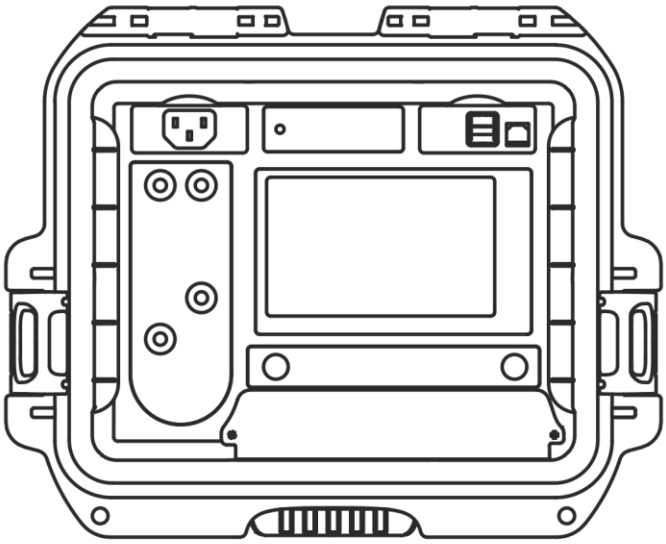
Sonel®



USER MANUAL

LOW RESISTANCE METER

MMR-640

MMR-640

Power socket
Measurement terminal I2
Measurement terminal I1
Measurement terminal U2
Measurement terminal U1
▪ Dual USB A socket for connecting flash memory
▪ USB socket (type B) for connecting to a PC
Touch screen
Meter power supply on/off button
Rechargeable batteries compartment
Measurement start/stop button
CAT III 600 V
Resistance object measurement
16:16 2019.04.10
Measurement point 1
260.6 µΩ
I = 10 A
Auto
10 A
MMR-640
START STOP

LOW RESISTANCE METER

MMR-640

USER MANUAL

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

Version 1.07 05.07.2023

Thank you for purchasing our low-resistance meter. MMR-640 is a modern, high-quality measuring device, which is easy and safe to use. Please acquaint yourself with this manual in order to avoid measuring errors and prevent possible problems in operation of the meter.

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1 Safety

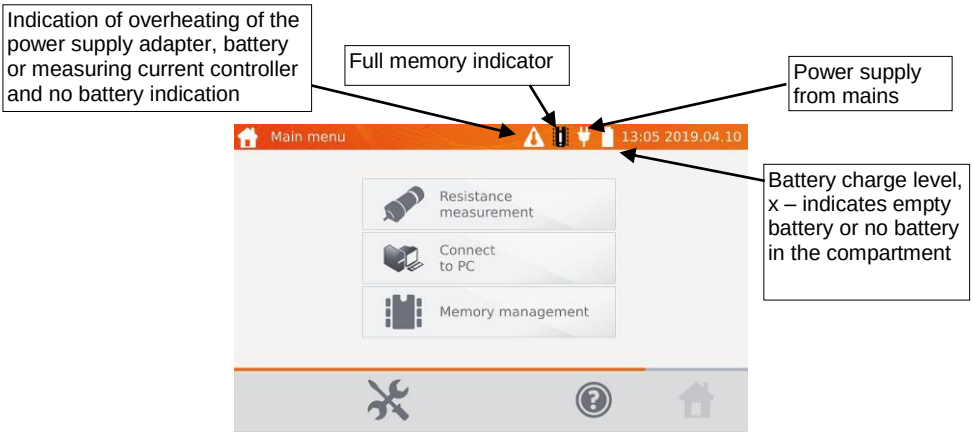
MMR-640 is a meter designed for measuring resistance of various types of connections (welded, soldered, butt). It is used to obtain results that determine safety condition of electrical installations. Therefore, in order to provide conditions for correct operation and accuracy of obtained results, the following recommendations must be observed:

- Before you proceed to operate the meter, acquaint yourself thoroughly with the present manual and observe the safety regulations and specifications provided by the producer.
- MMR-640 meter is designed to measure low-resistance values. Any application that differs from those specified in the present manual may result in a damage to the device and constitute a source of danger for the user.
- In case of measurements on systems, components and devices that may be under dangerous voltage, MMR-640 may be used only by qualified persons who are authorized to work on electric installations. Unauthorized use of the meter may result in its damage and may be a source of serious 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 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 device when:
  - ⇒ a damaged meter which is completely or partially out of order,
  - ⇒ a meter with damaged insulation,
  - ⇒ a meter stored for an excessive period of time in disadvantageous conditions (e.g. excessive humidity). **If the meter has been transferred from a cool to a warm environment with a high level of relative humidity, do not start measurements until the meter is warmed up to the ambient temperature (approximately 30 minutes).**
- Before measurement make sure that test leads are connected to appropriate measuring terminals.
- Do not operate a meter with an open or incorrectly closed battery compartment and do not power it from other sources than those specified in this manual.
- The inputs of the meter are protected electronically against overload e.g. due to having been connected to a live circuit: for all combinations of inputs - up to 600 V for 10 seconds.
- Repairs may be performed only by an authorised service point.
- The device meets the requirements of EN 61010-1, EN 61010-2-030 and EN 61010-031.

- The manufacturer reserves the right to introduce changes in appearance, equipment and technical data of the meter.
- An attempt to install drivers in 64-bit Windows 8 and Windows 10 may result in displaying "Installation failed" message.
  Cause: Windows 8 and Windows 10 by default block drivers without a digital signature.
  Solution: Disable the driver signature enforcement in Windows.

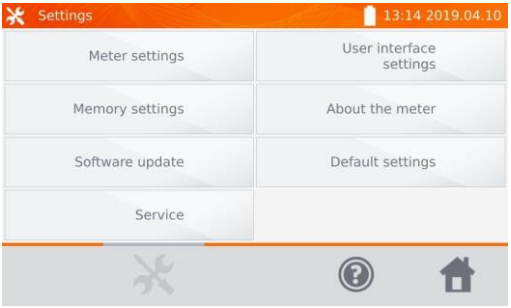
2 General settings - menu

When the meter is turned on, it displays the main menu.



2.1 Meter settings

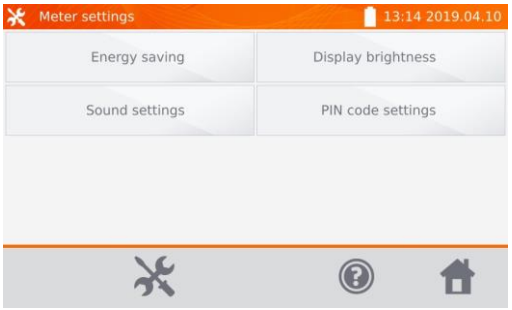
1. In the main menu, select icon .

2. 

Select **Meter settings**.

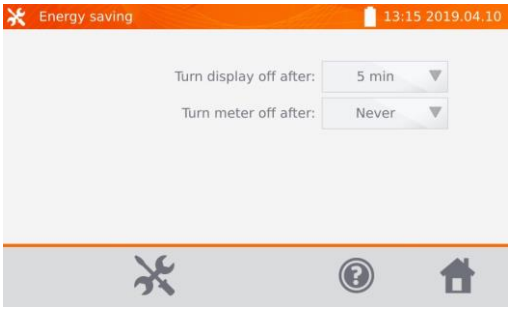
2.1.1 Energy saving

In order to save its rechargeable battery, the meter automatically shuts off or blanks the screen after an adjustable inactivity period.

1. 

Select **Energy saving**.

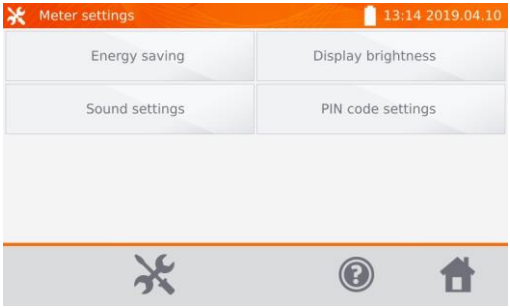
2



Set the inactivity time for blanking the screen and turning the meter off.

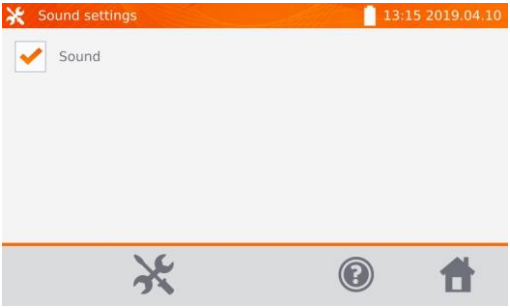
2.1.2 Sound settings

1



Select **Sound settings**.

2

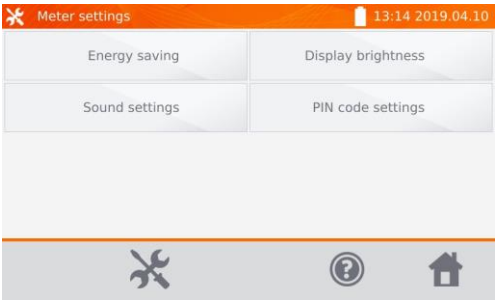


Select the box to turn on (✓) or off the sound signals.

2.1.3 PIN code settings

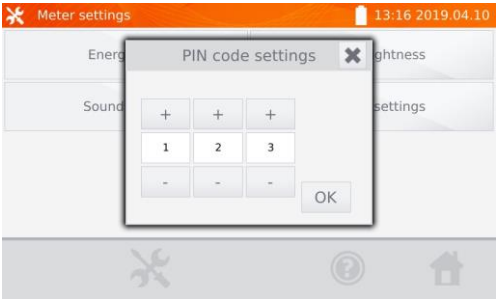
The PIN code is used for connecting the meter to the computer.

1



Select **PIN code settings**.

2

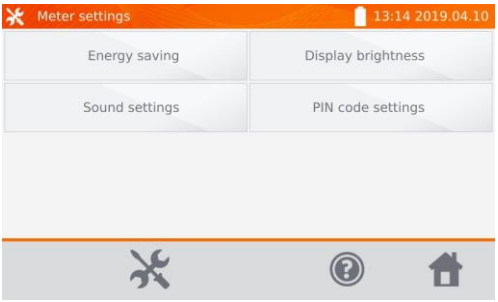


Use **+** and **-** icons to set the code and confirm it by pressing **OK**.

The PIN code is used for communication with PC. The default code is **123**.

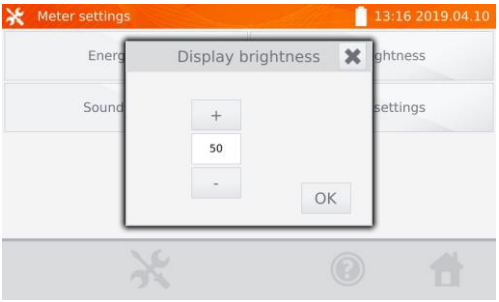
2.1.4 Display brightness settings

1



Select **Display brightness**.

2

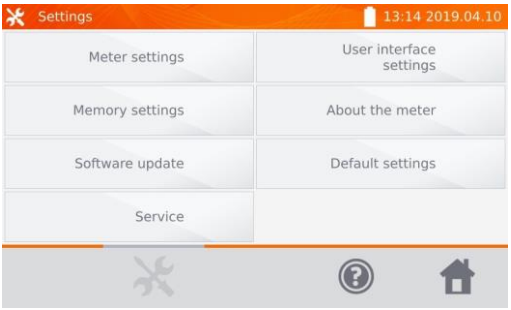


Use **+** and **-** icons to set the desired brightness. Confirm it by pressing **OK**.

2.2 *Memory settings*

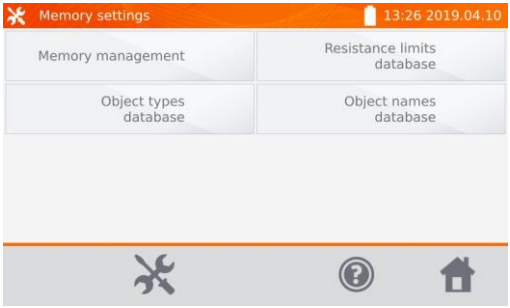
1. In the main menu, select icon.

By pressing icon, you may enter settings or enter the higher level in the settings.

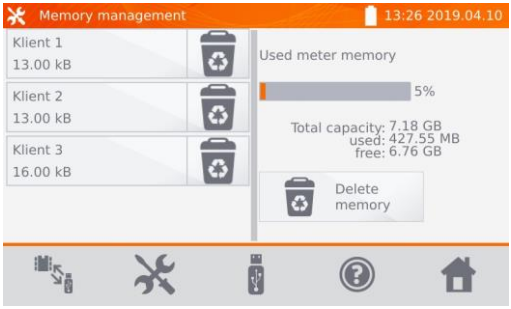
2. 

Select **Memory settings**.

2.2.1 Memory management

1. 

Select **Memory management**.

2. 

Except reading the % of the used memory, this option allows to clear it. After pressing **Delete memory** all clients are deleted with their objects and measurement results.

Use icon located at the client to delete individual client.

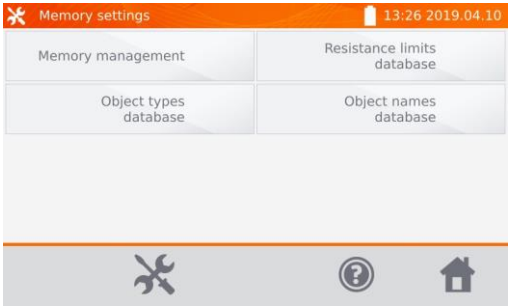
Use icons / to switch between USB memory and meter memory.

Use icon to initiate the process of copying clients to the USB memory and vice versa.

2.2.2 Object types database

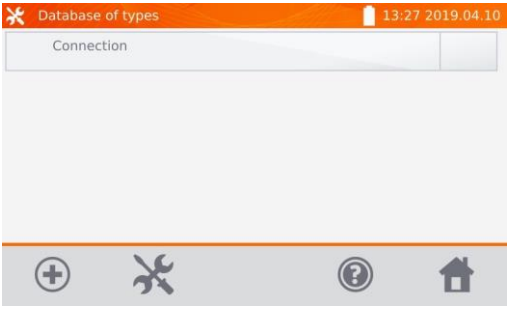
This is a list of types of tested objects.

1



Select **Object types database**.

2

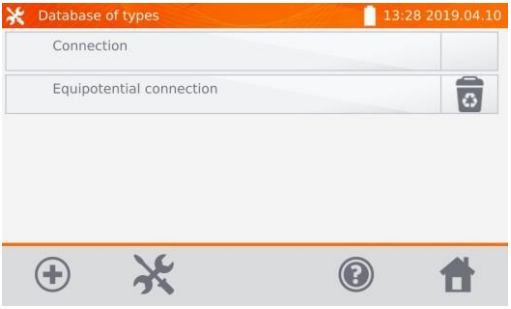


The meter has default types saved in its memory. Use ⊕ icon to add a new type of the tested object.

3

Enter a new type of the object being tested.

4

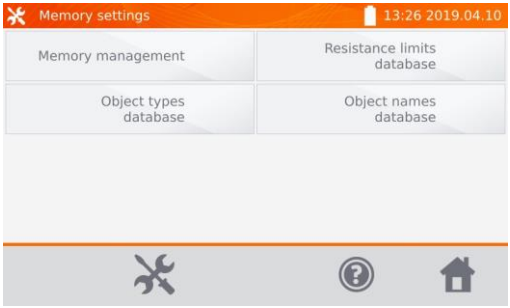


Added types may be deleted by pressing 🗑.

2.2.3 Object names database

It is a list of names of tested objects or measurement points.

1



Select **Object names database**.

2

The meter has 4 default names saved in its memory. Use ⊕ icon to add a new name.

3

Enter the name of the object.

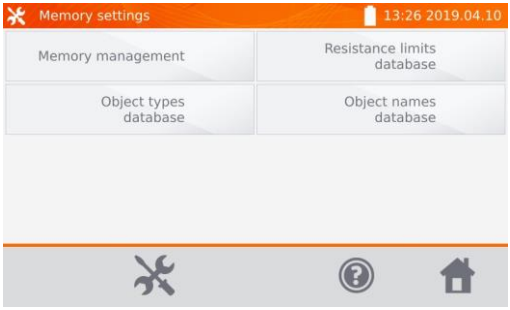
4

Added names may be deleted by pressing 🗑.

2.2.4 Resistance limits database

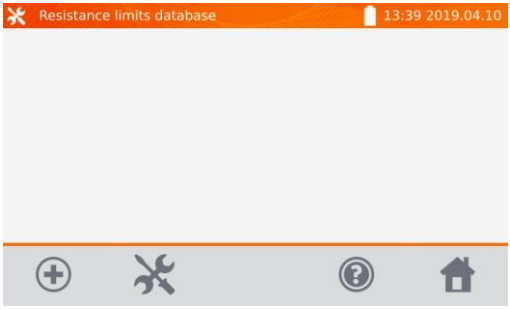
The specified limits may be used to automatically assess the validity of the results of resistance measurements.

1



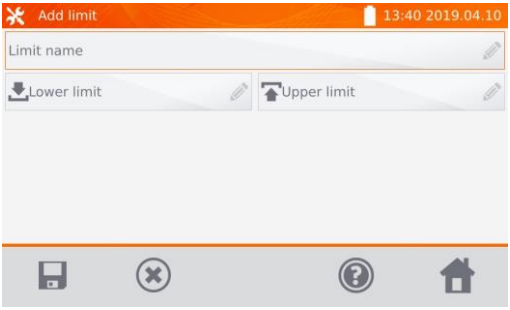
Select **Resistance limits database**.

2



Select ⊕ to add a new limit.

3

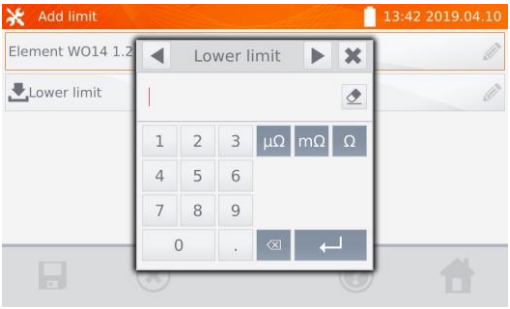


Tap **Limit name** box.

4

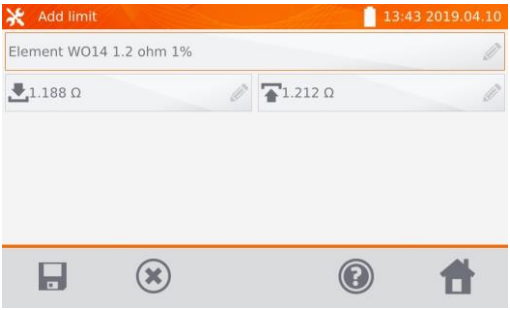
Enter the name of the limit. Use ▶ icon to go to the lower limit setting.

5



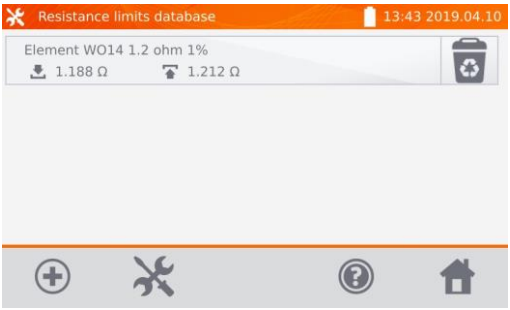
Enter the lower limit. Use ▶ icon to go to the upper limit setting. You can set only one of the limits.

6



Use 💾 to save the limit in the memory. By pressing ⊗ you may exit without saving.

7

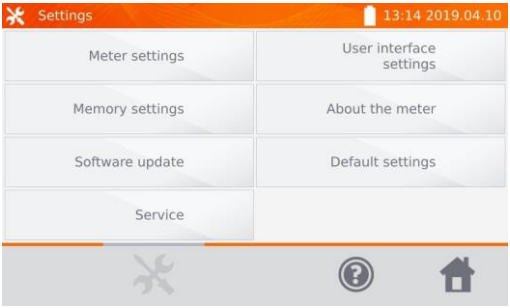


Use 🗑 to delete the limit.

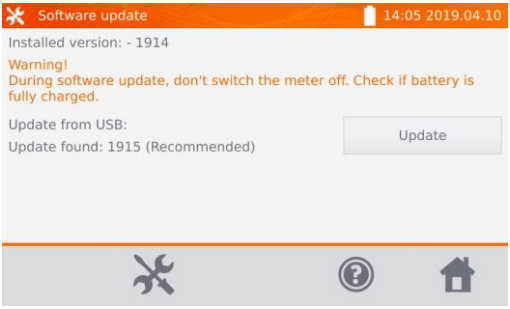
2.3 Software update

The software of the meter is periodically modified. You may download its current version from www.sonel.pl.

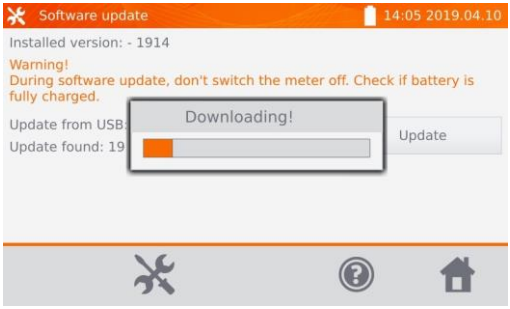
1. In the main menu, select icon .

2. 

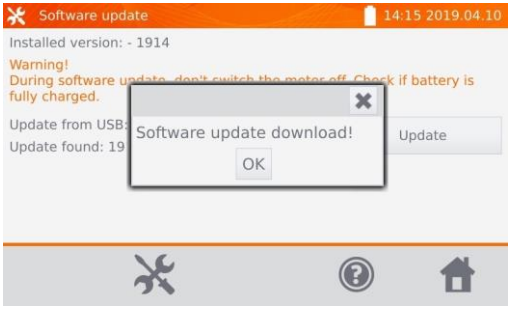
Select **Software update**.

3. 

Read the displayed text. To perform an update insert the USB drive with the update files and select **Update** button.

4. 

The meter is downloading software.

5. 

Select **OK** to run the update or close the window to cancel.

NOTE!

Update is performed automatically and may be divided into a few stages. During the update, do not turn off the power supply of the meter and do not remove the USB drive. The update process is continued until the meter displays the main menu screen.

6

Only at this point, you can turn off the power supply of the meter or start its use.

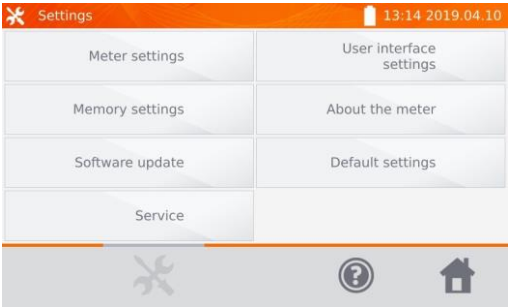
2.4 Service

This function is available for factory servicing and is protected by password.

2.5 User interface settings

1 In the main menu, select icon .

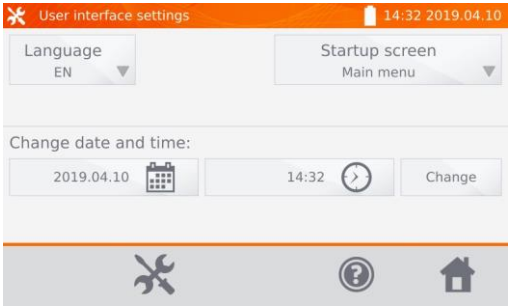
2



Select **User interface settings**.

2.5.1 Language selection

1



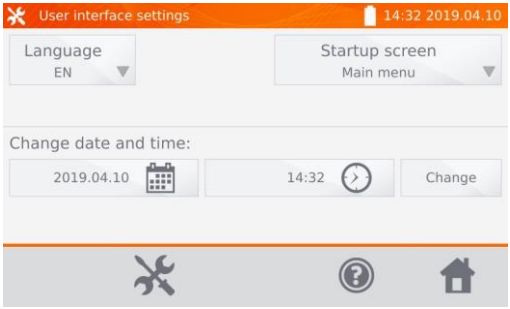
Select **Language** button.

2

Select the language.

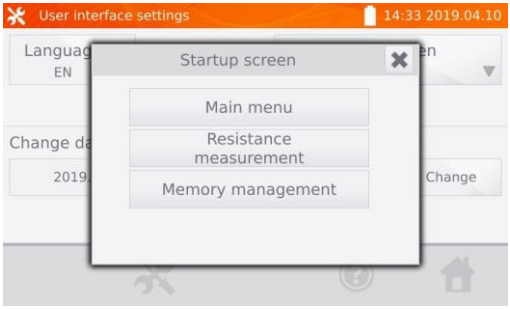
2.5.2 Selecting the startup screen

1



Select **Startup screen** button.

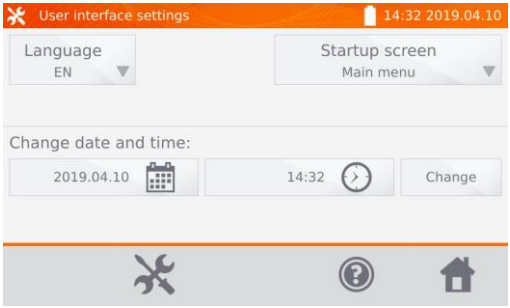
2



Select the desired startup screen. The screen will be automatically shown after turning the meter on.

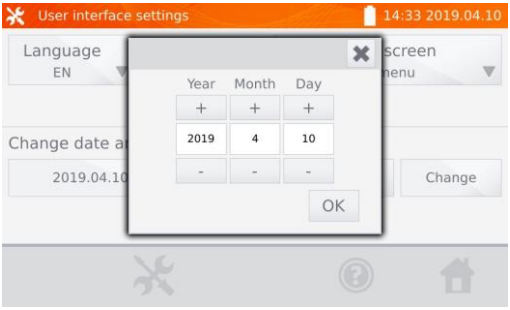
2.5.3 Changing the date and time

1



Select date icon.

2

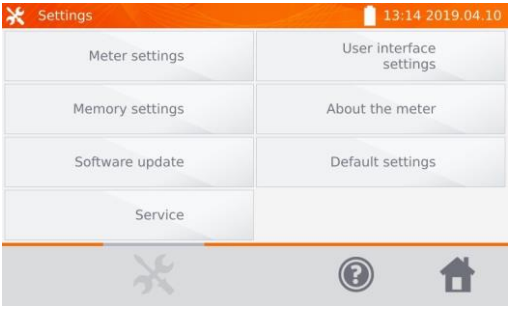


Use **+** and **-** icons to set year, month and day, then and confirm it by pressing **OK**. Similarly, you may set the time. To make changes, select **Change** button.

2.6 Information about the meter

1 In the main menu, select icon .

2



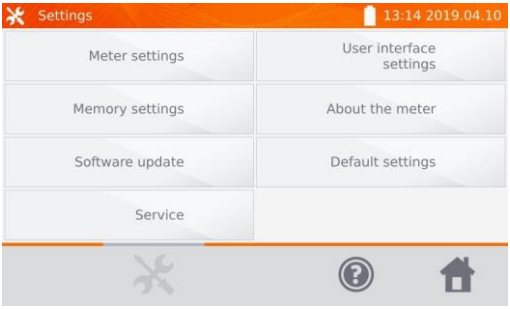
Select **About the meter**.

3

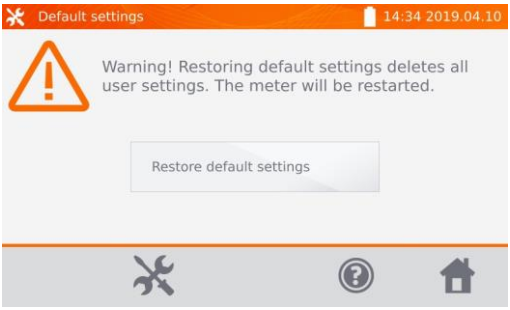
The screen will display information on the meter and its manufacturer.

2.7 Factory (default) settings

1. In the main menu, select icon .

2. 

Select **Default settings**.

3. 

Select **Restore default settings** to reset the meter. Select icon to cancel and return to the menu.

The following elements are restored to the default settings:

- measurement settings,
- list of object types,
- list of object names,
- list of R limits,
- list of T limit, sound settings,
- default startup screen,
- PIN code settings,
- energy saving settings,
- display brightness.

2.8 Communication with PC

1.

Press **Connect to PC**.

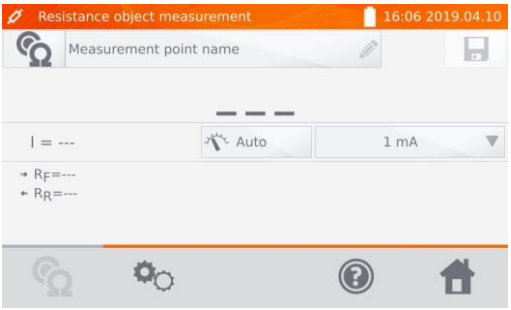
2. On your PC run **Sonel Reader** or **Sonel Reports PLUS**.

3. To terminate the connection press ⊗.

3 Measurements

- If the current test leads are not connected, a message appears: **Lack of continuity of current leads**.
- If the voltage test leads are not connected, a message appears: **Lack of continuity of voltage leads**.

1



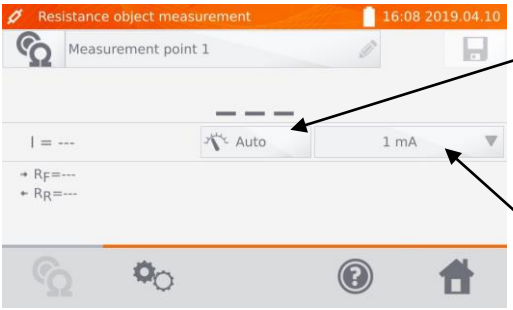
Measurement screen.

2

When necessary, enter the name of the measurement point.

- After entering the name of the measuring point, the measurement result will be saved in the memory - after selecting the client and object (subobject) you may simply select icon to create and save the point automatically.
- If another point already existing in the memory is selected when saving, the name will be overwritten.

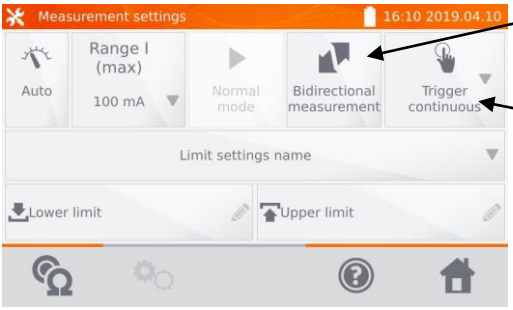
3



Auto/Manual switching (auto / manual range selection):
Auto - the measuring current is limited to a value not exceeding the set value,
Manual - measuring current has the set value.

Setting the measuring current.

④ Use icon to go to measurement settings.



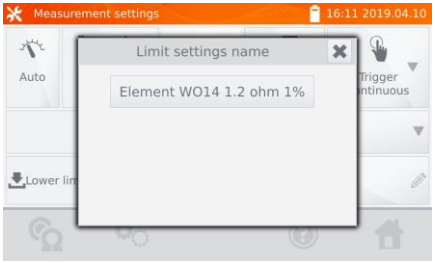
Switching measurement:
- unidirectional,
- bidirectional.

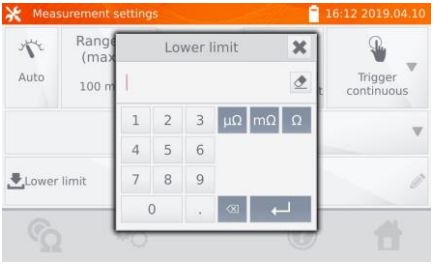
Selecting trigger method:
⇒ manual: use **START/STOP** button
⇒ automatic: by connecting test leads to the object,
⇒ continuous: after pressing **START/STOP** button, the meter measures the resistance in a continuous way to the moment, when the test is terminated by pressing **START/STOP** button.

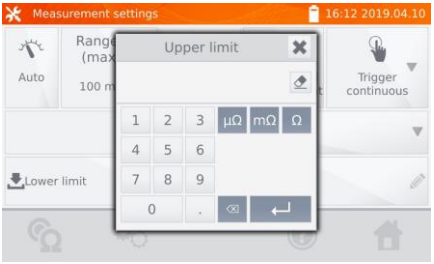
Boxes for setting the range and measurement current correspond to the same boxes shown in step ③.

- Bidirectional measurement is used to compensate the potential present at the contact point of two different conductors. In this case, the main result of the measurement is the average of results from individual directions.
- After selecting automatic trigger, the first measurement must be started by pressing **START/STOP** button. Next measurements may be initiated by connecting the test leads to the object.
- Automatic trigger operates correctly for resistance ≤4 kΩ. Above this value there is no guarantee of correct operation.

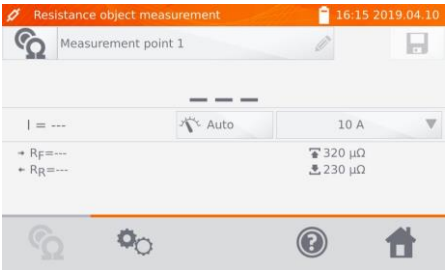
⑤ If necessary, select resistance limits from the database (**Limit settings name**) or set the required limits for the performed measurement by clicking **Lower limit** and/or **Upper limit**. To deactivate the limit delete the lower and upper values.





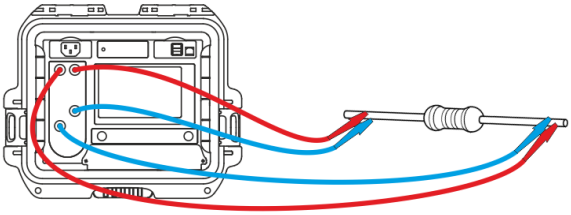


6

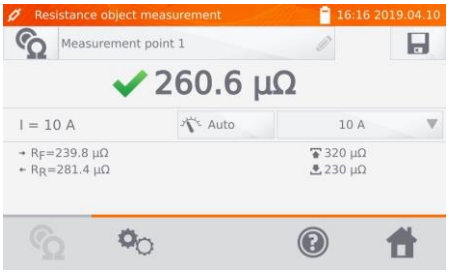


Press icon to go to the measurement.

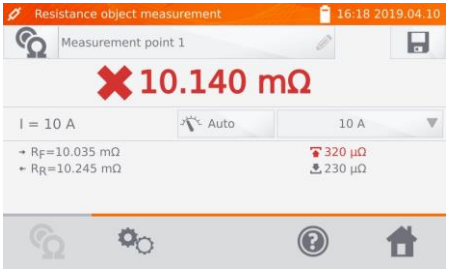
7 Connect the meter to the tested object. Press **START**/**STOP** button.



NOTE!
Touch the surface with the double-pin Kelvin probe held perpendicularly to the surface, as any other position may damage the probe.



Correct result: R_0 within limits.



Incorrect result" R_0 outside limits.

R_F – resistance at the measuring current flowing in the assumed positive direction
R_R – resistance at the measuring current flowing in the assumed negative direction
– upper limit
– lower limit

- The measuring current is obtained from a current source.
- The result may be entered into the memory by pressing icon (see **sec. 4.2**).

4 Memory

4.1 Memory management (clients, objects, measuring points)

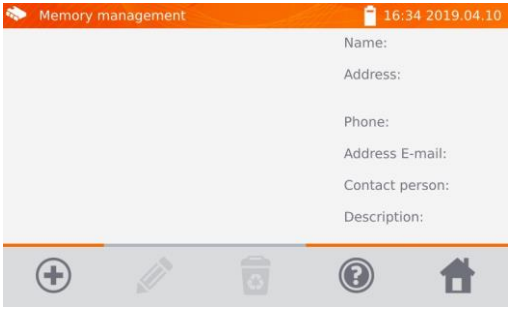
- The memory may be organized before the measurements, or on a regular basis, after the measurement.
- Use icon to enter the memory management for measurements results, as well as to enter a higher level in the memory.

4.1.1 Entering the clients

1

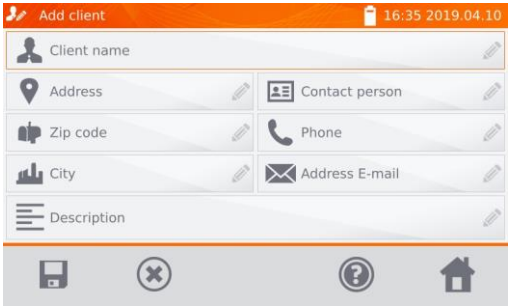
Select **Memory management** to enter the memory.

2



Select ⊕ to add a client.

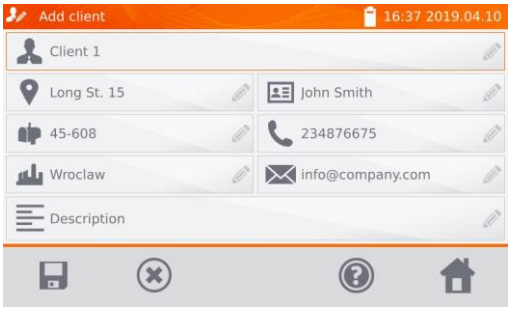
3



By selecting the individual fields, enter customer data using the keyboard.

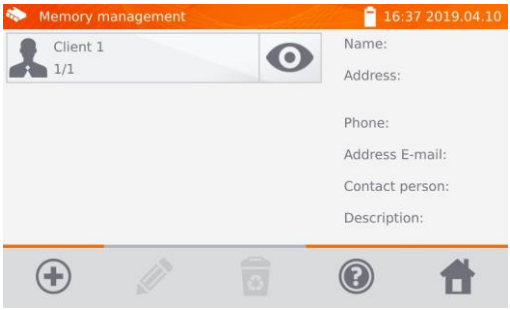
Client name (box marked in orange) is mandatory.

4



Use icon to save client's data in the memory.

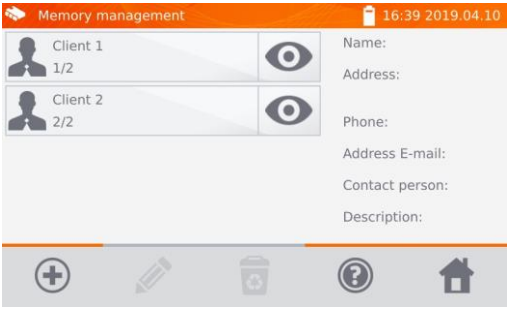
5



4.1.2 Entering objects, subobjects, measurement points

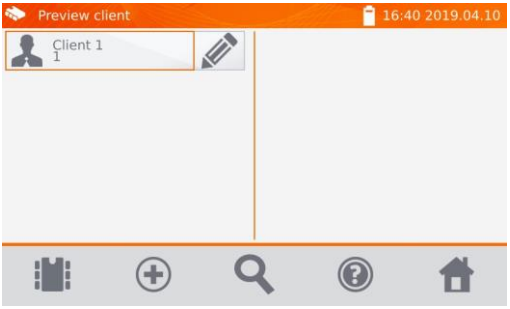
4.1.2.1 Entering objects and subobjects

1



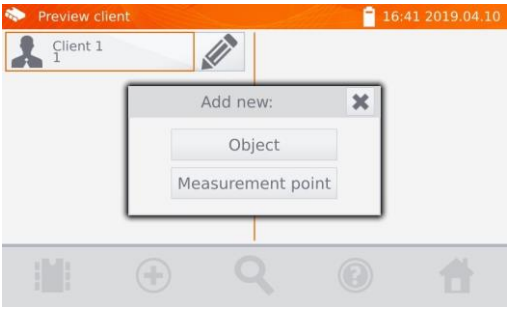
Select associated with the selected client.

2



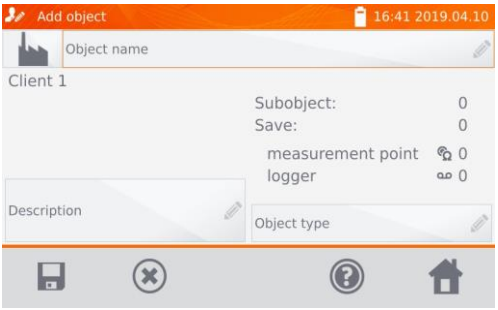
To add an object or measuring point select .

3



Select **Object** button.

4

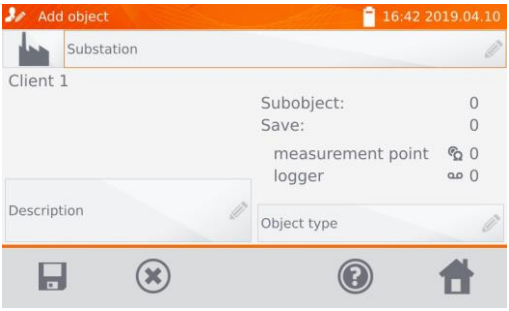


Select **Object name** box to name the object (mandatory).

5

Select one of the default names or enter your own.

6

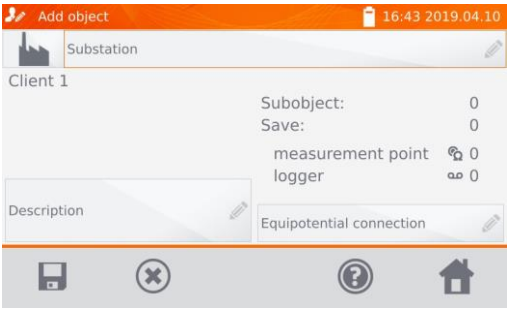


In the box **Description** you may attach an additional description. In the box **Object type** box you may select the default type of or enter your own.

7

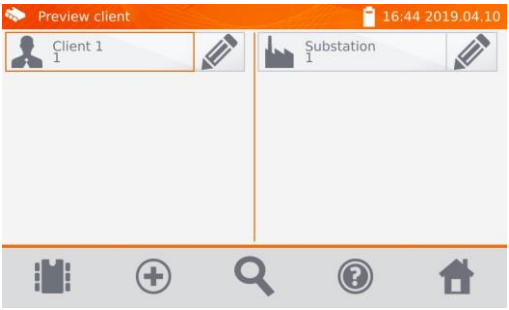
Select one of the default names or enter your own.

8



Use icon to save the object into the memory.

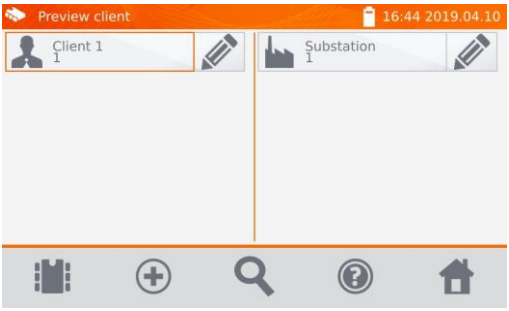
9

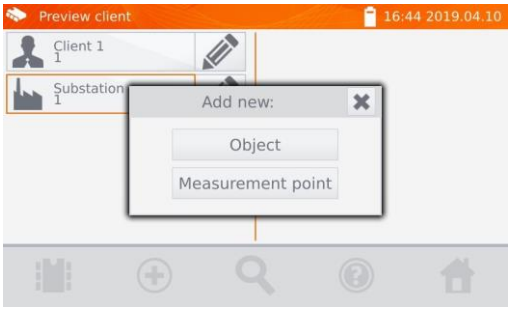


By clicking ⊕ you can add more objects.

By clicking the **object** field and ⊕ icon, you may enter subobjects in the object etc. - up to 4 levels.

10

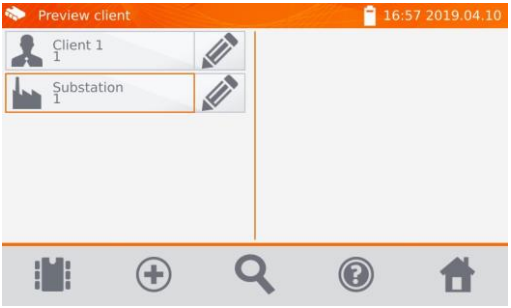




4.1.2.2 Entering measurement points

Measuring points may be entered at any memory level, i.e. at the level of client, object or subobject.

1



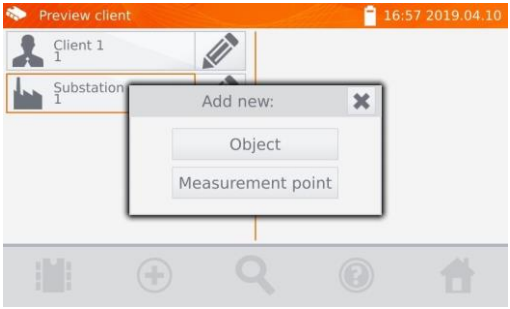
Select

⇒ 👁 associated with the client, and then ⊕

or

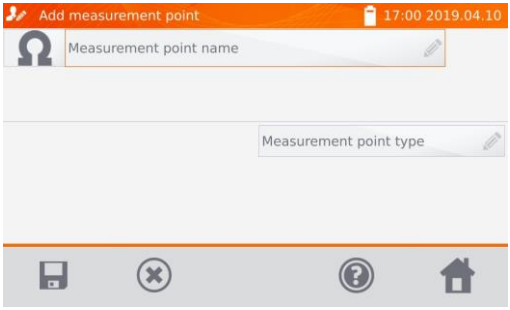
⇒ at the level of the object (subobject) press ⊕.

2



Select **Measurement point**.

3

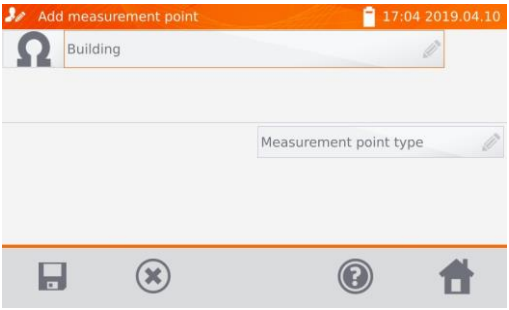


Select **Measurement point name** box to name the object (mandatory).

4

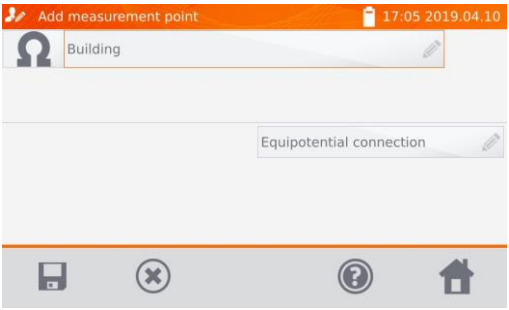
Select one of the default names or enter your own.

5



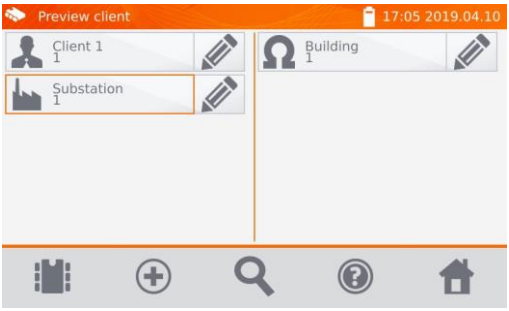
By clicking **Measurement point type** box, you may select the default type of or enter your own.

6



Use icon to save a measuring point to the memory.

7



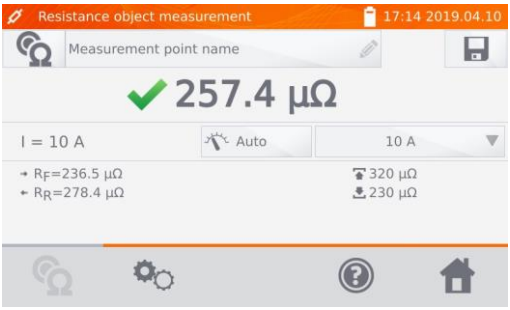
4.2 *Storing the measurement results in the memory*

NOTE!

- Before performing the next series of measurements at the same measuring points, the previous results must be archived, because **for one measuring point, you can save only one result.** Entering the next will erase the previous one.
- The measurement result may be entered only to the measuring point or to logger.

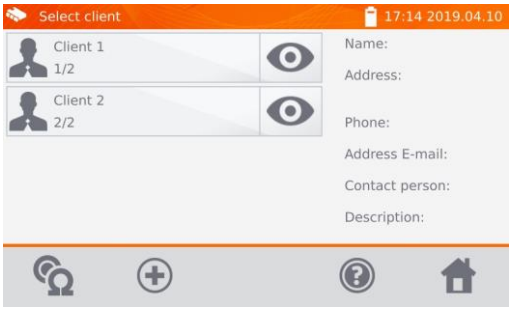
4.2.1 Entering the results of measurements with previously organized memory

1



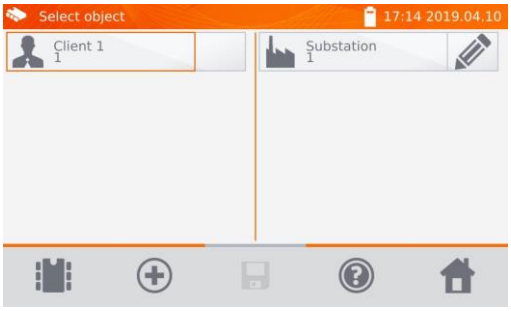
Tap icon after finishing the measurement.

2



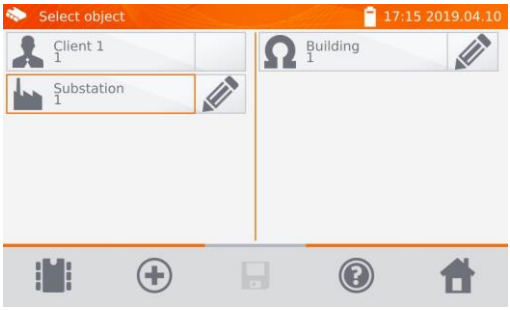
Select the client by tapping icon next to its name.

3



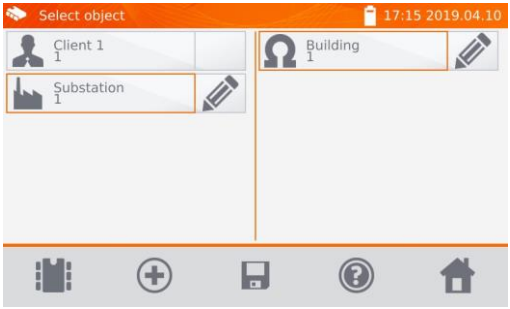
Select the object/subobject.

4



Select the measuring point (indicated by orange border).

5

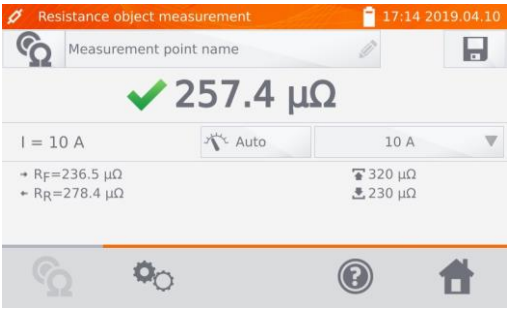


Save the result by selecting icon.

4.2.2 Entering the results of measurements without previously organized memory

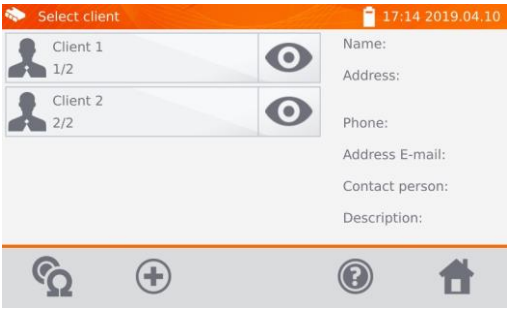
4.2.2.1 Method 1

1



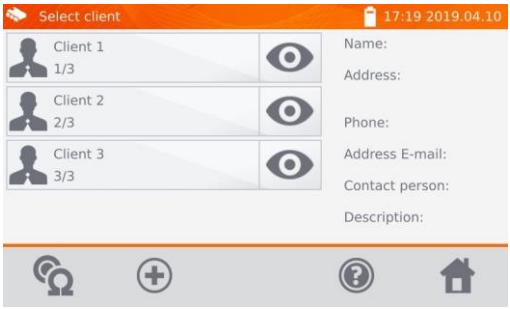
Tap icon after finishing the measurement.

2



Select icon to add a client.

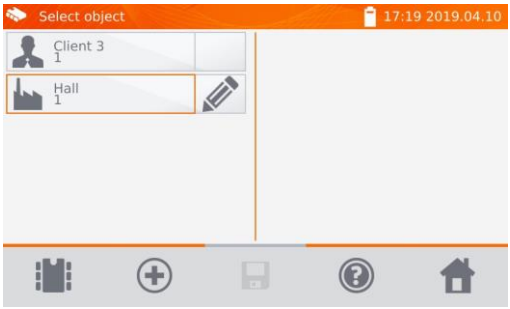
3



After saving the client:

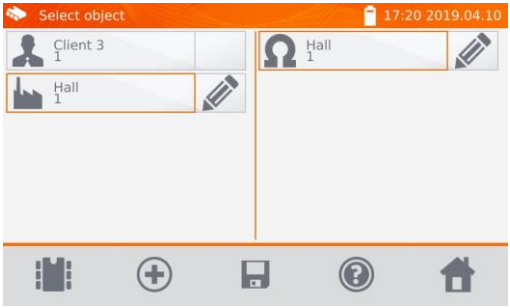
- select its icon
- and then select icon to add the object.

4

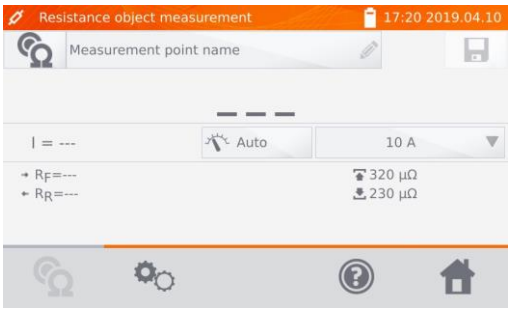


After adding and saving the object (also subobjects if necessary), select to add the measurement point.

5

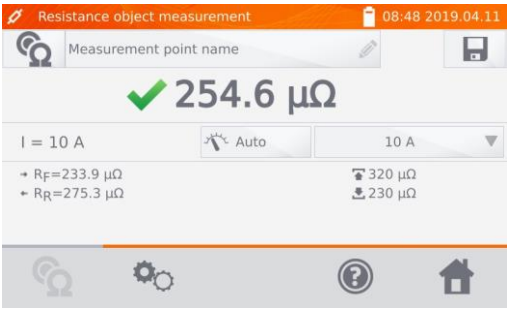


After adding and saving the measuring point, select . The result is saved to memory. The meter returns to the measuring mode.



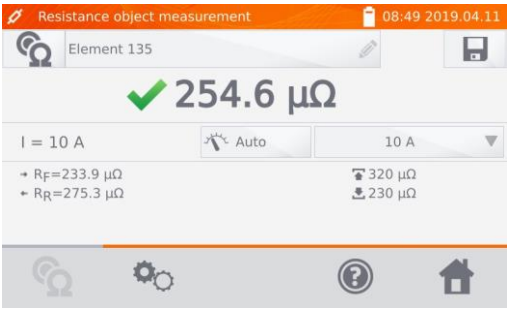
4.2.2.2 Method 2

1



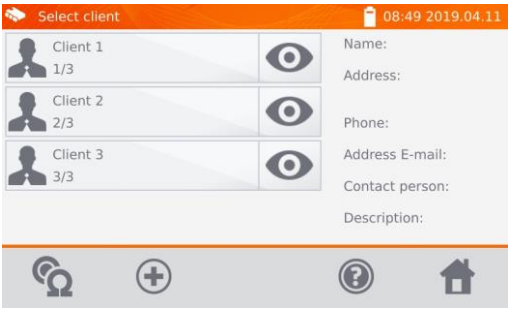
Before or after the measurement select **Measurement points name** and enter the name.

2



After finishing the measurement press icon.

3



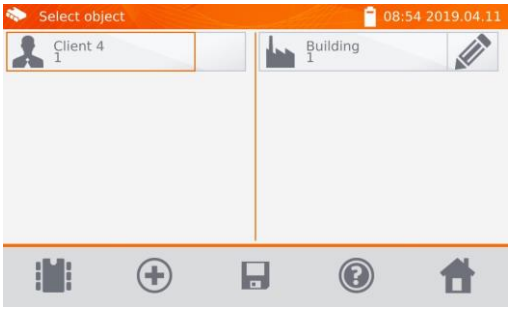
Select ⊕ to add a client.

4

After saving the client:

- select icon 👁 next to its name
- and then select ⊕ icon to add the object.

5



After adding and saving the object (also subobjects according to the needs), select the object and then . The measuring point with the measurement result will be saved automatically.

Having selected the client and object (subobjects) and performing a series of measurements on one object, after the measurement and entering the name of the measuring point, select and - on the displayed screen - select again . The measuring point with the measurement result will be saved automatically.

4.3 Viewing memory data

1

Select **Memory management**.

2

Select of the selected object and then select on the object, subobjects and measuring point.

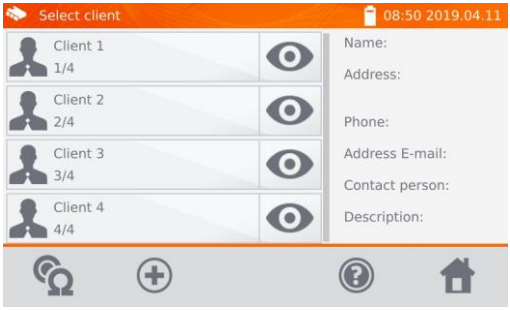
3

4.4 "Search" in the memory

1

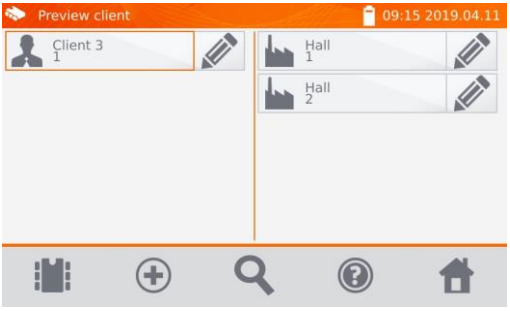
Select **Memory management**.

2



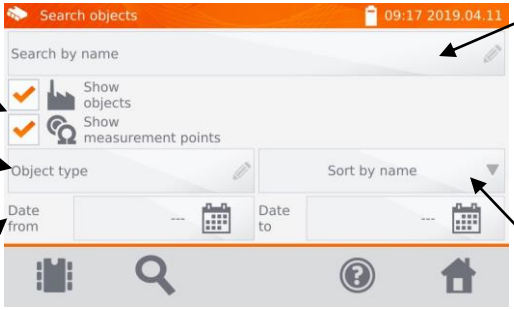
Select 👁 of the desired client.

3



In any of the client's window, select 🔍 icon.

4



Mark appropriate positions

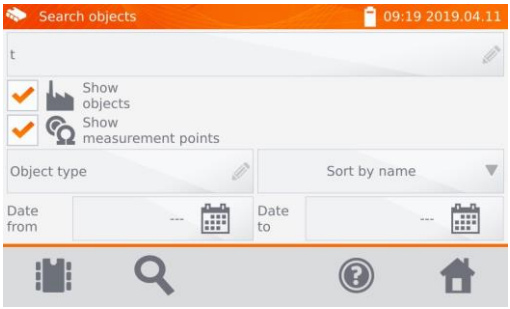
Enter the object type or select the default type

Enter the relevant dates

Enter the name or its several subsequent letters.

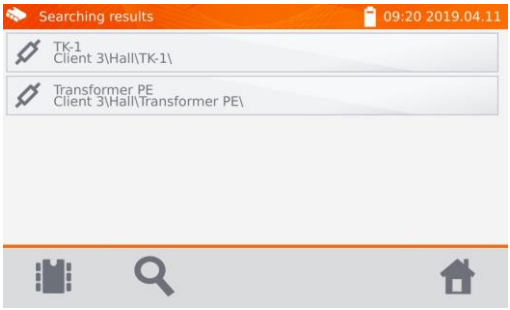
Selecting sorting by name or date

5



After entering all the search criteria, select icon again.

6

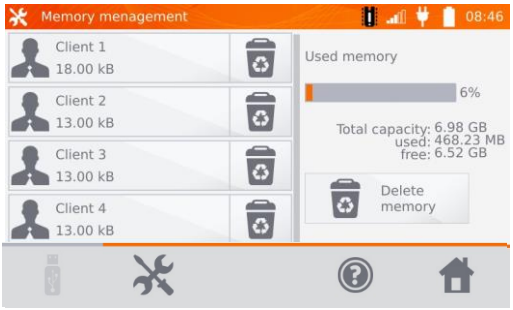


Search results.

- To perform the search, enter the name (or its part) or one of the dates.
- The size of letters in the name of searched item is ignored.

4.5 Copying client data from the memory to USB stick and vice versa

1



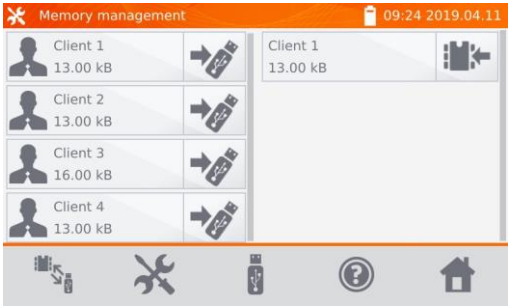
In the main menu, select , then **Memory settings** and **Memory management**.

2 Insert the USB stick into the appropriate USB slot of the meter.

3

Select icon.

4



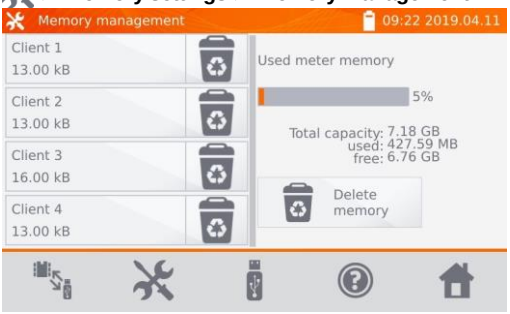
⇒ Select to save data in the USB stick.

⇒ Select to copy data from the USB stick to the memory of the meter.

4.6 Deleting data

4.6.1 Deleting the meter's memory data

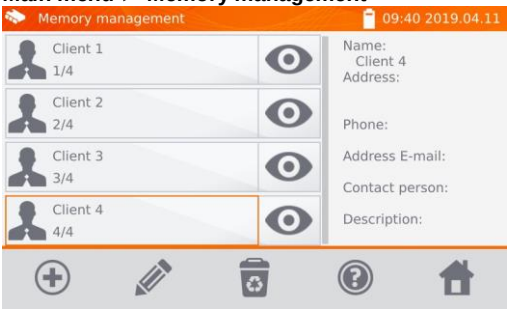
► **Memory settings** ► **Memory management**



To delete the whole memory, select **Delete memory** button.

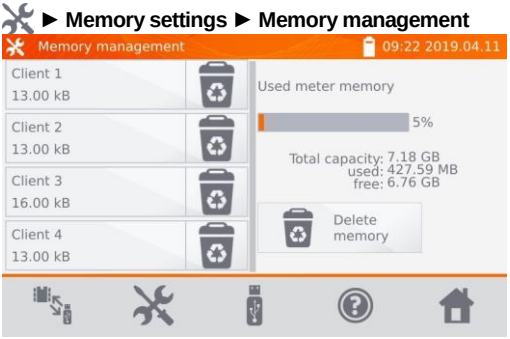
4.6.2 Deleting a client

① **Main menu** ► **Memory management**



or

► **Memory settings** ► **Memory management**

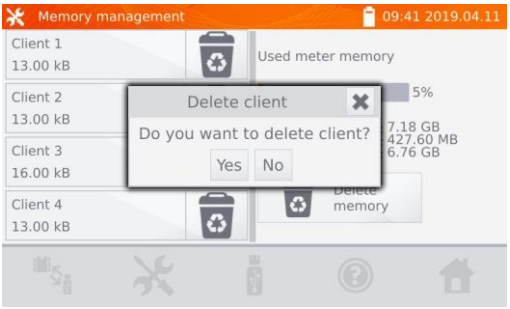


To delete a client:

⇒ in **location 1** select a client and then icon at the bottom bar,

⇒ in **location 2** select icon associated with its name.

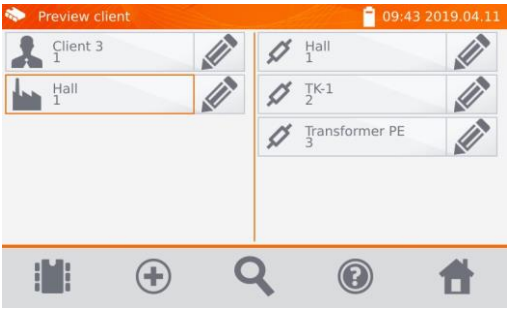
2



Select **Yes** to confirm deleting or **No** to cancel it.

4.6.3 Deleting an object

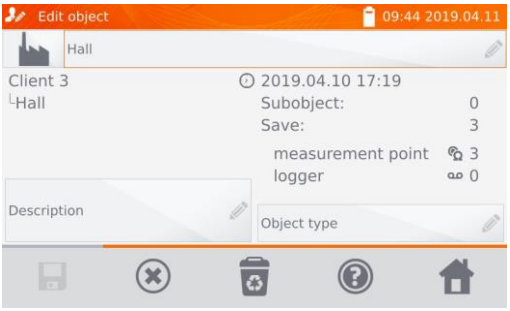
1



To delete an object or measuring point:

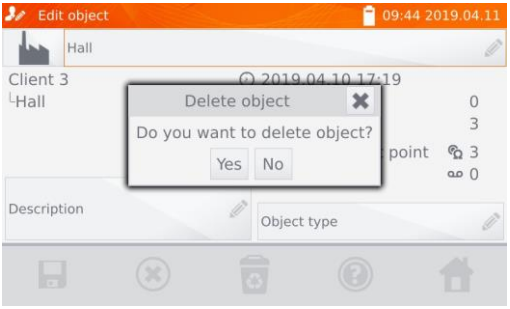
- go to location **Main menu ► Memory management**
- using icon go to the client's content,
- using icon start to edit the selected object…

2



…and then select .

3



Select **Yes** to confirm deleting or **No** to cancel it.

5 Power supply

The meter is powered by an AC adapter or a battery pack. When supplied from the mains, the battery pack is charged.

5.1 Monitoring the power supply voltage

The charge level of the battery pack is indicated by the symbol in the right upper corner of the display on a current basis:

the battery pack is charged

the battery pack is discharged

the battery pack is being charged

NOTE!

Remember that measurements performed with an insufficient supply voltage feature additional errors which the user is unable to evaluate. Consequently, such measurements cannot prove that the results of resistance measurements are correct.

5.2 Replacing the battery pack

MMR-640 is equipped with a rechargeable lithium-ion battery pack and a charger. The battery pack is placed in the battery compartment. Battery charger is installed inside the housing of the meter and is compatible only with the manufacturer's rechargeable battery pack.

WARNING

If the power cord is left in the socket during replacement of the battery pack, there is a risk of electric shock with a dangerous voltage.

In order to replace the batter-pack it is necessary to:

- remove all the test leads from the sockets and turn the meter off,
- remove the lid of the battery compartment (in the upper part of the housing) by removing 2 screws,
- remove the battery pack,
- remove two connector pins of the battery pack,
- connect the power plugs of the new battery pack,
- insert the battery pack into the battery compartment,
- place and tighten the lid of battery compartment.

NOTE!

Do not operate a meter with an open or incorrectly closed battery compartment and do not power it from other sources than those specified in this manual.

5.3 General rules for using Li-Ion rechargeable batteries

- If you do not use the device for a prolonged period of time, then it is recommended to remove the rechargeable batteries and store them separately.
- Store the half-charged battery pack in a plastic container placed in a dry, cool and well ventilated place and protect them from direct sunlight. The battery pack may be damaged if stored when fully discharged. The ambient temperature for prolonged storage should be maintained within the range of 5°C…25°C.
- Charge the batteries in a cool, well-ventilated place at a temperature of 10°C … 28°C. Modern fast chargers detect both too low and too high temperature of rechargeable batteries and react to the situation adequately. Too low temperature should prevent starting the process of charging, which might irreparably damage rechargeable batteries. The increase in temperature of the battery pack may cause electrolyte leakage and even its ignition or explosion.
- Do not exceed the charging current, as it may result in ignition or "swelling" of the battery pack. "Swollen" battery pack must not be used.
- Do not charge or use the batteries in extreme temperatures. Extreme temperatures reduce the lifetime of rechargeable batteries. Always observe the rated operating temperature. Do not dispose the battery pack into fire.
- Li-Ion cells are sensitive to mechanical damage. That may cause its permanent damage of the batteries and thus - ignition or explosion. Any interference in the structure of Li-ion battery pack may cause its damage. This may result in the ignition or explosion. A short-circuit of the battery poles + and - may permanently damage the battery pack or even cause its fire or explosion.
- Do not immerse Li-Ion battery in liquids and do not store in humid conditions.
- If the electrolyte contained in the Lithium-Ion battery pack, contacts eyes or skin, immediately rinse the affected place with plenty of water and consult a doctor. Protect the battery against unauthorised persons and children.
- When you notice any changes in the Lithium-Ion battery pack (e.g. changes in colour, swelling, excessive temperature), stop using it. Mechanical damaged, overcharged or excessively discharged battery pack is not suitable for use.
- Any misuse of the battery may cause its permanent damage. This may result in the ignition. The seller and the manufacturer shall not be liable for any damages resulting from improper handling Li-Ion battery pack.

6 Cleaning and maintenance

NOTE!

Use only the maintenance methods specified by the manufacturer in this manual.

The casing of the meter may be cleaned with a soft, damp cloth using all-purpose detergents. Do not use any solvents or cleaning agents which may scratch the casing (powders, pastes, etc.).

The electronic system of the meter does not require maintenance.

7 Storage

In the case of storage of the device, the following recommendations must be observed:

- disconnect all the test leads from the meter.
- make sure that the meter and accessories are dry,
- during prolonged storage remove the batteries,
- storage temperatures must be in accordance with those defined in technical specifications,
- in order to prevent total discharge of the rechargeable batteries during prolonged storage, charge them from time to time.

8 Dismantling and disposal

Worn-out electric and electronic equipment should be gathered selectively, i.e. it must not be placed with waste of another kind.

Worn-out electronic equipment should be sent to a collection point in accordance with the law of waste electrical and electronic equipment.

Before the equipment is sent to a collection point, do not dismantle any elements.

Observe the local regulations concerning disposal of packages, worn-out batteries and accumulators.

9 Technical data

9.1 Basic data

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

Uncertainty values stated in the table refer to the measurement with bidirectional current and relate to the average of two measurements according to the following formula:

$$R = \frac{R_F + R_R}{2}$$

where:
R_F – resistance at the assumed "forward" current direction,
R_R – resistance at the assumed "backward" current direction.

For measuring with unidirectional current, the specified accuracy is not guaranteed.

Resistance measurements of resistive objects

Range	Resolution	Accuracy	Measuring current
0…999.9 µΩ	0.1 µΩ	±(0.25% m.v. + 2 digits)	10 A
1.0000…1.9999 mΩ	0.0001 mΩ		
2.000…19.999 mΩ	0.001 mΩ		10 A
20.00…199.99 mΩ	0.01 mΩ		10 A / 1 A
200.0…999.9 mΩ	0.1 mΩ		1 A / 0.1 A
1.0000…1.9999 Ω	0.0001 Ω		
2.000…19.999 Ω	0.001 Ω		0.1 A
20.00…199.99 Ω	0.01 Ω		10 mA
200.0…1999.9 Ω	0.1 Ω		1 mA

Resistance measurement in the presence of noise of 50 Hz or 60 Hz

Signal/noise ratio	Additional uncertainty	Signalling
N ≥ 0.02	-	-
0.02 > N ≥ 0.004	1%	
N < 0.004	unspecified	

Measuring current settings
Resistance measurements of resistive objects: 1 mA, 10 mA, 100 mA, 1 A, 10 A

9.2 Other technical data

a) insulation type acc. to EN 61010-1 ..... double
b) measurement category acc. to EN 61010-2-030 ..... III 600 V

NOTE!

With the use of 10 m or 25 m measurement leads with a crocodile - CAT III 50 V.

c) ingress protection acc. to EN 60529
- with closed housing IP67
- with open housing, powered from the battery pack, installed plugs IP54
- with open housing, powered from mains and/or without plugs IP40

d) protection against external voltage ..... up to 600 V AC for 10 s
e) power supply ..... Li-Ion rechargeable battery 7.2 V 8.8 Ah
f) power supply to battery charger ..... 90 V…265 V, 50 Hz…60 Hz, 2 A
g) battery charging time ..... approximately 3.5 hours
h) number of measurements with 10 A current when powered from the battery pack ..... 700…800, depending on the ambient temp.
i) maximum wire resistance for 10 A current ..... 300 mΩ
j) accuracy of measuring current setting ..... ±10%
k) time of performing the resistance measurement with bidirectional current flow ..... 3 s
l) dimensions ..... 318 x 257 x 152 mm
m) meter weight ..... approx. 3.5 kg
n) operating temperature ..... -10°C…+50°C
o) charger operating temperature ..... 0°C…+45°C
p) storage temperature ..... -20°C…+60°C
q) humidity ..... 20%…90%
r) reference temperature ..... +23°C ± 2°C
s) reference humidity ..... 40%…60%
t) altitude (above sea level): ..... <2000 m
u) time to AUTO-OFF ..... 5…45 minutes or inactive
v) TFT graphic display ..... graphical TFT, 800 x 480 points
w) interface standard ..... USB
x) quality standard ..... design and manufacturing are ISO 9001 compliant
y) the product meets the EMC requirements (emission for industrial environment) according to: ..... EN 61326-1 and EN 61326-2-2

10 Manufacturer

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

SONEL S.A.
Wokulskiego 11
58-100 Świdnica
Poland
tel. +48 74 884 10 53 (Customer Service)
e-mail: customerservice@sonel.com
web page: www.sonel.com

NOTE!

Service repairs must be performed only by the manufacturer.

NOTES

NOTES

SYMBOLS DISPLAYED BY THE METER

Memory

Settings

Return to the main menu

Adding a client, object or measuring point

Entry to client objects

Entry to client edition, object or measurement point with a possibility of changing data

Fast entry deletion on the on-screen keyboard

Deletion of a measurement point, object or client

Measuring Mode

Measurement setup mode

Saving to memory

Help

Exit from the option

Searching for an object or measurement point

There was a limitation of the measuring current to a value lower than that ensuring maximum accuracy

Test leads interchanged

High level of noise (interference), measurement possible with additional uncertainty

High level of noise (interference), measurement possible without defining uncertainty

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