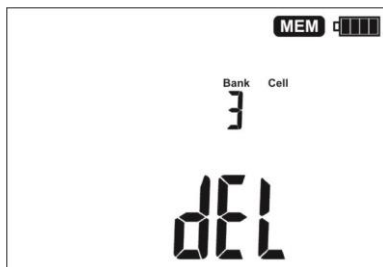


Turn on the meter.
Turn the rotary switch
to the **MEM** position.

②



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

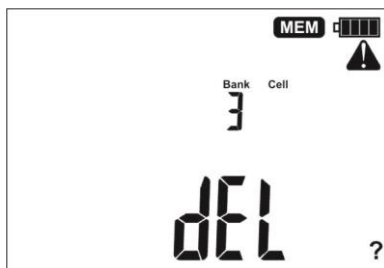



...the cell number
disappears, and
appears the **del**
symbol indicating the
readiness to delete.

③



Press **ENTER**.




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

3



Press **ENTER** .

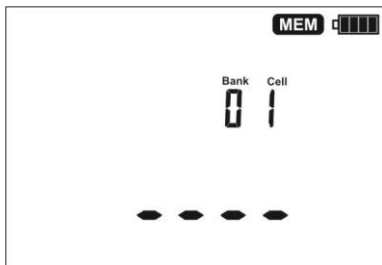


The "?" and  symbols appear, asking you to confirm deletion.

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.

3.5 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.

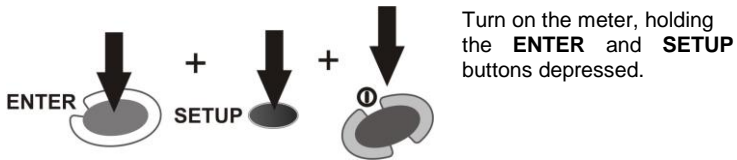
3.5.2 Data transmission

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.

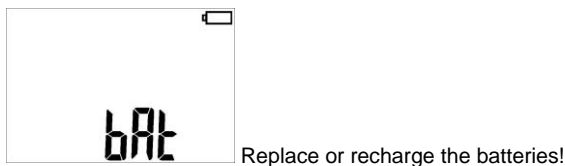
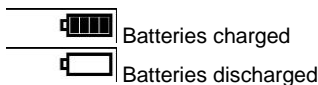
The following table describes the recommended procedure in certain situations that occur when using the meter.

Measuring function	Symptom	Cause	Action
All	The meter will not start after pressing the ON button. The batt symbol is displayed during the voltage measurement. Meter turns off during the initial test.	Discharged or incorrectly placed batteries/ rechargeable batteries	Check if the batteries 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; the 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:



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.

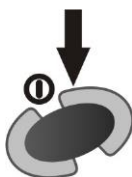
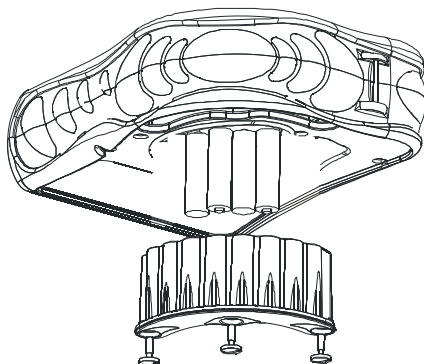
5.2 Replacement of batteries

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:

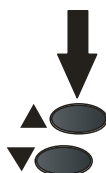
1. Disconnect the leads from the measuring circuit and turn off the meter,
2. Unscrew the 3 screws and remove the battery compartment (in the bottom of the enclosure).
3. Replace all batteries. Observe the correct polarity when putting new batteries ("-" on the elastic part of the contact plate). Reverse 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.

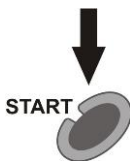


Selected power supply:
rechargeable batteries:



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	$\pm(2\% \text{ m.v.} + 4 \text{ digits})$
250...750V	1V	$\pm(2\% \text{ m.v.} + 2 \text{ digits})$

- 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	$\pm(5\% \text{ m.v.} + 3 \text{ digits})$
20.0 ... 199.9 Ω	0.1 Ω	$\pm(4\% \text{ m.v.} + 3 \text{ digits})$
200...1999 Ω	1 Ω	$\pm(4\% \text{ m.v.} + 3 \text{ digits})$

- 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
- operating 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	$\pm(5\% + 5 \text{ digits})$ of Z_s value
20.0 .. 199.9 Ω	0.1 Ω	$\pm(5\% + 5 \text{ digits})$ of Z_s value

- Calculated and displayed for $Z_s < 200\Omega$

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	

- Prospective fault current calculated and displayed by the meter may slightly differ from the value calculated by the user with a calculator, basing on the displayed value of the impedance, because the meter calculates the current from unrounded value of fault loop impedance (which is used for displaying). As the correct value, consider I_k current value, displayed by the meter or by firmware.

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	$\pm(6\% \text{ m.v.} + 10 \text{ digits})$
20.0 ... 199.9 Ω	0.1 Ω	$\pm(6\% \text{ m.v.} + 5 \text{ digits})$
200...1999 Ω	1 Ω	

- It will not trip RCD's of $I_{\Delta n} \geq 30 \text{ mA}$
- 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	$\pm(6\% + 10 \text{ digits})$ of Z_S value
20.0 .. 199.9 Ω	0.1 Ω	$\pm(6\% + 5 \text{ digits})$ of Z_S value

- Calculated and displayed for $Z_S < 200\Omega$

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	

- Prospective fault current calculated and displayed by the meter may slightly differ from the value calculated by the user with a calculator, basing on the displayed value of the impedance, because the meter calculates the current from unrounded value of fault loop impedance (which is used for displaying). As the correct value, consider I_k current value, displayed by the meter or by firmware.

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) altitude (above sea level) <2000 m
- m) Time to Auto-OFF 120 seconds
- n) number of Z measurements (for alkaline batteries) >3000 (2 measurements per minute)
- o) display LCD segment
- p) memory of measurement results 990 cells, 3500 entries
- q) data transmission USB
- r) quality standard quality, design and manufacturing are ISO 9001 compliant
- s) the device meets the requirements of the IEC 61557 standard
- t) 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°C	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

WAADAWS05



- adapter WS-05 with UNI-SCHUKO angle plug

WAADAAGT32P - five-wire version

WAADAAGT32C - four-wire version



- AGT-32P adapter for three-phase sockets

WAPROSONPE4



- SONELElectrical measurements software for measurement reports

WAADAWS01



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

WAADAAGT16P - five-wire version

WAADAAGT16C - four-wire version



- AGT-16P adapter for three-phase sockets

WAADAAGT63P - five-wire version



- 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 S.A.

ul. Wokulskiego 11

58-100 Świdnica

Poland

tel. +48 74 858 38 60

fax +48 74 858 38 09

E-mail: export@sonel.pl

Web page: www.sonel.pl

NOTE

Service repairs must be performed solely by the manufacturer.



MPI-525
Multifunction Electrical
Installations Meter



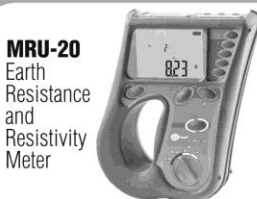
MPI-505
Multifunction
Electrical
Installations
Meter



MPI-502
Multifunction
Electrical
Installations
Meter



MRU-200
Earth Resistance
and Resistivity Meter



MRU-20
Earth
Resistance
and
Resistivity
Meter



MIC-2510
Insulation
Resistance
Meter



MIC-2
Insulation
Resistance
Meter



KT-384
Thermal
imager



MIC-30
Insulation
Resistance
Meter



PQM-701
Power
quality
analyzer

LXP-1
Datalogging
Light
Meter



PAT-805
Portable
appliance
tester



CMM-40
Industrial
multimeter



CMP-1006
Digital
Clamp-on
multimeter



MMR-630
Microohmmeters



CMP-200
Digital
Clamp-on
AC



DIT-500
IR thermometer



LKZ-700
Wire tracer





NOTES

NOTES

WARNINGS AND GENERAL INFORMATION DISPLAY BY THE METER

NOTE!

The MZC-305 meter is designed for measurements at rated phase-to-neutral voltages of 110V, 115V, 127V, 220V, 230V, 240V, 290V and 400V and phase-to-phase voltages of 190V, 200V, 220V, 380V, 400V, 415V, 500V i 690V. Connection of the voltage higher than allowed between any of the test terminals may damage the meter and cause a hazard to the user.

<div>> 750^u_v and </div> <div>and continuous audio signal</div>	Voltage exceeds 750V. Immediately disconnect the meter from the mains!
<div>PE and </div> <div>and continuous audio signal</div>	Incorrect connection of the PE conductor (after the contact electrode has been touched). If the symbol does not appear, although the voltage between the contact electrode and the PE conductor exceeds the detector triggering threshold (approximately 50V), the meter must be returned for servicing; using of a malfunctioning meter is not acceptable. Contact electrode is active for the measurements of the fault loop parameters, except the $Z_{L-N,L-L}$ $U_{L-N,L-L}$ function.
<div></div>	Measurement blocked by the thermal protection. Long beep after pressing the START button.
<div></div>	Status of batteries: Batteries charged, Batteries discharged. 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).
<div>bAt (on the main field)</div>	Discharged batteries do not allow for stable operation of the meter. Replace or recharge the batteries.
<div>SUPP</div> <div>Acc bAt (on additional field)</div>	Power supply type (after replacing the batteries): Rechargeable batteries. Disposable batteries.
<div>USB (on additional field)</div> <div>dAt UPdt</div>	Used USB: Data transmission via USB, Software update via USB.



SONEL S.A.
Wokulskiego 11, St
58-100 Swidnica
Poland



+48 74 85 83 860
+48 74 85 83 800
fax +48 74 85 83 809

<http://www.sonel.pl>
e-mail: export@sonel.pl