



<p><b>7"</b> touch screen</p>	<p>MPI-540-PV measurement of PV installations</p>	<p>3-phase power quality recorder</p>	<p><math>\rho</math> <math>R_E</math> <math>R_{ISO}</math> <math>Z_S</math> <math>R_{CONT}</math> <math>E</math> complex measurements of installations</p>
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## Much more than a multifunctional meter

- **The largest touch screen on the market (7") – remarkable ergonomics and ease of use**
- Removable microSD memory card – easy increase of memory capacity
- Li-Ion battery – longer operation of the meter
- **MPI-540-PV: measurement of photovoltaic installations according to EN 62446 standard**
- MPI-540-PV: photovoltaic installation test report with **Sonel Reports PLUS** software
- **Three-phase power recorder – advanced power quality diagnostics**
- Real time display of network parameters – immediate evaluation of the test site conditions
- Parameters measured in accordance to class S of EN 61000-4-30 standard – high accuracy of measurements
- Energy cost calculator – quick evaluation of potential savings
- **Measurement of all parameters related to earthing and protection against electric shock – one device instead of several**
- Quick measurement of the fault loop impedance in networks secured with RCD without triggering (up to several seconds) – time saver
- Auto measurements – the ability to perform automatic measurements in sequence – simplified measurements
- Fast path from measurements to report – time saver



## Features

The meter has **above-average functionality**. It combines the measuring capabilities of several devices, while ensuring equally good accuracy.

- The **MPI-540-PV** instrument can measure photovoltaic installations in accordance with the EN 62446 standard:
  - » continuity of protective and equipotential bondings,
  - » earth resistance,
  - » insulation resistance on the DC side,
  - » open circuit voltage  $U_{oc}$ ,
  - » short circuit current  $I_{sc}$ ,
  - » work currents and powers on both DC and AC side,
  - » inverter efficiency.
- **MPI-540 / MPI-540-PV** can record 50/60 Hz power quality parameters in accordance to S class of EN 61000-4-30:
  - » voltage L1, L2, L3, – average values in the range up to 500 V,
  - » L1, L2, L3 currents, – average values, current measurement in the range up to 3 kA (depending on the current probes used),
  - » frequency in the range of 40 Hz – 70 Hz,
  - » active (P), reactive (Q) and apparent (S) power,
  - » power factor (PF),  $\cos\phi$ ,
  - » harmonics (up to 40th for voltage and current),
  - » total harmonic distortion (THD) for current and voltage.
- **MPI-540 / MPI-540-PV** can be used for all measurements for commissioning of electrical installations in accordance with applicable regulations:
  - » short circuit loop impedance (also in circuits secured with RCDs),
  - » RCD parameters,
  - » insulation resistance,
  - » earth resistance (4 measurement methods + soil resistivity measurement),
  - » continuity of protective and equipotential bondings,
  - » light intensity measurement,
  - » phase sequence test,
  - » motor rotation direction test.

## Automatic installation safety test

MPI-540 / MPI-540-PV allow safety control of **residential, commercial and industrial electrical installations**. Measurements can be easily automated with:

- auto mode of residual current devices (RCD) tests,
- auto measurements – freely configurable measuring sequences,
- AutoISO-1000C adapter for automatic insulation resistance test of 3-, 4- and 5-conductor cables, without switching.

## Photovoltaics under supervision

**MPI-540-PV** is an extremely universal meter, designed in particular for testing photovoltaic installations. The device allows a complete set of tests on the DC and AC side – in accordance with the guidelines of EN 62446 standard.

Measuring parameters related to the photovoltaic installation, the instrument will automatically convert them to the STC (Standard Test Conditions) reference conditions. Measurements of voltage, current and power on the AC and DC side of the inverter allow to verify its efficiency. **Sonel Reports PLUS** software enables creating PV installation test report with measurement results saved meter's in memory.



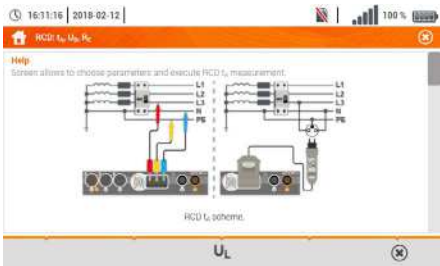
## Three-phase power quality recorder

The device has a three-phase power quality recorder with the LIVE mode view and the possibility to register electrical network parameters such as voltage, current, power, harmonics and THD. The meter enables reading of selected parameters and their graphic presentation on the screen in real time. These parameters are measured and displayed concurrently with the recording on the memory card. In the LIVE mode, the user can see:

- voltage and current waveforms (oscilloscope),
- voltage and current timeplots,
- a phasor graph,
- display of multiple parameters in tabular form,
- spectrum graph of current and voltage harmonics.

## Ease of reading

The device is equipped with a color TFT LCD touch screen with a resolution of 800x480 pixels and a diagonal of 7", which allows for convenient operation and easy reading of parameters and plotted waveforms. This screen size enables displaying more information, available at any time of use. The interface is visible in all conditions – also thanks to the appropriate size of displayed symbols. **Included stylus allows to work also with dielectric gloves.**



## Built-in help system

The device has built-in help screens with measurement diagrams. Thanks to this you can easily and quickly check and make sure how to connect to a given system depending on the type of performed measurement.



## Increased resistance to environmental conditions

The MPI-540 / MPI-540-PV meter will cope well in difficult environmental conditions. Protection against penetration of dust and water is ensured by a unique housing with a level of protection IP51. It is resistant to mechanical damage, and a special design allows you to easily protect the touch screen by shielding using the cover of the meter. In addition to the fact that it protects against damage, it also allows you to conveniently carry and use the device in different positions.



## Communication and software

A very strong feature of the device is the multitude of communication interfaces and cooperation with external software. You can easily transfer measurement data to your computer via USB port, removable SD memory card, or wireless communication (Bluetooth\*, Wi-Fi ).

In order to generate a report on measurements for electric shock protection, use **Sonel Reports PLUS** software. Saving the downloaded data to the simplest formats and printing is provided by free **Sonel Reader** software. The specialized, free **Sonel Analysis** software is used to read and analyze data from the power quality recorder.

\* The function will be available after the software update (no additional fees).

# MPI-540 • MPI-540-PV | Specifications – electrical installation parameters

Measurement functions	Measurement range	Display range	Resolution	Accuracy ±(% m.v. + digits)
<b>Fault loop impedance</b>				
Fault loop $Z_{L-PE}, Z_{L-N}, Z_{L-L}$	0.13 Ω...1999.9 Ω acc. to IEC 61557	0.000 Ω...1999.9 Ω	from 0.001 Ω	±(5% m.v. + 30 digits)
Fault loop $Z_{L-PE}$ in RCD mode	from 0.50 Ω...1999 Ω acc. to IEC 61557	0.00 Ω...1999 Ω	from 0.01 Ω	from ±(6% m.v. + 5 digits)
<b>Measurements of RCD parameters</b>				
RCD tripping test and measurement of tripping time $t_A$ measuring current $0.5 I_{\Delta n}, 1 I_{\Delta n}, 2 I_{\Delta n}, 5 I_{\Delta n}$				
general and short-time delay RCD	0 ms...300 ms	0 ms...300 ms	1 ms	from ±(2% m.v. + 2 digits)
selective RCD	0 ms...500 ms	0 ms...500 ms	1 ms	from ±(2% m.v. + 2 digits)
Measurement of RCD tripping current $I_A$ measuring current $0.2 I_{\Delta n}, 2.0 I_{\Delta n}$				
for sinusoidal residual current (AC type)	3.3 mA...1000 mA	3.3 mA...1000 mA	from 0.1 mA	±5% $I_{\Delta n}$
for unidirectional residual current and unidirectional with the 6 mA DC bias (type A)	3.5 mA...700 mA	3.5 mA...700 mA	from 0.1 mA	±10% $I_{\Delta n}$
for direct residual current (type B)	2.0 mA...1000 mA	2.0 mA...1000 mA	from 0.1 mA	±10% $I_{\Delta n}$
<b>Earth resistance</b>				
3- and 4-pole method	from 0.50 Ω...1.99 kΩ acc. to IEC 61557-5	0.00 Ω...1.99 kΩ	from 0.01 Ω	from ±(2% m.v. + 3 digits)
3-pole + clamp method	0.00 Ω...1.99 kΩ	0.00 Ω...1.99 kΩ	from 0.01 Ω	from ±(2% m.v. + 4 digits)
2-clamp method	0.00 Ω...99.9 kΩ	0.00 Ω...99.9 kΩ	from 0.01 Ω	from ±(10% m.v. + 4 digits)
<b>Resistance-to-earth</b>	0.0 Ωm...99.9 kΩm	0.0 Ωm...99.9 kΩm	from 0.1 Ωm	Depending on accuracy of $R_E$ measurement
<b>Insulation resistance</b>				
Measuring voltage 50 V	50 kΩ...250 MΩ acc. to IEC 61557-2	0 kΩ...250 MΩ	from 1 kΩ	from ±(3% m.v. + 8 digits)
Measuring voltage 100 V	100 kΩ...500 MΩ acc. to IEC 61557-2	0 kΩ...500 MΩ	from 1 kΩ	from ±(3% m.v. + 8 digits)
Measuring voltage 250 V	250 kΩ...999 MΩ acc. to IEC 61557-2	0 kΩ...999 MΩ	from 1 kΩ	from ±(3% m.v. + 8 digits)
Measuring voltage 500 V	500 kΩ...2.00 GΩ acc. to IEC 61557-2	0 kΩ...2.00 GΩ	from 1 kΩ	from ±(3% m.v. + 8 digits)
Measuring voltage 1000 V	1000 kΩ...9.99 GΩ acc. to IEC 61557-2	0 kΩ...9.99 GΩ	from 1 kΩ	from ±(3% m.v. + 8 digits)
<b>Resistance of protective conductors and equipotential bondings</b>				
Measurement of resistance of protective conductors and equipotential bondings with ±200 mA current	0.12 Ω...400 Ω acc. to IEC 61557-4	0.00 Ω...400 Ω	from 0.01 Ω	±(2% m.v. + 3 digits)
Measurement of resistance with low current	0.0 Ω...1999 Ω	0.0 Ω...1999 Ω	from 0.1 Ω	±(3% m.v. + 3 digits)
<b>Light intensity</b>				
Measurement in luxes (lx)	0 lx...399.9 klx	0 lx...399.9 klx	from 0.01 lx	from ±(2% m.v. + 5 digits)
Measurement in feet-candles (fc)	0 fc...39.99 kfc	0 fc...39.99 kfc	from 0.01 fc	from ±(2% m.v. + 5 digits)
<b>Phase sequence indication</b>	in the same direction (correct), opposite direction (incorrect), $U_{L-L}$ voltage: 95 V...500 V (45 Hz...65 Hz)			

# MPI-540 • MPI-540-PV | Specifications – 3-phase power quality recorder

The device is designed to work with mains:

- » with nominal frequency 50/60 Hz
- » with nominal voltage: 64/110 V, 110/190 V, 115/200 V, 127/220 V, 220/380 V, 230/400 V, 240/415 V, 254/440 V, 290/500 V
- » DC networks

Supported systems:

- » single-phase
- » split-phase with common N
- » three-phase – WYE with and without N conductor
- » three-phase – Delta

Parameter	Measuring range	Max. resolution	Accuracy
<b>Alternating voltage (TRMS)</b>	0.0...500 V	0.01% $U_{nom}$	$\pm 0.5\% U_{nom}$
<b>Alternating current (TRMS)</b>	depending on clamp*	0.01% $I_{nom}$	$\pm 2\%$ m.v. if m.v. $\geq 10\% I_{nom}$ $\pm 2\% I_{nom}$ if m.v. $< 10\% I_{nom}$ (error does not account for clamp error)
<b>Frequency</b>	40.00...70.00 Hz	0.01 Hz	$\pm 0.05$ Hz
<b>Active, reactive, apparent and distortion power</b>	depending on configuration (transducers, clamps)	4 significant digits	depending on configuration (transducers, clamps)
<b>Active, reactive and apparent energy</b>	depending on configuration (transducers, clamps)	4 significant digits	as power error
<b>cos<math>\phi</math> and power factor (PF)</b>	0.00...1.00	0.01	$\pm 0.03$
<b>Harmonics</b>			
Voltage	as for alternating voltage True RMS	as for alternating voltage True RMS	$\pm 5\%$ m.v. if m.v. $\geq 3\% U_{nom}$ $\pm 0.15\% U_{nom}$ if m.v. $< 3\% U_{nom}$
Current	as for alternating current True RMS	as for alternating current True RMS	$\pm 5\%$ m.v. if m.v. $\geq 10\% I_{nom}$ $\pm 0.5\% I_{nom}$ if m.v. $< 10\% I_{nom}$
<b>THD</b>			
Voltage	0.0...100.0% (relative to RMS value)	0.1%	$\pm 5\%$
Current			
<b>Unbalance factor</b>	0.0...10.0%	0.1%	$\pm 0.15\%$ (absolute error)

\* **F-1A, F-2A, F-3A** clamp: 0...3000 A AC (10 000 A<sub>p-p</sub>) • **C-4A** clamp: 0...1000 A AC (3600 A<sub>p-p</sub>) • **C-5A** clamp: 0...1000 A AC/DC (3600 A<sub>p-p</sub>) • **C-6A** clamp: 0...10 A AC (36 A<sub>p-p</sub>) • **C-7A** clamp: 0...100 A AC (360 A<sub>p-p</sub>)



**C-4A**

WACEGC4A0KR



**C-5A**

WACEGC5A0KR



**C-6A**

WACEGC6A0KR



**C-7A**

WACEGC7A0KR



**F-1A**

WACEGF1A0KR



**F-2A**

WACEGF2A0KR



**F-3A**

WACEGF3A0KR

<b>Rated current</b>	1000 A AC	1000 A AC 1400 A DC	10 A AC	100 A AC		3000 A AC	
<b>Frequency</b>	30 Hz...10 kHz	DC...5 kHz	40 Hz...10 kHz	40 Hz...1 kHz		40 Hz...10 kHz	
<b>Output signal level</b>	1 mV / 1 A	1 mV / 1 A	100 mV / 1 A	5 mV / 1 A	77.6 $\mu$ V / 1 A	38.8 $\mu$ V / 1 A	19.4 $\mu$ V / 1 A
<b>Max. diameter of measured conductor</b>	52 mm	39 mm	20 mm	24 mm	360 mm	235 mm	120 mm
<b>Minimum accuracy</b>	$\leq 0.5\%$	$\leq 1.5\%$	$\leq 1\%$	0.5%		1%	
<b>Battery power</b>	–	✓	–	–		–	
<b>Lead length</b>	2.2 m	2.2 m	2.2 m	3 m		2.2 m	
<b>Measurement category</b>	IV 300 V	IV 300 V	IV 300 V	III 300 V		IV 600 V	
<b>Ingress protection</b>			IP40				IP67

# MPI-540-PV | Specifications – photovoltaic installation parameters

Measurement functions	Display range	Resolution	Accuracy ±(% m.v. + digits)
Open circuit voltage $U_{oc}$	0.0 V...1000 V	from 0.1 V	from ±(3% m.v. + 2 digits)
Short circuit current $I_{sc}$	0.00 A...20.00 A	0.1 A	±(3% m.v. + 0.10 A)

## Other technical data

### Safety and work conditions

Measuring category according to EN 61010	IV 300 V, III 500 V II 1000 V DC (only MPI-540-PV)
Ingress protection	IP51
Type of insulation according to EN 61010-1 and IEC 61557	double
Dimensions	288 x 223 x 75 mm
Weight	ca. 2.5 kg
Operating temperature	0...+45°C
Storage temperature	-20...+60°C
Humidity	20...90%
Nominal temperature	23 ± 2°C
Reference humidity	40%...60%
Altitude a.s.l.	≤2000 m

### Memory and communication

Memory of measurement results	unlimited
Data transmission	USB 2.0

### Other information

Quality standard – development, design and production	ISO 9001
The product meets the EMC (emission for industrial environment) requirements according to standards	EN 61326-1 EN 61326-2-2



## Standard accessories



**PVM-1 adapter  
(only MPI-540-PV)**  
WAADAPVM1



**MC4-banana sockets adapter (set)  
(only MPI-540-PV)**  
WAADAMC4



**WS-03 adapter with  
START button with  
UNI-Schuko plug  
(CAT III 300 V)**  
WAADAWS03



**C-PV clamp  
(only MPI-540-PV)**  
WACEGCPVOKR



**Adapter for C-PV  
clamp (only  
MPI-540-PV)**  
WAADACPV



**3x F-3A flexible  
clamp (Ø 120 mm)**  
WACEGF3AOKR



**Test lead 1,2 m  
(banana plugs) black  
/ red / blue / yellow**  
WAPRZ1X2BLBB  
WAPRZ1X2REBB  
WAPRZ1X2BUBB  
WAPRZ1X2YEBB



**Crocodile clip 1 kV  
20 A black / red  
/ blue / yellow**  
WAKROBL20K01  
WAKRORE20K02  
WAKROBU20K02  
WAKROYE20K02



**Pin probe 1 kV  
(banana socket)  
red / blue / yellow**  
WASONREOGB1  
WASONBUOGB1  
WASONYEOGB1



**Test lead 15 m,  
blue (on a reel)**  
WAPRZ015BUBBSZ



**Test lead 30 m,  
red (on a reel)**  
WAPRZ030REBBSZ



**2x earth contact test  
probe (rod), 30 cm**  
WASONG30



**4x voltage adapter  
with M4/M6 thread**  
WAADAM4M6



**USB cable**  
WAPRZUSB



**4 GB microSD card**



**Charging**  
  
**Mains cable with  
IEC C7 plug**  
WAPRZLAD230  
  
**Z7 power supply**  
WAZASZ7



**Cable for battery charging  
from car cigarette  
lighter socket (12 V)**  
WAPRZLAD12SAM



**Li-Ion battery 11.1 V 3.4 Ah**  
WAAKU15



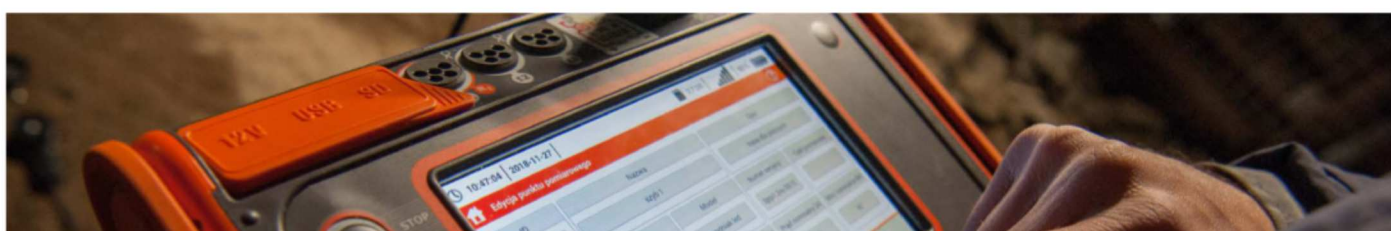
**L2 hanging  
straps (set)**  
WAPOZSZEKPL



**Carrying case M13  
(only MPI-540-PV)**  
WAFUTM13



**L2 carrying case**  
WAFUTL2



## Optional accessories



**EVSE-01 adapter for testing vehicle charging stations**

WAADAEVSE01



**AutoISO-1000C adapter**

WAADAAISO10C



**WS-04 adapter with UNI-SCHUKO angular plug**

WAADAWS04



**F-1A flexible clamp (Ø 360 mm)**

WACEGF1AOKR



**F-2A flexible clamp (Ø 235 mm)**

WACEGF2AOKR



**C-3 clamp (Ø 52 mm)**

WACEGC3OKR



**C-4A clamp (Ø 52 mm) 1000 A AC**

WACEGC4AOKR



**C-5A clamp (Ø 39 mm) 1000 A AC/DC**

WACEGC5AOKR



**C-6A clamp (Ø 20 mm) 10 A AC**

WACEGC6AOKR



**C-7A clamp (Ø 24 mm) 100 A AC**

WACEGC7AOKR



**N-1 transmitting clamp (Ø 52 mm)**

WACEGN1BB



**Hard carrying case for clamps**

WAWALL2



**Test lead for fault loop measurement (banana plugs) 5 m / 10 m / 20 m**

WAPRZ005REBB  
WAPRZ010REBB  
WAPRZ020REBB



**Test lead for earth resistance measurement 25 m / 50 m**

WAPRZ025BUBBSZ  
WAPRZ050YEBBSZ



**Industrial socket adapter 16 A / 32 A**

WAADAAGT16T  
WAADAAGT32T



**Three-phase socket adapter 16 A / 32 A**

WAADAAGT16C  
WAADAAGT32C



**Three-phase socket adapter 16 A / 32 A**

WAADAAGT16P  
WAADAAGT32P



**Three-phase socket adapter 63 A**

WAADAAGT63P



**LP-10A light meter probe with WS-06 plug**

set  
WAADALP10AKPL

only probe with miniDIN-4P plug  
WAADALP10A

only WS-06 adapter with miniDIN-4P socket  
WAADAWS06



**LP-10B light meter probe with WS-06 plug**

set  
WAADALP10BKPL

only probe with miniDIN-4P plug  
WAADALP10B

only WS-06 adapter with miniDIN-4P socket  
WAADAWS06



**LP-1 light meter probe with WS-06 plug**

set  
WAADALP1KPL

only probe with miniDIN-4P plug  
WAADALP1

only WS-06 adapter with miniDIN-4P socket  
WAADAWS06

