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ELECTRICAL SAFETY TESTING & MEASURING



VIVAX
METROTECH

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Multifunction Meter Selection Guide



MPI-540-PV / MPI-540 / MPI-535

MPI-530-IT / MPI-530

MPI-525

MPI-520 / MPI-520 Start

MPI-506

MPI-502

Display	7" LCD touchscreen	LCD graphic	LCD graphic	LCD graphic	segmented LCD	segmented LCD
Network parameters recorder	three-phase / three-phase / –	single-phase	–	–	–	–
Autotests	✓	–	–	–	–	–
Energy losses calculator	✓ / ✓ / –	–	–	–	–	–
Fault loop impedance resolution [Ω]	0...1999	0...1999	0...1999	0...1999	0...1999	0...1999
Maximum resolution of fault loop impedance measurement [Ω]	0.001	0.001	0.01	0.01	0.01	0.01
Measurement voltages [V]	95...440	95...440	95...440	95...440	180...460	180...460
Resolution of fault loop impedance measurement without RCD tripping [Ω]	0,01	0,01	0,01	0,01	0.01	0,01
Calculation of fault current according to rated voltage	✓	✓	✓	✓	✓	✓
Calculation of fault current according to measured voltage	✓	✓	✓	✓	✓	–
Residual current device measurements	AC, A, F, B, B+, EV □ □ G S	AC, A, F, B, B+ □ □ G S	AC, A, F, B, B+ □ □ G S	AC, A, F, B, B+ □ □ G S	AC, A □ □ G S	AC, A □ □ G S
Auto Rejestrator parametrów sieci matic measurement of the full set of parameters	✓	✓	✓	✓	✓	✓
Measurement of tripping current I_{Δ} with rising current	10, 30, 100, 300, 500, 1000	10, 30, 100, 300, 500, 1000	10, 30, 100, 300, 500, 1000	10, 30, 100, 300, 500, 1000	10, 15, 30, 100, 300, 500	10, 30, 100, 300, 500
Simultaneous measurement of I_{Δ} and t_{Δ} in one RCD trip	✓	✓	✓	✓	✓	✓
Measurement of tripping time for factor of rated current	$1/2, 1, 2, 5$	$1/2, 1, 2, 5$	$1/2, 1, 2, 5$	$1/2, 1, 2, 5$	$1/2, 1, 2, 5$	$1/2, 1, 2, 5$
Measurement of touch voltage U_B	✓	✓	✓	✓	✓	✓
Detection of L and N swapping	✓	✓	✓	✓	✓	✓
Measurement of insulation resistance	✓	✓	✓	✓	✓	–
Measurement voltages [V]	50, 100, 250, 500, 1000	50, 100, 250, 500, 1000	50, 100, 250, 500, 1000, 2500	50, 100, 250, 500, 1000	100, 250, 500	–
Measuring range [Ω]	10G / 3G	10G	10G	3G	600M	–
Automatic discharging of object after measurement	✓	✓	–	✓	–	–
Protection against appearance of voltage	✓	✓	✓	✓	✓	–
Automatic discharging of object after measurement	✓	✓	✓	✓	✓	–
Automatic measurement of multi-core cords with AutoISO adapter AutoISO-1000C	✓	✓	✓	✓	–	–
Automatic measurement of multi-core cables with AutoISO adapter AutoISO-2500	–	–	✓	–	–	–
Sound signalling of time intervals for characteristics	✓	✓	✓	✓	–	–
Calculation of absorption coefficients	–	–	✓	–	–	–
Continuity testing with current $\geq 200\text{mA}$	✓	✓	✓	✓	✓	✓
Low-voltage resistance measurement	✓	✓	✓	✓	✓	✓
Earth resistance measurement	3p, 4p, 3p+clamps, double-clamp	3p, 4p, 3p+clamps, double-clamp	3p	3p	–	–
Capability of setting limit for every function	✓	✓	–	–	–	–
Quick check of PE connection	✓	✓	✓	✓	✓	✓
Voltage measurement [V]	0...500	0...500	0...500	0...500	0...500	0...500
Frequency measurement [Hz]	✓	✓	✓	✓	✓	✓
Alternating current measurement [A]	optionally 0...3000	optionally 0...3000	–	optionally 0...400	–	–
Power and $\cos\phi$ measurement	✓ / ✓ / –	✓	–	✓	–	–
Measurement of U harmonics: I up to the 40th	✓ / ✓ / –	✓	–	–	–	–
THD measurement for U and I	✓ / ✓ / –	✓	–	–	–	–
Phase sequence check [V]	95...500	95...500	95...500	95...500	95...500	–
Memory (records)	unlimited	10 000 for every measurement type	990	990	990	990
Power supply	rechargeable batteries	rechargeable batteries / batteries	rechargeable batteries / batteries	batteries / rechargeable batteries	batteries / rechargeable batteries	batteries / rechargeable batteries
Built-in quick charger	✓	✓	✓	✓	–	–
Data transmission	USB, Bluetooth, Wi-Fi	USB, Bluetooth	USB	USB	Bluetooth	Bluetooth
Weight [kg]	2.5	2.2	2.2	2.2	0.6	0.6
Dimensions [mm]	288 x 223 x 75	288 x 223 x 75	288 x 223 x 75	288 x 223 x 75	220x98x58	220x98x58
Weight [kg]	2.5	2.2	2.2	2.2	0,6	0.6



Much more than a multifunctional meter

- **the largest 7 „touch panel on the market - remarkable ergonomics and ease of use**
- removable memory card - easy increase of memory capacity
- Li-Ion battery - longer operation of the meter
- the ability to add a voice memo or photo for measurement - a multimedia description of the measurement site*
- **measurement of all parameters related to earthing and protection against electric shock - one device instead of several**
- quick measurement of the short circuit impedance with the RCD without triggering (up to several seconds) – time saver
- auto-tests - the ability to perform automatic measurements in sequence * - simplified measurements
- fast path from measurements to report - saves time
- **three-phase power network data logger - basic power quality diagnostics**
- real time display of network parameters - immediate evaluation of the tested device
- parameters measured in accordance to class S of EN 61000-4-30 standard - high accuracy of measurements
- energy calculator* - quick evaluation of potential savings

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

Product features

- this device can be used for all measurements for commissioning of electrical installations in accordance with applicable regulations:
 - short circuit loop impedance (also in circuits with RCDs)
 - parameters of RCDs
 - insulation resistance
 - earthing resistance (4 measurement methods + ground resistivity measurement)
 - continuity of protective and equipotential bondings
 - lighting measurement
 - phase sequence tester
 - motor rotation direction tester
- the device can record 50/60 Hz power network parameters in acc. 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 clamps used)
 - frequency in the range of 40Hz - 70Hz
 - active (P), reactive (Q) and apparent (S) power
 - power factor (PF), $\cos\phi$
 - harmonics (up to 40 in voltage and current)
 - total harmonic distortion (THD) for current and voltage



Application

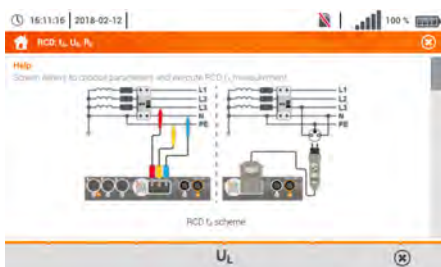
The MPI-540 meter is designed for checking home and industrial electrical installations. The measurements that can be made, by using the device, provides the results which determine the safety of the installation. In addition, the user has the possibility to register the parameters of electrical networks located at these facilities. This allows verification of the quality of electricity, and measurement of the parameters of protection against electric shock using a single universal device. Significant automation of measurements of the meter makes possible to test functioning of residual current circuit breakers in the Auto mode, as well as in pre-programmed measuring sequences (so-called auto-tests), which can also be extended with own sequences. Automatic measurement of insulation resistance of 3-, 4- and 5-wire conductors is possible by using additional the AUTO ISO-1000C adapter.

Device capabilities

The meter combines the measurement capabilities of several devices, while ensuring equally and accuracy. In terms of functionality and capabilities it all makes the meter characterized as superior.

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. Thanks to this screen size, you can display more information that is available at any time of use. Users will definitely like the right size of displayed symbols and clear results in all conditions.



Built-in help system

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



Much more than a multifunctional meter

- the largest 7" touch panel on the market – remarkable ergonomics and ease of use
- removable memory card – easy increase of memory capacity
- Li-Ion battery – longer operation of the meter
- measurement of all parameters related to earthing and protection against electric shock – one device instead of several
- quick measurement of the short circuit impedance with the RCD without triggering (up to several seconds) – time saver
- auto-tests - the ability to perform automatic measurements in sequence – simplified measurements
- fast path from measurements to report – saves time

Product features

- this device can be used for all measurements for commissioning of electrical installations in accordance with applicable regulations:
 - short circuit loop impedance (also in circuits with RCDs)
 - parameters of RCDs
 - insulation resistance
 - earthing resistance (3 measurement methods + ground resistivity measurement)
 - continuity of protective and equipotential bondings
 - lighting measurement
 - phase sequence tester



Application

The MPI-535 meter is designed for checking home and industrial electrical installations. The device provides measurements, results of which determine the safety of the installation. Significant automation of measurements of the meter makes possible to test functioning of residual current circuit breakers in the Auto mode, as well as in pre-programmed measuring sequences (so-called auto-tests), which can also be extended with own sequences. Automatic insulation resistance measurement of 3-, 4- and 5-wire conductors is possible by using the additional AUTO ISO-1000C adapter.

Device capabilities

The meter combines the measurement capabilities of several devices, while ensuring equally and accuracy. In terms of functionality and capabilities it all makes the meter characterized as superior.



Ease of reading

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Built-in help system

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

Increased resistance to environmental conditions

The MPI-535 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

You can easily transfer measurement data to your computer via USB port or removable SD memory card. In order to generate a report on measurements for electric shock protection the Sonel Report Plus program should be used. Saving the downloaded data to the simplest formats and printing is provided by Sonel Reader program, which is a standard and free software of the meter.

SPQ

power
measurement

Z_s R_E
 R_{ISO} E R_{CONT}

complex
measurements of
installations



IP54

CAT III

600 V

CAT IV

300 V

Professional measurements for every budget

Features

The meter offers a **wide range** of functionalities. It combines the measuring capabilities of several devices, while ensuring equally good accuracy. The device 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 (3-pole method),
- » continuity of protective and equipotential bondings,
- » phase sequence test,
- » AC voltage and AC current, frequency,
- » cosφ, active (P), reactive (Q) and apparent (S) power (using clamp).

MPI-520 Start does not include accessories for earth resistance measurements.

Additional functions

- Checking the correctness of PE connection using a contact electrode.
- Measurement of voltage (0 ... 500 V) and network frequency.
- Memory of 990 results.
- Wireless data transmission to a computer.



Application areas

MPI-520 is simple in design and use, providing user with many measurement options. It may be successfully used to test household and industrial electrical systems.

Inspection of electrical safety

Measurements can be easily automated with:

- auto mode of residual current devices (RCD) tests,
- the WS adapter that can be used for testing systems via standard 230 V sockets,
- AutoISO-1000C adapter for automatic insulation resistance test of 3-, 4- and 5-conductor cables, without switching.

Increased resistance to environmental conditions

The 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 IP54. It is resistant to mechanical damage, and a special design allows you to easily protect the 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

You can easily transfer measurement data to your computer via USB port or wireless communication. 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.





300 V

600 V

Great little multitasker

Features

- **Measurement of short circuit loop parameters**
 - Measurement of short circuit loop impedance in networks with rated voltage: 220/380 V, 230 V/400 V, 240/415 V and frequency 45...65 Hz, operating voltage range: 180...460 V
 - Indication of short circuit loop resistance R and short circuit loop reactance X
 - Measurements of short circuit loop impedance with 15 mA current, without tripping the RCD circuit breaker
 - Maximum test current: 7.6 A (at 230 V), 13.3 A (at 400 V)
- **Testing RCD breakers of AC, A types**
 - Testing of prompt, short-delay and selective RCDs with rated current values 10, 15, 30, 100, 300, 500 mA
 - Measurement of I_A trip current and tripping time t_A for currents $0.5 I_{\Delta n}$, $1 I_{\Delta n}$, $2 I_{\Delta n}$, $5 I_{\Delta n}$
 - R_E and U_B measurement without RCD tripping
 - Extended AUTO function of RCD measurement, with the possibility of measuring Z_{L-PE} with low current
 - Measurement of I_A and t_A during one RCD tripping
- **Insulation resistance measurement**
 - Test voltage 100 V, 250 V, 500 V
- **Measurement of resistance of protective conductors and equipotential bondings**
 - Measurement of protective connections continuity with a ± 200 mA current in accordance with EN 61557-4
 - Autocalibration of test leads - any leads can be used
 - Low current resistance measurement with sound signaling
- **Phase sequence indication**



Additional functions

- Checking the correctness of PE connection using a contact electrode
- Measurement of voltage (0 ... 500 V) and network frequency
- Memory of 990 results, wireless data transmission to a computer
- Backlit keypad

Measurement of short circuit loop impedance Z_{L-PE} , Z_{L-N} , Z_{L-L}
 Test current 7.6/13.3 A, test range according to EN 61557-3:
0.13...1999 Ω :

Display range	Resolution	Accuracy
0.00...19.99 Ω	0.01 Ω	$\pm(5\% \text{ m.v.} + 3 \text{ digits})$
20.0...199.9 Ω	0.1 Ω	
200...1999 Ω	1 Ω	

Measurement of short circuit loop impedance Z_{L-PE} in RCD mode
 Test current 15 mA, test range according to EN 61557-3:
0.50...1999 Ω

Display range	Resolution	Accuracy
0.00...19.99 Ω	0.01 Ω	$\pm(6\% \text{ m.v.} + 10 \text{ digits})$
20.0...199.9 Ω	0.1 Ω	$\pm(6\% \text{ m.v.} + 5 \text{ digits})$
200...1999 Ω	1 Ω	

Insulation resistance measurement
 Test range according to IEC 61557-2

- $U_{ISO} = 100 \text{ V}$: 100 k Ω ...99.9 M Ω
- $U_{ISO} = 250 \text{ V}$: 250 k Ω ...199.9 M Ω
- $U_{ISO} = 500 \text{ V}$: 500 k Ω ...599.9 M Ω

Display range for $U_{ISO} = 100 \text{ V}$	Resolution	Accuracy
0...1999 k Ω	1 k Ω	$\pm(5\% \text{ m.v.} + 8 \text{ digits})$
2.00...19.99 M Ω	0.01 M Ω	
20.0...99.9 M Ω	0.1 M Ω	

Display range for $U_{ISO} = 250 \text{ V}$	Resolution	Accuracy
0...1999 k Ω	1 k Ω	$\pm(5\% \text{ m.v.} + 8 \text{ digits})$
2.00...19.99 M Ω	0.01 M Ω	
20.0...199.9 M Ω	0.1 M Ω	

Display range for $U_{ISO} = 500 \text{ V}$	Resolution	Accuracy
0...1999 k Ω	1 k Ω	$\pm(5\% \text{ m.v.} + 8 \text{ digits})$
2.00...19.99 M Ω	0.01 M Ω	
20.0...599.9 M Ω	0.1 M Ω	

Measurement of RCD parameters (operating voltage range 180...270 V)
RCD switching test and measurement of tripping time t_A
 (for measuring function t_A)

RCD type	Multiplication factor	Range	Resolution	Accuracy
General	0.5 $I_{\Delta n}$	0...300 ms	1 ms	$\pm(2\% \text{ m.v.} + 2 \text{ digits})$
	1 $I_{\Delta n}$			
	2 $I_{\Delta n}$	0...150 ms		
	5 $I_{\Delta n}$			
Selective	0.5 $I_{\Delta n}$	0...500 ms		
	1 $I_{\Delta n}$			
	2 $I_{\Delta n}$	0...200 ms		
	5 $I_{\Delta n}$	0...150 ms		

Measurement of RCD tripping current I_A for sinusoidal residual current

Rated current	Measurement range	Resolution	Test current	Accuracy
10 mA	3.0...10.0 mA	0.1 mA	0.3 I _{Δn} ...1.0 I _{Δn}	±5% I _{Δn}
15 mA	4.5...15.0 mA			
30 mA	9.0...30.0 mA			
100 mA	30...100 mA	1 mA		
300 mA	90...300 mA			
500 mA	150...500 mA			

- Measurement start with positive or negative half-period of forced residual current

Measurement of RCD tripping current I_A for single direction pulsating differential current

Rated current	Measurement range	Resolution	Test current	Accuracy
10 mA	3.5...20.0 mA	0.1 mA	0.35 $I_{\Delta n}$...2.0 $I_{\Delta n}$	$\pm 10\% I_{\Delta n}$
15 mA	5.3...21.0 mA		0.35 $I_{\Delta n}$...1.4 $I_{\Delta n}$	
30 mA	10.5...42.0 mA			
100 mA	35...140 mA	1 mA	0.35 $I_{\Delta n}$...1.4 $I_{\Delta n}$	
300 mA	105...420 mA			

- Measurement for positive or negative half-periods of forced leakage current

Phase sequence indication

- phase sequence indication: compliant, not compliant
- network voltage range: 100...440 V
- displaying the values of phase-to-phase voltages

Technical data

Safety and operating conditions

Measuring category acc. to EN 61010	IV 300 V (III 600 V)
Ingress protection	IP67
Type of insulation acc. to EN 61010-1 and IEC 61557	double
Dimensions	220 x 98 x 58 mm
Weight	ca. 0.8 kg

Memory and communication

Memory	990
Data transmission	Bluetooth

Other data

The product meets the EMC (emission for industrial environment) requirements according to standards	EN 61326-1 EN 61326-2-2
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"m.v." - measured value


300 V
600 V

The simplest method of professional measurements

Features

- **Measurement of short circuit loop parameters**
 - Measurement of short circuit loop impedance in networks with rated voltage: 220/380 V, 230/400 V, 240/415 V and frequency 45...65 Hz, operating voltage range: 180...460 V
 - Indication of short circuit loop resistance R and short circuit loop reactance X
 - Measurements of short circuit loop impedance with 15 mA current, without tripping the RCD circuit breaker
 - Maximum test current: 7.6 A (at 230 V), 13.3 A (at 400 V)
- **Testing RCD breakers of AC, A types**
 - Testing of prompt, short-delay and selective RCDs with rated current values 10, 15, 30, 100, 300, 500 mA
 - Measurement of I_A trip current and tripping time t_A for currents $0.5 I_{\Delta n}$, $1 I_{\Delta n}$, $2 I_{\Delta n}$, $5 I_{\Delta n}$
 - R_E and U_B measurement without RCD tripping
 - Extended AUTO function of RCD measurement, with the possibility of measuring Z_{L-PE} with low current
 - Measurement of I_A and t_A during one RCD tripping
- **Measurement of resistance of protective conductors and equipotential bondings**
 - Measurement of protective connections continuity with a ± 200 mA current in accordance with EN 61557-4
 - Autocalibration of test leads - any leads can be used
 - Low current resistance measurement with sound signaling



Additional functions

- Checking the correctness of PE connection using a contact electrode
- Measurement of voltage (0 ... 500 V) and network frequency
- Memory of 990 results
- Wireless data transmission to a computer
- Backlit keypad



Simplicity included in the price

Features of MPI-502 are focused on ergonomics and maximally simplified user experience. The functions are selected with a rotary switch. Additional parameters are set with buttons located on the housing face. The settings are saved by the device even when the battery is completely discharged.

All buttons and the modular display have backlight, which significantly improves operation in low light. Large memory eliminates the need for taking notes during the measurements.

Inspection of electrical safety

This device may be used to **inspect safety of electrical systems in households and industrial facilities**. Measurements can be easily automated with:

- auto mode of residual current devices (RCD) tests,
- the WS adapter that can be used for testing systems via standard 230 V sockets.



Increased resistance to environmental conditions

The 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 IP67.

Communication and software

You can easily transfer measurement data to your computer via Bluetooth wireless communication. 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.



CAT II

300 V

IP40



Type 2 connector

Measurement of single- and three-phase AC charging stations



Communication connector

Works with Sonel MPI devices



Rotary switches

Quick and simple state simulation of the connected object



Quick and full diagnostics of charging stations

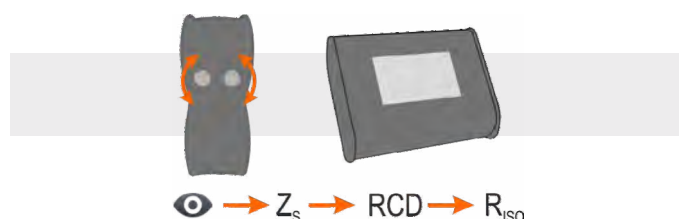
Capabilities

Adapter allows to perform comprehensive **measurements of electric vehicle charging stations** - quickly and in accordance with applicable regulations. Simulating the charging cable (proximity pilot line - PP) and vehicle connection status (control pilot line - CP), it will bring the station into different operating states. This will enable **measurements in the field of electric shock protection**: Z_s fault loop impedance, R_{iso} insulation resistance and checking the parameters of RCD residual current devices.

To facilitate diagnostics, one of the EVSE-01 sockets is provided with **pulse width modulation signal (PWM)**.

Application

The EVSE-01 adapter enables measurements of AC electric vehicle charging stations with **type 2 connector**. Tests for 1-phase and 3-phase stations are available - both with and without ventilation.



Works with*



* the scope of measurements depends on the capabilities and technical parameters of each model.

Technical specifications

measurement category according to EN 61010-1		CAT II 300 V
ingress protection according to EN 60529		IP40
pollution degree		2
input voltage		400 V (3-phase)
frequency		50 Hz
simulation of charging cable PP		open circuit, 13 A, 20 A, 32 A, 63 A
vehicle connection simulation CP	state A	vehicle not connected
	state B	vehicle connected, not charging
	state C	vehicle connected, charging without ventilation
	state D	vehicle connected, charging with ventilation
	state E	error - CP short to PE
socket types		<div>▪ measuring sockets: L1, L2, L3, N, PE</div> <div>▪ 1-phase socket</div> <div>▪ CP signal socket - PWM communication</div>
test lead (length)	EVSE	1 m
	MPI	0.5 m
operating temperature		-5...+45°C
storage temperature		-20...+60°C
dimensions		220 x 100 x 60 mm
weight		1.4 kg

Functional comparison

	MPI-540-PV MPI-540 MPI-535	MPI-530-IT MPI-530 MPI-525 MPI-520	MPI-506	MPI-502
auto measurements	✓	–	–	–
automatic three-phase measurement via multiplug	✓	–	–	–
visual inspection	✓	–	–	–
fault loop Z_{L-PE} Z_{L-N} parameters measurement	✓	✓	✓	✓
6 mA RCD test	✓	–	–	–
RCD test	AC, A, F, B, B+, EV	AC, A, F, B, B+	AC, A	AC, A
insulation resistance R_{iso} measurement	✓	✓	✓	–
measurements report	✓	✓	✓	✓

Standard accessories



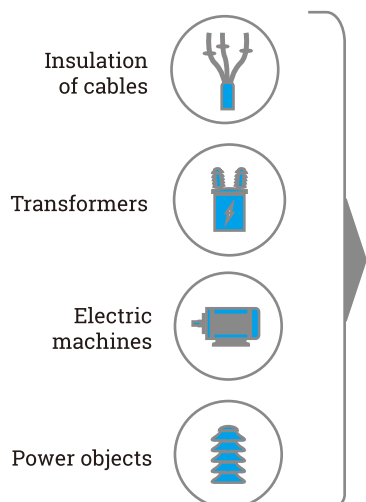
Carrying case

WAFUTM6



User manual

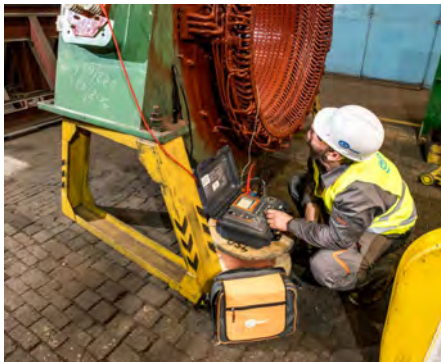



CAT III
1000 V
CAT IV
600 V
IP67
BLUETOOTH

Damage location and insulation measurements

Features

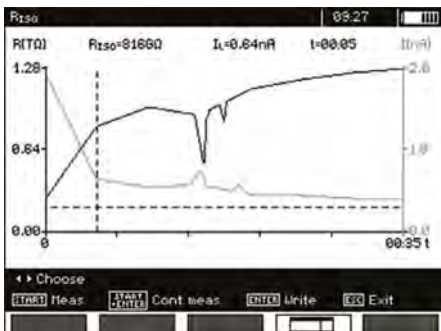
- Insulation resistance measurement
 - up to **40 TΩ** (MIC-10k1, MIC-10s1)
 - up to **20 TΩ** (MIC-5050, MIC-05s1)
- Measurement voltage - any in the range of
 - MIC-10k1, MIC-10s1: **50...10000 V**, 50...1000 V with steps of 10 V, 1...10 kV with steps of 25 V
 - MIC-5050, MIC-05s1: **50...5000 V**, 50...1000 V with steps of 10 V, 1...5 kV with steps of 25 V
- Continuous indication of measured insulation resistance or leakage current
- Automatic discharge of measured object capacitance voltage after the end of insulation resistance measurement
- Acoustic signalling of 5-second intervals to facilitate capturing time characteristics
- Adjustable measuring time - up to **99'59"**
- T_1 , T_2 and T_3 test times for measuring one or two absorption coefficients from the range of 1...600 s
- Polarization index (PI), absorption coefficients Ab1, Ab2 and dielectric absorption ratio (DAR) measurement
- Indication of actual test voltage during measurement
- **1.2 mA**, **3 mA** or **6 mA** test current
- Insulation resistance measurement using two- or three-wire method
- Measurements with test leads up to 20 m
- Protection against measuring live objects
- Automatic measurement of multiple core cables with the optional **AutoISO-5000 adapter** (for MIC-10k1 and MIC-10s1 max. measuring voltage 5 kV)
- Measurement of capacitance during the measurement of R_{ISO}
- Measurement of temperature (with optional probe ST-1)
- Step voltage insulation resistance measurement (SV)
- Dielectric Discharge calculation (DD)
- Damage location (burnout)
- Digital filters for measurements with strong interferences
- It can work in an environment where electromagnetic interferences of 400 kV occur
- Measurement of DC and AC voltages within the range of 0...750 V



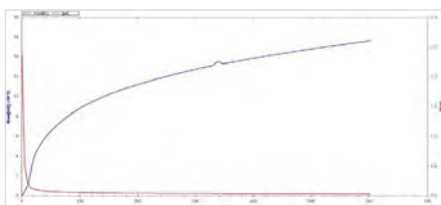
Professional diagnostic tool



Several measurements in one connection



Graphic interpretation of results



Dedicated PC software



For the toughest working conditions

Application

MIC-10k1 meter is designed to measure the insulation resistance of electro-power objects, i.e. single- and multi-core cables, transformers, motors and generators, capacitors, switches and other devices installed in power stations. MIC-10s1 meter is an reinforced version of MIC-10k1, dedicated for measurements in areas with very high electromagnetic disturbances, e.g. electrical substations with 765 kV voltage or higher.

Capabilities

Highly efficient HV inverter, with test voltage of 10 kV and current of 6 mA, suitable for measuring the insulation resistance up to 40 TΩ. Achieving such a result makes these meters unrivalled devices. Three-wire resistance measurement, performed using a "GUARD" wire, eliminates surface leakage currents caused by contaminated insulation, thereby increasing the reliability of obtained results.

The meter measures temperature of tested object, which is necessary to determine the temperature correction factor for R_{iso} . In addition, it indicates the absorption coefficient (DAR - Dielectric Absorption Ratio), Polarization Index (PI) and the value of Dielectric Discharge (DD). The device allows user to assess the condition of the insulation, by applying the test voltage incrementally in steps (SV). This solution ensures that a dielectric in good condition will provide the same results, regardless of the applied voltage. Deviations in obtained resistance values of approx. 25%, observed on the chart in the individual steps, may indicate the potential insulation defects.

MIC-10s1 and MIC-10k1 have the unique ability to perform measurements on multi-core cables, within one connection step, using the AutoISO-5000 adapter. This solution reduces the duration of measurements on repetitive of objects, such as cables of street lighting systems. Inverter with a power of almost 60 W is able to intensify the point of cable damage, which facilitates finding the location of the fault using a reflectometric method e.g. with TDR-420 device.

Built-in digital filters, with averaging time of 10, 30, 60 sec. (and additionally 100, 200 sec. in MIC-10s1) and "smart" solution guarantee stable measurement results in areas of strong electromagnetic interference.

Data analysis

The device, with its backlight graphical screen may display a waveform of insulation resistance, voltage and current as a function of time. The operator, basing on the trend shown by the waveform, may quickly assess the insulation condition right after starting the measurement. This provides full control over the tested object and clear image of the tested insulation. In addition, with movable tags, the operator may trace the course of the measurement and check resistance values obtained for any time of the current measurement and of measurements made in the past.

After installing mobile application, as a part of the set the user receives Sonel Reader software for collecting historical data and comparing it with current results, transferred from the extensive memory of the meter. This solution helps user to prepare a measurements report, track the insulation degradation and plan the maintenance / repair works.

Comparison

	MIC-10k1	MIC-5050	MIC-10s1	MIC-05s1
maximum measuring voltage	10 000 V	5000 V	10 000 V	5000 V
maximum measuring range	40 TΩ	20 TΩ	40 TΩ	20 TΩ
resistance to external interference voltages	do 750 V	do 750 V	do 1550 V	do 1550 V
advanced, digital interference filtration	10 / 30 / 60 seconds	10 / 30 / 60 seconds	10 / 30 / 60 / 100 / 200 seconds and SMART	10 / 30 / 60 / 100 / 200 seconds and SMART
test leads lock	—	—	✓	✓

MIC-5010 / 5005

index: WMGBMIC5010 / WMGBMIC5005



CAT III

1000 V

CAT IV

600 V



IP67



BLUETOOTH



Insulation of cables



Transformers


Electric
machines


Power objects


Pole transform-
er substations

Street lighting
power cables

Insulation resistance measurements: go premium

Features

- Insulation resistance measurement up to **15 TΩ**
- Measuring voltage in the range of **50...5000 V**, 50...1000 V in steps of 10 V, 1...5 kV in steps of 25 V
- Continuous indication of measured insulation resistance and leakage current
- Automatic discharge of measured object capacitance voltage after the end of insulation resistance measurement
- Acoustic signalling of 5-second intervals to facilitate capturing time characteristics
- Adjustable measuring time - max. **99'59"**
- Metered T_1 , T_2 and T_3 test times for measuring one or two absorption coefficients from the range of 1...600 s
- Measurement of coefficients: polarisation (PI), absorption Ab1, Ab2, dielectric absorption ratio (DAR)
- Indication of actual test voltage during measurement
- Test current: **1.2 mA** or **3 mA**
- Two- and three-lead method of insulation resistance measurement
- Measurements with test leads up to 20 m
- Protection against measuring live objects
- Measurement of capacitance during the measurement of R_{ISO}
- Step voltage insulation resistance measurement (SV)
- Dielectric Discharge calculation (DD)
- Digital filters for measurements with strong interferences



Additional features

- Continuity measurement of protective connections and equipotential bonding in accordance with EN 61557-4 with current > 200 mA (**MIC-5010**)
- Adjustable limits for measured insulation resistance (**MIC-5010**)
- Adjustable limits for measured R_{CONT} resistance (**MIC-5010**)
- High resistance to interferences - digital filters (10 s, 30 s, 60 s)
- Measurement of capacitance during the measurement of R_{ISO}
- Measurement of leakage current during insulation resistance testing
- DC and AC voltage measurement in the range of 0...600 V
- 990 cells of memory (11880 records) with the capability of wireless data transmission to a PC (with Bluetooth) or via USB cable
- Power supply from mains or battery pack
- Backlit display
- Backlit keys (**MIC-5010**)
- The instruments meet the requirements of the EN 61557 standard

Comparison of meters

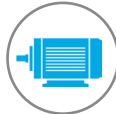
	MIC-5010	MIC-5005
maximum measuring voltage	5000 V	5000 V
maximum measuring range	15 TΩ	15 TΩ
resistance to external interference voltages	up to 500 V	up to 500 V
advanced, digital interference filtration	10 / 30 / 60 seconds	10 / 30 / 60 seconds
continuity measurement of protective conductors	✓	-
backlit keys	✓	-



For measurement of wiring in flats, houses and public buildings



For measurement of low voltage motors



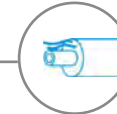
For measurement of home appliances



For measurement of telephone and IT wiring



For measurement of pre-insulated pipes



For measurements in anti-icing systems


CAT III
1000 V
CAT IV
600 V
IP67


Measure insulation resistance up to 10 GΩ with the MIC-10 Insulation Resistance Meter

Main features

- measurement of insulation resistance up to 10 GΩ thanks to max 1000 V measurement voltage
- designed for harsh environmental conditions - IP67 ingress protection
- allows for testing electrical continuity - R_{CONT} 200 mA function
- checking start capacitors in motors thanks to capacity measurement function

...and much more

- measurement voltage selected from: 50, 100, 250, 500, 1000 V
- continuous reading of measured insulation resistance
- automatic discharge of the measured object's capacitance upon completion of insulation resistance measurement
- sound signalling of five-second time intervals, facilitating capture of time characteristics
- readings of actual measurement voltage during measurement
- protection against measurement of live objects
- three-lead measurement
- capacitance measurement during measurement of R_{ISO}
- low-voltage measurement of circuit continuity and resistance
- continuity test of protective conductors and equipotential bonding with current ≥ 200 mA flowing in two directions in compliance with EN 61557-4
- measurement of direct and alternating voltages within the range of 0...600 V



Application

MIC-10 is an insulation resistance meter, which may be very useful for various electrical works (even the simplest), in locations with Low Voltage power supply, including: electrical systems in single- and multi-family buildings as well as in public buildings and in small workshops or factories. With its test voltage settings of 50 V, 100 V or 250 V the device is perfect for quick checking of the insulation condition in telecommunications systems and control cables.



Features

Test voltage settings of 500 V or 1000 V perfectly match the requirements for assessing the protection of power supply lines but also of floors and walls - PRS-1 probe (optional accessory) is very useful for this purpose.

With MIC-10 meter you can check whether an object is under voltage (measuring range up to 600 V), both in overhead and cable networks (measuring category of the device: CAT IV 600 V). You can verify the continuity of cables, e.g. PE connections and equipotential bonding - using the current of at least 200 mA, according to EN 61557-4. You can check the capacity of the start-up capacitors in household appliances and drives of any type (measuring range up to 10 μ F).

This makes MIC-10 meter an essential tool for every service technician.



Durable housing

Handy and ergonomic housing provides protection of IP67, ensuring reliability of the meter even in the harshest environmental conditions (moisture, dust, high temperature, etc.).

Insulation resistance measurement

Range	Resolution	Accuracy	U_n	Measuring range
0.0...999.9 k Ω	0.1 k Ω	$\pm (3\% \text{ m.v.} + 8 \text{ digits})$	50 V	50 k Ω ...250.0 M Ω
1.000...9.999 M Ω	0.001 M Ω		100 V	100 k Ω ...500.0 M Ω
10.00...99.99 M Ω	0.01 M Ω		250 V	250 k Ω ...2.000 G Ω
100.0...250.0 M Ω (for $U_n = 50 \text{ V}$) 100.0...500.0 M Ω (for $U_n = 100 \text{ V}$) 100.0...999.9 M Ω (for $U_n \geq 250 \text{ V}$)	0.1 M Ω		500 V	500 k Ω ...5.000 G Ω
1.000...2.000 G Ω (for $U_n = 250 \text{ V}$)	0.001 G Ω	$\pm (4\% \text{ m.v.} + 6 \text{ digits})$	1000 V	1000 k Ω ...10.00 G Ω
1.000...5.000 G Ω (for $U_n = 500 \text{ V}$)	0.001 G Ω			
1.000...9.999 G Ω (for $U_n = 1000 \text{ V}$)	0.001 G Ω			
10.00 G Ω (for $U_n = 1000 \text{ V}$)	0.01 G Ω			

Abbreviation „m.v.“ used in the specification of measurement means a measured value.

Pocket measurements

Capabilities

- Fault loop impedance measurement with 0.01 Ω resolution.
- Operates in networks with voltages 220/380 V, 230/400 V, 240/415 V (operating range 180...440 V).
- Operating frequency 45...65 Hz
- Calculation of I_k fault current.
- Automatic differentiation between phase and phase-to-phase voltage.
- Possibility of applying test leads: 1.2 m, 5 m and longer.
- Measurement with swapped L and N conductors.
- Measurement of resistance (R_s) and reactance (X_s) components.

Additional features

- Voltage measurement 0...440 V AC.
- Power supply: batteries (4 x LR6) or rechargeable batteries (4 x NiMH).

Application

This meter is designed for measurements on objects protected by circuit breakers with rating up to 63 A, where fault currents reach **1 kA**, i.e. in housing industry, single and multi-family houses, office buildings, small factories and all other facilities that are equipped with low-voltage electrical systems. In addition, the meter is a useful tool for maintenance services.



Technical specifications

Measurement functions	Measurement range	Display range	Resolution	Accuracy \pm (% m.v. + digits)
Voltage	0 V...440 V	0 V...440 V	1 V	\pm (2% m.v. + 2 digits)
Short-circuit loop parameters				
2p method - standard current measurement maximum current 26.7 A	from 0.24 Ω ...200 Ω acc. to EN 61557	0.00 Ω ...200 Ω	from 0.01 Ω	from \pm (2.5% m.v. + 3 digits)
Short-circuit current readings				
2p method - standard current measurement	Calculated on the basis of test Z_s ranges and rated voltages	1.15 A...40 kA	from 0.01 A	Calculated on the basis of error for fault loop

Bezpieczeństwo i warunki użytkowania

Kategoria pomiarowa wg EN 61010	III 300 V
Stopień ochrony	IP67
Rodzaj izolacji wg EN 61010-1 i EN 61557	double
Zasilanie	4x LR6 1.5 V alkaline battery 4x AA size NiMH rechargeable battery
Wymiary	220 x 98 x 58 mm
Masa miernika	509 g
Temperatura pracy	-10...+50°C
Temperatura przechowywania	-20...+70°C
Wilgotność	20...80%
Temperatura nominalna	23 \pm 2°C
Wilgotność odniesienia	40%...60%

Pozostałe informacje

Standard jakości – opracowanie, projekt i produkcja	ISO 9001
Wyrób spełnia wymagania EMC (emisja dla środowiska przemysłowego) wg norm	EN 61326-1 EN 61326-2-2



w.m. - wartość mierzona



measurements
without tripping
RCDs

Measurement of fault loop and more

Capabilities

- Fault loop impedance measurement with 0.01 Ω resolution.
- Low-current impedance measurement in circuits protected by RCD $\geq 30\text{mA}$ with 0.01 Ω resolution (range of 180...270 V)
- Operates in networks with voltages 220/380 V, 230 V/400 V, 240/415 V (operating range 180...460 V)
- Operating voltage range: 180...270 V (for Z_{L-PE} and Z_{L-N}) and 180...460 V (for Z_{L-L}).
- Maximum measuring current: 7.6 A for 230 V (3x10 ms), 13.3 A for 400 V (3x10 ms).
- Operating frequency 45...65 Hz
- Calculation of I_k fault current.
- Measurement with swapped L and N conductors.
- Measurement of resistance (R_s) and reactance (X_s) components.
- Low-voltage measurement of continuity of circuit and resistance.

Additional features

- Contact electrode - quick testing of proper connection of PE conductor.
- Voltage measurement 0...500 V.
- Frequency measurement 45.0...65.0 Hz.
- Memory of 990 measurement results, ability to transfer the data to a PC via Bluetooth.
- Power supply: batteries (4 x LR14) or rechargeable batteries (4 x NiMH).

Application

The instrument is dedicated to personnel performing measurements in single and multi-family buildings, office buildings, industrial plants and any other places equipped with low voltage electrical systems. In addition, the meter is intended for maintenance personnel working on objects, where fault currents reach **4.4 kA** (measured according to EN 61557). MZC-304 is also a great tool for checking circuits additionally protected by residual current devices.



Technical specifications

Measurement functions	Measurement range	Display range	Resolution	Accuracy ±(% m.v. + digits)
Voltage	0 V...500 V	0 V...500 V	from 0.1 V	from ±(2% m.v. + 2 digits)
Frequency	45.0 Hz...65.0 Hz	45.0 Hz...65.0 Hz	0.1 Hz	±(0.1% m.v. + 1 digit)
Short-circuit loop parameters				
2p method - standard current measurement maximum current 13.3 A	from 0.13 Ω...1999 Ω acc. to EN 61557	0.00 Ω...1999 Ω	from 0.01 Ω	±(5% m.v. + 3 digits)
2p method - measurements without tripping RCDs	from 0.5 Ω...1999 Ω acc. to EN 61557	0.00 Ω...1999 Ω	from 0.01 Ω	from ±(6% m.v. + 5 digits)
Short-circuit current readings				
2p method - standard current measurement	Calculated on the basis of test Z_s ranges and rated voltages	1.110 A...40.0 kA	from 0.001 A	Calculated on the basis of error for fault loop
2p method - measurements without tripping RCDs	Calculated on the basis of test Z_s ranges and rated voltages	1.110 A...24.0 kA	from 0.001 A	Calculated on the basis of error for fault loop
Measurement of continuity of protective conductors and equipotential bonding				
Low-voltage measurement of continuity of circuit and resistance with ±200 mA current	0.12 Ω...400 Ω acc. to EN 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)

Safety and work conditions

Measuring category according to EN 61010	IV 300 V, III 600 V
Ingress protection	IP67
Type of insulation according to EN 61010-1 and EN 61557	double
Power supply	4x LR6 1.5 V alkaline battery 4x AA size NiMH rechargeable battery
Dimensions	220 x 98 x 58 mm
Weight	ca. 0.6 kg
Operating temperature	0...+50°C
Storage temperature	-20...+70°C
Humidity	20...90%
Nominal temperature	23 ± 2°C
Reference humidity	40%...60%

Memory and communication

Memory of measurement results	990 results
Data transmission	Bluetooth

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

m.v. - measured value

MZC-330S

750 V

maximum
network voltage

0.1 mΩ

maximum
resolution

CAT IV

600 V



IP67



BLUETOOTH



Heavyweight for high-current measurements

Capabilities

- Measurement of very low short circuit loop impedances (with resolution 0,1 mΩ) with a current of 130 A at 230 V; maximum 300 A at 690 V (500 V in MZC-320S).
- Measurement with a current of 24 A at 230 V, maximum 37 A at 690 V (maximum 27 A at 500 V in MZC-320S) with resolution 0,01 Ω.
- Measurements in installations with rated voltages: 110/190 V, 115/200 V, 127/220 V, 220/380 V, 230/400 V, 240/415 V, 290/500 V and 400/690 V (MZC-330S only) and frequencies 45...65 Hz.
- Ability to perform measurements in short circuit system: phase-phase, phase-PE, phase-N.
- Differentiation between the phase voltage and the inter-phase voltage while calculating the short circuit current.
- Ability to change the length of test lead (measurement with 2p method).
- 4p (four-pole) method, test leads do not require calibration (measurement with current up to 300 A).
- Measurement of resistance (R_s) and reactance (X_s) components.

Additional features

- Touch voltage and touch shock voltage measurement with resistor 1 kΩ).
- AC voltage measurement in range 0...750 V (0...550 V in MZC-320S).
- Frequency measurement 45.0...65.0 Hz.
- Memory of 990 measurement results, ability to transfer the data to a PC via USB and Bluetooth.
- Power supply: rechargeable battery.



Reaching the areas unattainable to others

In direct vicinity of transformers or in transformer stations, where the circuits are equipped with a high current protection (fuse-links with the rating of several hundred amperes, motor circuit breakers), **fault currents may reach several hundreds of kilo-amperes**. Measurement of fault loop impedance in such networks requires a **high-current meter**, which is capable of measuring Z_s values at the level of single milliohms. Our patented technical solution, which uses components not available in the commercial offer (unique fault resistor), enables us to offer the meter with perfect performance in such demanding conditions.

Measurements without compromise

Commercially available fault loop impedance meters perform the measurements asymmetrically, i.e. using half-wave current. This solution introduces the transitional constant and DC constant, which does not always result in a linear behaviour of the transformer during the tests. This in turn, affects the accuracy of the results.

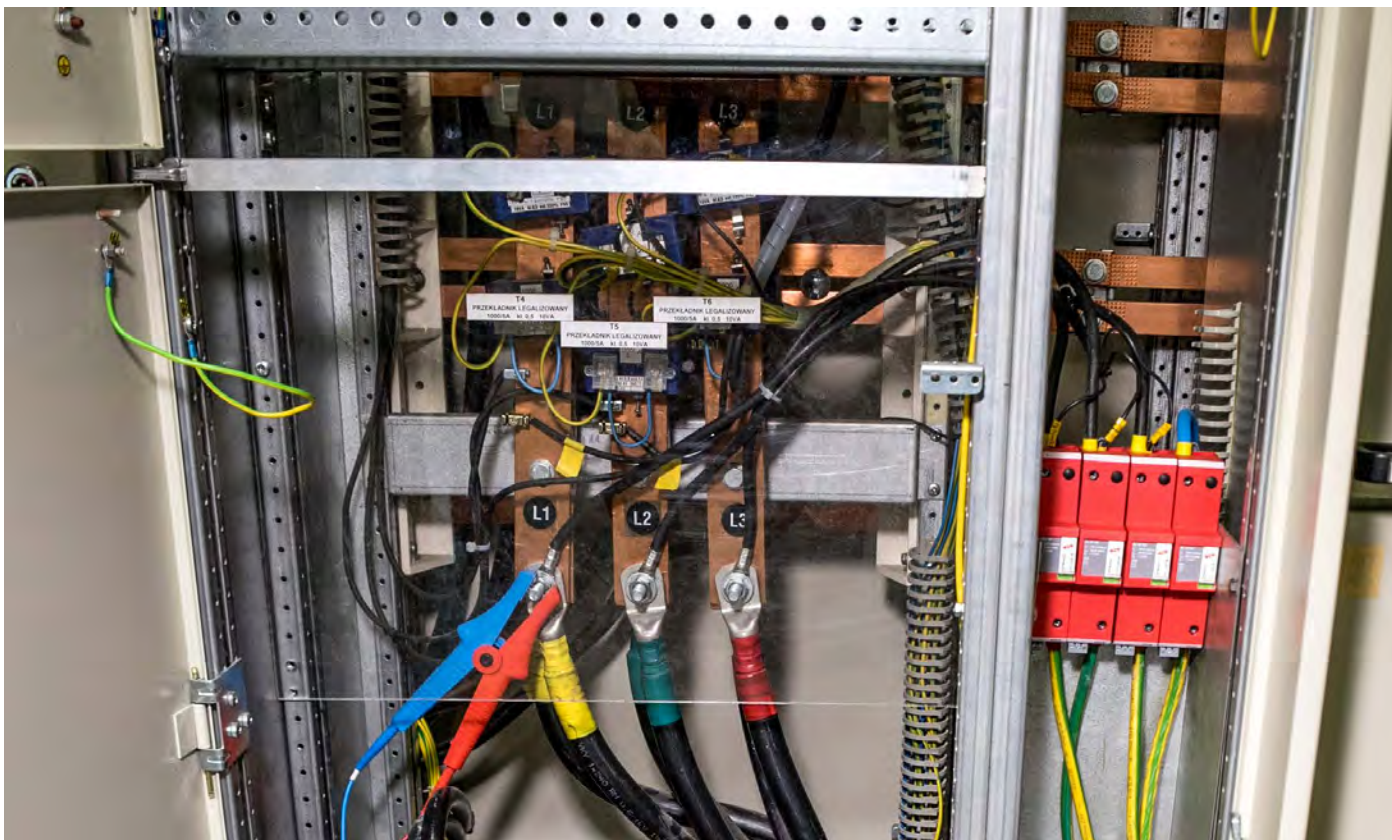
MZC-330S and MZC-320S high-current meters apply **symmetrical current** for measurements, which means that they use the full wave - thanks to the advanced design of the measuring system and fault circuit.

Applications

The instruments are used for measurements in networks with the following rated voltage:

- **up to 750 V**, where the prospective fault current may reach **95.8 kA**, as measured according to EN 61557 (**MZC-330S**),
- **up to 500 V**, where the prospective fault current may reach **69.4 kA**, as measured according to EN 61557 (**MZC-320S**).

These parameters make the meters perfect for tests and measurements at wind farms, high-speed rail and in facilities controlled by power companies.





200 mA

measurement
current



soil resistivity
without manual
conversion

MRU-200-GPS



built-in
GPS receiver

CAT III

600 V

CAT IV

300 V



IP54



BLUETOOTH

Multifunctional earthing and soil resistivity meter

Measurement methods

- **Impulse method** – measurement of lightning protection systems with a measuring impulse ramp of 4/10 μ s, 8/20 μ s, 10/350 μ s
- **3-pole and 4-wire method** – measurement of earthing systems using auxiliary probes
- **3-pole method with clamp** – measurement of earthing systems with multiple earth electrodes
- **Two-clamp method** – measurement of earthing system when the auxiliary probes cannot be used
- **Earth resistivity** – Wenner method
- **Resistance of earth connection and equipotential bonding** measured using current ≥ 200 mA with auto-zero function – meets the requirements of EN 61557-4
- **Measurement of leakage current**

Additional features

- **Built-in GPS receiver** – recording results with location coordinates (MRU-200-GPS)
- Measurement of resistance of auxiliary electrodes R_s and R_H
- Measurement of interference voltage
- Measurement of interference frequency
- Measurement in the presence of interference voltage generated by power networks with frequency of 16 2/3 Hz, 50 Hz, 60 Hz, 400 Hz
- Selection of maximum measuring voltage (25 V and 50 V)
- Automatic calculation of soil resistivity in ohm-meters (Ω m) and ohm-feet (Ω ft)
- Memory of 990 measurement results (10 banks of 99 cells each)
- Calibration of clamp used
- Real time clock (RTC)
- Data transmission to the computer and mobile devices
- Battery indication





Application

MRU-200 and MRU-200-GPS meters were created for **the most difficult working conditions**. They generate a measuring current exceeding 200 mA, which provides effective measurements of grounding of energy objects such as transformer stations and power stations.

Thanks to the methods using clamps, it is **not necessary to disconnect the control connectors**, which is sometimes a very tedious operation. This plays a special role when performing works on objects exposed to weather conditions, where the connecting elements are sometimes corroded or tarnished.

The graphical user interface provides clear readings and explicit messages. This translates into quick, trouble-free service.



Impulse method

MRU-200 and MRU-200-GPS may be used to test earthing of **lightning protection systems**, as these meters are able to simulate the conditions occurring during a lightning strike – they generate currents with a standardized pulse leading edge and a time to half-peak. Available **impulse ramps** include 4/10 μ s, 8/20 μ s, 10/350 μ s.

Compatible with ERP-1 adapter

ERP-1 adapter allows user to test earthing systems using flexible clamps. This is particularly useful, e.g. in case of lattice towers – there is no need to switch off the line or disconnect control connectors. Proprietary algorithm allows user to check the current direction in the individual measurements and facilitates damage detections, e.g. corroded steel strip (hoop).



Capabilities

The measuring methods available in the device allow for comprehensive control of working and protective grounding. The calibration function of the test leads eliminates the influence of their resistance on the result. However, this is just the beginning.

- **The 4-wire method** provides very accurate measurement of the expected small values of resistance – eliminates the resistance of the test leads connecting the meter to grounding.
- **Measurement of resistance** of earth connection and equipotential bonding with a current exceeding 200 mA meets the requirements of EN 61557-4 standard.
- Before performing the measurement, the meter checks whether the tested object is a subject to excessive **interference voltage**, which may indicate additional problems.



Memory and results

The results can be saved to the device's memory. It is divided into **10 banks of 99 cells**, each corresponding to one measurement. These results can be easily transferred to the **Sonel Reader** software for archiving or subsequent analysis and research.

Bluetooth wireless interface may be used to transfer measurement results to PC software or to a mobile phone with dedicated app – **Sonel MRU Mobile**. This provides not only data archiving function, but further data transfer – directly from the measurement site via an e-mail.



CAT IV

300 V

IP67

closed case

IP54

open case

50°C
HEAVY
DUTY
-10°C

Armored meter for earth resistance and soil resistivity

Measurement methods

- Earth resistance measurement with 3-pole and 4-pole method,
- Earth resistance measurement without disconnecting measured earthings (using clamp)
- Two-clamp earth resistance measurement without auxiliary earth probes
- Earth resistivity (Wenner method)
- Continuity of equipotential bondings and protective conductors with ≥ 200 mA current and auto-zero function – complies with EN 61557-4

Additional features

- **Outstanding resistance to harsh environmental conditions** – the suit-case housing protects against the ingress of dust and water and protects against the effects of falls
- Measurement of resistance of auxiliary electrodes R_s and R_H
- Measurement of interference voltage
- Measurement of interference frequency
- Measurement in the presence of interference voltage generated by power networks with frequency of 50 Hz or 60 Hz
- Selection of maximum measuring voltage (25 V and 50 V)
- Selection of distance between the electrodes for resistivity measurement – meters (m) or feet (ft)
- Memory of 990 measurement results (10 banks of 99 cells each)
- Calibration of clamp used
- Real time clock (RTC)
- Data transmission to the computer
- Battery indication





Application

MRU-120HD was created for **the most difficult working conditions**. It generates a measuring current exceeding 200 mA, which provides effective measurements of grounding of energy objects such as transformer stations and power stations.

Thanks to the methods using clamps, it is **not necessary to disconnect the control connectors**, which is sometimes a very tedious operation. This plays a special role when performing works on objects exposed to weather conditions, where the connecting elements are sometimes corroded or tarnished.

The graphical user interface provides clear readings and explicit messages. This translates into quick, trouble-free service.



Transport and security

It doesn't matter if you take measurements while wading in the mud or if you act in the sand amongst clouds of dust. The MRU-120HD meter is ready and will not disappoint. **IP67** protection degree when the cover is closed ensures dust-tightness and prevents water ingress – even when the housing is immersed briefly! When measuring, the tightness is still high (IP54), providing protection against dust and water splashes from any direction.



Capabilities

The measuring methods available in the device allow for comprehensive control of working and protective grounding. The calibration function of the test leads eliminates the influence of their resistance on the result. However, this is just the beginning.

- **The four-lead method** provides very accurate measurement of the expected small values of resistance – eliminates the resistance of the test leads connecting the meter to grounding.
- **Measurement of the continuity** of protective connections and equipotential bondings with a current exceeding 200 mA meets the requirements of EN 61557-4 standard.
- Before performing the measurement, the meter checks whether the tested object is a subject to excessive **interference voltage**, which may indicate additional problems.

Memory and results

The results can be saved to the device's memory. It is divided into **10 banks of 99 cells**, each corresponding to one measurement. These results can be easily transferred to the **Sonel Reader** software for archiving or subsequent analysis and research.





200 mA

measurement
current



soil resistivity
without manual
conversion

CAT IV

300 V



IP54

Multifunctional earthing resistance meter

Measurement methods

- **3- and 4-wire method** – measurement of earthing systems using auxiliary probes
- **3-wire method with clamps** – measurement of earthing systems with multiple earth electrodes
- **Two-clamp method** – measurement of earthing system when the auxiliary probes cannot be used
- **Soil resistivity** – Wenner method
- **Resistance of earth and compensatory conductors** measured using current ≥ 200 mA with auto-zero function – meets the requirements of EN 61557-4

Additional features

- **Measurement current of 200 mA** – facilitates earth resistance measurements in difficult areas (sand, stony soil)
- Measurement of resistance of auxiliary electrodes R_s and R_H
- Measurement of interference voltage
- Measurement in the presence of interference voltage generated by power networks with frequency of 50 Hz and 60 Hz
- Selection of maximum measuring voltage (25 V and 50 V)
- Automatic calculation of soil resistivity in ohm-meters (Ωm) and ohm-feet (Ωft)
- Memory of 990 measurement results (10 banks of 99 cells each)
- Calibration of clamp used
- Real time clock (RTC)
- Data transmission to the computer
- Battery indication





Application

MRU-120 meter was created for **the most difficult working conditions**. It generates a measuring current exceeding 200 mA, which provides effective measurements of grounding of energy objects such as transformer stations and power stations.

Thanks to the methods using clamps, it is **not necessary to disconnect the control connectors**, which is sometimes a very tedious operation. This plays a special role when performing works on objects exposed to weather conditions, where the connecting elements are sometimes corroded or tarnished.

The graphical user interface provides clear readings and explicit messages. This translates into quick, trouble-free service.



Protection and equipment

Housing of MRU-120 ensures safe operation in field conditions and inside buildings. Ingress protection rating of IP54 protects the device against water and solids in case of splashes or dusty conditions. Moreover, the design of the device provides very good protection during transport and handling. Extensive standard equipment allows user to perform most measurements without the need to purchase additional accessories. MRU-120 is a versatile solution that offers comprehensive testing of earthing systems.



Capabilities

The measuring methods available in the device allow for comprehensive control of working and protective grounding. The calibration function of the test leads eliminates the influence of their resistance on the result. However, this is just the beginning.

- **The four-lead method** provides very accurate measurement of the expected small values of resistance – eliminates the resistance of the test leads connecting the meter to grounding.
- **Measurement of the continuity** of protective connections and equipotential bondings with a current exceeding 200 mA meets the requirements of EN 61557-4 standard.
- Before performing the measurement, the meter checks whether the tested object is a subject to excessive **interference voltage**, which may indicate additional problems.

Memory and results

The results can be saved to the device's memory. It is divided into **10 banks of 99 cells**, each corresponding to one measurement. These results can be easily transferred to the **Sonel Reader** software for archiving or subsequent analysis and research.

Other useful functions

Built-in help function – auxiliary illustrations demonstrate how to properly perform the measurement for each method.

Correctness of connections – if the meter detects an error, which prevents a correct measurement, it will indicate this in the top of the screen using the appropriate test socket symbol.

Complete measurement data – in addition to earth resistance measurement, the device performs additional measurements on interference voltages and resistance of auxiliary probes. Their results are provided with information about the date and time of testing, which facilitates preparing test documentation.





Universal earth tester

Measurement methods

- With auxiliary electrodes (3-lead and 4-lead)
- With auxiliary electrodes and clamp (for measurement of multiple earthing systems)
- With two clamps (for measuring multiple earthing without underground edge connections)
- Soil resistivity (Wenner method)
- Continuity of protective conductors and equipotential bonding - with 200 mA current - meeting the requirements of EN 61557-4

Features

- Measurement of auxiliary electrode resistances R_s and R_h
- Measurement of interference voltage
- Measurement in the presence of interference voltages in networks with frequencies of 50 Hz and 60 Hz
- Selection of maximum measurement voltage (25 V and 50 V)
- In ground resistivity measurements, distances between electrodes can be input in meters (m) or feet (ft)





Application

The MRU-30 earth resistance meter is designed to measure single and multiple earthings using auxiliary electrodes and/or clamps. Moreover it is possible to measure ground resistivity (Wenner method) and verify the continuity of equipotential bondings and protective conductors.



Capabilities

The meter provides the ability to make grounding tests with all kinds of the technical method. High immunity to interference allows it to be used even in difficult conditions in circuits with interfering currents. Simple and intuitive operation makes the measurements easier and faster. The meter has internal memory. The measurement results can be transmitted to a computer for data processing and preparation of documentation from the grounding tests.

Durable and practical casing

Ergonomic, small and practical housing allows comfortable and easy operation. The meter is resistant to all weather conditions. IP65 ingress protection guarantees dustproof and resistance to water jets on each side. The battery is permanently built-in and can be charged from a PowerBank or car cigarette lighter.




300 V

Easy way to measure earthing and soil



soil resistivity
without manual
conversion

>20 mA

short-circuit
measuring
current

Earthing resistance measurements

- soil resistivity
- earthing resistance using 3- and 4-wire method with auxiliary electrodes
- earthing resistance using 2-wire method

Features

- resistance of auxiliary electrodes R_H and R_S
- measurement of interference voltage to 100 V
- indication of battery state
- selection of maximum measuring voltage (25 V and 50 V)
- Auto-OFF function

Overview

MRU-11 is a simple meter that allows you to measure grounding by the use of the technical method (3- and 4-wire) and soil resistivity by Wenner method. The instrument is easy to handle, resistive to interference, and highly accurate.

MRU-11 is a basic device that allows for checking the quality of the ground - ing system on the basis of the received measurement result. Its ergonomic shape, durable and firm housing, as well as big and clear display make this instrument ideal to use both in the field and most working environments.

The device is simple to operate and intuitive. It is the best choice for electrical installations contractors, technicians, and professionals dealing with grounding measurements.



Technical specification

Measurement functions	Measurement range	Display range	Resolution	Accuracy ±(% m.v. + digits)
Interference voltage	0 V...100 V	0 V...100 V	1 V	±(10% m.v. + 1 digit)
Earth resistance				
2-wire method	0.00...9999 Ω	0.00...9999 Ω	from 0.01 Ω	from ±(3% m.v. + 3 digits)
3- and 4-wire method	0.53...9999 Ω acc. to EN 61557-5	0.00...9999 Ω	from 0.01 Ω	from ±(3% m.v. + 3 digits)
auxiliary electrodes resistance	0 Ω...19.9 kΩ	0 Ω...19.9 kΩ	from 1 Ω	±(5% m.v. + 8 digits)
Earth resistivity	0.0 Ωm...999 kΩm	0.0 Ωm...999 kΩm	from 0.1 Ωm	Depends on the accuracy of the R_E 4p measurement, but not less than ±1 digit
Safety and work conditions				
Measuring category according to EN 61010			III 300 V	
Ingress protection			IP67	
Type of insulation according to EN 61010-1 and IEC 61557			double	
Dimensions			221 x 102 x 62 mm	
Weight			ca. 660 g	
Operating temperature			-10...+50°C	
Storage temperature			-20...+60°C	
Humidity			20...90%	
Nominal temperature			23 ± 2°C	
Reference humidity			40%...60%	
Altitude a.s.l.			≤2000 m	
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	


IP67
CAT III
300 V

Basic grounding measurements under all conditions

Earthing resistance measurements

- earthing resistance using 3-wire method with auxiliary electrodes
- earthing resistance using 2-wire method

Features

- resistance of auxiliary electrodes R_H and R_S
- measurement of interference voltage to 100 V
- indication of battery state
- selection of maximum measuring voltage (25 V and 50 V)
- Auto-OFF function

Overview

MRU-10 is a simple meter that allows you to measure grounding by the use of the technical method and to measure grounding resistance by the use of the 2-pole method. The instrument is easy to handle, resistive to interference, and highly accurate.

MRU-10 is a basic device that allows checking the quality of the grounding system on the basis of the received measurement result. Its ergonomic shape, durable and firm housing, as well as big and clear display make this instrument ideal to use both in the field and most working environments. The device is simple to operate and intuitive. It is the best choice for electrical installations contractors, technicians, and professionals dealing with grounding measurements.



Technical specification

Measurement functions	Measurement range	Display range	Resolution	Accuracy ±(% m.v. + digits)
Interference voltage	0 V...100 V	0 V...100 V	1 V	±(10% m.v. + 1 digit)
Earth resistance				
2-wire method	0.00...9999 Ω	0.00...9999 Ω	from 0.01 Ω	from ±(3% m.v. + 3 digits)
3-wire method	0.53...9999 Ω acc. to EN 61557-5	0.00...9999 Ω	from 0.01 Ω	from ±(3% m.v. + 3 digits)
auxiliary electrodes resistance	0 Ω...19.9 kΩ	0 Ω...19.9 kΩ	from 1 Ω	±(5% + 8 digits)

Safety and work conditions

Measuring category according to EN 61010	III 300 V
Ingress protection	IP67
Type of insulation according to EN 61010-1 and IEC 61557	double
Dimensions	221 x 102 x 62 mm
Weight	ca. 660 g
Operating temperature	-10...+50°C
Storage temperature	-20...+60°C
Humidity	20...90%
Nominal temperature	23 ± 2°C
Reference humidity	40%...60%
Altitude a.s.l.	≤2000 m

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



Low resistance within range

Product features

- measurement of very low resistance
- high immunity to disturbances
- easy operation
- big touchscreen
- automatic measurement mode
- autoranging

Application

The MMR-640 meter is designed to measure very low resistance of resistive objects. This product is made to be used in power plants, railways and maintenance companies to measure resistance of:

- breakers, contacts,
- earthing conductors, equipotential bondings,
- welded and soldered connections,
- bolted connections,
- and other resistive objects.

MMR-640 can be also utilized on production lines (eg. at the final production control stage).



Device capabilities

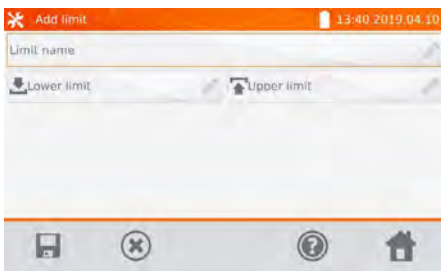
The MMR-640 meter provides an innovative combination of a high-performance measuring device with a modern user interface and advanced data management system.

Durable and practical casing

In response to the customers needs the MMR-640 has been designed to operate in difficult environmental conditions. A unique casing with the IP67 ingress protection rating ensures that the device is both waterproof and dustproof.

Easy readout

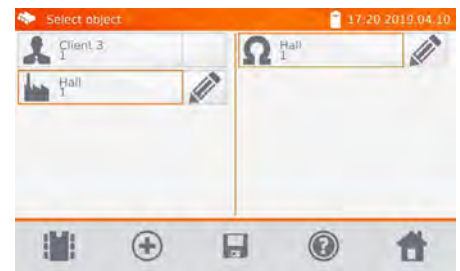
The MMR-640 meter is equipped with a readable colour touchscreen that, due to its 800 x 480 pixel resolution, provides both high comfort of interacting with the interface and high readability of the measurement results.



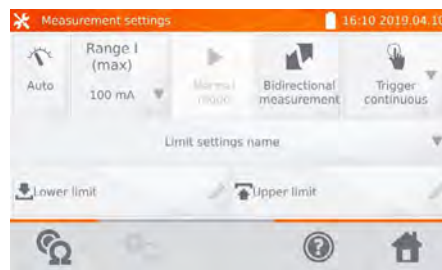
Possibility of setting limits



Readable interface



Extensive memory



Resistance measurement

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

„m.v.“ - measured value.



Measure winding resistance and low resistance with MMR-650

Product features

- measurement of winding resistance (inductive objects including amorphous core transformers)
- measurement of very low resistance
- transformer core demagnetization function
- automatic temperature compensation function (temperature probe)
- function of determining the temperature of a motor under load
- high immunity to disturbances



Application

The MMR-650 winding resistance and low resistance meter is designed to measure very low very low resistance of both windings - including amorphous core transformers - and resistive objects. This product is made to be used in power plants, railways and maintenance companies to measure resistance of:

- windings of power transformers and motors,
- breakers, contacts,
- earthing conductors, equipotential bondings,
- welded and soldered connections,
- bolted connections,
- and other resistive and inductive objects.

MMR-650 can be also utilized on production lines (eg. at the final production control stage).



Device capabilities

The MMR-650 winding resistance and low resistance meter provides an innovative combination of a high-performance measuring device with a modern user interface and advanced data management system. Wireless data transmission, enhanced system of 2D codes and ability to print labels to identify test items, all contribute to bringing new quality of work and allow the user to perform a wide range of measurements.



Easy readout

The MMR-650 winding resistance and low resistance meter is equipped with a readable colour touchscreen that, due to its 800 x 480 pixel resolution, provides both high comfort of interacting with the interface and high readability of the measurement results.

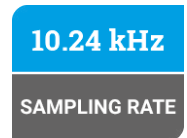


Durable and practical casing

In response to the customers needs the MMR-650 microohmmeter has been designed to operate in difficult environmental conditions. A unique casing with the IP67 ingress protection rating ensures that the device is both waterproof and dustproof.

Resistance measurement

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



Portable power quality analysis center

Features

- 7" touchscreen - ergonomic and intuitive graphical user interface.
- Over 10 years of recording.
- CAT IV 600 V measurement category - high safety.
- All parameters according to class S - high accuracy of measurements.
- Li-Ion rechargeable battery - higher mobility.
- Powering from measured network - reliability of measurements.
- Removable memory card - recording data with no restrictions.
- Quick setup and reporting - ease of use.
- Cooperation with desktop Sonel Analysis software - extended data analysis.

Measured parameters

- Inrush current.
- Inverter efficiency.
- **Voltages L1, L2, L3, N, PE (five measurement inputs)** – average, minimum, maximum and instant values within the range up to 760 V, interoperability with voltage transducers.
- **Currents L1, L2, L3, N (four measurement inputs)** – average, minimum and maximum values, current measurement within the range up to 6 kA (depending on applied current clamp), interoperability with current transducers.
- Crest factors for current CFI and voltage CFU.
- Frequency within the range of 40...70 Hz.
- Active (P), reactive (Q), distortion (D) and apparent (S) power with the type of reactive power (capacitive and inductive).
- Active (E_p), reactive (E_q) and apparent (E_s) energy.
- Power factor PF, $\cos\phi$, $\tan\phi$.
- Harmonics up to the 50th order of voltage and current.
- Event logging for current and voltage along with oscillograms and half-period RMS charts.
- Energy cost calculator.
- ...and much more.
- **All parameters are recorded in compliance with class S according to IEC 61000-4-30 standard**



Wide range of mains to analyze

- With rated frequency 50/60 Hz
- With rated voltages: 58/100 V, 64/110 V, 110/190 V, 115/200 V, 120/208 V, 127/220 V, 133/230 V, 220/380 V, 230/400 V, 240/415 V, 254/440 V, 290/500 V, 400/690 V
- Direct current
- Systems:
 - » single-phase
 - » split-phase with common N
 - » three-phase – WYE with and without N conductor
 - » three-phase – Delta
 - » three-phase – WYE and Delta Aron
 - » with current and voltage transducers



Capabilities

PQM-707 is an autonomous meter allowing versatile measurement, analysis, and registration of energy network (DC and 50/60 Hz) parameters. All parameters are measured I/A/W class S of the IEC 61000-4-30 standard guaranteeing high accuracy of measurements. The **7-inch colour touchscreen** - The largest in this class of analyzers! - enables intuitive and ergonomic operation. Thanks to the built-in lithium-ion battery, the analyzer allows for efficient work during the measurement without the necessity of connecting an external AC adapter.



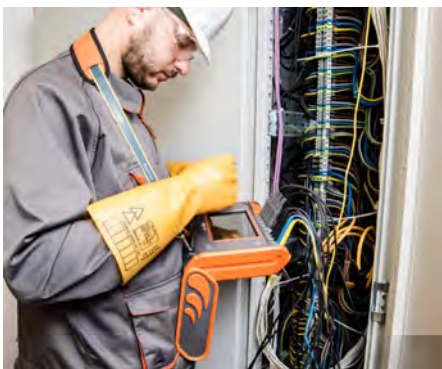
Displaying data

The analyzer is equipped with a readable colour touchscreen. Its **800 x 480 pixel** resolution provides both high comfort of interacting with the interface and high readability of the measurement results. **The included stylus allows you to work with dielectric gloves.**



Application

The analyzer is directed to a very wide range of users, with particular reference to the maintenance staff. Due to its mobility and autonomy, any problems occurring in the supply networks can be diagnosed on the spot. The analyzer can be used in virtually all kinds of networks with rated voltage from 54 V to 760 V - directly or indirectly via transducers. PQM-707 can be used in the field of professional power engineering, maintenance services in industrial plants, as well as among those providing services focused on network analysis.



Durable and practical casing

The casing has been designed to allow easy access to the touchscreen and all measurement and communication sockets. Folding lid protects the display from damages. Thanks to the IP51 protection degree, the device can be used in difficult conditions - it is not afraid of dust or water splashes.



Class A remote analysis

Features

- Remote control and data transfer through a built-in GSM modem.
- Anti-theft feature – SMS notification in the event of position change (built-in GPS receiver).
- Real-time clock synchronized to GPS protocol.
- Remote control of the analyzer via software: **Soneil Analysis** (Wi-Fi and GSM for Windows) or **Soneil Analysis Mobile** (Wi-Fi for Android).

Measured parameters

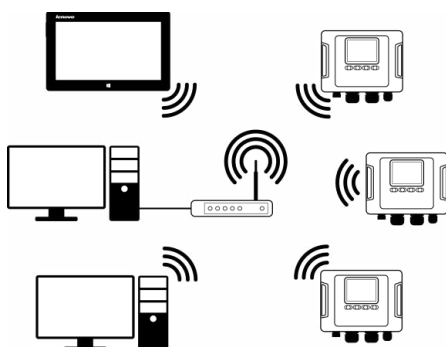
- **Transients up to ± 8000 V with max. sampling frequency 10 MHz.** Minimal transient time is **650 ns** (only PQM-711)
- **Voltages L1, L2, L3, N, PE (five measurement inputs)** – average, minimum, maximum and instant values within the range up to 1000 V, interoperability with voltage transducers.
- **Currents L1, L2, L3, N (four measurement inputs)** – average, minimum, maximum and instant values, current measurement within the range up to 6 kA (depending on applied current clamp), interoperability with current transducers.
- Measurement of control signals up to 3000 Hz.
- Crest factors for current (CFI) and voltage (CFU).
- Frequency within the range of 40 Hz – 70 Hz.
- Active power (P), reactive power (Q), distortion power (D), apparent power (S) with identification of the nature of reactive power (capacitive, inductive).
- Calculation of reactive power using the Budeanu method and IEEE 1459 method.
- Active energy (E_p), reactive energy (E_Q), apparent energy (E_S).
- Power factor, $\cos\varphi$, $\tan\varphi$.
- K factor (transformer overload caused by the harmonics).
- Up to 50th harmonics for voltage and current.
- Interharmonics measured as groups.
- Total Harmonic Distortion (THD) for voltage and current.
- Short-term (PST) and long-term (PLT) flicker (IEC 61000-4-15 class A).
- Unbalance of voltage (IEC 61000-4-30 class A) and current.
- Current events detection including waveforms recording.
- Current and voltage events recording with waveforms (up to 1 s) and $RMS_{1/2}$ graphs with 30 s maximum recording time.
- Current and voltage waveforms recording after each averaging period.



Wide range of mains to analyze

- With rated frequency 50/60 Hz
- With rated voltages: 64/110 V; 110/190 V; 115/200 V; 120/208 V; 127/220 V; 133/230 V; 220/380 V; 230/400 V; 240/415 V; 254/440 V; 265/460 V; 277/480 V; 290/500 V; 400/690 V; 480/830 V (for systems with N conductor)
- Direct current
- Systems:
 - » single-phase
 - » split-phase with common N
 - » three-phase – WYE with and without N conductor
 - » three-phase – Delta
 - » three-phase – WYE and Delta Aron
 - » with current and voltage transducers

Capabilities



PQM-710 and PQM-711 have a **built-in GPS receiver** ensuring real time clock accuracy and an integrated **GSM modem** that facilitates remote analyzer operation. Furthermore, PQM-711 is also equipped with a **transient recorder** (sampling frequency 10 MHz, voltage range **up to ± 8000 V**).

An additional trump card of the analyzers is the built-in **Wi-Fi communication module**, providing a number of advantages: no restrictions on file transfer, no data transfer costs, use of local wireless infrastructure... This gives the user the opportunity to adapt to the conditions prevailing on the site. They can supervise measurements from a convenient location – for example, an area without electromagnetic interference – using a laptop, smartphone or tablet.



Displaying data

PQM-710 and PQM-711 can be operated using a **touch screen computing device** equipped with **Sonel Analysis** software (Windows) or **Sonel Analysis Mobile** app (Android). The user can supervise the measurements and conduct diagnostics while maintaining mobility – he doesn't even have to be near the analyzer. In typical applications, the device plays the role of a remote display and an intermediate storage of measurement data with the functionality of a router. Therefore, the user can also connect to it using a wireless network – for example, to transfer the collected registrations to a desktop computer.



Application

PQM-710 and PQM-711 are widely used in the professional power industry. They provide full 4-quadrant analysis, meeting the needs of energy consumers and producers, such as renewable energy, including photovoltaic and wind farms. They enable forecasting failures in distribution networks. They provide analysis of the load capacity of networks and transformers, as well as recording their current states. In addition, they are powerful investment tools. Thanks to PQM-710 and PQM-711, the user will obtain the necessary data for development of power infrastructure, predict potential problems, and finally – verify the correctness and quality of implementation.

CLASS S

IEC 61000-4-30

CAT IV
300 V
 **IP65**
 **55°C**
HEAVY DUTY
 **-20°C**
EVENTS


Recording and diagnostics in all conditions



Features

- **4 current inputs**, physical measurement of current in the neutral conductor.
- **Registration of up to 1100 parameters**, including average, maximum, minimum and instantaneous values.
- **Built-in heater**, stable operation at low temperatures down to -20°C.
- **Internal rechargeable battery**, autonomy of the meter (min. 6 hours).
- **IP65 ingress protection**, possibility of work in rain, snow and high humidity.

Measured parameters

- **Voltages L1, L2, L3, N (four measurement inputs)** – average, minimum, maximum and instant values within the range up to 760 V, interoperability with voltage transducers.
- **Currents L1, L2, L3, N (four measurement inputs)** – average, minimum, maximum and instant values, current measurement within the range up to 6 kA (depending on applied current clamp), interoperability with current transducers.
- Crest factors for current (CFI) and voltage (CFU).
- Frequency within the range of 40 Hz – 70 Hz.
- Active power (P), reactive power (Q), distortion power (D), apparent power (S) with identification of the nature of reactive power (capacitive, inductive).
- Calculation of reactive power using the Budeanu method and IEEE 1459 method.
- Active energy (E_p), reactive energy (E_q), apparent energy (E_s).
- Power factor (PF), $\cos\varphi$, $\tan\varphi$.
- Harmonics up to the 40th in voltage and current.
- Total harmonic distortion THD for current and voltage.
- Short-term (P_{ST}) and long-term (P_{LT}) light flicker index.
- Unbalance of voltages (in compliance with IEC 61000-4-30 class S) and currents.
- Event logging for current and voltage along with oscillograms and half-period RMS charts.
- **All parameters are registered in compliance with class S according to standard EN 61000-4-30.**



Wide range of mains to analyze

- **With rated frequency** 50/60 Hz
- **With rated voltages:** 64/110 V; 110/190 V; 115/200 V; 120/208 V; 127/220 V; 133/230 V; 220/380 V; 230/400 V; 240/415 V; 254/440 V; 265/460 V; 277/480 V; 290/500 V; 400/690 V
- **Direct current**
- **Systems:**
 - » single-phase
 - » split-phase with common N
 - » three-phase – WYE with and without N conductor
 - » three-phase – Delta
 - » three-phase – WYE and Delta Aron
 - » with current and voltage transducers



Capabilities

The analyzer provides comprehensive measurements of power quality parameters in **class S**, in accordance with IEC 61000-4-30, which guarantees high accuracy of results. Even when the temperature reaches -20°C, the measurements are reliable and the device operation is stable - all thanks to the built-in heater.

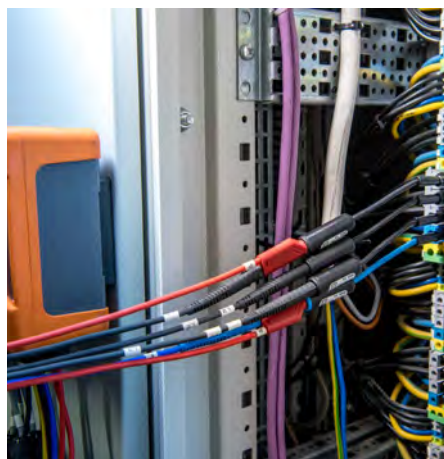
Thanks to the internal battery, the analyzer does not turn off after a power failure, but maintains recording - **up to 6 hours**. Data is recorded on a removable 2 GB memory card. Logs can be downloaded using a USB connection or using an external reader. Then they can be analyzed in free Sonel Analysis software.



Displaying data

All recorded parameters - including indicated events - can be easily read using the dedicated **Sonel Analysis** software. The advanced features of the application allow you to view the collected results and save them on your computer's hard drive - in the form of raw data or reports.

Sonel Analysis is constantly updated and developed. This means that the user will keep up with the latest requirements of norms and standards.



Application

PQM-700 fulfills its role in industry - in hands of electricians, maintenance services etc. - as a cheap, multi-functional load parameter recorder. It is also used by consumers and producers of renewable energy (wind farms, solar farms), where a 4-quadrant power analysis is required.

PV150

The fast and simple PV tester.



The Seaward **PV150** Solar Installation Tester allows electrical safety and performance verification of photovoltaic installations in a safe and easy-to-use device.

Transforming the way PV systems are tested, the **PV150** combines ground continuity, DC operating power and operating current test functions in a hand-held device. It can also test insulation resistance, open circuit voltage and short circuit current at the push of a button. The unit can also wirelessly capture and record real time irradiance, ambient temperature and PV module temperature measurements from the Solar Survey 200R.

The **PV150** has memory to store up to 200 complete test records with USB connectivity to enable these to be quickly and easily downloaded to a PC. Professional test certificates and reports can also be created when used with Seaward's SolarCert software.

These are just a few of the reasons we believe you'll want to invest in our **PV150**.

Why buy the PV150?

- > **Easy to use** – single key testing and measurement.
- > **Small and compact** – hand held, rugged and robust device.
- > **Safe test connection** – safely test energized PV arrays.
- > **Easy to manage data** – on board memory for test records with PC download.
- > **Combines PV commissioning tests** – required by IEC 62446.
- > **Free online product training and support.**



SEAWARD
ELECTRICAL SAFETY TESTING & MEASURING.

PV150

The fast and simple PV tester.



Key Features:

- > Ground (earth) continuity measurement with test lead null for long test-leads.
- > PV string open circuit voltage measurement up to 1000V DC with polarity indication.
- > PV string short circuit current measurement up to 15A DC.
- > PV array insulation test at 250/500/1000V.
- > Tests individual PV modules or strings.
- > Memory for up to 200 records and USB download to PC (CSV file).
- > High contrast display, visible in bright light.
- > 2 x MC4 test lead adaptors.
- > 2 x Combiner box test probes and detachable alligator clips (MC4).
- > 2 x Test leads, with test probes and detachable alligator clips (4mm).
- > AC/DC current clamp.
- > Solar Survey 200R irradiance meter and temperature probe.
- > Solar Survey 200R mounting bracket
- > Rugged carry bag.
- > Quick Start Guide.
- > UKAS Calibration Certificate (PV150).
- > SolarCert PC Software.

Complete Kit Includes:

- > Seaward Solar Installation PV150 instrument.

Optional Accessories:

- > Solar Power Clamp.
- > MC4 fused / unfused test leads.



SEAWARD
ELECTRICAL SAFETY TESTING & MEASURING.

PV200

The most compact I-V curve tracer around.



The **PV200** is a compact & cost effective I-V curve tracer that uses simple push button operation making it an efficient and versatile tester for PV systems. 999 datasets can be stored on the instrument and once downloaded to the SolarCert software comparison to the standard test conditions can be made.

The tester measures ground (earth) continuity, open circuit voltage, short circuit current, maximum power point voltage, current and power (with AC/DC clamp). The instrument will also give you the fill factor of the PV module or system under test.

The PV200 has a separate 1kV insulation resistance test function, eliminating the need for a separate, expensive device. Meanwhile the high contrast display on the device is clearly visible in direct sunlight.

The unit can also wirelessly capture and record real-time irradiance, ambient temperature and PV module temperature from the Solar Survey 200R. Using the Solar Survey 200R your data can be converted to standard test conditions, in SolarCerts, for you to compare to the manufacturer's published data.

These are just a few of the reasons we believe you'll want to invest in our **PV200**.

Why buy the PV200?

- > **Small and Compact** – Robust, affordable, handheld PV diagnostic tool.
- > **Compliant** – with IEC 62446 and IEC 61829.
- > **Fast and accurate testing** – 1 button operation makes testing quicker and more controlled.
- > **Compare to standard test conditions** – Using the SolarCert software.
- > **Instantly view detailed I-V curves anywhere** – Using the PVMobile Android app.
- > **Free online product training and support.**



SEAWARD
ELECTRICAL SAFETY TESTING & MEASURING.

PV200

The most compact I-V curve tracer around.



Key Features:

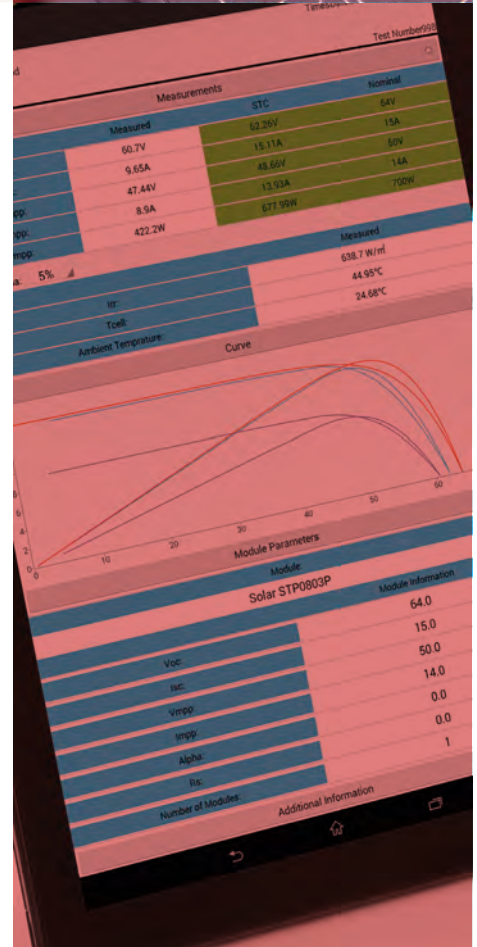
- > All-in-one commissioning tests and I-V curve tracing.
- > Automatic fill factor calculation.
- > Ground (earth) continuity measurement with test lead null.
- > PV string open circuit and maximum power point voltage measurements up to 1000V DC.
- > PV string short current up to 15ADC.
- > PV array insulation test at 250/500/1000V.
- > Tests individual PV modules or strings.
- > Memory for up to 999 records with USB download to PC.
- > Instant NFC data transfer using the PVMobile app.
- > High contrast display, visible in bright light.

Complete Kit includes:

- > Seaward Installation PV200 instrument.
- > 2 x MC4 test lead adaptors.
- > 2 x Combiner box test probes and detachable alligator clips (MC4).
- > 2 x Test leads, with test probes and detachable alligator clips (4mm).
- > AC/DC current clamp.
- > Solar Survey 200R irradiance meter and temperature probe.
- > Solar Survey 200R mounting bracket.
- > Rugged carry bag.
- > Quick Start Guide.
- > UKAS Calibration Certificate (PV200).
- > 2 year warranty.
- > SolarCert PC software.

Optional Accessories:

- > Solar Power Clamp.
- > MC4 fused / unfused test leads.



SEAWARD
ELECTRICAL SAFETY TESTING & MEASURING.

Solar Utility Pro

The only 1500V, 40A string checker.



The new **Solar Utility Pro** from Seaward takes PV testing to the next level. With the introduction of more efficient 1500V modules and inverters, Seaward have answered the industry call for an easy to use and robust tester with 1500V capabilities.

Its market leading 40A current capability enables the **Solar Utility Pro** to test parallel wired strings up to a maximum of 1500V / 40A, eliminating the time consuming task of separating strings to keep within lower limits of other instruments.

A single press of the Test button will give values for Open Circuit Voltage and Short Circuit Current, and when paired with the Seaward Solar Survey 200R irradiance meter, will also record irradiance, module and ambient temperature measurements. The large internal storage memory can record up to 999 complete record sets, which can be downloaded as a CSV file to a PC for review.

To make on site testing easier, the **Solar Utility Pro** is supplied with 1.5M long conversion leads that convert the standard MC4 leads to alligator clips – particularly useful in combiner boxes and junction boxes.

These features, in a rugged enclosure, give the larger scale PV engineer the most efficient, portable and highest rated tester available.



Why buy the Solar Utility Pro?

- > **Test up to 1500V / 40A systems**
– ideal for today's more modern powerful PV installations
- > **Highest rated PV tester on the market** – minimizing accidental damage to the instrument or the user by testing across multiple strings
- > **Record up to 999 full sets of string data** – maximizing time in the field to complete testing without downloading and clearing the memory
- > **Rugged case design** – giving more protection while being transported around large utility scale sites
- > **Contact us for product training and support**

***Now includes access to the latest Seaward Solar Cert reporting software**



SEAWARD
ELECTRICAL SAFETY TESTING & MEASURING.

Solar Utility Pro

The only 1500V, 40A string checker.



Key Features:

- > 1500V / 40A rated
- > Large display designed for reading in direct sunlight
- > Direct MC4 connections, with the option to add a conversion lead set for safer connections in combiner boxes
- > Simple single button test
- > Rugged case designed for continuous site work
- > Store up to 999 complete record sets
- > CSV output to PC to review data
- > Pairs to Solar Survey 200R irradiance meter to capture the irradiance and temperature measurements at the time to test (single person testing)

Kit includes:

- > Solar Utility Pro unit
- > Set of 1.2M red and black MC4 leads with test probe and alligator clip
- > Set of 2M red and black MC4 extension leads
- > SS200R irradiance meter
- > SS200R irradiance meter clamp
- > PV hold-all bag
- > 3 x 18650 protected lithium-ion batteries
- > Battery charger
- > 2 x Dust covers
- > 1 x UK mains lead
- > 1 x Schuko mains lead

Seaward Solar Cert Software

- > Free access to the latest version
- > Now compares measured Voc and Isc against expected values calculated using the panel parameters
- > If temperature or irradiance is missing, Solar Cert now has an interpolation option



SEAWARD
ELECTRICAL SAFETY TESTING & MEASURING.



Multi-function meter of electrical system parameters

MPI-540 / 540-PV

index: WMGBMPI540 / WMGBMPI540PV
WMGBMPI540NC (MPI-540 without 3xF-3A clamps)



CAT IV 300 V	CAT III 500 V
CAT II 1000 V DC MPI-540-PV	Li-Ion BATTERY
WORK IN IT MAINS	IP51
BLUETOOTH	WiFi

7"

touch
screen

MPI-540-PV



measurement of
PV installations



3-phase
power quality
recorder

ρ R_E
 R_{ISO} Z_S R_{CONT}
 E
complex
measurements of
installations

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

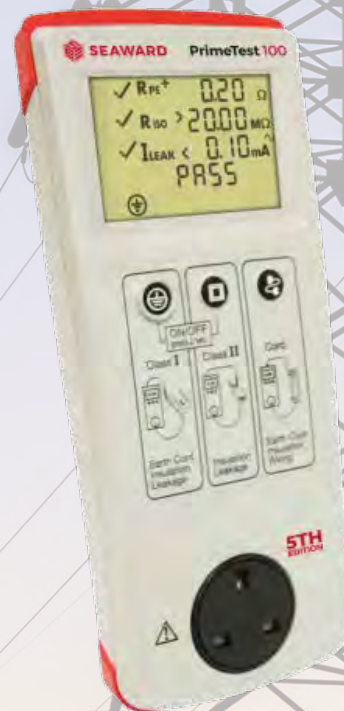
MPI-540-PV is an extremely universal meter, designed in particular for testing photovoltaic installations. The device allows a complete set of tests on the DC and AC side – in accordance with the guidelines of EN 62446 standard.

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.

Portable Appliance Testers

Portable Appliance Testers (PAT Testers) are used to perform the essential electrical tests required by the AS/NZS 3760 standard.

We offer a wide range of Portable Appliance Testers from leading brands that range in price and functionality. Printers, scanners, tags and other accessories can be added for you all Test & Tagging requirements.



Full Portable Appliance Testers courses are available. These courses are delivered by experienced qualified trainers.



Diagnose faults with instruments from the TDR series

Product features

- fault location in power and telecommunication cables
- two independent cursors to indicate two fault locations and the distance between them (**TDR-420**)
- fault location in coaxial cables
- fault location in infrastructure cables
- detection of breaks, short-circuits, damage caused by moisture and other changes in cable impedance
- graphic presentation of cable faults with an indication of the distance to the fault on the display

LKO-720
receiver



LKO-720



Locate wires and cables with the LKZ-720 Wire Tracer

Main features

- detection of wires and cables (live or not)
- tracing underground cables
- tracing conductive water and heating pipelines
- flow and accurate locating the object
- phase detection mode
- operation in wide range of rated voltage, up to 500 V RMS
- five modes of wire tracer operation - voltage, current, current-voltage, power and clamp
- additional accessories enable precise localization - such as contact or non-contact probes and measurement clamp

...and much more

- the function 3D in the receiver - detecting the direction of current
- receiver operation with four transmitters at the same time to locate interruptions or distinguish wires
- a LED bright torch
- headphone socket in receiver
- screens backlight for work in dark
- transmission battery status and settings of the transmitter to the receiver
- measurement of voltage at the object to 500 V RMS
- three levels of transmitter amplification
- automatic or manual selection of transmitter operation modes
- software upgrade via USB



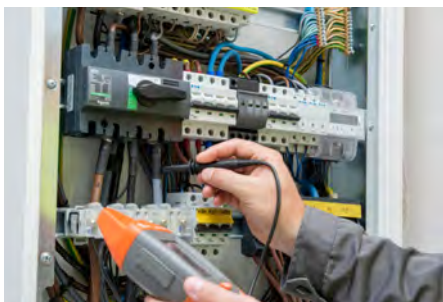
LKN-720
transmitter



Application

Detection and tracing cables in ceilings, walls and floors

In response to the needs of customers, the LKO-720 has a specially designed 3D antenna that raises the precision of the wire tracing. Determine direction of wires in concrete up to 5 cm will not be a problem now.

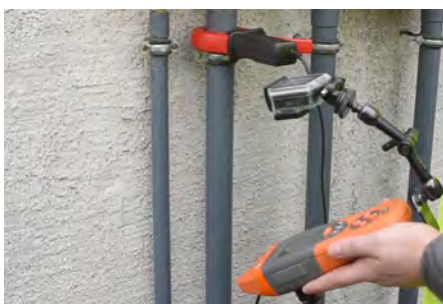


Locating power points and switches in buildings

pulse generated by a LKN-720 transmitter with a specific frequency allows to locate and identify sockets and switches in energized and de-energized circuits.

Identification of fuses on the distribution board

Thanks to the precise sensor in LKO-720 and additional contact and non-contact probes, identify of breakers and fuses now will be easily and time-saving.



Possibility to tracing in no access conductors

LKO-720 with C-8 clamp used in the current mode or in other mode forcing current, allows to uniquely identify wire or cable with a forced current signal.

Non-contact detection of live cables

LKO-720 allows to precisely detect energized wires in air and concrete without additional probes.



Additional areas of use

- detection of breaks in cables and wires
- locating short circuits between leads
- tracing shielded cables
- tracing cables in metal ducts
- tracing underground cables
- tracing conductive water and heating pipelines



Technical specification

insulation type	double, acc. to EN 61010-1	
transmitter measurement category	III 600 V acc. to EN 61010-1	
transmitter ingress protection rating acc. to EN 60529	IP67	
receiver ingress protection rating acc. to EN 60529	IP40	
transmitter power supply	4 x AA alkaline batteries or 4 x Ni-MH rechargeable batteries	
maximum transmitter operating voltage	500 V RMS	
maximum depth of the analysed object	("I" mode) 2 m	
maximum range of contactless neon probe	in air	50 cm
	in concrete	5 cm
receiver power supply	9 V 6LR61 alkaline battery	
operating temperature	-10°C...+50°C	



VIVAX
METROTECH

vScan & vScanM

Pipe & cable locator for avoidance & tracing applications



**The ideal choice for the novice through
to the skilled technician**

vScan utility avoidance tool

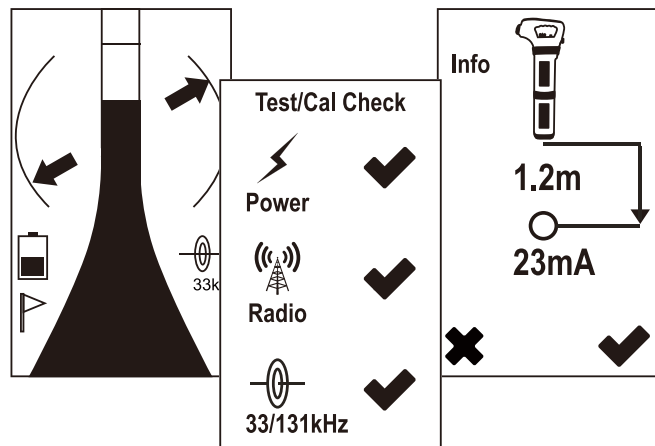
The vScan utility avoidance tool has been designed to make buried utility detection a simple and cost-effective process. You don't need to be an electronics expert to get the most out of the vScan's features. Main features and operational controls are in keeping with industry standards so minimal training is required.

Together with the dual frequency transmitter, data logging, optional metal manhole cover detector, GPS, and Bluetooth, the vScan is available in various models to suit all applications.

The vScan locator kits are shipped with a spacious canvas carry bag which fits the receiver, transmitter, leads and any optional accessories.

Making locating easier.....

- Power and Radio modes - for passive locating
- 33kHz & 131kHz for active locating using optional transmitter
- Sonde modes of 33kHz, 512Hz/640Hz
- M mode for locating metal covers (vScanM only)
- Rotary control for sensitivity
- Paddle control for mode and navigation
- Two pushbuttons - on/off and depth/menu/select
- High contrast display with back-light
- Compass - arrows indicate line direction
- Depth and current measurement (configurable)
- Both internal & removable loudspeakers
- Internal or external GPS (optional)



vScan Alerts, warnings and signal distortion

A new standard for safety.....

- Self-test/calibration verification - confirms 100% locate functionality
- User settings for warnings/alerts
 - ▶ Visual
 - ▶ Vibrate warning
 - ▶ Audio warning
 - ▶ Shutdown

Real time alerts are displayed on the LCD accompanied with a mechanical vibration in the handle



Signal Overload Warning - usually caused by operating very close to a power transformer or placing the unit very close to a transmitter in the Induction mode.



Shallow Cable - indicates that the locator has detected a cable that is possibly less than 5.9"/15cm deep. Proceed with caution.



Swing Alert - indicates that the operator is swinging the locator excessively and could result in misleading information.



Overhead Cable - indicates that the signal is mainly radiating from above. This is usually caused by the signal travelling along overhead cables.



Action Required Alert

Select warnings, and how they communicate.

Warnings advise but do NOT interrupt the locating process.



Features of vScan avoidance tool

vScan and vScanM Receivers.....Premium features included as standard

RECEIVER

Feature	vScan	vScanM
High contrast display with back light	✓	✓
On/Off & depth/select pushbuttons	✓	✓
Rotary gain/sensitivity control	✓	✓
Paddle for navigating menus and modes	✓	✓
Power Mode	✓	✓
Radio Mode	✓	✓
Active Modes 33kHz & 131kHz	✓	✓
Sonde Modes 33kHz, 512Hz/640Hz	✓	✓
Metal Locate Mode		✓
Internal & removable loudspeakers	✓	✓
Removable wear boot	✓	✓
Alkaline batteries (6 x AA's)	✓	✓
Lithium ion rechargeable battery pack (& charger)	○	○
Carry bag	Standard when purchased with RX & Tx	
Depth measurement (configurable)	✓	✓
Current measurement (configurable)	✓	✓
Compass (line direction indicator)	✓	✓
Self-test and calibration verification	✓	✓
Recording of test/cal history	✓	✓
Printed cal certificate (using MyvScan)	✓	✓
Swing Alert	✓	✓
Shallow Line Alert	✓	✓
Signal Overload Alert	✓	✓
Overhead Signal Alert	✓	✓
Action Required Alert	✓	✓
Alert Notification (display, audio, vibrate, shutdown)	✓	✓
Battery Condition Status/Alert	✓	✓
Data logging	✓	✓
Bluetooth	○	○
Internal GPS	○	○
External GPS	○	○
MyvScan - Product configuration utility	✓	✓
MyvScan - Data transfer and management application	✓	✓
Pre-defined reports	✓	✓
Custom reporting	✓	✓

TRANSMITTER

Feature	vScan/vScanM Transmitter
1-Watt output	✓
High/low output selection	✓
Pulse/continuous output	✓
Simple pushbutton controls/LED's	✓
Connection frequency - 33kHz/131kHz (simultaneous transmission)	✓
Clamp frequency - 33kHz/131kHz	✓
Induction frequency - 33kHz	✓
Tone change to indicate good connection	✓
Alkaline batteries (4 x D cells)	✓
Lithium ion battery and charger	○
Low battery warning	✓
The Dragon connection lead kit comprising:	
Dragon (tangle free - cable tidy)	✓
Connection leads	✓
Ground/earth stake	✓
2 x Magnets (UK market only)	✓
Tx foot - broad induction stand	✓

ACCESSORIES

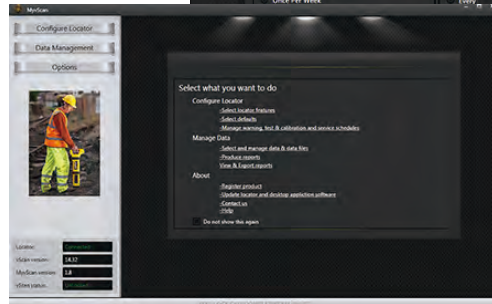
Receiver - Lithium ion battery and charger	○
Transmitter - Lithium ion battery and charger	○
Extension ground cable	○
50mm (2 inch) transmitter clamp	○
100mm (4 inch) transmitter clamp	○
125mm (5 inch) transmitter clamp	○
Clamp extension rod	○
Live plug connector (240V AC)	○
Live cable connector (480V AC)	○
D18 sonde - 33kHz	○
D23 sonde - 512 or 640Hz	○
D38 sonde - 33kHz	○
D64 sonde - 33kHz	○

* ✓ = standard, ○ = optional

MyvScan App

Keep the operating system of the vScan up to date with the free MyvScan Desktop App. The vScan management tool allows the user to configure the features in the locator, download data collected from locating, set alarms useable while locating, and check and update the locator's firmware.

- **Software updates** – MyvScan checks for locator software updates and desktop software updates whenever connected to internet.
- **Data transfer** – MyvScan will download the data collected from the locator. This data can include the date, time, GPS coordinates, depth measurements and current on the line.
- **Personalize** – Add owner/user information, a background picture or logo, or a short message to the startup screen.
- **Lock feature** – The locator's configurations and settings can be locked, enabling equipment or safety officers to ensure that features selected or removed by management cannot be overridden by the user. (Requires optional lockout dongle)



VMMMap Utility mapping and cloud storage

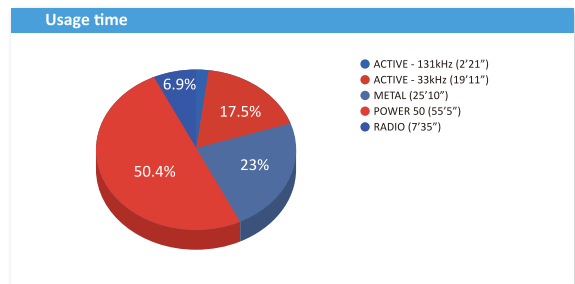
When used with the vScan Receiver, the VMMMap Utility Mapping app records data from the field which is instantly available online or can be shared by using the email function in the app to send .kml or .csv files. Field technicians using a vScan Receiver can capture and store to the cloud depth readings, GPS coordinates, distance between locates and more.

The image capture feature in the app allows the user to attach a JPEG format image to the surveys. This is useful to add points of interest or a snapshot of the completed survey. Access the image files and all the data captured in the app in the web portal or email it from within the app. The data is compatible with Google Maps, Asset Management and GIS software. The VMMMap app generates maps in real time giving confidence to the field technician that the data being collected is accurate. Location data is obtained from the mobile phone, the locators GPS or an external GPS device of your choice.

For Training Managers wishing to identify how the vScan is being used, VMMAP offers the ability to have a real-time view of field usage stats. When paired with a mobile phone with the VMMAP app installed, it is possible, via the cloud, to see how, when and where the equipment is being used. Information in the form of mapping data and usage pie charts are available in real-time helping to reduce that critical time between identifying training requirements and actual targeted training, resulting in a safer environment for both operators and below ground assets.

- Uses both Google and Apple Maps
- Low and high GPS accuracy settings
- Plug-and-play Bluetooth pairing to receivers
- Export to a .kml file for use with popular GIS programs
- Compatible with Google Maps, Asset Management and GIS software
- Show multiple utilities on one map with color coded utility drop pins

The VMMMap application is compatible with both iOS and Android devices.



VMMMap





VIVAX
METROTECH

vLoc3 Series Utility Locators



**Locate with speed, accuracy and confidence with the
vLoc3 series of buried utility locators**

vLoc3-Pro Utility Locator

The **vLoc3-Pro utility locator** introduces new innovative tools for locating buried utilities assuring damage prevention while gathering information for analysis. Distortion is easily detected by the receiver's two sets of 3D antennas and displayed on the bright full-color display. Along with classic locate screens the vLoc3 series locators offer new locate perspective screens:

Vector Locate - for fully-automatic non-walkover locating

Transverse Graph - showing both peak and null simultaneously providing immediate measurement of signal distortion

Plan View - showing the relative orientation of the cable at any angle

Sonde Locate - with guidance arrows leading to the sonde location even when it is vertical

The highly user-configurable vLoc3 series contains eight passive locate modes, fault-find mode, SD (showing direction of outgoing current), and a range of configurable frequencies from 98Hz to 200kHz. Audio and mechanical vibration alerts can also be configured by the user providing warnings for shallow depth, overload, overhead cables, and excessive swinging. Plug-in-play options for the receiver include optional Bluetooth module usable with external GPS devices and MLA foot to locate buried markers. The optional factory fitted Tx-Link (receiver to transmitter radio link) connects the receiver to the transmitter for remote operation up to 300m/985ft.

Real time distortion alerts in the vLoc3-Pro and vLoc3-ML



A green bar graph indicates clean locating conditions with very low distortion

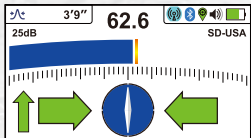


A blue bar graph indicates a medium level of distortion

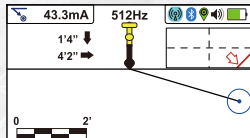


A red bar graph indicates very high distortion. Both Peak and Null locates are subject to significant positional errors

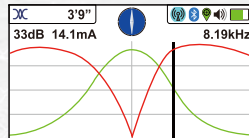
Utility locate modes for vLoc3-Pro and vLoc3-ML



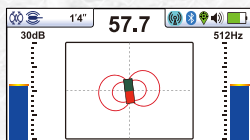
Classic Screen - as in previous vLoc locators, with the addition of three color-coded distortion levels



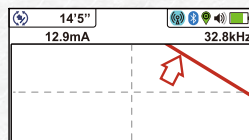
Vector Locate - shows orientation, line position, and distance relative to the locator in 3D



Transverse Plot Screen - is used to display the peak and null to compare distortion shape



Sonde Screen - arrow guidance showing direction to the sonde and depth of cover



Plan View Screen - displays the theoretical line in 2D from above ground in omnidirectional mode



Loc3-5Tx
5-Watt Transmitter



Loc3-10Tx
10-Watt Transmitter



vLoc3-ML Marker and Utility Locator

The **vLoc3-ML** with built-in transceiver is designed for contractors and utility companies to accurately detect and pinpoint major brands of buried passive electronic markers. The vLoc3-ML locator combines Vivax-Metrotech's advanced line locating technology and electronic marker system (EMS) detection in a single instrument capable of detecting and measuring the depth of commercially available EMS markers.



Along with classic locate screens the vLoc3 series locators offer new locate perspective screens:

Vector Locate - for fully automatic non-walkover locating

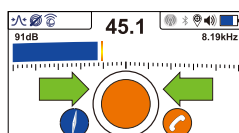
Transverse Graph - showing both peak and null simultaneously providing immediate measurement of signal distortion

Plan View - showing the relative orientation of the cable at any angle

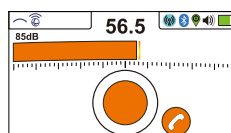
Sonde Locate - with guidance arrows leading to the sonde location even when it is vertical

The highly user-configurable vLoc3-ML includes EMS marker locate mode, eight passive locate modes, fault-find mode, SD (showing direction of outgoing current), and a range of configurable frequencies from 98Hz to 200kHz. Audio and mechanical vibration alerts can also be configured by the user providing warnings for shallow depth, overload, overhead cables, and excessive swinging. Plug-in-play options for the receiver include an optional Bluetooth module usable with external GPS devices. The optional factory fitted Tx-Link (radio link between receiver and transmitter) allows remote operation of the transmitters functions at distances over 300m/985ft.

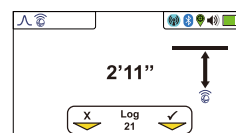
Marker locate modes



Dual Mode - Shows a peak locate response for both utility and marker location simultaneously

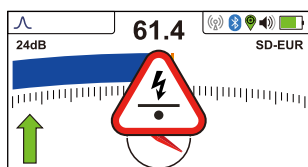


Dedicated Marker Mode - Shows a peak locate response for the buried marker



Marker Depth Readings - along with logging options are shown in the Dedicated Marker Mode

Real-time warnings in the vLoc3-Pro and vLoc3-ML



Real-time warnings are displayed across the receiver's display and accompanied by a mechanical vibration alert. Warnings are logged along with the cover of depth information when using the data logging feature of the receiver. All warnings can be turned on or off through the receiver's setup menu.



Signal Overload - Usually caused by operating very close to a power transformer or placing the unit very close to a transmitter in the Induction mode.



Shallow Cable - Indicates that the locator has detected a cable that is possibly less than 5.0"/15cm deep.

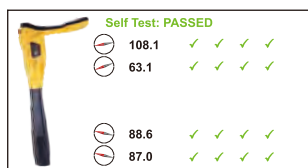


Swing Alert - This indicates that the operator is swinging the locator excessively and could result in misleading information.



Overhead cable - This indicates that the signal is mainly radiating from above traveling along overhead cables.

Self-test feature in the vLoc3 series receivers



Our patented on-the-fly integrated self-test feature provides the operator with total confidence that the equipment is in full working order. The test can be initiated in the field and require no extra equipment and no need to connect to a computer. Direct signal injection is used to confirm the antenna transfer function while further self-test check everything from the circuit boards to the LCD. Measurements are compared to the initial factory calibration and then subsequent tests

performed to check the system has remained within the specified accuracy. The self-test automatically checks all six sensors using three frequencies of low, medium, and high. The self-test results are stored in the internal memory with date and time stamps for later extraction using the free MyLocator3 desktop app available from our website.

vLoc3-9800 Utility Locator

The **vLoc3-9800** is the updated version of the popular legacy 9860XT and 9890XT locators. Now with updated modern technology we have combined the best of both legacy locators into the vLoc3-9800.

The vLoc3-9800 utility locator introduces new innovative tools for locating buried utilities assuring damage prevention while gathering information for analysis. The highly user-configurable vLoc3-9800 contains two passive locate modes, and a range of configurable frequencies from 98Hz to 200kHz. Depth cover and current on the line are shown with the push of a button. Pinpoint cable faults using directional arrows with the optional plug-in A-Frame.

The vLoc3-9800's 16-bit color, high visibility LCD, 4.3"/10cm display provides ultra-fast response with left/right arrow indicators while in auto-gain mode or peak locate bar graph with numeric value in manual gain mode. The vLoc3-9800 provides versatility with low frequencies for the telecom, power, and CATV industries as well as higher frequencies for the gas, water and sewer industries.

Options for the vLoc3-9800 include Tx-Link (radio link) from the receiver to transmitter, Bluetooth and plug-in Marker Locator Adapter.



vLoc3-MLA Marker Locator Adapter

The **vLoc3-MLA (Marker Locator Adapter)** is designed for easy, fast and accurate location of buried EMS markers. Once located the MLA will give depth of cover to the buried marker with the touch of a button. The MLA attaches to the bottom of vLoc3-Pro, vLoc3-9800 and vLoc3-5000 receivers.

When attached and plugged in to the receivers two marker related operating modes are enabled. In the dedicated marker mode, the receiver screens show a peak bar graph with the signal strength from the marker, the marker type and depth to the marker. In the dual marker mode all the above are shown in addition to the standard utility locate screen including left/right arrows and compass.

The plug-and-play MLA will detect any one of nine marker types, in good conditions, buried to a depth of 6'/2m and large flat markers to 9'/3m.



Loc3 Series Broadband Transmitters

The Loc3-series broadband transmitters have selectable induction frequencies from 8kHz to 200kHz and direct-connect frequencies from 98Hz to 200kHz. SD (signal direction), fault find and true resistance measurement up to 1 Mohm are all standard. The two inch by one-inch backlit dot matrix display shows output current, connection type, volts, resistance, frequency, volume, battery condition and high voltage warnings. The Tx-Link (receiver to transmitter radio link) connects the receiver to the transmitter for remote operation up to 300m/985ft. With the Tx-Link the user can change the transmitters frequencies, power output and operate most of the transmitters features remotely.

Packaged in a lightweight, rugged, ergonomic IP54 housing, the transmitter provides consistent current output in direct connect, clamp and induction modes. The transmitter has protection against incoming voltages up to 260V.

The Loc3 series broadband transmitters are available in both 5-watt and 10-watt versions. These transmitters operate on "D" cell alkaline batteries and have rechargeable Li-ion options.

- Transmit up to three frequencies simultaneously
- Fault-find mode for locating sheath to ground faults
- Optional 300m/985ft link to receiver for remote operation



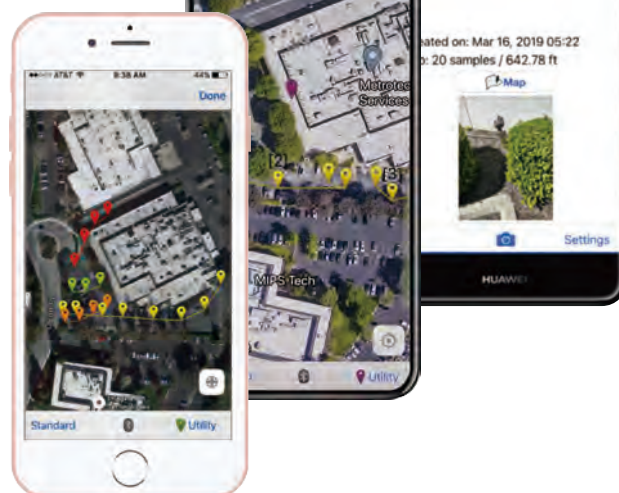
VMap Utility Mapping and Cloud Storage

When used with the vLoc series receivers, the VMap Utility Mapping app records data from the field which is instantly available online or can be shared by using the email function in the app to send .kml or .csv files. Field technicians using a vLoc series receiver can capture and store to the cloud depth readings, GPS coordinates, distance between locates and more.

The image capture feature in the app allows the user to attach a JPEG format image to the surveys. This is useful to add points of interest or a snapshot of the completed survey. Users can access the log files with the data captured in the app via the web portal or share it from within the app. The data is compatible with Google Maps, Asset Management and GIS software. The VMap app generates maps in real time giving confidence to the field technician that the data being collected is accurate. Location data is obtained from the mobile phone, the locators GPS or an external GPS device of your choice.



VMap



- Uses both Google and Apple Maps
- Low and high GPS accuracy settings
- Plug-and-play Bluetooth pairing to receivers
- Export to a .kml file for use with popular GIS programs
- Compatible with Google Maps, Asset Management and GIS software
- Show multiple utilities on one map with color coded utility drop pins

The VMap application is compatible with both iOS and Android devices.



MyLocator3 Fleet Management Tool

Manage a single or fleet of vLoc3 series utility locators with the free MyLocator3 app. Configure locators by turning on or off features, selecting which frequencies the user has access to and creating custom startup screens with logo or owners information.



MyLocator3

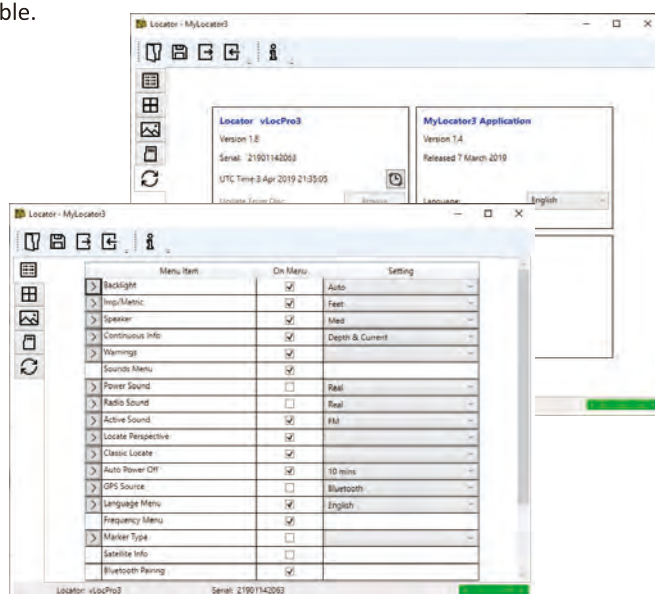
When a locator is connected to a computer running the MyLocator3 software, the program will automatically search our database for the latest software for both the utility locator and desktop application. The utility locator connects to the computer running MyLocator3 by the supplied USB cable.

Data transfer – MyLocator3 app will download the data collected from the locator including timestamps, GPS coordinates, depth measurements, current on the line, and notes entered at the time of locate.

Software updates – MyLocator3 checks for locator software updates and app software updates whenever connected to the Internet.

Personalize – Add owner/user information, a background picture or logo, or a short message to the startup screen.

Lock Feature – The locator's configurations and settings can be locked, enabling equipment or safety officers to ensure that features selected or removed by management cannot be over ridden by the user (requires optional lockout dongle).



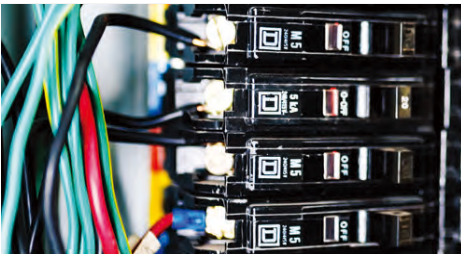


TRUE RMS DIGITAL MULTIMETERS FOR ELECTRICAL AND FIELD SERVICE™ FLIR DM62/DM66™

The DM62 and DM66 digital multimeters combine a rich feature set, precise measurements, and quality construction into tools of exceptional value. The meters are easy to use and built to last, offering long term stability for everyday use. The DM62 offers the accuracy and range of measurement options you need, whether you're a professional or just need the right tool for DIY.

The DM66 has all the great features of the DM62 plus the added benefit of low impedance (LoZ) mode to prevent ghost voltage from delivering false readings. It measures frequency, diode, capacitance, and temperature, for a comprehensive feature set ideal for commercial electricians, automation field service, or electronics repair technicians.

Whichever one you choose, you'll get the job done fast and efficiently.



ALL THE FEATURES YOU NEED IN ONE TOOL

Rich feature set ideal for various electrical applications

- Safely check voltage with non-contact voltage detection
- Measure both AC/ DC voltage and current (A, mA, μ A)
- Diagnose faults with broad DMM test functions including variable-frequency drive (VFD) mode and voltage range up to 600 V



FAST, EFFICIENT TESTING AND TROUBLESHOOTING

Intuitive and simple user interface for more effective and efficient troubleshooting and testing of electrical and electronic systems

- Operate the meter with one hand, thanks to compact design and easy-to-access buttons
- Work efficiently using integrated non-contact voltage detector with a flashing backlight and audible indicator
- Navigate the meter's on-screen menu system easily



TOUGH, RELIABLE, HIGH QUALITY

High-quality measurements, long-term stability, and reliability ensure years of safe, accurate and trouble-free operation

- Take the meter with you anywhere - 2 m drop-tested and IP40 rated
- Work with peace of mind knowing your meter has CAT IV-300V, CAT III-600V Safety Category Rating
- Make your job easier with helpful features including auto power off, MIN-MAX-AVG, relative mode, and data hold



The World's **Sixth Sense™**



INDUSTRIAL TRMS MULTIMETERS

FLIR DM90/91™

The FLIR DM90 and DM91 are affordable, safe, and reliable digital multimeters for a wide range of electrical and electronic system applications. With durable design, intuitive user interfaces, and comprehensive features covering high and low voltage applications, the DM90 and DM91 are uniquely positioned to help you troubleshoot electrical, electronic and HVAC/R systems. The DM91 is also enhanced with Bluetooth® technology, so you can connect via METERLiNK® to FLIR infrared cameras, or to mobile devices running FLIR Tools™ or the FLIR InSite™ workflow management system.



FAST & EFFECTIVE TROUBLESHOOTING

Rich feature set ensures safe and accurate operations

- Diagnose complex systems with high and low voltage measurement capabilities
- Measure True RMS, LoZ, and VFD, as well as microamp and milliamp current
- Assess temperatures up to 400°C (752°F) with Type-K thermocouple
- Work safely with built-in, non-contact AC voltage



WORK EFFICIENTLY

Designed and built to make your job easier

- User-friendly design with an intuitive interface and enhanced ergonomics
- Work longer with flexible battery options, powerful LED worklights, and rugged, drop-tested design
- Detect and document intermittent trends using the datalogging mode with on-board storage of 40k measurements*
- Rely on the protection of CAT IV-600V, CAT III-1000V safety ratings



DOCUMENT & SHARE RESULTS

View and share wirelessly for improved workflow

- Send readings via METERLiNK to compatible FLIR infrared cameras to embed data into live or saved thermal images*
- Wirelessly connect to FLIR Tools or the FLIR InSite workflow management application, for efficient troubleshooting and streamlined inspections*

* FLIR DM91 model only.



The World's **Sixth Sense™**



FLIR DM92/ DM93

True RMS Industrial Multimeters

FLIR's DM92 and DM93 world-class digital multimeters offer advanced variable frequency drive filtering to help you accurately analyze non-traditional sine waves and noisy signals. No matter what electrical challenge you're up against, the DM92 and DM93's powerful lighting and durable design will make the job simple. The DM93 offers additional features including Bluetooth technology to connect a compatible smartphone for remote viewing and sharing, and METERLiNK technology, to wirelessly embed electrical readings into radiometric infrared images on compatible FLIR thermal cameras.

Accurate readings.

Clearly analyze non-traditional sine wave and noisy signals

- Advanced variable frequency drive filtering and dual display shows voltage and frequency at once
- True RMS voltage and current
- LoZ Mode eliminates ghost voltage error readings caused by long wires that share a conduit

Efficient illumination and design.

Constructed to make any electrical challenge easier to troubleshoot. Powerful LED worklights eliminate need for flashlight in dim lighting.

- Durable double-molded construction (IP54, 3m Drop Test)
- Large, easy-to-read digits, backlit display and analog bargraph

Remote viewing and sharing (DM93 only).

Wireless data transfer

- Integrated Bluetooth technology connects to the FLIR Tools Mobile app on compatible mobile devices
- METERLiNK technology wirelessly sends readings to compatible FLIR infrared cameras, embedding the data into live and saved thermal images
- Data Record captures electrical measurements and provides wireless data transfer



DM92 and DM93 feature powerful LED worklights

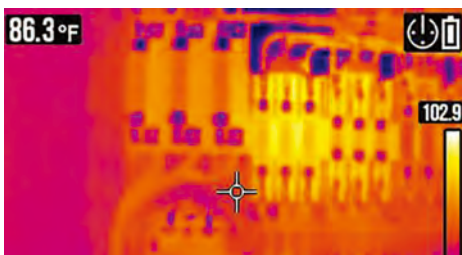


INDUSTRIAL IMAGING MULTIMETERS

FLIR DM284™/285™



The FLIR DM284 and DM285 are industrial, all-in-one True RMS digital multimeters and thermal imagers that can show you exactly where a hot spot or temperature anomaly is for faster troubleshooting. Featuring Infrared Guided Measurement (IGM™) powered by a built-in 160 × 120 FLIR thermal imager, the meters visually guide you to the precise location of a problem. You'll pinpoint issues faster, more safely, and efficiently. Both multimeters are ideal for inspecting industrial-electrical, mechanical, HVAC/R, and electronic systems, and can be used for both benchtop electronics or in the field. The DM285 is Bluetooth-enabled for wireless transfer of thermal images and data via METERLiNK® to mobile devices running the FLIR Tools® mobile app.



WORK SAFER AND SMARTER

Thermal imaging allows you to quickly scan for overheating system components, then use the DMM test functions to troubleshoot and diagnose the fault

- Identify energized and faulty equipment from a safe distance with non-contact temperature measurement
- Simplify data and thermal imaging collection and produce instant reports by connecting via METERLiNK to a smartphone or tablet running the FLIR Tools app*
- Save electrical parameter data and thermal images with onboard data storage*

TROUBLESHOOT CHALLENGING PROBLEMS EFFECTIVELY

Fully loaded with features for high and low voltage applications

- Solve challenging problems with the 18-function DMM including VFD mode, True RMS, LoZ, NCV, a built-in worklight, and laser pointer
- Measure voltage, current, frequency, resistance, continuity, diode, capacitance, and temperature
- Operate easily with an intuitive menu system

DESIGN AND FUNCTIONALITY

An all-in-one tool that's built to last

- Rely on the meters' drop-tested durability in any working condition
- Change the battery quickly and easily with the 'no tool' battery compartment*
- See readings clearly on the TFT display with a wide viewing angle*

*DM285 Only.



The World's Sixth Sense™

MULTIMETER SELECTION GUIDE

MARKET	GENERAL PURPOSE	PROFESSIONAL				INDUSTRIAL					INSULATION
Model	FLIR DM62	FLIR DM64	FLIR DM66	FLIR DM166	FLIR DM90	FLIR DM91	FLIR DM284	FLIR DM285	FLIR DM92	FLIR DM93	FLIR IM75
IGM Resolution	—	—	—	80 x 60	—	—	160 x 120	160 x 120	—	—	—
IGM Temperature Range	—	—	—	-10°C to 150°C (14°F to 302°F)	—	—	-10°C to 150°C (14°F to 302°F)	-10°C to 150°C (14°F to 302°F)	—	—	—
Display Counts/Type	6,000/Backlit LCD	6,000/Backlit LCD	6,000/Backlit LCD	6,000/2.4" TFT	6,000/Backlit LCD	6,000/Backlit LCD	6,000/2.8" TFT	6,000/2.8" TFT	40,000/Backlit LCD	40,000/Backlit LCD	4,000/40,000/ Backlit LCD
Bar Graph	—	—	—	—	•	•	•	•	•	•	•
Basic Accuracy (DCV)	±0.4%	±0.4%	±0.4%	±0.5%	±0.09%	±0.09%	±0.09%	±0.09%	±0.05%	±0.05%	±0.1%
True RMS AC/DC Voltage	600 V	600 V	600 V	600 V	1,000 V	1,000 V	1,000 V	1,000 V	1,000 V	1,000 V	1,000 V
True RMS AC/DC Current	10 A	10 A	10 A	10 A	10 A	10 A	10 A	10 A	10 A	10 A	—
AC/DC µA Current	•	•	•	•	•	•	•	•	—	—	—
Resistance	60 MΩ	60 MΩ	60 MΩ	60 MΩ	50 MΩ	50 MΩ	50 MΩ	50 MΩ	40 MΩ	40 MΩ	Insulation: 20 GΩ Earth Bond: 40 KΩ
Capacitance	—	10 mF	10 mF	10 mF	10 mF	10 mF	10 mF	10 mF	40 mF	40 mF	10 mF
Frequency	—	50 kHz	50 kHz	50 kHz	100 kHz	100 kHz	100 kHz	100 kHz	100 kHz	100 kHz	40 kHz
Temperature	—	-40°C to 400°C (-40°F to 752°F)	-40°C to 400°C (-40°F to 752°F)	-40°C to 400°C (-40°F to 752°F)	-40°C to 400°C (-40°F to 752°F)	-40°C to 400°C (-40°F to 752°F)	-40°C to 400°C (-40°F to 752°F)	-40°C to 400°C (-40°F to 752°F)	-200°C to 1200°C (-328°F to 2192°F)	-200°C to 1200°C (-328°F to 2192°F)	—
Data Hold	•	•	•	•	•	•	•	•	•	•	•
Relative	•	•	•	•	•	•	•	•	•	•	—
Min/Max/Average	•	•	•	•	•	•	•	•	•	•	—
LoZ Mode	—	•	•	—	•	•	•	•	•	•	—
Peak	—	—	—	—	•	•	•	•	•	•	—
Low Pass Filter/VFD	•	•	•	•	•	•	•	•	•	•	•
Ingress Protection (IP)/ Drop Proof	IP40/2 m	IP40/2 m	IP40/2 m	IP40/3 m	IP54/3 m	IP40/3 m	IP54/3 m	IP40/3 m	IP54/3 m	IP54/3 m	IP54/3 m
Non-Contact Voltage Detection (NCV)	•	•	•	•	•	•	•	•	—	—	—
Worklights	—	—	—	—	•	•	•	•	•	•	•
Data Storage	—	—	—	—	—	40,000 readings	—	10 Sets (40,000 readings each) and 100 images	Store/Recall 99 readings	Store/Recall 99 readings	Store/Recall 99 readings
Bluetooth/METERLINK®	—	—	—	—	—	•	—	•	—	•	•
Safety Category	CAT III-600 V CAT IV-300 V	CAT III-600 V CAT IV-300 V	CAT III-600 V CAT IV-300 V	CAT III-600 V CAT IV-300 V	CAT III-1000 V CAT IV-600 V	CAT III-1000 V CAT IV-600 V	CAT III-1000 V CAT IV-600 V	CAT III-1000 V CAT IV-600 V	CAT III-1000 V CAT IV-600 V	CAT III-1000 V CAT IV-600 V	CAT III-1000 V CAT IV-600 V



VOLTAGE, CONTINUITY, AND CURRENT TESTER

FLIR VT8™

The FLIR VT8 is a high-quality voltage, continuity, and current tester, ideal for electricians and service technicians who troubleshoot and verify electrical installations or systems within commercial and light industrial facilities. The FLIR VT8's optimized and open-jaw design allows it to fit into tight spaces and reliably measure large-diameter cables. Extensive measurement features make the FLIR VT8 a versatile tool – just one meter can get the job done. Carry the compact tester in your pocket to be ready at any moment for easy troubleshooting.

Choose from two models: the FLIR VT8-600 with a CAT III-600 V /CAT IV-300 V safety rating and a 100 A/600 V measuring range; or the FLIR VT8-1000 with the CAT III-1000 V/CAT IV-600 V safety rating and a 200 A/1000 V measuring range.



RUGGED AND SAFE

Made with the quality and reliability you have come to expect from FLIR test and measurement tools

- Work more safely with the CAT IV safety ratings
- Safely store test leads when not in use with the built-in test lead holder
- Keep the test leads out of your way when you're not using them - the length is short enough to minimize interference, yet long enough to get the job done



RICH FEATURES

Equipped with the capabilities you need for one versatile troubleshooting tool

- Measure AC/DC voltage and current, continuity, resistance, and capacitance
- Work efficiently in dimly lit areas using the bright LED worklight and backlit display
- Detect live AC voltages with the built-in non-contact voltage (NCV) detector
- Improve accuracy of readings with True RMS measurements



FLEXIBLE, EASY TO USE

Designed for long, trouble-free operation so you can focus on the task at hand

- Take measurements in tight spaces with the optimized jaw design, and measure large-diameter cables with the wide jaw opening
- Operate the meter with one hand thanks to the compact, ergonomic design
- View information easily at any distance on the large multi-function LCD display



The World's **Sixth Sense™**

SPECIFICATIONS

Part Number	VT8-600	VT8-1000
Electrical Measurement		
True RMS Voltage and Current	Yes	
Auto-Ranging	Yes	
AC/DC Current Range	100 A	200 A
AC/DC Current Resolution	0.1 A	
AC (50 to 60 Hz) / DC Current Accuracy	±2.5%	
AC/DC Voltage Range	600 V	1000 V
AC/DC Voltage Resolution	0.1 V	
AC (45 to 66 Hz) / DC Voltage Accuracy	± 1.5%, ±1.0%	
Resistance	60.00 MΩ ± (1.5%)	
Continuity Check Threshold	10 Ω to 100 Ω	
Capacitance	600 μF ±4.0%, 6000 μF ±10.0%	
Non-Contact Voltage Detector (NCV)	≥100 Vrms; ≤10 mm distance (LED/buzzer alerts)	
Additional Measurement Functions	DCA zero, relative mode (AC/DC voltage, AC current, and capacitance), data hold	
General		
Worklights	White LED	
Jaw Opening	15.5 mm (0.61 in)	
Display	6000-count backlit multi-function LCD	
Display Rate	Approximately 3 times per second	
Polarity	Automatic display of positive and negative polarity	
Over-Range Indication	"OL" or "-OL" displayed	
Auto Power Off	After 15 minutes	
Power Source	2 x AA alkaline batteries	
Low battery Indication	Battery symbol is displayed when batteries need changing	
Environmental Data		
Operating Temperature	-10 to 50°C (14 to 122°F)	
Relative Humidity	95% max; 5 to 30°C (41 to 86°F) / 75% max; 30 to 40°C (86 to 104°F) / 45% max; 40 to 50°C (104 to 122°F)	
Storage Temperature	-30 to 60°C (-22 to 140°F), batteries not installed	
Drop Test	2 m (6.6 ft)	
Physical Data		
Dimensions: (W × H × D)	210 mm × 53 mm × 35 mm (8.27 in × 2.1 in × 0.67 in)	
Weight	163.7 g (5.7 oz) including batteries	
General Information		
Warranty	Limited 3-year	
Certifications	C-UL-US, CE, RCM	
Safety Category Rating	CAT IV-300 V CAT III-600 V	CAT IV-600 V CAT III-1000 V
	EN 61010-1 EN 61010-2-032 EN 61010-2-033	



FLIR CM4X

*Professional 400A True RMS
Clamp Meter Family with Accu-Tip™*

The FLIR CM4X Clamp Meter Family includes three professional and affordable True RMS meters designed for commercial and residential electricians. The CM42 and CM44 feature AC clamp measurement, and the CM46 offers both AC/DC measurement to meet your unique needs. Each meter is equipped with a bright backlit display for ease of use inside electrical panels. Accu-Tip™ technology delivers amperage measurements on smaller-gauged wires more accurately – to a tenth of a digit. All models offer MAX/MIN/AVG recording, frequency measurement, and electrical field detection to help you determine voltage presence and relative strength of the field. Made with an over-molded, easy-to-grip design, the CM4X clamp meter family is durable enough to withstand a two-meter drop, and the slim form factor is convenient to carry in your toolbag anywhere you go.

Precise, accurate measurements

High accuracy and resolution in small panels

- Accu-Tip enables more accurate amperage measurements on smaller-gauged wires
- MAX/MIN/AVG recording, and frequency and diode measurement
- Data hold, zero function, and low pass filter (VFD) for voltage measurement



Accu-Tip enables more accurate amperage measurements

Engineering you can have confidence in

Built rugged to last you for years to come

- Durable to withstand a 2-meter drop, and operates at -10 to 50°C (14 to 122°F)
- Large, bright backlit display makes readings easy to see
- Tough, over-molded, easy-to-grip design and slim, portable size

Professional performance at an affordable price

Provides all the critical features you need

- Built to accept up to a 30mm max conductor
- Electrical field detection (NCV) determines if voltage is present and the relative strength of the field for safety
- True RMS professional clamp meters



The World's **Sixth Sense™**



FLIR

CM72/CM74

Commercial Clamp Meters

The FLIR CM72 600A AC Clamp Meter and the CM74 600A AC/DC Clamp Meter give you better access to wiring in hard-to-reach places, and provide all the measurement capabilities you need for advanced troubleshooting. Made with a narrow jaw and high-powered LED worklights, the CM72 and CM74 make it easier to take measurements in dark, crowded panels and cabinets. Their slim, light design is convenient to carry in your back pocket wherever you go. With advanced electrical features including Autoranging, True RMS Voltage and Current, LoZ, Inrush (CM74 only), VFD Mode (CM74 only), and an input for a flexible current probe accessory, the CM72 and CM74 have all the measurement functions you need to stay competitive and ensure accurate readings.

BETTER CLAMP ACCESS AND PORTABILITY

Take measurements in hard-to-reach places, and carry the clamp wherever you go

- Made with a narrow jaw for easy access to wiring in crowded panels and cabinets
- Slim clamp design makes it convenient to carry in your back pocket
- Dual bright high-powered LED worklights guide you to your target in poor lighting conditions

ALL THE ELECTRICAL FEATURES YOU NEED

Tackle modern challenges, get accurate readings

- Advanced electrical features including: True RMS, LoZ, VFD Mode (CM74 only), Inrush (CM74 only), Smart Diode with Disable
- Expandable to 3000A AC with TA72 & TA74 Flex Clamp Accessories (sold separately)
- Min / Max, Hold and Auto Power Off with Disable

ENGINEERING YOU CAN HAVE CONFIDENCE IN

Built rugged, and includes accessories to make troubleshooting easier

- Premium gold-tipped silicone test lead accessories included
- Large digit LCD display with bright backlight
- Rubberized double molded hand grips reduce slippage



Make awkward measurements easy with optional TA74 flex clamp accessory



True RMS AC Current up to 600A



The World's **Sixth Sense™**



FLIR CM82/ CM83/CM85

True RMS Power Clamps

FLIR's CM82, CM83 and CM85 industrial-grade power clamp meters are engineered with advanced power analysis and variable frequency drive (VFD) filtering functions required by electrical troubleshooters. The CM83 and CM85 meters offer additional features including Bluetooth technology to connect compatible mobile devices for remote viewing and sharing, and METERLiNK technology, to wirelessly embed electrical readings into radiometric infrared images on compatible FLIR thermal cameras.

Superior accuracy.

Advanced power analysis and variable frequency drive filtering functions

- VFD Mode provides superior accuracy for working on VFD-controlled equipment
- Advanced power efficiency and harmonics measurements for system level performance analysis
- True RMS voltage and current plus non-contact voltage detector



Analyze Power-related Issues

Reliable performance.

Dependable functionality vital to professionals

- 2 meter drop tested with lifetime warranty
- Inrush mode captures fast AC Current spikes during appliance start-up
- Phase Rotation testing ensures the motor and power source are aligned

Key for troubleshooting.

Designed for convenience and ease of use

- Powerful LED lamps assist with clamping and are bright enough to serve as a primary work light
- Remote viewing on smartphones and tablets via Bluetooth plus METERLiNK to wirelessly embed readings into thermal images on compatible FLIR cameras (CM83 and CM85 only)
- Large, easy-to-read digits, backlit display and analog bargraph



The World's **Sixth Sense™**



INDUSTRIAL IMAGING CLAMP METERS

FLIR CM174™/275™

The FLIR CM174 and CM275 clamp meters combine thermal imaging with electrical measurement into powerful inspection, troubleshooting, and diagnostic tools. Through Infrared Guided Measurement (IGM™), they provide a fast, reliable way to identify hot spots and overloaded circuits from a safe distance. Confirm your findings with the clamp meters' wide range of functions plus temperature readings. The FLIR CM275 is Bluetooth-enabled for wireless transfer of thermal images and data via METERLiNK® to mobile devices running the FLIR Tools® mobile app.



TROUBLESHOOT FASTER & SAFER

Identify electrical issues quickly with the power of IGM

- Scan entire targets for electrical issues with up to 160 × 120 (CM275) thermal resolution
- Safely check for live connections using non-contact temperature measurement
- Pinpoint exact hot spot locations with laser or crosshairs
- Easily reach difficult, dark locations thanks to narrow jaw and built-in worklights



DIAGNOSE EFFICIENTLY

Quickly verify problems, check loads, and validate hot spots

- Diagnose complex systems with high and low voltage measurement capabilities
- Use advanced electrical features including VFD mode, True RMS, and LoZ
- Expand measurement capabilities to 3000 A AC with FLIR Flex Clamp accessories
- Rely on the protection of CAT IV-600V, CAT III-1000V safety ratings



DOCUMENT & SHARE RESULTS

Store data or share wirelessly for improved workflow

- Store electrical measurements and thermal images internally, for later review*
- Simplify data and thermal imaging collection and produce instant reports by connecting via METERLiNK to a smartphone or tablet running the FLIR Tools app*

* FLIR CM275 model only.



The World's **Sixth Sense™**



CM57 & CM55 Flexible Clamp Meters

FLIR CM55/57

Flexible Clamp Meters

The FLIR Flexible Clamp Meters with Bluetooth® are ergonomic tools designed to simplify difficult current measurements. Made with a narrow flexible coil clamp, the CM55 and CM57 let you easily take measurements in tight or awkward spots—a difficult task with a traditional hard jaw clamp meter. With Bluetooth communication for remote viewing and data transfer to iOS® and Android™ devices via the FLIR Tools Mobile App, you can analyze and share data fast right from the jobsite.

TAKE ACCURATE MEASUREMENTS IN TIGHT OR AWKWARD SPOTS.

Tricky conductors conquered

- Snake the coil around obstacles with ease, even in deep, crowded cabinets
- True RMS AC Current up to 3,000 Amps for multiple conductor measurements
- Inrush current function for equipment start-up spikes

EASY INSPECTION AND NAVIGATION.

Designed with your convenience in mind

- Standalone flexible clamp meter displays the readings you need
- Bright, dual LED worklights provide built-in illumination for dark cabinets
- Drop tested to 3 meters, portable, lightweight, and tangle-free without compromising measurement range

REMOTE VIEWING FROM A SAFE DISTANCE.

Transfer & view data on mobile devices with FLIR Tools Mobile App

- Connect to iOS and Android smartphones or tablets
- Multiple units wirelessly connect for remote viewing of multiphase systems
- Data recording for trend analysis transferable via Bluetooth

CHOOSE FROM TWO FLEXIBLE COIL LENGTHS:

- **CM55 - 10"** (25.4cm) for easy maneuverability and compact convenience
- **CM57 - 18"** (45.72 cm) for larger and multiple conductor measurements, double-wrap requirements, and deeper access



FLIR CM57's Flexible Cable works into tight areas



Bluetooth capability gives readings at safe distances



The World's **Sixth Sense™**

Specifications

Flexible Clamp Meters	CM55	CM57
Maximum AC current	3000A	
AC response	True RMS	
AC current ranges and resolution	30.00A, 300.0A, 3000A	
Basic AC current accuracy (of reading)	± 3.0% + 5 digits	
Maximum resolution	0.01A	
AC current bandwidth	45Hz – 500Hz (sine wave)	
Inrush current	Min 0.5A, 100mS	
Data record mode	20,000 points , 1 min sample rate	
Positional error (distance from optimum)	0.6" (15mm) ± 2.0% 1.0" (25mm) ± 2.5% 1.4" (35mm) ± 3.0%	1.4" (35mm) ± 1.0% 2.0" (50mm) ± 1.5% 2.4" (60mm) ± 2.0%
Meter Data		
Display	3000 count LCD with backlight and multi-function indicators	
Max conductor diameter	2.4" (6cm)	4.7" (12cm)
Flex coil length	10" (25cm)	18" (45cm)
Flex coil diameter	0.3" (7.5mm)	
Flex coil tip diameter	0.5" (13mm)	
Worklight	Two white LEDs	
Bluetooth range max	32' (10m)	
Wireless ID# max	Up to 20	
Power supply	(2) 1.5V "AAA"	
Drop test	9.8' (3m)	
Agency approvals	FCC Class B, CE, UL	
Safety rating	CAT IV 600V, CAT III 1000V	
Standards	EN61010-1, EN61010-2-032, EN61326-1	
Warranty	Limited lifetime with registration*	



Ordering Information	CM55	CM57
UPC	793950370551	793950370575
EAN	0793950370551	0793950370575

CLAMP METER SELECTION GUIDE

Specs		Residential/Commercial				Commercial/Industrial				Industrial						
Model	FLIR CM42	FLIR CM44	FLIR CM46	FLIR CM65	FLIR CM72	FLIR CM74	FLIR CM174	FLIR CM275	FLIR CM78	FLIR CM82	FLIR CM83	FLIR CM85	FLIR CM55	FLIR CM57	FLIR CM94	
IGM® Resolution	—	—	—	—	—	—	80 x 60	160 x 120	IR Thermometer	—	—	—	—	—	—	
IGM Temperature Range	—	—	—	—	—	—	-10°C to 150°C (14°F to 302°F)	-10°C to 150°C (14°F to 302°F)	-20°C to 270°C (-4°F to 518°F)	—	—	—	—	—	—	
Display Counts/Type	6000/Backlit LCD	6000/Backlit LCD	6000/Backlit LCD	3-5/6 digits 6000 counts	6000/Backlit LCD	6000/Backlit LCD	6000/2 in Color TFT	6000/2.4 in Color TFT	4000/Backlit LCD	10000/Backlit LCD	10000/Backlit LCD	10000/Backlit LCD	3000/Backlit LCD	3000/Backlit LCD	3-5/6 digits 6000 counts; 3-1/2 digits 1999 counts for Hz	
Jaw Opening	1.2 in (30 mm)	1.2 in (30 mm)	1.2 in (30 mm)	1.18 in (30 mm)	1.38 in (35 mm)	1.38 in (35 mm)	1.38 in (35 mm)	1.38 in (35 mm)	1.70 in (42 mm)	1.45 in (37 mm)	1.45 in (37 mm)	1.77 in (45 mm)	10 in (25 cm) Flex Coil	18 in (45 cm) Flex Coil	2.17 in (55 mm)	
AC/DC Voltage	600 V	600 V	600 V	1000 V	600 V	1000 V	1000 V	1000 V	1000 V	1000 V	1000 V	1000 V	—	—	1000 V	
VFD AC Voltage	600 V	600 V	600 V	1000 V	—	1000 V	—	—	—	•	•	•	—	—	1000 V	
LoZ AC/DC Voltage	—	—	—	1000 V	•	•	•	•	—	—	—	—	—	—	1000 V	
AC Current	400 A	400 A	400 A	6000.0 A	600 A	600 A	600 A	600 A	1000 A	600 A	600 A	1000 A	3000 A	3000 A	2000 A	
DC Current	—	—	400 A	6000.0 A	—	600 A	600 A	600 A	1000 A	600 A	600 A	1000 A	—	—	2000 A	
VFD AC Current	—	—	—	—	600 A	600 A	600 A	600 A	—	—	—	—	—	—	—	
Inrush AC Current	—	•	•	—	—	•	•	•	—	•	•	•	•	•	—	
Resistance	60.00 kΩ	60.00 kΩ	60.00 kΩ	600.0, 6.000 kΩ	6.00 kΩ	6.00 kΩ	6.00 kΩ	6.00 kΩ	40.00 MΩ	100 kΩ	100 kΩ	100 kΩ	—	—	40.00 MΩ	
Capacitance	—	2500 µF	2500 µF	—	1000 µF	1000 µF	1000 µF	1000 µF	4000 µF	4000 µF	4000 µF	4000 µF	—	—	6.000 µF	
Frequency	1.00 kHz	1.00 kHz	1.00 kHz	1.0 kHz	60.00 kHz	60.00 kHz	60.00 kHz	60.00 kHz	4.00 kHz	10.00 kHz	10.00 kHz	10.00 kHz	—	—	0.4 kHz	
Temperature	—	-40°C to 400°C (-40°F to 752°F)	-40°C to 400°C (-40°F to 752°F)	-40.0 to 400°C (-40.0°F to 752°F)	—	—	—	—	-20°C to 760°C (-4°F to 1400°F)	—	—	—	—	—	-50°C to 1000°C (-58°F to 1832°F)	
Min/Max/Average	•	•	•	Min/Max	Min/Max	Min/Max	Min/Max	Min/Max	•	•	•	•	—	—	—	
Peak	—	•	•	—	—	—	—	—	•	•	•	•	—	—	—	
Power/Power Factor	—	—	—	—	—	—	—	—	—	600 kW/0.0 to 1.0	600 kW/0.0 to 1.0	1000 kW/0.0 to 1.0	—	—	—	
Harmonics/Total Harmonic Distortion (THD)	—	—	—	—	—	—	—	—	—	1 to 25/0 to 99.9	1 to 25/0 to 99.9	1 to 25/0 to 99.9	—	—	—	
Phase Rotation	—	—	—	—	—	—	—	—	—	•	•	•	—	—	—	
Non-Contact Voltage Detector (NCV)	•	•	•	—	—	—	—	—	—	•	•	•	—	—	—	
Worklights	—	—	—	—	•	•	•	•	•	•	•	•	•	•	—	
Data Storage	—	—	—	Record measuring data	—	—	—	10 files (40k readings each), 100 images	—	—	—	—	2000 readings	2000 readings	—	
Bluetooth® / METERLINK®	—	—	—	•	—	—	—	•	•	—	•	•	•	•	—	
Safety Category	CAT IV-300V CAT III-600V	CAT IV-300V CAT III-600V	CAT IV-300V CAT III-600V	CAT IV-600 V, CAT III-1000 V	CAT IV-600V CAT III-1000V	CAT IV-600V CAT III-1000V	CAT IV-600V CAT III-1000V	CAT IV-600V CAT III-1000V	CAT IV-600V CAT III-1000V	CAT IV-600V CAT III-1000V	CAT IV-600V CAT III-1000V	CAT IV-600V CAT III-1000V	CAT IV-600V CAT III-1000V	CAT III-1000V	CAT IV-1000V	



PRO-GRADE THERMAL CAMERAS FOR iOS® AND ANDROID™ SMARTPHONES

FLIR ONE® PRO-SERIES

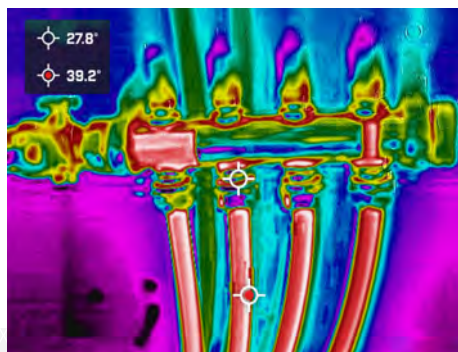
The FLIR ONE Pro-Series are affordable smartphone attachment thermal imaging cameras designed to help professionals find problems faster and get more work done in less time. These lightweight, pocket-sized inspection tools allow users to see and measure temperature differences accurately and from a safe distance, making it easier to detect and diagnose issues. With unique image-enhancement features including FLIR VividIR™ and MSX® (Multi-Spectral Dynamic Imaging), the FLIR ONE Pro and Pro LT provide best-in-class thermal imagery. FLIR ONE Pro-Series cameras also provide a OneFit™ connector that adjusts and extends up to 4 mm to fit many popular protective cases. Whether inspecting electrical panels, looking for HVAC problems, or finding water damage, FLIR ONE Pro-Series thermal imaging cameras enable users of all experience levels to work efficiently while on-the-go.



PROFESSIONAL IMAGE QUALITY

Detect problems with precision using the FLIR ONE Pro-Series' image enhancement features including VividIR and MSX

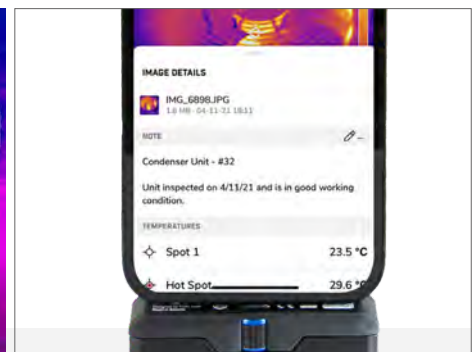
- Take crisp thermal images with VividIR, which combines multiple image frames to deliver one sharper, final image
- Easily recognize where problems are located and identify targets with MSX, which enhances thermal images by embossing visual details from the 1440 × 1080 HD camera onto the thermal image
- Capture images with solid thermal contrast; FLIR ONE Pro provides thermal sensitivity of 70 mK while FLIR ONE Pro LT provides 100 mK sensitivity



TEMPERATURE ACCURACY

Get reliable results from the FLIR ONE Pro LT or upgrade to the FLIR ONE Pro for a wider temperature range and improved sensitivity

- Troubleshoot faster with 160 × 120 (19,200 pixels) thermal resolution using the FLIR ONE Pro and 80 × 60 (4,800 pixels) using the FLIR ONE Pro LT
- Quickly see both the hottest and coldest spots in a scene
- Measure temperatures up to 400°C (752°F) with the FLIR ONE Pro



FLEXIBLE REPORTING TOOLS

Improve workflow using the sleek, intuitive FLIR ONE mobile app without ever leaving the job site

- Capture, store, and edit images; add notes, and easily share data with team members and customers using the improved FLIR ONE Pro app
- Create professional reports quickly using FLIR Thermal Studio desktop software
- Conveniently access a wide variety of compatible FLIR ONE mobile apps (developed using FLIR mobile SDK)



The World's **Sixth Sense™**

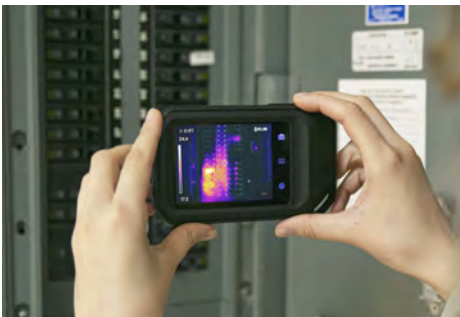


COMPACT THERMAL CAMERA

FLIR C5™



The FLIR C5 compact thermal camera is your go-to tool for building inspections, facilities maintenance, HVAC/R, electrical repair, and other troubleshooting applications. Featuring a thermal camera, visual inspection camera, and LED flashlight, the powerful FLIR C5 makes it easy to identify hidden problems. Built-in FLIR Ignite™ cloud connectivity allows direct data transfer, storage, and backup, so images are always available on all your devices. The 3.5 inch integrated touchscreen is simple to use, so you can quickly inspect, document repairs, and share evidence with customers. With the FLIR C5 in your pocket, you'll be ready anytime to find hot fuses, air leaks, plumbing issues, and more.



FIND AND TROUBLESHOOT

Quickly find hidden faults and reduce diagnostic time with this powerful, professional tool

- Identify and troubleshoot problems faster with the 160 × 120 true thermal imager and 5-megapixel visual camera
- Save time on manual thermal adjustments using 1-Touch Level/Span, which auto-adjusts the level and span in an area of interest with one touch
- Instantly recognize the location of a temperature issue with FLIR MSX® (Multi-Spectral Dynamic Imaging), which uses scene details from the built-in visual camera and embosses them onto the full thermal image



DOCUMENT AND SHARE

Pinpoint and communicate potential issues faster

- Upload directly to FLIR Ignite to conveniently store, organize, and back-up images
- Identify and describe potential issues by adding annotations to images
- Share findings easily and securely by sending a password-protected link via email
- Provide customers professional reports with images that document problems and repairs using preferred software, such as FLIR Thermal Studio



RUGGED, RELIABLE, AND COMPACT

Take the portable, affordable C5 with you to every job – it's the perfect tool for every person on your team

- IP54 enclosure provides a high level of protection against dust and water
- Designed to withstand a 2 m (6.6 ft) drop
- Carry the compact C5 in your pocket or stow easily in a crowded tool bag
- See into dark, difficult-to-reach areas with the help of the bright LED flashlight



The World's **Sixth Sense™**

SPECIFICATIONS

Overview	
IR sensor	160 × 120 (19,200 pixels)
Thermal sensitivity/NETD	<70 mK
Field of view (FOV)	54° × 42°
Minimum focus distance	<ul style="list-style-type: none"> Thermal: 0.1 m (3.94 in) MSX®: 0.3 m (11.8 in)
Image frequency	8.7 Hz
Focus	Focus free
Spectral range	8–14 µm
Screen size	3.5 in
Visual camera	5 MP
Digital camera focus	Fixed
Image Presentation	
Image adjustment	<ul style="list-style-type: none"> Automatic level and span Manual level and span 1-Touch level and span
Image modes	<ul style="list-style-type: none"> Infrared image Visual image MSX (Embossed visual details on thermal image) Picture-in-picture (IR area on visual image)
Gallery	Thumbnails and custom folder structure
Color palettes	<ul style="list-style-type: none"> Iron Gray Rainbow Arctic Lava Rainbow HC
Screen rotation	Yes
Touchscreen	Capacitive touch
Measurement & Analysis	
Object temperature range	-20 to 400°C (-4 to 752°F)
Accuracy	At ambient temp. 15 to 35°C (59 to 95°F) and object temp. above 0°C (32°F) 0 to 100°C (32 to 212°F): ±3°C (±5.5°F) 100 to 400°C (212 to 752°F): ±3%
Measurement functions	<ul style="list-style-type: none"> Spot Box with max./min.
Measurement correction	<ul style="list-style-type: none"> Emissivity: matt/semi-matt/semi-gloss + custom value Reflected apparent temperature Atmospheric compensation

Image Storage & Streaming	
Storage media	Internal memory and onboard FLIR Ignite cloud connectivity (with Wi-Fi)
Image storage capacity	>5000 images
Image file format	Standard JPEG, 14-bit measurement data included
Communication & Connectivity	
Wi-Fi®	802.11 a/ac/b/g/n (2.4 and 5 GHz)
USB	USB 2.0, Type-C connector
Bluetooth®	PAN
Image upload	Directly upload images to FLIR Ignite cloud library and services
Additional Information	
Battery type	Rechargeable built-in Lithium ion battery
Battery operating time	4 hours
Charging system	USB-C (1 A)
Charging time	2 hours
External power operation	5 V, USB-C
Operating temperature range	-10 to 50°C (14 to 122°F)
Storage temperature range	-40 to 70°C (-40 to 158°F)
Encapsulation	Camera housing and lens: IP54 (IEC 60529)
Drop test	Designed for 2 m (6.6 ft)
Weight (including battery)	0.19 kg (0.42 lb)
Size (L × W × H)	138 × 84 × 24 mm (5.4 × 3.3 × 0.94 in)
Tripod mounting (built-in)	UNC ¼"-20



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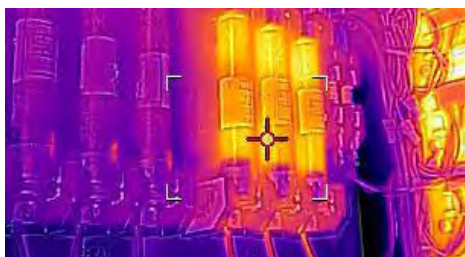


INFRARED CAMERA WITH MSX® & WI-FI

FLIR Ex-Series™



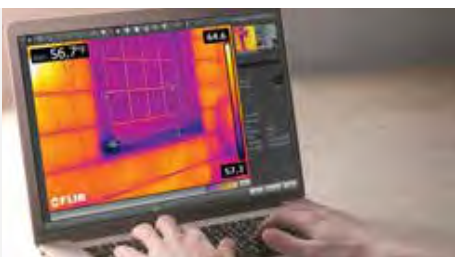
FLIR E4, E5-Xt, E6-Xt, and E8-Xt are powerful, cost-effective, easy-to-use troubleshooting tools for building, electrical, and mechanical applications. With four resolution options—up to 320 × 240 infrared pixels—and the ability to accurately measure temperatures from -20°C to 550°C/-4°F to 1022°F (E6-Xt and E8-Xt), the Ex-Series has models to fit your target size, working distance, visual detail needs, and budget. All models include MSX® technology for extraordinary thermal imaging detail. Wi-Fi connectivity to smartphones and tablets via the FLIR Tools® Mobile app makes sharing images and sending reports from any location easier, enabling you to make critical decisions faster. With Ex-Series cameras, you can gain the competitive advantage by providing clients with thermal images that clearly reveal the source of electrical, mechanical, and building-related problems.



EASY TO USE

Intuitive graphic interface simplifies measurements in both thermal and MSX mode

- Fully automatic and focus-free
- Accurately measure your target using center spot or max/min area box
- Navigate easily to on-screen settings, image modes, and measurement tools using simple button controls
- Activate MSX to enhance IR images with visual detail for better perspective and interpretation



CONVENIENT TO SHARE IMAGES AND FINDINGS

Download images, create reports, and share what you've found instantly

- Records standard JPEGs with embedded temperature data for easy sharing with clients
- Wi-Fi connectivity to mobile devices via the FLIR Tools Mobile app
- Rapid Wi-Fi or USB image transfer for documentation
- Image analysis and editing, plus report creation, through FLIR Tools



COMPACT AND RUGGED

Built for portability and safe, efficient use in harsh environments

- Lightweight and well-balanced at just 1.2 lbs (0.575 kg)
- Withstands a 2-meter drop test
- IP54 Enclosure provides a high level of protection against dust and water
- Comes with 2-year warranty coverage on the camera and 10-year coverage for the detector



The World's Sixth Sense™

SPECIFICATIONS

Image and optical data	E4	E5-XT	E6-XT	E8-XT
IR resolution	80 × 60 (4,800 pixels)	160 × 120 (19,200 pixels)	240 × 180 (43,200 pixels)	320 × 240 (76,800 pixels)
Thermal sensitivity/NETD	<0.15°C (0.27°F) / <150 mK	<0.10°C (0.27°F) / <100 mK	<0.06°C (0.11°F) / <60 mK	<0.05°C (0.09°F) / <50 mK
Spatial resolution (IFOV)	10.3 mrad	5.2 mrad	3.4 mrad	2.6 mrad
Field of view (FOV)	45° × 34°			
F-number	1.5			
Image frequency	9 H			
Focus	Focus-free			
Detector data				
Detector type	Focal Plane Array (FPA), uncooled microbolometer			
Spectral range	7.5–13 µm			
Image presentation and modes				
Display	3" 320 × 240 color LCD			
Image adjustment	Automatic adjust/lock image			
Image modes	Thermal MSX, thermal, picture-in-picture, thermal blending, digital camera			
Color palettes	Iron, Rainbow, Black & White			
Measurement and analysis				
Object temperature range	–20°C to 250°C (–4°F to 482°F)	-20°C to 400°C (-4°F to 752°F) in two ranges	-20°C to 550°C (-4°F to 1022°F) in two ranges	-20°C to 550°C (-4°F to 1022°F) in two ranges
Accuracy	±2°C (±3.6°F) or ±2% of reading for ambient temperature 10°C to 35°C (50°F to 95°F) and object temperature above 0°C (32°F)			
Spotmeter	Center spot			
Area	Box with max/min			
Isotherm	Above alarm, below alarm			
Data communication and interfaces				
Interfaces	USB Micro: data transfer to and from PC and Mac device			
Wi-Fi	Peer-to-peer or infrastructure			
File format	Standard JPEG, 14-bit measurement data included			
General				
Operating temperature range	15°C to 50°C (5°F to 122°F)			
Battery	Rechargeable 3.6 V Li ion battery			
Battery operating time	Approx. 4 hours at 25°C (77°F) ambient temperature and typical use			
Battery charging time	2.5 hours to 90% capacity in camera. 2 hours in charger			
Drop	2 m (6.6 ft.)			
Camera weight, incl. battery	0.575 kg (1.27 lb.)			
Camera size (L × W × H)	244 × 95 × 140 mm (9.6 × 3.7 × 5.5 in)			
Box contents	Infrared camera, hard transport case, battery, USB cable, power supply/charger with EU, UK, US and Australian plugs, printed documentation			



FLIR Exx-Series

ADVANCED THERMAL IMAGING CAMERAS

SPECIFICATIONS

Model	E54	E76	E86	E96
IR resolution	320 × 240 pixels	320 × 240 pixels	464 × 348 pixels	640 × 480 pixels
Resolution with UltraMax® enhancement	—	307,200 pixels	645,888 pixels	1.2 megapixels
MSX® image enhancement	Yes: details from visual camera add depth and perspective			
Built-in visual camera	5 MP, fixed focus, with built in LED light			
Thermal sensitivity	<40 mK @ 30°C (86°F)	<30 mK @ 30°C (86°F), 42°lens	<30 mK @ 30°C (86°F), 42°lens	<30 mK @ 30°C (86°F), 42°lens
Temperature range	-20°C to 120°C (-4°F to 248°F); 0°C to 650°C (32°F to 1202°F)	-20°C to 120°C (-4°F to 248°F); 0°C to 650°C (32°F to 1202°F)	-20°C to 120°C (-4°F to 248°F); 0°C to 650°C (32°F to 1202°F); 300°C to 1500°C (572°F to 2732°F)	-20°C to 120°C (-4°F to 248°F); 0°C to 650°C (32°F to 1202°F); 300°C to 1500°C (572°F to 2732°F)
Optional temperature range	—	300°C to 1000°C (572°F to 1832°F)		
Accuracy	±2°C (±3.6°F) or ±2% of the reading			
Focus modes	Manual	Continuous laser distance meter (LDM), one-shot LDM, one-shot contrast, manual	Continuous LDM, one-shot LDM, one-shot contrast, manual	Continuous LDM, one-shot LDM, one-shot contrast, manual
Digital zoom	1–4x continuous			1–8x continuous
Measurement tools	3 spotmeters in live mode, 1 area meter in live mode	3 spotmeters in live mode, 3 area meters in live mode		
Measurement presets	None, center spot, hot spot, cold spot, 3 spots, hot spot-spot*	None, center spot, hot spot, cold spot, User Presets 1&2		
Available lenses	None (fixed lens)	14°, 24°, 42°, macro (2x)		
Lens identification	—	Automatic (FLIR AutoCal™)		
1-Touch Level/Span	Yes: automatic contrast enhancement			
Laser pointer	Yes			
Laser distance meter	—	Yes		
Area measurement information	—	—	Yes	
On-camera routing software	FLIR Inspection Route™ — enabled			
On-camera report building	Voice annotation and GPS tagging to images and video; on-screen text; sketch on infrared images from touchscreen			
FLIR software integration	FLIR Thermal Studio Starter, FLIR Thermal Studio, FLIR Thermal Studio Pro, FLIR Research Studio			
Radiometric JPEG	Yes			
IR, radiometric, visual video recording	Yes			
IR, radiometric, visual video streaming	Yes, over UVC (radiometric, non-radiometric, visual) and Wi-Fi (non-radiometric, visual)			
Communication modes	USB 2.0, Bluetooth, Wi-Fi, DisplayPort			
METERLiNK®	Yes			
Display	640 × 480 pixels (VGA) Dragontrail® touchscreen			
Drop-testing	2 m (6.6 ft)			
Battery operation time	>2.5 hours, typical use			

*Hot spot to center spot Delta measurement



The World's Sixth Sense™



FLIR AutoCal™ Lenses

FLIR E76, E86, and E96 camera are compatible with all our interchangeable AutoCal lenses. The camera automatically recognizes when a new lens is attached and launches a wizard to begin auto-calibrating the camera with the lens—no need to send the camera in for service. This helps ensure the camera always produces high-quality images and precise thermal measurements.



WHAT LENS DO YOU NEED?

14°, 29 mm lens: this telephoto lens has a narrow field of view for precise focus and crisp imaging of distant targets.

24°, 17 mm lens: often considered the “standard” lens, the 24° × 18° field of view allows users to remain a safe distance from energized equipment (e.g. 3 m/6.6 ft) while still obtaining a crisp focus on smaller targets.

42°, 10 mm lens: this wide-angle lens captures the largest field of view for imaging buildings, roofs, or other areas where it’s important to gather the most information in a single image.

THE Exx-SERIES and FLIR THERMAL STUDIO PRO

EMPOWERED WITH REPORTING SOLUTIONS TO STREAMLINE INSPECTIONS

Exx-Series cameras are the first FLIR models to come with our exclusive Inspection Route Camera Option automatically enabled in the camera.

Designed for thermographers who regularly inspect large numbers of objects over the course of a day, FLIR Inspection Route guides the user along a pre-defined route of inspection points so they can collect images and data in a structured manner.

The route begins in FLIR Thermal Studio Pro software, where users build their plan using the Route Creator plugin. They can include as many inspection targets as needed and organize them for maximum efficiency. Once they export the completed route to the Exx camera, they’re ready to begin the day.

The predefined route guides the user’s on-site movement to each inspection asset, automatically collecting and organizing saved images for a seamless import into FLIR Thermal Studio Pro. By ensuring that nothing is missed and that all inspection results are organized from start, the suite of FLIR inspection software speeds up inspections, improves organization, and simplifies reporting.

Learn more about [FLIR Thermal Studio Pro](#), the [FLIR Route Creator Plug-in](#), and the [FLIR Inspection Route Camera Option](#) at [FLIR.com](#).



The World's Sixth Sense™



CAT III

1000 V

CAT IV

600 V



IP65

Ergonomics, durability, reliability

New line of voltage testers

Product description

Sonel P-6, P-5 and P-4 are reliable, particularly durable and safe 2-pole testers, which enable testing voltage, circuit continuity and phase sequence. They have been designed for use in extreme conditions both in industry and commercial applications. Advanced technology, a high level of safety and user-friendliness are the key features of the P-line voltage testers.

Main functions and attributes of the P-line instruments

- **phase identification (P-6)** - unique feature in voltage indicators worldwide
- **automatic voltage test** up to 1000 V AC/DC
- **optical indication** by a LED bar (**P-4**) and additional LCD display (**P-6, P-5**)
- **sound indication** when dangerous voltage levels of 50 V AC and 120 V DC are exceeded
- **RCD trip test** with switchable load
- **automatic continuity test** upon connection to the object
- **2-pole test of phase rotation direction**
- **single-pole indication of 100 V presence**
- **resistance measurement** up to 1999 Ω (**P-6, P-5**)
- **HOLD function** for freezing the measurement results
- **robust, two-component housing** protecting from mechanical damages and impacts
- **integrated torch light** and backlit display (**P-6, P-5**) for tests in poorly lit areas
- **IP65 ingress protection** guarantees protection against dust and water
- **safety provided by measuring class** compliant with **CAT IV 600 V** and **CAT III 1000 V** standards

Digital Voltage Tester with Bargraph

Double molded IP64 housing multifunction voltage tester

Measures AC and DC Voltage with Continuity and Phase Tester functions and built-in Flashlight

Features:

- Large backlit LCD display with digital bargraph
- AC Voltage (0 to 480V) and DC Voltage (0 to 690V)
- Polarity LED indication for positive and negative DC
- Phase rotation test for motors
- Continuity Test with audible tone
- Two handed operation for low impedance testing
- Built-in flashlight for testing in dimly lit areas
- Rubberized double-molded IP64 housing
- Meets EN61010-1 CAT IV 600V and CAT III 600V safety rating
- Dimensions: 9.4x3x1.6" (240x78x40mm)
Weight: 8.4oz (237g)
- Complete with 2 AAA batteries, removable category control tip covers, and soft case



Conduct a 3-Phase
Sequence Test



Built-in flashlight



Ordering Information:

VT30Digital Multifunction Voltage Tester with Bargraph





TRIPLE ALARM CAT IV NON-CONTACT VOLTAGE DETECTOR WITH FLASHLIGHT

FLIR VP52-2™



The FLIR VP52-2 is a durable, CAT IV-rated non-contact voltage detector featuring light, vibration, and beeper feedback alarms and a powerful LED flashlight. Use the VP52-2 to reliably check whether an AC circuit is live before beginning work; detect voltage on exposed conducting parts or through insulation; identify live wires within switchboxes, switches, and outlets; or trace live wires and map circuits. With an ergonomic and drop-tested design, the FLIR VP52-2 is the right choice for professionals performing field troubleshooting and verification of electrical installations within residential, commercial, and industrial buildings.



RUGGED AND RELIABLE

Designed for long-term, trouble-free operation, the FLIR VP52-2 will last for years to come

- Detect voltage in electrical systems in both large industrial facilities and residential low-voltage installations
- Reliably test for voltage in the latest safety outlets
- Never miss voltage presence with tactile vibration, sound, and LED alarms—even in dark or noisy areas
- Durable to withstand a 3 m (9.8 ft) drop



EASY TO USE

Offers an ergonomic design that's easy to grip and operate

- Avoid touching live wires with non-contact voltage (NCV) technology
- Reduce risk of dropping the VP52-2 with double molded slip-resistant grip and anti-roll case
- Place the sensor closer to electrical sources with the low-profile probe tip



TROUBLESHOOT QUICKLY

Provides high-end features that improve work efficiency

- See target area clearly in poor lighting conditions with the bright flashlight and tip light
- Eliminate interruption from a dead battery with the low-battery indication feature
- Maximize battery life with the auto power off feature



The World's **Sixth Sense™**

SPECIFICATIONS

Measurement	
AC Voltage Range (default, solid green light)	190 to 1000 V AC
High-Sensitivity Mode (solid amber light)	24 to 1000 V AC
Frequency Range	45 to 65 Hz
Meter Data	
Sound Alert	Yes
Flashing LED Alert	Yes
Vibration Alert	Yes
Flashlight	Yes
Tip Light	Yes
Category Rating	CAT IV 1000 V
General Information	
Warranty	Limited 3-year
Certifications	CE, RCM
Power System	
Power Requirements	2 × AAA (LR03) alkaline batteries
Battery Life	~5 hours continuous (flashlight off)
Low Battery Voltage	Status LED flashes amber color
Auto Power Off	After 3 minutes of inactivity
Environmental Data	
Drop Test	3 m (9.8 ft)
Operating Ambient Temperatures	-10 to 50°C (14 to 122°F)
Storage Temperature	-20 to 60°C (-4 to 140°F)
Physical Data	
Weight	59 g (2.1 oz) including batteries
Dimensions (L × W × H)	158.5 × 26 × 29 mm (6.24 × 1.02 × 1.14 in)

PHASE SEQUENCE TESTER TKF-12



PHASE SEQUENCE AND MOTOR ROTATION TESTER TKF-13



The unique TKF-12 & TKF-13 testers has been designed for checking triple phase power installations in the wide range of the phase-phase voltage between 100V to 690V in distribution network frequency range 10-70Hz. Our testers enables rotary field and motor rotation indication also with contact-less detection. TKF-13 provides quick indication of 3 phase rotation using test leads or can be used to determine motor rotation on 3 phase motors. TKF-12 is powered from tested network. TKF-13 is powered from 9V battery with AUTO-OFF function.

Standard accessories of the tester TKF-12:

- pin probe with banana connector - black
- pin probe with banana connector - red
- pin probe with banana connector - yellow
- „crocodile“ clip K01; black

WASONBLOGB1
WASONREOGB1
WASONYEOGB1
WAKROBL20K01

Optional accessories of the tester TKF-12:

- AGT-16P (triple phase socket adapter)
- AGT-32P (triple phase socket adapter)
- AGT-63P (triple phase socket adapter)
- carrying case S1

WAADAAGT16P
WAADAAGT32P
WAADAAGT63P
WAFUTS1

Standard accessories of the tester TKF-13:

- test lead with banana plug; 1,2m; black
- test lead with banana plug; 1,2m; red
- test lead with banana plug; 1,2m; yellow
- pin probe with banana connector - black
- pin probe with banana connector - red
- pin probe with banana connector - yellow
- „crocodile“ clip K01; black
- alkaline battery 6LR61 (9V)

WAPRZ1X2BLBB
WAPRZ1X2REBB
WAPRZ1X2YEBB
WASONBLOGB1
WASONREOGB1
WASONYEOGB1
WAKROBL20K01

Optional accessories of the tester TKF-13:

- AGT-16P (triple phase socket adapter)
- AGT-32P (triple phase socket adapter)
- AGT-63P (triple phase socket adapter)
- carrying case S1

WAADAAGT16P
WAADAAGT32P
WAADAAGT63P
WAFUTS1

TKF-12

- Phase sequence indication (direction of field rotation) in the power network with rated phase-to-phase voltage (120...690V) AC by LED signalization.
- Operation in the power network with frequency range 10...70Hz.
- Indication of the voltage presence in the particular phases by neon lamps signalization.
- Power supply from the tested network (continuous operation to 15 minutes for max. voltage).
- Protection against faulty indication of field rotation.

Electric security:

- type of insulation double, according to EN 61010-1
- measurement category CAT III 600V acc. to EN 61010-1
- protection class acc. to EN 60529 IP42

Rated operational conditions:

- rated phase-to-phase voltage range 120...690V AC
- maximum operation phase-to-phase voltage 760V AC
- frequency range 10...70Hz
- operating temperature -10...+45°C
- storage temperature -20...+60°C

Other technical data:

- power supply from the tested electrical installation, up to 15 min for max. voltage
- dimensions 130 x 70 x 35mm
- weight (without test leads) approx. 200g

TKF-13

- Phase sequence indication (direction of field rotation) in the power network with rated phase-to-phase voltage (120...690V AC) by LED signalization.
- Operation in the power network with frequency 2...70Hz.
- Indication of the voltage presence in the particular phases by means of neon lamps.
- Indication of direction of motor rotations:
 - under state without voltage with using the test leads,
 - remonte, during motor operation.
- Detection of magnetic field presence.
- AUTO-OFF function.

Electric security:

- type of insulation double, according to EN 61010-1
- measurement category CAT III 600V acc. to EN 61010-1
- protection class acc. to EN 60529 IP42

Rated operational conditions:

- rated phase-to-phase voltage range 120...690V AC
- maximum operation phase-to-phase voltage 760V AC
- EMF motors voltage range 1...760V AC
- frequency range 2...70Hz
- operating temperature -10...+45°C
- storage temperature -20...+60°C

Other technical data:

- power supply alkaline battery 6LR61 (9V)
- dimensions 130 x 70 x 35mm
- weight approx. 250g
- diode flashing time of battery state approx. 1s
- function auto-off 5min





Non-Contact Phase Sequence Tester



Checks phase sequence and phase status

Tests up to 1000VAC with LED and audible indication

Features:

- 75 to 1000VAC input voltage with 45 to 65Hz frequency range
- LEDs indicate phase orientation (clockwise or counter-clockwise) and whether each phase is live
- Beeper sounds intermittently when correct phase is detected and continuously if phase is reversed
- Durable housing with back cover magnet for attachment to an AC distribution panel for easy measurement
- Adjustable Hi/Lo LED brightness switch for making measurements in dimly lit areas or sunlight
- Fully insulated alligator clips with wide jaws
- Low battery warning
- CAT IV-600V safety rating
- Dimensions: 4.7 x 2.7 x 1.5" (118 x 69 x 38mm); Weight: 13oz (370g)
- Complete with three built-in 30" test leads with large color-coded alligator clips, four AA batteries, and pouch case



Ordering Information:

PRT200Non-Contact Phase Sequence Tester

About Pro-Test Instruments Ltd

Pro-Test Instruments Ltd is a supplier of quality Test & Measurement Equipment for the Electrical and Power Industries throughout New Zealand. Product is sourced from top manufacturers around the world, and we offer the latest technologies available to ensure accurate and efficient testing of electrical installations and assets.

PTI's sales engineers receive regular training from our suppliers and can offer expert advice on equipment selection, operation and application.

We offer service and calibration for all equipment that we sell.

Tailored training courses on equipment are offered in house or at our customers premises to ensure you receive the maximum benefits from your purchase.

The following is a list of other equipment PTI supply but not included in this catalogue

Battery Test Equipment

- Discharge Load Banks
- Monitoring Equipment
- Resistance Testers

Cable Fault Location Equipment

- Time Domain Reflectometers
- Surge Generators (Thumpers)
- Acoustic Receivers

Cable Testing Equipment

- VLF Test Sets
- Damped AC (DAC) Test Equipment
- Tan Delta & Partial Discharge

Circuit Breaker Test Equipment

- High Current Micro-ohmmeters
- Timers and Analysers
- Power Supplies

Current Injection Equipment

- Primary and Secondary Injection Test Equipment

Dielectric Testing

- Hipot Testers
- Oil Breakdown Voltage Testers

Partial Discharge Detection

- Acoustic & TEV detectors
- Cable PD fault location equipment
- Acoustic & Corona Cameras

Phasing Equipment

- GPS Phasing Equipment
- Phasing Sticks

Transformer Test Equipment

- Winding Resistance Testers
- Turns Ratio Testers
- SFRA
- Power Factor Test Sets

PTI's product range is continually expanding and evolving, so try us for any of your requirements not on the list.



Professional Test & Measurement Solutions

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