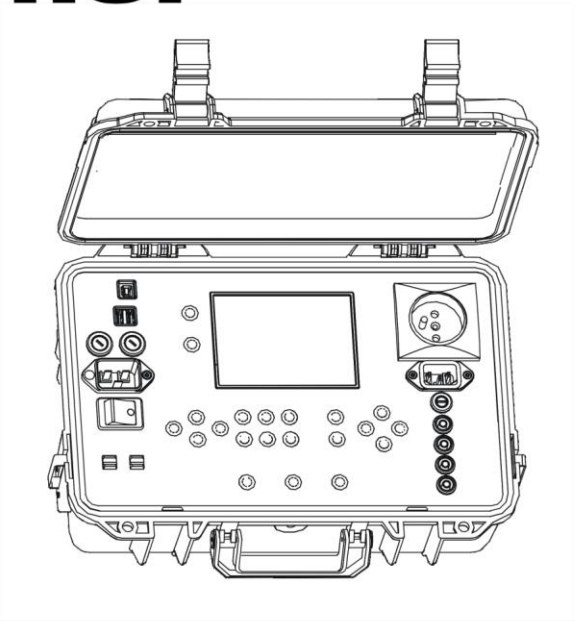
Sonel®

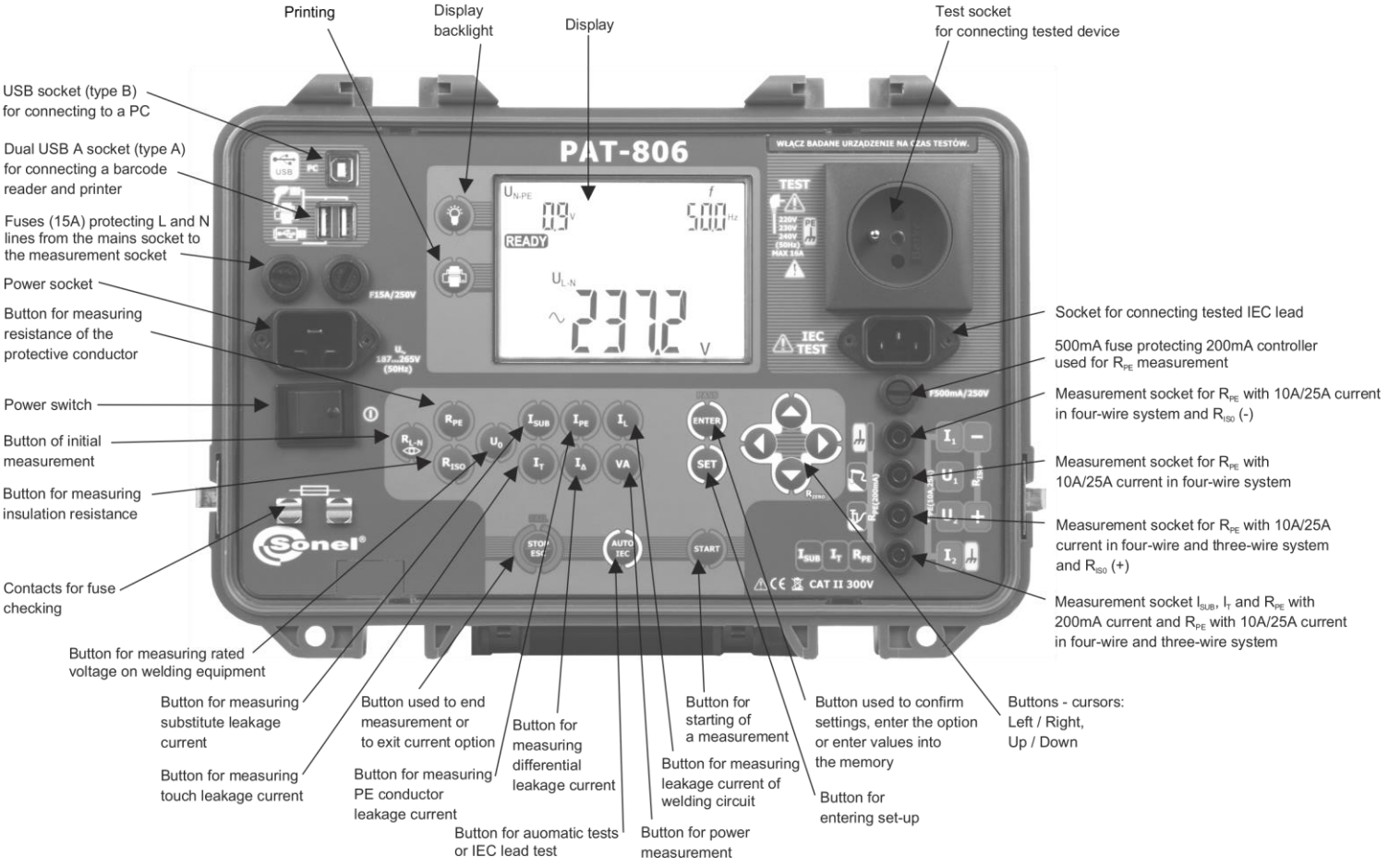


USER MANUAL

PORTABLE APPLIANCE TESTER

PAT-806

PAT-806


Printing
Display backlight
Display
Test socket for connecting tested device
USB socket (type B) for connecting to a PC
Dual USB A socket (type A) for connecting a barcode reader and printer
Fuses (15A) protecting L and N lines from the mains socket to the measurement socket
Power socket
Button for measuring resistance of the protective conductor
Power switch
Button of initial measurement
Button for measuring insulation resistance
Contacts for fuse checking
Button for measuring rated voltage on welding equipment
Button for measuring substitute leakage current
Button for measuring touch leakage current
Button used to end measurement or to exit current option
Button for measuring PE conductor leakage current
Button for measuring differential leakage current
Button for auomatic tests or IEC lead test
Button for power measurement
Button for measuring leakage current of welding circuit
Button for starting of a measurement
Button for entering set-up
Button used to confirm settings, enter the option or enter values into the memory
Buttons - cursors: Left / Right, Up / Down
Socket for connecting tested IEC lead
500mA fuse protecting 200mA controller used for R_{PE} measurement
Measurement socket for R_{PE} with 10A/25A current in four-wire system and R_{ISO} (-)
Measurement socket for R_{PE} with 10A/25A current in four-wire system
Measurement socket for R_{PE} with 10A/25A current in four-wire and three-wire system and R_{ISO} (+)
Measurement socket I_{SUB}, I_T and R_{PE} with 200mA current and R_{PE} with 10A/25A current in four-wire and three-wire system
PAT-806
WŁĄCZ BADANE URZĄDZENIE NA CZAS TESTÓW.
READY
TEST
IEC TEST
F15A/250V
F500mA/250V
CAT II 300V
ENTER
SET
START
AUTO TEC
STOP ESC

USER MANUAL

PORTABLE APPLIANCE TESTER
PAT-806

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

Version 1.13 05.03.2020

PAT-806 meter is a modern, high-quality meter, easy and safe in operation. Please acquaint yourself with the present manual in order to avoid measuring errors and prevent possible problems related to operation of the meter.

CONTENTS

1 Safety

PAT-806 meter is designed for performing check tests on electrical equipment, providing measurement results which determine the safety status of tested devices. Therefore, in order to provide conditions for correct operation and the correctness of the 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 determined by the producer.
- 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.
- PAT-806 meter must be operated only by appropriately qualified personnel with relevant certificates authorising the personnel to perform works on electric systems. Operating the meter by unauthorised personnel may result in damage to the device and constitute a source of danger for the user.
- The instrument must not be used with installations or equipment situated in dangerous environments, e.g. where fire or explosion hazards exist.
- It is unacceptable to operate the following:
  - ⇒ A damaged meter which is completely or partially out of order,
  - ⇒ A meter with damaged test leads 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).
- The meter may be supplied only from grounded mains sockets.
- Before measurements may commence, make sure the test leads are connected to the appropriate measurement sockets.
- Do not touch the tested device during measurements.
- Banana test sockets and the socket for testing IEC cables are protected against improper connection to the voltage up to 300 V AC for 60 seconds.
- Repairs may be carried out only by an authorised service point.

NOTE!

Only standard and additional accessories for a given device should be used, as listed in the "Equipment" section. Use of different accessories can lead to errors in the test connection and can introduce additional measurement uncertainties.

NOTE!

The plug on the housing near handle must be always tightened. It can be unscrewed only when the device is transported by an aeroplane.

Note:

Due to continuous development of the meter's software, the actual appearance of the display, in case of some of the functions, may slightly differ from the display presented in this operating manual.

2 General description and features of the instrument

PAT-806 digital meter is intended to measure the basic parameters of portable electrical devices (power tools, household appliances, etc.) important for their safety: protective conductor resistance, insulation resistance, continuity of connections, the leakage current.
The meter may be used to test the equipment, in accordance with the following standards:

- EN 60745-1 Hand-held motor-operated electric tools. Safety. Part 1: General requirements.
- EN 61029 Safety of transportable motor operated electric tools. General requirements.
- EN 60335-1 Household and similar electrical appliances. Safety. Part 1: General requirements.
- EN 60950 Information technology equipment – Safety- Part 1: General requirements.
- EN 60974-4 Arc welding equipment - Part 4: Periodic inspection and testing
- VDE 0404-1 Prüf- und Messeinrichtungen zum Prüfen der elektrischen Sicherheit von elektrischen Geräten. Teil 1: Allgemeine Anforderungen.
- VDE 0404-2 Prüf- und Messeinrichtungen zum Prüfen der elektrischen Sicherheit von elektrischen Geräten. Teil 2: Prüfeinrichtungen für Prüfungen nach Instandsetzung, Änderung oder für Wiederholungsprüfungen.
- VDE 0701-0702 Prüfung nach Instandsetzung, Änderung elektrischer Geräte. Wiederholungsprüfung elektrischer Geräte. Allgemeine Anforderungen für die elektrische Sicherheit.

Basic functions of the instrument:

- **Measurement of network voltage and frequency**

- **Rated voltage measurement on welding equipment**

- **Checking the resistance of L-N circuit**

- **Checking the fuse**

- **Measurement of protective conductor resistance (Protection class - I):**
  - technical measurement method
  - measurement with sinusoidal current of network frequency and values: 200 mA, 10 A and 25 A
  - adjustable measurement time
  - adjustable upper limit in the range of: 10 mΩ …1.99 Ω with resolution 0.01 Ω

- **Measurement of insulation resistance:**
  - three test voltages: 100 V, 250 V and 500 V
  - measurement of insulation resistance up to 600 MΩ
  - automatic discharge of the capacitance of tested object after the insulation resistance measurement is completed
  - adjustable measurement time
  - adjustable lower limit within the range of 0.1 MΩ ….9.9 MΩ with resolution of 0.1 MΩ
  - three point measurement of insulation resistance on welding equipment

- **Measurement of substitute leakage current:**
  - adjustable measurement time
  - adjustable upper limit in the range of: 0.01 mA ... 9.9 mA with resolution of 0.01 mA/0.1 mA

- **Measurement of PE leakage current**
  - adjustable measurement time
  - adjustable upper limit in the range of: 0.01 mA ... 9.9 mA with resolution of 0.01 mA/0.1 mA

- **Measurement of differential leakage current:**
  - adjustable measurement time
  - adjustable upper limit in the range of: 0.01 mA ... 9.9 mA with resolution of 0.01 mA/0.1 mA

- **Measurement of touch leakage current:**
  - adjustable measurement time
  - adjustable upper limit in the range of: 0.01 mA ... 1.99 mA with resolution of 0.01 mA

- **Leakage current measurement on welding circuit:**
  - adjustable measurement time
  - adjustable upper limit in the range of: 0,1 mA…14,9 mA with resolution 0,1 mA

- **Power measurement:**
  - adjustable measurement time

- **Current consumption measurement**

- **IEC lead test**

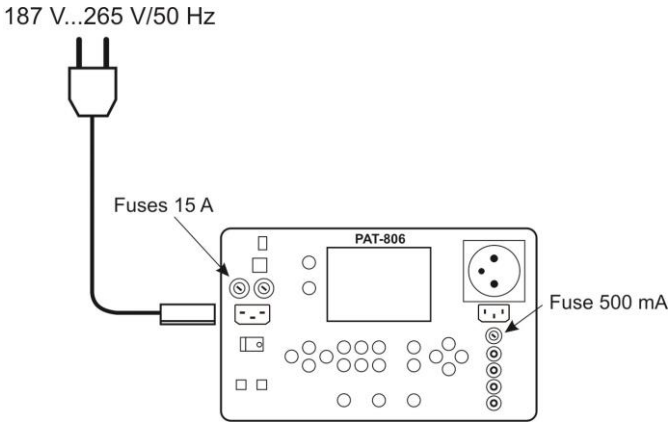
- **Other:**
  - automatic selection of measuring range
  - 990 memory cells for storing individual measurement results with the option to transfer them to a PC via USB socket or printing
  - cooperation with the bar-code reader and printer
  - large, readable display with backlight option
  - ergonomic operation

Note:
The displayed E02 symbol informs that the 10/25 A test set is damaged. The machine must be sent for repair.

3 Switching on and general settings

3.1 Power supply

The device is powered from the network 187 V ... 265 V, 50 Hz.



Two 15 A fuses protect L and N lines from the supply socket to the test socket, they are tripped when current consumption from the test socket is too high (>16 A).

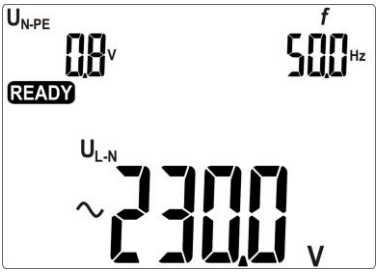
500 mA fuse protects 200 mA current controller for R_{PE} measurement.

3.2 Start test after switching the meter on

After switching on, the meter performs self-test to check its correct operational condition and when this test is successfully completed, the meter automatically performs the following measurements:

- measurement of the voltage in the power supply socket, i.e. the voltage between L and N of power supply to the meter
- measurement of mains frequency
- checking the continuity PE in the power supply socket
- measuring the voltage between N and PE in the power supply socket

When everything is correct the following screen is displayed:



Notes:

- When the network voltage is below 187 V the meter turns off automatically.

Additional information displayed by the meter

-PE [on, and an acoustic signal	Lack of PE continuity, the measurements are blocked (message [on blinks).
U_{N-PE} 38.7 V, and an acoustic signal	Voltage U_{N-PE} > 25 V, the measurements are blocked (the voltage value blinks).
> 265 V and an acoustic signal	Mains voltage > 265 V, measurements are blocked.
	Exchanged L and N, measurements are possible.

3.3 General Settings - MENU

By pressing **SET** button the user enters the mode where the following actions are available:

- setting date and time
- communicating with PC
- updating firmware
- operating the meter with a bar-code reader and printer
- transferring data to a pen-drive
- setting nominal network voltage
- setting current values in the measurement of R_{PE} on IEC lead.

1. 

To enter the setting mode (MENU): press **SET** button

2. 

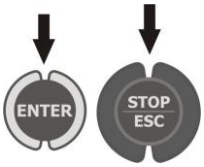
Press **ENTER** to enter the parameter setting.

3. 
Use buttons ◀, ▶ to go to the next parameter.

④

Use ▲, ▼ to set the parameter value.

⑤



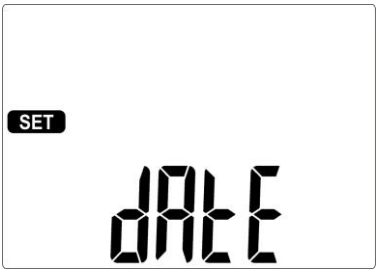
Press **ENTER** to approve the setting, press **ESC** go to the main MENU without changing any settings.

Notes:

- The value or symbol to be changed is blinking.
- Exit MENU using **STOP/ESC**.
- Settings are stored in memory after switching off the meter.

3.3.1 Setting date and time

①



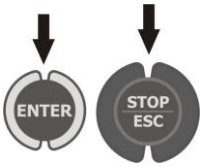
②

Press **ENTER**.

③

Use ◄, ► to move to the next group of digits, using ▲, ▼ set desired value.

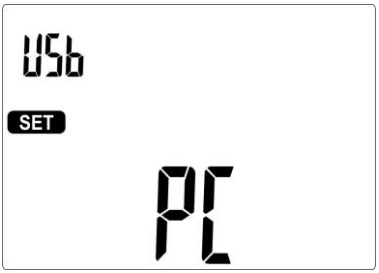
④



Press **ENTER** to confirm the settings or **ESC**, to exit to main MENU without changing any settings.

3.3.2 Communication with PC

①

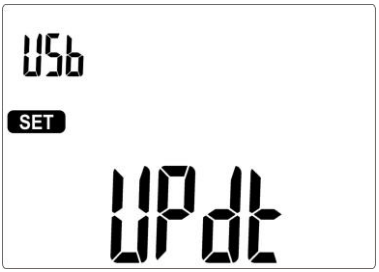


②

Press **ENTER** to start the transmission.

3.3.3 Firmware update

①



②

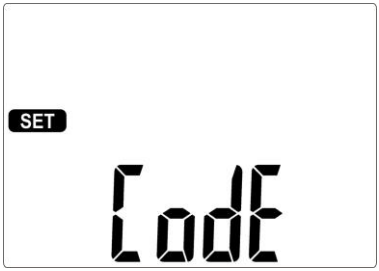
Press **ENTER** to start the transmission. On PC run the program downloaded from www.sonel.pl.

Notes:

- New versions of software for the meter are available at www.sonel.pl.
- This function may be used only by the computer proficient users.
- During programming, do not turn off the power supply of the meter and the power supply should be stable. Do not disconnect the USB cable.

3.3.4 Setting the bar-code reader

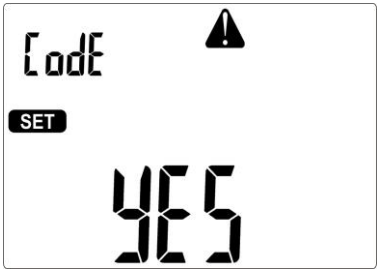
1



2

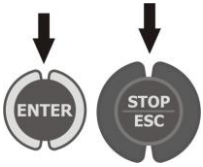
Press **ENTER**.

3



Use ▲, ▼ to set the operation of the meter with the bar-code reader (YES) or without it (no).

4



Press **ENTER**, to confirm the settings, or **ESC**, to exit to main MENU without changing any settings.

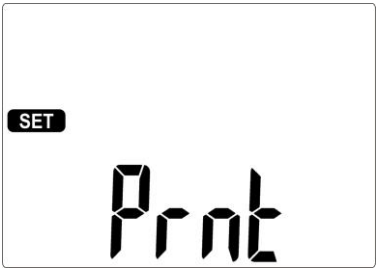
Notes:

- The reader and printer have been programmed to read the codes in CODE128 standard (in PAT devices we use digits only). PAT accepts only 7-character codes (e.g. "1234567"), any other are considered invalid. Therefore, if you attempt to read a 6-character code (or shorter) the reader will read it, but PAT will not save it - the same applies to 8-character codes and longer.
- The bar-code contains only ID number of the device, no additional information is coded.
- Reader configuration:

1. Connect the reader to your PC.
2. Wait until the reader is installed on your system.
3. Point the reader at the following code pressing the button. The reader signals successful read-out by lighting green LED and a beep.

3.3.5 Printer Settings

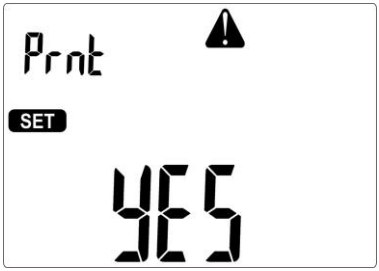
1



2

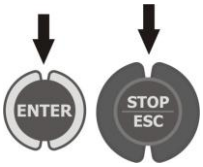
Press **ENTER**.

3



Use ▲, ▼ to set the operation of the meter with the printer (YES) or without it (no).

4



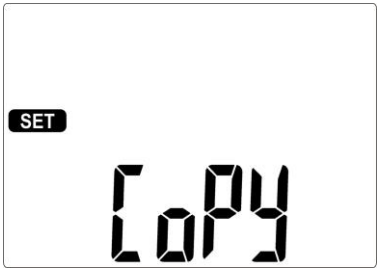
Press **ENTER**, to confirm the settings, or **ESC**, to exit to main MENU without changing any settings.

Note:

- The printer must be connected to any of the USB socket of "Host" type.
- Supported types of printers: Brother PT-9700PC, Brother QL-720NW, Brother QL-820NWB.

3.3.6 Transferring data to a pen-drive

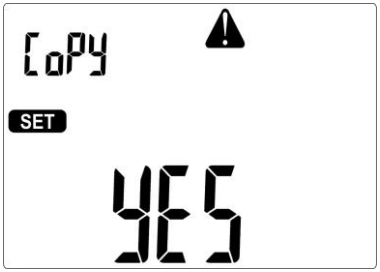
1



2

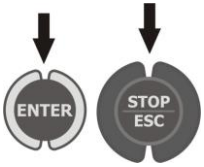
Press **ENTER**.

3



Use ▲, ▼ to set copying data (YES) or its absence (no).

4



Press **ENTER**, to confirm the settings and start data copying for YES, or to exit to main MENU for no, or **ESC**, to exit to main MENU without changing any settings.

Notes:

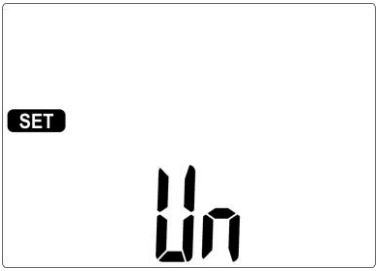
- Pen-drive must have FAT32 file system.
- Pen-drive must be plugged into the left USB socket of "Host" type.
- The content of memory is transferred to the pen-drive as a file in an independent format interpreted by "Sonel Reader" freeware and "Sonel PAT" commercial software.

Additional information displayed by the meter

no dISC	No communication or poor communication with the pen-drive.
FULL dISC	Pen-drive memory is full.

3.3.7 Setting nominal network voltage

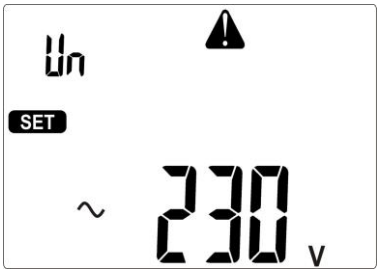
1



2

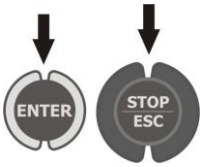
Press **ENTER**.

3



Use ▲, ▼ to set the desired voltage.

4



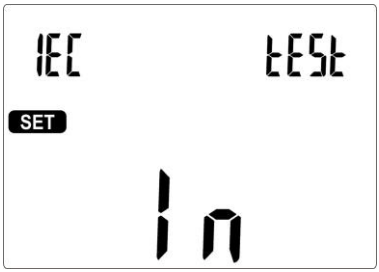
Press **ENTER**, to confirm the settings, or **ESC**, to exit to main MENU without changing any settings.

Notes:

- Nominal network voltage is used in $\mathbf{I_{SUB}}$ function for calculating the leakage current, which is measured at a voltage of 40V and its value is rescaled to the nominal voltage.

3.3.8 Setting current values in the measurement of R_{PE} on IEC lead test

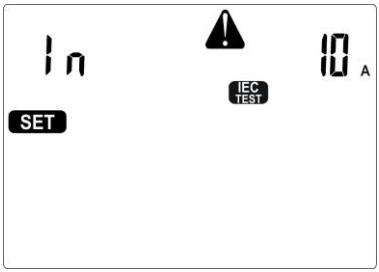
1



2

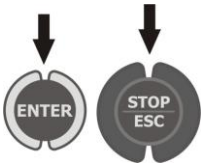
Press **ENTER**.

3



Use ▲, ▼ to set the test current (10 A or 200 mA).

4

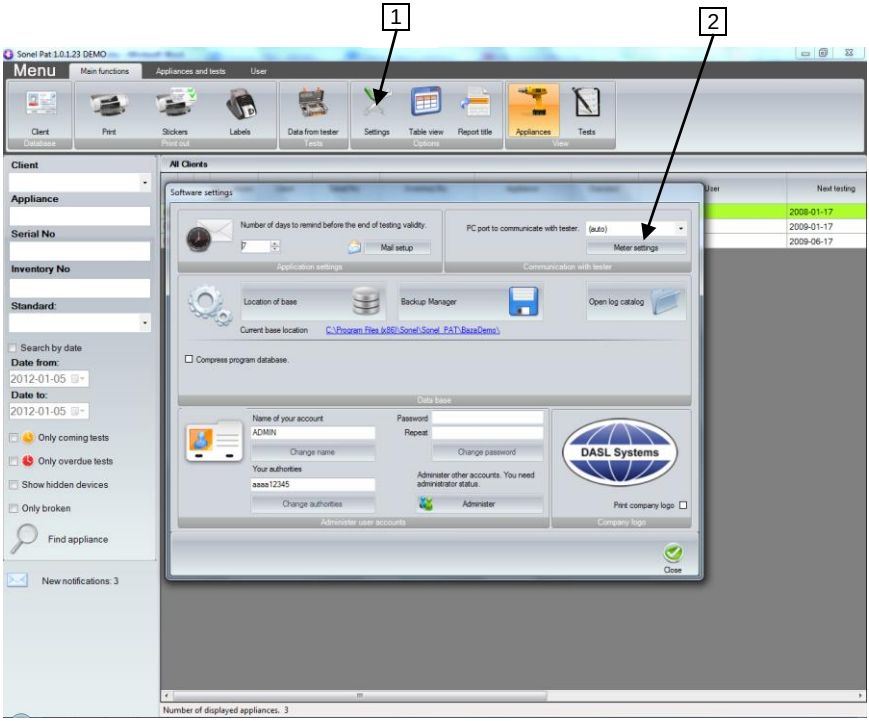


Press **ENTER**, to confirm the settings, or **ESC**, to exit to main MENU without changing any settings.

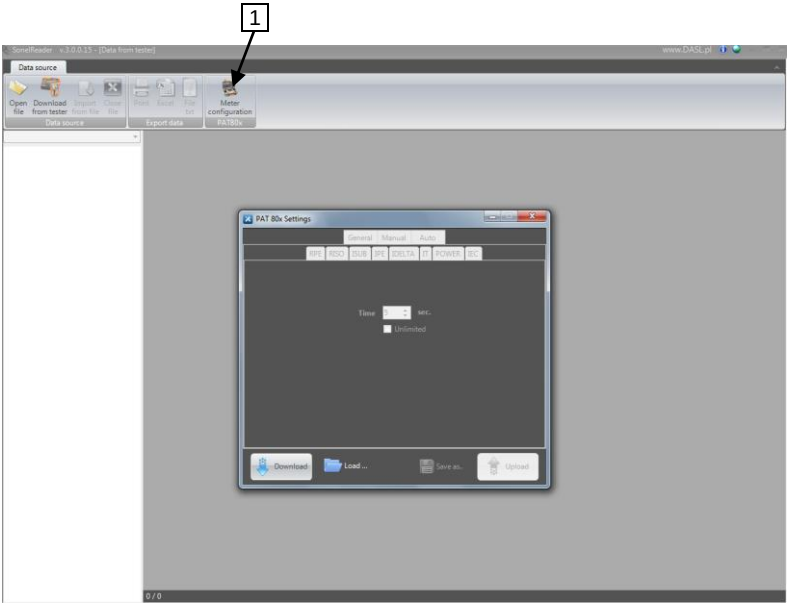
3.3.9 Configuration of settings from PC

"Sonel PAT" software and "Sonel Reader" freeware delivered with the meter, enable user to configure meter settings, both in terms of general data and individual parameters of each measurement function.

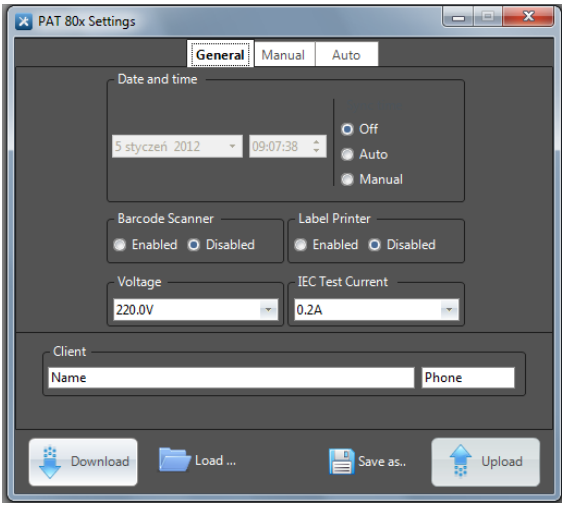
When using "Sonel PAT" software - start to configure the settings by pressing **Settings** 1 button displayed in the main window (**Main functions** tab), then in "Software settings" window press **Meter settings** 2.



When using "Sonel Reader" press **Meter configuration PAT80x** 1 button:



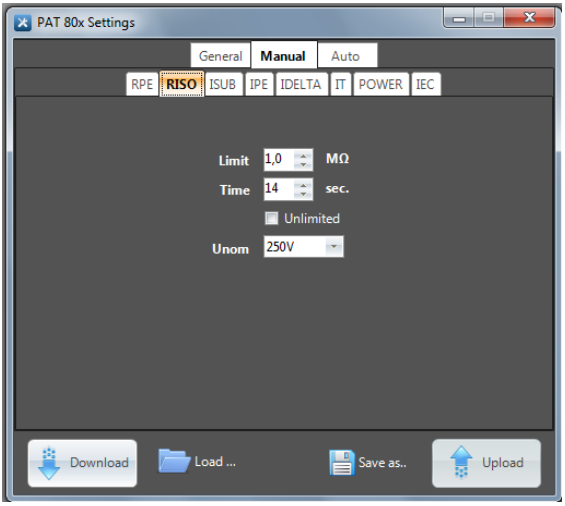
In both programs, window "PAT80x Settings" will be displayed:



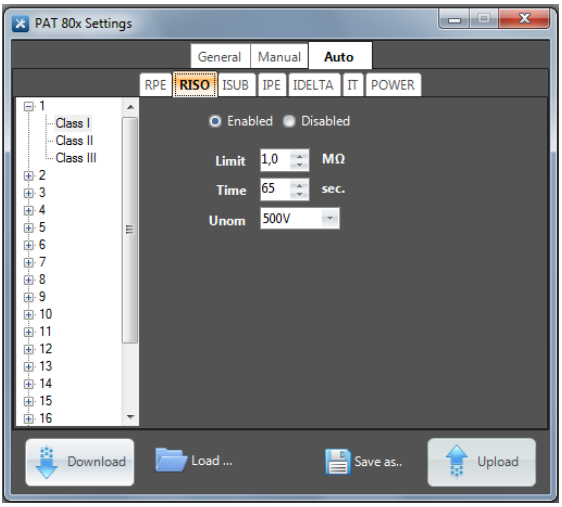
Window for configuring general settings.

You can use this module to enter your contact details which will be visible on the reports printed directly from the meter (using an optional printer). Moreover, here you can set the date, time and language of reports printed by the meter.

In **Manual** and **Auto** tabs you can configure the parameters of all measurements performed both individually and included in auto-tests.



Window for configuring manual measurements.



Window for configuring Auto-measurements.

The software enables user to read the current configuration of the meter, save the meter settings into a file, upload the configuration from a file, create files with different configurations, which is a simple way to prepare a number of configurations for various requirements, e.g. for different customers and quickly reset the meter according to current needs.

4 Measurements

Notes:

⚠

For the convenience of measurements on devices of Class II the socket marked with ⏚ symbol is connected with PE pin of the test socket. Do not connect dangerous voltage to this socket.

⚠

"I_2" banana socket is permanently connected to PE of IEC socket. Do not connect dangerous voltage to this socket.

- Tested device must be turned on.

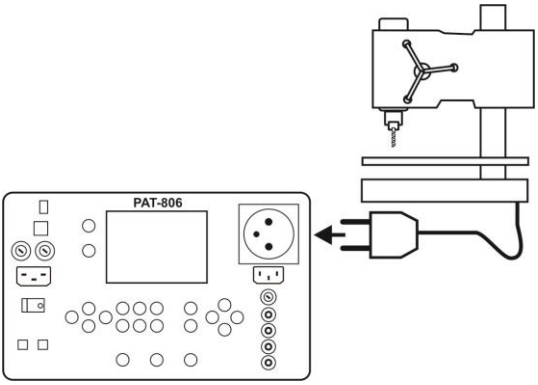
- Measurement activated with defined duration time = Cont - continuous measurement – lasts as long as **START** button is pressed. Maintaining the measurement is possible by pressing **ENTER** with **START** button kept pressed.

- Each measurement with duration = Cont - continuous measurement – maintaining the measurement by pressing **ENTER** may be stopped by pressing **STOP/ESC**.

- After completing each measurement use ◀, ▶ to see parameters (limits) including the date and time of measurement.
- All data can be entered using the program on your PC.

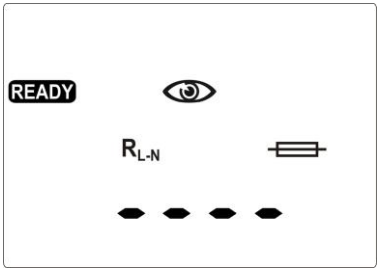
4.1 Preliminary test

1. Connect the mains plug of the tested device into the test socket of the meter.



2. 

Press the button of initial measurement R_{L-N}.
After that meter is prepared for measurement.



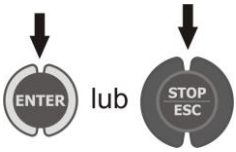
3. 

Press **START**.
Read the result.

Symbols PASS √ and FAIL × are blinking.

Symbol indicates the need for visual inspection on the tested device. Please check the power cord insulation, quality of housing and mains plug (for cracks or damages) etc.

4



Press **ENTER**, if this test is successful (PASS √ is displayed) or **STOP/ESC**, when the test result is negative (FAIL ✕ is displayed).

Symbol indicates the possibility to check the fuse removed from the tested device.

5

Contact the fuse with the test points. The efficiency of the fuse is indicated by displaying OK and an acoustic signal.

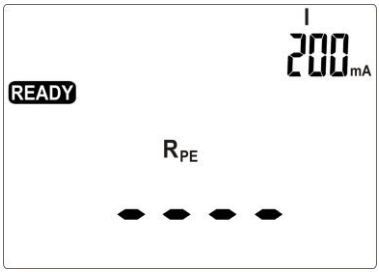
Notes:

- Tested device must be turned on.
- R_{L-N} measurement is intended for resistance objects, in case of inductive objects, the result may be burdened with an additional errors.
- Fuse test is possible when **READY** message is displayed.
- Do not touch the two metal ends of the fuse with your fingers during the test, because a blown fuse may be diagnosed as good.

4.2 Measurement of protective lead resistance using 200 mA current

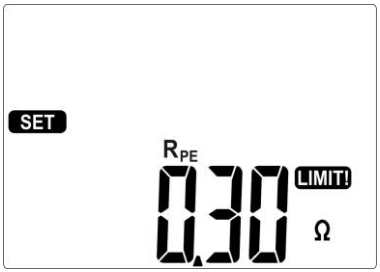
1

Keep pressing **R_{PE}** button, until the screen informing about the readiness for measurement with 200 mA current is displayed.



2

When parameters must be changed press **SET**.

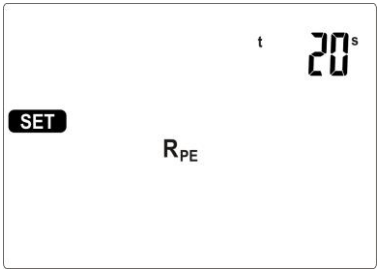


3

Use ▲, ▼ to set the upper limit of R_{PE} resistance.

4

Use ◄, ► to go to setting the time of measurement, using ▲, ▼ set the measurement time.

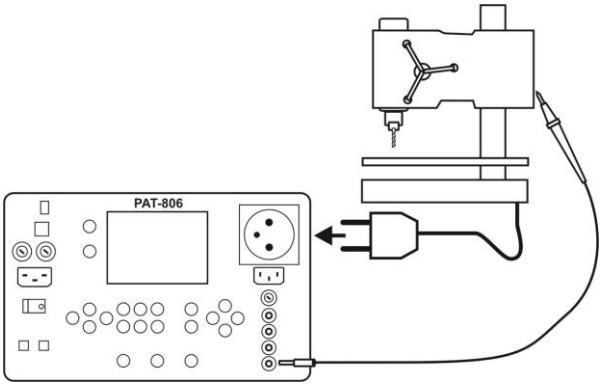


5

Press **ENTER** to confirm the settings.

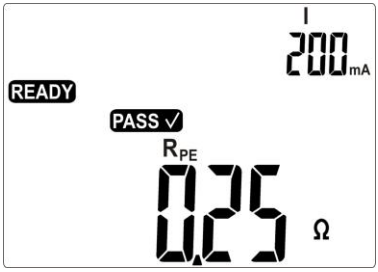
6

Connect the mains plug of the tested device into the test socket of the meter. Use the probe connected to socket **I2** and touch metal parts of the tested device connected to PE.

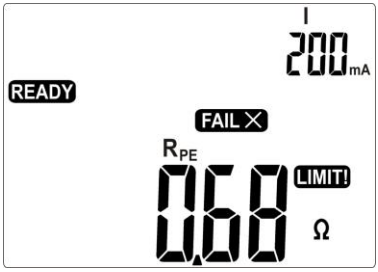


⑦

Press **START**.
After measuring is completed, read the result. The measurement may be stopped before the set time runs out by pressing **STOP/ESC**.



Correct result: R_{PE} < LIMIT



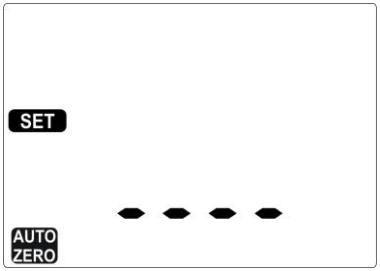
Incorrect result: R_{PE} > LIMIT

Notes:

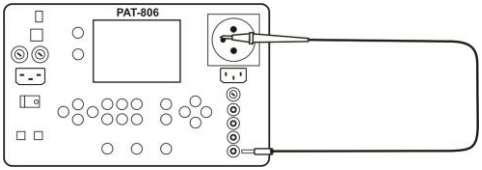
- Tested device must be turned on.
- Test circuit is electrically isolated from the mains and from PE mains lead.

4.3 Compensation of the test lead resistance during the measurement of the protective lead resistance using 200 mA current (auto-zero)

1. In **R_{PE} 200mA** mode, press ▼. Auto-zero screen will appear with blinking symbol AUTO ZERO.



2. Use the probe connected to **I2** socket and touch PE pin of the test socket.



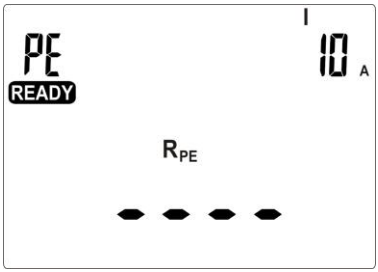
3. Press **START**, to begin auto-zero.
After finishing auto-zero process, for 1s is displayed message on and the meter enters the measuring function.

Completed auto -zero process is signalled during the measurement by displaying AUTO ZERO.
In order to remove auto-zero proceed in the same manner, but disconnect the test lead from PE. After finishing, for 1s is displayed message OFF.

4.4 Measurement of protective lead resistance using 10/25 A current

1

Keep pressing **RPE** button, until the screen informing about the readiness for measurement with desired current in desired configuration is displayed.



Symbol 2P indicates that 10/25, two-wire measurement is set, symbol 3P indicates that three-wire measurement is set, symbol 4P indicates that four-wire measurement is set. Another pressing of **RPE** results in switching current values and measurement types.

2

When parameters must be changed press **SET**. Setting is performed as in section 4.2.

Notes:

> ⚠
> **Note that any kind of adapter add extra resistance and thus the measurement result will be overestimated.**

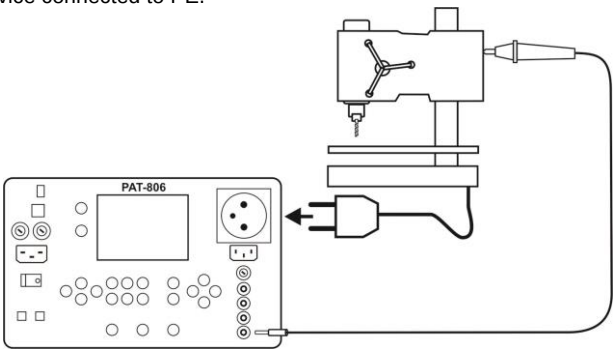
- For 10 A and 25 A current, there is no possibility of continuous measurement settings (Cont.) If such setting was set for the 200 mA current, then switching the meter to measure with 10/25 A current causes that a default value of 5 s. is set as measuring time.
- To avoid excessive heating of the measuring pin in PE socket, do not trigger the measurement with 25 A current at short intervals.
- The method of measurement and other observations are the same as for the measurement of 200 mA.

Additional information displayed by the meter

	Non-continuity in the test circuit during the measurement

4.4.1 Two-wire measurement of protective lead resistance using 10/25 A current

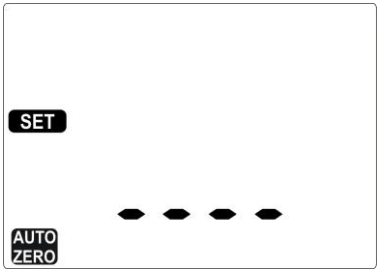
Connect the mains plug of the tested device into the test socket of the meter. Use the probe connected to socket **I2** and touch metal parts of the tested device connected to PE.



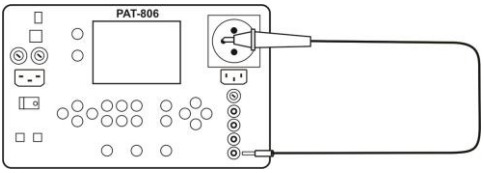
The method of measurement and observations are the same as for the measurement of 200mA.

4.4.2 Compensation of the test lead resistance during the measurement of the protective lead resistance using 10 A or 25 A current (auto-zero)

1. In R_{PE} **10A** or **25A** mode, press ▼. Auto-zero screen will appear with blinking symbol AUTO ZERO.



2. Use the probe connected to **I2** socket and touch PE pin of the test socket.



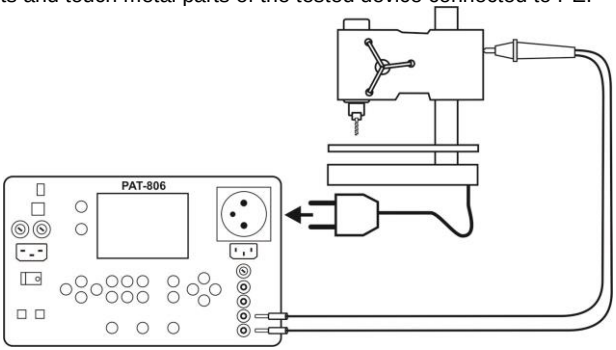
③

Press **START**, to begin auto-zero.
After finishing auto-zero process, for 1s the on message is displayed and the meter enters the measuring function.

Completed auto -zero process during the measurement is signalled by displaying AUTO ZERO.
In order to remove auto-zero proceed in the same manner, but disconnect the test lead from PE. After finishing for 1s the OFF message is displayed.

4.4.3 Three-wire measurement of protective lead resistance using 10/25 A current

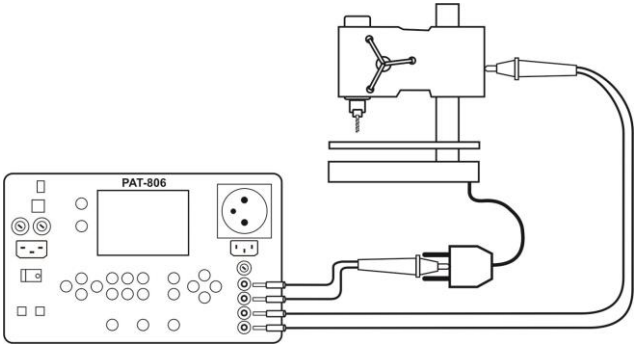
Connect the mains plug of the tested device into the test socket of the meter. Use the power probe (or Kelvin crocodile clip) connected to **U2** and **I2** sockets and touch metal parts of the tested device connected to PE.



The method of measurement and observations are the same as for the measurement of 200 mA.

4.4.4 Four-wire measurement of protective lead resistance using 10/25 A current

Connect one probe (or crocodile clip) connected to **I1**, **U1** sockets, to PE of power cable of the tested device. Use the power probe (or Kelvin crocodile clip) connected to **U2** and **I2** sockets and touch metal parts of the tested device connected to PE.

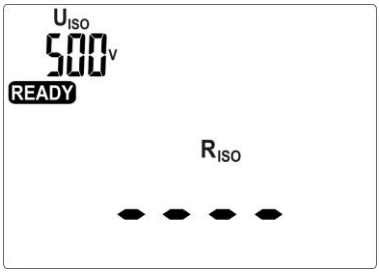


The method of measurement and observations are the same as for the measurement of 200 mA.

4.5 Measurement of insulation resistance

1

Press **R_{ISO}**. After that meter is prepared for measurement.



Further pressing of **R_{ISO}** results in switching from standard R_{ISO} measurement to a three-point measurement on welding equipment.

2

When parameters must be changed press **SET**. Setting is performed as in section 4.2 (lower limit is set). For the standard measurement the following parameters are set: U_{ISO} voltage, the lower limit value and measurement time. For the triple measurement U_{ISO} voltage is set for all three measurements as well as limits and measurement times for each measurement.

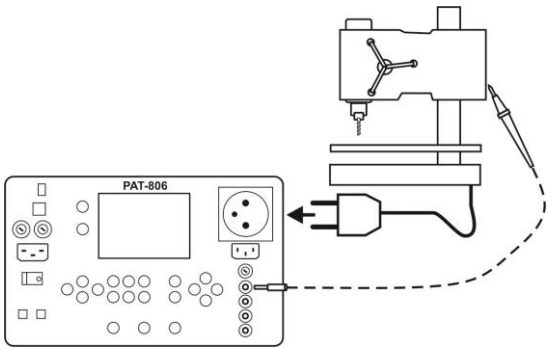
Notes:

- Tested device must be turned on.
- Test circuit is electrically isolated from the mains and from PE mains lead.
- The measurement result should be read after displayed values are stabilized.
- After the measurement the tested object is automatically discharged.

4.5.1 R_{ISO} measurement on devices of Class I

1

Connect the mains plug of the tested device into the test socket of the meter. The measurement is made between shorted L, N and PE. In addition, it is possible to carry out the measurement with the probe connected to **R_{ISO-}** socket.

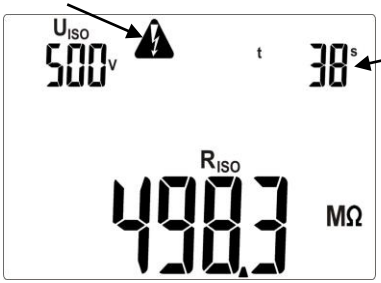


(2)

With continuous measurement set (time = Cont) press and hold **START**. To block the measurement press **ENTER**.
At the time with pre-set value it is not necessary.

Signalling the presence of high-voltage

View of the screen during measurement.



Time remaining to the end of the measurement

(3)

The measurement ends after a preset time runs out or after pressing **STOP/ESC**.
After measuring is completed, read the result.

Correct result: R_{ISO} > LIMIT

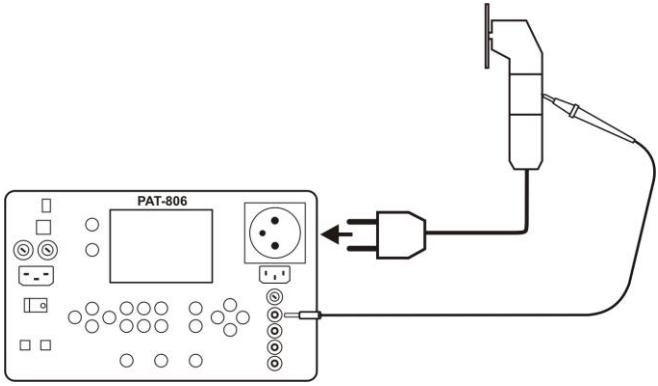
Incorrect result: R_{ISO} < LIMIT

Notes:

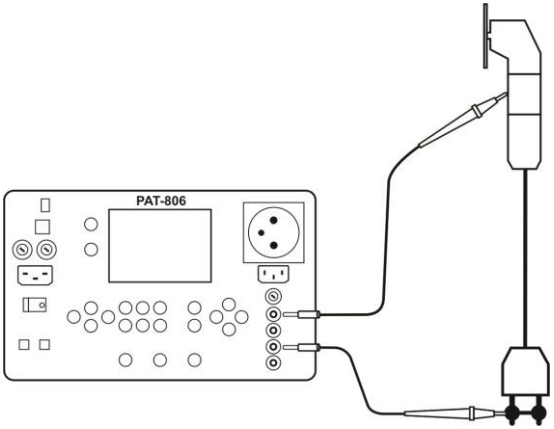
- Before the measurement (also in AUTO test) check the resistance of the protective conductor R_{PE}, which should be correct.

4.5.2 R_{ISO} measurement on devices of Class II (III)

Connect the mains plug of the tested device into the test socket of the meter. L and N are shorted. Use the probe connected to socket **R_{ISO-}** and touch the conductive accessible parts of the tested device.



It is also possible to perform measurement without the test socket - by using the following sockets: **R_{ISO-}** and **R_{ISO+}**.

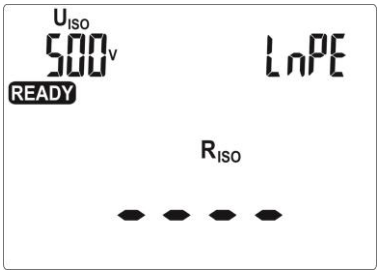


The measurement is performed similarly as in 4.5.1.

4.5.3 Three-point R_{ISO} measurement on welding equipment

1

Keep pressing **R_{ISO}** button, until the screen informing about the readiness for measurement is displayed.

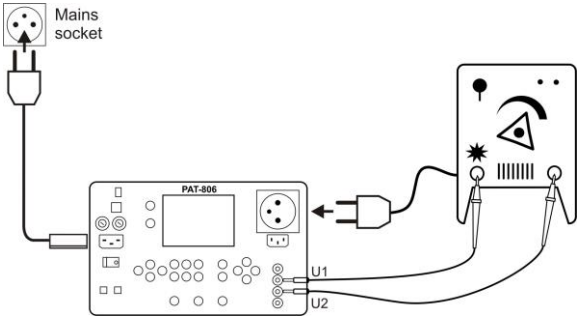


(2)

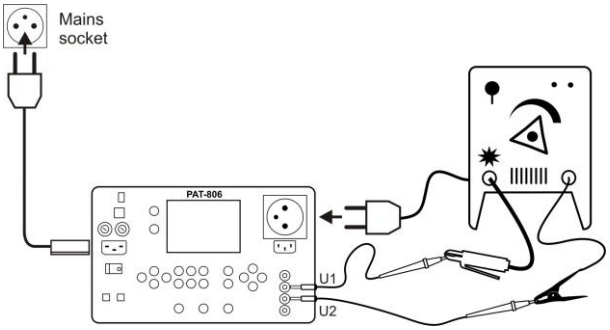
When parameters must be changed press **SET**. Setting is performed as in section 4.2. Measurement parameters are set in the following order: U_{ISO} ▶ a limit value for LN-PE measurement ▶ LN-PE measurement time ▶ a limit value for LN-S measurement ▶ LN-S measurement time ▶ a limit value for PE-S measurement ▶ PE-S measurement time, where S means shorted outputs of the welding machine.

(3)

Connect the socket plug of the tested device into the test socket of the meter, whereas the outputs to **U_1** and **U_2** sockets of the meter.



or additionaly:

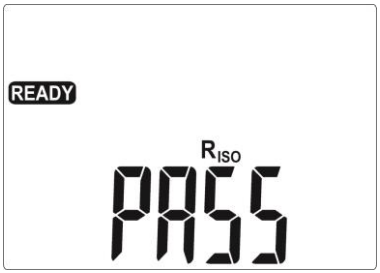


④

Press **START** button to start the measurements that are executed automatically one after the other.

⑤

The final measurement result for all resistances above the limit values are shown below.



Individual results and measurement parameters may be browsed with buttons ◀, ▶.

Notes:

- Pressing **STOP/ESC** button, when the result is displayed, stops the measurement with the current result and puts the meter into the readiness mode - the next measurement may be started by pressing **START** button.
Pressing **STOP/ESC** button, when horizontal lines are displayed, results in stopping the measurement. Press **START** button to re-start the measurement.
- In order to avoid the consequences of accidental connecting the welding machine plug into a power socket, the outputs of the welding machine are shorted by 10 kΩ resistance and this value is negligible when compared to the typical values of insulation resistance.

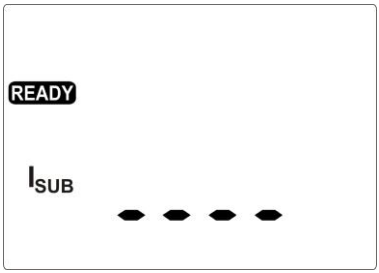
4.6 Measurement of substitute leakage current

⚠

I_{SUB} current is measured at 25 V...50 V voltage and its value is rescaled to the nominal mains voltage set in menu (see 3.3.7).

1

Press **I_{SUB}**. After that meter is prepared for measurement.

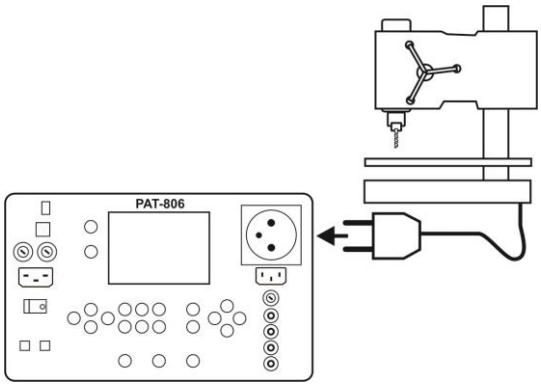


2

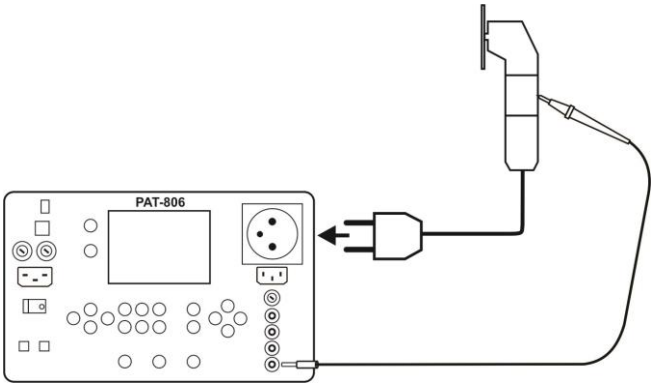
When parameters must be changed press **SET**. Setting is performed as in section 4.2.

3

For Class I, connect the mains plug of the tested device into the test socket of the meter.

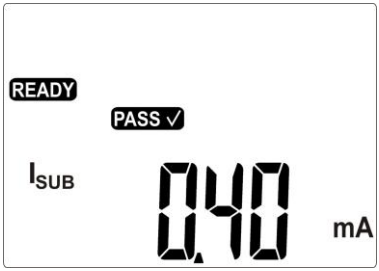


④ For Class II and for accessible parts not connected to PE in Class I, additionally connect **I2** socket to the probe which will be used for touching accessible parts of the tested device.

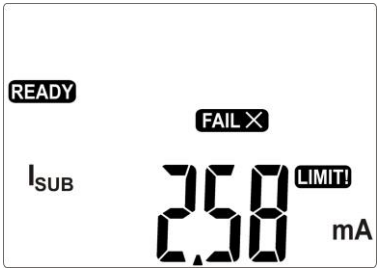


⑤ 

Press **START**.
After measuring is completed, read the result. The measurement may be stopped before the set time runs out by pressing **STOP/ESC**.



Correct result: I_{SUB} < LIMIT



Incorrect result: I_{SUB} > LIMIT

Notes:

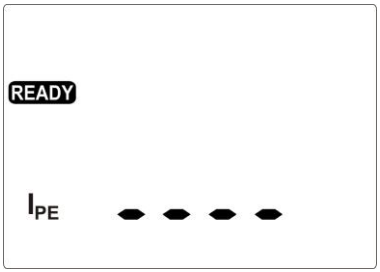
- Tested device must be turned on.
- Test circuit is electrically isolated from the mains and from PE mains lead.
- Test voltage is 25 V ... 50 V rms

4.7 Measurement of PE leakage current

⚠
It is recommended for checking the welding equipment to use the measurements: the leakage current of the primary circuit and leakage current welding circuit.

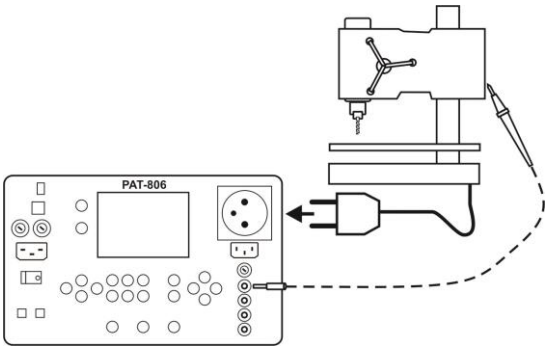
1

Press **I_{PE}**. After that meter is prepared for measurement.



2

Connect the mains plug of the tested device into the test socket of the meter. The measurement is made between shorted L, N and PE. In addition, it is possible to carry out the measurement with the probe connected to **R_{ISO-}** socket.



Settings and the measurement are as in 4.5.1.

Notes:

⚠
During the measurement in the test socket the voltage of mains is present.

⚠
During the measurement of a faulty device, RCD switch may be triggered off.

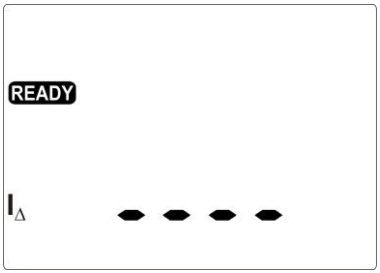
- PE leakage current is measured directly on this line enabling the user to get precise measurement results even when the device consumes 10 A or 16 A current. Note that if the current leakage is not caused by PE line but by other earthed elements (e.g. water pipe) – it cannot be measured in this measurement function. Then, it is recommended to perform a differential measurement of leakage current.
- Ensure that the location of the tested device is isolated.
- Tested device must be turned on.
- In the half-time of the measurement, the meter automatically changes the polarity of the test socket and as a result it displays the value of higher leakage current.

4.8 Measurement of differential leakage current

⚠
It is recommended for checking the welding equipment to use the measurements: the leakage current of the primary circuit and leakage current welding circuit.

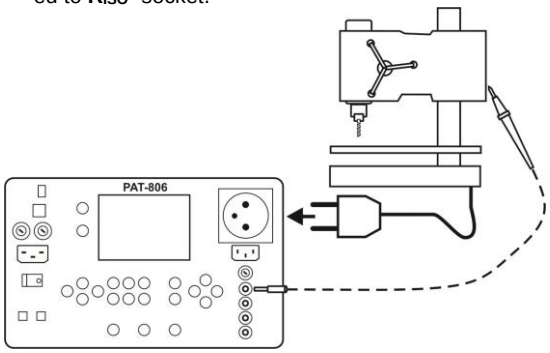
1

Press I_{Δ}. After that meter is prepared for measurement.



2

Connect the mains plug of the tested device into the test socket of the meter. The test consists in measuring the difference in currents flowing in the L and N conductors. In addition, it is possible to carry out the measurement with the probe connected to **R_{ISO-}** socket.



Settings and the measurement are as in 4.5.1.

Notes:

During the measurement in the test socket the voltage of mains is present.

During the measurement of a faulty device, RCD switch may be triggered off.

- Differential leakage current is measured as a difference between L current and N current. This measurement takes into account not only PE leakage current, but also leakage currents caused by other earthed elements - e.g. water pipe. The disadvantage of this measurement is the influence of the common current value (flowing to the tested device through line L and returning through line N) on the accuracy of the measurement. If this current is high, the measurement will be less accurate (as described in the technical data) than the measurement of PE leakage current.
- Tested device must be turned on.
- In the half-time of the measurement, the meter automatically changes the polarity of the test socket and as a result it displays the value of higher leakage current.
- The result of measurement may be affected by the presence of external fields and by the current used by the device.

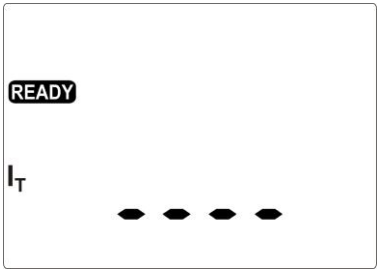
Note:
The differential method of leakage current measurement is permitted by EN 60974-4 standard as an alternative for measuring the primary leakage current performed during periodic tests of welding equipment.

4.9 Measurement of touch leakage current

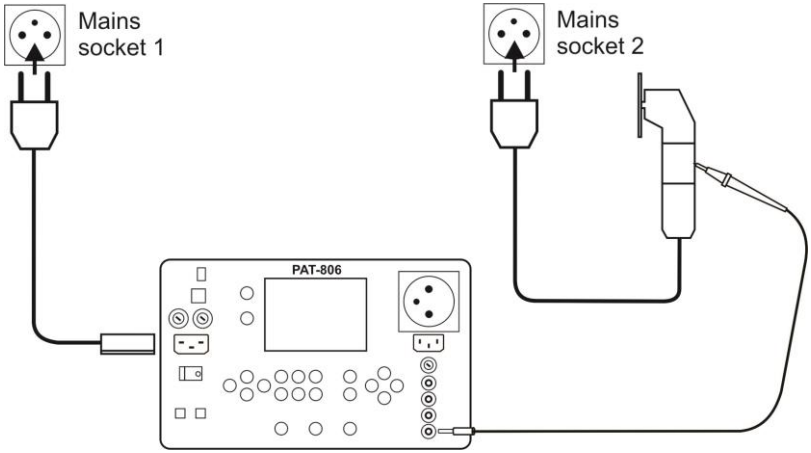
It is recommended for checking the welding equipment to use the measurements: the leakage current of the primary circuit and leakage current welding circuit.

1

Press I_T. After that meter is prepared for measurement.



(2) Supply the tested device from mains socket other than PAT (for Class I the socket must have PE). Additionally connect the probe which will be used for touching accessible parts of the tested device (for parts of Class I accessible and not connected to PE).



Settings and measurements as in section 4.5.

Notes:

- The measurement should be performed at both positions of the mains plug of the tested device and as the result the higher current value should be accepted.
- The bandwidth of test current results from the measuring system with adjusted touch current which simulates human perception and reaction, in accordance with EN 60990: 2002.

4.10 Measurement of leakage current in the primary circuit of the welding machine using PAT IPE adapter

Before performing the measurement, read the manual provided with PAT IPE adapter.

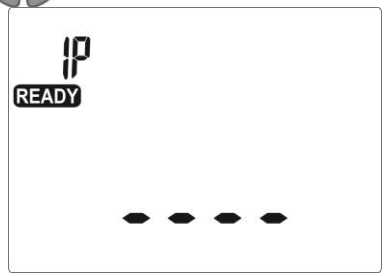
⚠
Following measurement method is recommended to check the welding machines (in accordance with PE-EN 60974-4 standard).

⚠
The adapter may be used only with PAT-806 device to measure the leakage current in the welding machine primary circuit. Any application that differs from those specified in the present manual may result in danger to the user. Do not use the adapter as an extension cord. Do not use the adapter for power measurements.

⚠
During the measurements performed on the welding circuit of the welding machine, the high-voltage contactless module used for igniting /arc sustaining (ionizer, HF), if present, should be disconnected or switched off.

1

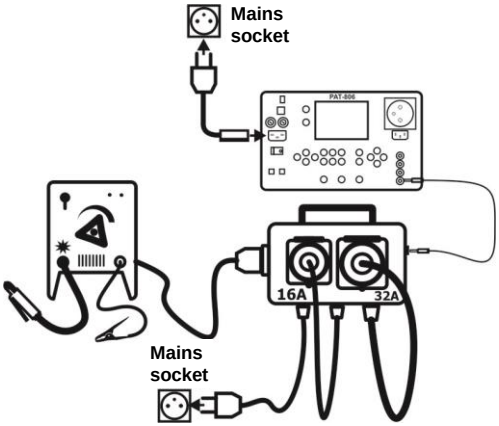
Press once or twice **IT/IP** button to display the below screen indicating that the device is ready for measurements.



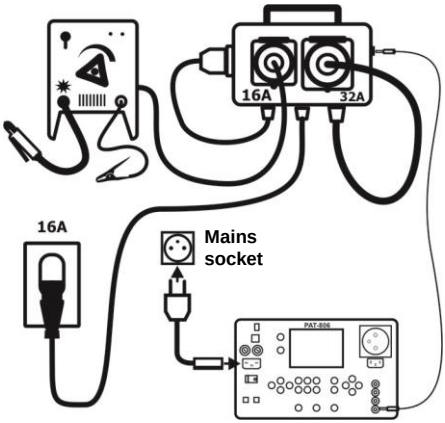
2

Depending on the type of power supply provided to the welding machine - apply one of the following diagrams. Unused leads must be plugged into appropriate sockets. Connect the banana socket of the adapter to **I2** socket of PAT-806.

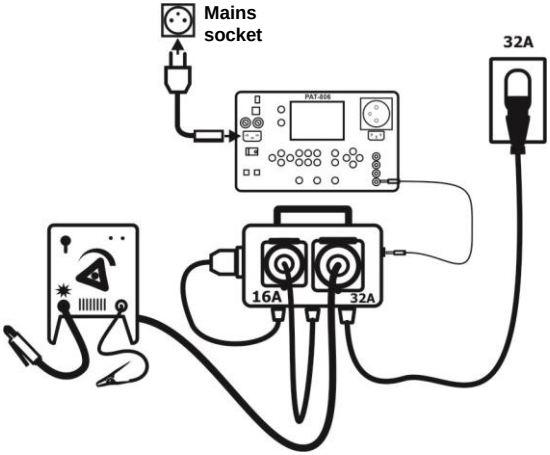
Power supply from 230 V mains



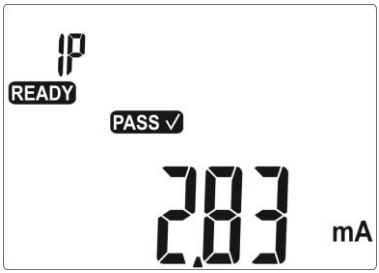
Three-phase power supply (16 A)



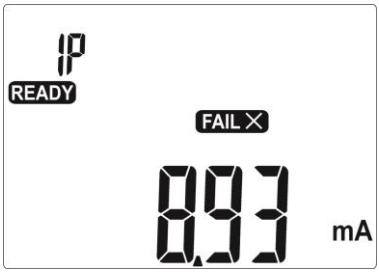
Three-phase power supply (32 A)



3 The measurement ends after the preset time runs out or after pressing **STOP/ESC**.
After the measurement is completed, read the result.



Correct result: I_P < LIMIT



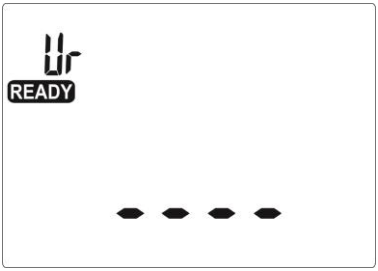
Incorrect result: I_P > LIMIT

Settings and measurements as in section 4.5.1.

4.11 Rated voltage measurement on welding equipment without load

1 

Press **U_0** button once or twice depending on chosen voltage measurement: r.m.s. Ur voltage or UP peak voltage. The screen informing about the readiness for measurement will be displayed with symbol Ur or UP.

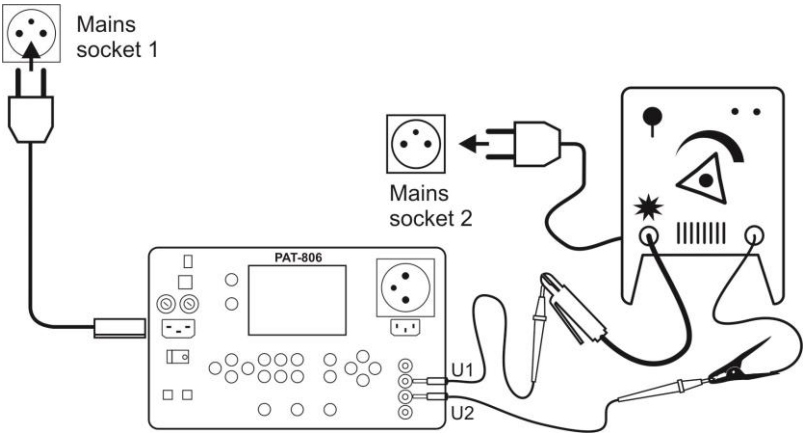


2

When the limit value must be changed press **SET**.

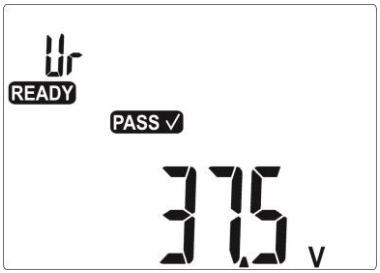
3

Connect the power plug of the tested welding machine to the mains socket, other than PAT. Connect the outputs of the welding machine to **U1** and **U2** sockets of the meter.



4

Press **START**. After the measurement is completed, read the result.



5

Perform the measurement for Ur and UP

Notes:

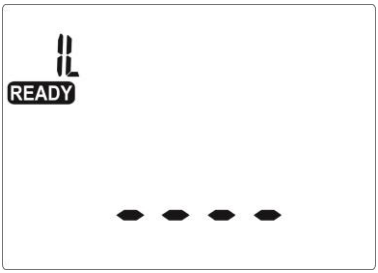
- During the measurement of r.m.s. voltage, the tested welding machine is loaded with 5 kΩ resistance, as defined in EN 60974-4.

- During the measurement of peak voltage the tested welding machine is loaded with the resistance varying in the range of 200 Ω...5 kΩ, as defined in EN 60974-4. Positive and negative peak values are measured and the highest measured value is displayed.
- Tested device must be turned on.
- The measuring time is not set.

4.12 Leakage current measurement on welding circuit I_L

1

Press **I_L**. The screen informing about the readiness for measurement will be displayed.

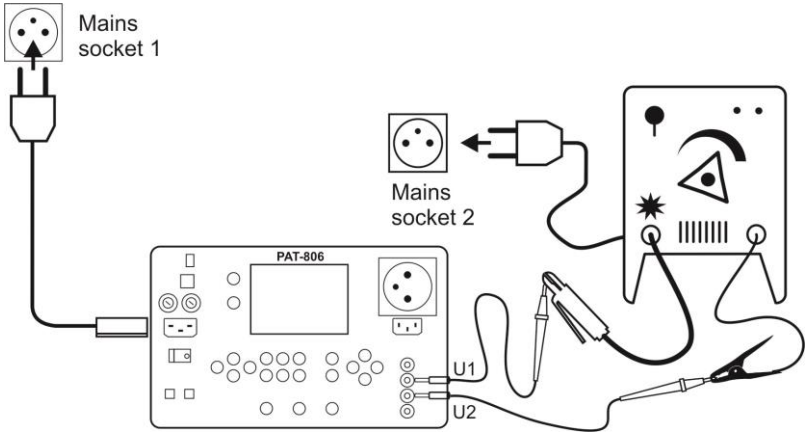


2

When parameters must be changed press SET (upper limit value and the measurement time are set).

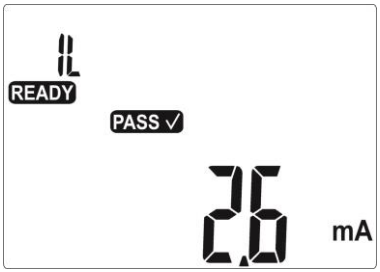
3

Connect the power plug of the tested welding machine to the mains socket, other than PAT. Connect the outputs of the welding machine to U1 and U2 sockets of the meter.



④

Press **START**. After the measurement is completed, read the result. The measurement may be stopped by pressing **STOP/ESC** button.



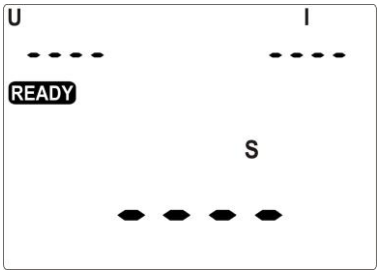
Notes:

- The measurement is performed in two stages: I_L leakage current is measured successively for both welding machine outputs and the higher value is displayed.
- Tested device must be turned on.
- The measurement is in compliance with EN 60974-4.

4.13 Measurement of current, power consumption and voltage

①

Press **VA**. After that meter is prepared for measurement.



②

Press **START**.
The measurement may be stopped before the set time runs out by pressing **STOP/ESC**.
After measuring is completed, read the result.
Symbols **PASS √** and **FAIL ✕** are blinking.

During the measurement current I is displayed alternatively with the time of measurement.

③ Press **ENTER**, if this test is successful (PASS √ is displayed) or **STOP/ESC**, when the test result is negative (FAIL ✕ is displayed).

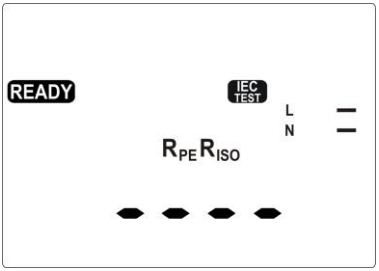
Notes:

> ⚠
> **During the measurement in the test socket the voltage of mains is present.**

4.14 IEC lead test

① 

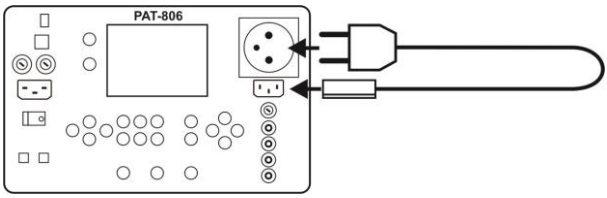
Keep pressing **AUTO/IEC** button, until the screen informing about the readiness for testing IEC conductor is displayed.



② 

When parameters must be changed press **SET**. Setting is performed as in section 4.2. The following must be successively set: LIMIT for R_{PE}, measurement time R_{PE}, LIMIT for R_{ISO}, measurement time R_{ISO}.

③ Connect the mains plug into the test socket and the other into the IEC socket.



④ 

Press **START**.
The measurement may be stopped before the set time runs out by pressing **STOP/ESC**.
After measuring is completed, read the result: PASS or FAIL.

Additional information displayed by the meter

	Lack of continuity in conductor L.
	Lack of continuity in conductor N.
	L and N are shorted.
	L and N are replaced.

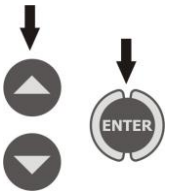
4.15 Automatic tests

① 

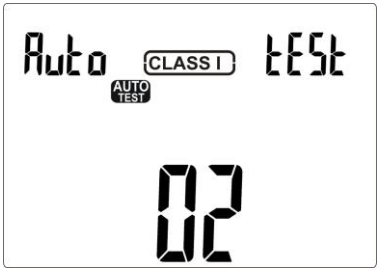
Keep pressing **AUTO/IEC**, until the screen with the test choice is displayed (1 ... 20), the number of test blinks.

Notes:

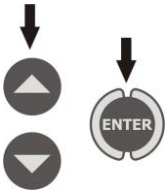
- Only numbers of programmed tests are displayed
- If no test is programmed, after pressing **AUTO** the meter immediately enters the set-up mode (SET is displayed).
- Programmed test is a test where at least for one class, one measurement is performed (set on YES).
- Default programmed tests are: 1 ... 4 for all three classes.

② 

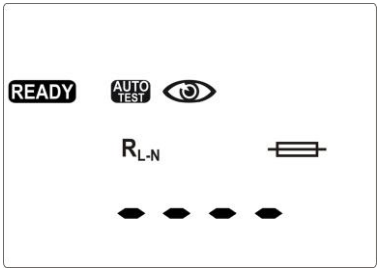
Use ▲, ▼ to set the number of chosen test and confirm by pressing **ENTER**.



3



Use ▲, ▼ to select the device class and confirm by pressing **ENTER**.



4

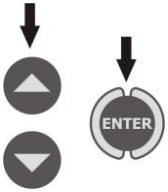
Press **START** to start the measurement.

To program an inactive test or change the parameters, after entering the AUTO mode ...

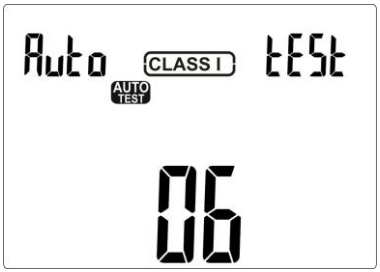
1

...press **SET** button.

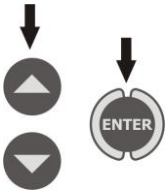
2



Use ▲, ▼ to set the number of chosen test and confirm by pressing **ENTER**.



③



Use ▲, ▼ to select the device class and confirm by pressing **ENTER**.

Now you can choose performing of individual measurements for a given test and class.

④

Use ▲ and ▼ to choose performing the measurement (YES) or cancel it (NO).

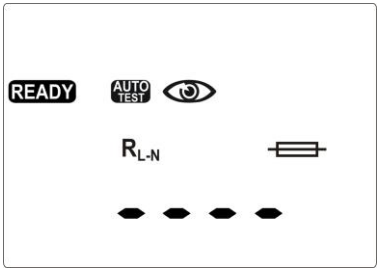
⑤

To change the parameters of the active measurement press **SET**. Set the next parameters as in section 4.2. Confirm by pressing **ENTER**. Use ▶ to activate and set parameters of the next measurement.

In this way, you may program the test by activating measurements in the following sequence: an initial measurement → R_E → R_{ISO} (1 - single, 3 - triple for welding machines) → I_{SUB} → I_{PE} → I_Δ → I_T → I_L (for welding machines) → Ur (for welding machines) → Up (for welding machines) → S.

⑥

After approving the last change by pressing **ENTER** press it two more times and the meter will enter standby mode displaying the following screen.



⑦

Press **START** to start the measurement.

Notes:

- Readiness for next measurement is obtained automatically, but the individual measurements should be initiated by pressing **START**, as in single measurements.
- The duration of the measurement may be reduced by pressing **STOP/ESC**. The result remains as at the time of stopping the measurement and the meter turns into standby mode until the next measurement. Double pressing of **STOP/ESC** interrupts the cycle of automatic measurement and all the previous results are lost.
- If the result of one of the tests is improper (FAIL), you may record it (finish the autotest by pressing **ENTER** and consider the tested device as faulty) or press **START** to repeat this test (e.g. when improper result was caused by an error in connections).
- For R_{ISO} measurement, there are three options: no - no R_{ISO} measurement, **R_{ISO} 1** - R_{ISO} standard measurement, **R_{ISO} 3** - R_{ISO} triple measurement - only for welding machines.

5 Memory of measurement result data

PAT-806 meter has memory divided into 10 banks of 99 cells. 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 option, 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.

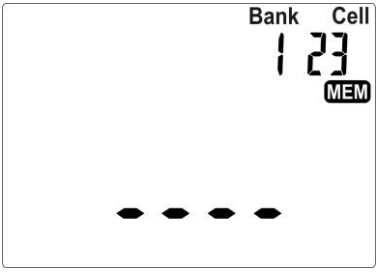
Notes:

- In a single cell you may store a set of results and other data (time, barcode, Pass/Fail, limit, etc) for AUTO and IEC test or the result of a single measurement (+ time, code, Pass / Fail).
- It is recommended to delete the memory after reading the data or before performing a new series of measurements that may be stored into the same memory cells as the previous ones.

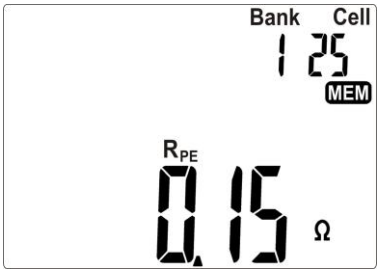
5.1 Storing the measurement results in the memory

1

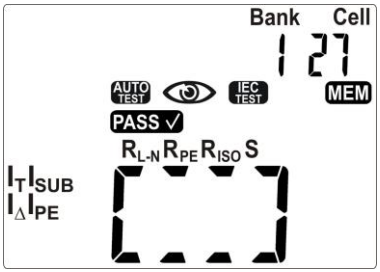
After completing measurement press **ENTER**.



Free cell.



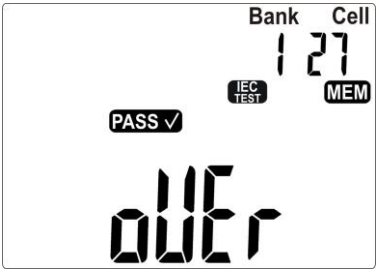
Cell is filled with the result of a single measurement.



Cell is filled with the result of AUTO test.

(2) Switch between the number of a bank or number of a cell by pressing **SET** (chosen digit blinks), chose the number using ▲ and ▼. Enter into the memory by pressing **ENTER**.

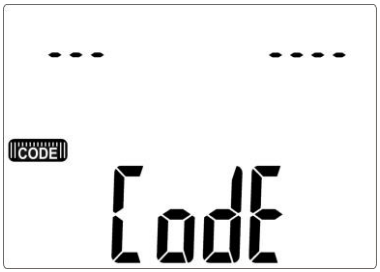
(3) If you try to store data in an occupied memory cell, the following warning message will appear:



(4) Press **ENTER**, to overwrite the result or **STOP/ESC**, to cancel saving.

Notes:

- If the meter is set to work with the barcode reader, before exiting to the screen with the measurement, the following screen will be displayed:



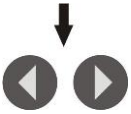
Read the bar-code of the tested device, then the meter will record the result and the code in selected memory cell, and it will proceed to the measurement screen. In order to skip reading the barcode press **ENTER**.

5.2 Viewing memory data

1. 

In the mode of displaying the mains voltage press **ENTER**.

2. To select a number of the data bank and cell, proceed as described in 5.1.

3. 
Using ◀ and ▶ you may scroll through the components of the result and other data such as date/time of measurement and bar code.

5.3 Deleting memory data

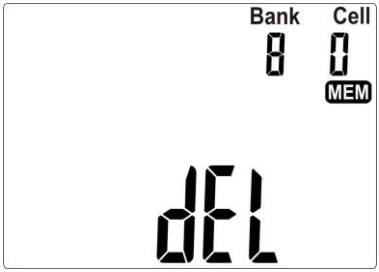
1. 

In the mode of displaying the network voltage press **ENTER**.

5.3.1 Deleting bank data

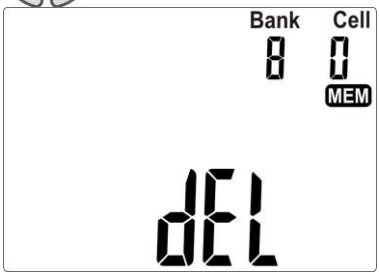
2

Use ▲ and ▼ set the number of a cell on 0. Press **SET** to select the number of a bank. Use ▲ and ▼ set the bank number to be deleted.

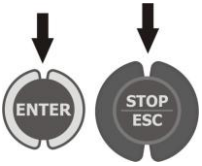


3

Press **ENTER**. A message will be displayed asking you to confirm your choice and informing about the loss of data contained in the bank.



4



Press **ENTER**, to start deleting or **STOP/ESC**, to cancel.

5.3.2 Deleting the whole memory

(2) 

Use ▲ and ▼ set the number of bank at 0.

(3) Proceed similarly as when deleting data bank.

6 Report printing

To print a measurement report set the operation with printer in general settings (par. 3.2.6). The printer must be connected to any of the USB socket of "Host" type. To start printing, press button  . Te following will be displayed Prnt and OK. Printing may be activated:

- after completing a single measurement, when the result is presented,
- After completing the measurement in AUTO mode, when the result is presented,
- while browsing the memory, if the selected cell contains data.

If the meter is set to work with the barcode reader, the meter will ask you to read the code (see par. 5.1). This does not apply printing from a memory cell which had the barcode already saved.

Supported types of printers: Brother PT-9700PC, Brother QL-720NW, Brother QL-820NWB.

7 Data transmission

7.1 Computer connection accessories

In order to operate the meter with a PC, an USB cable is required and appropriate software. The kit includes "Sonel Reader" software used for reading data. Increased ability to read data and create reports are provided by "Sonel PAT" software, which can be purchased from the manufacturer or authorized distributor.

The software may be used for many devices manufactured by SONEL S.A. which are equipped with the USB interface.

Detailed information regarding software is available from the manufacturer or an authorised distributor.

7.2 Data transmission with USB port

1. Connect the cable to the USB port of the computer and the USB socket of the meter.
2. In general settings, select data transmission (section 3.2.3).
3. Start the programme.

8 Cleaning and maintenance

NOTE!
Apply solely 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 might scratch the casing (powders, pastes, etc.).

The electronic system of the meter does not require maintenance.

9 Storage

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

- Disconnect all the test leads from the meter.
- Clean the meter and all its accessories thoroughly.

10 Dismantling and disposal

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

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

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

Observe the local regulations concerning disposal of packages.

11 Technical specifications

⇒ Abbreviation "m.v." used in the specification of measurement uncertainty means a standard measured value.
⇒ Ranges and uncertainties are additionally provided according to DIN VDE 404-1.

Measurement of network voltage

Display range	Resolution	Measurement uncertainty (basic)
187.0 V…265.0 V	0.1 V	±(2 % m.v. + 2 digits)

- measurement of the mains voltage between L and N of power supply to the meter

Measurement of network frequency

Display range	Resolution	Measurement uncertainty (basic)
45.0 Hz…55.0 Hz	0.1 Hz	±(2 % m.v. + 2 digits)

- measurement of the mains voltage frequency of power supply to the meter

Measurement of PE network (mains) voltage

Display range	Resolution	Measurement uncertainty (basic) *
0.0 V ... 59.9 V	0.1 V	±(2 % m.v. + 2 digits)

- measurement of the mains voltage between PE and N of power supply to the meter

* for U < 5 V accuracy ic not specified

Resistance measurement for L - N circuit

Display range	Resolution	Measurement uncertainty (basic)
0 Ω…999 Ω	1 Ω	±(5 % m.v. + 5 digits)
1.00 kΩ ... 4.99 kΩ	0.01 kΩ	

- test voltage: 4 V ... 8 V AC
- short-circuit current: max. 5 mA

Checking the fuse

- test voltage: 4 V ... 8 V AC
- test current: max. 5 mA

Measurement resistance of protective conductor I=200 mA (only Protection Class I)

Display range	Resolution	Measurement uncertainty (basic)
0.00 Ω ... 0.99 Ω	0.01 Ω	±(4 % m.v. + 2 digits)
1.00 Ω ... 19.99 Ω		±(4 % m.v. + 3 digits)

Influencing factor	Designation	Additional uncertainty
Position	E_1	0 %
Supply voltage	E_2	0 %
Temperature	E_3	0.1 %/° C for R ≥ 0.5 Ω 0 %/ºC for R < 0.5 Ω

- unloaded output voltage: 4 V ... 12 V AC
- Test current: ≥ 200 mA for R = 0.2 Ω ... 1.99 Ω
- adjustable upper limit in the range of: 10 mΩ …1.99 Ω with resolution 0.01 Ω
- adjustable measuring time: 1 s…60 s with a resolution of 1 s, and "Cont" mode (continuous measurement) at point 0

Measurement resistance of protective conductor I=10 A (only Protection Class I)

Display range	Resolution	Measurement uncertainty (basic)
0 mΩ...999 mΩ	1 mΩ	±(3 % m.v. + 4 digits)
1.00 Ω ... 1.99 Ω	0.01 Ω	±(3 % m.v. + 40 digits)*

* for two-wire measurement

Influencing factor	Designation	Additional uncertainty
Position	E_1	0 %
Supply voltage	E_2	0 %
Temperature	E_3	0.1 %/ºC

- unloaded output voltage: <12 V AC
- Test current: ≥ 10 A for R ≤ 0.5 Ω
- adjustable upper limit in the range of: 10 mΩ …1.99 Ω with resolution 0.01 Ω
- adjustable measuring time in the range of: 1 s…60 s with resolution of 1 s

Measurement resistance of protective conductor I=25 A (only Protection Class I)

Display range	Resolution	Measurement uncertainty (basic)
0 mΩ...999 mΩ	1 mΩ	±(3 % m.v. + 4 digits)
1.00 Ω ... 1.99 Ω	0.01 Ω	±(3 % m.v. + 40 digits)*

* for two-wire measurement

Influencing factor	Designation	Additional uncertainty
Position	E_1	0 %
Supply voltage	E_2	0 %
Temperature	E_3	0.1 %/ºC

- unloaded output voltage: <12 V AC
- test current: ≥ 25 A for R ≤ 0.2 Ω
- adjustable upper limit in the range of: 10 mΩ …1.99 Ω with resolution 0.01 Ω
- adjustable measuring time in the range of: 1 s…60 s with resolution of 1 s

Measurement of insulation resistance using test voltage of 100 V

Test range according to IEC 61557-2 for U_N = 100 V: 100 kΩ…99.9 MΩ

Display range	Resolution	Measurement uncertainty (basic)
0 kΩ...1999 kΩ	1 kΩ	± (5 % m.v. + 8 digits)
2.00 MΩ ... 19.99 MΩ	0.01 MΩ	
20.0 MΩ ... 99.9 MΩ	0.1 MΩ	

Influencing factor	Designation	Additional uncertainty
Position	E_1	0 %
Supply voltage	E_2	0 %
Temperature	E_3	0.1 %/ºC
Capacity	E_7	0 % for R ≤ 20 MΩ unspecified for R> 20 MΩ

- Accuracy of generated voltage (Robc [Ω] ≥ 1000*UN [V]): -0 % +30 % from the set value
- nominal current: min 1 mA ... 1.4 mA
- adjustable lower limit within the range of 0.1 MΩ ….9.9 MΩ with resolution of 0.1 MΩ
- adjustable measuring time: "Cont" mode (continuous measurement) 4 s…3 min with a resolution of 1 s
- detection of a dangerous voltage before commencing a measurement
- discharging the object tested

Note: For R <50 kΩ, the uncertainty is not specified.

Measurement of insulation resistance using test voltage of 250 V

Test range according to IEC 61557-2 for U_N = 250 V: 250 kΩ…199.9 MΩ

Display range	Resolution	Measurement uncertainty (basic)
0 kΩ...1999 kΩ	1 kΩ	± (5 % m.v. + 8 digits)
2.00 MΩ ... 19.99 MΩ	0.01 MΩ	
20.0 MΩ...199.9 MΩ	0.1 MΩ	

Influencing factor	Designation	Additional uncertainty
Position	E_1	0 %
Supply voltage	E_2	0 %
Temperature	E_3	0.1 %/ºC
Capacity	E_7	0 % for R ≤ 20 MΩ unspecified for R> 20 MΩ

- Accuracy of generated voltage (Robc [Ω] ≥ 1000*UN [V]): -0 % +30 % from the set value
- nominal current: min 1 mA ... 1.4 mA
- adjustable lower limit within the range of 0.1 MΩ ….9.9 MΩ with resolution of 0.1 MΩ
- adjustable measuring time: "Cont" mode (continuous measurement) 4 s…3 min with a resolution of 1 s
- detection of a dangerous voltage before commencing a measurement
- discharging the object tested

Note: For R <50 kΩ, the uncertainty is not specified.

Measurement of insulation resistance using test voltage of 500 V

Test range according to IEC 61557-2 for U_N = 500 V: 500 kΩ…599.9 MΩ

Display range	Resolution	Measurement uncertainty (basic)
0 kΩ...1999 kΩ	1 kΩ	± (5 % m.v. + 8 digits)
2.00 MΩ ... 19.99 MΩ	0.01 MΩ	
20.0 MΩ...599.9 MΩ	0.1 MΩ	

Influencing factor	Designation	Additional uncertainty
Position	E_1	0 %
Supply voltage	E_2	0 %
Temperature	E_3	0.1 %/ºC
Capacity	E_7	0 % for R ≤ 20 MΩ unspecified for R> 20 MΩ

- Accuracy of generated voltage (Robc [Ω] ≥ 1000*UN [V]): -0 % +30 % from the set value
- nominal current: min 1 mA ... 1.4 mA
- adjustable lower limit within the range of 0.1 MΩ ….9.9 MΩ with resolution of 0.1 MΩ
- adjustable measuring time: "Cont" mode (continuous measurement) 4 s…3 min with a resolution of 1 s
- detection of a dangerous voltage before commencing a measurement
- discharging the object tested

Note: For R <50 kΩ, the uncertainty is not specified.

Measurement of substitute leakage current

Display range	Resolution	Measurement uncertainty (basic)
0.00 mA ... 3.99 mA	0.01 mA	± (5 % m.v. + 2 digits)
4.0 mA ... 19.9 mA	0.1 mA	

Influencing factor	Designation	Additional uncertainty
Position	E_1	0 %
Supply voltage	E_2	0 %
Temperature	E_3	0.075 %/ºC

- opening voltage: 25 V ... 50 V
- internal resistance of the testing device 2 kΩ ± 20 %
- adjustable upper limit in the range of: 0.01 mA ... 9.9 mA 0.01 mA with resolution of 0.01 mA / 0.1 mA
- adjustable measuring time in the range of: Cont , 4 s…60 s with resolution of 1 s

Measurement of PE leakage current

Note: In the half-time of the measurement, the meter automatically changes the polarity of the test socket and as a final result it displays the value of higher leakage current.

Display range	Resolution	Measurement uncertainty (basic)
0.00 mA ... 3.99 mA	0.01 mA	± (5 % m.v. + 2 digits)
4.0 mA ... 19.9 mA	0.1 mA	

Influencing factor	Designation	Additional uncertainty

Position	E_1	0 %
Supply voltage	E_2	0 %
Temperature	E_3	0.1 %/ºC
Power consumption of the tested unit	E_4	0 %
Low frequency magnetic field	E_5	0.02 mA I <4 mA 0 for I ≥ 4 mA
The shape of the network voltage (CF)	E_8	0 %

- measurements are made using mains voltage
- bandwidth of current measurement 40 Hz ... 100 kHz
- uncertainty related to the measurement within the bandwidth up to 100 kHz should not exceed ± 3 dB for 100 kHz
- adjustable upper limit in the range of: 0.01 mA ... 9.9 mA with resolution of 0.01 mA / 0.1 mA
- adjustable measuring time in the range of: Cont , 4 s…60 s with resolution of 1 s

Measurement of differential leakage current

Note: In the half-time of the measurement, the meter automatically changes the polarity of the test socket and as a final result it displays the value of higher leakage current.

Display range	Resolution	Measurement uncertainty (basic)
0.00 mA ... 3.99 mA	0.01 mA	± (5 % m.v. + 2 digits)
4.0 mA ... 19.9 mA	0.1 mA	

Influencing factor	Designation	Additional uncertainty
Position	E_1	0 %
Supply voltage	E_2	0 %
Temperature	E_3	0.1 %/ºC
Power consumption of the tested unit	E_4	Current common / Additional uncertainty 0 A...4 A / 0 4 A...8 A / ±0.03 mA 8 A...16 A / ±0,08 mA
Low frequency magnetic field	E_5	2 digits I <4 mA 0 digit for I ≥ 4 mA
The shape of the network voltage (CF)	E_8	0 %

- bandwidth of current measurement 20 Hz ... 100 kHz
- uncertainty related to the measurement within the bandwidth up to 100 kHz should not exceed ± 3 dB for 100 kHz
- adjustable upper limit in the range of: 0.01 mA ... 9.9 mA with resolution of 0.01 mA / 0.1 mA
- adjustable measuring time in the range of: Cont , 4 s…60 s with resolution of 1 s

Measurement of touch leakage current

Display range	Resolution	Measurement uncertainty (basic)
0.000 mA...4.999 mA	0.001 mA	± (5 % m.v. + 3 digits)

Influencing factor	Designation	Additional uncertainty
Position	E_1	0 %
Supply voltage	E_2	0 %
Temperature	E_3	0,25 µA/ºC
The shape of the network voltage (CF)	E_8	0 %

- the bandwidth of test current results from the measuring system with adjusted touch current which simulates human perception and reaction, in accordance with EN 60990: 2002
- adjustable upper limit in the range of: 0.01 mA ... 1.99 mA with resolution 0.01 mA
- adjustable measuring time in the range of: Cont , 4 s…60 s with resolution of 1 s

Rated voltage measurement on welding equipment without load U_0

Measurement of voltage U_R (r.m.s.)

Display range	Resolution	Measurement uncertainty (basic)
5.0 V…170.0 V	0.1 V	±(2.5 % m.v. + 5 digits)

- adjustable upper limit in the range of: 5,0 V…170,0 V with resolution of 1 V

Measurement of voltage U_P (peak)

Display range	Resolution	Measurement uncertainty (basic)
5.0 V…240.0 V	0.1 V	±(2.5 % m.v. + 5 digits)

- adjustable upper limit in the range of: 5.0 V…240.0 V with resolution of 1 V

Leakage current measurement on welding circuit I_L

Display range	Resolution	Measurement uncertainty (basic)
0.00 mA…14.99 mA	0.01 mA	±(5 % m.v. + 2 digits)

Influencing factor	Designation	Additional uncertainty
Position	E_1	0 %
Supply voltage	E_2	0 %
Temperature	E_3	0.25 µA/ºC
The shape of the network voltage (CF)	E_8	0 %

- current measurement range results from the applied measurement system, which is in accordance with EN 60974-4
- adjustable upper limit in the range of: 0.10 mA…14.90 mA with resolution of 0.1 mA
- adjustable measuring time in the range of: 6 s…60 s with resolution of 1 s

Power measurement S

Display range	Resolution	Measurement uncertainty (basic)
0 VA...999 VA	1 VA	± (5 % m.v. + 3 digits)
1 kVA …3.99 kVA	0.01 kVA	

- adjustable measuring time in the range of: Cont , 1 s…60 s with resolution of 1 s

Current consumption measurement

Display range	Resolution	Measurement uncertainty (basic)
0.00 A ... 15.99 A	0.01 A	± (2 % m.v. + 3 digits)

- adjustable measuring time in the range of: Cont , 1 s…60 s with resolution of 1 s

Measurement of voltage at the test socket

Display range	Resolution	Measurement uncertainty (basic)
187.0 V ... 265.0 V	0.1 V	±(2 % m.v. + 2 digits)

Other technical specification

a) type of insulation.....double, EN 61010-1 and IEC 61557 compliant

NOTE!
During the measurement of S, I_{Δ}, I_{PE} and I_T PE of the power supply socket is connected to PE of the test socket.

b) measurement category ..... II 300 V acc. to EN 61010-1
c) protection class of enclosure acc. to EN 60529 ..... IP40
d) power supply for the meter.....187 V…265 V, 50 Hz
e) load current..... max 16 A (230 V)
f) dimensions .....330 mm x 235 mm x 120 mm
g) meter weight ..... approx. 5,0 kg
h) storage temperature.....–20 °C...+70 °C
i) operating temperature.....0 °C...+40 °C
j) humidity ..... 20 %…80 %
k) nominal temperature .....+20 °C...+25 °C
l) reference humidity ..... 40 %…60 %
m) altitude (above sea level) .....< 2000 m
n) display ..... LCD, segment
o) memory of measurement results .....990 cells
p) data transmission.....USB 2.0
q) quality standard .....development, design and manufacturing are ISO 9001 compliant
r) the product meets the EMC requirements acc. to ..... EN 61326-1 and EN 61326-2-2

Note:
During the measurement of PE continuity with PE 10/25 current the meter may produce interference with values exceeding allowable limits defined in EN 61326-1 and cause interference in other devices.

Note:
F500mA/250V fuse protects the following measurements: R_{PE} 200mA, I_T and I_L.

12 Accessories

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

12.1 Standard accessories

Standard set of equipment supplied by the manufacturer includes:
- power lead 1pc – **WAPRZZAS1**
- test lead banana/banana, black 1.2m 1pc – **WAPRZ1X2BLBB2X5**
- 1.2 m double-wire lead (10/25A) U2/I2 1pc – **WAPRZ1X2DZBB2**
- black crocodile clip 1kV 1pc – **WAKROBL30K03**
- Kelvin crocodile clip 1pc – **WAKROKELK06**
- 1kV probe - black 1pc – **WASONBLOGB3**
- power probe Sonel 1pc – **WASONSPGB1**
- USB cable – **WAPRZUSB**
- fuse 0314 015.VXP 15A 250VAC 6.3x32mm Littlefuse 2 pcs – **WAPOZB15PAT**
- cover – **WAFUTL5**
- user manual
- calibration certificate issued by an accredited laboratory

12.2 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:
- barcode stickers
- PASS stickers (roll - 50 pieces of stickers)
- FAIL stickers (roll - 50 pieces of stickers)
- barcode stickers (roll - 100 stickers)
- 1.2 m double-wire lead (10/25A) U1/I1 – **WAPRZ1X2DZBB1**
- black crocodile clip 1kV – **WAKROBL20K01**
- brush probe for PAT Testers – **WASONSZ1**
- cable - adapter Shuko / IEC (for testing extensions) – **WAADAPATIEC2**
- three phase socket adapter 16A* – **WAADAPAT16P**
- three phase socket adapter 16A, switchable** – **WAADAPAT16PR**
- PAT16-C three-phase socket adapter 16 A (4P) – **WAADAPAT16C**
- PAT16-CPR three-phase socket adapter 16 A (4P, switchable) – **WAADAPAT16CPR**
- three phase socket adapter 32A* – **WAADAPAT32P**
- three phase socket adapter 32A, switchable**– **WAADAPAT32PR**
- PAT32-C three-phase socket adapter 32 A (4P) – **WAADAPAT32C**
- PAT32-CPR three-phase socket adapter 32 A (4P, switchable) – **WAADAPAT32CPR**

- adapter for industrial sockets 16A*** – **WAADAPAT16F1**
- adapter for industrial sockets 32A*** – **WAADAPAT32F1**
- adapter for measuring leakage currents PAT IPE – **WAADAPATIPE**
- adapter IEC 60320 C6 Plug to IEC 60320 C13 Connector Block – **WAADAPATIEC1**
- USB barcode reader – **WAADACK1**
- USB printer for reports / codes, portable – **WAADAD1**
- Sonel PAT software – **WAPROSONPAT2**

* - These adapters have permanently shorted lines of three-phase socket: L1, L2, L3 and they are connected to L line of one-phase socket.
** - These adapters have a rotary switch providing the following connections:
1 - L of test socket connected to L1
2 - L of test socket connected to L2
3 - L of test socket connected to L3
4 - L of test socket connected to L1+L2+L3 (shorted)

*** - These adapters are designed for testing security of devices powered from industrial sockets 16 A and 32 A, providing that the tested device does not consume current higher than 16 A. The adapters enable users to perform all measurements available in PAT-806 meter on the network measurement socket.

NOTE!
Adapters for three-phase sockets and for 32 A industrial sockets must not be used for the following measurements: leakage currents I_{PE} and I_{Δ}, power and current consumption (for detailed information on the use of adapters see PAT Adapters User's Guide).

13 Manufacturer

The manufacturer of the device, which also provides guarantee and post-guarantee service is the following company:

SONEL S.A.
Wokulskiego 11
58-100 Świdnica
Poland
tel. +48 74 858 38 60
fax +48 74 858 38 09
E-mail: export@sonel.pl
Web page: www.sonel.pl

Attention:
Service repairs must be realised solely by the manufacturer.

14 Laboratory services

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

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

- **METERS FOR MEASUREMENTS OF ELECTRICAL PARAMETERS**
  - voltage meters,
  - current meters (including clamp meters),
  - resistance meters,
  - insulation resistance meters,
  - earth resistance and resistivity meters,
  - RCD meters,
  - short-circuit loop impedance meters,
  - power quality analyzers,
  - portable appliance testers (PAT),
  - power meters,
  - multimeters,
  - multifunction meters covering the functions of the above-mentioned instruments,
- **ELECTRICAL STANDARDS**
  - calibrators,
  - resistance standards,
- **METERS FOR MEASUREMENTS OF NON-ELECTRICAL PARAMETERS**
  - pyrometers,
  - thermal imagers,
  - luxmeters.

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

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

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

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

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WARNINGS AND GENERAL INFORMATION DISPLAYED BY THE METER

-PE Con + ⚠ + acoustic signal	Lack of EP continuity, measurements are blocked message Con blinks).
U_{N-PE} 38.7 V + ⚠ + acoustic signal	Voltage U_{N-PE} > 25V, measurements are blocked (the voltage value blinks).
> 265 V + acoustic signal	Mains voltage > 265V, measurements are blocked.
	Exchanged L and N, measurements are possible.
Cont	Lack of continuity or poor connection quality.
PASS ✓ , PASS	Correct measurement result.
FAIL ✗ , FAIL	Incorrect measurement result.
READY	The meter is ready for measurement.
	Non-continuity in the test circuit during R_{PE} measurement with 10/25A current.
	IEC conductor test: lack of continuity in conductor L.
	IEC conductor test: lack of continuity in conductor N.
	IEC conductor test: L and N shorted.
	IEC conductor test: L and N exchanged.
dEL	Ready to delete memory bank.
E1 , E2	Internal error, return the meter to the service.
Hot	Too high temperature of 10/25A current adjuster.
FUSE	Blown fuse or internal damage. Check the fuse and replace it when blown. When it does not help, return the meter to the service.
UdEt	Voltage present on tested object.
no dISC	No communication or poor communication with the pen-drive.
FULL dISC	Pen-drive memory is full.

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