



# **USER MANUAL**

## **DIGITAL CLAMP METER FOR PHOTOVOLTAIC INSTALLATIONS**

### **CMP-1015-PV**



Version 1.05 13.05.2024

CMP-1015-PV True RMS multimeter is intended for measuring direct and alternating voltage, direct and alternating current, resistance, capacitance, frequency, duty cycle (filling) and temperature and for testing diodes and circuit continuity.

The most important features of CMP-1015-PV include:

- **possibility of carrying out measurements in the output circuits of inverters and frequency converters,**
- non-contact voltage detector,
- **Bluetooth wireless communication** used for transmitting the measurement results to mobile devices with Android OS,
- automatic and manual range setting,
- **REL** function for relative measurements,
- **MAX/MIN** function for displaying maximum and minimum values,
- **PEAK** function for displaying the peak value,
- the **INRUSH** function captures the starting current precisely in the beginning of 100-millisecond period when the device is just started,
- **HOLD** function used to maintain the read-out on the meter screen,
- built-in flashlight for lighting the measurement location,
- sound signal for circuit continuity,
- AUTO-OFF function,
- graphical LCD display (read-out 6000).

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# 1 Introduction

Thank you for purchasing Sonel multimeter. CMP-1015-PV meter is a modern, easy and safe measuring device. Please acquaint yourself with this manual in order to avoid measuring errors and prevent possible problems in operation of the meter.

This manual contains three types of warnings. They are presented as a framed text describing the possible risks for the user and the device. Texts  **WARNING** describe situations, which may endanger user's life or health, when instructions are not followed. Texts  **CAUTION!** begin a description of a situation, which may result in device damage, when instructions are not followed. Indication of possible problems is preceded by symbol .



## WARNING

- **CMP-1015-PV meter is designed to measure the current and AC/DC voltage, frequency, resistance, capacitance, as well as to test the circuit continuity and diodes. 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.**
- **CMP-1015-PV meter must be operated only by appropriately qualified personnel with relevant certificates authorising the personnel to perform works on electric systems. Unauthorized use of the meter may result in its damage and may be a source of serious hazard to the user.**
- **Before operating the device, read thoroughly this manual and observe the safety regulations and guidelines provided by the producer. Failure to follow instructions specified in this manual may result in a damage to the device and be a source of serious hazard to the user.**

## 2 Safety

### 2.1 General rules

In order to provide conditions for correct operation and the correctness of the obtained results, the following recommendations must be observed:

- before using the meter read carefully this manual,
- the meter should be operated only by qualified persons that have passed health and safety training,
- be very careful when measuring voltages exceeding (as per IEC 61010-1:2010/AMD1:2016):

| Normal locations        | Wet locations           |
|-------------------------|-------------------------|
| 60 V DC                 | 35 V DC                 |
| 30 V AC RMS             | 16 V RMS                |
| 42.4 V AC of peak value | 22.6 V AC of peak value |

as they generate a potential risk of electric shock,

- do not exceed the maximum limits of the input signal,
- during the voltage measurements do not switch the device in the current or resistance measuring mode and vice versa,
- when changing ranges, always disconnect the test leads from the tested circuit,
- hold the measuring probes by the spot provided, restricted by a special barrier to avoid accidental contact with exposed metal parts,
- If during the measurement symbol **OL** appears on the screen, it indicates that the measured value exceeds the measurement range,
- It is unacceptable to operate:
  - ⇒ a damaged meter which is completely or partially out of order,
  - ⇒ a device with damaged insulation of test leads,
  - ⇒ a meter stored for an excessive period of time in disadvantageous conditions (e.g. excessive humidity).
- repairs may be carried out only by an authorised service point.



## WARNING

- Never start the measurements if you have wet or damp hands.
- Do not perform measurements in explosive atmosphere (e.g. in the presence of flammable gases, vapours, dusts, etc.). Using the meter in such conditions may result in sparking and cause an explosion.

| The limit values of the input signal                                   |                         |
|------------------------------------------------------------------------|-------------------------|
| Function                                                               | The maximum input value |
| A DC, A AC                                                             | 1000 A DC/AC            |
| V DC, V AC                                                             | 1500 V DC/1000 V AC RMS |
| Resistance, continuity, diode test, capacitance, frequency, duty cycle | 1000 V DC/AC RMS        |
| Temperature                                                            | 1000 V DC/AC            |

## 2.2 Safety symbols



This symbol located near another symbol or terminal, indicates that the user should read the further information contained in the manual.



This symbol located near the terminal, indicates that in normal use there is a possibility of dangerous voltages.



Protection class II – double insulation



Terminals with this marking cannot be connected to a circuit where the voltage to ground exceeds the maximum safe voltage of the device.

### 3 Preparing the meter for operation

After purchasing the meter, check whether the content of the package is complete.

Before performing the measurement:

- make sure that the battery level is sufficient for measurements,
- check whether the meter casing and insulation of the test leads are not damaged,
- to ensure consistent measurement results it is recommended to connect **black** lead to **COM** terminal and **red** lead to other terminals,
- when the meter is not in use, set the function switch in **OFF** position.

The device has the **AUTO-OFF function** triggered after 15...60 minutes of user inactivity depending on the settings. To turn the meter on again, set the function switch to **OFF** position and then set it at the desired function.



#### WARNING

- **Connecting wrong or damaged leads may cause electric shock.**
- **The meter must not be connected to the voltage source when it is set to current or resistance measurement or to diode test. Failure to observe this precaution may damage the meter!**

When using the meter, be sure to:

- discharge capacitors in the tested power sources,
- disconnect the power supply when measuring the resistance and diode tests,
- turn off the meter and disconnect test leads before removing the back cover to replace the rechargeable battery.



## **WARNING**

**Do not use the meter if the cover of battery compartment is removed.**



It is possible that in certain low ranges of AC or DC voltage, when the meter is not connected to the leads, the screen will show random and variable readings. This is a normal phenomenon, which results from the input sensitivity with high input resistance. When connected to a circuit, the read-out will stabilize and the meter will provide the correct value.

## 4 Functional Description

### 4.1 Measuring terminals and functions



- 1 **Non-contact voltage detector**
- 2 **Current clamp**
- 3 **Flashlight**
- 4 **Indicator light of the non-contact voltage detector**
- 5 **Clamp-opening trigger**
- 6 **LCD display**
- 7 **Function buttons**

- **MODE / VFD button**

- The choice of sub-functions and modes assigned to the selected measurement function
- Changing the measurement mode in functions: A / V / LoZ / frequency / duty cycle / resistance / diode test / continuity / capacitance / temperature measurement (press briefly)
- Measurement of current and voltage behind the inverter, frequency converter, in the VFD system (press and hold)

- **MENU / INRUSH button**

- Displays the menu (press briefly)
- Displays the starting current (press and hold)

- **Arrow buttons** 

- The choice of sub-functions and modes assigned to the selected measurement function
- Function selection in menu
- Moving around the screen

- **HOLD / REL button**

- The choice of sub-functions and modes assigned to the selected measurement function
- HOLD mode – freezing the measurement results on the display (press briefly)
- REL mode – press and hold:
  - ⇒ Reset display (DC current measurement)
  - ⇒ Displaying the measurement result related to the reference value (other measuring functions)

- **RANGE button**

Setting the measurement range:

- automatic (press and hold)
- manual (press briefly)

- **Button  – flashlight mode (press briefly)**

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## Turn the rotary switch

Function selection:

- **60A ** – measurement of direct and alternating current up to 60 A
- **600A ** – measurement of direct and alternating current up to 600 A
- **1000A ** – measurement of direct and alternating current up to 1000 A
- **OFF** – the meter is switched off
- **V  AC+DC** – measurement of direct and alternating current, as well as AC and DC voltage components
- ** LoZ AC+DC** – low impedance AC voltage measurement, low impedance AC and DC voltage measurement
- **Hz%** – frequency and duty cycle measurement
- **    CAP** – measurement of resistance, diode test, measurement of continuity, capacitance
- **K-Temp °C °F** – temperature measurement

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## COM measuring terminal

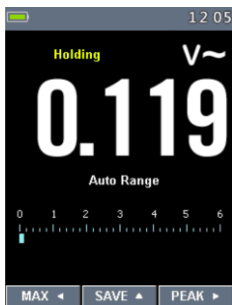
Measuring input, common for all measuring functions excluding current.

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## Measurement terminal V LoZ V CAP Hz%K-Temp

Measuring input for measurements other than current measurement.

## 4.2 Display



|                                         |                                                                         |
|-----------------------------------------|-------------------------------------------------------------------------|
| <b>V</b>                                | Voltage measurement                                                     |
| <b>A</b>                                | Current measurement                                                     |
| $\sim$                                  | Alternating signal                                                      |
| $\equiv$                                | Constant signal                                                         |
| $\approx$                               | Alternating signal with differentiation of its components: AC and DC    |
|                                         | Voltage exceeds 30 V AC/DC                                              |
|                                         | Be careful!                                                             |
|                                         | Relative measurement                                                    |
|                                         | Pulse width                                                             |
| <b>VFD</b>                              | Measurement behind the inverter, frequency converter, in the VFD system |
| <b>HVDC</b>                             | DC voltage measurement                                                  |
|                                         | Inrush current                                                          |
| <b>-</b>                                | Negative read-out value                                                 |
| <b><math>\Omega</math></b>              | Measurement of resistance                                               |
|                                         | Continuity test                                                         |
|                                         | Diode test                                                              |
| <b>F</b>                                | Measurement of capacitance                                              |
| <b>n / <math>\mu</math> / m / k / M</b> | The prefix of multiple measurement unit                                 |
| <b>OL</b>                               | Exceeded measurement range                                              |
|                                         | Low battery                                                             |
| <b>Auto Range</b>                       | Automatic range setting                                                 |
| <b>H</b>                                | <b>HOLD</b> function activated                                          |
| <b>LoZ</b>                              | Low-impedance voltage measurement                                       |
| <b>MAX / MIN</b>                        | Maximum / Minimum value                                                 |

### 4.3 Leads

The manufacturer guarantees the correctness of read-outs only when original test leads are used.



#### **WARNING**

**Connecting wrong leads may cause electric shock or measurement errors.**



- The probes are equipped with additional removable tip guards.
- The probes must be stored in a designated area.

## 5 Measurements

The content of this chapter should be thoroughly read and understood since it describes methods of measurements and basic principles of interpreting measurement results.

### 5.1 Current measurement

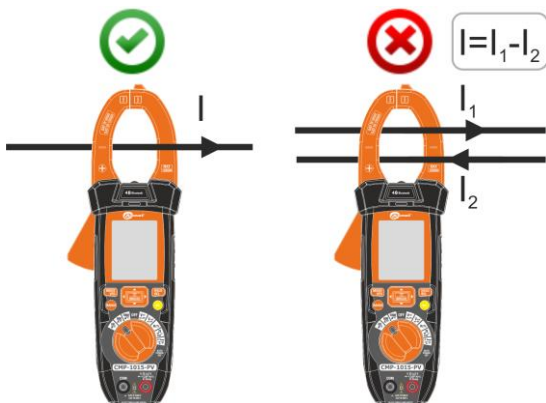


**WARNING:**

**Disconnect the test leads before measuring current using clamp.**

To perform the current measurement:

- set the rotary switch at **60A**  $\overline{\sim}$  / **600A**  $\overline{\sim}$  / **1000**  $\overline{\sim}$  **A**,
- press **MODE/VFD** button to display the following symbol:
  - ⇒  $\sim$ , if you are measuring alternating current,
  - ⇒  $\overline{\sim}$ , if you are measuring direct current,
- use the clamp-opening trigger **5** and attach the clamps on the tested conduit. Only one conduit must be within the testing range of the clamps,
- read the measurement result on the display.





If DC current is measured and the meter is not attached to the tested circuit, but it still indicates a non-zero value, then you must reset it by pressing and holding **HOLD/REL** button.

## 5.2 Non-contact voltage detector



### WARNING

- The detector is designed to detect the presence of a voltage, not for determining its absence.
- Electric shock hazard. Before using the tester, check if its operational by testing it on a known AC voltage (i.e. next applicable socket with live voltages).

To activate the detector:

- set the rotary switch at any position,
- touch the tip of the detector to the tested object.

If the AC voltage is present, the **indicator light will glow red**.



- The wires in the extension cords are often twisted. For best results, move the tip of the detector along the wire to locate the live line.
- The indicator has a high sensitivity. It can be randomly actuated by static electricity or other energy sources. This is normal.
- The type and thickness of the insulation, distance from the power source, shielded cables and other factors may affect the operation of the tester. If you are unsure about the test result, check the presence of voltage in a different way.

### 5.3 Voltage measurement



#### WARNING

- Electric shock hazard. The ends of measuring probes, due to their length, may not reach the live parts inside some network connections of low-voltage electrical equipment, because the contacts are arranged inside the sockets. In such a case, the read-out will be 0 V with the simultaneous presence of voltage in the socket.
- Before acknowledging the absence of voltage in the socket make sure that the ends of the probe touch the metal contacts inside the socket.



#### CAUTION!

Do not measure the voltage when an electric motor located within the circuit is being switched on or off. Resulting voltage spikes may damage the meter.

To perform AC voltage measurement:

- set the rotary switch at  $V \sim_{AC+DC}$ ,
- press **MODE/VFD** button to display the following symbol:
  - ⇒  $\sim$ , if an alternating voltage is to be measured,
  - ⇒  $\equiv$ , if a constant voltage is to be measured,
  - ⇒  $\sim \equiv$ , if the AC and DC voltage components are measured,
- connect black test lead to **COM** terminal, and red test lead to **VΩLoZV-+•))) CAP Hz%K-Temp** terminal,
- contact the tips of test probes to the points of measurement,
- read the measurement result on the display.

## 5.4 LoZ measurement (elimination of interference and induced voltages)

Measurement function in 'LoZ' mode eliminates the influence or interference voltages or induced voltages, making the measurement more accurate and reliable. These voltages may occur due to capacitive feedback between the live conductors and the unused conductors located in the vicinity:

- set the rotary switch at  $\tilde{V}LoZ_{AC+DC}$ ,
- connect black test lead to **COM** terminal, and red test lead to **VΩLoZV-** **CAP Hz%K-Temp**,
- contact probe blades to measurement points,
- read the measurement result on the display.

## 5.5 Frequency measurement (mains)

To perform frequency measurement:

- set the rotary switch at  $V \approx AC+DC$ ,
- press **MODE/VFD** button to display the symbol **Hz**,
- connect black test lead to **COM** terminal, and red test lead to **VΩLoZV-** **CAP Hz%K-Temp** terminal,
- contact the tips of test probes to the points of measurement,
- read the measurement result on the display.

## 5.6 Frequency measurement (electronics)

To perform frequency measurement:

- set the rotary switch at **Hz%**,
- connect black test lead to **COM** terminal, and red test lead to **VΩLoZV-** **CAP Hz%K-Temp** terminal,
- contact the tips of test probes to the points of measurement,
- read the measurement result on the display.

## 5.7 Measurement % of duty cycle (pulse filling indicator)

To perform the measurement:

- set the rotary switch at **Hz%** or **V**  AC+DC,
- press **MODE** button, until symbol **%** is shown on the display,
- connect black test lead to **COM** terminal, and red test lead to **VΩLoZV**  **CAP Hz%K-Temp** terminal,
- contact the tips of test probes to the points of measurement,
- read the measurement result on the display (pulse width ).

## 5.8 Measurement of resistance



### WARNING

Do not perform measurements on the circuit under the voltage. Before the measurement disconnect the power and discharge capacitors.

To perform measurement of resistance:

- set the rotary switch at **Ω**  **CAP**,
- connect black test lead to **COM** terminal, and red test lead to **VΩLoZV**  **CAP Hz%K-Temp** terminal,
- contact the tips of test probes to the points of measurement; the best solution is to disconnect one side of the tested element, to prevent the remaining part of the circuit interfere with the read-out of the resistance value,
- read the measurement result on the display.

## 5.9 Circuit continuity test



## WARNING

**Do not perform measurements on the circuit under the voltage. Before the measurement disconnect the power and discharge capacitors.**

To perform the continuity test:

- set the rotary switch at **Ω** **→** **•** **)))** **CAP**,
- connect black test lead to **COM** terminal, and red test lead to **VΩLoZV** **→** **•** **)))** **CAP Hz%K-Temp** terminal,
- press **MODE** button, to display **Ω** **•** **)))** on the screen,
- contact the tips of test probes to the points of measurement,
- read the measurement result on the display; the beep will be activated when resistance values are below approx. **50 Ω**.

### 5.10 Diode test



## WARNING

**Do not perform measurements on the circuit under the voltage. Before the measurement disconnect the power and discharge capacitors. Do not test the diode under voltage.**

To perform the diode test:

- set the rotary switch at  **$\Omega \rightarrow \bullet$**  CAP,
  - connect black test lead to **COM** terminal, and red test lead to **V $\Omega$ LoZV  $\rightarrow \bullet$**  CAP Hz%K-Temp terminal,
  - press **MODE** button, to display **V  $\rightarrow \bullet$**  on the screen,
  - contact the tips of test probes to the diode. The red test probe should contact the anode and the black should contact cathode,
  - read the test result on the display – the forward voltage is displayed.
- ⇒ For a typical silicon rectifier diode, it is approx. 0.7 V, and for a germanium diode it is approx. 0.3 V

- ⇒ For LEDs with a low power, typical voltage value is in the range of 1.2...5.0 V depending on the colour.
- ⇒ If the diode is polarized in the reverse direction, or there is a break in the circuit, the display will show **OL**.
- ⇒ When the diode is shorted, the meter will show a value near **0 V**,
- after completing the measurements, remove test leads from the terminals of the meter.

### 5.11 Measurement of capacitance



#### WARNING

**Risk of electric shock. Disconnect the power supply from the tested capacitor and discharge all capacitors before any starting capacity measurements.**

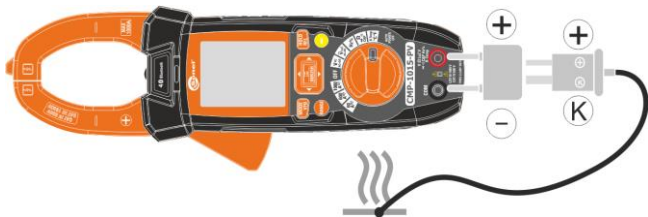
To perform the measurement:

- set the rotary switch at **Ω-⚡-●-))) CAP**,
- press **MODE** button to display **nF** on the screen,
- connect black test lead to **COM** terminal, and red test lead to **VΩLoZV-⚡-●-))) CAP Hz%K-Temp** terminal,
- contact the probe tips to the tested capacitor,
- read the measurement result on the display.

## 5.12 Temperature measurement

To perform the measurement:

- set the rotary switch at **K-Temp °C °F**,
- to change the unit, press **MODE**,
- **place the adapter of the temperature probe** in **COM** terminal (black leg) and **VΩLoZV→+•))) CAP Hz%K-Temp** (red leg):
- **place the temperature probe** in the **adapter**, as shown in the figure:
  - ⇒ thin pin of the probe (marked as **+**) fits to terminal **+**;
  - ⇒ thick pin of the probe (marked as **K**) fits to terminal **-**;
  - ⇒ reversed connection of the probe is mechanically **impossible**,
- contact the head of the temperature probe to the device under test. Maintain the contact of the probe head with the part of the device under test, until the reading stabilizes.
- read the measurement result on the display,
- after completing the measurements, disconnect the probe from the meter.



### CAUTION!

Risk of burns. The temperature probe heats up, adapting to the temperature of tested object.

## 6 Special features

### 6.1 Button **HOLD/REL**

#### 6.1.1 HOLD function

This function is used to 'freeze' the measurement result on the display. To do this, briefly press **HOLD/REL** button. When the function is enabled, the display shows symbol **HOLD**.

To return to the normal operation mode of the device, press **HOLD/REL** button again.

#### 6.1.2 REL function

This mode enables a measurement relative to a reference value.

- To enable the mode, press and hold **HOLD/REL**. Then, the displayed readout value is taken as the reference value, and the readout will be reset.
- From this moment, the readings will be presented as the ratio of the measured value to the reference value.
- To enable the mode, press **HOLD/REL**.

The displayed main result is the difference between the reference value (read-out at the moment of activating REL mode) and the current read-out. Example: if **the reference value is 20 A**, and the current **reading is 12.5 A**, then the main result on the **display will be -7.5 A**. If the new reading is identical to the reference value, then the result will be zero.



- When the function is activated, the automatic adjustment of the measuring range is not available.
- If the reading is outside the measurement range, symbol **OL** is displayed. In this situation, turn off the function and manually switch to a higher range.
- This function is **not available** for diode test.

## 6.2 VFD function

To measure the AC current or voltage behind the inverter, frequency converter or in the VFD system:

- set the rotary switch to the voltage or current measurement position,
- press and hold the **MODE/VFD** button until the "VFD" symbol appears.

## 6.3 HVDC function

To measure the high DC voltage (HVDC) e.g. in a **photovoltaic installation**:

- connect the high-voltage adapter to the device,
- set the rotary switch at  $V \approx_{AC+DC}$ ,
- press the **MODE/VFD** button to display the symbol  $\approx$ ,
- using the  $\blacktriangleright$  button, select the **HVDC** option.

## 6.4 AC+DC function

The meter measures the **AC** and **DC** component of the measured signal. To perform AC+DC voltage measurement:

- set the rotary switch at  $V \approx_{AC+DC}$ ,
- press **MODE/VFD** button to display the following symbol  $\approx$ .

## 6.5 PEAK function

PEAK function is intended to measure peak values and it is different from MAX function, which measures maximum values, by the duration of recorded event. In case of PEAK function, it is **1 ms**. This allows user to record very short alternating voltage surges.

The meter will update the display each time a lower negative, or higher positive peak occurs. Auto Power Off feature will be disabled automatically in this mode.

- To activate the mode, use the buttons  to select the **PEAK** option.
- To deactivate the mode, select the **PEAK** option again.



- This function is available only when measuring AC voltage and current.
- While PEAK is active, autoranging is disabled, therefore it is advised to start the function after connecting test leads to the measurement point. Running PEAK before that may cause overrange symbols to appear.

## 6.6 INRUSH function

The INRUSH function captures the starting current precisely in the beginning of 100-millisecond period when the device is just started. To perform the measurement:

- activate the AC measurement,
- press and hold **MENU/INRUSH** button,
- fasten the clamp on the cord supplying power to the tested object,
- turn ON the tested object,
- read the results.

## 6.7 MAX/MIN function

- To activate the mode, use the buttons  to select the **MAX** option.
  - ⇒ **Max** symbol – the meter displays the highest value out of existing measurement readings.
  - ⇒ **Min** symbol – the meter displays the lowest value out of existing measurement readings.
- To deactivate the function, select the **MAX** option again.



- When the function is activated, the automatic adjustment of the measuring range is not available.
- If the reading is outside the measurement range, symbol **OL** is displayed.

## 6.8 button

Briefly press , to turn on or off the flashlight mode

## 6.9 MENU button and main menu

Press the **MENU** button briefly to call up the main menu.

- Use the ▲ ▼ buttons to select the item.
- Use the ► or **MENU** button to enter the desired item.
- Use the ◀ button to return to the higher level menu.

To exit the main menu, use the ◀, **MODE/VFD**, **RANGE**, **HOLD/REL.** buttons.

### 6.9.1 Language

Here you can set the interface language.

### 6.9.2 Setup

Here you can enable/disable:

- button sounds,
- Bluetooth function
- display brightness,
- AUTO-OFF time.

### 6.9.3 Wireless communication

The multimeter is equipped with a wireless data transfer mode for devices with installed **Sonel Multimeter Mobile** software. To enable the mode, turn on the Bluetooth communication. The meter will be visible in the Bluetooth manager of any receiver device as **CMP-1015-PV**.

Details of cooperation with the mobile application are provided in **Sonel Multimeter Mobile** manual.

### 6.9.4 Time/date

Here you can change the date and time and their format.

### 6.9.5 Information

Here you can check the meter hardware and firmware version.

### 6.9.6 Factory set

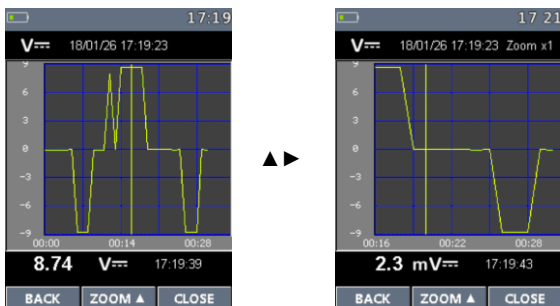
Here you can restore the meter to factory settings.

## 6.9.7 Recorder and memory of measurement results

The following functions are available here.

- **Start recording** – by selecting this item you switch to the measurement screen and start recording results into the memory. To stop recording, select **Stopped**. To save it to memory, select **SAVE**.
- **Recall** – by selecting this item you go to the memory viewing screen.
  - ⇒ To view a specific registration, press the ► button. The results of the recording are displayed in the form of a graph.
  - ⇒ The ◀► buttons move the cursor, which displays the unit result.
  - ⇒ The ▲ button (ZOOM function) expands the timeline.

To exit to the registration list press the **MODE/VFD** (BACK) button. To close the graph press the **HOLD/REL** (CLOSE) button.



- **Sample interval** – setting the sample interval.
- **Duration** – setting the recording duration.
- **Memory** – displays the number of registrations and the amount of free memory.
- **Delete all recordings** – deletes all recordings.

## 7 Replacing the battery



### WARNING

To avoid electric shock, do not use the meter if the battery compartment cover is not in place or is not properly fastened.

CMP-1015-PV is powered by one Li-Pol 7.4 V 1200 mAh rechargeable battery.

To replace the rechargeable battery:

- set the rotational function selector at OFF,
- **remove test leads from the terminals of the meter.**
- turn the fixing screw of the compartment cover to the position:



- remove the cover,
- remove the rechargeable battery and insert a new one, observing the polarity,
- put on the cover and turn the fixing screw to the position:



- While performing the measurements with the low battery symbol displayed, the user must be aware of additional measurement uncertainties or unstable operation of the device.
- If the meter does not work properly, check the rechargeable battery in order to ensure that it is in proper condition and properly installed in the device.

## 8 Maintenance and care

The digital multimeter has been designed for many years of reliable use, provided that the following recommendations are observed for its maintenance and care:

1. **THE METER MUST BE DRY.** Wipe the dampened meter.
2. **THE METER MUST BE USED AND STORED IN NORMAL TEMPERATURES.** Extreme temperatures may shorten the life of electronic components and distort or melt plastic parts.
3. **THE METER MUST BE HANDLED CAREFULLY AND GENTLY.** Dropping the meter may damage its electronic elements or the housing.
4. **THE METER MUST BE KEPT CLEAN.** From time to time wipe the housing with a damp cloth. DO NOT use chemicals, solvents or detergents.
5. **USE ONLY NEW BATTERIES OF RECOMMENDED SIZE AND TYPE.** Remove the old or discharged batteries from the meter to avoid leakage and damage.
6. **IF THE METER IS TO BE STORED FOR LONGER THAN 60 DAYS,** remove the batteries and keep them separately.



The electronic system of the meter does not require maintenance.

## **9 Storage**

During the storage of the device, the following recommendations must be observed:

- disconnect the test leads from the meter,
- make sure that the meter and accessories are dry,
- when the device is to be stored for longer time, remove the battery.

## **10 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 local regulations concerning disposal of packages, waste batteries and accumulators.

## 11 Technical data

### 11.1 Basic data

⇒ "m.v." means a standard measured value.

#### True RMS measurement for AC current

| Range   | Resolution | Accuracy                                      |
|---------|------------|-----------------------------------------------|
| 60.00 A | 0.01 A     | $\pm (2.5\% \text{ m.v.} + 5 \text{ digits})$ |
| 600.0 A | 0.1 A      |                                               |
| 1000 A  | 1 A        |                                               |

- All AC current ranges are specified from 10% to 100% of range
- Frequency range: 50 Hz...60 Hz
- Overload protection: 1000 V DC/AC RMS

#### DC current measurement

| Range   | Resolution | Accuracy                                      |
|---------|------------|-----------------------------------------------|
| 60.00 A | 0.01 A     | $\pm (2.0\% \text{ m.v.} + 8 \text{ digits})$ |
| 600.0 A | 0.1 A      |                                               |
| 1000 A  | 1 A        |                                               |

- Overload protection: 1000 V DC/AC RMS

#### True RMS voltage measurement

| Range   | Resolution | Accuracy                                                                        |
|---------|------------|---------------------------------------------------------------------------------|
| 6.000 V | 0.001 V    | $f = 50 \dots 60 \text{ Hz}$<br>$\pm (1.2\% \text{ m.v.} + 5 \text{ digits})$   |
| 60.00 V | 0.01 V     | $f = 61 \dots 1000 \text{ Hz}$<br>$\pm (2.5\% \text{ m.v.} + 5 \text{ digits})$ |
| 600.0 V | 0.1 V      |                                                                                 |
| 1000 V  | 1 V        |                                                                                 |

- All AC voltage ranges are specified from 10% to 100% of range
- Input impedance:  $\geq 10 \text{ M}\Omega$
- PEAK function accuracy: 10% m.v.
- Frequency range: 50 Hz...1000 Hz
- Overload protection: 1000 V DC/AC RMS

## DC voltage measurement

| Range    | Resolution | Accuracy                                      |
|----------|------------|-----------------------------------------------|
| 600.0 mV | 0.1 mV     | $\pm (0.8\% \text{ m.v.} + 8 \text{ digits})$ |
| 6.000 V  | 0.001 V    | $\pm (0.5\% \text{ m.v.} + 5 \text{ digits})$ |
| 60.00 V  | 0.01 V     |                                               |
| 600.0 V  | 0.1 V      | $\pm (0.8\% \text{ m.v.} + 5 \text{ digits})$ |
| 1500 V   | 1 V        |                                               |

- Input impedance:  $\geq 10 \text{ M}\Omega$
- Overload protection: 1500 V DC

## AC+DC voltage measurement

| Range   | Resolution | Accuracy                                       |
|---------|------------|------------------------------------------------|
| 6.000 V | 0.001 V    | $\pm (1.5\% \text{ m.v.} + 20 \text{ digits})$ |
| 60.00 V | 0.01 V     |                                                |
| 600.0 V | 0.1 V      |                                                |
| 1000 V  | 1 V        | $\pm (2.5\% \text{ m.v.} + 20 \text{ digits})$ |

- Input impedance:  $10 \text{ M}\Omega$
- Frequency range: 50 Hz...1000 Hz
- Overload protection: 1000 V DC/AC RMS

## LoZ measurement

| Range   | Resolution | Accuracy                                       |
|---------|------------|------------------------------------------------|
| 6.000 V | 0.001 V    | $\pm (3.0\% \text{ m.v.} + 40 \text{ digits})$ |
| 60.00 V | 0.01 V     |                                                |
| 300.0 V | 0.1 V      |                                                |
| 600.0 V | 0.1 V      | unspecified                                    |
| 1000 V  | 1 V        |                                                |

- All AC voltage ranges are specified from 10% to 100% of range
- Input impedance:  $300 \text{ k}\Omega$
- Overload protection: 1000 V DC/AC RMS

### LoZ AC+DC measurement

| Range   | Resolution | Accuracy                                       |
|---------|------------|------------------------------------------------|
| 6.000 V | 0.001 V    | $\pm (3.5\% \text{ m.v.} + 40 \text{ digits})$ |
| 60.00 V | 0.01 V     |                                                |
| 300.0 V | 0.1 V      |                                                |
| 600.0 V | 0.1 V      | unspecified                                    |
| 1000 V  | 1 V        |                                                |

- All AC voltage ranges are specified from 10% to 100% of range
- Input impedance: 300 k $\Omega$
- Overload protection: 1000 V DC/AC RMS

### Resistance measurement

| Range            | Resolution       | Accuracy                                       |
|------------------|------------------|------------------------------------------------|
| 600.0 $\Omega$   | 0.1 $\Omega$     | $\pm (1.0\% \text{ m.v.} + 10 \text{ digits})$ |
| 6.000 k $\Omega$ | 0.001 k $\Omega$ | $\pm (0.8\% \text{ m.v.} + 5 \text{ digits})$  |
| 60.00 k $\Omega$ | 0.01 k $\Omega$  |                                                |
| 600.0 k $\Omega$ | 0.1 k $\Omega$   |                                                |
| 6.000 M $\Omega$ | 0.001 M $\Omega$ |                                                |
| 60.00 M $\Omega$ | 0.01 M $\Omega$  | $\pm (2.5\% \text{ m.v.} + 10 \text{ digits})$ |

- Overload protection: 1000 V DC/AC RMS

### Capacitance measurement

| Range         | Resolution    | Accuracy                                       |
|---------------|---------------|------------------------------------------------|
| 60.00 nF      | 0.01 nF       | $\pm (3.0\% \text{ m.v.} + 20 \text{ digits})$ |
| 600.0 nF      | 0.1 nF        | $\pm (3.0\% \text{ m.v.} + 8 \text{ digits})$  |
| 6.000 $\mu$ F | 0.001 $\mu$ F |                                                |
| 60.00 $\mu$ F | 0.01 $\mu$ F  |                                                |
| 600.0 $\mu$ F | 0.1 $\mu$ F   |                                                |
| 6000 $\mu$ F  | 1 $\mu$ F     | $\pm (3.5\% \text{ m.v.} + 20 \text{ digits})$ |
| 60.00 mF      | 0.01 mF       | unspecified                                    |
| 100.0 mF      | 0.1 mF        |                                                |

- Overload protection: 1000 V DC/AC RMS

## Frequency measurement

| Range     | Resolution | Accuracy                                      |
|-----------|------------|-----------------------------------------------|
| 60.00 Hz  | 0.01 Hz    | $\pm (0.2\% \text{ m.v.} + 5 \text{ digits})$ |
| 600.0 Hz  | 0.1 Hz     |                                               |
| 6.000 kHz | 0.001 kHz  |                                               |
| 60.00 kHz | 0.01 kHz   |                                               |
| 600.0 kHz | 0.1 kHz    |                                               |
| 6.000 MHz | 0.001 MHz  |                                               |
| 10.00 MHz | 0.01 MHz   |                                               |

- Sensitivity:
  - >2 V RMS for 20...80% of duty cycle and <100 kHz
  - >5 V RMS for 20...80% of duty cycle and >100 kHz
- Frequency measured starting from 1 Hz
- Overload protection: 1000 V DC/AC RMS

## Duty cycle measurement

| Range         | Resolution | Accuracy                                       |
|---------------|------------|------------------------------------------------|
| 10.0... 90.0% | 0.1%       | $\pm (1.2 \% \text{ m.v.} + 8 \text{ digits})$ |

- Pulse amplitude:  $\pm 5 \text{ V}$
- Pulse width: 0.1 ms...100 ms
- Frequency: 40 Hz...10 kHz
- Overload protection: 1000 V DC/AC RMS

## Temperature measurement

| Range           | Resolution | Accuracy                                       |
|-----------------|------------|------------------------------------------------|
| -40.0...+1000°C | 0.1 or 1°C | $\pm (1.5\% \text{ m.v.} + 3^\circ\text{C})$   |
| -40.0...+1832°F | 0.1 or 1°F | $\pm (1.0\% \text{ m.v.} + 5.4^\circ\text{F})$ |

- The accuracy of the temperature probe is not taken into account
- Overload protection: 1000 V DC/AC RMS

## 11.2 Operating data

|     |                                                                   |                                                                                          |
|-----|-------------------------------------------------------------------|------------------------------------------------------------------------------------------|
| a)  | measurement category according to IEC 61010-1 .....               | CAT IV 600 V (III 1000 V)                                                                |
| b)  | type of insulation .....                                          | double, Class II                                                                         |
| c)  | housing type .....                                                | double-composite                                                                         |
| d)  | degree of housing protection acc. to EN 60529 .....               | IP40                                                                                     |
| e)  | pollution degree .....                                            | 2                                                                                        |
| f)  | opening of measurement clamp .....                                | 48 mm (1.9")                                                                             |
| g)  | power supply of the meter .....                                   | Li-Pol 7.4 V 1200 mAh rechargeable battery                                               |
| h)  | diode test .....                                                  | I = 1.5 mA, U <sub>0</sub> < 3.3 V DC                                                    |
| i)  | continuity test .....                                             | acoustic signal for R < 50 Ω                                                             |
|     | .....                                                             | measuring current < 0.5 mA                                                               |
| j)  | indication for range exceeding .....                              | OL symbol                                                                                |
| k)  | low battery indication .....                                      | symbol  |
| l)  | measurement rate .....                                            | 3 measurements per second                                                                |
| m)  | INRUSH function                                                   |                                                                                          |
|     | ▪ sampling time .....                                             | 37.5 Hz (RMS), 2.4576 MHz (clock)                                                        |
|     | ▪ integration time .....                                          | 100 ms                                                                                   |
| n)  | VFD function                                                      |                                                                                          |
|     | ▪ maximum operating voltage .....                                 | 1500 V DC / 1000 V AC                                                                    |
| o)  | HVDC function                                                     |                                                                                          |
|     | ▪ maximum operating voltage .....                                 | specified by the high-voltage adapter                                                    |
| p)  | range of the non-contact voltage detector .....                   | 100...1000 V AC (50/60 Hz)                                                               |
| q)  | response time for PEAK function .....                             | 1 ms                                                                                     |
| r)  | temperature sensor .....                                          | type K thermocouple                                                                      |
| s)  | input impedance .....                                             | ≥ 10 MΩ (V AC/DC)                                                                        |
| t)  | compatibility with HVDC adapters .....                            | yes                                                                                      |
| u)  | AC read-out .....                                                 | True RMS (A AC and V AC)                                                                 |
| v)  | AC bandwidth .....                                                | 50...1000 Hz                                                                             |
| w)  | display .....                                                     | backlit LCD with bargraph                                                                |
|     | .....                                                             | 6000 counts with function indicators                                                     |
| x)  | recorder memory                                                   |                                                                                          |
|     | ▪ capacity .....                                                  | up to 16 recordings, 100 000 samples <sup>1</sup>                                        |
|     | ▪ sampling frequency .....                                        | from 1 Hz <sup>1</sup>                                                                   |
| y)  | dimensions .....                                                  | 273 x 96 x 48 mm                                                                         |
| z)  | meter weight .....                                                | 490 g                                                                                    |
| aa) | operating temperature .....                                       | +5...+40°C                                                                               |
| bb) | operating humidity .....                                          | < 80%                                                                                    |
| cc) | storage temperature .....                                         | -20...+60°C                                                                              |
| dd) | storage humidity .....                                            | < 80%                                                                                    |
| ee) | maximum operating altitude .....                                  | 2000 m                                                                                   |
| ff) | Auto-Off function .....                                           | 15...60 min                                                                              |
| gg) | compliance with the requirements of the following standards ..... | EN 61326-1                                                                               |
| hh) | quality standard .....                                            | ISO 9001                                                                                 |

<sup>1</sup> depending on the sampling time set



SONEL S.A. hereby declares that the radio device type CMP-1015-PV complies with Directive 2014/53/EU. The full text of the EU Declaration of Conformity is available at the following website address: <https://sonel.pl/en/download/declaration-of-conformity/>

### 11.3 Bluetooth specification

Version ..... v4.0+EDR  
Frequency range ..... 2400 MHz...2483.5 MHz (ISM band)  
Guard band ..... 2 MHz < f < 3.5 MHz  
Modulation method ..... GFSK, 1 Mbps, 0.5 gauss  
Receiving signal range ..... -82...-20 dBm  
Transmission power minimum ..... -18...+4 dBm

## 12 Manufacturer

The provider of guarantee and post-guarantee services is:

**SONEL S.A.**  
Wokulskiego 11  
58-100 Świdnica  
Poland  
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### CAUTION!

Service repairs must be performed only by the manufacturer.