MEASURING INSTRUMENTS AND TESTERS

- Electrical Installation Safety
- High Voltage Insulation Diagnostics
- Appliance / Machine / Switchboard Safety
- Power Quality Analysis
- LAN Cabling Certification
- Indoor Environment Quality
- Digital Multimeters / Clamp Meters / Voltage and Continuity Testers
- Accessories

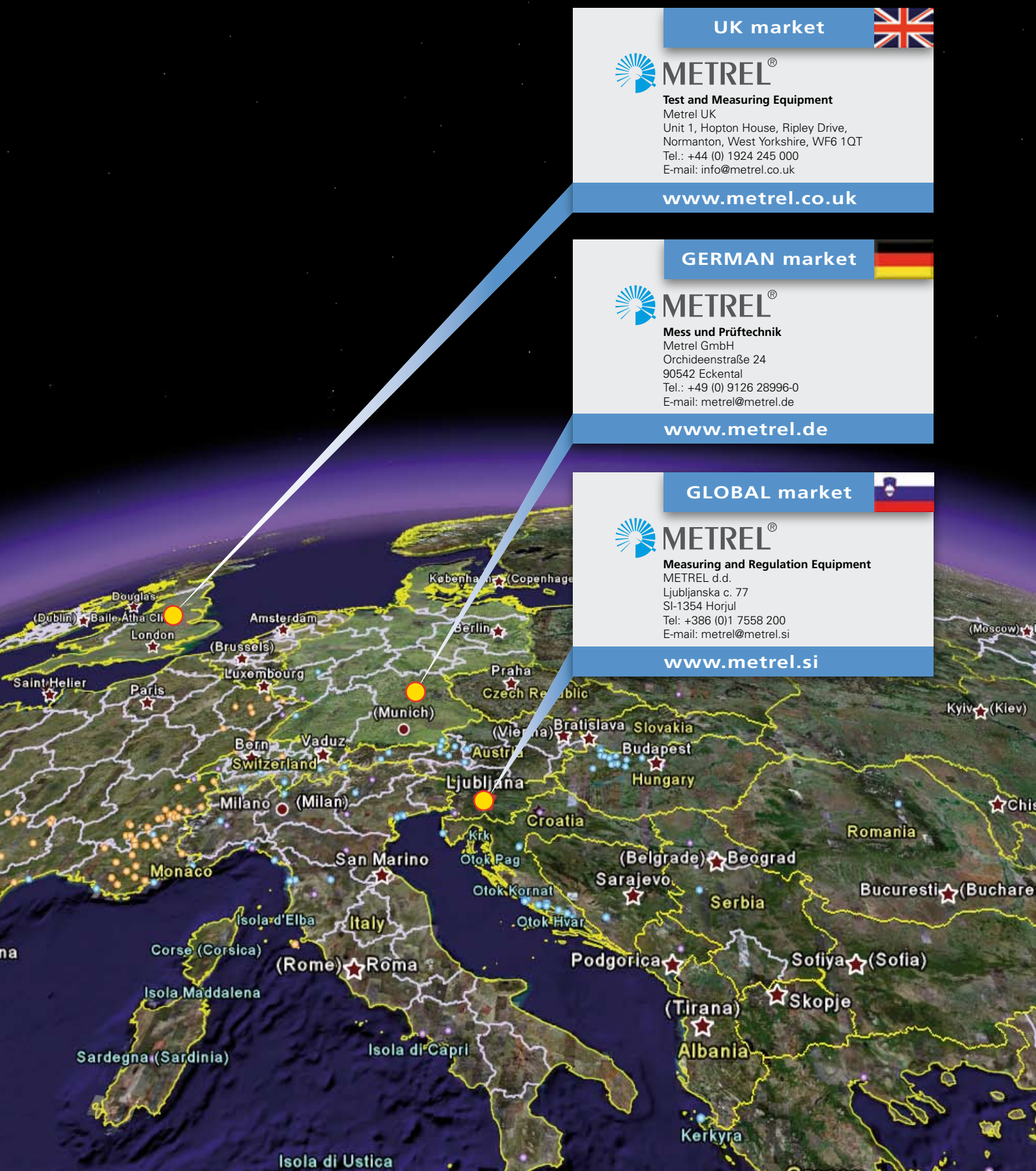
www.metrel.si
Metrel d.d.; Ljubljanska c. 77; SI -1354 Horjul; Slovenia

METREL®

CATALOGUE 2010

METREL®

Measuring and Regulation Equipment Manufacturer



UK market

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Metrel - Measuring and Regulation Equipment Manufacturer

Metrel is an international Group and an expert in the research, development and production of test and measurement equipment. Metrel brand name is worldwide recognized and associated with high quality test and measurement products.

Metrel's instruments provide test and measurement solutions in different maintenance areas including the safety testing of electrical installations and appliances, power quality analysis, local area network analysis and the measurement of indoor environmental conditions. In short, our products help to provide information about the safety and functionality of different installations and environments. Through innovative design, electronics and software solutions we provide accurate, reliable and safe to use products.

The company strives to be the leader in advanced technological solutions and therefore invests over 10 % of the yearly turnover into the R&D department.

Our wide range of products is backed up with a complete support package including repair and calibration, technical support and customer training programs. A detailed calibration certificate is supplied as standard with all Metrel products.

SALES NETWORK

Metrel's products are sold and serviced in over 80 countries by local agents and distributors. Our associated companies are managed by local people who know the special needs of their markets. Sales engineers and specially trained technicians staff give excellent service to our customers.

The GERMAN market is supported by Metrel GmbH based in Eckental (www.metrel.de) and the UK market is supported by Metrel UK based in Normanton (www.metrel.co.uk). Inquiries for other countries please direct to Metrel d.d., the headquarters based in SLOVENIA (www.metrel.si).

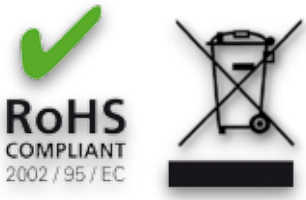
COMMITMENT TO QUALITY

Metrel's quality assurance system is based on BS EN ISO 9001. Through permanent training and education of our employees we strive to increase the efficiency and quality of all our processes.

Our commitment to quality is recognized by our customers and is ensured by continuous and extensive research and development of new, accurate, reliable and safe to use products.

ECOLOGY

Metrel test and measurement equipment complies to the RoHS and WEEE directives. Metrel strives to meet its goals with the most efficient use of resources and the least possible impact on the environment.



RESEARCH, DEVELOPMENT AND PRODUCTION

The research, development and production of Metrel's products are based in Europe (Slovenia) at Metrel d.d. The company strives for total quality control. A dedicated quality assurance department ensures strict adherence to customer specifications. Highly competent R&D engineers provide advanced solutions for our customers.

TEST LABORATORY

The highly professional test laboratory based in Metrel d.d. provides internal services including the testing of components, subassemblies and prototypes of products. This enables Metrel to launch safe and reliable new products into the market. The laboratory provides testing according to the Low Voltage Directive (2006/95/EC) and the EMC Directive (2004/108/EC). The main standards that Metrel also complies to include IEC/EN 61010 and IEC/EN 61326.

PRODUCTS

Metrel is producing test and measurement equipment that is covering the following fields:

- **Electrical Installations Safety Testing** (IEC/EN 61557, VDE 0413, VDE 0100, BS 7671, HD 60364, CEI 64.8, AS/NZS 3017, AS/NZS3760).
- **Portable Appliances, Machines and Switchgears Safety Testing** (IEC/EN 60204-1, IEC/EN 61439-1, IEC/EN 60335-1, VDE 0701-0702).
- **Measurement and Testing of Cable Networks** (TIA/EIA-568-B, ISO 11801, EN 50173, EN 50346, IEC/EN 61935).
- **Testing of Power Distribution Systems and Power Quality Analysis** (EN 50160).
- **Analysis of Indoor Environment Quality** (DIN 5032, IEC/EN 60584-1, EN 12599, EN ISO 7726, ISO 11664).
- **Equipment for Laboratories and Schools:** Metrel produces a variety of instruments for electrical testing laboratories and educational purposes. Typical application areas are: electrical workshops, testing labs, research, development and education. The main products Metrel produces include demo boards, power supply units, R-L-C decades.
- **Transformers:** Metrel produces two kinds of toroidal transformers: variable transformers (according to standard EN60989) and power transformers (according to standard EN 61558).

Besides the test and measurement product portfolio offered by Metrel d.d. Metrel's daughter company Metrel Mehanika d.o.o. also provide a variety of products focusing on metal processing. Their core business is sheet metal production, milled / turned production, manufacturing of tools and surface protection. For more information please visit www.metrel-mehanika.si.

Metrel - Measuring and Regulation Equipment Manufacturer

SERVICES

Metrel provides a variety of services relating to training, repair and calibration of test equipment to the highest standards in the industry.

REPAIR

Metrel provides fast and efficient repair services either directly at Metrel's head quarters service centre or through approved business partners.

CALIBRATION

The Calibration Laboratory at Metrel DUS is able to calibrate electronic measuring instruments and devices in compliance with the requirements of the ISO/IEC 17025 standard. The laboratory is accredited by Slovenian Accreditation (SA), a member of European Accreditation (EA), signatory of the Multilateral Agreements for the European Co-operation for Accreditation (EA) and International Laboratory Accreditation Co-operation (ILAC) for calibration and testing.

The products from the calibration can be issued with an Inspection report and a Calibration certificate (non accredited). Accredited calibration certificate can also be issued if it is required by the customer.

TECHNICAL SUPPORT

Metrel provides the following support to its customers and distributors:

- **On-line technical support:** any inquires related to Metrel products can be sent onto a designated e-mail address:
  - help@metrel.si - GLOBAL market;
  - info@metrel.co.uk - UK market;
  - metrel@metrel.de - GERMAN market.
- **Technical support line:** the technical support can be obtained also over the phone:
  +386 (0)1 7558 200 - GLOBAL market;
  +44 (0) 1924 245 000 - UK market;
  +49 (0) 9126 28996-0 - GERMAN market.
- **B2B web support:** for Metrel partners a B2B zone enables to obtain technical and marketing information.
- **Download centre:** enables to download files with technical product information. Visit www.metrel.si/support/download-centre.html.

TRAINING CENTER

Metrel d.d. offers to its customers and distributors:

- **Training on Metrel's instruments:** the product training can be customized on the customer's needs. Metrel can offer training on technical standards, measuring and test methods, use and application of Metrel instruments.
- **Complete distributor setup training:** when establishing a new distributor, Metrel can offer a complete "package" on product training, repair and calibration training and assign in establishing e local calibration and repair department.
- **Training for calibration and repair of Metrel products:** this is help for Metrel's existing and new distributors to enable a high standard of local support to customers who purchase a Metrel product.
- **Bespoke training for larger end users:** In case that a larger customer is requesting training, Metrel can organize the training according to their specific needs. This can be carried out on site or at Metrel's premises.

Contact us

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Web: www.metrel.co.uk

Instruments Designed with Future in Mind

METREL is one of the world leading manufacturers and distributor of high quality electrical measurement and test instruments, providing the market with innovative solutions on the following segments:

ELECTRICAL INSTALLATION SAFETY

Metrel offers single and multifunctional electrical installation testers. The instruments are used for initial and periodic testing of domestic and industrial installations, testing of single and multiphase systems and testing of TT, TN, IT and 115 V systems. Metrel meters offer wide selection of functionalities and measurements (depending on the model), can be downloadable or non-downloadable. All meters comply with the European standard IEC/EN 61557.

POWER QUALITY ANALYSIS

The power quality analysers can be widely used for general power quality assessment in distribution and industrial low and middle voltage electric systems (according to EN 50160), capturing and recording of power supply events, flicker measurement, power factor correction measurements, harmonics measurements, transients recording and over-voltage protection devices performance testing, assessment of UPS, consumption profile recording, ect.

HIGH VOLTAGE DIAGNOSTICS

Metrel's high voltage diagnostic equipment (5 ... 10 kV) is used for testing insulation resistance of rotating machinery and cables, production line periodic testing and maintenance, troubleshooting and analysis of all kinds of insulation problems. It gives effective readings in high noise environments such as high voltage substations and switchyards. Some of key features of Metrel's instruments (depends on the model) are PI, DD, DAR testing, R(t) graph plotting, high 5 mA charging current, selectable noise rejection filters, etc.

PORTABLE APPLIANCE / MACHINE / SWITCHBOARD SAFETY

Metrel's testers can be used in professional PAT testing, general PAT testing, factory / warehouse PAT testing, multi-location PAT testing and after repair safety testing. Metrel's instruments offer a selection of key features for example auto sequencing, automatic testing, Pass / Fail evaluation of results, RCD testing, project uploading, bar-coding system and Pass / Fail barcode label printing, flash test, test of both 230 V appliances and 115 V appliances and many more.

LAN CABLING CERTIFICATION

Metrel's LAN testers are designed to be used for verification of copper cabling networks up to CAT VI / Class E, troubleshooting and fault finding of connections / links, troubleshooting in IT networks.

INDOOR ENVIRONMENT QUALITY

Metrel's indoor environmental measuring instruments are used for measurement, recording and analysis of various indoor ambient parameters. The testers integrate a number of innovative solutions and fit the most demanding applications such as testing of indoor air quality, factory climatic conditions, lightning conditions; heat, ventilation and air conditioning systems testing, indoor or dry outdoor sound level measurement, industrial sound measurement, bandpass and acoustic filter testing, calibration work, acoustic equipment testing and much more.

DIGITAL MULTIMETERS / CLAMP METERS / VOLTAGE AND CONTINUITY TESTERS

The digital multimeters, clamp meters and voltage continuity testers are used for general / basic testing up to high level industrial testing, electronic fault finding, field servicing and heavy duty electrical testing. Some of the key features (depending on the model) are TRMS testing, high accuracy, temperature measurement, lead alert, conductance, PC communication, autocheck function, recording of data, etc.

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Electrical Installation Safety

Compliant with IEC/EN 61557 Electrical Installation Safety Standard

METREL®

CATALOGUE 2010

Glossary - Electrical Installation Safety Testing

All-in-one insulation testing
A full automated procedure where the resistance measurements between L-N, L-PE and N-PE are all performed with the single press of the test button.

Autosequence
Autosequence® is a method by which a series of installation tests are performed with a single press of the test button. By pressing the test button, the instrument will automatically start working through pre-set list of tests, pausing where appropriate. Autosequence testing can be up to 5 times faster than conventional methods.

Continuity resistance test
A 200 mA resistance test is used to ensure that the resistance of PE conductors and equipotential bonding is sufficiently low for the application.

Dead testing
Testing on circuits that do not have a voltage applied to them (e.g. a continuity or insulation test).

Electrical Installation safety testing
This is a combination of dead circuit and live testing.
The dead circuit tests are:
- Continuity.
- Insulation.
- Earth resistance testing.

Live testing includes:
- Voltage measurement.
- Phase sequence.
- Line impedance measurement.
- Loop impedance measurement.
- RCD testing.

These tests are performed in order to ensure that the requirements are met for the protection of persons, livestock and property against the risk of electric shock and to ensure that the automatic disconnection of the supply is performed correctly.

Earth resistance testing
Earth resistance testing is used on TN, TT and IT systems to ensure that the resistance of the earth electrode is sufficiently low so that, in the case of a fault, a dangerous voltage does not appear on any parts of the installation or on any appliances which have a connection to earth.

Insulation resistance
The insulation is intended to prevent any contact with live parts and withstanding mechanical, chemical, electrical and thermal stresses. The insulation resistance test is performed with a D.C. voltage on a dead system and the resistance must be above the minimum limit set out in the appropriate standards and regulations.

Loop impedance test
This is a live test used to measure the fault loop impedance between the line and earth conductor (sometimes the neutral is required to prevent an RCD/RCBO tripping during the test). This function can be used for both Z LOOP and Zs(rcd) testing.

Live testing
Performing tests on circuits that have a voltage applied to them (e.g. an RCD trip time test).

Line impedance test
This is a live test used to measure the impedance between the line and neutral conductors or between lines on a 3-phase system.

Fuse tables
Various RCDs and fuse types and ratings can be selected on the test instrument. When a loop or line test is performed, the measured value is automatically compared to the maximum values set out in the standard (EN 61557) and either a PASS or FAIL symbol will appear on the screen to inform the user if the result is within the required limits.

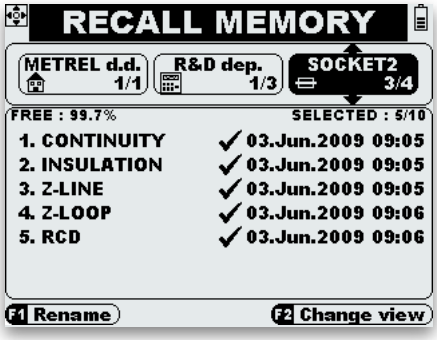
Phase rotation
A test used for determining the phase sequence of a 3-phase system. Example results displayed on the tester are 1.2.3 (correct) and 2.1.3 (not correct).

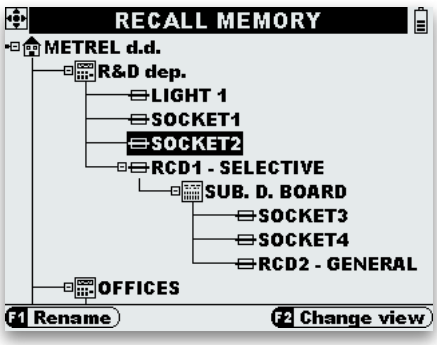
Plug commander
An electronic remote to help make line / loop impedance and RCD testing easier by placing the test button and either memory or backlight button in the hand of the electrician.

RCD Auto
An automated function which performs RCD testing at x1/2, x1 and x5 current multipliers at both 0° and 180° automatically. This removes the need to walk repeatedly between the RCD and the test instrument to measure trip-times.

RCD Ramp test
A test which slowly ramps up the current between line and PE conductor until the RCD/RCBO trips. After this test the current required to trip the RCD is displayed and later it can be used to find the cause of nuisance tripping occurring in a circuit.

Structure building
Design buildings in the instrument as they are laid out in the installation. This includes the distribution boards, sockets, sub-distribution boards, earth connections, etc. This visual interpretation of the tested electrical installation makes the saving and recalling of test results quick and simple.





Trip-lock RCD
A method of performing a loop impedance measurement on RCD protected installations without tripping the RCD. All Metrel's multifunctional installation testers have the non trip facility.

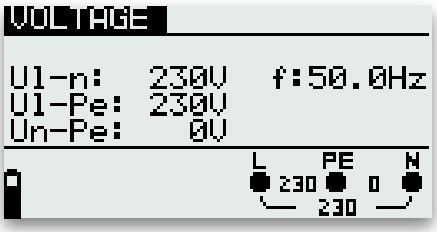
Tip commander
An electronic remote to help make continuity and insulation testing easier by placing the test button and either memory or backlight button in the hand of the electrician. Available as a 2-wire tip commander or 3-wire tip commander that allows loop impedance and RCD testing.

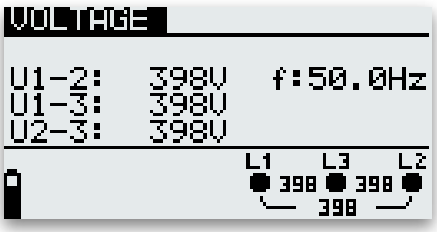
Time delayed (S-type) RCDs
In situations where multiple RCDs occur in an installation the need to discriminate or coordinate when the RCDs will trip has become more important. If a 100 mA RCD and a 30 mA RCD are protecting the same circuit (e.g. one at source and one on the individual circuit) and a fault above 100 mA occurs, it may not always be the case that the 30 mA RCD trips first (e.g. the 100 mA RCD could have a faster response time in the case of a fault). In this situation, a time delayed or selective (S-type) RCD is required at the source of the installation so that the 30 mA RCD has time to trip and, if the problem is caused by a none RCD protected circuit, the supply is still safely disconnected.

Not all installation test instruments have the ability to check time delayed RCDs. Therefore as RCDs become more commonplace, it is useful to have a test instrument that has the ability to test them. All Metrel's multifunctional test instruments and single function live circuit testers have the ability to test both general and selective RCDs.

Online voltage monitoring
The online voltage monitoring function built into all of Metrel's MI 3000 series multifunctional installation testers. This function displays on one screen the AC voltages and frequency occurring between L to PE, L to N and N to PE (single phase systems) and L1 to L2, L2 to L3 and L3 to L1 (3-phase systems).

This feature is very useful for fault finding on systems e.g. quickly identifying incorrect connections, disconnected wires and incorrect voltages.





Safety CAT Ratings
Transients are very fast, high energy spikes that can occur on the mains power supply. Low energy transients can be caused by simply turning on a switch to a circuit or electromagnetic interference while high energy transients can be caused, for example, by a powerful motor stalling or a lightning striking a power line.

Transients can have a variety of effects which could include blowing the protective fuse in the appliance, causing light bulbs to blow, causing insulation between conductors to break down and, in the case of high energy transients causing appliances connected to the supply to set on fire or produce dangerous sparks.

The less protection provided against these transients enables higher energy transients to occur (i.e. if lightning strikes the power lines, you would not expect the full fault voltage to occur at the power supply socket on the wall in your house). The level of danger due to transients is therefore divided into categories. This is illustrated in the following diagram:

The higher the CAT rating of your test instrument, the more protection it will give you in the case of a fault occurring on the system under test (e.g. CAT IV / 300 V installation test instrument provides significantly more protection to the user in the case of a fault than a CAT III / 300 V installation test instrument).

All Metrel's MI 3000 series multifunctional installation test instruments are rated CAT IV / 300 V. CAT IV / 300 V means that the instrument is suitable for testing up to CAT IV locations up to 300 V between line and earth and, due to the relationship set out in IEC/EN 60364, testing in CAT III locations up to 600 V between line and earth.

Accessories: page 8.01

Selection Guide for Multifunctional Testers

Part No.		MI 3125 EurotestCOMBO	MI 3100 EurotestEASI	MI 3002 EurotestLITE
Features	**Description**			
INSULATION	Insulation resistance	✓	✓	✓
	Test voltage (V_{DC})	50 … 1000	100 … 1000	100 … 1000
	Autotest insulation L-PE, N-PE, L-N	–	–	–
	Diagnostic test (PI, DAR calculation)	–	–	–
CONTINUITY AND LOW RESISTANCE MEASUREMENT	Contunuity of PE conductors with automatic polarity change, test current 200 mA	✓	✓	✓
	Low resistance measurement (continuous measurement), test current 7 mA	–	✓	✓
LINE / LOOP IMPEDANCE	Line impedance with Ipsc calculation	✓	✓	✓
	Loop impedance with Ipsc calculation	✓	✓	✓
	RCD Trip Lock loop impedance	✓	✓	✓
	Built-in fuse tables for PASS / FAIL evaluation	✓	✓	–
RCD TESTING	Contact voltage measurement without RCD tripping	✓	✓	✓
	RCD trip-out time	✓	✓	✓
	RCD trip-out current with rising test current	✓	✓	✓
	Automatic testing of RCDs	✓	✓	✓
	RCD type (general and selective)	A, AC	A, AC	A, AC
VOLTAGE, FREQUENCY	AC voltage measurement	✓	✓	✓
	Online voltage monitor	✓	✓	✓
	Frequency measurement	✓	✓	✓
PHASE SEQUENCE	L1 - L2 - L3	✓	✓	✓
EARTH MEASUREMENTS	Earth resistance 3-(4-)wire method	–	–	–
	Earth resistance 3-(4-)wire method with additional current clamp	–	–	–
	Earth resistance measurement with 2 current clamps	–	–	–
	Specific earth resistance	–	–	–
AUTO SEQUENCE	Automatic installation safety testing on Switchboards and Circuts	–	–	–
OTHER MEASUREMENTS	TRMS leakage / load current	–	–	–
	Illuminance measurement	–	–	–
	Varistor test	–	–	–
	Fuse / fault locator	–	–	–
	High resolution loop impedance (mΩ)	–	–	–
	Insulation Monitoring Devices (IMD) testing (IT systems)	–	–	–
OTHER FEATURES	Nominal frequency range	45 … 65 Hz	45 … 65 Hz	45 … 65 Hz
	PASS / FAIL evaluation of test results	✓	✓	✓
	IT earthing mode systems support	–	✓	✓
	Low voltage supply systems support	–	✓	✓
	Touch electrode	✓	✓	✓
	HELP menu	✓	✓	–
COMMUNICATION PORTS	RS232	–	–	✓
	USB	–	–	✓
MEMORY SOFTWARE	Number of memory levels / memory locations	–	–	3 / 500
	Professional PC SW	–	–	✓
	Advanced PC SW	–	–	Option
GENERAL DATA	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
	Batteries	6 x AA	6 x AA	6 x AA
	Built-in battery charger	✓	✓	✓
	Wieght (kg)	1.0	1.31	1.31
	Dimensions (mm)	140 x 80 x 230	230 x 103 x 115	230 x 103 x 115

Accessories: page 8.01

MI 3125B	MI 3102	MI 3102H	MI 3101	MI 3105 (EU)	MI 2086 (EU)	MI 2087	MI 2088
EurotestCOMBO	EurotestXE	EurotestXE 2.5kV	EurotestAT	EurotestXA	Eurotest 61557	Installtest 61557	Earth Insulation
							
✓	✓	✓	✓	✓	✓	✓	✓
50 … 1000	100 … 1000	100 … 2500	50 … 1000	50 … 1000	50 … 1000	50 … 1000	50 … 1000
–	–	–	✓	✓	–	–	–
–	–	✓					
✓	✓	✓	✓	✓	✓	✓	✓
✓	✓	✓	✓	✓	✓	✓	✓
✓	✓	✓	✓	✓	✓	✓ (R)	–
✓	✓	✓	✓	✓	✓	✓ (R)	–
✓	✓	✓	✓	✓	✓ (R)	–	–
✓	✓	✓	✓	✓	–	–	–
✓	✓	✓	✓	✓	✓	✓	–
✓	✓	✓	✓	✓	✓	✓	–
✓	✓	✓	✓	✓	✓	✓	–
✓	✓	✓	✓	✓	✓	✓	–
A, AC, B	A, AC	A, AC	A, AC, B	A, AC, B	A, AC	AC	–
✓	✓	✓	✓	✓	✓	✓	✓
✓	✓	✓	✓	✓	–	–	–
✓	✓	✓	✓	✓	✓	✓	–
✓	✓	✓	✓	✓	✓	✓	–
✓	✓	✓	✓	✓	✓	–	✓
–	–	–	–	✓	✓	–	Option
–	–	–	–	Option	Option	–	Option
–	–	–	Option	Option	✓	–	✓ (without ρ adapter)
–	–	–	✓	✓	–	–	–
–	Option	Option	–	✓	✓	–	Option
–	Option	Option	–	Option	Option	Option	–
–	–	–	✓	✓	✓	✓	✓
–	–	–	Option	Option	Option	Option	–
–	–	–	Option	Option	Option	–	–
–	✓	–	–	✓	–	–	–
45 … 65 Hz	45 … 65 Hz	45 … 65 Hz	14 … 500 Hz	14 … 500 Hz	45 … 65 Hz	45 … 65 Hz	45 … 65 Hz
✓	✓	✓	✓	✓	–	–	–
–	✓	–	✓	✓	–	–	–
–	✓	–	✓	✓	–	–	–
✓	✓	✓	✓	✓	✓	–	–
✓	✓	✓	✓	✓	✓	–	–
✓	✓	✓	✓	✓	✓	✓	✓
✓	✓	✓	✓	✓	Option	Option	Option
3 / 1700	3 / 500	3 / 500	10 / 2000	10 / 2000	3 / 3000	2 / 1000	2 / 1000
✓	✓	✓	✓	✓	✓	✓	✓
Option	Option	–	Option	✓	✓	–	–
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 / 600 V CAT IV / 300 V	CAT III / 300 V CAT II / 600 V	CAT III / 300 V CAT II / 600 V	CAT III / 300 V CAT II / 600 V
6 x AA	6 x AA	6 x AA	6 x AA	6 x AA	4 x C	4 x C	4 x C
✓	✓	✓	✓	✓	–	–	–
1.0	1.31	1.31	1.32	1.37	2.1	1.8	1.7
140 x 80 x 230	230 x 103 x 115	230 x 103 x 115	230 x 103 x 115	230 x 103 x 115	265 x 110 x 185	265 x 110 x 185	265 x 110 x 185

Accessories: page 8.01

MI 3125 EurotestCOMBO

The MI 3125 EurotestCOMBO is the appropriate instrument for the installation safety testing on TT and TN systems. The large graphic display with backlight offers easy reading of results, indications, measurement parameters and messages. Two LED Pass / Fail indicators are placed on both sides of the LCD. EurotestCOMBO contains integrated characteristics of fuses and RCDs for the evaluation of test results. The handling of the instrument is designed to be as simple and clear as possible. Each test has its own individual help screen describing how to connect the instrument into the installation and how to perform a measurement. MI 3125 EurotestCOMBO performs continuity, insulation, RCD, loop, line, voltage, frequency and phase sequence tests required by the EN 61557 standard.

MEASURING FUNCTIONS:

- Insulation resistance with DC voltage.
- Continuity of PE conductors with 200 mA test current with polarity change.
- Line impedance.
- Loop impedance.
- Loop impedance with Trip Lock RCD function.
- TRMS voltage and frequency.
- Phase sequence.
- RCD testing (general and selective, type AC, A).

KEY FEATURES:

- **LED Pass/Fail indicators:** two LED indicators for PASS / FAIL evaluation of test results are placed on both sides of the LCD.
- **Help screens:** instrument comes complete with built-in help screens for referencing on site.
- **Built-in fuse tables:** this unique feature allows automatic evaluation of the line / loop impedance compared to the regulations.
- **Online voltage monitoring:** monitors all 3 voltages in real-time.
- **Upgradeable:** if changes occur to the regulations, upgrades can be made to the firmware to keep the unit up to date.
- **Polarity swap:** automatic polarity reversal on continuity test.
- **Insulation range:** wide range of insulation test voltages from 50 V to 1000 V, reading up to 1000 MΩ.
- **Trip Lock function:** Zs (RCD) function performs a loop impedance test without tripping the RCD.
- **Multi-system testing:** tests on single and multiphase TT and TN systems.
- **Built-in charger & rechargeable batteries:** unit has a built-in charging circuit and comes complete with a set of rechargeable NiMH batteries.
- **RCD auto:** automated RCD testing procedure significantly reduces test time.

APPLICATION:

- Initial and periodic testing of domestic and industrial installations.
- Testing of single and multiphase systems.
- Testing of TT and TN systems.

STANDARDS:

Functionality: IEC/EN 61557
Other reference standards for testing: VDE 0413; IEC/EN 61008; IEC/EN 61009; IEC/EN/HD 60364; HD 384; BS 7671; IEC/TR 60755; CEI 64.8; AS/NZ 3760; AS/NZ 3018
Electromagnetic compatibility: IEC/EN 61326-1; IEC/EN 61326-2-2
Safety: IEC/EN 61010-1; IEC/EN 61010-031

TECHNICAL DATA:

Function	Measuring range	Resolution	Accuracy
Insulation resistance (EN 61557-2)	U = 50, 100, 250 V_{DC}: R: 0.00 MΩ … 19.99 MΩ 20.0 MΩ … 99.9 MΩ 100.0 MΩ … 199.9 MΩ U = 500 V_{DC}, 1 kV_{DC}: R: 0.00 MΩ … 19.99 MΩ 20.0 MΩ … 199.9 MΩ 200 MΩ … 999 MΩ	 0.01 MΩ 0.1 MΩ 0.1 MΩ 0.01 MΩ 0.1 MΩ 1 MΩ	 ±(5 % of reading + 3 digits) ±10 % of reading ±20 % of reading ±(5 % of reading + 3 digits) ±5 % of reading ±10 % of reading
Continuity 200 mA of PE conductor with polarity change (EN 61557-4)	0.00 Ω … 19.99 Ω 20.0 Ω … 199.9 Ω 200 Ω … 1999 Ω	0.01 Ω 0.1 Ω 1 Ω	±(3 % of reading + 3 digits) ±5 % of reading ±5 % of reading
Loop impedance (EN 61557-3)	0.00 Ω … 9.99 Ω 10.0 Ω … 99.9 Ω 100 Ω … 999 Ω 1.00 kΩ … 9.99 kΩ	0.01 Ω 0.1 Ω 1 Ω 10 Ω	±(5 % of reading + 5 digits) ±(5 % of reading + 5 digits) ±10 % of reading ±10 % of reading
Line impedance (EN 61557-3)	0.00 Ω … 9.99 Ω 10.0 Ω … 99.9 Ω 100 Ω … 999 Ω 1.00 kΩ … 9.99 kΩ	0.01 Ω 0.1 Ω 1 Ω 10 Ω	±(5 % of reading + 5 digits) ±(5 % of reading + 5 digits) ±10 % of reading ±10 % of reading
Voltage	0 V … 550 V	1 V	±(2 % of reading + 2 digits)
Frequency	0.00 Hz … 9.99 Hz 10.0 Hz … 499.9 Hz	0.01 Hz 0.1 Hz	±(0.2 % of reading + 1 digits)
Phase sequence (EN 61557-7)	1.2.3 or 3.2.1		
RCD testing (EN 61557-6)	$I_{\Delta N}$: 10 mA, 30 mA, 100 mA, 300 mA, 500 mA, 1 A		
- Contact voltage U_C	0.0 V … 19.9 V 20.0 V … 99.9 V	0.1 V 0.1 V	(-0 % / +15 %) of reading ±10 digits (-0 % / +15 %) of reading
- Trip-out time	0 ms … 40.0 ms 0 ms … max. time	0.1 ms 0.1 ms	±1 ms ±3 ms
- Trip-out current	0.2 x $I_{\Delta N}$ … 1.1 x $I_{\Delta N}$ (AC type) 0.2 x $I_{\Delta N}$ … 2.2 x $I_{\Delta N}$ (A type, $I_{\Delta N}$ < 30 mA) 0.2 x $I_{\Delta N}$ … 1.5 x $I_{\Delta N}$ (A type, $I_{\Delta N}$ ≥ 30 mA)	0.05 x $I_{\Delta N}$ 0.05 x $I_{\Delta N}$ 0.05 x $I_{\Delta N}$	±0.1 x $I_{\Delta N}$ ±0.1 x $I_{\Delta N}$ ±0.1 x $I_{\Delta N}$
Power supply	6 x 1.2 V rechargeable batteries, type AA		
Overvoltage category	CAT III / 600 V; CAT IV / 300 V		
Protection class	Double insulation		
Dimensions	140 x 80 x 230 mm		
Weight	1.0 kg		

STANDARD SET:

- Instrument EurotestCOMBO
- Test lead, 3 x 1.5 m
- Schuko-plug test cable
- Power supply adapter + 6 NiMH recharge-able batteries, type AA
- Test probe, 3 pcs (blue, black, green)
- Crocodile clip, 3 pcs (blue, black, green)
- Set of carrying straps
- Short Instruction manual
- Instruction manual on CD
- Handbook on CD
- Calibration certificate

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MI 3100 EurotestEASI

The MI 3100 EurotestEASI is a fast, accurate and easy to use rechargeable installation tester. The large, bright LCD screen with backlight is perfect for working in dark conditions while the online voltage monitoring system and phase sequence function enable EurotestEASI to work on both single phase and 3 phase systems. MI 3100 EurotestEASI incorporates full schematic help screens for each test, describing exactly how to connect the instrument into the installation and how to perform a test. The instrument also contains a list of characteristics of fuses and RCDs for PASS / FAIL evaluation of test results. The MI 3100 EurotestEASI performs continuity, insulation, RCD, loop, line, voltage, frequency and phase sequence tests required by the EN 61557 standard.

MEASURING FUNCTIONS:

- Insulation resistance with DC voltage.
- Continuity of PE conductors with 200 mA test current with polarity change.
- Continuity of PE conductors with 7 mA test current (continuous measurement) without RCD tripping.
- Line impedance.
- Loop impedance.
- Loop impedance with Trip Lock RCD function.
- TRMS voltage and frequency.
- Phase sequence.
- RCD testing (general and selective, type AC, A).

KEY FEATURES:

- **Help screens:** instrument comes complete with built-in help screens for referencing on site.
- **Built-in fuse tables:** this unique feature allows automatic evaluation of the line / loop impedance compared to the regulations.
- **Tip commander:** tip commander is included in the standard set and intended for simplification of continuity and insulation testing.
- **Online voltage monitoring:** monitors all 3 voltages in real-time.
- **Upgradeable:** if changes occur to the regulations, upgrades can be made to the firmware to keep the instrument up to date.
- **Polarity swap:** automatic polarity reversal on continuity test.
- **Insulation range:** wide range of insulation test voltages from 100 V to 1000 V, reading up to 1000 MΩ.
- **Trip Lock function:** Zs (RCD) function performs a loop impedance test without tripping the RCD.
- **Multi-system testing:** tests on TT, TN, IT and 115 V systems.
- **Built-in charger & rechargeable batteries:** unit has a built-in charging circuit and comes complete with a set of rechargeable NiMH batteries.
- **RCD auto:** automated RCD testing procedure significantly reduces test time.

APPLICATION:

- Initial and periodic testing of domestic and industrial installations.
- Testing of single and multiphase systems.
- Testing of TT, TN, IT and 115 V systems.

STANDARDS:

Functionality:
IEC/EN 61557
Other reference standards for testing:
IEC/EN/HD 60364; IEC/EN 61008;
IEC/EN 61009; IEC/EN/TR 60755;
BS 7671;
AS/NZ 3018;
CEI 64.8;
HD 384;
VDE 0413
Electromagnetic compatibility:
IEC/EN 61326-1; IEC/EN 61326-2-2
Safety:
IEC/EN 61010-1; IEC/EN 61010-031

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TECHNICAL DATA:

Function	Measuring range	Resolution	Accuracy
Insulation resistance (EN 61557-2)	U = 100, 250 V_{DC}: R: 0.000 MΩ … 1.999 MΩ 2.00 MΩ … 99.99 MΩ 100.0 MΩ … 199.9 MΩ U = 500 V_{DC}, 1 kV_{DC}: R: 0.000 MΩ … 1.999 MΩ 2.00 MΩ … 99.99 MΩ 100.0 MΩ … 199.9 MΩ 200 MΩ … 999 MΩ	 0.001 MΩ 0.01 MΩ 0.1 MΩ 0.001 MΩ 0.01 MΩ 0.1 MΩ 1 MΩ	 ±(5 % of reading + 3 digits) ±(5 % of reading + 3 digits) ±(5 % of reading + 3 digits) ±(2 % of reading + 3 digits) ±(2 % of reading + 3 digits) ±(2 % of reading + 3 digits) ±10 % of reading
Continuity 200 mA of PE conductor with polarity change (EN 61557-4)	0.00 Ω … 19.99 Ω 20.0 Ω … 99.9 Ω 100 Ω … 1999 Ω	0.01 Ω 0.1 Ω 1 Ω	±(3 % of reading + 3 digits) ±5 % of reading ±5 % of reading
Low resistance continuity measurement, test current 7 mA (Continuous measurement)	0.0 Ω … 99.9 Ω 100 Ω … 1999 Ω	0.1 Ω 1 Ω	±(5 % of reading + 3 digits) ±(5 % of reading + 3 digits)
Loop impedance (EN 61557-3)	0.00 Ω … 19.99 Ω 20.0 Ω … 99.9 Ω 100 Ω … 1999 Ω	0.01 Ω 0.1 Ω 1 Ω	±(5 % of reading + 5 digits)
Line impedance (EN 61557-3)	0.00 Ω … 19.99 Ω 20.0 Ω … 99.9 Ω 100 Ω … 1999 Ω	0.01 Ω 0.1 Ω 1 Ω	±(5 % of reading + 5 digits)
Voltage	0 V … 500 V	1 V	±(2 % of reading + 2 digits)
Frequency	45.0 Hz … 65.0 Hz	0.1 Hz	±2 digits
Phase sequence (EN 61557-7)	1.2.3 or 2.1.3		
RCD testing (EN 61557-6)	$I_{\Delta N}$: 10 mA, 30 mA, 100 mA, 300 mA, 500 mA, 1 A		
- Contact voltage U_C	0.0 V … 9.9 V 10.0 V … 99.9 V	0.1 V 0.1 V	(-0 % / +10 %) of reading ±2 digits (-0 % / +10 %) of reading
- Trip-out time	0 ms … 300 ms (1/2 x $I_{\Delta N}$, $I_{\Delta N}$) 0 ms … 150 ms (2 x $I_{\Delta N}$) 0 ms … 40 ms (5 x $I_{\Delta N}$)	1 ms 1 ms 1 ms	±3 ms ±3 ms ±3 ms
- Trip-out current	0.2 x $I_{\Delta N}$ … 1.1 x $I_{\Delta N}$ (AC type, $I_{\Delta N}$=10 mA) 0.2 x $I_{\Delta N}$ … 2.2 x $I_{\Delta N}$ (A type, $I_{\Delta N}$=10 mA) 0.2 x $I_{\Delta N}$ … 1.1 x $I_{\Delta N}$ (AC type, $I_{\Delta N}$ ≥30 mA) 0.2 x $I_{\Delta N}$ … 1.5 x $I_{\Delta N}$ (A type, $I_{\Delta N}$ ≥30 mA)	0.05 x $I_{\Delta N}$ 0.05 x $I_{\Delta N}$ 0.05 x $I_{\Delta N}$ 0.05 x $I_{\Delta N}$	±0.1 x $I_{\Delta N}$ ±0.1 x $I_{\Delta N}$ ±0.1 x $I_{\Delta N}$ ±0.1 x $I_{\Delta N}$
Power supply	6 x 1.2 V rechargeable batteries, type AA		
Overvoltage category	CAT III / 600 V; CAT IV / 300 V		
Protection class	Double insulation		
Dimensions	230 x 103 x 115 mm		
Weight	1.3 kg		

STANDARD SET:

- Instrument EurotestEASI
- Tip commander, 1.5 m
- Schuko-plug test cable
- Test lead, 3 x 1.5 m
- Power supply adapter + 6 NiMH recharge-able batteries, type AA
- Test probe, 3 pcs (blue, black, green)
- Crocodile clip, 3 pcs (blue, black, green)
- Soft carrying neck belt
- Soft carrying bag
- Short Instruction manual
- Instruction manual on CD
- Handbook on CD
- Calibration certificate

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MI 3002 EurotestLITE

The MI 3002 EurotestLITE is the appropriate instrument for the installation safety testing on TT, TN, IT and 115 V systems. The online voltage monitoring system and phase sequence function enable EurotestLITE to work on both single phase and 3 phase systems. All the results can be quickly saved and referenced on the instrument and then downloaded via the EuroLink PRO software to the computer for evaluation and report generation after testing. The MI 3002 EurotestLITE performs continuity, insulation, RCD, loop, line, voltage, frequency and phase sequence tests required by the EN 61557 standard.

MEASURING FUNCTIONS:

- Insulation resistance with DC voltage.
- Continuity of PE conductors with 200 mA test current with polarity change.
- Continuity of PE conductors with 7 mA test current (continuous measurement) without RCD tripping.
- Line impedance.
- Loop impedance.
- Loop impedance with Trip Lock RCD function.
- TRMS voltage and frequency.
- Phase sequence.
- RCD testing (general and selective, type AC, A).

KEY FEATURES:

- **Downloadable:** downloads via RS232 or USB cable directly to the PC with the help of the software included in the standard set.
- **Online voltage monitoring:** monitors all 3 voltages in real-time.
- **Upgradeable:** if changes occur to the regulations, upgrades can be made to the firmware to keep the instrument up to date.
- **Polarity swap:** automatic polarity reversal on continuity test.
- **Insulation range:** wide range of insulation test voltages from 100 V to 1000 V, reading up to 1000 MΩ.
- **Trip Lock function:** Zs (RCD) function performs a loop impedance test without tripping the RCD.
- **Multi-system testing:** tests on TT, TN, IT and 115 V systems.
- **Built-in charger & rechargeable batteries:** unit has a built-in charging circuit and comes complete with a set of rechargeable NiMH batteries.
- **RCD auto:** automated RCD testing procedure significantly reduces test time.
- **PC SW Eurolink PRO** included in the the standard set enables downloading of test results and parameters and creation of test reports.

APPLICATION:

- Initial and periodic testing of domestic and industrial installations.
- Testing of single and multiphase systems.
- Testing of TT, TN, IT and 115 V systems.

STANDARDS:

Functionality: IEC/EN 61557

Other reference standards for testing:
IEC/EN/HD 60364;
IEC/EN 61008;
IEC/EN 61009;
IEC/EN/TR 60755;
BS 7671;
AS/NZ 3018;
CEI 64.8;
HD 384;
VDE 0413

Electromagnetic compatibility:
IEC/EN 61326-1;
IEC/EN 61326-2-2

Safety:
IEC/EN 61010-1;
IEC/EN 61010-031

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TECHNICAL DATA:

Function	Measuring range	Resolution	Accuracy
Insulation resistance (EN 61557-2)	U = 100, 250 V_{DC}: R: 0.000 MΩ … 1.999 MΩ 2.00 MΩ … 99.99 MΩ 100.0 MΩ … 199.9 MΩ U = 500 V_{DC}, 1 kV_{DC}: R: 0.000 MΩ … 1.999 MΩ 2.00 MΩ … 99.99 MΩ 100.0 MΩ … 199.9 MΩ 200 MΩ … 999 MΩ	 0.001 MΩ 0.01 MΩ 0.1 MΩ 0.001 MΩ 0.01 MΩ 0.1 MΩ 1 MΩ	 ±(5 % of reading + 3 digits) ±(5 % of reading + 3 digits) ±(5 % of reading + 3 digits) ±(2 % of reading + 3 digits) ±(2 % of reading + 3 digits) ±(2 % of reading + 3 digits) ±10 % of reading
Continuity 200 mA of PE conductor with polarity change (EN 61557-4)	0.00 Ω … 19.99 Ω 20.0 Ω … 99.9 Ω 100 Ω … 1999 Ω	0.01 Ω 0.1 Ω 1 Ω	±(3 % of reading + 3 digits) ±5 % of reading ±5 % of reading
Low resistance continuity measurement, test current 7 mA (Continuous measurement)	0.0 Ω … 99.9 Ω 100 Ω … 1999 Ω	0.1 Ω 1 Ω	±(5 % of reading + 3 digits) ±(5 % of reading + 3 digits)
Loop impedance (EN 61557-3)	0.00 Ω … 19.99 Ω 20.0 Ω … 99.9 Ω 100 Ω … 1999 Ω	0.01 Ω 0.1 Ω 1 Ω	±(5 % of reading + 5 digits)
Line impedance (EN 61557-3)	0.00 Ω … 19.99 Ω 20.0 Ω … 99.9 Ω 100 Ω … 1999 Ω	0.01 Ω 0.1 Ω 1 Ω	±(5 % of reading + 5 digits)
Voltage	0 V … 500 V	1 V	±(2 % of reading + 2 digits)
Frequency	45.0 Hz … 65.0 Hz	0.1 Hz	±2 digits
Phase sequence (EN 61557-7)	1.2.3 or 2.1.3		
RCD testing (EN 61557-6)	$I_{\Delta N}$: 10 mA, 30 mA, 100 mA, 300 mA, 500 mA, 1 A		
- Contact voltage U_C	0.0 V … 9.9 V 10.0 V … 99.9 V	0.1 V 0.1 V	(-0 % / +10 %) of reading ±2 digits (-0 % / +10 %) of reading
- Trip-out time	0 ms … 300 ms (1/2 x $I_{\Delta N}$, $I_{\Delta N}$) 0 ms … 150 ms (2 x $I_{\Delta N}$) 0 ms … 40 ms (5 x $I_{\Delta N}$)	1 ms 1 ms 1 ms	±3 ms ±3 ms ±3 ms
- Trip-out current	0.2 x $I_{\Delta N}$ … 1.1 x $I_{\Delta N}$ (AC type, $I_{\Delta N}$=10 mA) 0.2 x $I_{\Delta N}$ … 2.2 x $I_{\Delta N}$ (A type, $I_{\Delta N}$=10 mA) 0.2 x $I_{\Delta N}$ … 1.1 x $I_{\Delta N}$ (AC type, $I_{\Delta N} \geq 30$ mA) 0.2 x $I_{\Delta N}$ … 1.5 x $I_{\Delta N}$ (A type, $I_{\Delta N} \geq 30$ mA)	0.05 x $I_{\Delta N}$ 0.05 x $I_{\Delta N}$ 0.05 x $I_{\Delta N}$ 0.05 x $I_{\Delta N}$	±0.1 x $I_{\Delta N}$ ±0.1 x $I_{\Delta N}$ ±0.1 x $I_{\Delta N}$ ±0.1 x $I_{\Delta N}$
Power supply	6 x 1.2 V rechargeable batteries, type AA		
Overvoltage category	CAT III / 600 V; CAT IV / 300 V		
Protection class	Double insulation		
COM port	RS232 and USB		
Dimensions	230 x 103 x 115 mm		
Weight	1.3 kg		

STANDARD SET:

- Instrument EurotestLITE
- Schuko-plug test cable
- Test lead, 3 x 1.5 m
- Power supply adapter + 6 NiMH recharge-able batteries, type AA
- Test probe, 3 pcs (blue, black, green)
- Crocodile clip, 3 pcs (blue, black, green)
- Soft carrying neck belt
- Soft carrying bag
- PC Software EuroLink PRO
- RS232 - PS/2 cable
- USB cable
- Short Instruction manual
- Instruction manual on CD
- Handbook on CD
- Calibration certificate

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MI 3125B EurotestCOMBO

The MI 3125B EurotestCOMBO performs all the necessary tests for installation safety testing on TT and TN systems. The large graphic display with backlight offers easy reading of results, indications, measurement parameters and messages. Two LED Pass/Fail indicators are placed on both sides of the LCD. MI 3125B EurotestCOMBO contains integrated characteristics of fuses and RCDs (including B type) for the evaluation of test results. Each test has its own individual help screen describing how to connect the instrument into the installation and how to perform a measurement. All the results can be quickly saved and referenced on the instrument and then downloaded via the EuroLink PRO software, included in the standard set, to the computer for evaluation and report generation after testing. MI 3125B EurotestCOMBO performs continuity, insulation, RCD, loop, line, voltage, frequency, earth resistance testing and phase sequence tests required by the EN 61557 standard.

MEASURING FUNCTIONS:

- Insulation resistance with DC voltage.
- Continuity of PE conductors with 200 mA test current with polarity change.
- Continuity of PE conductors with 7 mA test current (continuous measurement) without RCD tripping.
- Line impedance.
- Loop impedance.
- Loop impedance with Trip Lock RCD function.
- TRMS voltage and frequency.
- Phase sequence.
- RCD testing (general and selective, type AC, A and B).
- Earth resistance (3-wire method).

KEY FEATURES:

- **LED Pass/Fail indicators:** two LED indicators for PASS / FAIL evaluation of test results are placed on both sides of the LCD
- **Help screens:** instrument comes complete with built-in help screens for referencing on site.
- **Earth resistance measurement:** instrument performs 3-wire earth resistance testing with two additional rods.
- **Built-in fuse tables:** this unique feature allows automatic evaluation of the line / loop impedance compared to the regulations.
- **Online voltage monitoring:** monitors all 3 voltages in real-time.
- **Upgradeable:** if changes occur to the regulations, upgrades can be made to the firmware to keep the instrument up to date.
- **Polarity swap:** automatic polarity reversal on continuity test.
- **Insulation range:** wide range of insulation test voltages from 50 V to 1000 V, reading up to 1000 MΩ.
- **Trip Lock function:** Zs (RCD) function performs a loop impedance test without tripping the RCD.
- **Multi-system testing:** tests on single and multiphase TT and TN systems.
- **Built-in charger & rechargeable batteries:** unit has a built-in charging circuit and comes complete with a set of rechargeable NiMH batteries.
- **RCD auto:** automated RCD testing procedure significantly reduces test time.
- **B type RCD testing** is supported.
- **PC SW Eurolink PRO** included in the the standard set enables downloading of test results and parameters and creation of test reports.

APPLICATION:

- Initial and periodic testing of domestic and industrial installations.
- Testing of single and multiphase systems.
- Testing of TT and TN systems.

STANDARDS:

Functionality: IEC/EN 61557
Other reference standards for testing: VDE 0413; IEC/EN 61008; IEC/EN 61009; IEC/EN/HD 60364; HD 384; BS 7671; IEC/TR 60755; CEI 64.8; AS/NZ 3760; AS/NZ 3018
Electromagnetic compatibility: IEC/EN 61326-1; IEC/EN 61326-2-2
Safety: IEC/EN 61010-1; IEC/EN 61010-031

TECHNICAL DATA:

Function	Measuring range	Resolution	Accuracy
Insulation resistance (EN 61557-2)	U = 50, 100, 250 V_{DC}: R: 0.00 MΩ … 19.99 MΩ 20.0 MΩ … 99.9 MΩ 100.0 MΩ … 199.9 MΩ U = 500 V_{DC}, 1 kV_{DC}: R: 0.00 MΩ … 19.99 MΩ 20.0 MΩ … 99.9 MΩ 200 MΩ … 999 MΩ	 0.01 MΩ 0.1 MΩ 0.1 MΩ 0.01 MΩ 0.1 MΩ 1 MΩ	 ±(5 % of reading + 3 digits) ±10 % of reading ±20 % of reading ±(5 % of reading + 3 digits) ±5 % of reading ±10 % of reading
Continuity 200 mA of PE conductor with polarity change (EN 61557-4)	0.00 Ω … 19.99 Ω 20.0 Ω … 199.9 Ω 200 Ω … 1999 Ω	0.01 Ω 0.1 Ω 1 Ω	±(3 % of reading + 3 digits) ±5 % of reading ±5 % of reading
Low resistance continuity measurement, test current 7 mA (Continuous measurement)	0.0 Ω … 19.9 Ω 20 Ω … 1999 Ω	0.1 Ω 1 Ω	±(5 % of reading + 3 digits) ±(5 % of reading + 3 digits)
Loop impedance (EN 61557-3)	0.00 Ω … 9.99 Ω 10.0 Ω … 99.9 Ω 100 Ω … 999 Ω 1.00 kΩ … 9.99 kΩ	0.01 Ω 0.1 Ω 1 Ω 10 Ω	±(5 % of reading + 5 digits) ±(5 % of reading + 5 digits) ±10 % of reading ±10 % of reading
Line impedance (EN 61557-3)	0.00 Ω … 9.99 Ω 10.0 Ω … 99.9 Ω 100 Ω … 999 Ω 1.00 kΩ … 9.99 kΩ	0.01 Ω 0.1 Ω 1 Ω 10 Ω	±(5 % of reading + 5 digits) ±(5 % of reading + 5 digits) ±10 % of reading ±10 % of reading
Voltage	0 V … 550 V	1 V	±(2 % of reading + 2 digits)
Frequency	0.00 Hz … 9.99 Hz 10.0 Hz … 499.9 Hz	0.01 Hz 0.1 Hz	±(0.2 % of reading + 1 digits)
Phase sequence (EN 61557-7)	1.2.3 or 3.2.1		
RCD testing (EN 61557-6)	$I_{\Delta N}$: 10 mA, 30 mA, 100 mA, 300 mA, 500 mA, 1 A		
- Contact voltage U_C	0.0 V … 19.9 V 20.0 V … 99.9 V	0.1 V 0.1 V	(-0 % / +15 %) of reading ±10 digits (-0 % / +15 %) of reading
- Trip-out time	0 ms … 40.0 ms 0 ms … max. time	0.1 ms 0.1 ms	±1 ms ±3 ms
- Trip-out current	0.2 x $I_{\Delta N}$ … 1.1 x $I_{\Delta N}$ (AC type) 0.2 x $I_{\Delta N}$ … 2.2 x $I_{\Delta N}$ (A type, $I_{\Delta N}$ < 30 mA) 0.2 x $I_{\Delta N}$ … 1.5 x $I_{\Delta N}$ (A type, $I_{\Delta N}$ ≥ 30 mA) 0.2 x $I_{\Delta N}$ … 2.2 x $I_{\Delta N}$ (B type)	0.05 x $I_{\Delta N}$ 0.05 x $I_{\Delta N}$ 0.05 x $I_{\Delta N}$ 0.05 x $I_{\Delta N}$	±0.1 x $I_{\Delta N}$ ±0.1 x $I_{\Delta N}$ ±0.1 x $I_{\Delta N}$ ±0.1 x $I_{\Delta N}$
Earth resistance (EN 61557-5)	0.00 Ω … 19.99 Ω 20.0 Ω … 199.9 Ω 200 Ω … 9999 Ω	0.01 Ω 0.1 Ω 1 Ω	±(5 % of reading + 5 digits) ±(5 % of reading + 5 digits) ±(5 % of reading + 5 digits)
Power supply	6 x 1.2 V rechargeable batteries, type AA		
Overvoltage category	CAT III / 600 V; CAT IV / 300 V		
Protection class	Double insulation		
COM port	RS232 and USB		
Dimensions	140 x 80 x 230 mm		
Weight	1.0 kg		

STANDARD SET:

- Instrument EurotestCOMBO
- Set of carrying straps
- Test lead, 3 x 1.5 m
- Schuko-plug test cable, 1.5 m
- Test probe, 3 pcs (blue, black, green)
- Crocodile clip, 3 pcs (blue, black, green)
- Power supply adapter + 6 NiMH recharge-able batteries, type AA
- USB cable
- RS232 - PS/2 cable
- PC SW EuroLink PRO
- Short instruction manual
- Instruction manual and handbook on CD
- Calibration certificate

Accessories: page 8.01

MI 3102 EurotestXE

The MI 3102 EurotestXE is the ideal instrument for engineers who perform high volume installation safety testing. Performing all the necessary tests for installation testing, EurotestXE also enables online voltage monitoring, phase sequence testing, 3-wire earth resistance measurement (using the accessories included in the standard set), illuminance measurement and TRMS current measurement. EurotestXE is equipped with integrated characteristics of fuses and RCDs for PASS / FAIL evaluation of test results. All the results can be quickly saved and referenced on the instrument and then downloaded via the EuroLink PRO software, included in the standard set, to the computer for evaluation and report generation after testing. MI 3102 EurotestXE performs continuity, insulation, RCD, loop, line, voltage, frequency, earth resistance testing and phase sequence tests required by the EN 61557 standard.

MEASURING FUNCTIONS:

- Insulation resistance with DC voltage.
- Continuity of PE conductors with 200 mA test current with polarity change.
- Continuity of PE conductors with 7 mA test current (continuous measurement) without RCD tripping.
- Line impedance.
- Loop impedance.
- Loop impedance with Trip Lock RCD function.
- TRMS voltage and frequency.
- Phase sequence.
- RCD testing (general and selective, type AC, A).
- Earth resistance (3-wire method).
- TRMS leakage and load currents (option).
- Illumination (option).
- Testing of Insulation Monitoring Devices (IMDs).
- First fault leakage current in IT systems.

KEY FEATURES:

- **Earth resistance measurement:** instrument performs 3-wire earth resistance testing with two additional rods.
- **Medical site testing:** measurement of First fault leakage current (ISFL) and insulation monitoring device (IMD) checking.
- **Downloadable:** downloads via RS232 or USB cable directly to the PC with the help of the software included in the standard set.
- **Help screens:** instrument comes complete with built-in help screens for referencing on site.
- **Built-in fuse tables:** this unique feature allows automatic evaluation of the line / loop impedance compared to the regulations.
- **Tip commander:** tip commander is included in the standard set and intended for simplification of continuity and insulation testing.
- **Online voltage monitoring:** monitors all 3 voltages in real-time.
- **Upgradeable:** if changes occur to the regulations, upgrades can be made to the firmware to keep the instrument up to date.
- **Polarity swap:** automatic polarity reversal on continuity test.
- **Insulation range:** wide range of insulation test voltages from 100 V to 1000 V, reading up to 1000 MΩ.
- **Trip Lock function:** Zs (RCD) function performs a loop impedance test without tripping the RCD.
- **Multi-system testing:** tests on TT, TN, IT and 115 V systems.
- **Built-in charger & rechargeable batteries:** unit has a built-in charging circuit and comes complete with a set of rechargeable NiMH batteries.
- **RCD auto:** automated RCD testing procedure significantly reduces test time.
- **PC SW Eurolink PRO** included in the the standard set enables downloading of test results and parameters and creation of test reports.

APPLICATION:

- Initial and periodic testing of domestic and industrial installations.
- Testing of single and multiphase systems.
- Testing of TT, TN, IT and 115 V supply systems.
- Medical installation testing.

STANDARDS:

Functionality:
IEC/EN 61557
Other reference standards for testing:
IEC/EN/HD 60364; IEC/EN 61008; IEC/EN 61009; IEC/EN/TR 60755; BS 7671; AS/NZ 3018; CEI 64.8; HD 384; VDE 0413
Electromagnetic compatibility:
IEC/EN 61326-1; IEC/EN 61326-2-2
Safety:
IEC/EN 61010-1; IEC/EN 61010-031; IEC/EN 61010-2-032

Accessories: page 8.01

TECHNICAL DATA:

Function	Measuring range	Resolution	Accuracy
Insulation resistance (EN 61557-2)	U = 100, 250 V_{DC}: R: 0.000 MΩ … 1.999 MΩ 2.00 MΩ … 99.99 MΩ 100.0 MΩ … 199.9 MΩ U = 500 V_{DC}, 1 kV_{DC}: R: 0.000 MΩ … 1.999 MΩ 2.00 MΩ … 99.99 MΩ 100.0 MΩ … 199.9 MΩ 200 MΩ … 999 MΩ	 0.001 MΩ 0.01 MΩ 0.1 MΩ 0.001 MΩ 0.01 MΩ 0.1 MΩ 1 MΩ	 ±(5 % of reading + 3 digits) ±(5 % of reading + 3 digits) ±(5 % of reading + 3 digits) ±(2 % of reading + 3 digits) ±(2 % of reading + 3 digits) ±(2 % of reading + 3 digits) ±10 % of reading
Continuity 200 mA of PE conductor with polarity change (EN 61557-4)	0.00 Ω … 19.99 Ω 20.0 Ω … 99.9 Ω 100 Ω … 1999 Ω	0.01 Ω 0.1 Ω 1 Ω	±(3 % of reading + 3 digits) ±5 % of reading ±5 % of reading
Low resistance continuity measurement, test current 7 mA (Continuous measurement)	0.0 Ω … 99.9 Ω 100 Ω … 1999 Ω	0.1 Ω 1 Ω	±(5 % of reading + 3 digits) ±(5 % of reading + 3 digits)
Loop impedance (EN 61557-3)	0.00 Ω … 19.99 Ω 20.0 Ω … 99.9 Ω 100 Ω … 1999 Ω	0.01 Ω 0.1 Ω 1 Ω	±(5 % of reading + 5 digits)
Line impedance (EN 61557-3)	0.00 Ω … 19.99 Ω 20.0 Ω … 99.9 Ω 100 Ω … 1999 Ω	0.01 Ω 0.1 Ω 1 Ω	±(5 % of reading + 5 digits)
Voltage	0 V … 500 V	1 V	±(2 % of reading + 2 digits)
Frequency	45.0 Hz … 65.0 Hz	0.1 Hz	±2 digits
Phase sequence (EN 61557-7)	1.2.3 or 2.1.3		
RCD testing (EN 61557-6)	$I_{\Delta N}$: 10 mA, 30 mA, 100 mA, 300 mA, 500 mA, 1 A		
- Contact voltage U_C	0.0 V … 9.9 V 10.0 V … 99.9 V	0.1 V 0.1 V	(-0 % / +10 %) of reading ± 2 digits (-0 % / +10 %) of reading
- Trip-out time	0 ms … 300 ms (1/2 x $I_{\Delta N}$, $I_{\Delta N}$) 0 ms … 150 ms (2 x $I_{\Delta N}$) 0 ms … 40 ms (5 x $I_{\Delta N}$)	1 ms 1 ms 1 ms	±3 ms ±3 ms ±3 ms
- Trip-out current	0.2 x $I_{\Delta N}$ … 1.1 x $I_{\Delta N}$ (AC type, $I_{\Delta N}$=10 mA) 0.2 x $I_{\Delta N}$ … 2.2 x $I_{\Delta N}$ (A type, $I_{\Delta N}$=10 mA) 0.2 x $I_{\Delta N}$ … 1.1 x $I_{\Delta N}$ (AC type, $I_{\Delta N} \geq$ 30 mA) 0.2 x $I_{\Delta N}$ … 1.5 x $I_{\Delta N}$ (A type, $I_{\Delta N} \geq$ 30 mA)	0.05 x $I_{\Delta N}$ 0.05 x $I_{\Delta N}$ 0.05 x $I_{\Delta N}$ 0.05 x $I_{\Delta N}$	±0.1 x $I_{\Delta N}$ ±0.1 x $I_{\Delta N}$ ±0.1 x $I_{\Delta N}$ ±0.1 x $I_{\Delta N}$
Earth resistance (EN 61557-5)	0.00 Ω … 19.99 Ω 20.0 Ω … 99.9 Ω 100 Ω … 1999 Ω	0.01 Ω 0.1 Ω 1 Ω	±(2 % of reading + 3 digits) ±(2 % of reading + 3 digits) ±(2 % of reading + 3 digits)
TRMS Current	0.0 mA … 99.9 mA 100 mA … 999 mA 1.00 A … 19.99 A	0.1 mA 1 mA 0.01 mA	±(5 % of reading + 3 digits) ±5 % of reading ±5 % of reading
Illuminance (Type B)	0.01 lux … 19.99 lux 20.0 lux … 199.9 lux 200 lux … 1999 lux 2.00 klux … 19.99 klux	0.01 lux 0.1 lux 1 lux 10 lux	±(5 % of reading + 2 digits) ±5 % of reading ±5 % of reading ±5 % of reading
Power supply	6 x 1.2 V rechargeable batteries, type AA		
Overvoltage category	CAT III / 600 V; CAT IV / 300 V		
Protection class	Double insulation		
COM port	RS232 and USB		
Dimensions	230 x 103 x 115 mm		
Weight	1.3 kg		

STANDARD SET:

- Instrument EurotestXE
- Tip commander, 1.5 m
- Schuko-plug test cable
- Test lead, 3 x 1.5 m
- Earth test set (test lead, 4 m; 2 x test lead, 20 m; 2 x test rod)
- Power supply adapter + 6 NiMH recharge-able batteries, type AA
- PC Software EuroLink PRO
- Test probe, 3 pcs (blue, black, green)
- Crocodile clip, 3 pcs (blue, black, green)
- RS232 - PS/2 cable
- USB cable
- Soft carrying neck belt
- Soft carrying bag
- Short instruction manual
- Instruction manual on CD
- Handbook on CD
- Calibration certificate

Accessories: page 8.01

MI 3102H EurotestXE 2,5 kV

The MI 3102H EurotestXE 2,5 kV practically replicates the MI 3102 EurotestXE with the exception of Insulation resistance function. Apart from all the necessary functions for complete installation safety testing, the EurotestXE 2,5 kV performs insulation resistance measurement with the test voltage up to 2.5 kV (measuring range is up to 10 GΩ) and enables diagnostic test by PI and DAR indexes calculation. Besides MI 3102H enables online voltage monitoring, phase sequence testing, 3-wire earth resistance measurement (using the accessories included in the standard set), illuminance measurement and TRMS current measurement. EurotestXE 2,5 kV is equipped with integrated characteristics of fuses and RCDs for PASS / FAIL evaluation of test results. All the results can be quickly saved and referenced on the instrument and then downloaded via the EuroLink PRO software, included in the standard set, to the computer for evaluation and report generation after testing. The MI 3102H EurotestXE 2,5 kV performs continuity, insulation, RCD, loop, line, voltage, frequency, earth resistance testing and phase sequence tests required by the EN 61557 standard.

MEASURING FUNCTIONS:

- Insulation resistance with DC voltage.
- Diagnostic test (PI, DAR calculation).
- Continuity of PE conductors with 200 mA test current with polarity change.
- Continuity of PE conductors with 7 mA test current (continuous measurement) without RCD tripping.
- Line impedance.
- Loop impedance.
- Loop impedance with Trip Lock RCD function.
- TRMS voltage and frequency.
- Phase sequence.
- RCD testing (general and selective, type AC, A).
- Earth resistance (3-wire method).
- TRMS leakage and load currents (option).
- Illumination (option).

KEY FEATURES:

- **Insulation range:** wide range of insulation test voltages from 100 V to 2500 V, reading up to 10 GΩ.
- **Earth resistance measurement:** instrument performs 3-wire earth resistance testing with two additional rods.
- **Downloadable:** downloads via RS232 or USB cable directly to the PC with the help of the software included in the standard set.
- **Help screens:** instrument comes complete with built-in help screens for referencing on site.
- **Built-in fuse tables:** this unique feature allows automatic evaluation of the line / loop impedance compared to the regulations.
- **Tip commander:** tip commander is included in the standard set and intended for simplification of continuity and insulation testing.
- **Online voltage monitoring:** monitors all 3 voltages in real-time.
- **Upgradeable:** if changes occur to the regulations, upgrades can be made to the firmware to keep the instrument up to date.
- **Polarity swap:** automatic polarity reversal on continuity test.
- **Trip Lock function:** Zs (RCD) function performs a loop impedance test without tripping the RCD.
- **Built-in charger & rechargeable batteries:** unit has a built-in charging circuit and comes complete with a set of rechargeable NiMH batteries.
- **RCD auto:** automated RCD testing procedure significantly reduces test time.
- **PC SW EuroLink PRO** included in the the standard set enables downloading of test results and parameters and creation of test reports.

APPLICATION:

- Initial and periodic testing of domestic and industrial installations.
- Testing of single and multiphase systems.
- Testing of TT and TN supply systems.

STANDARDS:

Functionality:

IEC/EN 61557

Other reference standards for testing:

IEC/EN/HD 60364; IEC/EN 61008;
IEC/EN 61009; IEC/EN/TR 60755;
BS 7671;
AS/NZ 3018;
CEI 64.8;
HD 384;
VDE 0413

Electromagnetic compatibility:

IEC/EN 61326-1;
IEC/EN 61326-2-2

Safety:

IEC/EN 61010-1;
IEC/EN 61010-031;
IEC/EN 61010-2-032

Accessories: page 8.01

TECHNICAL DATA:

Function	Measuring range	Resolution	Accuracy
Insulation resistance (EN 61557-2)	U = 100, 250 V_{DC}: R: 0.000 MΩ … 1.999 MΩ 2.00 MΩ … 99.99 MΩ 100.0 MΩ … 199.9 MΩ U = 500 V_{DC}, 1 kV_{DC}: R: 0.000 MΩ … 1.999 MΩ 2.00 MΩ … 99.99 MΩ 100.0 MΩ … 199.9 MΩ 200 MΩ … 999 MΩ U = 2.5 kV_{DC}: R: 0.000 MΩ … 1.999 MΩ 2.00 MΩ … 99.99 MΩ 100.0 MΩ … 199.9 MΩ 200 MΩ … 1999 MΩ 2.00 GΩ … 9.99 GΩ	 0.001 MΩ 0.01 MΩ 0.1 MΩ 0.001 MΩ 0.01 MΩ 0.1 MΩ 1 MΩ 0.001 MΩ 0.01 MΩ 0.1 MΩ 1 MΩ 10 MΩ	 ±(5 % of reading + 3 digits) ±(5 % of reading + 3 digits) ±(5 % of reading + 3 digits) ±(2 % of reading + 3 digits) ±(2 % of reading + 3 digits) ±(2 % of reading + 3 digits) ±10 % of reading ±(2 % of reading + 3 digits) ±(2 % of reading + 3 digits) ±(2 % of reading + 3 digits) ±10 % of reading ±10 % of reading
DAR, PI (U = 500 V_{DC}; 1 kV_{DC}; 2.5 kV_{DC})	0.01 … 9.99 10.0 … 100.0	0.01 0.1	±(5 % of reading + 2 digits) ±5 digits
Continuity 200 mA of PE conductor with polarity change (EN 61557-4)	0.00 Ω … 19.99 Ω 20.0 Ω … 99.9 Ω 100 Ω … 1999 Ω	0.01 Ω 0.1 Ω 1 Ω	±(3 % of reading + 3 digits) ±5 % of reading ±5 % of reading
Low resistance continuity measurement, test current 7 mA (Continuous measurement)	0.0 Ω … 99.9 Ω 100 Ω … 1999 Ω	0.1 Ω 1 Ω	±(5 % of reading + 3 digits) ±(5 % of reading + 3 digits)
Loop impedance (EN 61557-3)	0.00 Ω … 19.99 Ω 20.0 Ω … 99.9 Ω 100 Ω … 1999 Ω	0.01 Ω 0.1 Ω 1 Ω	±(5 % of reading + 5 digits)
Line impedance (EN 61557-3)	0.00 Ω … 19.99 Ω 20.0 Ω … 99.9 Ω 100 Ω … 1999 Ω	0.01 Ω 0.1 Ω 1 Ω	±(5 % of reading + 5 digits)
Voltage	0 V … 500 V	1 V	±(2 % of reading + 2 digits)
Frequency	45.0 Hz … 65.0 Hz	0.1 Hz	±2 digits
Phase sequence (EN 61557-7)	1.2.3 or 2.1.3		
RCD testing (EN 61557-6)	$I_{\Delta N}$: 10 mA, 30 mA, 100 mA, 300 mA, 500 mA, 1 A		
- Contact voltage U_C	0.0 V … 9.9 V 10.0 V … 99.9 V	0.1 V 0.1 V	(-0 % / +10 %) of reading ± 2 digits (-0 % / +10 %) of reading
- Trip-out time	0 ms … 300 ms (1/2 x $I_{\Delta N}$, $I_{\Delta N}$) 0 ms … 150 ms (2 x $I_{\Delta N}$) 0 ms … 40 ms (5 x $I_{\Delta N}$)	1 ms 1 ms 1 ms	±3 ms ±3 ms ±3 ms
- Trip-out current	0.2 x $I_{\Delta N}$ … 1.1 x $I_{\Delta N}$ (AC type, $I_{\Delta N}$=10 mA) 0.2 x $I_{\Delta N}$ … 2.2 x $I_{\Delta N}$ (A type, $I_{\Delta N}$=10 mA) 0.2 x $I_{\Delta N}$ … 1.1 x $I_{\Delta N}$ (AC type, $I_{\Delta N} \geq$ 30 mA) 0.2 x $I_{\Delta N}$ … 1.5 x $I_{\Delta N}$ (A type, $I_{\Delta N} \geq$ 30 mA)	0.05 x $I_{\Delta N}$ 0.05 x $I_{\Delta N}$ 0.05 x $I_{\Delta N}$ 0.05 x $I_{\Delta N}$	±0.1 x $I_{\Delta N}$ ±0.1 x $I_{\Delta N}$ ±0.1 x $I_{\Delta N}$ ±0.1 x $I_{\Delta N}$
Earth resistance (EN 61557-5)	0.00 Ω … 19.99 Ω 20.0 Ω … 99.9 Ω 100 Ω … 1999 Ω	0.01 Ω 0.1 Ω 1 Ω	±(2 % of reading + 3 digits) ±(2 % of reading + 3 digits) ±(2 % of reading + 3 digits)
TRMS Current	0.0 mA … 99.9 mA 100 mA … 999 mA 1.00 A … 19.99 A	0.1 mA 1 mA 0.01 mA	±(5 % of reading + 3 digits) ±5 % of reading ±5 % of reading
Illuminance (Type B)	0.01 lux … 19.99 lux 20.0 lux … 199.9 lux 200 lux … 1999 lux 2.00 klux … 19.99 klux	0.01 lux 0.1 lux 1 lux 10 lux	±(5 % of reading + 2 digits) ±5 % of reading ±5 % of reading ±5 % of reading
Power supply	6 x 1.2 V rechargeable batteries, type AA		
Overvoltage category	CAT III / 600 V; CAT IV / 300 V		
Protection class	Double insulation		
COM port	RS232 and USB		
Dimensions	230 x 103 x 115 mm		
Weight	1.3 kg		

STANDARD SET:

- Instrument EurotestXE 2,5 kV
- Tip commander, 1.5 m
- Schuko-plug test cable
- 2.5 kV test lead, 2 x 1.5 m
- Test lead, 3 x 1.5 m
- Earth test set (test lead, 4 m; 2 x test lead, 20 m; 2 x test rod)
- Power supply adapter + 6 NiMH rechargeable batteries, type AA
- PC Software EuroLink PRO
- Test probe, 3 pcs (blue, black, green)
- Crocodile clip, 3 pcs (blue, black, green)
- RS232 - PS/2 cable
- USB cable
- Soft carrying neck belt
- Soft carrying bag
- Short instruction manual
- Instruction manual on CD
- Handbook on CD
- Calibration certificate

Accessories: page 8.01

MI 3101 EurotestAT

The MI 3101 EurotestAT is the first installation safety tester with automated testing based on patented technology *AUTO SEQUENCE* ®. This remarkable instrument in eqipped with a number of unique features including "All-in-one" insulation testing, integrated characteristics of fuses and RCDs (including B type), PASS / FAIL evaluation of test results and 10-level memory structure. Besides the EurotestAT has an additional features like fuse / wire locating facility, specific earth resistance measuring function and built-in battery charger. All the results can be quickly saved and referenced on the instrument and then downloaded via the EuroLink PRO software, included in the standard set, to the computer for evaluation and report generation after testing. The MI 3101 EurotestAT performs continuity, insulation, RCD, loop, line, voltage, frequency, earth resistance testing and phase sequence tests required by the EN 61557 standard.

MEASURING FUNCTIONS:

- Insulation resistance with DC voltage.
- Continuity of PE conductors with 200 mA test current with polarity change.
- Continuity of PE conductors with 7 mA test current (continuous measurement) without RCD tripping.
- Line impedance.
- Loop impedance.
- Loop impedance with Trip Lock RCD function.
- TRMS voltage and frequency.
- Phase sequence.
- RCD testing (general and selective, type AC, A and B).
- Earth resistance (3-wire method).
- Specific earth resistance (option).
- Overvoltage protection devices testing.
- Tracing the installations (option).
- High resolution loop impedance (mΩ).

KEY FEATURES:

- **Autosequences:** Testing of electrical installation safety with *AUTO SEQUENCE* ® is up to 5 times faster compared to traditional installation tester.
- **All-in-one insulation:** insualation tests between L-N, L-PE and N-PE can be performed simultaneously in less than 10 seconds.
- **Structure building:** a structure of the installation (up to 10 levels) can be built either using the software (which can then be sent to the instrument) or directly on the tester so that test results are always saved on the correct circuit.
- **Fuse location:** function enables the locating of fuses / wires / faults with the help of the optional A 1191 Fuse locator.
- **Earth resistance measurement:** Unit can perform 3-wire earth resistance testing and specific earth resistance measurement.
- **Downloadable:** downloads via RS232 or USB cable directly to the PC with the help the software included in the standard set.
- **Help screens:** instrument comes complete with built-in help screens for referencing on site.
- **Built-in fuse tables:** this unique feature allows automatic evaluation of the line / loop impedance compared to the regulations.
- **Online voltage monitoring:** monitors all 3 voltages in real-time.
- **Upgradeable:** if changes occur to the regulations, upgrades can be made to the firmware to keep the instrument up to date.
- **Polarity swap:** automatic polarity reversal on continuity test.
- **Insulation range:** wide range of insulation test voltages from 50 V to 1000 V, reading up to 1000 MΩ.
- **Trip Lock function:** Zs (RCD) function performs a loop impedance test without tripping the RCD.
- **Multi-system testing:** tests on TT, TN, IT and 115 V systems.
- **Wide frequency range:** 14 ... 500 Hz.
- **Built-in charger & rechargeable batteries:** unit has a built-in charging circuit and comes complete with a set of rechargeable NiMH batteries.
- **RCD auto:** automated RCD testing procedure significantly reduces test time.
- **B type RCD testing** is supported.
- **PC SW EuroLink PRO** included in the the standard set enables downloading of test results and parameters and creation of test reports.

APPLICATION:

- Initial and periodic testing of domestic and industrial installations (testing in aviation, railway networks, agriculture).
- Testing of single and multiphase systems.
- Testing of TT, TN, IT and 115 V systems.
- High volume testing (industrial, aircraft, railway, mining, chemistry, fery boat)

STANDARDS:

Functionality: IEC/EN 61557
Other reference standards for testing: IEC/EN/HD 60364; IEC/EN 61008; IEC/EN 61009; IEC/EN/TR 60755; BS 7671; AS/NZ 3760; AS/NZ 3018; AS/NZ 3017; CEI 64.8; HD 384; 0VDE 413
Electromagnetic compatibility: IEC/EN 61326-1; IEC/EN 61326-2-2
Safety: IEC/EN 61010-1; IEC/EN 61010-031

TECHNICAL DATA:

Function	Measuring range	Resolution	Accuracy
Insulation resistance (EN 61557-2)	U=50, 100, 250 V_{DC}: R: 0.00 MΩ … 19.99 MΩ 20.0 MΩ … 99.9 MΩ 100.0 MΩ … 199.9 MΩ U= 500 V_{DC}, 1 kV_{DC}: R: 0.00 MΩ … 19.99 MΩ 20.0 MΩ … 199.9 MΩ 200 MΩ … 299 MΩ 300 MΩ … 1000 MΩ	 0.01 MΩ 0.1 MΩ 0.1 MΩ 0.01 MΩ 0.1 MΩ 1 MΩ 1 MΩ	 ±(5 % of reading + 5 digits) ±(10 % of reading) ±(20 % of reading) ±(5 % of reading + 3 digits) ±(10 % of reading) ±(10 % of reading) ±(20 % of reading)
Continuity of PE conductor with polarity change, test current 200 mA (EN 61557-4)	0.00 Ω … 19.99 Ω 20.0 Ω … 199.9 Ω 200 Ω … 1999 Ω 2000 Ω … 9999 Ω	0.01 Ω 0.1 Ω 1 Ω 1 Ω	±(3 % of reading + 3 digits) ±(5 % of reading) ±(5 % of reading) indicative
Low resistance continuity measurement, test current 7 mA (Continuous measurement)	0.0 Ω … 19.9 Ω 20 Ω … 1999 Ω 2000 Ω … 9999 Ω	0.1 Ω 1 Ω 1 Ω	±(5 % of reading + 3 digits) ±(5 % of reading + 3 digits) indicative
Line impedance (EN 61557-3)	0.00 Ω … 9.99 Ω 10.0 Ω … 99.9 Ω 100 Ω … 999 Ω 1.00 kΩ … 9.99 kΩ 10.0 kΩ … 19.9 kΩ	0.01 Ω 0.1 Ω 1 Ω 10 Ω 100 Ω	±(5 % of reading + 5 digits)
Loop impedance (EN 61557-3)	0.00 Ω … 9.99 Ω 10.0 Ω … 99.9 Ω 100 Ω … 19999 Ω	0.01 Ω 0.1 Ω 1 Ω	±(5 % of reading + 5 digits)
Voltage	0 V … 550 V	1 V	±(2 % of reading + 2 digits)
Frequency	0.00 Hz … 999.99 Hz	0.01 Hz	±(0.2 % of reading + 1 digit)
Phase sequence (EN 61557-7)	1.2.3 or 3.2.1		
RCD testing (EN 61557-6)	$I_{\Delta N}$: 10 mA, 30 mA, 100 mA, 300 mA, 500 mA, 1 A		
- Contact voltage U_C	0.0 V … 19.9 V 20.0 V … 99.9 V	0.1 V 0.1 V	(-0 % / +15 %) of reading ± 10 digits (-0 % / +15 %) of reading
- Trip-out time	0.0 ms … 40.0 ms 0.0 ms … max. time	0.1 ms 0.1 ms	±1 ms ±3 ms
- Trip-out current	0.2 x $I_{\Delta N}$ … 1.1 x $I_{\Delta N}$ (AC type) 0.2 x $I_{\Delta N}$ … 1.5 x $I_{\Delta N}$ (A type, $I_{\Delta N} \geq 30$ mA) 0.2 x $I_{\Delta N}$ … 2.2 x $I_{\Delta N}$ (A type, $I_{\Delta N} < 30$ mA) 0.2 x $I_{\Delta N}$ … 2.2 x $I_{\Delta N}$ (B type)	0.05 x $I_{\Delta N}$ 0.05 x $I_{\Delta N}$ 0.05 x $I_{\Delta N}$ 0.05 x $I_{\Delta N}$	±0.1 x $I_{\Delta N}$ ±0.1 x $I_{\Delta N}$ ±0.1 x $I_{\Delta N}$ ±0.1 x $I_{\Delta N}$
Earth resistance (EN 61557-5) (three-wire method)	0.00 Ω … 19.99 Ω 20.0 Ω … 199.9 Ω 200 Ω … 1999 Ω 2000 Ω … 9999 Ω	0.01 Ω 0.1 Ω 1 Ω 1 Ω	±(3 % of reading + 3 digits) ±(3 % of reading + 3 digits) ±(5 % of reading) ±(10 % of reading)
Specific earth resistance	0.0 Ωm … 99.9 Ωm 100 Ωm … 999 Ωm 1.00 kΩm … 9.99 kΩm 10.0 kΩm … 99.9 kΩm > 100 kΩm	0.1 Ωm 1 Ωm 0.01 kΩm 0.1 kΩm 1 kΩm	±(5 % of reading) ±(5 % of reading) ±(5 % of reading); ±(10 % of reading) ±(10 % of reading); ±(20 % of reading) ±(20 % of reading)
Varistor Test	0 … 625 V_{AC}; 0 … 1000 V_{DC}	1 V	±(3 % of reading + 3 digits)
Power supply	6 x 1.2 V rechargeable batteries, type AA		
Overvoltage category	CAT III / 600 V; CAT IV / 300 V		
Protection class	Double insulation		
COM port	RS232 and USB		
Dimensions	230 x 103 x 115 mm		
Weight	1.3 kg		

STANDARD SET:

- Instrument EurotestAT
- Plug commander, 1.5 m
- Test lead, 3 x 1.5 m
- Power supply adapter + 6 NiMH recharge-able batteries, type AA
- Test probe, 3 pcs (blue, black, green)
- Crocodile clip, 3 pcs (blue, black, green)
- RS232 - PS/2 cable
- USB cable
- Soft carrying bag
- Soft carrying neck belt
- PC Software EuroLink PRO
- Short Instruction manual
- Instruction manual on CD
- Handbook on CD
- Calibration certificate

Accessories: page 8.01

MI 3105 EurotestXA

The top model of Metrel's installation testers is MI 3105 EurotestXA. Features including "All-in-one" insulation testing, *AUTO SEQUENCE* ® testing, integrated characteristics of fuses and RCDs (including B type), PASS / FAIL evaluation of test results, 10-level memory structure and built-in battery charger make the EurotestXA an exemplary instrument. Additional features include TRMS current measurement, 3-wire / one clamp / two clamps earth resistance and 4-wire specific earth resistance measurements, illumination measurement and fuse / fault locator function. All the results can be quickly saved and then downloaded via the EuroLink PRO software to the computer for evaluation and professional report generation after testing. The MI 3105 EurotestXA performs continuity, insulation, RCD, loop, line, voltage, frequency, earth resistance and phase sequence testing required by the EN 61557 standard.

MEASURING FUNCTIONS:

- Insulation resistance with DC voltage.
- Continuity of PE conductors with 200 mA test current with polarity change.
- Continuity of PE conductors with 7 mA test current (continuous measurement) without RCD tripping.
- Line impedance.
- Loop impedance.
- Loop impedance with Trip Lock RCD function.
- TRMS voltage and frequency.
- Phase sequence.
- RCD testing (general and selective, type AC, A and B).
- Earth resistance (3-wire method, one clamp method, two clamps method).
- Specific earth resistance (option).
- TRMS leakage and load currents.
- Overvoltage protection devices testing.
- Illumination (option).
- Tracing the installations (option).
- Testing of Insulation Monitoring Devices (IMDs).
- First fault leakage current in IT systems.
- High resolution loop impedance (mΩ).

KEY FEATURES:

- **Autosequences:** Testing of electrical installation safety with *AUTO SEQUENCE*® is up to 5 times faster compared to traditional installation tester.
- **All-in-one insulation:** insualation tests between L-N, L-PE and N-PE can be performed simultaneously in less than 10 seconds.
- **Medical site testing:** measurement of First fault leakage current (ISFL) and insulation monitoring device (IMD) checking.
- **Structure building:** a structure of the installation (up to 10 levels) can be built either using the software (which can then be sent to the instrument) or directly on the tester so that test results are always saved on the correct circuit.
- **Fuse location:** function enables the locating of fuses / wires / faults with the help of the optional A 1191 Fuse locator.
- **Earth resistance measurement:** Tester can perform 3-wire earth resistance testing, one clamp and two clamps earth resistance and specific earth resistance measurement.
- **Downloadable:** downloads via RS232 or USB cable directly to the PC with the help of the software included in the standard set.
- **Help screens:** instrument comes complete with built-in help screens for referencing on site.
- **Built-in fuse tables:** this unique feature allows automatic evaluation of the line / loop impedance compared to the regulations.
- **Online voltage monitoring:** monitors all 3 voltages in real-time.
- **Upgradeable:** if changes occur to the regulations upgrades can be made to the firmware to keep the instrument up to date.
- **Polarity swap:** automatic polarity reversal on continuity test.
- **Insulation range:** wide range of insulation test voltages from 50 V to 1000 V, reading up to 1000 MΩ.
- **Trip Lock function:** Zs (RCD) function performs a loop impedance test without tripping the RCD.
- **Multi-system testing:** tests on TT, TN, IT and reduced low voltage systems.
- **Wide frequency range:** 14 ... 500 Hz.
- **Built-in charger & rechargeable batteries:** unit has a built-in charging circuit and comes complete with a set of rechargeable NiMH batteries.
- **RCD auto:** automated RCD testing procedure significantly reduces test time.
- **B type RCD testing** is supported.
- **PC SW EuroLink PRO** included in the the standard set enables downloading of test results and parameters and creation of test reports.

APPLICATION:

- Initial and periodic testing of domestic and industrial installations
- Testing on high and low frequency installations e.g. testing in aviation, railway networks etc.
- Testing of single and multiphase systems.
- Testing of TT, TN, IT and 115 V systems.
- High volume testing (industrial, aircraft, railway, mining, chemistry, fery boat)
- Medical installation testing.

STANDARDS:

Functionality: IEC/EN 61557
Other reference standards for testing: IEC/EN/HD 60364; IEC/EN 61008; IEC/EN 61009; IEC/EN/TR 60755; BS 7671; AS/NZ 3760; AS/NZ 3018; AS/NZ 3017; CEI 64.8; HD 384; VDE 0413
Electromagnetic compatibility: IEC/EN 61326-1; IEC/EN 61326-2-2
Safety: IEC/EN 61010-1; IEC/EN 61010-031

TECHNICAL DATA:

Function	Measuring range	Resolution	Accuracy
Insulation resistance (EN 61557-2)	U=50, 100, 250 V_{DC}: R: 0.00 MΩ … 19.99 MΩ 20.0 MΩ … 99.9 MΩ 100.0 MΩ … 199.9 MΩ U= 500 V_{DC}, 1 kV_{DC}: R: 0.00 MΩ … 19.99 MΩ 20.0 MΩ … 199.9 MΩ 200 MΩ … 299 MΩ 300 MΩ … 1000 MΩ	 0.01 MΩ 0.1 MΩ 0.1 MΩ 0.01 MΩ 0.1 MΩ 1 MΩ 1 MΩ	 ±(5 % of reading + 5 digits) ±10 % of reading ±20 % of reading ±(5 % of reading + 3 digits) ±10 % of reading ±10 % of reading ±20 % of reading
Continuity 200mA of PE conductor with polarity change (EN 61557-4)	0.00 Ω … 19.99 Ω 20.0 Ω … 199.9 Ω 200 Ω … 1999 Ω 2000 Ω … 9999 Ω	0.01 Ω 0.1 Ω 1 Ω 1 Ω	±(3 % of reading + 3 digits) ±5 % of reading ±5 % of reading indicative
Low resistance continuity measurement, test current 7 mA (Continuous measurement)	0.0 Ω … 19.9 Ω 20 Ω … 1999 Ω 2000 Ω … 9999 Ω	0.1 Ω 1 Ω 1 Ω	±(5 % of reading + 3 digits) ±(5 % of reading + 3 digits) indicative
Line impedance (EN 61557-3)	0.00 Ω … 9.99 Ω 10.0 Ω … 99.9 Ω 100 Ω … 999 Ω 1.00 kΩ … 9.99 kΩ 10.0 kΩ … 19.9 kΩ	0.01 Ω 0.1 Ω 1 Ω 10 Ω 100 Ω	±(5 % of reading + 5 digits)
Loop impedance (EN 61557-3)	0.00 Ω … 9.99 Ω 10.0 Ω … 99.9 Ω 100 Ω … 19999 Ω	0.01 Ω 0.1 Ω 1 Ω	±(5 % of reading + 5 digits)
Voltage	0 V … 550 V	1 V	±(2 % of reading + 2 digits)
Frequency	0.00 Hz … 999.99 Hz	0.01 Hz	±(0.2 % of reading + 1 digit)
Phase sequence (EN 61557-7)	1.2.3 or 3.2.1		
RCD testing (EN 61557-6)	$I_{\Delta N}$: 10 mA, 30 mA, 100 mA, 300 mA, 500 mA, 1 A		
- Contact voltage U_C	0.0 V … 19.9 V 20.0 V … 99.9 V	0.1 V 0.1 V	(-0 % / +15 %) of reading ± 10 digits (-0 % / +15 %) of reading
- Trip-out time	0.0 ms … 40.0 ms 0.0 ms … max. time	0.1 ms 0.1 ms	±1 ms ±3 ms
- Trip-out current	0.2 x $I_{\Delta N}$ … 1.1 x $I_{\Delta N}$ (AC type) 0.2 x $I_{\Delta N}$ … 1.5 x $I_{\Delta N}$ (A type, $I_{\Delta N} \geq$ 30 mA) 0.2 x $I_{\Delta N}$ … 2.2 x $I_{\Delta N}$ (A type, $I_{\Delta N}$ < 30 mA) 0.2 x $I_{\Delta N}$ … 2.2 x $I_{\Delta N}$ (B type)	0.05 x $I_{\Delta N}$ 0.05 x $I_{\Delta N}$ 0.05 x $I_{\Delta N}$ 0.05 x $I_{\Delta N}$	±0.1 x $I_{\Delta N}$ ±0.1 x $I_{\Delta N}$ ±0.1 x $I_{\Delta N}$ ±0.1 x $I_{\Delta N}$
Earth resistance (EN 61557-5) (three-wire method; one clamp method)	0.00 Ω … 19.99 Ω 20.0 Ω … 199.9 Ω 200 Ω … 1999 Ω 2000 Ω … 9999 Ω	0.01 Ω 0.1 Ω 1 Ω 1 Ω	±(3 % of reading + 3 digits) ±(3 % of reading + 3 digits) ±5 % of reading ±10 % of reading
Earth resistance (two clamps method)	0.00 Ω … 19.99 Ω 20.0 Ω … 30.0 Ω 30.1 Ω … 39.9 Ω	0.01 Ω 0.1 Ω 0.1 Ω	±(10 % of reading + 10 digits) ±20 % of reading ±30 % of reading
Specific earth resistance	0.0 Ωm … 99.9 Ωm 100 Ωm … 999 Ωm 1.00 kΩm … 9.99 kΩm 10.0 kΩm … 99.9 kΩm > 100 kΩm	0.1 Ωm 1 Ωm 0.01 kΩm 0.1 kΩm 1 kΩm	±5 % of reading ±5 % of reading ±(5 % of reading); ±(10 % of reading) ±(10 % of reading); ±(20 % of reading) ±20 % of reading
TRMS Current	0.0 mA … 99.9 mA 100 mA … 999 mA 1.00 A … 19.99 A	0.1 mA 1 mA 0.01 A	±(3 % of reading + 3 digits)
Illuminance (Type B)	0.00 lux … 19.99 lux 20.0 lux … 199.9 lux 200 lux … 1999 lux 2.00 klux … 19.99 klux	0.01 lux 0.1 lux 1 lux 10 lux	±(5 % of reading + 2 digits)
Varistor Test	0 … 625 V_{AC}; 0 … 1000 V_{DC}	1 V	±(3 % of reading + 3 digits)
Power supply	6 x 1.2 V rechargeable batteries, type AA		
Overvoltage category	CAT III / 600 V; CAT IV / 300 V		
Protection class	Double insulation		
COM port	RS232 and USB		
Dimensions	230 x 103 x 115 mm		
Weight	1.3 kg		

STANDARD SET:

MI 3105 ST
- Instrument EurotestXA
- Plug commander, 1.5 m
- Test lead, 3 x 1.5 m
- Power supply adapter + 6 NiMH recharge-able batteries, type AA
- Test probe, 3 pcs (blue, black, green)
- Crocodile clip, 3 pcs (blue, black, green)
- RS232 - PS/2 cable
- USB cable
- Soft carrying bag
- Soft carrying neck belt
- PC Software EuroLink PRO
- Short instruction manual
- Instruction manual on CD
- Handbook on CD
- Calibration certificate

MI 3105 EU
- MI 3105 ST
- Current clamp A 1018 (low range, leakage)
- PC Software EuroLink PRO Plus

MI 3105 EU

Accessories: page 8.01

MI 2086 Eurotest 61557

The MI 2086 Eurotest 61557 performs complete testing of electrical installations and enables a number of additional features including TRMS current measurement, 4-wire / one clamp / two clamps earth resistance and 4-wire specific earth resistance measurements, illumination measurement and fuse / fault locator function. The handling of the instrument is simple and clear. Each test has its own individual help screen describing how to connect the instrument into the installation and how to perform a measurement. All the results can be saved on the instrument and then downloaded with the help of the EuroLink LITE software to the computer for evaluation and report generation after testing. The MI 2086 Eurotest 61557 performs continuity, insulation, RCD, loop, line, voltage, frequency, earth resistance and phase sequence testing required by the EN 61557 standard.

MEASURING FUNCTIONS:

- Insulation resistance with DC voltage.
- Continuity of PE conductors with 200 mA test current with polarity change.
- Continuity of PE conductors with 7 mA test current (continuous measurement) without RCD tripping.
- Line impedance.
- Loop impedance.
- Loop resistance with Trip Lock function.
- Voltage and frequency.
- Phase sequence.
- RCD testing (general and selective, type AC and A).
- Earth resistance (4-wire method, one clamp method, two clamps method).
- Specific earth resistance.
- TRMS leakage and load currents.
- Overvoltage protection devices testing.
- Illumination (option).
- Tracing the installations (option).
- High resolution loop impedance (mΩ).

KEY FEATURES:

- **Fuse location:** function enables the locating of fuses / wires / faults with the help of the optional A 1005 Fuse locator.
- **Earth resistance measurement:** instrument performs 4-wire earth resistance measurement with two additional rods; 4-wire earth resistance measurement in combination with an additional current clamp; earth resistance measurement with 2 current clamps without breaking the loop and 4-wire specific earth resistance measurement.
- **Downloadable:** downloads via RS232 cable directly to the PC with the help of the software included in the standard set.
- **Help screens:** instrument comes complete with built-in help screens for referencing on site.
- **Polarity swap:** automatic polarity reversal on continuity test.
- **Insulation range:** wide range of insulation test voltages from 50 V to 1000 V, reading up to 1000 MΩ.
- **Trip Lock function:** RLOOP function performs a loop resistance test without tripping the RCD.
- **RCD auto:** automated RCD testing procedure significantly reduces test time.
- **PC SW EuroLink LITE** included in the the standard set enables downloading of test results and parameters and creation of test reports.

APPLICATION:

- Initial and periodic testing of domestic and industrial installations
- Testing of single and multiphase systems.
- Testing of TT and TN systems.

STANDARDS:

Functionality:
IEC/EN 61557
Other reference standards for testing:
IEC/EN/HD 60364; IEC/EN 61008; IEC/EN 61009; IEC/EN/TR 60755; AS/NZ 3018; CEI 64.8; HD 384; BS 7671; VDE 0413
Electromagnetic compatibility:
EN 50081 - 1; EN 50082 - 1
Safety: IEC/EN 61010-1; IEC/EN 61010-031; IEC/EN 61010-2-032

TECHNICAL DATA:

Function	Measuring range	Resolution	Accuracy
Insulation resistance (EN 61557-2)	U = 50, 100 V_{DC}: R: 0.000 MΩ … 1.999 MΩ 2.00 MΩ … 19.99 MΩ 20.0 MΩ … 199.9 MΩ U= 250, 500, 1000 V_{DC}: R: 0.000 MΩ … 1.999 MΩ 2.00 MΩ … 19.99 MΩ 20.0 MΩ … 199.9 MΩ 200 MΩ … 1000 MΩ	 0.001 MΩ 0.01 MΩ 0.1 MΩ 0.001 MΩ 0.01 MΩ 0.1 MΩ 1 MΩ	 ±(5 % of reading + 3 digits) ±(5 % of reading + 3 digits) ±(5 % of reading + 3 digits) ±(2 % of reading + 2 digits) ±(2 % of reading + 2 digits) ±(2 % of reading + 2 digits) ±10 % of reading
Continuity of PE conductor with polarity change, test current 200 mA (EN 61557-4)	0.00 Ω … 19.99 Ω 20.0 Ω … 199.9 Ω 200 Ω … 1999 Ω	0.01 Ω 0.1 Ω 1 Ω	±(2 % of reading + 2 digits) ±3 % of reading ±3 % of reading
Low resistance continuity measurement, test current 7mA (continuous measurement)	0.0 Ω … 199.9 Ω 200 Ω … 2000 Ω	0.1 Ω 1 Ω	±(3 % of reading + 3 digits) ±(3 % of reading + 3 digits)
Loop impedance (EN 61557-3)	0.00 Ω … 19.99 Ω 20.0 Ω … 199.9 Ω 200 Ω … 2000 Ω	0.01 Ω 0.1 Ω 1 Ω	±(2 % of reading + 3 digits)
Line impedance (EN 61557-3)	0.00 Ω … 19.99 Ω 20.0 Ω … 199.9 Ω 200 Ω … 2000 Ω	0.01 Ω 0.1 Ω 1 Ω	±(2 % of reading + 3 digits)
Voltage	0 V … 440 V	1 V	±(2 % of reading + 2 digits)
Phase sequence (EN 61557-7)	1.2.3 or 2.1.3.		
RCD testing (EN 61557-6)	$I_{\Delta N}$: 10 mA, 30 mA, 100 mA, 300 mA, 500 mA, 1 A		
- Contact voltage U_C	0.0 V … 9.99 V 10.0 V … 100.0 V	0.01 V 0.1 V	(-0 / +10 %) of reading ± 0.2 V (-0 / +10 %) of reading
- Trip-out time	0 ms … 500 ms	1 ms	±3 ms
- Trip-out current	0.2 x $I_{\Delta N}$ … 1.1 x $I_{\Delta N}$ (AC type) 0.2 x $I_{\Delta N}$ … 1.5 x $I_{\Delta N}$ (A type)	0.05 x $I_{\Delta N}$ 0.05 x $I_{\Delta N}$	±0.1 x $I_{\Delta N}$ ±0.1 x $I_{\Delta N}$
Earth resistance (EN 61557-5) (4-wire method; 4-wire method with one clamp)	0.00 Ω … 19.99 Ω 20.0 Ω … 199.9 Ω 200 Ω … 1999 Ω 2.00 kΩ … 19.99 kΩ	0.01 Ω 0.1 Ω 1 Ω 10 Ω	±(2 % of reading + 3 digits) ±(2 % of reading + 3 digits) ±(2 % of reading + 3 digits) ± 5 % of reading
Earth resistance, two clamps method	0.00 Ω … 19.99 Ω 20.0 Ω … 100.0 Ω	0.01 Ω 0.1 Ω	±(10 % of reading + 2 digits) ± 20 % of reading
Current TRMS	0.0 mA … 99.9 mA 100 mA … 999 mA 1.00 A … 9.99 A 10.0 A … 99.9 A 100 A … 200 A	0.1 mA 1 mA 0.01 A 0.1 A 1 A	±(5 % of reading + 3 digits) ± 5 % of reading ± 5 % of reading ± 5 % of reading ± 5 % of reading
Varistor Test	0 V … 1000 V	1 V	± (5 % of reading +10 V)
Illuminance (Type B)	0.00 lux … 19.99 lux 20.0 lux … 199.9 lux 200 lux … 1999 lux 2.00 klux … 19.99 klux	0.01 lux 0.1 lux 1 lux 10 lux	±(5 % of reading + 2 digits)
Power supply	4 x 1.2 V rechargeable batteries or 4 x 1.5 V alkaline batteries, type C		
Over voltage category	CAT III / 300 V; CAT II / 600 V		
Protection class	Double insulation		
COM port	RS232		
Dimensions	265 x 110 x 185 mm		
Weight	2.1 kg		

STANDARD SET:

MI 2086 ST
- Instrument Eurotest 61557
- Plug commander, 1.5 m
- Test lead, 3 x 1.5 m
- Crocodile clip
- Test probe, 2 pcs (blue, black)
- RS232 cable
- PC Software EuroLink LITE
- Set of carrying belts
- Soft carrying bag
- Instruction manual
- Handbook on CD
- Calibration certificate

MI 2086 EU
- MI 2086 ST
- Current clamp A 1018 (low range, leakage)
- Test lead, 4 m
- PC Software EuroLink PRO

MI 2086 EU

Accessories: page 8.01

MI 2087 Instaltest 61557

The MI 2087 Instaltest 61557 is a high professional, multifunctional, portable test instrument intended for testing of electrical installations. Additional features include illumination measurement, overvoltage protection devices testing and fuse /fault locator function. Plug commander included in the standard set makes measurements easier and faster. All the results can be saved on the instrument and then downloaded with the help of the EarthLink software to the computer for evaluation and report generation after testing. The MI 2087 Instaltest 61557 performs continuity, insulation, RCD, loop, line, voltage, frequency and phase sequence testing required by the EN 61557 standard.

MEASURING FUNCTIONS:

- Insulation resistance with DC voltage.
- Continuity of PE conductors with 200 mA test current with polarity change.
- Continuity of PE conductors with 7 mA test current (continuous measurement) without RCD tripping.
- Line resistance.
- Loop resistance.
- Voltage and frequency.
- Phase sequence.
- RCD testing (general and selective, type AC).
- Overvoltage protection devices testing.
- Illumination (option).
- Tracing the installations (option).

KEY FEATURES:

- **Fuse location:** function enables the locating of fuses / wires / faults with the help of the optional A 1005 Fuse locator.
- **Downloadable:** downloads via RS232 cable directly to the PC with the help of the software included in the standard set.
- **Polarity swap:** automatic polarity reversal on continuity test.
- **Insulation range:** wide range of insulation test voltages from 50 V to 1000 V, reading up to 1000 MΩ.
- **RCD auto:** automated RCD testing procedure significantly reduces test time.
- **PC SW InstalLink:** included in the the standard set enables downloading of test results and parameters and creation of test reports.

APPLICATION:

- Initial and periodic testing of domestic and industrial installations
- Testing of single and multiphase systems.
- Testing of TT and TN systems.

STANDARDS:

Functionality:
IEC/EN 61557
Other reference standards for testing:
IEC/EN/HD 60364;
IEC/EN 61008;
IEC/EN 61009;
IEC/EN/TR 60755;
AS/NZ 3018;
CEI 64.8;
HD 384;
BS 7671;
VDE 0413

Electromagnetic compatibility:
EN 50081 - 1
EN 50082 - 1

Safety:
IEC/EN 61010-1;
IEC/EN 61010-031

Accessories: page 8.01

TECHNICAL DATA:

Function	Measuring range	Resolution	Accuracy
Insulation resistance (EN 61557-2)	U < 250 V_{DC}: R: 0.000 MΩ … 1.999 MΩ 2.00 MΩ … 19.99 MΩ 20.0 MΩ … 199.9 MΩ U ≥ 250 V_{DC}: R: 0.000 MΩ … 1.999 MΩ 2.00 MΩ … 19.99 MΩ 20.0 MΩ … 199.9 MΩ 200 MΩ … 1000 MΩ	 0.001 MΩ 0.01 MΩ 0.1 MΩ 0.001 MΩ 0.01 MΩ 0.1 MΩ 1 MΩ	 ±(5 % of reading + 3 digits) ±(5 % of reading + 3 digits) ±(5 % of reading + 3 digits) ±(2 % of reading + 2 digits) ±(2 % of reading + 2 digits) ±(2 % of reading + 2 digits) ±(10 % of reading)
Continuity of PE conductor, with polarity change, test current 200 mA (EN 61557-4)	0.00 Ω … 19.99 Ω 20.0 Ω … 199.9 Ω 200 Ω … 1999 Ω	0.01 Ω 0.1 Ω 1 Ω	±(2 % of reading + 2 digits) ±(3 % of reading) ±(3 % of reading)
Low resistance continuity measurement, test current 7 mA (continuous measurement)	0.0 Ω … 199.9 Ω 200 Ω … 2000 Ω	0.1 Ω 1 Ω	±(3 % of reading + 3 digits) ±(3 % of reading + 3 digits)
Loop resistance (EN 61557-3)	0.00 Ω … 19.99 Ω 20.0 Ω … 199.9 Ω 200 Ω … 1999 Ω	0.01 Ω 0.1 Ω 1 Ω	±(5 % of reading + 5 digits)
Line resistance (EN 61557-3)	0.00 Ω … 19.99 Ω 20.0 Ω … 199.9 Ω 200 Ω … 1999 Ω	0.01 Ω 0.1 Ω 1 Ω	±(5 % of reading + 5 digits)
Phase sequence (EN 61557-7)	1.2.3 or 2.1.3		
RCD testing (EN 61557-6)	10 mA, 30 mA, 100 mA, 300 mA, 500 mA, 1 A		
- Contact voltage UC	0.00 V … 9.99 V 10.0 V … 100.0 V	0.01 V 0.1 V	(-0 / +10)% of reading ± 0.2 V (-0 / +10)% of reading
- Trip-out time	0.0 ms … 500 ms	1 ms	±3 ms
- Trip-out current	0.2 x $I_{\Delta N}$ … 1.1 x $I_{\Delta N}$	0.05 x $I_{\Delta N}$	±0.1 x $I_{\Delta N}$
Voltage	0 V … 440 V	1 V	±(2 % of reading + 2 digits)
Frequency	45.0 Hz … 65.0 Hz	0.1 Hz	±(0.1 % of reading + 1 digit)
Varistor Test	0 V … 1000 V	1 V	± (5 % of reading + 10 V)
Illuminance (Type B)	0.00 lux … 19.99 lux 20.0 lux … 199.9 lux 200 lux … 1999 lux 2.00 klux … 19.99 klux	0.01 lux 0.1 lux 1 lux 10 lux	±(5 % of reading + 2 digits)
Power supply	4 x 1.2 V rechargeable batteries or 4 x 1.5 V alkaline batteries, type C		
Over voltage category	CAT III / 300 V; CAT II / 600 V		
Protection class	Double insulation		
COM port	RS232		
Dimensions	265 x 110 x 185 mm		
Weight	1.8 kg		

STANDARD SET:

MI 2087
- Instrument Instaltest 61557
- Plug commander, 1.5 m
- Test lead, 3 x 1.5 m
- Crocodile clip
- Test probe, 2 pcs (blue, black)
- RS232 cable
- PC Software InstalLink
- Soft carrying bag
- Instruction manual
- Handbook on CD
- Calibration certificate

Accessories: page 8.01

MI 2088 Earth - Insulation Tester

The MI 2088 Earth - Insulation Tester is a high professional, multifunctional, portable test instrument intended for carrying out earth resistance, insulation resistance and continuity of protection conductors measurements. The Earth - Insulation Tester enables 4-wire earth resistance measuring method, 4-wire earth resistance method in combination with one clamp, two clamps earth resistance measurement, 4-wire specific earth resistance measurement and TRMS current measurement. Besides the breakdown voltage of overvoltage protection devices can be checked by the instrument. All the results can be saved on the instrument and then downloaded with the help of the EarthLink software to the computer for evaluation and report generation after testing. The MI 2088 Earth - Insulation Tester performs earth resistance, continuity, insulation and voltage measurements required by the EN 61557 standard.

MEASURING FUNCTIONS:

- Insulation resistance with DC voltage.
- Continuity of PE conductors with 200 mA test current with polarity change.
- Continuity of PE conductors with 7 mA test current (continuous measurement) without RCD tripping.
- Voltage.
- Earth resistance (4-wire method, one clamp method, two clamps method).
- Specific earth resistance.
- TRMS leakage and load currents (option).
- Overvoltage protection devices testing.

KEY FEATURES:

- **Earth resistance measurement:** instrument performs 4-wire earth resistance measurement with two additional rods; 4-wire earth resistance measurement in combination with an additional current clamp; earth resistance measurement with 2 current clamps without breaking the loop and 4-wire specific earth resistance measurement.
- **Downloadable:** downloads via RS232 cable directly to the PC with the help of the software included in the standard set.
- **Polarity swap:** automatic polarity reversal on continuity test.
- **Insulation range:** wide range of insulation test voltages from 50 V to 1000 V, resistance measuring range up to 30 GΩ.
- **PC SW EarthLink** included in the the standard set enables downloading of test results and parameters and creation of test reports.

APPLICATION:

- Initial and periodic testing of domestic and industrial installations
- Testing of single and multiphase systems.
- Testing of TT and TN systems.

STANDARDS:

Functionality:
IEC/EN 61557
Other reference standards for testing:
IEC/EN/HD 60364;
AS/NZ 3018;
CEI 64.8;
HD 384;
BS 7671;
VDE 0413
Electromagnetic compatibility:
EN 50081-1; EN 50082-1
Safety:
IEC/EN 61010-1; IEC/EN 61010-031;
IEC/EN 61010-2-032

Accessories: page 8.01

TECHNICAL DATA:

Function	Measuring range	Resolution	Accuracy
Insulation resistance (EN 61557-2)	U ≥ 250 VDC: R: 0.000 MΩ … 1.999 MΩ 2.00 MΩ … 19.99 MΩ 20.0 MΩ … 199.9 MΩ 200 MΩ … 1999 MΩ 2.00 GΩ … 19.99 GΩ 20.0 GΩ … 29.9 GΩ U < 250 VDC: R: 0.000 MΩ … 1.999 MΩ 2.00 MΩ … 19.99 MΩ 20.0 MΩ … 199.9 MΩ	 0.001 MΩ 0.01 MΩ 0.1 MΩ 1 MΩ 10 MΩ 100 MΩ 0.001 MΩ 0.01 MΩ 0.1 MΩ	 ±(2 % of reading + 2 digits) ±(2 % of reading + 2 digits) ±(2 % of reading + 2 digits) ±(1 % of r. / 1 GΩ + 2% of r. + 2 digits) ±(1 % of r. / 1 GΩ + 2% of r. + 2 digits) ±(1 % of r. / 1 GΩ + 2% of r. + 2 digits) ±(5 % of reading + 3 digits) ±(5 % of reading + 3 digits) ±(5 % of reading + 3 digits)
Continuity 200 mA of PE conductor with polarity change (EN 61557-4)	0.00 Ω … 19.99 Ω 20.0 Ω … 199.9 Ω 200 Ω … 1999 Ω	0.01 Ω 0.1 Ω 1 Ω	±(2 % of reading + 2 digits) ±(3 % of reading) ±(3 % of reading)
Low resistance continuity measurement, test current 7 mA (continuous measurement)	0.0 Ω … 199.9 Ω 200 Ω … 1999 Ω	0.1 Ω 1 Ω	±(3 % of reading + 3 digits) ±(3 % of reading + 3 digits)
Earth resistance 4-wire method	0.00 Ω … 19.99 Ω 20.0 Ω … 199.9 Ω 200 Ω … 1999 Ω 2.00 kΩ … 19.99 kΩ	0.01 Ω 0.1 Ω 1 Ω 10 Ω	±(2 % of reading + 3 digits) ±(2 % of reading + 3 digits) ±(2 % of reading + 3 digits) ±(5 % of reading)
Earth resistance 4-wire method with one current clamp	0.00 Ω … 19.99 Ω 20.0 Ω … 199.9 Ω 200 Ω … 999 Ω 1.00 kΩ … 1.99 kΩ	0.01 Ω 0.1 Ω 1 Ω 10 Ω	±(2 % of reading + 3 digits) ±(2 % of reading + 3 digits) ±(2 % of reading + 3 digits) ±(2 % of reading + 3 digits)
2-clamp earth resistance measurement	0.00 Ω … 19.99 Ω 20.0 Ω … 100.0 Ω	0.01Ω 0.1Ω	±(10 % of reading + 2 digits) ±(20 % of reading)
Specific earth resistance (EN 61557-5)	0.00 Ω … 19.99 Ω 20.0 Ω … 199.9 Ω 200 Ω … 1999 Ω 2.00 kΩ … 19.99 kΩ 20.0 kΩ … 199.9 kΩ 200 kΩ … 999 kΩ (a < 8 m) 200 kΩ … 1999 kΩ (a ≥ 8m)	0.01 Ω 0.1 Ω 1 Ω 10 Ω 0.1 kΩ 1 kΩ 1 kΩ	±(2 % of reading + 3 digits) ±(2 % of reading + 3 digits) ±(2 % of reading + 3 digits) ±(5 % of reading) ±(5 % of reading) ±(5 % of reading) ±(5 % of reading)
TRMS Current	0.0 mA … 99.9 mA 100 mA … 999 mA 1.00 A … 9.99 A 10.0 A … 99.9 A 100 A … 200 A	0.1 mA 1 mA 0.01 A 0.1 A 1 A	±(5 % of reading + 3 digits) ±(5 % of reading) ±(5 % of reading) ±(5 % of reading) ±(5 % of reading)
Varistor Test	0 V … 1000 V	1 V	±(5 % of reading + 10 V)
Power supply	4 x 1.2 V rechargeable batteries or 4 x 1.5 V alkaline batteries, type C		
Over voltage category	CAT III / 300 V; CAT II / 600 V		
Protection class	Double insulation		
COM port	RS232		
Dimensions	265 x 110 x 185 mm		
Weight	1.7 kg		

STANDARD SET:

MI 2088 ST
- Instrument Earth-Insulation Tester
- Test lead, 2 x 1,5 m
- Soft carrying bag
- RS232 cable
- Test probe, 2 pcs (red, black)
- Crocodil clip
- PC Software EarthLink
- Instruction manual
- Handbook on CD
- Calibration certificate

MI 2088 - 20 m
- MI 2088 ST
- Earth test set, 20 m (test lead, 4 x 1 m; 2 x test lead, 20 m; 2 x test lead, 4.5 m; 4 x earth test rod; small soft carrying bag)

MI 2088 - 50 m
- MI 2088 ST
- Earth test set, 50 m (test lead, 4 x 1 m; 2 x test lead, 50 m; 2 x test lead, 1 m; 2 x test lead, 4.5 m; 4 x earth test rod; soft carrying bag)

MI 2088 - 50 m

Accessories: page 8.01

Selection Guide for Single-functional Testers

Part No.		MI 3121	MI 3122
		Insulation / Continuity	Z Line-Loop / RCD
Features	**Description**		
INSULATION	Insulation resistance	✓	–
	Test voltage (V_{DC})	50 … 1000	–
CONTINUITY AND LOW RESISTANCE MEASUREMENT	Continuity of PE conductor with automatic polarity change, test current 200mA	✓	–
	Low resistance measurement (continuous measurement), test current 7 mA.	✓	–
LINE / LOOP IMPEDANCE	Line impedance with Ipsc calculation	–	✓
	Loop impedance with Ipsc calculation	–	✓
	RCD Trip Lock loop impedance	–	✓
	Built-in fuse tables for PASS / FAIL evaluation	–	✓
RCD TESTING	Contact voltage without RCD tripping	–	✓
	RCD trip-out time	–	✓
	RCD trip-out current with rising test current	–	✓
	Automatic testing of RCDs	–	✓
	RCD type (general and selective)	–	A , AC
VOLTAGE, FREQUENCY	AC voltage measurement	✓	–
	Online voltage monitor	–	✓
	Frequency measurement	✓	✓
PHASE SEQUENCE	L1 - L2 - L3	–	✓
EARTH, CURRENT MEASUREMENTS	Earth resistance 3-(4-)wire method	–	–
	Earth resistance 3-(4-)wire method with additional current clamp	–	–
	Earth resistance measurement with 2 current clamps	–	–
	Soil resistance measurement	–	–
	TRMS current	–	–
OTHER FEATURES	PASS / FAIL evaluation of test results	✓	✓
	Touch electrode	–	✓
	Help menu	–	✓
COMMUNICATION PORTS	RS232	✓	✓
	USB	✓	✓
MEMORY, SOFTWARE	Memory	✓	✓
	Number of memory levels / memory locations	2 / 1500	3 / 1500
	Professional PC SW	Option	Option
	Advanced PC SW	Option	Option
GENERAL DATA	Safety category	CAT III / 600 V CAT IV / 300 V	CAT III / 600 V CAT IV / 300 V
	Batteries	6 x AA	6 x AA
	Built-in battery charger	✓	✓
	Weight	850 g	930 g
	Dimentions (mm)	140 x 80 x 230	140 x 80 x 230

MI 3123 Earth / Clamp	MI 2126 Earth 2-3	MI 3103 GigaOhm 1 kV	MI 2150 Installcheck
			
–	–	✓	✓
–	–	250 … 1000	500
–	–	✓	–
–	–	✓	✓
–	–	–	✓
–	–	–	✓
–	–	–	✓
–	–	–	–
–	–	–	✓
–	–	–	✓
–	–	–	✓
–	–	–	–
–	–	–	A, AC (standard)
–	–	✓	–
–	–	–	–
–	–	–	–
–	–	–	✓
✓	✓	–	–
Option	–	–	–
Option	–	–	–
✓	–	–	–
Option	–	–	–
✓	–	–	✓
–	–	–	✓
✓	–	–	–
✓	–	–	–
✓	–	–	–
✓	–	–	–
3 / 1500	–	–	–
Option	–	–	–
Option	–	–	–
CAT IV / 50 V	–	CAT III / 300 V	CAT III / 300 V
6 x AA	4 x C	4 x C	4 x AA
✓	–	–	–
850 g	410 g	490 g	600 g
140 x 80 x 230	280 x 70 x 80	280 x 70 x 80	200 x 100 x 50

Accessories: page 8.01

MI 3121 SMARTEC® Insulation / Continuity

The MI 3121 SMARTEC Insulation / Continuity is a new generation tester for dead testing of electrical installations. With both an analogue and digital representation of the results, the instrument ensures accurate measurements up to 2000 Ω on continuity and up to 30 GΩ on insulation function. Configurable limits enable a PASS / FAIL evaluation of test results, which is accompanied with the bright red and green indicator lights for comfortable use even in the dark conditions. The MI 3121 is equipped with a built-in charger and has a magnetic holder in order to free up hands for testing. All the results can be quickly saved on the instrument and then downloaded via the optional A 1291 EuroLink PRO or A 1290 EuroLink PRO Plus software for evaluation and professional report generation after testing. The MI 3121 SMARTEC Insulation / Continuity performs continuity, insulation AC voltage and frequency measurement tests.

MEASURING FUNCTIONS:

- Insulation resistance with DC voltage.
- Continuity of PE conductors with 200 mA test current with polarity change.
- Continuity of PE conductors with 7 mA test current (continuous measurement) without RCD tripping.
- TRMS voltage and frequency.

KEY FEATURES:

- **Analogue scale and digital LCD:** measuring results are displayed both in numeric and analogue representation.
- **Downloadable:** downloads via RS232 or USB cable directly to the PC with the help of the optional software.
- **Upgradeable:** if changes occur to the regulations upgrades can be made to the firmware to keep the instrument up to date.
- **Polarity swap:** automatic polarity reversal on continuity test.
- **Insulation range:** wide range of insulation test voltages from 50 V to 1000 V, maesuring range up to 30 GΩ.
- **Built-in charger & rechargeable batteries:** instrument has a built-in charging circuit and comes complete with a set of rechargeable NiMH batteries.
- **Custom limits:** if limits are set on insulation or continuity function then large green and red lights of the LEDs will indicate a PASS or FAIL evaluation of test result.
- **Easy to use:** large bright LCD display and large buttons enable easy handling of the instrument (even while wearing gloves).
- **Magnetic holder:** magnet for fixing instrument on metal surfaces enables hands-free operation.

APPLICATION:

- Domestic dead circuit testing.
- Industrial dead circuit testing.
- Telecommunication systems testing.
- Resistance measurements.

STANDARDS:

Functionality:
IEC/EN 61557
Other reference standards for testing:
IEC/EN/HD 60364;
AS/NZ 3018;
CEI 64.8;
HD 384;
BS 7671;
VDE 0413
Electromagnetic compatibility:
IEC/EN 61326-1;
IEC/EN 61326-2-2
Safety:
IEC/EN 61010-1;

Accessories: page 8.01

TECHNICAL DATA:

Function	Measuring range	Resolution	Accuracy
Insulation resistance (EN 61557-2)	U = 500, 1000 V_{DC}: R: 0.00 MΩ … 19.99 MΩ 20.0 MΩ … 199.9 MΩ 200 MΩ … 999 MΩ 1.00 GΩ … 4.99 GΩ 5.00 GΩ … 19.99 GΩ 20.0 GΩ … 29.9 GΩ U = 50, 100, 250 V_{DC}: R: 0.00 MΩ … 19,99 MΩ 20.0 MΩ … 99.9 MΩ 100.0 MΩ … 199.9 MΩ	 0.01MΩ 0.1MΩ 1 MΩ 10 MΩ 10 MΩ 100 MΩ 0.01 MΩ 0.1 MΩ 0.1 MΩ	 ±(5 % of reading + 3 digits) ±5 % of reading ±5 % of reading ±10 % of reading ±20 % of reading indicative ±(5 % of reading + 3 digits) ±10 % of reading ±20 % of reading
Continuity 200 mA of PE conductor with polarity change (EN 61557-4)	0.00 Ω … 19.99 Ω 20.0 Ω … 199.9 Ω 200 Ω … 1999 Ω	0.01 Ω 0.1 Ω 1 Ω	±(3 % of reading + 3 digits) ±5 % of reading ±5 % of reading
Low resistance measurement with 7 mA test current (continuous measurement)	0.0 Ω … 19.9 Ω 20 Ω … 1999 Ω	0.1 Ω 1 Ω	±(5 % of reading + 3 digits) ±(5 % of reading + 3 digits)
Voltage	0.00 V … 9.99 V 10.0 V … 99.9 V 100 V … 550 V	0.01 V 0.1 V 1 V	±(3 % of reading + 3 digits)
Frequency	0.00 Hz … 19.99 Hz 20.0 Hz … 199.9 Hz 200 Hz … 500 Hz	0.01 Hz 0.1 Hz 1 Hz	±(0.2 % of reading + 1 digits)
Power supply	6 x 1.2 V rechargeable batteries, type AA		
Overvoltage category	CAT III / 600 V; CAT IV / 300 V		
Protection class	Double insulation		
COM port	RS232 and USB		
Dimensions	140 x 230 x 80 mm		
Weight	0.85 kg		

KEY FEATURES

Large LCD screen with backlight and PASS / FAIL indicators.

Simple and fast manipulation.

USB and RS232 communication ports.

STANDARD SET:

- Instrument Smartec Insulation / Continuity
- Soft hand strap
- Test lead, 2 x 1.5 m
- Test probe, 2 pcs (black, red)
- Crocodile clip, 2 pcs (black, red)
- Power supply adapter + 6 NiMH rechargeable batteries, type AA
- Instruction manual on CD
- Short instruction manual
- Handbook on CD
- Calibration certificate

Accessories: page 8.01

MI 3122 SMARTEC® Z Line-Loop / RCD

The MI 3122 SMARTEC Z Line-Loop / RCD is designed specifically for live circuit testing. The instrument contains integrated characteristics of fuses and RCDs for the evaluation of test results. The online voltage monitoring system allows the operator to control what is happening on three simultaneous voltages in real-time. The bright red and green PASS / FAIL lights and help screens for each measurement make the handling of the instrument easy and clear. All the results can be quickly saved on the instrument and then downloaded via the optional A 1291 EuroLink PRO or A 1290 EuroLink PRO Plus software for evaluation and professional report generation after testing. The MI 3122 SMARTEC Z Line-Loop / RCD performs RCD, loop, line, AC voltage, frequency and phase sequence tests required by the EN 61557 standard.

MEASURING FUNCTIONS:

- Line impedance.
- Loop impedance.
- Loop impedance with Trip Lock RCD function.
- TRMS voltage and frequency
- Phase sequence.
- RCD testing (general and selective, type AC and A).

KEY FEATURES:

- **Help screens:** instrument comes complete with built-in help screens for referencing on site.
- **LED Pass/Fail indicators:** two LED indicators for PASS / FAIL evaluation of test results are placed on both sides of the LCD.
- **Built-in fuse tables:** this unique feature allows automatic evaluation of the line / loop impedance compared to the regulations.
- **Online voltage monitoring:** monitors all 3 voltages in real-time.
- **Downloadable:** downloads via RS232 or USB cable directly to the PC with the help of the optional software.
- **Upgradeable:** if changes occur to the regulations upgrades can be made to the firmware to keep the instrument up to date.
- **Trip Lock function:** Zs (RCD) function performs a loop impedance test without tripping the RCD.
- **Built-in charger & rechargeable batteries:** instrument has a built-in charging circuit and comes complete with a set of rechargeable NiMH batteries.
- **RCD auto:** automated RCD testing procedure significantly reduces test time.
- **Easy to use:** large bright LCD display and large buttons enable easy handling of the instrument (even while wearing gloves).
- **Magnetic holder:** magnet for fixing instrument on metal surfaces enables hands-free operation.

APPLICATION:

- Domestic and Industrial live circuit testing.
- Testing of single phase and 3-phase, TT and TN systems.

STANDARDS:

Functionality:
IEC/EN 61557
Other reference standards for testing:
IEC/EN/HD 60364; IEC/EN 61008; IEC/EN 61009; IEC/EN/TR 60755; AS/NZ 3760; AS/NZ 3018; CEI 64.8; HD 384; BS 7671; VDE 0413
Electromagnetic compatibility:
IEC/EN 61326-1;
IEC/EN 61326-2-2
Safety:
IEC/EN 61010-1; IEC/EN 61010-031

TECHNICAL DATA:

Function	Measuring range	Resolution	Accuracy
RCD testing (EN 61557-6)	$I_{\Delta N}$: 10 mA, 30 mA, 100 mA, 300 mA, 500 mA, 1 A		
- Scaling factor for $I_{\Delta N}$	x 0.5; x 1; x 2; x 5		
- Contact voltage U_C	0.0 V … 19.9 V 20.0 V … 99.9 V	0.1 V 0.1 V	(-0%/+15%) of reading ± 10 digits (-0%/+15%) of reading
- Trip-out current	(0.2 … 1.1) x $I_{\Delta N}$ (AC type) (0.2 … 1.5) x $I_{\Delta N}$ (A type, $I_{\Delta N} \geq 30$ mA) (0.2 … 2.2) x $I_{\Delta N}$ (A type, $I_{\Delta N} < 30$ mA)	0.05 x $I_{\Delta N}$ 0.05 x $I_{\Delta N}$ 0.05 x $I_{\Delta N}$	± 0.1x $I_{\Delta N}$ ± 0.1x $I_{\Delta N}$ ± 0.1x $I_{\Delta N}$
- Trip-out time	0.0 ms … 40.0 ms 0.0 ms … max. time	0.1 ms 0.1 ms	± 1 ms ± 3 ms
Loop impedance (EN 61557-3)	0.00 Ω … 9.99 Ω 10.0 Ω … 99.9 Ω 100 Ω … 999 Ω 1.00 kΩ … 9.99 kΩ	0.01 Ω 0.1 Ω 1 Ω 10 Ω	±(5 % of reading + 5 digits) ±(5 % of reading + 5 digits) ±10 % of reading ±10 % of reading
Line impedance (EN 61557-3)	0.00 Ω … 9.99 Ω 10.0 Ω … 99.9 Ω 100 Ω … 999 Ω 1.00 kΩ … 9.99 kΩ	0.01 Ω 0.1 Ω 1 Ω 10 Ω	±(5 % of reading + 5 digits) ±(5 % of reading + 5 digits) ±10 % of reading ±10 % of reading
Voltage	0 V … 550 V	1 V	±(2 % of reading + 2 digits)
Frequency	15.0 Hz … 499.9 Hz	0.1 Hz	±(0.2 % of reading + 1 digit)
Phase sequence (EN 61557-7)	1.2.3 or 3.2.1		
Power supply	6 x 1.2 V rechargeable batteries, type AA		
Overvoltage category	CAT III / 600 V; CAT IV / 300 V		
Protection class	Double insulation		
COM port	RS232 and USB		
Dimensions	140 x 230 x 80 mm		
Weight	0.93 kg		

KEY FEATURES

Large LCD screen with backlight and PASS / FAIL indicators.

Simple and fast manipulation.

USB and RS232 communication ports.

STANDARD SET:

- Instrument Smartec Z Line - Loop / RCD
- Soft hand strap
- Schuko-plug test cable
- Test lead, 3 x 1.5 m
- Test probe, 3 pcs (blue, black, green)
- Crocodile clip, 3 pcs (blue, black, green)
- Power supply adapter + 6 NiMH recharge-able batteries, type AA
- Instruction manual on CD
- Short instruction manual
- Handbook on CD
- Calibration certificate

Accessories: page 8.01

MI 3123 SMARTEC® Earth / Clamp

The MI 3123 SMARTEC Earth / Clamp is a new generation earth resistance tester with the ability to perform 4-wire earth resistance measurement and 4-wire specific earth resistance measurement. With the optional A 1018 and A 1019 current clamps the instrument can perform 4-wire earth resistance measurement with one current clamp, contactless earth resistance testing with two clamps and TRMS current measurement up to 20 A. Configurable limits enable a PASS / FAIL evaluation of test results. All the results can be saved on the instrument and then downloaded via the optional software for evaluation and professional report generation after testing. The lightweight design, large bright LCD screen, built-in help screens, optional downloading via RS232 or USB ports and overvoltage category CAT IV make the MI 3123 an incredible earth resistance measuring instrument.

MEASURING FUNCTIONS:

- Earth resistance, 4-wire method.
- Earth resistance, 4-wire method with one current clamp (option).
- Earth resistance, two clamps method (option).
- Specific earth resistance.
- TRMS current (option).

KEY FEATURES:

- **Earth resistance measurement:** instrument performs standard 4-wire earth resistance tests with two earthing rods and specific earth resistance measurement.
- **Selective earth resistance test:** optional 4-wire earth resistance measurement in combination with an additional current clamp is used for measuring earth resistance of individual earthing rods.
- **Contactless earth resistance test**: earth resistance measurement with 2 current clamps without breaking the loop is intended for measuring resistance of individual earthing rods and is reccomended first of all for urban areas.
- **Downloadable:** downloads via RS232 or USB cable directly to the PC with the help of the optional software.
- **Upgradeable:** if changes occur to the regulations upgrades can be made to the firmware to keep the instrument up to date.
- **Help screens:** instrument comes complete with built-in help screens for referencing on site.
- **Built-in charger & rechargeable batteries:** instrument has a built-in charging circuit and comes complete with a set of rechargeable NiMH batteries.
- **Custom limits:** the limits can be set on any function, in that case large green and red lights of the LEDs will indicate a PASS or FAIL evaluation of test result.
- **Easy to use:** large bright LCD display and large buttons enable easy handling of the instrument (even while wearing gloves).
- **Magnetic holder:** magnet for fixing instrument on metal surfaces enables hands-free operation.

APPLICATION:

- Testing on TT and IT systems.
- Testing sub-station earthing.
- Lightning system testing.

STANDARDS:

Functionality: IEC/EN 61557
Other reference standards for testing: IEC/EN/HD 60364; AS/NZ 3018; CEI 64.8; HD 384; BS 7671; VDE 0413
Electromagnetic compatibility: IEC/EN 61326-1; IEC/EN 61326-2-2
Safety: IEC/EN 61010-1; IEC/EN 61010-031; IEC/EN 61010-2-032

Accessories: page 8.01

TECHNICAL DATA:

Function	Measuring range	Resolution	Accuracy
Earth resistance (4-wire method (EN 61557-5); 4-wire method with one current clamp)	0.00 Ω … 19.99 Ω 20.0 Ω … 199.9 Ω 200 Ω … 1999 Ω 2000 Ω … 9999 Ω	0.01 Ω 0.1 Ω 1 Ω 1 Ω	±(3 % of reading + 3 digits) ±(3 % of reading + 3 digits) ±5 % of reading ±10 % of reading
Earth resistance (2 clamps method)	0.00 Ω … 19.99 Ω 20.0 Ω … 30.0 Ω 30.1 Ω … 99.9 Ω	0.01 Ω 0.1 Ω 0.1 Ω	±(10 % of reading + 10 digits) ±20 % of reading ±30 % of reading
Specific earth resistance (EN 61557-5)	0.0 Ωm … 99.9 Ωm 100 Ωm … 999 Ωm 1.00 kΩm … 9.99 kΩm 10.0 kΩm … 99.9 kΩm >100 kΩm	0.1 Ωm 1 Ωm 0.01 kΩm 0.1 kΩm 1 kΩm	Calculated value, consider earth resistance 4-wire method
TRMS Current	0.0 mA … 99.9 mA 100 mA … 999 mA 1.00 A … 19.99 A	0.1 mA 1 mA 0.01 A	±(3 % of reading + 3 digits)
Power supply	6 x 1.2 V rechargeable batteries, type AA		
Overvoltage category	CAT IV / 50 V		
Protection class	Double insulation		
COM port	RS232 and USB		
Dimensions	140 x 230 x 80 mm		
Weight	0.85 kg		

KEY FEATURES

Large LCD screen with backlight and PASS / FAIL indicators.

Simple and fast manipulation.

USB and RS232 communication ports.

STANDARD SET:

- Instrument Smartec Earth / Clamp
- Soft hand strap
- Test lead, 4.5 m (blue)
- Test lead, 4.5 m (red)
- Test lead, 20 m (green)
- Test lead, 20 m (black)
- Earth test rod, 4 pcs
- Power supply adapter + 6 NiMH rechargeable batteries, type AA
- Instruction manual on CD
- Short instruction manual
- Handbook on CD
- Calibration certificate

Accessories: page 8.01

MI 2126 Earth 2/3

The MI 2126 Earth 2/3 is a high quality, professional grade test instrument for performing three-wire earth resistance measurements in accordance with European standard EN 61557-5, on which the estimation of earthing quality is based. The equipment was designed and produced according to many years of experience of producing and dealing with earth resistance and electric installation test equipment.

MEASURING FUNCTION:

- Earth resistance, 3-wire method.

KEY FEATURES:

- **Earth resistance measurement:** instrument performs standard 3-wire earth resistance tests with two earthing rods.
- **Easy to use:** only 3 buttons control all the operations of the test instrument and instruction manual explains various earth resistance measuring methods.
- **Portable:** the MI 2126 is light and battery operated instrument and can be easily placed with other test instruments for moving between tested items.
- **Reliable:** reliable results even in the presence of stray currents.
- **Repeatability:** outstanding repeatability of test results especially in the case of high test probe resistance of various earthing structures (e.g. asphalt, sand, and stone).

APPLICATION:

- 3-wire earth resistance testing.
- Testing single rod and multiple spiked earthing networks.

STANDARDS:

Functionality:
IEC/EN 61557-1; IEC/EN 61557-5

Other reference standards for testing:
IEC/EN/HD 60364; AS/NZ 3018;
CEI 64.8; HD 384; BS 7671; VDE 0413
Electromagnetic compatibility:
IEC/EN 61326
Safety: IEC/EN 61010-1;
IEC/EN 61010-031

STANDARD SET:

- Instrument Earth 2/3
- Carrying strap
- Test lead, 4.5 m (black)
- Test lead, 15 m (red)
- Test lead, 20 m (blue)
- Earth test rod, 2 pcs
- Instruction manual
- Calibration certificate

TECHNICAL DATA:

Function	Measuring range	Resolution	Accuracy
Earth resistance	0.00 Ω … 19.99 Ω	0.01 Ω	± (2% of reading + 10 digits)
	20.0 Ω … 199.9 Ω	0.1 Ω	± (2% of reading + 10 digits)
	200 Ω … 999 Ω	1 Ω	± (2% of reading + 10 digits)
	1.000 kΩ … 1.999 kΩ	1 Ω	± (2% of reading + 10 digits)
	2.00 kΩ … 19.99 kΩ	10 Ω	±5% of reading
Power supply	4 x 1.5 V alkaline batteries, type C		
Protection class	Double insulation		
Dimensions	280 x 70 x 80 mm		
Weight	410 g		

Accessories: page 8.01

MI 3103 GigaOhm 1 kV

The MI 3103 GigaOhm 1 kV tester is an easy to use installation tester with the ability to perform accurate resistance measurements quickly and efficiently. Features including AC voltage testing, robust design, easy to read display and rotary switch (which can be used even while wearing gloves) make the MI 3103 Gigaohm 1 kV an extremely good value and versatile instrument to use.

MEASURING FUNCTIONS:

- Insulation resistance with DC voltage.
- Continuity of PE conductors with 200 mA test current with polarity change.
- Continuity of PE conductors with 7 mA test current (continuous measurement) without RCD tripping.
- Voltage.

KEY FEATURES:

- **Easy to use:** 3 buttons and rotary function selector control all the operations of the test instrument.
- **Insulation range:** three different test voltages (250, 500 and 1000 V), wide maesuring range up to 2 GΩ.
- **Polarity swap:** automatic polarity reversal on continuity test.
- **Compensation of test leads** (up to 5 Ω) eliminates lead resistance.

APPLICATION:

- Domestic installation dead testing.
- Periodic installation testing.

STANDARDS:

Functionality: IEC/EN 61557-1, IEC/EN 61557-2, IEC/EN 61557-4, IEC/EN 61557-10,
Other reference standards for testing: IEC/EN/HD 60364; AS/NZ 3018; CEI 64.8; HD 384; BS 7671; VDE 0413
Electromagnetic compatibility: IEC/EN 61326
Safety: IEC/EN 61010-1; IEC/EN 61010-031

TECHNICAL DATA:

Function	Measuring range	Resolution	Accuracy
Insulation resistance (EN 61557-2)	U = 500, 1000 V_{DC}:		
	R: 0.000 MΩ … 1.999 MΩ	0.001 MΩ	± (3% of reading + 3 digits)
	2.00 MΩ … 19.99 MΩ	0.01 MΩ	± (3% of reading + 3 digits)
	20.0 MΩ … 199.9 MΩ	0.1 MΩ	± (3% of reading + 3 digits)
	> 200 MΩ	1 MΩ	± 10% of reading
	U = 250 V_{DC}:		
	R: 0.000 MΩ … 1.999 MΩ	0.001 MΩ	± (5% of reading + 3 digits)
	2.00 MΩ … 19.99 MΩ	0.01 MΩ	± (5% of reading + 3 digits)
	20.0 MΩ … 199.9 MΩ	0.1 MΩ	± (5% of reading + 3 digits)
	200 MΩ … 1999 MΩ	1 MΩ	± 15% of reading
Continuity 200 mA of PE conductor with polarity change (EN 61557-4)	0.11 Ω … 19.99 Ω	0.01 Ω	±(3% of reading + 3 digits)
	20.0 Ω … 199.9 Ω	0.1 Ω	±(3 % of reading + 3 digits)
	200 Ω … 1999 Ω	1 Ω	±5% of reading
Low resistance measurement 7 mA (continuous measurement)	0.0 Ω … 199.9 Ω	0.1 Ω	±(5% of reading + 3 digits)
	200 Ω … 999 Ω	1 Ω	±10% of reading
	1000 Ω … 1999 Ω	1 Ω	±10% of reading
Voltage	0 V … 600 V	1 V	±(3% of reading + 3 digits)
Power supply	4 x 1.5 V alkaline batteries, type C		
Overvoltage category	CAT III / 300 V		
Dimensions	280 x 70 x 80 mm	Weight	490 g

STANDARD SET:

- Instrument GigaOhm 1 kV
- Carrying strap
- Test lead with test probe, 2 m, (black)
- Test lead with test probe, 2 m, (red)
- Crocodile clip (black)
- Instruction manual
- Calibration certificate

Accessories: page 8.01

MI 2150 Installcheck

The MI 2150 Installcheck is an easy to use electric installation safety test instrument for fast inspection of sockets and wiring. Preset limits of basic safety parameters enables PASS / FAIL evaluation of test results which is displayed through LED lamps. Installcheck completes safety check at the socket in only 5 seconds.

MEASURING FUNCTIONS:

- Continuity of protective conductors.
- Insulation resistance.
- Line resistance.
- Loop resistance.
- Loop resistance without RCD tripping.
- RCD testing.
- Phase rotation.
- PE terminal test.

KEY FEATURES:

- **Preset limits** enables evaluation of test results.
- **PASS / FAIL indication:** OK - LED lamps confirms the on going measurement and indicates positive result of the test.
- **Acoustic signal** confirms the completion of test operations.
- **Flashing LED** indicates the type of fault found in installation.

APPLICATION:

- Domestic installation testing.
- Initial and periodic installation testing.
- Testing of single phase and 3-phase systems.

STANDARDS:

Functionality: IEC/EN 61557
Electromagnetic compatibility: IEC/EN 61326
Safety: IEC/EN 61010-1; IEC/EN 61010-031

TECHNICAL DATA:

Function	Test conditions	Limit value
PE continuity	Itest = 10 mA	2 Ω ± 0.5 Ω
Insulation resistance	Utest > 500 V_{DC}	(0.6 … 1.2 MΩ) ± 0.2 MΩ
RCD testing	IΔN = 30; 100; 300; 500 mA	
- Contact voltage	Itest < 0.5 x $I_{\Delta N}$	25 V (at $I_{\Delta N}$) ± 5 V
- Trip-out time of RCD	Itest = $I_{\Delta N}$; 5 x $I_{\Delta N}$ (30 mA only)	0,3 s (at $I_{\Delta N}$) or 0,04 s (at 5 x $I_{\Delta N}$)
Fault loop resistance (with RCD)	Itest < 0.5 x $I_{\Delta N}$	25 V / $I_{\Delta N}$
Fault loop resistance (without RCD)	Itest = 0.5 A	1.5 Ω ± 0.3 Ω
Line resistance	Itest = 0.5 A	1.5 Ω ± 0.3 Ω
Power supply	4 x 1.5 V alkaline batteries, type AA	
Overvoltage category	CAT III / 300 V	
Dimensions (W x H x D):	100 x 200 x 50 mm	
Weight (without accessories):	0.6 kg	

STANDARD SET:

- Instrument Installcheck
- Carrying belt
- Schuko-plug test cable, 1 m
- Test lead with test probe, 1.5 m, 2 pcs (black, red)
- Instruction manual
- Calibration certificate

Accessories: page 8.01

A 1143 Euro Z 290 A

The A 1143 Euro Z 290 A is a professional portable high current impedance tester. It performs high precision line and high precision fault loop impedance measurements in environments up to CAT IV / 310 V.

MEASURING FUNCTIONS:

- High precision line impedance.
- High precision fault loop impedance.
- Contact voltage.

KEY FEATURES:

- **Independence**: instrument is designed to work independantly or in conjunction with: MI 2086 Eurotest 61557, MI 3101 EurotestAT, MI 3105 EurotestXA and MI 3321 MultiServicerXA.
- **Range widening:** adapts the instruments to read from 0.1 mΩ up to 19.99 Ω.
- **Multi-system testing:** works on both single phase and 3-phase systems (115 V to 440 V).
- **I_{PSC} and I_{PFC} calculation:** I_{PSC} and I_{PFC} readings calculated up to 400 kA.
- **4-wire measurement** for elimination of voltage drop on measuring leads.
- **Comfortable carrying:** all the accessories are put in the strong, rugged, durable case of the instrument.
- **LCD:** Built-in LCD for standalone measurements.

APPLICATION:

- High accuracy loop and line measurements.
- Power transformer and motor winding measurement.

STANDARDS:

Functionality: IEC/EN 61557
Other reference standards for testing:
IEC/EN/HD 60364; AS/NZ 3018; CEI 64.8; BS 7671; VDE 0413
Electromagnetic compatibility:
IEC/EN 61326-1; IEC/EN 61326-2-2
Safety: IEC/EN 61010-1; IEC/EN 61010-031

STANDARD SET:

- Instrument Euro Z 290 A
- Test lead, 2-wire, 2 pcs
- Test lead, black, 2 m
- Test probe, red, 2 pcs
- Crocodile clip, black, 3 pcs
- Crocodile clip, red, 2 pcs
- RS232 cable
- RS232-PS/2 cable
- Instruction manual
- Calibration certificate

TECHNICAL DATA:

Function	Measuring range	Resolution	Accuracy
High resolution Line / Loop impedance measurement	0.1 mΩ … 199.9 mΩ 200 mΩ … 1999 mΩ 2.00 Ω … 19.99 Ω	0.1 mΩ 1 mΩ 10 mΩ	±(5% of reading + 1 mΩ) ±(5% of reading + 1 mΩ) ±(5% of reading + 10 mΩ)
Measuring voltage range	90 V … 530 V		
Maximum test current (at 230 V)	154 A (10 ms)		
Maximum test current (at 400 V)	267 A (10 ms)		
Maximum test current (at 530 V)	350 A (10 ms)		
Contact voltage	0 V … 100 V	1 V	±(10% of reading + 3 digits)
Power supply	4 x 1.5 V alkaline batteries, type C		
Overvoltage category	310 V / CAT IV		
Protection class	Double insulation		
Pollution degree	2		
Dimensions	345 x 160 x 335 mm		
Weight	5.0 kg		

Accessories: page 8.01

MI 2093 Line Tracer

The MI 2093 Line Tracer is an universal instrument intended for tracing hidden conductive paths under plasters in walls, floors and ground or for determining one wire in a tuft of wires. Fuses or outlets belonging to a certain loop can be located as well. Line Tracer helps the operator to resolve hidden line problems easily (short circuits, interruptions, breakages).

FUNCTIONS:

- Tracing cables in walls, ceilings, floor and ground.
- Tracing live or voltage free cables.
- Locating cable interruptions and short-circuits in cables.
- Locating concealed sockets and distribution boxes.
- Locating fuses and assignment to circuits.
- Determining an individual wire in a bundle of wires.
- Tracing pipe installations and other conductive loops.

KEY FEATURES:

- Detection depth up to 2 m can be achieved.
- Works on both, energized and non-energized systems.
- The highly sensitive Receiver R10K detects injected signal around the measured line or object.
- Three levels of sensitivity adjustment: low, middle and high. Each level can be additionally precisely adjusted.
- Dual, bar-graph and buzzer indicator ensures indication in dark and noisy environment.

APPLICATION:

- Electrical installations testing.
- Cable networks testing.
- Pipe installations testing.
- Telecommunication sytems testing.

STANDARDS:

Electromagnetic compatibility:
IEC/EN 61326
Safety:
IEC/EN 61010-1; IEC/EN 61010-031

STANDARD SET:

- Transmitter T10K
- Receiver R10K
- Test lead for R10K with built-in resistor and test probe, 1.5 m
- Test lead for T10K, 1.5 m, 2 pcs
- Special selective probe
- Test probe, black, 2 pcs
- Crocodile clip, black, 2 pcs
- Soft carrying bag
- Instruction manual
- Calibration certificate

TECHNICAL DATA:

Transmitter T10K	
Power supply	4 x 1.5 V alkaline or 4 x 1.2 V rechargeable batteries, type AA
Overvoltage category	CAT III / 300 V
Dimensions	80 x 50 x 150 mm
Weight	280 g
Receiver R10K	
Power supply	1 x 9 V battery
Dimensions	45 x 450 x 210 mm
Weight	140 g

Accessories: page 8.01

A 1199 ρ-Adapter

The ρ-Adapter is a special accessory intended for using only with METREL installation testers MI 3101 Eurotest AT and MI 3105 EurotestXA. It is designed for measurement of specific earth resistance.

KEY FEATURES:

- Adapter is used for performing 4-wire specific earth resistance measurements.
- Designed for use in conjunction with the MI 3101 Eurotest AT and MI 3105 EurotestXA.
- The instrument comes complete with 4-wire test lead, 15 m red extension lead, 2 earthing rods and carrying bag.
- Instruction manual contains step by step guide on how to perform the measurement.
- It is recommended to use A 1199 in combination with 3-wire 20 m earth test lead set (S 2026).

APPLICATION:

- 4-wire earth resistance measurement.
- Specific earth resistance measurement.

STANDARDS:

Functionality: IEC/EN 61557
Other reference standards for testing:
IEC/EN/HD 60364; AS/NZ 3018;
CEI 64.8; BS 7671; VDE 0413
Electromagnetic compatibility:
IEC/EN 61326
Safety:
IEC/EN 61010-1

TECHNICAL DATA:

Power supply	4 x 1.5 V alkaline or 4 x 1.2 V rechargeable batteries, type AA
Overvoltage category	CAT IV / 50 V
Dimensions	100 x 200 x 50 mm
Weight	390 g

STANDARD SET:

- ρ-adapter
- Small soft carrying bag
- Earth test rod, 2 pcs
- Test lead, red, 15 m
- Connection cable
- Instruction manual
- Calibration certificate

Accessories: page 8.01

CS 2099 Eurocheck

The CS 2099 Eurocheck is a professional, multifunctional field calibrator intended for use with installation test instruments. Accuracy and functionality of all Metrel and most other manufacturer's installation testers can be verified with the Eurocheck. The CS 2099 Eurocheck can provide a simple field calibration of the most frequently used functions when testing installations.

FUNCTIONS:

- Insulation calibration with test voltage up to 1000 V.
- Calibration of low resistance and continuity functions.
- Fault loop and trip-lock RCD impedance functions calibration (all test currents supported on Metrel instruments).
- Calibration of RCD trip-out time function.
- Calibration of line impedance measuring function.
- Calibration of voltage and frequency.
- PE test terminal functional verification.
- Automatic polarity verification

APPLICATION:

- On-site testing of installation measuring instruments.
- Occasional routine control of the safety testers.

STANDARDS:

Electromagnetic compatibility:
IEC/EN 61326
Safety:
IEC/EN 61010-1

TECHNICAL DATA:

Power supply	230 V, 50 / 60 Hz
Overvoltage category	CAT II / 300 V
Dimensions	103 x 61 x 205 mm
Weight	780 g

STANDARD SET:

- Instrument Eurocheck
- Small soft carrying bag
- Instruction manual

Accessories: page 8.01

MI 2166 Demonstration Board

Demonstration board MI 2166 simulates common electrical installation usually met in individual house or apartment. Demonstration board is to be used preferably by sales personnel when demonstrating operation of electrical installation test equipment. Various test methods supported by different test instruments can be presented.

KEY FEATURES:

- A number of different measurements in accordance to EN 61557 are possible (insulation resistance, continuity of PE conductors, earth resistance (four-lead and two clamp methods), specific earth resistance, line and loop impedance, phase rotation, load current, RCD testing, contact voltage, etc.).
- Real elements of electrical installation are placed on the front panel like RCD, ON/OFF switch with lamp, mains test outlet and connection terminals.
- All standardised testing methods can be presented.
- 5 different errors can be preset by »fault« switches.
- TN or TT system can be simulated.
- Demonstration board is put in the strong rugged case with a handle for comfortable carrying.

APPLICATION:

- Presentation of complete testing of any electrical installation.
- Demonstration of electrical installation test equipment operation by sales personnel.

STANDARDS:

Electromagnetic compatibility:
IEC/EN 61326
Safety:
IEC/EN 61010-1

TECHNICAL DATA:

Power supply	230 V, 50 Hz
Overvoltage category	CAT II / 300 V
Dimensions	450 × 330 × 110 mm
Weight	3.56 kg

STANDARD SET:

- Demonstration board
- Jumper, 2 pcs
- Mains cable
- Instruction manual
- Calibration certificate

Accessories: page 8.01

MI 3099 Demonstration Board

Demonstration board MI 3099 simulates typical electrical installation usually met in individual houses or apartments with important elements on switchboard and on circut site. Demonstration board is intended for use preferably by sales personnel when demonstrating operation of electrical installation test equipment, especially the new Metrel's electrically installations safety testers with built-in AUTOSEQUENCE procedure.

KEY FEATURES:

- The board contains real elements of electrical installation like RCD, mains switch, automatic fuses, switches, lamps, 1-phase and 3-phase mains test outlet, N and PE collector.
- All standardised testing methods can be presented.
- TN or TT system with or without RCD can be simulated.
- Possibility of connection to single phase or 3-phase supply system.
- Various Autosequence test procedures are supported for demonstration of testing safety by new EurotestAT and EurotestXA.
- Demonstration board is put in the strong rugged case with a handle for comfortable carrying.

APPLICATION:

- Presentation of complete testing of any electrical installation.
- Demonstration of electrical installation test equipment operation by sales personnel.

STANDARDS:

Electromagnetic compatibility:
IEC/EN 61326
Safety:
IEC/EN 61010-1

TECHNICAL DATA:

Power supply	230 V / 400 V, 50 Hz
Overvoltage category	CAT II / 300 V
Dimensions	480 × 387 × 136 mm
Weight	5 kg

STANDARD SET:

- Demonstration board
- Jumper
- Special probe, 3 pcs
- Mains cable
- Three phase to one phase adapter
- Instruction manual
- Calibration certificate

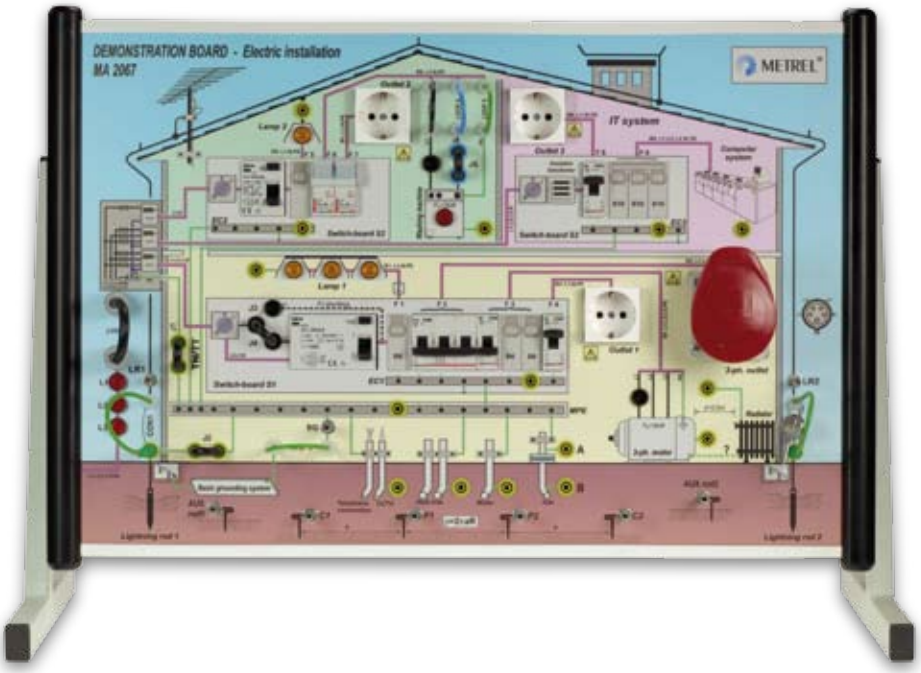
Accessories: page 8.01

MA 2067 Demonstration Board

Demonstration Board MA 2067 is an excellent demonstration and educational tool that simulates real conditions in low voltage electrical installations. The Demonstration board consists of all significant elements of electrical installations like RCDs of different types, fuses, PE equalization bars, 1-phase and 3-phase sockets, various consumers of electrical energy and various grounding systems (TT, TN, IT). The MA 2067 Demonstration Board provides simulation of different types of faults in electroinstallation. Complete testing and troubleshooting of the installation is possible by using suitable instruments.

KEY FEATURES:

- 65 different measurements in accordance to EN 61557 are possible (insulation resistance, continuity of PE conductors, earth resistance, specific earth resistance, line and loop impedance, phase rotation, leakage current, RCD testing, voltage and frequency).
- 19 different errors can be selected on a lockable distributor.
- Different types of RCD are integrated for measurement of trip-out time, trip-out current and contact voltage
- Simulation of TT, TN and IT earth systems.
- Possibility of connection to single phase or 3-phase supply system.
- Booklet with theory and exercises for schools and training centers is included in a standard set.



APPLICATION:

- Education of students of electrotechnical specialities.
- Education and practical training of electrical contractors about measurements on low voltage electroinstallations.
- Demonstration on how to use different measurement instruments by sales personnel.

STANDARDS:

Electromagnetic compatibility:
IEC/EN 61326

Safety:
IEC/EN 61010-1

STANDARD SET:

- Demonstration board
- Jumper, 4 pcs
- Board support for vertical use
- Three phase to one phase adapter
- 1-phase mains cable
- Instruction manual
- Booklet with exercises
- Calibration certificate

TECHNICAL DATA:

Power supply	230 V / 400 V, 50 Hz
Dimensions	680 x 450 mm (w x h)
Weight	12.5 kg

Accessories: page 8.01

Metrel working team for the absolute pole position.

Accessories: page 8.01

MEASURING INSTRUMENTS AND TESTERS

- Electrical Installation Safety
- **High Voltage Insulation Diagnostics**
- Appliance / Machine / Switchboard Safety
- Power Quality Analysis
- LAN Cabling Certification
- Indoor Environment Quality
- Digital Multimeters / Clamp Meters / Voltage and Continuity Testers
- Accessories

METREL®

CATALOGUE 2010

High Voltage Insulation Diagnostics

High Voltage Insulation Resistance Testing with PI, DD and DAR Calculation

Glossary - HV Insulation Diagnostics

PI - Polarization Index
As a voltage is applied to an insulating material, the particles inside the materials line up and become polarized. The more atoms that become polarizes, the resistance of the material increases. In an insulating material, the quicker the particles polarize, the better the insulating material is. PI is defined in the IEEE Std 43-2000 as the ratio between two insulation resistances readings, during the test, the first is taken after 1 minute and the second is taken after 10 minutes of continuous insulation measurement.

DAR - Dielectric Absorption Ratio
The principle behind an insulating material is to keep two conductive materials separated. If an insulating material becomes contaminated (e.g. through dirt, grease, etc.) leakage current can be absorbed by the insulating material. This leakage current reduces the resistance of the material which results in less power can be delivered to the load. DAR is defined as the ratio between two insulation resistances measured after 30 seconds and after 60 seconds (1 min) of continuous insulation measurement.

IR - Insulation Resistance of Insulator
According to IEV 151-15-43 IR is the resistance under specified conditions between two conductive elements, separated by insulating materials.

DD - Dielectric Discharge
After the power is turned off to a high voltage appliance, the built-up charge needs time to dissipate away before the appliance is safe. Typically the insulation material is left connected to the test voltage for 10 ... 30 min and then discharged before DD test is carried out. After 1 minute, the capacitance, voltage and discharge current is measured and the DD can be calculated.

Step voltage
Step voltage test involves insulation resistance measurement at different test voltages. Good insulation will show very little deviation between particular readings. In case of microcracks, dirt or humidity in insulation system the insulation resistance decreases with rising test voltage. When performing a step voltage test, it is important to start with the lowest test voltage and then move to a higher voltage level. Typical test duration is 60 seconds.

Withstanding voltage test
This function offers withstanding voltage test of insulation material. It covers two types of tests:
a) Breakdown voltage test of high voltage devices, e.g. transient suppressors;
b) DC withstanding voltage test for insulation coordination purposes.
Both functions require breakdown current detection. The test voltage increases step by step from the Start up to the Stop value over a predefined time and it is kept at the Stop value for a predefined test time.

Guard terminal
The purpose of the GUARD terminal is to lead away potential leakage currents (e.g. surface currents), which are not a result of the measured insulation material itself but of the surface contamination and moisture. Guard terminal is to be used in conjunction with shielded test leads when measuring insulation resistances in GΩ and TΩ range.

R(t) graphs
Sometimes a simple value does not show the full picture about the quality of an insulating material. R(t) graphs illustrate how resistance (on the Y or vertical axis) changes in relation to time (on the X or horizontal axis).

Leakage
Leakage current is an AC or DC current that flows trough or on the insulation's surface.

Part No.
MEASUREMENTS
Test voltage range
Voltage steps
Insulation resistance measuring range
Calculation of DD, DAR, PI
Withstanding voltage test
Voltage ramp test
Leakage current measurement
Capacitance measurement
Short circuit / charge current
Voltage measurement AC / DC
OTHER FEATURES
Programmable timer
Automatic discharge after test
Graph insulation resistance R(t)
Bar graph
Auto adjustment function
Auto ranging
Audible warnings
Guard terminal
Shielded test leads
COMMUNICATION PORTS
USB
RS232
MEMORY, SOFTWARE
Memory
Number of memory locations
Software
GENERAL DATA
Display type
Backlight
Safety category
Rechargeable batteries
Built-in battery charger
Low battery indication
Battery life (no load connected)
Weight
Dimensions (mm)

Accessories: page 8.01

Selection Guide for HV Insulation Testers

MI 3202	MI 2077	MI 3201	MI 3200
GigaOhm 5 kV	TeraOhm 5 kV	TeraOhm 5 kV Plus	TeraOhm 10 kV
			
250 V_{DC} … 5 kV_{DC}	250 V_{DC} … 5 kV_{DC}	250 V_{DC} … 5 kV_{DC}	500 V_{DC} … 10 kV_{DC}
250 V; 500 V; 1 kV; 2.5 kV; 5 kV	50 V	25 V	25 V
1 TΩ	5 TΩ	10 TΩ	10 TΩ
–	✓	✓	✓
–	✓	✓	✓
–	✓	✓	✓
–	✓	✓	✓
–	✓	✓	✓
5 mA	1.4 mA	5 mA	5 mA
up to 600 V	up to 600 V	up to 600 V	up to 600 V
–	✓	✓	✓
✓	✓	✓	✓
–	–	✓	✓
✓	✓	✓	✓
✓	✓	✓	✓
✓	✓	✓	✓
✓	✓	✓	✓
✓	✓	✓	✓
✓	Option	✓	✓
–	Option	✓	✓
–	✓	✓	✓
–	✓	✓	✓
–	1000	1000	1000
–	Option (TeraLink)	Option (TeraLink PRO)	Option (TeraLink PRO)
Custom LCD	Graphical LCD	Graphical LCD	Graphical LCD
✓	✓	✓	✓
CAT IV / 600 V	CAT III / 600 V	CAT IV / 600 V	CAT IV / 600 V
✓	Option	✓	✓
✓	✓	✓	✓
✓	✓	✓	✓
4 h at 5 kV	4 h at 5 kV	4 h at 5 kV	4 h at 10 kV
3 kg	2.1 kg	3 kg	5.5 kg
310 x 130 x 250	265 x 110 x 185	310 x 130 x 250	345 x 160 x 335

Accessories: page 8.01

MI 3202 GigaOhm 5 kV

The MI 3202 GigaOhm 5 kV provides quick and accurate testing of insulation resistance. Five test voltages up to 5 kV and 1 TΩ resistance measuring range cover most of the industrial and power distribution applications. The large analogue / digital LCD screen with backlight offers easy reading of test results. The instrument is placed in a rugged carrying case which allows to use it in harsh environments.

MEASURING FUNCTIONS:

- Insulation resistance measurement.
- Voltage measurement.
- Frequency measurement.

KEY FEATURES:

- **Measuring range** up to 1 TΩ.
- **Analogue scale and digital LCD:** measuring results are displayed both in numeric and analogue form.
- **Quick set-up:** quick and easy selection of test voltage (250 V; 500 V; 1 kV; 2,5 kV; 5 kV).
- **Fast testing:** 5 mA current source for quick charging of capacitive load.
- **Guard test terminal:** for elimination of potintial surface leakage currents.
- **Automatic discharge** of tested object after test.
- **Safe**: high CAT IV / 600 V voltage protection.
- **Easy to read:** large bright LCD with backlight.
- **Built-in charger & rechargeable batteries:** instrument has a built-in charger and comes complete with a set of rechargeable NiMH batteries.
- **High quality accessories:** shielded test leads are included in a standard set.
- **Portable:** lightweight 3 kg design with carry handle and shoulder strap.

APPLICATION:

- Testing insulation resistance of rotating machinery and cables.
- Production line periodic testing and maintenance.
- Troubleshooting and analysis of all kinds of insulation problems.

STANDARDS:

Functionality:
IEC/EN 61557-2
Electromagnetic compatibility:
EN 61326 class B
Safety: EN 61010-1; EN 61010-031

STANDARD SET:

- Instrument GigaOhm 5 kV
- Mains cable
- 10 kV shielded test lead, black, 2 m
- 10 kV shielded test lead, red, 2 m
- 10 kV crocodile clip, 2 pcs (black, red)
- Guard lead, green, 2 m
- Crocodile clip, green
- 6 x 1.2 V NiMH rechargeable batteries, type C
- Handbook on CD
- Instruction manual
- Calibration certificate

High Voltage Insulation Diagnostics

METREL®

TECHNICAL SPECIFICATION:

Function	Measuring range	Resolution	Accuracy
Insulation resistance	0 kΩ … 999 kΩ 1.00 MΩ … 9.99 MΩ 10.0 MΩ … 99.9 MΩ 100 MΩ … 999 MΩ 1.00 GΩ … 9.99 GΩ 10.0 GΩ … 99.9 GΩ 100 GΩ … 999 GΩ	1 kΩ 10 kΩ 100 kΩ 1 MΩ 10 MΩ 100 MΩ 1 GΩ	±(5 % of reading + 3 digits) ±(5 % of reading + 3 digits) ±(5 % of reading + 3 digits) ±(5 % of reading + 3 digits) ±(5 % of reading + 3 digits) ±(5 % of reading + 3 digits) ±(10 % of reading + 3 digits)
Test voltage	0 V … 5500 V	1 V	±(3% of reading + 3 V)
Voltage AC / DC	0 V … 600 V	1 V	±(3% of reading + 4 V)
Frequency	45.0 Hz … 65.0 Hz	0.1 Hz	±0.2 Hz
Battery power supply	6 × 1.2 V NiMH rechargeable batteries, type C		
Display	Analogue / digital LCD with backlight		
Overvoltage category	CAT IV / 600 V		
Protection class	Double insulation		
Dimensions	310 x 130 x 250 mm		
Weight	3 kg		

KEY FEATURES

Fast and simple adjustment of the test parameters

Large analogue / digital LCD with backlight

Guard terminal for connecting shielded test leads

Accessories: page 8.01

MI 2077 TeraOhm 5 kV

The MI 2077 TeraOhm 5 kV is an advanced, field proven high voltage diagnostic insulation tester. Its small lightweight design make it easily portable and its bright LCD display ensures that readings can be made in almost any lighting conditions. TeraOhm 5 kV enables insulation resistance measurements up to 5 TΩ, step voltage test, withstanding voltage test, PI, DD and DAR calculation and capacitance measurement. Built-in memory and optional PC SW TeraLink enables data storing, downloading to PC, analysis of test results and printout of test reports.

MEASURING FUNCTIONS:

- Insulation resistance measurement.
- Step voltage insulation resistance testing.
- Withstanding voltage testing.
- Diagnostic test (PI, DD, DAR).
- Capacitance measurement.
- Voltage measurement.
- Frequency measurement.

KEY FEATURES:

- **Measuring range** up to 5 TΩ.
- **Wide range of DC test voltages:** from 250 V up to 5000 V in steps of 50 V.
- **Withstanding voltage:** testing of insulation with programmable ramp test voltage from 250 V up to 5 kV and programmable threshold current.
- **Step voltage:** insulation resistance measurement with five discrete proportionately set test voltages and programmable timer per step.
- **Automated testing:** PI, DD, DAR calculations with automated resistance ranging. All data is displayed during one single measurement.
- **Fault finding:** fully programmable step voltage and withstanding voltage test functions assist in diagnosing faults in insulation.
- **Guard test terminal:** for elimination of potential surface leakage currents.
- **Automatic discharge** of tested object after test.
- **Accurate:** selectable noise rejection filters ensure accurate measurement.
- **Built-in timer:** programmable timer from 1 s up to 30 min.
- **Memory:** stores up to 1000 results with date and time stamp.
- **Easy to read:** large custom LCD dot matrix display with bar graph and with backlight.
- **Built-in charger:** instrument has a built-in charger which enables measurement during the charging.
- **Portable:** lightweight 2.1 kg design with carrying bag and neck strap.

APPLICATION:

- Testing insulation resistance of rotating machinery, cables, transformers, HV generators, surge arresters.
- Production line periodic testing and maintenance.
- Troubleshooting and analysis of all kinds of insulation problems.
- Diagnostic testing.

STANDARDS:

Functionality:
IEC/EN 61557-2
Electromagnetic compatibility:
EN 61326 Class B
Safety:
EN 61010-1;
EN 61010-031

STANDARD SET:

- Instrument TeraOhm 5 kV
- Soft carrying bag
- Mains cable
- Test lead, black, 2 m
- Test lead, red, 2 m
- Guard lead, green, with crocodile clip, 2 m
- Test probe, black
- Test probe, red
- Crocodile clip, black, 2 pcs
- Handbook on CD
- Instruction manual
- Calibration certificate

High Voltage Insulation Diagnostics

TECHNICAL SPECIFICATION:

Function	Measuring range	Resolution	Accuracy
Insulation resistance	0 kΩ … 999 kΩ 1.00 MΩ … 9.99 MΩ 10.0 MΩ … 99.9 MΩ 100 MΩ … 999 MΩ 1.00 GΩ … 9.99 GΩ 10.0 GΩ … 99.9 GΩ 100 GΩ … 999 GΩ 1.00 TΩ … 5.00 TΩ	1 kΩ 10 kΩ 100 kΩ 1 MΩ 10 MΩ 100 MΩ 1 GΩ 10 GΩ	±(5 % of reading + 3 digits) ±(5 % of reading + 3 digits) ±(5 % of reading + 3 digits) ±(5 % of reading + 3 digits) ±(5 % of reading + 3 digits) ±(5 % of reading + 3 digits) ±(5 % of reading + 3 digits) ±(5 % of reading + 3 digits)
Test voltage	0 V … 5500 V	1 V	±(3% of reading + 3 V)
Insulation leakage current	0.00 nA … 9.99 nA 10.0 nA … 99.9 nA 100 nA … 999 nA 1.00 µA … 9.99 µA 10.0 µA … 99.9 µA 100 µA … 999 µA 1.00 mA … 1.54 mA	0.01 nA 0.1 nA 1 nA 10 nA 100 nA 1 µA 10 µA	±(5% of reading + 0.05 nA)
Dielectric absorption ratio (DAR)	0.01 … 9.99 10.0 … 100.0	0.01 0.1	±(5 % of reading + 2 digits) ±5 % of reading
Polarization index (PI)	0.01 … 9.99 10.0 … 100.0	0.01 0.1	±(5 % of reading + 2 digits) ±5 % of reading
Dielectric discharge (DD)	0.01 … 9.99 10.0 … 100.0	0.01 0.1	±(5 % of reading + 2 digits) ±5 % of reading
Voltage AC / DC	0 V … 600 V	1 V	±(3% of reading + 3 V)
Frequency	45.0 Hz … 65.0 Hz	0.1 Hz	±0.2 Hz
Capacitance	0.0 nF … 99.9 nF 100 nF … 999 nF 1.00 µF … 50.00 µF	0.1 nF 1 nF 10 nF	±(5 % of reading + 2 digits)
Battery power supply	6 x 1.2 V NiMH rechargeable batteries, type C		
Display	Matrix LCD with backlight, 160 x 116 dots		
Overvoltage category	CAT III / 600 V		
Protection class	Double insulation		
COM port	RS232 (optional USB with serial converter)		
Dimensions	265 × 110 × 185 mm		
Weight	2.1 kg		

KEY FEATURES

Large custom LCD dot matrix display with bar graph and backlight.

User friendly keyboard enables simple and fast adjustment.

Guard connection terminal to eliminate the influence of surface insulation currents.

Accessories: page 8.01

MI 3201 TeraOhm 5 kV Plus

The new insulation tester MI 3201 TeraOhm 5 kV Plus is a portable instrument intended to measure insulation resistance by using high DC test voltages up to 5 kV. TeraOhm 5 kV Plus enables insulation resistance measurements up to 10 TΩ, step voltage test, withstanding voltage test, PI, DD and DAR calculation and capacitance measurement. The large LCD screen enables real-time graph R(t) to be displayed. Results can be stored and downloaded to a computer via USB or RS232 connection with the help of the optional TeraLink PRO software. The high quality instrument, shielded test leads and quality accessories included in the standard set enable to perform insulation testing quickly and effectively.

MEASURING FUNCTIONS:

- Insulation resistance measurement.
- Step voltage insulation resistance testing.
- Withstanding voltage testing.
- Diagnostic test (PI, DD, DAR).
- R(t) graph plotting.
- Capacitance measurement.
- Voltage measurement.
- Frequency measurement.

KEY FEATURES:

- **Measuring range** up to 10 TΩ.
- **Wide range of DC test voltages:** from 250 V up to 5000 V in steps of 25 V.
- **Withstanding voltage:** testing of insulation with programmable ramp test voltage from 250 V up to 5 kV and programmable threshold current.
- **Step voltage:** insulation resistance measurement with five discrete proportionately set test voltages and programmable timer per step.
- **Automated testing:** PI, DD, DAR calculations with automated resistance ranging. All data is displayed during one single measurement.
- **Guard test terminal:** for elimination of potential surface leakage currents.
- **Fault finding:** fully programmable step voltage and withstanding voltage test functions assist in diagnosing faults in insulation.
- **Graph R(t):** real time resistance against time graph plotting facility to graphically illustrate the response of a material to an applied test voltage.
- **Built-in timer:** programmable timer from 1 s up to 30 min.
- **Automatic discharge** of tested object after test.
- **Fast testing:** 5 mA current source for quick charging of capacitive load.
- **Accurate:** selectable noise rejection filters and shielded test leads included in a standard set ensure accurate measurement.

- **Safe:** high CAT IV / 600 V voltage protection.
- **Built-in charger & rechargeable batteries:** instrument has a built-in charger and comes complete with a set of rechargeable NiMH batteries.
- **Portable:** lightweight 3 kg design with carry handle and shoulder strap.

APPLICATION:

- Testing insulation resistance of rotating machinery, cables, transformers, HV generators, surge arresters.
- Production line periodic testing and maintenance.
- Troubleshooting and analysis of all kinds of insulation problems.
- Diagnostic testing.

STANDARDS:

Functionality: IEC/EN 61557-2
Electromagnetic compatibility:
EN 61326 class B
Safety:
EN 61010-1;
EN 61010-031

Accessories: page 8.01

High Voltage Insulation Diagnostics

TECHNICAL SPECIFICATION:

Function	Measuring range	Resolution	Accuracy
Insulation resistance	0 kΩ … 999 kΩ 1.00 MΩ … 9.99 MΩ 10.0 MΩ … 99.9 MΩ 100 MΩ … 999 MΩ 1.00 GΩ … 9.99 GΩ 10.0 GΩ … 99.9 GΩ 100 GΩ … 999 GΩ 1.00 TΩ … 10.00 TΩ	1 kΩ 10 kΩ 100 kΩ 1 MΩ 10 MΩ 100 MΩ 1 GΩ 10 GΩ	±(5 % of reading + 3 digits) ±(5 % of reading + 3 digits) ±(5 % of reading + 3 digits) ±(5 % of reading + 3 digits) ±(5 % of reading + 3 digits) ±(5 % of reading + 3 digits) ±(5 % of reading + 3 digits) ±(15 % of reading + 3 digits)
Test voltage	0 V … 5500 V	1 V	±(3% of reading + 3 V)
Insulation leakage current	0.00 nA … 9.99 nA 10.0 nA … 99.9 nA 100 nA … 999 nA 1.00 µA … 9.99 µA 10.0 µA … 99.9 µA 100 µA … 999 µA 1.00 mA … 5.50 mA	0.01 nA 0.1 nA 1 nA 10 nA 100 nA 1 µA 10 µA	±(5% of reading + 0.05 nA)
Dielectric absorption ratio (DAR)	0.01 … 9.99 10.0 … 100.0	0.01 0.1	±(5 % of reading + 2 digits) ±5 % of reading
Polarization index (PI)	0.01 … 9.99 10.0 … 100.0	0.01 0.1	±(5 % of reading + 2 digits) ±5 % of reading
Dielectric discharge (DD)	0.01 … 9.99 10.0 … 100.0	0.01 0.1	±(5 % of reading + 2 digits) ±5 % of reading
Voltage AC / DC	0 V … 600 V	1 V	±(3% of reading + 4 V)
Frequency	45.0 Hz … 65.0 Hz	0.1 Hz	±0.2 Hz
Capacitance	0.0 nF … 99.9 nF 100 nF … 999 nF 1.00 µF … 50.00 µF	0.1 nF 1 nF 10 nF	±(5 % of reading + 4 nF)
Power supply	6 × 1.2 V NiMH rechargeable batteries, type C		
Display	Matrix LCD with backlight, 160 x 116 dots		
Overvoltage category	CAT IV / 600 V		
Protection class	Double insulation		
COM port	RS232 and USB		
Dimensions	310 x 130 x 250 mm		
Weight	3 kg		

STANDARD SET:

- Instrument TeraOhm 5 kV Plus
- Small soft carrying bag
- Mains cable
- 10 kV shielded test lead, black, 2 m
- 10 kV shielded test lead, red, 2 m
- 10 kV crocodile clip, 2 pcs (black, red)
- Guard lead, green, 2 m
- Crocodile clip, green
- 6 x 1.2 V NiMH rechargeable batteries, type C
- Handbook on CD
- Instruction manual
- Calibration certificate

Accessories: page 8.01

MI 3200 TeraOhm 10 kV

The new insulation tester MI 3202 TeraOhm 10 kV is a portable instrument intended to measure insulation resistance by using high DC test voltages up to 10 kV. TeraOhm 10 kV enables insulation resistance measurements up to 10 TΩ, step voltage test, withstanding voltage test, PI, DD and DAR calculation and capacitance measurement. The large LCD screen enables real-time graph R(t) to be displayed. Results can be stored and downloaded to a computer via USB or RS232 connection with the help of the optional TeraLink PRO software. The high quality instrument, shielded test leads and quality accessories included in the standard set enable to perform insulation testing quickly and effectively.

MEASURING FUNCTIONS:

- Insulation resistance measurement.
- Step voltage insulation resistance testing.
- Withstanding voltage testing.
- Diagnostic test (PI, DD, DAR).
- R(t) graph plotting.
- Capacitance measurement.
- Voltage measurement.
- Frequency measurement.

KEY FEATURES:

- **Measuring range** up to 10 TΩ.
- **Wide range of DC test voltages:** from 500 V up to 10000 V in steps of 25 V.
- **Withstanding voltage:** testing of insulation with programmable ramp test voltage from 500 V up to 10 kV and programmable threshold current.
- **Step voltage:** insulation resistance measurement with five discrete proportionately set test voltages and programmable timer per step.
- **Automated testing:** PI, DD, DAR calculations with automated resistance ranging. All data is displayed during one single measurement.
- **Guard test terminal:** for elimination of potential surface leakage currents.
- **Fault finding:** fully programmable step voltage and withstanding voltage test functions assist in diagnosing faults in insulation.
- **Graph R(t):** real time resistance against time graph plotting facility to graphically illustrate the response of a material to an applied test voltage.
- **Built-in timer:** programmable timer from 1 s up to 30 min.
- **Automatic discharge** of tested object after test.
- **Fast testing:** 5 mA current source for quick charging of capacitive load.
- **Accurate:** selectable noise rejection filters and shielded test leads included in a standard set ensure accurate measurement.

- **Safe:** high CAT IV / 600 V voltage protection.
- **Built-in charger & rechargeable batteries:** instrument has a built-in charger and comes complete with a set of rechargeable NiMH batteries.
- **Portable:** lightweight 5.5 kg design with carry handle.

APPLICATION:

- Testing insulation resistance of rotating machinery, cables, transformers, HV generators, surge arresters.
- Production line periodic testing and maintenance.
- Troubleshooting and analysis of all kinds of insulation problems.
- Effective measurements in high noise environments such as high voltage substations and switchyards.
- Diagnostic testing.

STANDARDS:

Functionality:
IEC/EN 61557-2
Electromagnetic compatibility:
EN 61326 class B
Safety:
EN 61010-1;
EN 61010-031

Accessories: page 8.01

High Voltage Insulation Diagnostics

TECHNICAL SPECIFICATION:

Function	Measuring range	Resolution	Accuracy
Insulation resistance	0 kΩ … 999 kΩ	1 kΩ	±(5 % of reading + 3 digits)
	1.00 MΩ … 9.99 MΩ	10 kΩ	±(5 % of reading + 3 digits)
	10.0 MΩ … 99.9 MΩ	100 kΩ	±(5 % of reading + 3 digits)
	100 MΩ … 999 MΩ	1 MΩ	±(5 % of reading + 3 digits)
	1.00 GΩ … 9.99 GΩ	10 MΩ	±(5 % of reading + 3 digits)
	10.0 GΩ … 99.9 GΩ	100 MΩ	±(5 % of reading + 3 digits)
	100 GΩ … 999 GΩ	1 GΩ	±(5 % of reading + 3 digits)
	1.00 TΩ … 10.00 TΩ	10 GΩ	±(15 % of reading + 3 digits)
Test voltage	0 V … 9999 V	1 V	±(3% of reading + 3 V)
	≥ 10 kV	0.1 kV	±(3% of reading)
Insulation leakage current	0.00 nA … 9.99 nA	0.01 nA	±(5% of reading + 0.05 nA)
	10.0 nA … 99.9 nA	0.1 nA	
	100 nA … 999 nA	1 nA	
	1.00 µA … 9.99 µA	10 nA	
	10.0 µA … 99.9 µA	100 nA	
	100 µA … 999 µA	1 µA	
	1.00 mA … 5.50 mA	10 µA	
Dielectric absorption ratio (DAR)	0.01 … 9.99	0.01	±(5 % of reading + 2 digits)
	10.0 … 100.0	0.1	±(5 % of reading)
Polarization index (PI)	0.01 … 9.99	0.01	±(5 % of reading + 2 digits)
	10.0 … 100.0	0.1	±(5 % of reading)
Dielectric discharge (DD)	0.01 … 9.99	0.01	±(5 % of reading + 2 digits)
	10.0 … 100.0	0.1	±(5 % of reading)
Voltage AC/DC	0 V … 600 V	1 V	±(3% of reading + 4 V)
Frequency	45.0 Hz … 65.0 Hz	0.1 Hz	±0.2 Hz
Capacitance	0.0 nF … 99.9 nF	0.1 nF	±(5 % of reading + 2 digits)
	100 nF … 999 nF	1 nF	
	1.00 µF … 50.00 µF	10 nF	
Power supply	6 × 1.2 V NiMH rechargeable batteries, type D		
Display	Matrix LCD with backlight, 160 x 116 dots		
Overvoltage category	CAT IV / 600 V		
Protection class	Double insulation		
COM port	RS232 and USB		
Dimensions	345 x 160 x 335 mm		
Weight	5.5 kg		

STANDARD SET:

- Instrument TeraOhm 10 kV
- Mains cable
- 10 kV shielded test lead with tip, 2 m
- 10 kV shielded test lead black, 2 m
- 10 kV shielded test lead red, 2 m
- 10 kV crocodile clip, 2 pcs (black, red)
- Guard lead, green, 2 m
- Crocodile clip, green
- 6 x 1.2 V NiMH rechargeable batteries, type D
- Instruction manual
- Handbook on CD
- Calibration certificate

Accessories: page 8.01

MI 3299 HV demo BOX

The MI 3299 High voltage Demonstration Box 10 kV has been developed for demonstration purposes at high voltage insulation diagnostics. It simulates typical electrical insulation usually met in the industrial environment. It is equipped with high quality resistors in different ranges, high voltage capacitors and a discharge facility to simulate a breakdown phenomenon in gases. Additionally measurements of polarization index (PI), dielectric discharge (DD) and dielectric absorption ratio (DAR) can be demonstrated. Packed with all these features the demonstration box is also well suited for basic calibration of DC high voltage insulation resistance measuring instruments.

KEY FEATURES:

- 10 kV rated resistors with very low voltage coefficient.
- Resistive decade with 200 kΩ, 500 MΩ, 200 GΩ and 2 TΩ resistors.
- HV capacitors in 2.5 µF and 5 nF range.
- Built-in spark gap and gas discharge tube.
- Demonstration of insulation breakdown in gases is possible.
- Two models of insulation material (good and bad cables) enable the demonstration of real insulation behavior under high DC voltage.
- Demonstration box is put in the strong rugged case with handle for comfortable carrying.

APPLICATION:

- Demonstration of insulation diagnostics measurement with DC test voltage.
- Demonstration of functionality of HV insulation measuring instruments.
- Training centres, schools, laboratories.
- Basic calibration of DC high voltage insulation testers.

STANDARDS:

Safety:
EN 61010-1

TECHNICAL DATA:

Dimensions	440 × 320 × 110 mm
Weight	4 kg

STANDARD SET:

- HV demo BOX 10 kV
- HV test leads, 2 pcs
- Instruction manual
- Handbook on CD
- Calibration certificate

Accessories: page 8.01

MEASURING INSTRUMENTS AND TESTERS

- Electrical Installation Safety
- High Voltage Insulation Diagnostics
- **Appliance / Machine / Switchboard Safety**
- Power Quality Analysis
- LAN Cabling Certification
- Indoor Environment Quality
- Digital Multimeters / Clamp Meters / Voltage and Continuity Testers
- Accessories

Appliance / Machine / Switchboard Safety

In-service Inspection and Testing of Electrical Equipment

METREL®

CATALOGUE 2010

Glossary - Testing the safety of electrical appliances

PAT testing
"PAT" is an abbreviation for Portable Appliance Testing. This refers to the formal inspection and testing of portable appliances to ensure that they are safe to use.

Class I appliance
Class I equipment is an equipment in which protection from electric shock is provided by both basic insulation and connection of exposed metal parts to the protective conductor and onto the earthing of the plug.

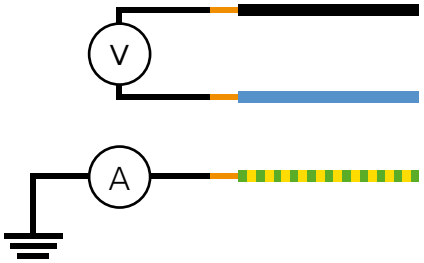
Class II appliance
Class II equipment is an equipment in which protection against electric shock is provided by basic insulation and an additional safety precaution (e.g. supplementary insulation) or via reinforced insulation. Class II appliances usually have the following symbol on them:

Visual check
Visual test of the equipment is intended to confirm that there are no visible signs of damage or defects. This can be recorded on most of Metrel's PAT testers for future reference.

Earth Bond / Continuity test
Test to ensure that the earth cable has the ability to withstand a fault current in case a problem occur in the appliance. IT equipment can have problems with high current Earth Bond tests, in which case a soft current continuity test (20 ... 200 mA) can be performed to simply check if an earth path exists (for Class I appliances only).

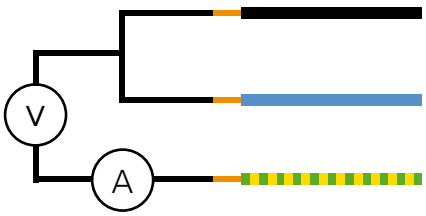
Insulation test
A high DC voltage test to ensure that the insulation resistance between the phases (i.e. live and neutral) and earth is high enough to guarantee that equipment is safe to use.

Leakage test
The amount of current that finds an alternative path back to the supply, other than through the neutral conductor. High leakage currents can cause both operation problems (e.g. tripping RCDs) and health and safety issues (e.g. cause voltages to appear on pipework which can be a reason of injury). This test powers up the equipment with 230 V a.c. and measures the amount of leakage current the equipment produces.



Differential leakage
Differential leakage is measured in case an appliance has more than one connection to ground (e.g. the metal housing of the appliance sits on the ground or is screwed down). A measure of the current passing through the cable may not be a true indication of the full leakage current supplied by the appliance. Differential leakage measures the difference in current between the live and neutral cable which provides a true value of how much current the appliance leaks to ground.

Substitute leakage
In this test the live and neutral conductors of the appliance are shorted together and a voltage of 40 V a.c. is applied between this point and either the earth conductor (class I) or the probe connected to any exposed conductive part (class I and class II). The test measures how much current passes from the live conductors into the test point.



Touch leakage
This test measures the amount of current that would pass through the human body if a person touched the appliance while it was in operation. The PAT tester powers up the appliance and via the probe connected to the tested device simulates the average resistance of the Human body and measures how much current would pass through a person if he touched the appliance.

Polarity test
A polarity test checks that all the connections in an IEC cable or extension cable are correctly fitted. Results include L-open, N-open, PE-open, L-PE shorted, L-N shorted, N-PE shorted, L-N crossed, L-PE crossed, N-PE crossed and multiple faults.

Flash test
Flash test is also referred to as Hi-Pot or Dielectric strength test. The test is a high AC voltage test which checks the dielectric strength of the insulation in a piece of equipment. This can be 1500 V for class I equipment and 3000 V for class II equipment and tends to be used in accordance with CE tests once an appliance has been repaired.

RCD test
This test checks how long it takes for a portable RCD to trip in the case that a fault occurs.

Project uploading
When retesting a site or location, project uploading allows previously saved information to be reloaded onto the PAT tester to speed up testing and enable trend comparison.

Autosequencing
Autosequencing is a series of tests that are initiated with the single press of a button and are automatically executed in a particular order by the test instrument.

Custom tests
Custom tests allow the user to define the tests and times involved in the autosequence. This is extremely useful feature for testing unusual appliances or appliances that require a special method of testing that is not included in the standard autosequences.

Trend comparison
Trend comparison allows test information from different dates to be compared in order to discover if deterioration is occurring in an appliance. In case the deterioration was found, the test engineer can make an informed decision as to if the frequency of testing and inspection is sufficient for the appliance.

Accessories: page 8.01

Selection Guide for PAT testers

Part No.	MI 3311 GammaGT	MI 2142 AlphaPAT	MI 3304 BetaGT Plus	MI 3305 OmegaGT Plus
				
MEASUREMENTS				
Continuity 200 mA	✓	✓	✓	✓
Continuity 10 A	–	✓	✓	✓
Continuity 25 A	–	✓	✓	✓
Insulation resistance 250 VDC	✓	✓	✓	✓
Insulation resistance 500 VDC	✓	✓	✓	✓
Differential leakage current	–	✓	✓	✓
Touch leakage current	–	✓	✓	✓
Substitute leakage current	✓	✓	✓	✓
Leakage current measurements with optional clamp	–	✓	✓	✓
Flash test	–	–	–	✓
PRCD testing	–	–	✓	✓
Polarity test (IEC lead test)	✓	✓	✓	✓
Functional (load) test	–	✓	✓	✓
Voltage TRMS	✓	–	–	–
ADDITIONAL FEATURES				
PASS / FAIL evaluation	✓	✓	✓	✓
Mains supply check	✓	✓	✓	✓
Built-in Checkbox	✓	–	–	–
Graphical LCD	✓	✓	✓	✓
Graphical on-line help	✓	✓	✓	✓
Backlight	✓	✓	✓	✓
Real time clock	✓	✓	✓	✓
QWERTY keyboard	–	–	✓	✓
Auto testing (organizer, custom autotests)	✓	✓	✓	✓
Barcode shortcut auto testing	✓	✓	✓	✓
Communication ports USB / RS232	✓/ ✓	Option / ✓	✓/ ✓	✓/ ✓
"Test and tag" (barcode scanner + label printer)	–	–	✓	✓
Data download to PC	✓	✓	✓	✓
Project upload from PC	–	–	✓	✓
Trend (compare) on instrument's LCD	–	–	✓	✓
Trend with PC SW PATLink PRO Plus	–	–	✓	✓
Number of memory locations	1500	1100	6500	6500
STANDARD / OPTIONAL ACCESSORIES				
Barcode scanner	Option	Option	Option	Option
Label printer	–	–	Option	Option
Receipt printer	–	Option	Option	Option
Basic PC SW	Option	Option	✓	✓
Advanced PC SW	Option	–	Option	Option
GENERAL DATA				
Weight	0.86 kg	3.5 kg	8.4 kg	8.4 kg
Dimensions	140 x 80 x 230 mm	265 x 110 x 185	345 x 160 x 335	345 x 160 x 335

Accessories: page 8.01

MI 3311 GammaGT

The new MI 3311 GammaGT is a battery powered multifunctional instrument intended to perform measurements for testing the electrical safety of portable electrical equipment. Due to large graphical LCD with backlight, two PASS / FAIL LED indicators and HELP screens for each measurement the handling of the instrument is clear and simple. Up to 1500 test results with parameters can be stored in the internal memory of the instrument and then downloaded to the PC for further data handling and creation of test report. Lightweight design, pre-programmed and custom test sequences, optional barcoding system and built-in calibration unit make the MI 3311 an ideal instrument for high volume professional safety testing of portable appliances.

MEASURING FUNCTIONS:

- Continuity test with 200 mA.
- Insulation resistance.
- Insulation resistance of isolated accessible conductive parts.
- Substitute leakage current.
- Substitute leakage current of isolated. accessible conductive parts.
- IEC cord polarity test.
- Voltage.
- Functional and visual inspection.

KEY FEATURES:

- **Autosequencing:** pre-programmable VDE compatible autosequences, up to 50 custom prepared autosequences and barcode autotests speed up testing and ensure that no tests are missed.
- **Checkbox:** built-in calibration unit performs calibration of the instrument and the calibration results are automatically stored into instrument's memory.
- **PASS / FAIL:** large green and red lights of the LEDs indicate a PASS or FAIL evaluation of test result.
- **Barcoding system:** barcode scanner support for quick test code selection and identification of appliance under test.
- **User friendly:** large LCD screen, two Pass / Fail LED indicators, help screens and warnings make the instrument an extremely easy to use.
- **Multi-tasking:** instrument performs continuity test, 250 V and 500 V insulation tests, substitute leakage measurement, functioanal and polarity tests.
- **Downloadable:** up to 1500 test results with measuring parameters can be stored in two level memory and downloaded to the PC with the help of PC SW PATLink PRO.
- **Built-in charger & rechargeable batteries:** instrument has a built-in charging circuit and comes complete with a set of rechargeable NiMH batteries.
- **PC SW PATLink PRO** enables downloading, viewing, printing of test results and exporting of data to spreadsheet applications.
- **PC SW PATLink PRO Plus** enables advanced analysis of test results, upload of pre-programmed custom autosequences, creation of professional test reports.

APPLICATION:

- Professional PAT testing.
- General PAT testing.
- After repair PAT safety testing.

STANDARDS:

Functionality:
EN 61557; VDE 0404-1; VDE 0404-2; VDE 0701; VDE 0702; NEN 3140
Electromagnetic compatibility:
EN 61326
Safety: EN 61010-1; EN 61010-031

Accessories: page 8.01

TECHNICAL SPECIFICATION:

Function	Measuring range	Resolution	Accuracy
PE continuity (200 mA)	0.00 Ω … 19.99 Ω 20.0 Ω … 199.9 Ω 200 Ω … 1999 Ω	0.01 Ω 0.1 Ω 1 Ω	±(5 % of reading + 3 digits) Indicative Indicative
Insulation resistance	0.00 MΩ … 19.99 MΩ 20.0 MΩ ... 199.9 MΩ	0.01 MΩ 0.1 MΩ	±(5 % of reading + 3 digits) ±(5 % of reading + 3 digits)
Substitute leakage current	0.00 mA … 9.99 mA 10.0 mA … 20.0 mA	0.01 mA 0.1 mA	±(5 % of reading + 3 digits) ±(5 % of reading + 3 digits)
Voltage	0 V … 300 V	1 V	±(2 % of reading + 2 digits)
Polarity test	Test voltage < 50 V_{AC}		
Power supply	6 x 1.2 V NiMH rechargeable batteries, type AA		
Overvoltage category	CAT II / 300 V		
COM port	RS232 and USB		
Dimensions	140 x 80 x 230 mm		
Weight	0.86 kg		

STANDARD SET:

MI 3311
- Instrument GammaGT
- Small soft carrying bag
- IEC cable, 2 m
- Test probe, black
- Test lead, black, 1.5 m
- Crocodile clip, black
- Power supply adapter
- NiMH rechargeable battery, type AA, 6 pcs
- Instruction manual
- Calibration certificate

KEY FEATURES

Large LCD screen with backlight and PASS / FAIL indicators.

Simple and fast manipulation.

USB and PS/2 connectors for communication with PC and barcode scanner.

Accessories: page 8.01

MI 2142 AlphaPAT

AlphaPAT is a handheld instrument intended for safety testing of electrical portable appliances, information technology equipment and IEC cords. Autosequence mode offers 110 pre-programmed autotests based on appliance type and class, length of supply cord, maximum current capacity etc. and allows to program up to 50 custom test sequences for speed-up appliance's safety testing. Internal memory of the instrument allows to store up to 1100 results and then download them to the PC for storage and report creation with the help of the PC SW PATLink PRO included in the standard set. The simple menu system, bright LCD screen, optional barcoding system, automated PASS / FAIL evaluation of test results and built-in help screens make this instrument an extremely easy to use.

MEASURING FUNCTIONS:

- Continuity tests (200 mA, 10 A, 25 A).
- Insulation resistance.
- Substitute leakage current.
- Differential leakage current.
- Touch leakage current.
- IEC cord polarity test.
- Leakage and load TRMS current measurement with current clamp.
- Functional test.

KEY FEATURES:

- **Autosequencing:** built in Autosequences speed up testing and ensure no tests are missed.
- **Automated:** automatic testing and Pass/Fail evaluation of results according to the code of practice.
- **Adaptable:** tests both 230 V appliances and 115 V appliances (via socket adapter included in standard set).
- **Multi-tasking:** can perform Hard and Soft Earth Bond test, 250 V / 500 V insulation tests, differential /substitute / touch leakage test, Load tests, fuse tests and polarity tests.
- **Intelligent:** hard or soft tests are chosen automatically to reduce the risk of damage occurring on the selected appliance.
- **Downloadable:** with memory capacity of 1100 locations, the unit can be downloaded to a computer via the PATLink software (included in the standard set).

APPLICATION:

- Domestic PAT testing.
- Hotel PAT testing.
- General PAT testing.
- Factory / warehouse PAT testing.

STANDARDS:

Functionality:
VDE 0701;
VDE 0702;
BS 89;
IEC 60335-1;
IEC 60598-1;
IEC 60745;
IEC 60950

Electromagnetic compatibility:
EN 61326

Safety:
EN 61010-1

STANDARD SET:

MI 2142

- Instrument AlphaPAT
- Carrying bag
- Continuity / Leakage cable
- Instruction manual
- Calibration certificate

Accessories: page 8.01

TECHNICAL SPECIFICATION:

Function	Measuring range	Resolution	Accuracy
PE continuity (25 A, 10 A, 200 mA)	0.00 Ω … 19.99 Ω	0.01 Ω	±(5% of reading + 3 digits)
Insulation resistance (250 V_{DC}, 500 V_{DC})	0.000 MΩ … 0.500 MΩ 0.501 MΩ … 1.999 MΩ 2.00 MΩ … 19.99 MΩ	0.001 MΩ 0.001 MΩ 0.01 MΩ	±(10% of reading + 5 digits) ±(5% of reading + 3 digits) ±(5% of reading + 3 digits)
Substitute leakage current	0.00 mA … 19.99 mA	0.01 mA	±(5% of reading + 5 digits)
Differential leakage current	0.00 mA … 19.99 mA	0.01 mA	±(5% of reading + 5 digits)
Touch leakage current	0.00 mA … 1.99 mA	0.01 mA	±(5% of reading + 5 digits)
Functional test	0.00 kVA … 3.70 kVA	0.01 kVA	±(10% of reading + 3 digits)
Current with clamp-on adapter	0.00 mA … 9.99 mA 10.0 mA … 99.9 mA 100 mA … 999 mA 1.00 A … 9.99 A 10.0 A … 24.9 A	0.01 mA 0.1 mA 1 mA 0.01 A 0.1 A	±(5% of reading + 5 digits) ±(5% of reading + 5 digits) ±(5% of reading + 5 digits) ±(5% of reading + 5 digits) ±(5% of reading + 5 digits)
Power supply	230 V, 50 Hz / 60 Hz		
Overvoltage category	CAT II / 300 V		
Protection class	I		
COM port	RS232		
Dimensions	265 x 110 x 185 mm		
Weight	3.5 kg		

KEY FEATURES

Mobile phone type keypad for fast entering of appliance data and date.

Input / output ports: barcode reader, RFID reader / writer, printer, PC.

Small and lightweight design makes AlphaPAT ideal for PAT testing on variety of environments.

Accessories: page 8.01

MI 3304 BetaGT Plus

The innovative MI 3304 BetaGT Plus is a high-class instrument intended for electrical safety testing of a wide range of portable electrical appliances, IT equipment, IEC cords and portable RCDs according to IEC/EN and VDE standards. This portable, self-contained and durable instrument can be moved between sites with minimum time and effort. The large, bright LCD screen enables work with the instrument in almost all lighting conditions. New features including portable RCD testing, clamp leakage current measurement, project uploading, recall and retest functions, fixed appliance test ports, optional PASS/FAIL label printing and on-site test result comparison make this instrument perfect for PAT testing in almost any situation.

MEASURING FUNCTIONS:

- Continuity tests (200 mA, 10 A, 25 A).
- Insulation resistance.
- Substitute leakage current.
- Differential leakage current.
- Touch leakage current.
- IEC cord polarity test.
- Leakage and load TRMS current measurement with current clamp.
- Portable RCD testing.
- Functional test.

KEY FEATURES:

- **Autosequencing:** 24 pre-set autosequences and custom prepared autosequences speed up testing and ensure that no tests are missed.
- **Automated:** automatic testing and PASS / FAIL evaluation of test results according to appropriate standard.
- **Project uploading:** previous test data can be uploaded for fast retesting of the appliance.
- **Scan and test:** optional barcoding system and PASS / FAIL barcode label printing make retesting quick and simple.
- **RFID:** support for advanced RFID identification system.
- **User friendly:** large LCD screen, full QWERTY keyboard, help screens and warnings make the instrument an extremely easy to use.
- **Multi-tasking:** instrument performs continuity tests with different test currents, 250 V and 500 V insulation tests, differential /substitute / touch leakage mesurements, functioanal and polarity tests.
- **PRCD testing:** instrument enables measurement of trip-out time of portable RCDs.
- **Clamp leakage current measurement:** quick measurement of leakage current with current clamps directly on power supply cable without disconnection of appliance from mains.
- **Trend functionality:** test results can be uploaded from PC to the instrument for comparison between old and new test results on-site.
- **Downloadable:** up to 6500 test results with measuring parameters can be stored in two level memory and downloaded to the PC with the help of PC SW PATLink PRO.
- **PC SW PATLink PRO** included in the standard set enables downloading, viewing, printing of test results and exporting of data to spreadsheet applications.
- **PC SW PATLink PRO Plus** enables advanced analysis of test results, upload of structures and data upload to the instrument for on site comparison of old and new results, upload of pre-programmed custom autosequences and creation of professional test reports.

APPLICATION:

- Professional PAT testing.
- General PAT testing.
- Factory / warehouse PAT testing.
- After repair PAT safety testing.

STANDARDS:

Functionality:
IEC 60335-1; IEC 60598-1; IEC 60745; IEC 60745; VDE404-1; VDE404-2; VDE 0701; VDE 0702
Electromagnetic compatibility: EN 61326
Safety: EN 61010-1; EN 61010-031

Accessories: page 8.01

TECHNICAL SPECIFICATION:

Function	Measuring range	Resolution	Accuracy
PE continuity (10 A, 25 A)	0.00 Ω ...1.99 Ω 2.00 Ω ...19.99 Ω	0.01 Ω 0.01 Ω	±(5 % of reading + 3 digits) ±(10 % of reading)
PE continuity (200 mA)	0.00 Ω ... 1.99 Ω 2.00 Ω ... 9.99 Ω 10.0 Ω ... 19.9 Ω	0.01 Ω 0.01 Ω 0.1 Ω	±(5 % of reading + 3 digits) ±(5 % of reading + 5 digits) ±(5 % of reading + 5 digits)
Insulation resistance (250 V_{DC}, 500 V_{DC})	0.000 MΩ ... 0.500 MΩ 0.501 MΩ ... 1.999 MΩ 2.00 MΩ ... 19.99 MΩ 20.0 MΩ ... 199.9 MΩ	0.001 MΩ 0.001 MΩ 0.01 MΩ 0.1 MΩ	±(10 % of reading + 5 digits) ±(5 % of reading + 3 digits) ±(5 % of reading + 3 digits) ±(5 % of reading + 3 digits)
Substitute leakage current	0.00 mA ... 19.99 mA	0.01 mA	±(5 % of reading + 5 digits)
Touch leakage current	0.00 mA ... 1.99 mA	0.01 mA	±(10 % of reading + 5 digits)
Differential leakage current	0.00 mA ... 9.99 mA	0.01 mA	±(5 % of reading + 5 digits)
Functional test: apparent power	0.00 kVA ... 4.00 kVA	0.01 kVA	±(5 % of reading + 3 digits)
Current with clamp-on adapter	0.00 mA ... 9.99 mA 10.0 mA ... 99.9 mA 100 mA ... 999 mA 1.00 A ... 9.99 A 10.0 A ... 24.9 A	0.01 mA 0.1 mA 1 mA 0.01 A 0.1 A	±(5 % of reading + 5 digits)
Portable RCD: trip-out time ($I_{\Delta N}$= 10 mA, 15 mA, 30 mA)	0 ms ... 1999 ms (½x$I_{\Delta N}$) 0 ms ... 300 ms ($I_{\Delta N}$) 0 ms ... 40 ms (5x$I_{\Delta N}$)	1 ms 1 ms 1 ms	±3 ms
Polarity test	Test voltage < 50 V_{AC}		
Power supply	115 V / 230 V, 50 Hz / 60 Hz		
Overvoltage category	CAT II / 300 V		
Protection class	I		
COM port	RS232 and USB		
Dimensions	345 x 160 x 335 mm		
Weight	8.4 kg		

KEY FEATURES

Fast and easy access to test procedure: select the auto test and press START.

Input / output ports:
- Barcode reader
- Printer
- PC

STANDARD SET:

MI 3304
- Instrument BetaGT Plus
- Continuity / Leakage cable
- PRCD cable
- PC SW PATLink PRO
- RS232 cable
- USB cable
- Crocodile clip, green
- Crocodile clip, black
- Test probe, green
- Test probe, black
- Test lead, green 1.5 m
- Test lead, black 1.5 m
- Instruction manual
- Calibration certificate

Accessories: page 8.01

MI 3305 OmegaGT Plus

The innovative MI 3305 OmegaGT Plus is a high-class instrument intended for electrical safety testing of a wide range of portable electrical appliances, IT equipment, IEC cords and portable RCDs according to IEC/EN and VDE standards. This portable, self-contained and durable instrument can be moved between sites with minimum time and effort. The large, bright LCD screen enables work with the instrument in almost all lighting conditions. New features including portable RCD testing, clamp leakage current measurement, flash test, project uploading, recall and retest functions, fixed appliance test ports, optional PASS/FAIL label printing and on-site test result comparison make this instrument perfect for PAT testing in almost any situation.

MEASURING FUNCTIONS:

- Continuity tests (200 mA,10 A, 25 A).
- Insulation resistance.
- Substitute leakage current.
- Differential leakage current.
- Touch leakage current.
- IEC cord polarity test.
- Leakage and load TRMS current measurement with current clamp.
- Portable RCD testing.
- HV Flash test.
- Functional test.

KEY FEATURES:

- **Autosequencing:** 24 pre-set autosequences and custom prepared autosequences speed up testing and ensure that no tests are missed.
- **Automated:** automatic testing and PASS / FAIL evaluation of test results according to appropriate standard.
- **Project uploading:** previous test data can be uploaded for fast retesting of the appliance.
- **Scan and test:** optional barcoding system and PASS / FAIL barcode label printing make retesting quick and simple.
- **RFID:** support for advanced RFID identification system.
- **User friendly:** large LCD screen, full QWERTY keyboard, help screens and warnings make the instrument an extremely easy to use.
- **Multi-tasking:** instrument performs continuity tests with different test currents, 250 V and 500 V insulation tests, differential /substitute / touch leakage mesurements, functioanal and polarity tests.
- **Flash test:** dielectic strength test after repair safety testing.
- **PRCD testing:** instrument enables measurement of trip-out time of portable RCDs.
- **Clamp leakage current measurement:** quick measurement of leakage current with current clamps directly on power supply cable without disconnection of appliance from mains.
- **Trend functionality:** test results can be uploaded from PC to the instrument for comparison between old and new test results on-site.
- **Downloadable:** up to 6500 test results with measuring parameters can be stored in two level memory and downloaded to the PC with the help of PC SW PATLink PRO.
- **PC SW PATLink PRO** included in the standard set enables downloading, viewing, printing of test results and exporting of data to spreadsheet applications.
- **PC SW PATLink PRO Plus** enables advanced analysis of test results, upload of structures and data upload to the instrument for on site comparison of old and new results, upload of pre-programmed custom autosequences and creation of professional test reports.

APPLICATION:

- Professional PAT testing.
- General PAT testing.
- Factory / warehouse PAT testing.
- After repair PAT safety testing.

STANDARDS:

Functionality:
IEC 60335-1; IEC 60598-1; IEC 60745; IEC 60745; VDE404-1; VDE404-2; VDE 0701; VDE 0702
Electromagnetic compatibility:
EN 61326
Safety: EN 61010-1; EN 61010-031

Accessories: page 8.01

Appliance / Machine / Switchboard Safety
PAT TESTERS

TECHNICAL SPECIFICATION:

Function	Measuring range	Resolution	Accuracy
PE continuity (10 A, 25 A)	0.00 Ω ...1.99 Ω 2.00 Ω ...19.99 Ω	0.01 Ω 0.01 Ω	±(5 % of reading + 3 digits) ±(10 % of reading)
PE continuity (200 mA)	0.00 Ω ... 1.99 Ω 2.00 Ω ... 9.99 Ω 10.0 Ω ... 19.9 Ω	0.01 Ω 0.01 Ω 0.1 Ω	±(5 % of reading + 3 digits) ±(5 % of reading + 5 digits) ±(5 % of reading + 5 digits)
Insulation resistance (250 V_{DC}, 500 V_{DC})	0.000 MΩ ... 0.500 MΩ 0.501 MΩ ... 1.999 MΩ 2.00 MΩ ... 19.99 MΩ 20.0 MΩ ... 199.9 MΩ	0.001 MΩ 0.001 MΩ 0.01 MΩ 0.1 MΩ	±(10 % of reading + 5 digits) ±(5 % of reading + 3 digits) ±(5 % of reading + 3 digits) ±(5 % of reading + 3 digits)
Substitute leakage current	0.00 mA ... 19.99 mA	0.01 mA	±(5 % of reading + 5 digits)
Touch leakage current	0.00 mA ... 1.99 mA	0.01 mA	±(10 % of reading + 5 digits)
Differential leakage current	0.00 mA ... 9.99 mA	0.01 mA	±(5 % of reading + 5 digits)
Functional test: apparent power	0.00 kVA ... 4.00 kVA	0.01 kVA	±(5 % of reading + 3 digits)
Current with clamp-on adapter	0.00 mA ... 9.99 mA 10.0 mA ... 99.9 mA 100 mA ... 999 mA 1.00 A ... 9.99 A 10.0 A ... 24.9 A	0.01 mA 0.1 mA 1 mA 0.01 A 0.1 A	±(5 % of reading + 5 digits)
Flash insulation test	0.00 mA ... 2.50 mA	0.01 mA	±(5 % of reading + 5 digits)
Portable RCD: trip-out time ($I_{\Delta N}$= 10 mA, 15 mA, 30 mA)	0 ms ... 1999 ms (½x$I_{\Delta N}$) 0 ms ... 300 ms ($I_{\Delta N}$) 0 ms ... 40 ms (5x$I_{\Delta N}$)	1 ms 1 ms 1 ms	±3 ms
Polarity test	Test voltage < 50 V_{AC}		
Power supply	115 V / 230 V, 50 Hz / 60 Hz		
Overvoltage category	CAT II / 300 V		
Protection class	I		
COM port	RS232 and USB		
Dimensions	345 x 160 x 335 mm		
Weight	8.4 kg		

KEY FEATURES

Fast and easy access to test procedure: select the auto test and press START.

Input / output ports:
- Barcode reader
- Printer
- PC

STANDARD SET:

MI 3305
- Instrument OmegaGT Plus
- Continuity / Leakage cable
- PRCD cable
- Flash cable
- PC SW PATLink PRO
- RS232 cable
- USB cable
- Crocodile clip, green
- Crocodile clip, black
- Test probe, green
- Test probe, black
- Test lead, green 1.5 m
- Test lead, black 1.5 m
- Instruction manual
- Calibration certificate

Accessories: page 8.01

MI 3300 Portable Appliance Simulation Board

The MI 3300 PAT Demoboard is an excellent instrument for teaching or demonstrating PAT testing. The MI 3300 simulates a wide variety of portable equipment in normal operation or in fault conditions with the simple flick of a switch. The strong rugged portable case with detachable lid allows the unit to be easily moved between sites. The ability of the unit to simulate unlimited number of different equipment and the possibility to set fault conditions make the PAT Demoboard the ideal unit for teaching or assessing learning in classrooms, training sessions, demonstration sessions, seminars and on PAT training courses.

KEY FEATURES:

- Practically unlimited number of different equipment (portable appliances, machines and switchgears) can be simulated by using different tables (eight are included in a standard set).
- On demand the demonstration board can be simply upgraded with new tables.
- Normal and fault situations can be switched on and off, offering fault conditions for the assessment of learning.
- Demoboard simulates the following faults: PE continuity faults, insulation resistance faults, leakage and touch leakage faults, polarity and functional faults.
- The demonstration board is built into a strong rugged case with a handle and detachable lid for storing leads, adapters and manuals.

APPLICATION:

- Presentation of complete safety testing of any portable appliance, machine or switchgear.
- Demonstration of PAT test equipment operation by sales personnel.

STANDARDS:

Safety:
EN 61010-1

Accessories: page 8.01

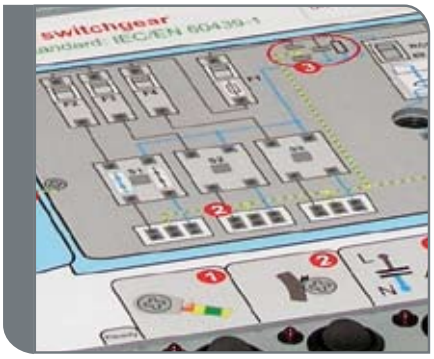
Appliance / Machine / Switchboard Safety
PAT TESTERS

TECHNICAL SPECIFICATION:

Protection class	I
Nominal input voltage	230 V
Optional on request	115 V
Power consumption	15 VA max.
Overvoltage category	CAT II / 300 V
Frequency range	45 Hz … 66 Hz
Pollution degree	2
Dimensions	345 x 160 x 335 mm
Weight	2.76 kg

KEY FEATURES

Normal and fault conditions can be switched on and off.



8 demonstration tables (iron, receiver, IEC cord, extension drum, coffee machine, washing machine, switchgear)

STANDARD SET:

MI 3300
- Instrument PAT Demoboard
- 8 demonstration tables (iron, receiver, IEC cord ,extension drum, coffee machine, washing machine, switchgear)
- Jumper
- IEC cord
- Mains cable
- Class I mains cable
- Class II mains cable
- Test cable for discharge time testing
- Carrying bag for demonstration tables
- Handbook "Electrical Equipment Testing" on CD
- Instruction manual
- Calibration certificate

Accessories: page 8.01

Glossary - Testing the safety of machines and switchboards

Appliance
A device, machine or piece of equipment especially an electrical one that is used in the house, for example a cooker or washing machine.

Machine
A piece of equipment with several moving parts which uses power to do a particular type of work.

Switchgear
A switching / interrupting device used in connection with generation, transmission, distribution and conversion of electric power for controlling, metering protecting and regulating devices.

CE Marking
It is mandatory that any product sold in the European Union (EU) should have a CE label on it. The CE mark is a conformity mark which proves that a product has met all the health, safety and environmental requirements set out by European Directives in order to ensure that the product is suitable for sale.

CE

Discharge time
When a high powered appliance or machine is powered up, the inductive and capacitive components within the device become charged. When the appliance or machine is switched off, people usually assume that the power will be immediately discharged but this is not always the case. Inductive and capacitive components can hold their charge (even after the power has been removed) which can prove dangerous for anybody who comes in contact with the appliance / machine / switchgear. The time it takes for an appliance to discharge can also change with time due to component degradation, impurities and pollution. The discharge time function on the Metrel's test instruments measure how long it takes for the device to discharge itself to a safe level of voltage.

Functional test
The functional test powers up an appliance to check that it works correctly. While doing this, the instrument can also measure a variety of different parameters including voltage, current, power usage, cos φ and power factor.

Loop test
In order for a high powered machine or switchgear to discharge correctly and for safety devices to act correctly and within the set time limits, it is important that the impedance of the fault loop (live to earth impedance) that supplies power to the device is adequate and appropriate. A loop test measures the amount of impedance in the wiring that supplies the device. Once measured, this can be compared to fault loop impedance limits set out in the appropriate regulations in order to ensure that the device is safe to use.

CE MultiTester integrated into the automated production line.

Accessories: page 8.01

Selection Guide for appliances, machines and switchboards testers

Part No.:	MI 2170 MultiServicer	MI 3321 MultiServicerXA	MI 2094 CE MultiTester
			
MEASUREMENTS			
Withstanding test 1000 VAC	✓	✓	✓
Withstanding test 1890 VAC	–	✓	✓
Withstanding test 2500 VAC	✓	✓	✓
Withstanding test 100 ... 5000 VAC (500 VA)	–	–	✓
Continuity 100 mA	–	–	✓
Continuity 200 mA	✓	✓	✓
Continuity 10 A	✓	✓	✓
Continuity 25 A	–	–	✓
Voltage drop test 10 A	✓	–	✓
Insulation resistance 250 VDC	–	✓	✓
Insulation resistance 500 VDC	✓	✓	✓
Insulation resistance 1000 VDC	–	–	✓
Differential leakage current	✓	✓	✓
Touch leakage current	✓	✓	✓
Substitute leakage current	✓	✓	✓
Discharge time	✓	✓	✓
Leakage current measurement with optional clamp	–	✓	–
RCD, PRCD testing	–	✓	–
Line impedance	–	✓	–
Loop impedance	–	✓	–
Voltage measurement	✓	✓	✓
Frequency measurement	–	✓	–
Phase rotation indication	–	✓	–
Polarity test (IEC lead test)	–	✓	–
Functional (load) test	✓	✓	✓
ADITIONAL FEATURES			
PASS / FAIL evaluation	✓	✓	✓
Mains supply autocheck	✓	✓	✓
Graphical LCD	✓	✓	✓
Graphical on-line help	–	✓	–
Backlight	–	✓	✓
Real time clock	–	✓	✓
QWERTY keyboard	–	✓	–
Auto testing (organizer, custom autotests)	–	✓	✓
Barcode shortcut auto testing	–	✓	–
Communication ports RS232 / USB	✓/ Option	✓/✓	✓/ Option
"Test and tag" (barcode scanner + label printer)	–	✓	–
Data download to PC	✓	✓	✓
Project upload from PC to instrument	–	✓	–
Trend (compare) on instrument's LCD	–	✓	–
Trend with PC SW PATLink PRO Plus	✓	✓	–
Number of memory locations	62	6000	1638
STANDARD / OPTIONAL ACCESSORIES			
Barcode scanner	–	Option	Option
Label printer	–	Option	–
Receipt printer	–	Option	Option
PC SW PATLink PRO (download, report, data export)	✓	✓	–
PC SW PATLink PRO Plus (download, PRO Plus report, data export, trend)	Option	Option	–
PC SW CE Link (download, report, autosequence editor)	–	–	Option
GENERAL DATA			
Power supply	230 V	115 V / 230 V	115 V / 230 V
Weight	9.5 kg	8.4 kg	13.5 kg
Dimensions (mm)	345 x 160 x 335	345 x 160 x 335	410 x 175 x 370

Accessories: page 8.01

MI 2170 MultiServicer

The MI 2170 MultiServicer is a multifunctional portable test instrument intended for performing all necessary measurements for testing the electrical safety of machines, switchgears and portable electrical appliances. Apart from insulation resistance, leakage currents and continuity measurements, MultiServicer enables measurement of discharge time, current consumption and resistance to excessive voltages which are the main parameters in the safety testing of hard wired appliances and large machinery. MultiServicer is placed into robust waterproof case for use in harsh industrial environments. Quick reference guide for testing, large LCD screen, user friendly interface and rotary function selector make the safety testing with MultiServicer quick and simple.

MEASURING FUNCTIONS:

- Insulation resistance.
- Withstanding voltage tests (1000 V, 2500 V).
- Continuity tests (200 mA, 10 A).
- Voltage drop.
- Substitute leakage current.
- Differential leakage current.
- Touch leakage current.
- Discharge time.
- Functional test.

KEY FEATURES:

- **3 in 1:** instrument performs testing of portable appliances, machines and switchgears including functional and leakage tests for DUTs with nominal power up to 3.5 kW.
- **Easy to use:** instrument connection guide on lid and rotating function selector make the MI 2170 an extremely easy to use.
- **PASS / FAIL:** configurable limits enable evaluation of test results according to appropriate standard.
- **Fixed appliance tests:** ports, leads and optional accessories fully support the testing of fixed machines and appliances while normal socket supports plug-in machines and appliances testing.
- **Discharge time test:** testing of how long it takes for the machine discharge after power is removed.
- **Withstanding voltage test:** instrument performs 2500 VAC and 1000 VAC withstanding voltage tests with settable current limit.
- **Downloadable:** test results can be stored in two level memory structure.
- **PC SW PATLink PRO** included in the standard set enables downloading, viewing, printing of test results and exporting of data to spreadsheet applications.

- **PC SW PATLink PRO Plus** enables advanced analysis of test results and creation of professional test reports.

APPLICATION:

- Factory machinery safety testing.
- Industrial safety testing.
- Portable appliances safety testing.
- Switchgear safety testing.

STANDARDS:

Functionality:
IEC 60204; IEC 60439-1; VDE 701; VDE 702; IEC 60598-1; IEC 60755; IEC 50144-1
Electromagnetic compatibility:
EN 50081-1;
EN 61000-6-1
Safety:
EN 61010-1

TECHNICAL SPECIFICATION:

Function	Measuring range	Resolution	Accuracy
Withstanding test with 2500 VAC:			
- Test voltage	0.00 kV … 3.00 kV	0.01 kV	±(5% of reading + 5 digits)
- Current	0.0 mA … 99.9 mA	0.1 mA	±(5% of reading + 5 digits)
Withstanding test with 1000 VAC:			
- Test voltage	0.00 kV … 1.50 kV	0.01 kV	±(5% of reading + 5 digits)
- Current	0.0 mA … 109.9 mA 110 mA … 500 mA	0.1 mA 1 mA	±(5% of reading + 5 digits) ±(5% of reading + 5 digits)
Insulation resistance measurement with 500 VDC	0.00 MΩ … 19.99 MΩ	0.01 MΩ	±(5% of reading + 5 digits)
Voltage drop	0.00 V … 11.99 V	0.01 V	±(5% of reading + 5 digits)
PE continuity with 200 mA	0.00 Ω … 19.99 Ω	0.01 Ω	±(5% of reading + 5 digits)
PE continuity with 10 A	0.000 Ω … 1.999 Ω	0.001 Ω	±(5% of reading + 5 digits)
PE continuity with 200 mA	0.00 Ω … 19.99 Ω	0.01 Ω	±(5% of reading + 5 digits)
Discharge time	0.0 s … 9.9 s	0.1 s	±(5% of reading + 3 digits)
Differential leakage current	0.00 mA … 19.99 mA	0.01 mA	±(5% of reading + 5 digits)
Substitute leakage current	0.00 mA … 19.99 mA	0.01 mA	±(5% of reading + 5 digits)
Touch leakage current	0.00 mA … 1.99 mA	0.01 mA	±(5% of reading + 5 digits)
Functional test; current	0.00 A … 15.99 A	0.01 A	±(5% of reading + 3 digits)
Power supply	230 V, 50 Hz		
Overvoltage category	CAT III / 300 V		
Protection class	I		
COM port	RS232		
Dimensions	345 x 160 x 335 mm		
Weight	9.5 kg		

STANDARD SET:

MI 2170
- Instrument MultiServicer
- High voltage test lead
- Test lead, black, 2 m
- Test lead, red, 2 m
- Test probe, black
- Test probe, red
- Crocodile clip, black
- Crocodile clip, red
- PC SW PATLink PRO with RS232 cable
- Protective bag for accessories
- Instruction manual
- Calibration certificate

Accessories: page 8.01

MI 3321 MultiServicerXA

Multifunctional portable test instrument MI 3321 MultiServicerXA is intended to perform all necessary measurements for testing the electrical safety of portable electrical equipment, machines and switchgears. It is the first machine tester covering all necessary tests according to new IEC/EN 60204 ed.5 including Loop impedance, RCD and HV tests. MultiServicerXA enables measurement of discharge time, power and current consumption and resistance to excessive voltages which are the main parameters in the safety testing of hard wired appliances and large machinery. With an easy to use user interface, large graphic LCD, QWERTY keyboard, help menus with connection diagrams and extra ports for testing fixed installations the MI 3321 is the best solution for safety testing.

MEASURING FUNCTIONS:

- Continuity tests (200 mA, 10 A).
- Insulation resistance.
- Withstanding voltage tests (1000 V, 1890 V, 2500 V).
- Substitute leakage current.
- Differential leakage current.
- Touch leakage current.
- IEC cord polarity test.
- Leakage and load TRMS current measurement with current clamp.
- Portable RCD testing.
- RCD testing.
- Line and loop impedance.
- High resolution line / loop impedance (mΩ).
- Discharge time.
- Three phase voltage / rotary field.
- Functional test.

KEY FEATURES:

- **3 in 1:** instrument performs testing of portable appliances (acc. to VDE 0701 0702), machines (acc. to IEC/EN 60204 Ed.5) and switchgears (acc. to IEC/ EN 60439 and the new IEC 61439) including functional and leakage tests for DUTs with nominal power up to 3.5 kW.
- **Multi-tasking:** up to 18 different measurements can be performed either as a single test or pre-programmed test sequences (PAT mode).
- **Automated:** automatic testing and PASS / FAIL evaluation of test results according to appropriate standard.
- **Project uploading:** previous test data can be uploaded for fast retesting of the object.
- **Scan and test:** optional barcoding system and PASS / FAIL barcode label printing make retesting quick and simple.
- **RFID:** support for advanced RFID identification system.
- **User friendly:** large LCD screen, full QWERTY keyboard, help screens and warnings make the instrument an extremely easy to use.
- **Fixed appliance tests:** ports, leads and optional accessories fully support the testing of fixed machines and appliances while normal socket supports plug-in machines and appliances testing.
- **RCD testing:** instrument enables testing of parameters of RCDs and portable RCDs.
- **Clamp leakage current measurement:** quick measurement of leakage current with current clamps directly on power supply cable without disconnection of appliance from mains.
- **Discharge time test:** testing of how long it takes for the machine discharge after power is removed.
- **Withstanding voltage test:** instrument performs 2500 VAC, 1890 VAC and 1000 VAC withstanding voltage tests with settable current limit.
- **Trend functionality:** test results can be uploaded from PC to the instrument for comparison between old and new test results on site.
- **Downloadable:** up to 6000 test results with measuring parameters can be stored in two level memory and downloaded to the PC with the help of PC SW PATLink.
- **PC SW PATLink PRO** included in the standard set enables downloading, viewing, printing of test results and exporting of data to spreadsheet applications.
- **PC SW PATLink PRO Plus** enables advanced analysis of test results, upload of structures and data upload to the instrument for on site comparison of old and new results, upload of pre-programmed custom autosequences and creation of professional test reports.

APPLICATION:

- Factory machinery safety testing.
- Industrial safety testing.
- Portable appliances safety testing.
- Switchgear safety testing.

STANDARDS:

Functionality: IEC/EN 61557; IEC 60439-1; EN 60204; IEC/EN 60204-1 Ed.5; IEC/EN 60439; IEC 60755; IEC 60598-1; VDE 0404; VDE 0701-0702;
Electromagnetic compatibility: EN 61326
Safety: EN 61010-1; EN 61010-031

TECHNICAL SPECIFICATION:

Function	Measuring range	Resolution	Accuracy
Withstanding test with 1890 V_{AC} and 2500 V_{AC}:			
- Test voltage	0 V … 3000 V	1 V	±(5% of reading + 5 digits)
- Current	0.0 mA … 99.9 mA	0.1 mA	±(10% of reading + 8 digits)
Withstanding test with 1000 V_{AC}:			
- Test voltage	0 V … 1500 V	1 V	±(5% of reading + 5 digits)
- Current	0.0 mA … 199.9 mA 200 mA … 500 mA	0.1 mA 1 mA	±(5% of reading + 5 digits) ±(5% of reading + 5 digits)
Insulation resistance with 250 V_{DC}; 500 V_{DC}	0.000 MΩ … 0.500 MΩ 0.501 MΩ … 1.999 MΩ 2.00 MΩ … 19.99 MΩ 20.0 MΩ … 199.9 MΩ	0.001 MΩ 0.001 MΩ 0.01 MΩ 0.1 MΩ	±(10% of reading + 5 digits) ±(5% of reading + 3 digits) ±(5% of reading + 3 digits) ±(5% of reading + 3 digits)
Insulation - S resistance with 250 V_{DC}; 500 V_{DC}	0.000 MΩ … 0.500 MΩ 0.501 MΩ … 1.999 MΩ 2.00 MΩ … 19.99 MΩ	0.001 MΩ 0.001 MΩ 0.01 MΩ	±(10% of reading + 5 digits) ±(5% of reading + 3 digits) ±(5% of reading + 3 digits)
PE continuity with 10 A (PAT)	0.00 Ω … 1.99 Ω	0.01 Ω	±(5% of reading + 3 digits)
PE continuity with 10 A (other)	0.000 Ω … 0.999 Ω 1.00 Ω … 1.99 Ω	0.001 Ω 0.01 Ω	±(5% of reading + 6 digits) ±(5% of reading + 3 digits)
PE continuity with 200 mA	0.00 Ω … 1.99 Ω	0.01 Ω	±(5% of reading + 3 digits)
Discharge time	0.0 s … 9.9 s	0.1 s	±(5% of reading + 3 digits)
Differential leakage current	0.00 mA … 9.99 mA	0.01 mA	±(5% of reading + 5 digits)
Substitute leakage current	0.00 mA … 19.99 mA	0.01 mA	±(5% of reading + 5 digits)
Touch leakage current	0.00 mA … 2.50 mA	0.01 mA	±(10% of reading + 5 digits)
Functional test	0.00 kVA … 4.00 kVA	0.01 kVA	±(5% of reading + 3 digits)
TRMS current with clamp	0.00 mA … 9.99 mA 10.0 mA … 99.9 mA 100 mA … 999 mA 1.00 A … 9.99 A 10.0 A … 24.9 A	0.01 mA 0.1 mA 1 mA 0.01 A 0.1 A	±(5% of reading + 10 digits) ±(5% of reading + 5 digits) ±(5% of reading + 5 digits) ±(5% of reading + 5 digits) ±(5% of reading + 5 digits)
PRCD testing	$I_{\Delta N}$: 10, 15, 30 mA		
- Trip-out time	0 ms … 300 ms (1/2x$I_{\Delta N}$) 0 ms … 300 ms ($I_{\Delta N}$) 0 ms … 40 ms (5x$I_{\Delta N}$)	1 ms 1 ms 1 ms	±3 ms ±3 ms ±3 ms
RCD testing	$I_{\Delta N}$: 10, 30, 100, 300, 500, 1000 mA		
- Contact voltage	0.0 V … 19.9 V 20.0 V … 99.9 V	0.1 V 0.1 V	(-0%/+15%) of reading ±10 dig. (-0%/+15%) of reading
- Trip-out time	0.0 ms … 40.0 ms 0.0 ms … 300.0 ms	0.1 ms 0.1 ms	±1 ms ±3 ms
- Trip-out current	0.2×$I_{\Delta N}$ … 1.1×$I_{\Delta N}$ (AC type) 0.2×$I_{\Delta N}$ … 1.5×$I_{\Delta N}$ (A type, $I_{\Delta N}$ ≥30 mA) 0.2×$I_{\Delta N}$ … 2.2×$I_{\Delta N}$ (A type, $I_{\Delta N}$ <30 mA)	0.05×$I_{\Delta N}$ 0.05×$I_{\Delta N}$ 0.05×$I_{\Delta N}$	±0.1×$I_{\Delta N}$ ±0.1×$I_{\Delta N}$ ±0.1×$I_{\Delta N}$
Fault loop impedance / Line impedance	0.00 Ω … 9.99 Ω 10.0 Ω … 99.9 Ω 100 Ω … 1999 Ω	0.01 Ω 0.1 Ω 1 Ω	±(5% of reading + 5 digits) ±(5% of reading + 5 digits) ±10% of reading
Voltage	0 V … 550 V	1 V	±(2% of reading + 2 digits)
Frequency	14.0 Hz … 499.9 Hz	0.1 Hz	±(0.2% of reading + 1 digit)
Power supply	115 V / 230 V, 50 Hz / 60 Hz		
Overvoltage category	CAT II / 300 V		
Protection class	I		
COM port	RS232 and USB		
Dimensions	345 x 160 x 335 mm		
Weight	8.4 kg		

STANDARD SET:

MI 3321
- Instrument MultiServicerXA
- HV test lead
- Plug test cable
- 3-wire test lead
- Test lead, black, 1.5 m
- Test lead, red, 1.5 m
- Test lead, red, 4 m
- Test lead, green, 1.5 m
- Test probe, 4 pcs (black, red. green, blue)
- Crocodile clip, black, 3 pcs
- Protective bag for accessories
- PC SW PATLink PRO with RS232 and USB cable
- Instruction manual
- Calibration certificate

Accessories: page 8.01

MI 2094 CE MultiTester

The MI 2094 CE MultiTester is intended for electrical safety testing and CE certification of electrical appliances, machines and switchboards during the production. It is suitable for testing the appliances after repairs and maintenance work as well. With the ability to test a multitude of different appliances the MI 2094 still remains portable, safe and easy to use. The optional PC software CE Link enables the upload of automated test sequences, downloading of test results directly to the PC, automatic data storage into a file and printing of test reports. Due to selected test functions, durable construction and accompanying PC SW package CE MultiTester is the perfect instrument for electrical safety testing in the most demanding environments like laboratories, automated production lines or specialized workshops.

MEASURING FUNCTIONS:

- Withstanding programmed voltage.
- Withstanding voltage test.
- High voltage burn-out test.
- Continuity tests.
- Insulation resistance measurement.
- Substitute leakage current.
- Differential leakage current.
- Touch leakage current.
- Discharge time.
- Functional test (power, voltage, current, cos φ, frequency).

KEY FEATURES:

- **Auto testing:** up to 10 autosequences each composed of up to 50 steps, including pauses and comments, can be created via the optional CE Link software and saved in the memory of the instrument.
- **Withstanding voltage test:** testing of insulation with programmable test voltage up to 5 kV.
- **Burn test:** instrument performs insulation breakdown test with limited breakdown current.
- **Continuity testing:** wide selection of test currents (100 mA, 200 mA, 10 A, 25 A).
- **Easy to use:** rotary switch makes the selection of a single test simple and easy while the programmable autosequence testing prevent the risk of missing a test.
- **Portable:** due to lightweight design and rugged carrying case with handle CE MultiTester can be moved between locations.
- **Safe:** high quality accessories and optional safety devices like remote control pedal and warning lamp ensure the most safe performance of the measurements.
- **Rack mount:** due to the autotest facility and EXT / DOOR remote control of the instrument CE MultiTester can be integrated into the automated production line for output check of manufactured products.

- **Multi-system testing:** the instrument can be used on TT, TN, IT and 115 V supply systems.
- **Downloadable:** the optional PC SW CE Link enables the upload of test sequences, downloading of test results directly to the PC, automatic data storage into a file and printing of test reports.

APPLICATION:

- Portable appliances, switchgears, machines safety testing.
- Testing and verifying of manufactured products according to European Safety legislation.
- Testing of electrical appliances after repairs and maintenance work.

STANDARDS:

Functionality:
EN 61557; EN 60204-1; EN 60335-1; EN 60439-1; EN 60598-1; IEC 60745; IEC 60755; EN 61010-1; IEC 60950; IEC 61029; IEC 61558-1; EN 60065; VDE 701 T1; VDE 702 T1

Safety: IEC 61010-1

Electromagnetic compatibility:
EN 61326

TECHNICAL SPECIFICATION:

Function	Measuring range	Resolution	Accuracy
Withstanding test (PROG.HV and HV)			
- Test voltage (AC)	0.100 kV … 0.999 kV 1.000 kV … 5.000 kV	0.001 kV 0.001 kV	±(2% of reading + 5 digits) ±(3% of reading + 5 digits)
- Test current	0.0 mA … 500.0 mA	0.1 mA	±(5% of reading + 5 digits)
PE continuity			
- Test current 10 A and 25 A	0.000 Ω … 0.999 Ω 1.000 Ω … 2.000 Ω 2.001 Ω … 9.999 Ω	0.001 Ω 0.001 Ω 0.001 Ω	±(3% of reading + 3 digits) ±(3% of reading + 10 digits) indicative
- Test current 100 mA	0.00 Ω … 9.99 Ω 10.0 Ω … 100.0 Ω	0.01 Ω 0.1 Ω	±(5% of reading + 12 digits) ±(5% of reading + 6 digits)
- Test current 200 mA	0.00 Ω … 9.99 Ω 10.0 Ω … 100.0 Ω	0.01 Ω 0.1 Ω	±(5% of reading + 6 digits) ±(5% of reading + 6 digits)
Insulation resistance	0.000 MΩ … 1.999 MΩ 2.000 MΩ … 199.9 MΩ 200 MΩ … 999 MΩ	0.001 MΩ 0.001 MΩ, 0.01 MΩ, 0.1 MΩ 1 MΩ	±(5% of reading + 10 digits) ±(3% of reading + 3 digits) ±(10% of reading + 10 digits)
Differential leakage current	0.00 mA … 3.99 mA 4.0 mA … 20.0 mA	0.01 mA 0.1 mA	±(5% of reading + 3 digits) ±(5% of reading + 3 digits)
Substitute leakage current	0.00 mA … 20.00 mA	0.01 mA	±(5% of reading + 3 digits)
Touch leakage current	0.00 mA … 2.00 mA	0.01 mA	±(5% of reading + 3 digits)
Functional test			
- Active and apparent power (W or VA)	0.0 … 199.9 200 … 3500	0.1 1	±(5% of reading + 10 digits) ±(5% of reading + 3 digits)
- Voltage	0 V … 400 V	1 V	±(2% of reading + 2 digits)
- Test current	0.000 A … 0.999 A 1.00 A … 15.99 A	0.001 A 0.01 A	±(3% of reading + 5 digits) ±(5% of reading + 5 digits)
- cos φ	0.00 … 1.00	0.01	±(3% of reading + 3 digits)
- Frequency	45.00 Hz … 65.00 Hz	0.01 Hz	±(0.1% of reading + 3 digits)
Discharge time	0 s … 10 s	0.1 s	±(2% of reading + 0.2 s)
Power supply	115 V / 230 V, 50 Hz / 60 Hz		
Overvoltage category	CAT III / 300 V; CAT II / 600 V		
Protection class	I		
COM port	RS232 and USB		
Dimensions	410 x 175 × 370 mm		
Weight	13.5 kg		

STANDARD SET:

MI 2094
- Instrument CE MultiTester
- HV test pistol with 2 m cable, 2 pcs
- Continuity test lead, 2.5 m, 2 pcs
- Insulation test lead, red, 2.5 m
- Insulation test lead, black, 2.5 m
- Crocodile clip, black, 3 pcs
- Crocodile clip, red, 2 pcs
- Discharge time cable
- Mains cable
- Bag for accesories
- Instruction manual
- Calibration certificate

Accessories: page 8.01


MultiServicerXA:
Xtraordinary Abilities
Xtraordinarily Adaptable
We lead by XAmple

MEASURING INSTRUMENTS AND TESTERS

- Electrical Installation Safety
- High Voltage Insulation Diagnostics
- Appliance / Machine / Switchboard Safety
- **Power Quality Analysis**
- LAN Cabling Certification
- Indoor Environment Quality
- Digital Multimeters / Clamp Meters / Voltage and Continuity Testers
- Accessories

Power Quality Analysis

Power, Energy, Voltage, Power Factor and EN 50160 Analysis

METREL®

CATALOGUE 2010

Glossary - Power Quality Analysis

Real Power (P)
Real power is the power generated if a voltage is placed over a purely resistive load and current is allowed to flow. This is also called active power and is usually measured in watts (W) or kilowatts (kW).

Energy
Energy is the generation or use of electric power over a period of time. This is usually expressed in kilowatt-hours (kWh).

Reactive Power (Q)
Reactive power is the power that is generated by reactive components (e.g. inductors, capacitors) to create a magnetic field. This is usually measured in Volt-Ampers reactive (VAr).

Apparent Power (S)
Apparent power is the perceived power from a load that has both resistive and reactive components. Apparent power is the vector sum of both real and reactive power and is usually measured in Volt-Amperes (VA).

Power Factor
Power factor is a measure of a power system's efficiency and is the ratio of real power (Watts) to apparent power (Volt-Amperes).

Fundamental frequency
The fundamental frequency is the lowest and most predominant frequency in a power system (e.g. the fundamental frequency of the mains voltage in the EU is 50 Hz). The fundamental frequency is also called the first harmonic of the system.

Harmonics
Harmonics are a integer frequency multiplication of the fundamental frequency (e.g. with a fundamental of 50 Hz, the 2nd harmonic is 50 x 2 = 100 Hz, 3rd harmonic is 50 x 3 = 150 Hz). Harmonics can be in the form of current harmonics or voltage harmonics and can be caused by a variety of modern day equipment including resonating transformers, switch-mode power supplies, IT equipment, etc. Harmonics can cause a variety of system problems including overheating, false tripping of protective devices, excessive current draw and power fluctuations.

Interharmonics
Interharmonics are harmonics that are not an integer multiplication of the fundamental frequency. The main sources of interharmonic waveform distortion are static frequency converters, induction motors and arcing devices.

Total Harmonic Distortion (THD)
This is the ratio of a wave's harmonic content (for voltage or current) to its fundamental component. Note: this is expressed as a percentage and is also called the "harmonic factor".

Transients
A transient is a short surge of current or voltage, which often occurring before steady-state conditions have become established.

Inrush current
As a motor begins the current needed to start the motor can be 10 to 15 times the normal operating current. This initial surge of current can cause dips in voltage and can be hard to analyse with normal test instruments, for this reason an analyser with a fast logging function is required.

Flickers
Defined by the IEEE std 59 "Flicker is the impression of unsteadiness of visual sensation induced by a light stimulus whose luminance or spectral distribution fluctuates with time". It is thus a noticeable and repeated dip or change in voltage of a power system. This has many causes and many results including the surges in motors, problems to people with epilepsy, unpredicted responses of electronic circuits and displays to flicker.

Part No.
INPUTS
Number of current measuring inputs
Number of voltage measuring inputs
MEASUREMENTS
TRMS Current measurement (Min., Max., Avg.)
TRMS Voltage measurement (Min., Max., Avg.)
Scope function
On-line harmonics measurement
Frequency measurement
Power measurement (W, VA, VAr)
THD and harmonics analysis
Interharmonics analysis
Power Factor and cos φ
Registration of voltage events (sags, swells, interruptions)
Statistical evaluation
Current in neutral conductor
Phase diagram
Unbalance
EN 50160 Analysis
Flicker measurement
Transients measurement
Waveform recording
Inrush currents
Energy measurement
Integration period
COMMUNICATION PORTS
USB
RS232
GENERAL
Graphical LCD with backlight
On-site analysis of recorded data
Built-in power supply for flexible clamps
Maximal recording time
Memory module size
PC Sofware
Maximal test voltage – interphase value
Maximal test voltage – between phase and PE conductors
Frequency range
Over voltage category
AC power supply
Built-in battery charger
Rechargeable batteries (NiMH)
Battery life (tipically)
Weight
Dimensions (mm)

Accessories: page 8.01

Selection Guide for Power Quality Analysers

MI 2092 Power Harmonics Analyser	MI 2292 Power Quality Analyser *Plus*	MI 2492 PowerQ	MI 2392 PowerQ *Plus*	MI 2592 PowerQ4	MI 2130 VoltScanner
					
3	3	3	3	4	–
3	3	3	3	4	1
✓	✓	✓	✓	✓	–
✓	✓	✓	✓	✓	✓ (rms only)
✓	✓	✓	✓	✓	–
✓	✓	✓	✓	✓	–
✓	✓	✓	✓	✓	✓
✓	✓	✓	✓	✓	–
✓	✓	✓	✓	✓	–
–	✓	–	–	–	–
✓	✓	✓	✓	✓	–
✓	✓	–	✓	✓	✓
✓	✓	–	–	–	✓
calculated value	calculated value	calculated value	calculated value	✓	–
–	–	✓	✓	✓	–
–	✓	✓	✓	✓	–
–	✓	–	✓ (without flicker measurement)	✓	1-phase, without flicker measurement
–	✓	–	–	✓	–
–	✓	–	–	–	1-phase, voltage transients
–	✓	–	–	✓	–
–	✓	–	✓	✓	–
✓	✓	✓	✓	✓	–
1 ... 1800 s	1 ... 1800 s	1 ... 1800 s	1 ... 1800 s	1 ... 3600 s	1 ... 1260 s
Option	Option	✓	✓	✓	Option
✓	✓	✓	✓	✓	✓
160 x 116 dots	160 x 116 dots	160 x 160 dots	160 x 160 dots	320 x 200 dots	–
–	–	✓	✓	✓	–
–	–	✓	✓	✓	–
2 ... 4 weeks	2 ... 4 weeks	2 ... 5 days	2 ... 5 days	4 ... 8 weeks	2 ... 4 weeks
2 MB	2 MB	1 MB	1 MB	8 MB	32 kB
✓	✓	✓	✓	✓	✓
900 V rms	900 V rms	952 V rms	952 V rms	1730 V rms	265 V rms
550 V rms	550 V rms	550 V rms	550 V rms	1000 V rms	265 V rms
43 ... 68 Hz	43 ... 68 Hz	45 ... 66 Hz	45 ... 66 Hz	10 ... 70 Hz	47 ... 62 Hz
CAT III / 600 V	CAT III / 600 V	CAT III / 600 V	CAT III / 600 V	CAT IV / 600 V CAT III / 1000 V	CAT III / 300 V
✓	✓	✓	✓	✓	✓
✓	✓	✓	✓	✓	✓
4 x C	4 x C	6 x AA	6 x AA	6 x AA	4 x AA
5 h	5 h	12 h	12 h	15 h	180 h
2 kg	2 kg	0.65 kg	0.65 kg	0.65 kg	0.51 kg
265 x 110 x 185	265 x 110 x 185	220 x 115 x 90	220 x 115 x 90	220 x 115 x 90	103 x 51 x 199

Accessories: page 8.01

MI 2092 Power Harmonics Analyser

The MI 2092 Power Harmonics Analyser is a versatile, easy to use instrument for long term analysis of 3-phase power systems and can be used in industry, utilities and for general power quality diagnostics purposes. The internal memory of the instrument allows to monitor a system for up to 4 weeks and to register voltage and current fluctuations, power draw and usage, system loading, harmonic disturbance, power factor fluctuations and many more. The on-screen oscilloscope provides a visual description of the signal shape while the energy counter calculates how much energy has been used over the time of recording. Depending on the connected clamps, the instrument can read currents from 1 A up to 3 kA. The PowerLink software included in the standard set allows to analyse data in table or graphic form, which makes system analysing, fault finding, problem solving and report writing much easier.

MEASURING FUNCTIONS:

- TRMS voltage
- TRMS current
- Power (active, reactive, apparent)
- Power factor, cos φ
- Energy (active, reactive, generated, consumed)
- Harmonic analysis up to 63rd harmonics, THD measurement
- Capturing and recording of power supply events (shut-down's, interruptions, swells, dips)

KEY FEATURES:

- Three current and three voltage inputs.
- Internal memory module allows recording up to 4 weeks.
- 64 parameters can be monitored or recorded simultaneously.
- 4-quadrant measurements (generator and load with capacitive or inductive character).
- Energy counter.
- On-line scope and metering modes.
- Instrument can be programmed either directly or over PC.
- PC SW PowerLink included in the standard set is used for downloading, management of recorded data and preparation of test reports.

APPLICATION:

- General power quality assessment in distribution and industrial low and middle voltage electric systems.
- Power factor correction equipment measurements.
- Harmonics measurements and filter selection.
- Consumption profile recording.

STANDARDS:

Functionality:
EN 50160;
IEC/EN 61000-4-30, Class B

Electromagnetic compatibility:
EN 50081-1;
EN 50082-1

Safety:
IEC/EN 61010-1

Accessories: page 8.01

TECHNICAL SPECIFICATION:

Function		
AC Voltage inputs Number of inputs Input voltage range Maximum overload Accuracy Resolution Sampling rate Frequency range	 3 10 … 550 Vrms L-N 600 Vrms L-N (maximum overload 10 s) ±0.5 % of reading ±2 digits 0.1 V 6400 samples / sec 43 … 68 Hz for sinusoidal form	
AC Current inputs Number of inputs Input voltage range Resolution Maximum overload Accuracy Sampling rate Maximum input voltage	 3 0.02 … 1 Vrms (0.02 In … In) up to 3000 A via current clamps 0.3 mV (0.3 A at 1000 A / 1 V current clamps) 1.5 In (sinusoidal form) ±0.5 % of reading ±6 digits + accuracy of a measuring transducer 6400 samples / sec 1 Vrms	
Measuring function P, Q, S, PF, cos φ Harmonics analysis up to 63rd component	**Basic accuracy** ±1 % of measuring range (for P, Q, S) 0.2 % x Ur /U or Ir/I	**Resolution** 0.01 of reading (for P, Q, S) 0.1%
Recording Integration period (IP) Maximum number of signals	 1… 1800 s 64	
Measuring conditions AC voltage for power measurements AC current Power factor Frequency Waveform	 0.02 Un … Un 0.02 In … In 4 quadrants (1.00 cap … 0.00 … 1.00 ind) 45 … 65 Hz Sinusoidal AC current and voltage	
COM port	RS232 (optional USB with serial converter)	
Display	LCD with backlight, 160 x 116 dots	
Memory module size	2 MB SRAM, battery powered	
Voltage supply	230 V_{AC} or 4 x 1.2 V NiMh rechargeable batteries, type C	
Overvoltage category	CAT III / 600 V	
Protection class	Double insulation	
Dimensions	265 x 110 x 185 mm	
Weight	2 kg	

STANDARD SET:

MI 2092
- Instrument Power Harmonics Analyser
- Current clamp 1000 A / 1 V, 3 pcs
- Test probe, red, 3 pcs
- Test probe, black
- Crocodile clip, black, 4 pcs
- Voltage measurement lead, 6 pcs
- Mains cable
- PC SW PowerLink with RS232 cable
- 1.2 V NiMH rechargeable battery, 4 pcs
- Soft carrying bag
- Small soft carrying bag for current clamps
- Instruction manual
- Calibration certificate

MI 2092F
- MI 2092
- Current clamp 1000 A / 1 V (A 1033), 3 pcs, replaced by 3-phase flexible current clamp, 3000 / 300 / 30 A (A 1257), 3 pcs.

MI 2092F

Accessories: page 8.01

MI 2292 Power Quality Analyser Plus

The MI 2292 Power Quality Analyser Plus is top of the range power system test instrument for use in industry, utilities and suits the most demanding power quality diagnostics. The internal memory of the instrument allows to monitor a system for up to 4 weeks. Due to a wide variety of tasks the MI 2292 is suitable for low, mid and high level power system analysis. A number of measuring functions include periodic and statistic analysis, waveform recording, fast logging, transients analysis and recording according to EN 50160. Parameters can be set directly on the instrument, via the software or remotely through the optional GSM modem connection. The PowerLink software included in the standard set allows to analyse data in table or graphic form, which makes system analysing, fault finding, problem solving and report writing much easier.

MEASURING FUNCTIONS:

- TRMS voltage
- TRMS current
- Power (active, reactive, apparent)
- Power factor, cos φ
- Energy (active, reactive, generated, consumed)
- Power quality analysis according to EN 50160
- Harmonic analysis up to 63rd harmonics, THD measurement; interharmonic analysis
- Capturing and recording of power supply events (shut-down's, interruptions, swells, dips)
- Waveform displaying and recording
- Flicker measurement
- Transients recording
- Inrush currents monitoring and recording

KEY FEATURES:

- Three current and three voltage inputs.
- Power quality analysis according to EN 50160 including flicker measurement and standardized printout report in graph and table form.
- 64 parameters can be monitored or recorded simultaneously.
- 4-quadrant measurements (generator and load with capacitive or inductive character).
- Transients measurements down to 20 µs with adjustable level triggers.
- Waveform measurements with harmonics direction detection.
- Adjustable level and slope triggers on voltage and current.
- On-line scope and metering modes.
- Instrument or a group of them can be remotely controlled and programmed via GSM modem.
- Internal memory allows recording up to 4 weeks.
- Instrument can be programmed either directly or via PC.
- PC SW PowerLink included in the standard set is used for downloading, management of recorded data and preparation of test reports.

APPLICATION:

- General power quality assessment in distribution and industrial low and middle voltage electric systems.
- Power quality analysis according to EN 50160.
- Power factor correction equipment measurements.
- Harmonics measurements and filter selection.
- Transients recording and over-voltage protection devices (MO varistors) performance testing.
- Assessment of UPS performance.
- Consumption profile recording.
- Motor's inrush currents monitoring and recording for in-depth analysis of a machines start-up or shut-down effects on a power network.

STANDARDS:

Functionality:
EN 50160;
IEC/EN 61000-4-30, Class B

Electromagnetic compatibility:
EN 50081-1;
EN 61000-6-1

Safety:
IEC/EN 61010-1

TECHNICAL SPECIFICATION:

Function		
AC Voltage inputs		
Number of inputs	3	
Input voltage range	10 … 550 Vrms L-N	
Maximum overload	600 Vrms L-N (maximum overload 10 s)	
Accuracy	±0.5 % of reading ±2 digits	
Resolution	0.1 V	
Sampling rate	6400 samples / sec	
Frequency range	43 … 68 Hz for sinusoidal form	
AC Current inputs		
Number of inputs	3	
Input voltage range	0.02 … 1 Vrms (0.02 In … In) up to 3000 A via current clamps	
Resolution	0.3 mV (0.3 A at 1000 A / 1 V current clamps)	
Maximum overload	1.5 In (sinusoidal form)	
Accuracy	±0.5 % of reading ±6 digits + accuracy of a measuring transducer	
Sampling rate	6400 samples / sec	
Maximum input voltage	1 Vrms	
Measuring function	**Basic accuracy**	**Resolution**
P, Q, S, PF, cos φ	±1 % of measuring range (for P, Q, S)	0.01 of reading (for P, Q, S)
Harmonics analysis up to 63rd component	0.2 % x Ur /U or Ir/I	0.1%
Recording		
Integration period (IP)	1… 1800 s	
Maximum number of signals	64	
Measuring conditions		
AC voltage for power measurements	0.02 Un … Un	
AC current	0.02 In … In	
Power factor	4 quadrants (1.00 cap … 0.00 … 1.00 ind)	
Frequency	45 … 65 Hz	
Waveform	Sinusoidal AC voltage and current	
COM port	RS232 (optional USB with serial converter)	
Display	LCD with backlight, 160 x 116 dots	
Memory module size	2 MB SRAM, battery powered	
Voltage supply	230 VAC or 4 x 1.2 V NiMh rechargeable batteries, type C	
Overvoltage category	CAT III / 600 V	
Protection class	Double insulation	
Dimensions	265 x 110 x 185 mm	
Weight	2 kg	

STANDARD SET:

MI 2292
- Instrument Power Quality Analyser Plus
- Current clamp 1000 A / 1 A, 3 pcs
- Test probe, red, 3 pcs
- Test probe, black
- Crocodile clip, black, 4 pcs
- Safety flat clamp, 4 pcs
- Voltage measurement lead, 6 pcs
- Mains cable
- PC SW PowerLink with RS232 cable
- 1.2 V NiMH rechargeable battery, 4 pcs
- Soft carrying bag
- Small soft carrying bag for current clamps
- Instruction manual
- Calibration certificate

MI 2292F
- MI 2292
- Current clamp 1000 A / 1 V (A 1033), 3 pcs, replaced by 3-phase flexible current clamp, 3000 / 300 / 30 A (A 1257), 3 pcs.

MI 2292F

Accessories: page 8.01

MI 2492 PowerQ

The MI 2492 PowerQ is a lightweight, handheld, 3-phase analyser for quick power quality assessment in low and middle voltage systems. All major power quality parameters like U, I, P, Q, S, PF, cos φ, THD, individual harmonic components can be measured, recorded or monitored on-line. Thanks to various pre-set measuring profiles different diagnostics can be performed on-site even without using a PC. The MI 2492 PowerQ is built into a rugged case which allows to use it in harsh industrial conditions. Built-in memory module ensures up to five days of recording. Windows compatible PowerQ Link PC Software is included in a standard set and supports data downloading, evaluation of test results in both table and graphic form and making of test reports.

MEASURING FUNCTIONS:

- TRMS voltage
- TRMS current
- Power (active, reactive, apparent)
- Power factor, cos φ
- Energy (active, reactive, generated, consumed)
- Harmonic analysis up to 50th harmonics, THD measurement
- Phase diagram and unbalance
- Oscilloscope mode

KEY FEATURES:

- Three current and three voltage inputs.
- Measurement and recording of basic power quality parameters (U, I, P, Q, S, PF, cos φ, THD).
- 4-quadrant measurements (generator and load with capacitive or inductive character).
- Harmonics analysis up to 50th component.
- Quick set-up functions.
- On-line scope and metering modes.
- Voltage unbalance calculation for 3-phase systems.
- Lightweight design.
- Large LCD display enables on-line monitoring of measuring results either in table or graphic form.
- PC SW PowerView included in the standard set is used for downloading, management of recorded data and creation of test reports.

APPLICATION:

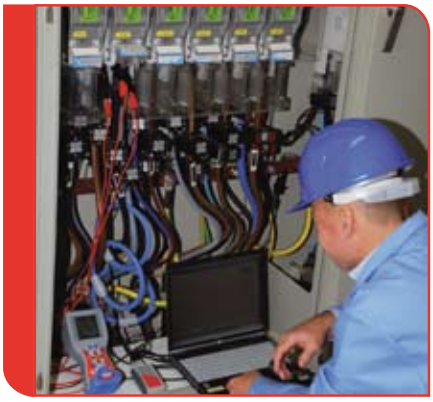
- Power quality assessment and troubleshooting in low and middle voltage electric systems.
- Power correction equipment performance testing and designing.
- Selection and designing of harmonics filters.
- Monitoring and managing of consumption profile.

STANDARDS:

Functionality:
EN 50160;
IEC/EN 61000-4-30, Class B

Electromagnetic compatibility:
IEC/EN 61326-1

Safety:
IEC/EN 61010-1



TECHNICAL SPECIFICATION:

Function			
AC Voltage inputs Number of inputs Input voltage range Basic accuracy Resolution Sampling rate	 3 3.0 … 550.0 Vrms L - N (952.0 Vrms L - L) ± (1% of reading + 0.5 V) 0.1 V 1024 samples per 10 periods		
AC Current inputs Number of inputs Input voltage range Current measuring range Resolution Basic accuracy Sampling rate	 3 0.04 … 1 Vrms 4 … 100 A and 40 … 1000 A (with current clamp A 1033) 0.1 A ± (2% of reading + 0.3 A) 1024 samples per 10 periods		
Function	**Measuring range**	**Resolution**	**Accuracy**
Frequency	45.00 … 66.00 Hz	10 mHz	± (0.5 % of reading + 0.02 Hz)
Power (W, VA, VAR)	0.000 … 0.999 k 0.00 … 9.99 k 0.0 … 999.9 k 0.000 … 9.999 M 0.00 … 99.99 M 0.0 … 999.9 M 0.000 … 9.999 G 0.00 … 40.00 G	1 10 100 1 k 10 k 100 k 1 M 10 M	± (3 % of reading + 3 digits)
Power factor, cos φ	0.00 … 0.39 0.40 … 1.00	0.01 0.01	± 0.06 ± 0.03
Harmonics analysis up 50th component	U_M > 3% U_N (I_M > 3% I_N) U_M < 3% U_N (I_M < 3% I_N)	0.1 % 0.1 %	5 % U_M (I_M) (3 % for DC) 0.15 % U_N (I_N)
Recording Integration period (IP) Maximum number of signals	 1 … 1800 s 6		
COM port	RS232 and USB		
Display	Graphic LCD with backlight, 160 x 160 dots		
Memory module	1 MB Flash		
Voltage supply	230 V_{AC} or 6 x 1.2 V NiMH rechargeable batteries, type AA		
Overvoltage category	CAT III / 600 V		
Protection class	Double insulation		
Dimensions	220 x 115 x 90 mm		
Weight	0.65 kg		

STANDARD SET:

MI 2492
- Instrument PowerQ
- Current clamp 1000 A / 1 V, 3 pcs
- Test probe, red, 3 pcs
- Test probe, black
- Crocodile clip, black
- Crocodile clip, red, 3 pcs
- Voltage measurement lead, 4 pcs
- PC SW PowerView with RS232 and USB cable
- Power supply adapter
- 1.2 V NiMH rechargeable battery, 6 pcs
- Soft carrying bag
- Instruction manual
- Calibration certificate

MI 2492F
- MI 2492
- Current clamp 1000 A (A 1033), 3 pcs, replaced by 1-phase flexible current clamps 3000 / 300 / 30 A (A 1227), 3 pcs.

MI 2492F

Accessories: page 8.01

MI 2392 PowerQ *Plus*

The MI 2392 PowerQ *Plus* is a portable multifunction instrument for measurement and analysis of three-phase power systems. Due to the small dimensions and user friendly interface of the MI 2392 PowerQ *Plus* it is ideally suited for routine or complex power quality assessment, while a rugged case allows to use it in heavy duty industrial environments. Pre-set measuring profiles allow on-site evaluation of all major power quality parameters (U, I, P, Q, S, PF, cos φ, THD, individual harmonic components, etc.) even without using a PC. Built-in memory module ensures up to five days of recording. Windows compatible PowerQ Link PC Software is included in a standard set and supports data downloading, evaluation of test results in both table and graphic form and making of test reports.

MEASURING FUNCTIONS:

- TRMS voltage
- TRMS current
- Power (active, reactive, apparent)
- Power factor, cos φ
- Energy (active, reactive, generated, consumed)
- Power quality analysis according to EN 50160
- Harmonic analysis up to 50th harmonics, THD measurement
- Capturing and recording of power supply events (shut-down's, interruptions, swells, dips)
- Phase diagram and unbalance
- Inrush currents monitoring and recording

KEY FEATURES:

- Three current and three voltage inputs.
- Measurement and recording of basic power quality parameters (U, I, P, Q, S, PF, cos φ, THD).
- Power quality analysis according to EN 50160 including standardized report printout.
- 4-quadrant measurements (generator and load with capacitive or inductive character).
- Quick set-up functions.
- On-line scope and metering modes.
- Voltage unbalance calculation for 3-phase systems.
- Recording of anomalies and inrush currents via adjustable triggers.
- Lightweight design.
- Large LCD display enables on-line monitoring of measuring results either in table or graphic form.
- PC SW PowerView included in the standard set is used for downloading, management of recorded data and creation of test reports.

APPLICATION:

- Power quality assessment and troubleshooting in low and middle voltage electrical systems.
- Balancing phase loads in 3-phase systems.
- Checking power correction equipment performance.
- Harmonics spectrum analysis for selection of harmonic filters.
- Motor's inrush currents monitoring and recording for in-depth analysis of a machines start-up or shut-down effects on a power network.
- Voltage fluctuation recording.
- Consumption recording.

STANDARDS:

Functionality:
EN 50160;
IEC/EN 61000-4-30, Class B

Electromagnetic compatibility:
IEC/EN 61326-1

Safety:
IEC/EN 61010-1

Accessories: page 8.01

TECHNICAL SPECIFICATION:

Function			
AC Voltage inputs Number of inputs Input voltage range Basic accuracy Resolution Sampling rate	 3 3.0 … 550.0 Vrms L - N (952.0 Vrms L - L) ± (1% of reading + 0.5 V) 0.1 V 1024 samples per 10 periods		
AC Current inputs Number of inputs Input voltage range Current measuring range Resolution Basic accuracy Sampling rate	 3 0.04 … 1 Vrms 4 … 100 A and 40 … 1000 A (with current clamp A 1033) 0.1 A ± (2% of reading + 0.3 A) 1024 samples per 10 periods		
Function	**Measuring range**	**Resolution**	**Accuracy**
Frequency	45.00 … 66.00 Hz	10 mHz	± (0.5 % of reading + 0.02 Hz)
Power (W, VA, VAR)	0.000 … 0.999 k 0.00 … 9.99 k 0.0 … 999.9 k 0.000 … 9.999 M 0.00 … 99.99 M 0.0 … 999.9 M 0.000 … 9.999 G 0.00 … 40.00 G	1 10 100 1 k 10 k 100 k 1 M 10 M	± (3 % of reading + 3 digits)
Power factor, cos φ	0.00 … 0.39 0.40 … 1.00	0.01 0.01	± 0.06 ± 0.03
Harmonics analysis up 50th component	U_M > 3% U_N (I_M > 3% I_N) U_M < 3% U_N (I_M < 3% I_N)	0.1 % 0.1 %	5 % U_M (I_M) (3 % for DC) 0.15 % U_N (I_N)
Recording Integration period (IP) Maximum number of signals	 1 … 1800 s 6		
COM port	RS232 and USB		
Display	Graphic LCD with backlight, 160 x 160 dots		
Memory module	1 MB Flash		
Voltage supply	230 V_{AC} or 6 x 1.2 V NiMH rechargeable batteries, type AA		
Overvoltage category	CAT III / 600 V		
Protection class	Double insulation		
Dimensions	220 x 115 x 90 mm		
Weight	0.65 kg		

STANDARD SET:

MI 2392
- Instrument PowerQ Plus
- Current clamp 1000 A / 1 V, 3 pcs
- Test probe, red, 3 pcs
- Test probe, black
- Crocodile clip, black
- Crocodile clip, red, 3 pcs
- Voltage measurement lead, 4 pcs
- PC SW PowerView with RS232 and USB cable
- Power supply adapter
- 1.2 V NiMH rechargeable battery, 6 pcs
- Soft carrying bag
- Instruction manual
- Calibration certificate

MI 2392F
- MI 2392
- Current clamp 1000 A (A 1033), 3 pcs, replaced by 1-phase flexible current clamp 3000 / 300 / 30 A (A 1227), 3 pcs.

MI 2392F

Accessories: page 8.01

MI 2592 PowerQ4

The MI 2592 PowerQ4 is a handheld, simple to use, portable power quality analyser with four current and four voltage measuring channels. Integrated in rugged housing and packed with powerful functions it can be effectively used for monitoring, troubleshooting and analysing of power quality conditions in power distribution networks either in industry or utilities. The PowerQ4 is the first handheld power quality analyser which is compliant with power quality standard IEC 61000-4-30 Class S and standard IEC 61557-12. Powerful PC Software package PowerView comes delivered as part of a standard set and enables downloading, analysing of recorded data and printing of professional test reports. Trough a simple but powerful interface PowerView helps to find recorded data quickly and allows to make complex analysis and data comparison.

MEASURING FUNCTIONS:

- Voltage: TRMS, peak, crest factor (4-channel)
- Current: TRMS peak, crest factor (4-channel)
- Power (active, reactive, apparent)
- Power factor, cos φ
- Unbalance, flicker measurement
- Harmonic analysis up to 50th harmonics, THD measurement
- Energy (active, reactive, generated, consumed)
- Power quality analysis according to EN 50160
- Capturing and recording of power supply events (shut-down's, interruptions, swells, dips)
- Inrush currents monitoring and recording
- Recording up to 10 adjustable alarms
- Waveform displaying and snapshot

KEY FEATURES:

- 4 voltage channels with wide measurement range: 0 ... 1000 Vrms (CAT III / 1000 V).
- 4 current channels with support for automatic clamp recognition.
- Simultaneous measurement and recording of basic power quality parameters (U, I, P, Q, S, PF, cos φ, THD).
- Power quality analysis according to EN 50160 including flicker measurement and standardized report printout in graphic and table form.
- 4-quadrant measurements (generator and load with capacitive or inductive character).
- 509 parameters can be monitored or recorded simultaneously.
- 8 MB of internal memory space allows recording over 4 weeks.
- PowerQ4 is compliant with power quality standard IEC 61000-4-30 Class S.
- Power measurements comply with IEC 61557-12 and IEEE 1448.
- Large LCD display, 320x200 dots, with backlight.
- On-line Scope, Trend and Metering modes.
- Flexible clamps (without additional supply) are included in the standard set.
- Simultaneous 8 channels - 16 bit AD conversion for accurate power measurements (minimal phase shift error)
- 15 hours of autonomous (battery) supply.
- Powerful PC SW PowerView enables downloading, view, analysis of recorded data and professional report creation.

APPLICATION:

- Power quality assessment and troubleshooting in low and middle voltage electrical systems.
- Checking power correction equipment performance.
- Harmonics spectrum analysis for selection of harmonic filters.
- UPS, voltage generators and regulators checking and troubleshooting.
- Voltage, current, power monitoring and recording.
- Consumption profile recording.

STANDARDS:

Functionality: IEC/EN 61000-4-30, Class S; IEC/EN 61557-12; IEC/EN 61000-4-7, Class II; IEC/EN 61000-4-15; EN 50160; IEEE 1448
Electromagnetic compatibility: EN 61326
Safety: EN 61010-1

Accessories: page 8.01

TECHNICAL SPECIFICATION:

Function			
AC Voltage inputs Number of inputs Input voltage range Basic accuracy Resolution Sampling rate Frequency range	 4 5 … 1500 Vrms L - N (20 … 2600 Vrms L - L) 0.2% of reading 10 mV, 100 mV 1024 samples per 10 periods 10 … 70 Hz		
AC Current inputs Number of inputs Input voltage range Current measuring range Resolution Basic accuracy Sampling rate	 4 20.0 mVrms … 2 Vrms 3 … 6000 A (for current clamp A 1227) 0.1 mV (0.1 A for current clamp A 1227) 0.25% of reading 1024 samples per 10 periods		
Function	**Measuring range**	**Resolution**	**Accuracy**
Frequency	10.00 … 70.00 Hz	2 mHz	±10 mHz
Power (W, VA, VAR)	0.000 k … 9.999 M	4 digits	±0.5 % of reading
Power factor	-1.00 … 1.00	0.01	±0.02
cos φ	0.00 … 1.00	0.01	±0.02
Harmonics analysis up 50th component	Uh_N < 3% U_{nom} 3% U_{nom} < Uh_N < 20% U_{nom} Ih_N < 10% I_N 10% I_N < Ih_N < 100% I_N	10 mV 10 mV 10 mV 10 mV	0.15 % U_{nom} 5 % Uh_N 0.15 % I_N 5 % Ih_N
THD	0 % U_{nom} < THD_U < 20% U_{nom} 0 % I_N < THD_I < 100% I_N 100 % I_N < THD_I < 200% I_N	0.1% 0.1% 0.1%	±0.3 ±0.6 ±1.5
Voltage dips and swells evaluation Magnitude Duration	 20 … 1500 V 30 ms … 7 days	 10 mV, 100 mV 1 ms	 0.5% of reading ±20 ms
Recording Integration period (IP) Maximum number of signals	 1 … 3600 s 509		
COM port	RS232 and USB		
Display	Graphic LCD with backlight, 320 x 200 dots		
Memory module	8 MB Flash		
Voltage supply	230 V_{AC} or 6 x 1.2 V NiMH rechargeable batteries, type AA		
Over voltage category	CAT III / 1000 V; CAT IV / 600 V		
Protection class	Double insulation		
Dimensions	220 x 115 x 90 mm		
Weight	0.65 kg		

STANDARD SET:

MI 2592
- Instrument PowerQ4
- 1-phase flexible current clamps 3000 / 300 / 30 A (A 1227), 4 pcs
- Test probe, red, 3 pcs
- Test probe, black
- Crocodile clip, black
- Crocodile clip, red, 3 pcs
- Voltage measurement lead, red, 3 pcs
- Voltage measurement lead, black
- Voltage measurement lead, green, 1 pcs
- PC SW PowerView with RS232 and USB cable
- Power supply adapter
- 1.2 V NiMH rechargeable battery, 6 pcs
- Soft carrying bag
- Instruction manual
- Calibration certificate

Accessories: page 8.01

MI 2130 VoltScanner

The MI 2130 VoltScanner is a 1-phase voltage recorder for testing supply voltage on a socket in accordance with EN 50160 power quality standard. Recording up to four weeks is possible and up to 3500 events can be stored into the instrument's memory. The instrument can be easily set up via the ScanLink software and then sent out to customers who can simply plug in the instrument for the definite period of time and then send it back for analysis. MS Windows compatible PC Software ScanLink supports programming of the instrument, downloading of recorded data and creation of test reports. Transfer of recorded data to other MS programs (e.g. Excel, Word, etc.) is possible as well.

MEASURING FUNCTIONS:

- Recording of voltage events (dips, swells, interruptions)
- Recording of frequency variations
- Recording of transient overvoltages
- Power quality analysis according to EN 50160

KEY FEATURES:

- The parameters of the measurement are set up via PC SW ScanLink.
- Recording up to 4 weeks is possible.
- Voltage transients down to 1 µs can be captured.
- Adjustable triggering limits for voltage events.
- Four LEDs indicates the state of the instrument (recorded events, low battery, memory full and incorrect polarity connection).
- PC Software ScanLink is included in a standard set and supports downloading, data analysis, report creation and programming of the instrument as well.

STANDARD SET:

MI 2130

- Instrument VoltScanner
- Mains measuring cable, 1.5 m
- 1.2 V NiMH rechargeable battery, 4 pcs
- PC SW ScanLink
- RS232 cable
- Instruction manual
- Calibration certificate

APPLICATION:

- Supply voltage testing in accordance with EN 50160.
- Ideal solution for IT managers for control of input voltage.
- Voltage monitoring on the customer's side for power distribution companies.

STANDARDS:

Functionality:
EN 50160
Electromagnetic compatibility:
IEC/EN 61326-1
Safety:
IEC/EN 61010-1

TECHNICAL SPECIFICATION:

Measuring function	Measuring range	Accuracy	Resolution
Voltage (swells and dips)	70 … 265 Vrms	± (2% of reading + 2 Vrms)	1 Vrms
Transients	50 … 2600 V	± (10% of reading + 50 Vrms)	5 Vrms
Frequency	47… 62 Hz	± 0.1 Hz	0.1 Hz
Interruptions	< 90 Vrms		1 s (for events up to 3.5 min) 8 s (for longer events)
COM port	RS232		
Memory module	32 kB		
Power supply	4 x 1.2 V NiMH rechargeable batteries, type AA		
Over voltage category	CAT III / 300 V		
Protection	Double insulation		
Dimensions	103 x 51 x 199 mm		
Weight	515 g		

Accessories: page 8.01

MEASURING INSTRUMENTS AND TESTERS

- Electrical Installation Safety
- High Voltage Insulation Diagnostics
- Appliance / Machine / Switchboard Safety
- Power Quality Analysis
- **LAN Cabling Certification**
- Indoor Environment Quality
- Digital Multimeters / Clamp Meters / Voltage and Continuity Testers
- Accessories

LAN Cabling Certification

Computer Network Cable Testers and Certifiers

METREL®

CATALOGUE 2010

Glossary - LAN Cabling Certification

Wire map
Provides a visual map of how the connections on either side of a multicore cable are connected together.

Near end
The part of the cable which is closest to the master test engineer.

Far end
The part of the cable which is furthest away from the master test engineer.

Crosstalk
Crosstalk occurs when the magnetic field generated by a pairs of wires creates interference on another pair of wires. Crosstalk is sometimes abbreviated to "XT".

Near End Crossover Talk (NEXT)
NEXT function monitors the effect sending a signal down one set of wires has on a second set of wire. Leaving the far end of the wires open, a signal is sent down one pair of wires and the induced signal is measured on the second set of wire. The ratio of the sent signal compared to the induced signal provides the NEXT value. NEXT tests should be performed at both sides of the cable. If a remote unit is used, one unit can check the transmitting side of the cable and by setting the MultiLAN to "Remote NEXT" test, the other side of the cable can be tested without the test engineer having to move location.

Power Sum Near End Cross Talk (PSNEXT)
In most modern LAN systems, a standard cable will contain 8 wires. PSNEXT looks at the effect of sending signals down three pairs of wires has on the pair of wires under test. This is calculated by performing a NEXT test on each pair of wires and then summing all the values together to create the PSNEXT value for the pair of wires under test. In most cases, the PSNEXT test should be performed from both sides of the cable, hence the "Remote PSNEXT" test function can be used.

Far End Crossover Talk (FEXT)
FEXT looks at the effect a signal induced into one pair of wires will have on a receiver connected to a second pair of wires. To perform the test, a signal placed onto a single pair of wires and the signal on the other set of wires is measured at the other end of the cable.

Equal Level Far End Crossover Talk (ELFEXT)
ELFEXT is a FEXT test which takes into account the attenuation of the wires (providing a more realistic representation of the wires).

Power Sum Equal Level Far End Crossover Talk (PSELFEXT)
PSELFEXT looks at the effect of sending signals down three pairs of wires has on the pair of wires under test. This is calculated by performing a ELFEXT test on each pair of wires and then summing all the values together to create the PSELFEXT value for the pair of wires under test.

Attenuation
The loss of strength in a signal as it is transmitted over a cable or fibre.

Attenuation to Crosstalk Ratio (ACR)
The difference between attenuation and crosstalk, measured in dB, at a given frequency. The higher the ACR value is, the better the signal is at the receiving end compared to the crosstalk interference signal.
The ACR value should be taken at both ends of the cable, hence the "Remote ACR" function is provided to stop the engineer continually having to move the master unit between locations.

Propagation delay
The time it takes for a signal to pass from one side of the cable to the other.

Delay skew
In multicore cable, where each pair has their own propagation delay time, the delay skew is the difference between the first signal arriving and the last signal arriving.

Selection Guide for LAN Testers

Part No.:	MI 2016 Multi LAN 350	MI 2014 Cable Scanner
		
TEST FUNCTIONS		
Wiremap	✓	✓
NEXT / Remote NEXT	✓ / ✓	–
PSNEXT / Remote PSNEXT	✓ / ✓	–
ELFEXT / PSELFEXT	✓ / ✓	–
Return Loss / Remote Return Loss	✓ / ✓	–
ACR / Remote ACR	✓ / ✓	–
PSACR / Remote PSACR	✓ / ✓	–
Length	✓	✓
Propagation delay	✓	–
Delay skew	✓	–
Impedance	✓	–
DC resistance	✓	–
Attenuation	✓	–
TDR	✓	✓
TDR with TDnext	✓	✓
FEATURES		
Frequency range	0 ... 350 MHz	–
CAT 6	✓	–
CAT 5 / 5e	✓ / ✓	✓ / ✓
Coax cable	–	✓
Internal memory	✓	–
Cable tracer option	✓	–
PC Software	✓	–
RS232 port and cable	✓	–
USB port and cable	✓	–
Talk over copper (Talk set)	✓	✓
Cable identifiers	✓	✓
RJ 45 output	✓	✓
BNC output	–	✓
GENERAL DATA		
Dimensions	265 x 110 x 185 mm	156 x 100 x 190 mm
Weight	2.1 kg	1 kg

Accessories: page 8.01

MI 2016 Multi LAN 350

The MI 2016 Multi LAN 350 is a high quality measuring instrument for LAN cabling verification up to CAT 6 / Class E according to international standards EN 50173, TIA/EIA 658B, ISO/IEC 11801, etc. The seamless execution of complete autotest with Pass / Fail evaluation of results can be performed within 55 seconds. The built-in intercom system allows easy communication through the length of the cabling. The autosequence mode and single test mode (useful in troubleshooting), large graphical LCD with backlight, help screens and PC software as standard accessory make LAN testing with MI 2016 simple, easy and comprehensive.

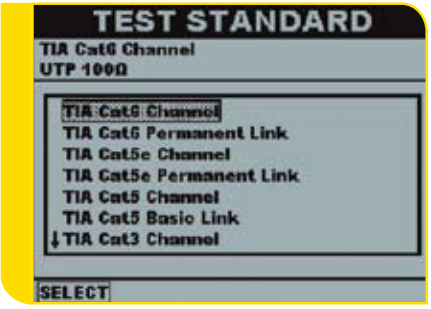
MEASURING FUNCTIONS:

- Cable length.
- Propagation delay.
- Delay skew.
- Characteristic Impedance.
- DC resistance.
- Attenuation.
- NEXT, Remote NEXT.
- PSNEXT, Remote PSNEXT.
- ELFEXT, Remote ELFEXT.
- PSELFEXT.
- Return loss, REMOTE Return loss.
- ACR, Remote ACR.
- PSACR, Remote PSACR.
- TDR (Time Domain Reflectometer).
- Time Domain Crosstalk.
- Wire map test.

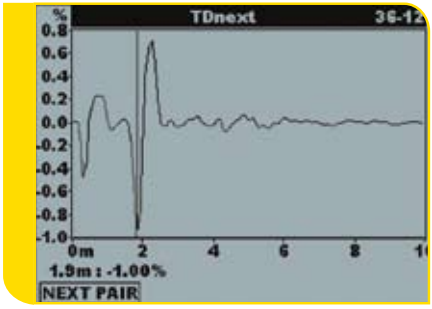
KEY FEATURES:

- Top class CAT 6 / Class E LAN certification tester for testing high speed networks with a test frequency up to 350 MHz.
- Extensive database of Autotests for complete and quick LAN cabling verification in accordance with all leading test standards.
- Instrument supports UTP, STP, ScTP and FTP cables testing.
- Adapters included in the standard set enables both Channel and Permanent Link connection.
- High resolution TDR with TDnext functions for quick determination of a distance to a faulty point along the cable.
- LAN Link PC software package included in the standard set enables analysis of test data and test report creation.
- PASS / FAIL evaluation of test results according to selected test standard.
- Graphical representation of test results on instrument's display.

KEY FEATURES



Selectable test standards for complet and quick LAN cabling verification.



TDNext function for determination of faulty points.

APPLICATION:

- Verification of LAN networks up to CAT 6 / Class E.
- Troubleshooting in IT networks.

STANDARDS:

Functionality:
TIA/EIA 568B Cat 3, Cat 5, Cat 5 E, Cat 6; ISO 11801; EN 50173
Safety: IEC/EN 611010-1; IEC 60825-1

Accessories: page 8.01

LAN Cabling Certification

TECHNICAL SPECIFICATION:

Function	Measuring range	Resolution	Accuracy
Length	0.0 … 99.9 m 100 … 300 m	0.1 m 1 m	±(3% of reading + 5 digits) ±4% of reading
Propagation delay	0 … 500 ns 501 … 4000 ns	1 ns 1 ns	±(3% of reading + 5 digits) ±3% of reading
Delay skew	0 … 500 ns	1 ns	±10 digits
Characteristic Impedance	35 … 180 Ω	1 Ω	±(10% of reading + 3 digits)
DC Resistance	0.0 … 199.9 Ω	0.1 Ω	±(10% of reading + 5 digits)
Attenuation			
- Frequency	1 MHz … 250 MHz	1 MHz	According to TIA/EIA 568-B.2
- Amplitude	0.0 … 60.0 dB	0.1 dB	
NEXT, Remote NEXT			
- Frequency	1 MHz … 350 MHz	0.15 MHz	According to TIA/EIA 568-B.2
- Amplitude	0.0 … 90.0 dB	0.1 dB	
PSNEXT, Remote PSNEXT			
- Frequency	1 MHz … 350 MHz	0.15 MHz	According to TIA/EIA 568-B.2
- Amplitude	0.0 … 90.0 dB	0.1 dB	
ELFEXT, Remote ELFEXT			
- Frequency	1 MHz … 350 MHz	0.15 MHz	According to TIA/EIA 568-B.2
- Amplitude	0.0 … 90.0 dB	0.1 dB	
PSELFEXT			
- Frequency	1 MHz … 350 MHz	0.15 MHz	According to TIA/EIA 568-B.2
- Amplitude	0.0 … 70.0 dB	0.1 dB	
Return Loss, Remote Return Loss			
- Frequency	1 MHz … 350 MHz	0.15 MHz	According to TIA/EIA 568-B.2
- Amplitude	0.0 … 40.0 dB	0.1 dB	
Time Domain Reflectometer (TDR)		at NVP=0.69·c:	
- Distance / Pulse length	0 … 10 (50, 100) m 0 … 200 m 0 … 400 m	1 ns, 0.1 m 2 ns, 0.2 m 4 ns, 0.4 m	±(3% of reading + 5 digits) ±5% of reading ±5% of reading
- Amplitude	in percents	1 %	
- Selectable propagation velocity rate	0.50·c … 0.99·c		
Time Domain Crosstalk			
- Distance / Pulse length	0 … 10 (50, 100) m 0 … 200 m	1 ns, 0.1 m 20 ns, 0.2 m	±(3% of reading + 5 digits) ±5% of reading
- Amplitude	in percents	0.1 %	
General			
COM port	RS232 and USB		
Display	Graphic LCD, 320 x 240 dots, with backlight		
Power supply	6 x 1.2 rechargeable batteries, type C		
Dimensions	265 x 110 x 185 mm		
Weight	2.1 kg		

STANDARD SET:

MI 2016ST
- Instrument Multi LAN 350
- Remote unit Multi LAN 350
- Permanent Link adapter, 2 pcs
- Chanel Link adapter, 2 pcs
- Locators (#1 ... #4), 4 pcs
- Attenuation calibration module
- Power supply adapter, 2 pcs
- Headphones set, 2 pcs
- Carrying bag, 2 pcs
- PC SW LAN Link with USB and RS232 cables
- 12 x 1.5 V NiMH rechargeable batteries, type C
- Instruction manual
- Calibration certificate

MI 2016PS
- MI 2016ST
- Remote unit Multi LAN 350 is replaced by Instrument Multi LAN 350

Accessories: page 8.01

MI 2014 Cable Scanner

MEASURING FUNCTIONS:

- Cable length.
- TDR (Time Domain Reflectometer).
- Time Domain Crosstalk.
- Wire map test.

KEY FEATURES:

- Fast termination fault finding with graphical indication of the failure type.
- Integrated high accuracy TDR function with adjustable NVP factor measures distance to the fault.
- Internal tone generator combined with an optional line tracer serves for wire finding in bounces of cables.
- Locators for simplified identification of sockets are included in a standard set.
- Optional Talk Remote Unit allows voice communication over the tested cable.
- Instrument's outputs allow testing on RJ 45 and coax terminations.

APPLICATION:

- Troubleshooting and maintenance of LAN and other cable networks.

STANDARDS:

Electromagnetic compatibility:
EN 50081-1, EN 50882-1
Safety: EN 611010-1

STANDARD SET:

MI 2014

- Instrument Cable Scanner
- Cat 5 Patch cable, 2 pcs
- Standard Remote #1
- Locators (#1 ... #4), 4 pcs
- Instruction manual
- Calibration certificate
- Instruction manual
- Product verification data

The MI 2014 Cable Scanner is a portable handheld battery powered instrument intended for testing LAN installations and cables. This simple but effective device performs copper terminations testing on shielded and unshielded LAN and coax cables. With optional Tracer can be performed tracing of cables and wires. Talk function enables full duplex communication between remote operators. Due to user friendly interface handling of the instrument is simple and clear.

TECHNICAL SPECIFICATION:

Function	Measuring range	Resolution	Accuracy
Twisted Pair cable / Length and Reflections			
- Distance	0.0 … 99.9 m 100 … 300 m	0.1 m 1 m	±(3% of readings + 5 digits) ±(5% of readings + 1 digits)
- Amplitude	-99 % … 100 %	1 %	±(5% of readings + 5 digits)
Coax cable / Length and Reflections			
- Distance	0.0 … 99.9 m 100 … 300 m	0.1 m 1 m	±(3% of readings + 5 digits) ± 5% of readings
- Amplitude	-99 % … 100 %	1 %	±(5% of readings + 5 digits)
Power supply	6 x 1.5 V alkaline or 6 x 1.2 V rechargeable batteries, type AA		
Dimensions	156 x 100 x 190 mm		
Weight	1 kg		

MEASURING INSTRUMENTS AND TESTERS

- Electrical Installation Safety
- High Voltage Insulation Diagnostics
- Appliance / Machine / Switchboard Safety
- Power Quality Analysis
- LAN Cabling Certification
- **Indoor Environment Quality**
- Digital Multimeters / Clamp Meters / Voltage and Continuity Testers
- Accessories

Indoor Environment Quality

Environmental Monitoring Equipment for Testing the Conditions of Indoor Environments

METREL®

CATALOGUE 2010

Glossary - Indoor Environment Quality

HVAC
Heating, Ventilation and Air Conditioning.

IEQ
Indoor Environmental Quality encompasses all aspects of the indoor setting including air quality, ventilation, thermal comfort, lighting and noise.

IAQ
Indoor air quality may be broadly defined as the nature of air that affects the health and well-being of occupants.

WBGT
Wet Bulb Globe Temperature is commonly used as a guidance for environmental heat stress to prevent heat stroke during physical exercise or while at work. It determines heat stress given in humans on the job in thermally harsh environments. It is specified in ISO 7243 under "Hot Environments". Estimation of the heat stress on is based on the WBGT index.

PMV
Predicted Mean Vote is average comfort vote predicted by a theoretical index for a group of people when subjected to a particular set of environmental conditions.

PPD
Predicted Percentage of Dissatisfied is the percentage of population who will be dissatisfied (uncomfortable) in a given environment as predicted by a theoretical index.

Class 1 / Class 2
Sound measuring instruments, processors and probes are classified as being Class 1 or Class 2 (also Type 1 or Type 2) according to the measurement accuracy achieved. A class 1 instrument may only be formed by combining a class 1 probe with a class 1 processor. Class 1 processor shall, at least, cover the range from 45 Hz to 7.1 kHz in one third octave bands. Class 2 processor shall, at least, cover the same range, or 45 Hz to 5,6 kHz in octave bands, as specified in ISO 9614.

Octave
The difference between two frequencies where one is twice the other. For example, 200 Hz is an octave higher than 100 Hz. 400 Hz is one octave higher than 200 Hz.

Decibel (dB)
A logarithmic measurement unit that describes a sound's relative loudness. It can also be used to describe the relative difference between two power levels. In sound, decibels generally measure a scale from 0 (the threshold of hearing) to 130 dB (the threshold of pain). A 1 dB difference over a broad frequency range is noticeable to most people, while a 0.5 dB difference can affect the subjective impression of a sound.

Illuminance
The density of incident luminous flux on a surface; illuminance is the standard metric for lighting level and is measured in lux (lx).

Luminance
The luminous intensity of a surface in a given direction per unit area of that surface as viewed from that direction.

Carbon monoxide (CO)
Poisonous gas that has no colour or odour. It is given off by burning fuel (as in exhaust from cars or household heaters) and tobacco products. Carbon monoxide prevents red blood cells from carrying enough oxygen for cells and tissues to live.

Carbon Dioxide (CO_2)
Colourless, odourless, noncombustible gas. Present in the atmosphere as a result of the decay of organic material and the respiration of living organisms, and it represents about 0.033 % of the air. Carbon dioxide is produced by the burning of wood, coal, coke, oil, natural gas or other fuels containing carbon, by the action of an acid on a carbonate or naturally from springs and wells.

Part No.:
MEASUREMENTS
Air Velocity
Air Flow
Relative Humidity
Dew point
Air teperature
Temperature difference
K Thermocouple temperature
Illuminance
Luminance
Contrast
Black globe radiant temperature
CO concentration
CO_2 concentration
Sound level, class 1 (IEC 1672)
Sound level, class 2 (IEC 1672)
Real time 1/1 octave analysis
Real time 1/3 octave analysis
TEST PROBES
A 1091 Microclimatic probe
A 1127 Humidity and temperature probe
A 1092 Illuminance probe, type B
A 1132 Luminance probe
A 1128 Thermocouple probe, type K
A 1146 Sound probe, class 1
A 1151 Sound probe, class 2
A 1131 Black globe thermometer
A 1180 CO_2 probe
A 1181 CO probe
PC SOFTWARE
A 1134 SensorLink PRO
A 1167 SoundLink LITE
A 1162 SoundLink PRO
CERTIFICATES
ISO calibration certificate for complete system
Calibration certificate

Selection Guide for Indoor Environment Quality Analysers

MI 6201PR	MI 6201EU	MI 6201ST	MI 6301PR	MI 6301EU	MI 6401EU	MI 6401ST
Multinorm			FonS		Poly	
						
✓	✓	✓	–	–	✓	✓
✓	✓	✓	–	–	✓	✓
✓	✓	✓	–	–	✓	✓
✓	✓	✓	–	–	✓	✓
✓	✓	✓	–	–	✓	✓
Option	Option	Option	–	–	Option	Option
Option	Option	Option	–	–	Option	Option
✓	✓	✓	–	–	✓	✓
Option	Option	Option	–	–	Option	Option
Option	Option	Option	–	–	Option	Option
Option	Option	Option	–	–	Option	Option
Option	Option	Option	–	–	Option	Option
Option	Option	Option	–	–	Option	Option
✓	–	–	✓	–	–	–
–	✓	✓	–	✓	–	–
✓	✓	✓	✓	✓	–	–
✓	✓	✓	✓	✓	–	–
✓	✓	✓	–	–	✓	✓
Option	Option	Option	–	–	Option	Option
✓	✓	✓	–	–	✓	✓
Option	Option	Option	–	–	Option	Option
Option	Option	Option	–	–	Option	Option
✓	–	–	✓	–	–	–
–	✓	✓	–	✓	–	–
Option	Option	Option	–	–	Option	Option
Option	Option	Option	–	–	Option	Option
Option	Option	Option	–	–	Option	Option
✓	✓	✓	–	–	✓	✓
✓	✓	✓	✓	✓	–	–
Option	Option	Option	Option	Option	–	–
✓	✓	–	✓	✓	✓	–
–	–	✓	–	–	–	✓

Accessories: page 8.01

MI 6201 Multinorm

The MI 6201 Multinorm is a portable multifunctional handheld instrument for measuring microclimate, sound and light parameters and it is an invaluable tool for the monitoring and evaluation of indoor environmental conditions according to national and European standards. Specially designed housing enables connection of a few probes at the same time for testing of several parameters simultaneously. A large selection of measuring probes allows to measure variety of different environmental conditions. The SensorLink PRO and SoundLink LITE software come as standard accessories and enable downloading data stored in the memory, plotting and printing test results in table and graphic form, on-screen graph plotting for straightforward data comparison and export of data in text file format. The MI 6201EU set comes complete with full ISO accredited calibration certificate while the MI 6201PS set comes complete with ISO calibration certificate and an upgraded sound probe (class 1).

MEASUREMENTS:

- Air temperature.
- Air velocity.
- Air flow.
- Relative humidity.
- Dew point.
- Temperature difference (option).
- K thermocouple temperature (option).
- Illuminance.
- Luminance (option).
- Contrast (option).
- Black globe radiant temperature (option).
- CO and CO2 concentration (option).
- Sound level.
- Real time 1/1 and 1/3 octave analysis.

KEY FEATURES:

- **Adaptable:** MI 6201 Multinorm can be used as either a sound meter or environmental meter to reduce the amount of measuring equipment to move between locations.
- **Environmental:** using various standard and optional probes, the MI 6201 can be adapted to measure and calculate a combination of up to 16 different environment parameters (maximum 11 at the same time).
- **Sound:** the instrument can simultaneously measure and calculate 19 different sound parameters (displaying maximum 6 at the same time).
- **Long lasting:** record up to 160 days worth of data.
- **Accommodating:** due to optional prolongation cable or telescopic rod measurements in hard-to-rich spots are possible, while mounting on a tripod enables long-lasting recording.
- **Versatile:** can be used for spot checking of different locations or performing long investigations in a specific location.
- **Easy to use:** plug in the suitable probes and the device will automatically adjust for appropriate measurements.
- **PPDa and PMV calculations:** predicted Percentage of Dissatisfied People (PPD) and Predicted Mean Vote (PMV) calculations are performed automatically.
- **Weighting:** A, C, Z frequeny weightings and fast, slow and impulse time weightings.
- **Octave frequency analysis:** instrument performs real time octave and one third octave frequency analysis in accordance with EN 61260 standard.
- **Logger:** logging memory module allows to save up to 4000 measurements with adjustable integration period.
- **Downloadable:** up to 4000 test results can be stored in a two level memory structure and then downloaded to the PC with the help of the PC software.

APPLICATION:

- Indoor air quality testing.
- Testing of factory climatic conditions.
- Testing of heating, ventilation and air conditioning systems.
- Testing of lighting conditions.
- Emergency lighting systems testing.
- Indoor or dry outdoor sound level measurement.
- Industrial sound measurement.
- Band-pass and acoustic filter testing.
- Acoustic equipment testing.

STANDARDS:

Functionality:
DIN 5032 P1; DIN 5032 P2; DIN 5032 P3; DIN 5032 P4; DIN 5032 P6; DIN 5032 P7; EN 60751; EN 60584-1; EN 12599; EN ISO 7726; ISO 10526; ISO 10527
Electromagnetic compatibility:
EN 61326
Safety:
EN 61010-1

Accessories: page 8.01

TECHNICAL SPECIFICATION:

Function	Measuring range	Resolution	Accuracy
Microclimatic probe A 1091			
- Air temperature	-20 °C … +60 °C	0.1 °C	±0.2 °C at 25°C ±0.5 °C over working range
- Relative humidity	0 %RH … 10 %RH 10 %RH … 90 %RH 90 %RH … 100 %RH	0.1 %RH 0.1 %RH 0.1 %RH	±3 %RH ±2 %RH ±3 %RH
- Air velocity	0.10 m/s … 9.99 m/s 10.0 m/s … 20.0 m/s	0.01m/s 0.1m/s	±(0.05 m/s + 5% of reading) ±(5% of reading)
Temperature and humidity probe A 1127			
- Air temperature	-20 °C … +60 °C	0.1 °C	±0.5 °C
- Relative humidity	0 %RH … 100 %RH	0.1 %RH	±3 %RH
Black Globe temperature (A 1131)	10.0 °C … 49.9 °C 50.0 °C … 84.9 °C 85.0 °C … 120.0 °C	0.1 °C 0.1 °C 0.1 °C	±0.5 °C ±1.0 °C ±1.5 °C
Illuminance (A 1092; DIN 5032, Class B)	0.01 Lux … 19.99 Lux 20.0 Lux … 199.9 Lux 200 Lux … 1999 Lux 2000 Lux … 20000 Lux	0.01 Lux 0.1 Lux 1 Lux 10 Lux	±(0.02 Lux +8% of reading) ±(8% of reading) ±(8% of reading) ±(8% of reading)
Luminance (A 1132; DIN 5032, Class B)	0.1 cd/m²… 39.9 cd/m² 40 cd/m²… 399 cd/m² 400 cd/m² … 3999 cd/m² 4000 cd/m²… 40000 cd/m²	0.1 cd/m² 1 cd/m² 1 cd/m² 1 cd/m²	±(0.2 cd/m² + 8% of reading) ±(8% of reading) ±(8% of reading) ±(8% of reading)
CO_2 concentration (A 1180)	0 ppm … 5000 ppm	1 ppm	±(3% of reading + 40 ppm)
CO concentration (A 1181)	0 ppm … 500 ppm	1 ppm	±(5% of reading + 5 ppm)
Sound level (A 1146)	30 dB … 140 dB	0.1 dB	Corresponds to EN 61672 Class 1
Sound level (A 1151)	30 dB … 140 dB	0.1 dB	Corresponds to EN 61672 Class 2
Sound probes A 1146 and A 1151	- Dynamic range: 80 dB - Frequency weighting: A,C, Zero - Time weighting: fast, slow, impulse		
COM port	USB		
Memory	up to 4000 values		
Display	Graphical LCD with backlight, 160 x 160 dots		
Power supply	6 x 1.2 V rechargeable batteries, type AA		
Protection degree	IP 40		
Dimensions	110 x 85 x 220 mm		
Weight	0.56 kg		

STANDARD SET:

MI 6201ST
- Instrument Multinorm
- Carrying case
- Probe adapter
- Microclimatic probe
- Illumination probe, type B
- Sound probe, class 2, with foam wind-screen
- Plastic shield for microphone
- Tripod adapter
- USB cable
- Power supply adapter
- 6 x NiMH rechargeable batteries, type AA
- PC SW SensorLink PRO
- PC SW SoundLink LITE
- Instruction manual
- Calibration certificate

MI 6201EU
- MI 6201ST
- ISO calibration certificate for complete system

MI 6201PS
- MI 6201EU
- Sound probe, class 1 (A 1146) instead of Sound probe, class 2 (A 1151)

Accessories: page 8.01

MI 6301 FonS

The MI 6301 FonS is a professional sound analyser for sound measurements in accordance with EN 61672 standard Class 1 or Class 2. The MI 6301 contains usual A, C and Z frequeny weightings and fast, slow and impulse time weightings and in addition the instrument has 2 independent measuring channels which can be set to different weightings. The MI 6301 FonS is ideal for spot checking different locations or performing long term analysis of an area. The PC software SoundLink LITE included in the standard set enables downloading, review, export and printing of test results while the optional PC SW SoundLink PRO enables full data analysis, charting and report generation.

MEASUREMENTS:

- LXY (Time weighted sound level).
- LXeq (Time average sound level).
- LXYmax (Maximum time weighted sound level).
- LXYmin (Minimum time weighted sound level).
- LXpeak (Peak sound level).
- LXE (Sound exposure level).
- Percentile sound pressure level.
- Real time 1/1 octave analysis.
- Real time 1/3 octave analysis.

KEY FEATURES:

- **Adaptable:** the instrument can simultaneously measure and calculate 19 different sound parameters (displaying maximum 6 at the same time).
- **Weighting:** A, C, Z frequeny weightings and fast, slow and impulse time weightings in accordance with EN 61672 standard.
- **Dual measuring:** two independent sound measuring channels that can be set to different time and weighting settings.
- **Octave frequency analysis:** instrument performs real time octave and one third octave frequency analysis in accordance with EN 61260 standard.
- **Long lasting:** record up to 80 days worth of data.
- **Versatile:** can be used for spot checking of different locations or performing long investigations in a specific location.
- **One stop readings:** according to custom configuration instrument can display MAX, MIN, peak readings, equalised readings, channel 1 and channel 2 readings.
- **Logger:** logging memory module allows to save up to 2000 measurements with adjustable integration period.
- **Downloadable:** up to 2000 test results can be stored in the two level memory structure and then downloaded to the PC with the help of the PC software.

APPLICATION:

- Indoor or dry outdoor sound level measurement.
- Industrial sound measurement.
- Acoustic equipment testing.
- Band-pass and acoustic filter testing.

STANDARDS:

Functionality:
EN 61672; EN 61260
Electromagnetic compatibility:
EN 61326
Safety: EN 61010-1

KEY FEATURES

Sample of on-line reading data analysis with SoundLink PRO PC software.

Logged data analysis with SoundLink PRO PC software.

TECHNICAL SPECIFICATION:

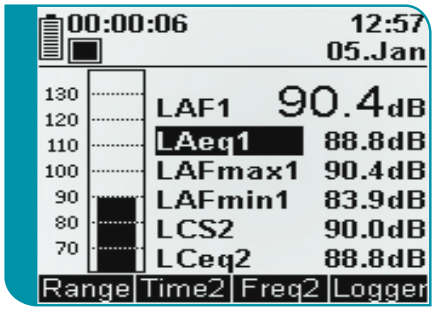
Function	Measuring range	Resolution	Accuracy
Sound level (A 1146)	30 dB … 140 dB	0.1 dB	Corresponds to EN 61672 Class 1
Sound level (A 1151)	30 dB … 140 dB	0.1 dB	Corresponds to EN 61672 Class 2
Sound probes A 1146 and A 1151	- Dynamic range: 80 dB - Frequency weighting: A,C, Zero - Time weighting: fast, slow, impulse		
COM port	USB		
Memory	2000 values		
Display	Graphical LCD with backlight, 160 x 160 dots		
Power supply	6 x 1.2 V rechargeable batteries, type AA		
Protection degree	IP 40		
Dimensions	110 x 85 x 220 mm		
Weight	0.56 kg		

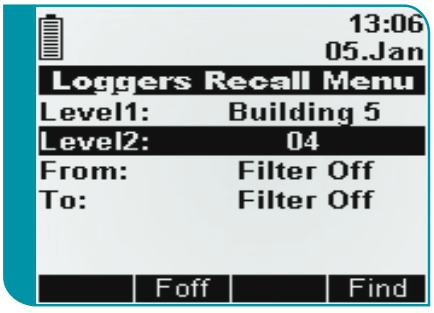
STANDARD SET:

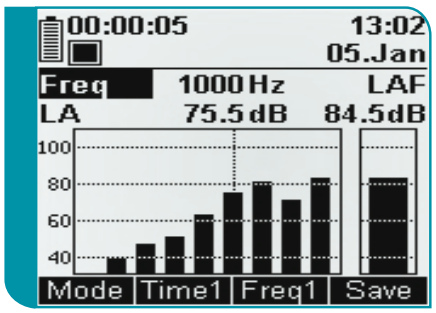
MI 6301EU
- Instrument FonS
- Carrying case
- Sound probe, class 2, with foam wind-screen
- Plastic shield for microphone
- Tripod adapter
- USB cable
- Power supply adapter
- 6 x NiMH rechargeable batteries, type AA
- PC SW SoundLink LITE
- Instruction manual
- Calibration certificate
- ISO calibration certificate for complete system

MI 6301PS
- MI 6301EU
- Sound probe, class 1 (A 1146) instead of Sound probe, class 2 (A 1151)

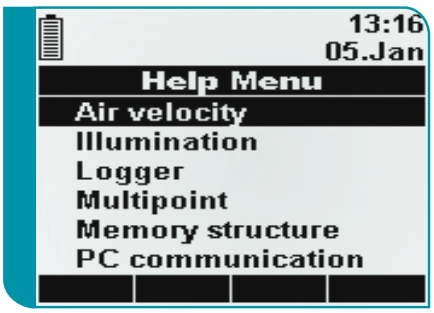
KEY FEATURES







Sound measurement, 1/1 and 1/3 octavian analisys.



Recalling of memory, sample of help menu.

Accessories: page 8.01

MI 6401 Poly

The MI 6401 Poly is a portable multifunctional handheld instrument for measuring microclimate and light parameters such as Illuminance, humidity, air temperature and air velocity of an environment. Emergency lighting, ventilation systems, lighting conditions, air conditioning systems, factory conditions, production line conditions and many more can be tested by the MI 6401. Specially designed housing enables connection of a few probes at the same time for testing of several parameters simultaneously. All the results can be stored in the internal memory of the instrument and then downloaded to PC via the SensorLink PRO software which is included in the standard set. For full data traceability to international standards the MI 6401EU set includes a full ISO accredited calibration certificate.

MEASUREMENTS:

- Air temperature.
- Air velocity.
- Air flow.
- Relative humidity.
- Dew point.
- Temperature difference (option).
- K thermocouple temperature (option).
- Illuminance.
- Luminance (option).
- Contrast (option).
- Black globe radiant temperature (option).
- CO and CO_2 concentration (option).

KEY FEATURES:

- **Adaptable:** using various standard and optional probes, the MI 6401 can be adapted to measure and calculate a combination of up to 16 different environments conditions (maximum 11 at the same time).
- **Long lasting:** record up to 160 days worth of data.
- **Accommodating:** due to optional prolongation cable or telescopic rod measurements in hard-to-rich spots are possible, while mounting on a tripod enables long-lasting recording.
- **Versatile:** can be used for spot checking of different locations or performing long investigations in a specific location.
- **Easy to use:** plug in the suitable probes and the device will automatically adjust for appropriate measurements.
- **PPDa and PMV calculations:** predicted Percentage of Dissatisfied People (PPD) and Predicted Mean Vote (PMV) calculations are performed automatically.
- **Logger:** logging memory module allows to save up to 4000 measurements with adjustable integration period.
- **Downloadable:** up to 4000 test results can be stored in a two level memory structure and then downloaded to the PC with the help of the PC software SensorLink PRO.

APPLICATION:

- Indoor air quality testing.
- Testing of factory climatic conditions.
- Testing of heating, ventilation and air conditioning systems.
- Testing of lighting conditions.
- Emergency lighting systems testing.

STANDARDS:

Functionality:

DIN 5032 P1; DIN 5032 P2; DIN 5032 P3; DIN 5032 P4; DIN 5032 P6; DIN 5032 P7; EN 60751; EN 60584-1; EN 12599; EN ISO 7726; ISO 10526; ISO 10527

Electromagnetic compatibility:

EN 61326

Safety:

EN 61010-1

TECHNICAL SPECIFICATION:

Function	Measuring range	Resolution	Accuracy
Microclimatic probe A 1091			
- Air temperature	-20 °C … +60 °C	0.1 °C	±0.2 °C at 25°C ±0.5 °C over working range
- Relative humidity	0 %RH … 10 %RH 10 %RH … 90 %RH 90 %RH … 100 %RH	0.1 %RH 0.1 %RH 0.1 %RH	±3 %RH ±2 %RH ±3 %RH
- Air velocity	0.10 m/s … 9.99 m/s 10.0 m/s … 20.0 m/s	0.01m/s 0.1m/s	±(0.05 m/s + 5% of reading) ±(5% of reading)
Temperature and humidity probe A 1127			
- Air temperature	-20 °C … +60 °C	0.1 °C	±0.5 °C
- Relative humidity	0 %RH … 100 %RH	0.1 %RH	±3 %RH
Black Globe temperature (A 1131)	10.0 °C … 49.9 °C 50.0 °C … 84.9 °C 85.0 °C … 120.0 °C	0.1 °C 0.1 °C 0.1 °C	±0.5 °C ±1.0 °C ±1.5 °C
Illuminance (A 1092; DIN 5032, Class B)	0.01 Lux … 19.99 Lux 20.0 Lux … 199.9 Lux 200 Lux … 1999 Lux 2000 Lux … 20000 Lux	0.01 Lux 0.1 Lux 1 Lux 10 Lux	±(0.02 Lux +8% of reading) ±(8% of reading) ±(8% of reading) ±(8% of reading)
Luminance (A 1132; DIN 5032, Class B)	0.1 cd/m²… 39.9 cd/m² 40 cd/m²… 399 cd/m² 400 cd/m² … 3999 cd/m² 4000 cd/m²… 40000 cd/m²	0.1 cd/m² 1 cd/m² 1 cd/m² 1 cd/m²	±(0.2 cd/m² + 8% of reading) ±(8% of reading) ±(8% of reading) ±(8% of reading)
CO_2 concentration (A 1180)	0 ppm … 5000 ppm	1 ppm	±(3% of reading + 40 ppm)
CO concentration (A 1181)	0 ppm … 500 ppm	1 ppm	±(5% of reading + 5 ppm)
COM port	USB		
Memory	4000 values		
Display	Graphical LCD with backlight, 160 x 160 dots		
Power supply	6 x 1.2 V rechargeable batteries, type AA		
Protection degree	IP 40		
Dimensions	110 x 85 x 220 mm		
Weight	0.56 kg		

STANDARD SET:

MI 6401ST
- Instrument Poly
- Carrying case
- Probe adapter
- Microclimatic probe
- Illumination probe, type B
- Tripod adapter
- USB cable
- Power supply adapter
- 6 x NiMH rechargeable batteries, type AA
- PC SW SensorLink PRO
- Instruction manual
- Calibration certificate

MI 6401EU
- MI 6401ST
- ISO calibration certificate for complete system

Accessories: page 8.01


Study the world
Capture the elements
Environmental testing made easy
MI 6201
Multinorm
MI 6401
Poly
MI 6301
FonS

MEASURING INSTRUMENTS AND TESTERS

- Electrical Installation Safety
- High Voltage Insulation Diagnostics
- Appliance / Machine / Switchboard Safety
- Power Quality Analysis
- LAN Cabling Certification
- Indoor Environment Quality
- **Digital Multimeters / Clamp Meters / Voltage and Continuity Testers**
- Accessories

METREL®

CATALOGUE 2010

Digital Multimeters / Clamp Meters / Voltage and Continuity Testers

Labratory and Field Testing Equipment for Electrical Parameters

Glossary - Multimeters

RMS - Root Mean Square
When an AC supply is placed onto a circuit, it produces heat. The RMS value is the equivalent DC supply that would produce the same amount of thermal heat as the actual AC supply.

True RMS
A specific method of measuring the RMS value of a signal. With inductive and capacitive systems distorting the sinusoidal wave of the mains supply, this method provides the most accurate RMS value regardless of the shape of the waveform. Other methods of measuring RMS values exist, such as the rectifier or mean absolute deviation method; however, these methods are accurate only for sine wave signals.

Crest factor
The crest factor describes the ratio of the peak value to the RMS value of an electrical variable (AC voltage and AC current).

High crest factors cause distortion of the reactive power and harmonics in the supply network, and so are undesirable.

With high crest factors electronic instruments often display inexact values. This must be considered when selecting an instrument. For example, if an instrument measures 20 A AC current, the peak value is around 28 A with a sinusoidal waveform. So the instrument must be able to handle much higher peak currents than the RMS value.

Number of Counts
The number of divisions into which a given measuring range is divided. This can be used to evaluate the resolution of an instrument.

Accuracy
A value to show how accurately an instrument can read a specific value. This is usually written as a percentage (e.g. 5 V ± 5 %).

Resolution
The smallest possible change in a signal that would produce a change in the value on the screen of the test instrument.

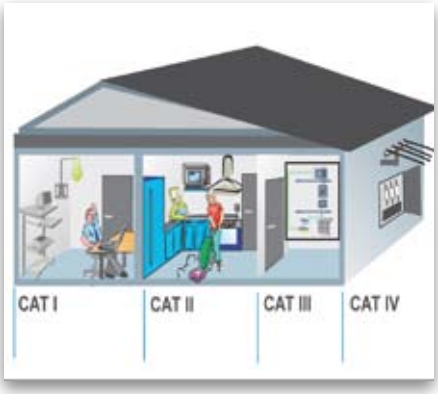
Overvoltage category
The overvoltage category specifies the highest mains voltage (or lightning strike, short circuit due to incorrect use, etc.) that the instrument can withstand without danger for the tester or for the object being measured. The standard specifies four overvoltage categories. The overvoltage category affects component sizing via the air gap. The higher the category, the bigger is the distance to the power source.

CAT I - electronic devices, signal level.

CAT II - domestic appliances, portable appliances, single-phase loads, sockets, (>10 m from CAT III; >20 m from CAT IV).

CAT III - three-phase distribution systems, lighting systems in large buildings, distribution panels.

CAT IV - three-phase systems on power stations, electricity meters, outdoor installations and supply cable incoming feed.



Part No.:
True RMS
DC current range (A)
Basic accuracy (%)
Maximum resolution (µA)
AC current range (A)
Basic accuracy (%)
Maximum resolution (µA)
DC voltage range (V)
Basic accuracy (%)
Maximum resolution (µV)
AC voltage range (V)
Basic accuracy (%)
Maximum resolution (µV)
Resistance measurement (MΩ)
Basic accuracy (%)
Maximum resolution (mΩ)
Acoustic continuity test
Diode test
Capacitance
Frequency measurement
Frequency of digital signals
Temperature measurement (Type K sensor)
Autocheck® V / Ω
Conductance (nS)
Count
Backlight
Analogue bar-graph
IR, RS232 interface
Automatic and manual range selection
Automatic switch off
Non-contact eletrical field detection (EF)
MAX hold
Peak hold
Data hold
Recording (MAX / MIN / AVG)
Relative value
Compensation for test leads
Overvoltage category
Dimensions with holster (mm)
Weight with holster (g)
CE mark

Selection Guide for Multimeters

MD 9010	MD 9015	MD 9020	MD 9030	MD 9040	MD 9050
					
–	–	–	✓	✓	✓
0.002	10	10	10	10	10
1.2	0.8	1.2	1.2	0.2	0.2
0.1	0.1	0.1	0.1	0.1	0.1
0.002	10	10	10	10	10
1.5	1	1.5	1.5	0.6	0.6
0.1	0.1	0.1	0.1	0.1	0.1
600	1000	1000	1000	1000	1000
0.5	0.3	0.3	0.3	0.06	0.06
1000	100	100	100	10	10
600	750	1000	1000	1000	1000
1.5	1	1.5	1.5	0.5	0.5
1000	100	100	100	10	10
6	25	40	40	60	60
1	0.4	0.6	0.6	0.1	0.1
100	100	100	100	100	100
✓	✓	✓	✓	✓	✓
✓	✓	✓	✓	✓	✓
✓	✓	✓	✓	✓	✓
✓	✓	✓	✓	✓	✓
–	–	–	–	✓	✓
–	T1	T1	T1	–	T1 & T2 (temperature comparison)
✓	–	–	–	–	✓
–	–	–	–	–	✓
6000	2500	4000	4000	9999 (AC/DCV, Hz, nS) 6000 (mV, µ/m/A, Ω , F)	9999 (AC/DCV, Hz, nS) 6000 (mV, µ/m/A, Ω , F)
–	–	–	✓	–	✓
–	–	–	–	41 segment	41 segment
–	✓	–	–	✓	✓
Auto	✓	✓	✓	✓	✓
✓	✓	✓	✓	✓	✓
✓	✓	–	–	–	✓
–	–	✓	✓	–	–
–	–	–	–	–	✓
–	✓	✓	✓	✓	✓
–	–	–	–	✓	✓
–	✓	✓	✓	✓	✓
–	–	–	–	✓	✓
CAT III / 300 V CAT II / 600 V	CAT IV / 300 V CAT III / 600 V CAT II / 1000 V	CAT IV / 300 V CAT III / 600 V CAT II / 1000 V	CAT IV / 300 V CAT III / 600 V CAT II / 1000 V	CAT IV / 1000 V	CAT IV / 1000 V
113 x 53 x 10.2	160 x 82 x 48	198 x 97 x 55	198 x 97 x 55	208 x 103 x 64.5	208 x 103 x 64.5
78	345	396	396	635	635
✓	✓	✓	✓	✓	✓

Accessories: page 8.01

MD 9010 General Purpose Autocheck Digital Multimeter

The MD 9010 is one of the smallest and lightest of our digital multimeters. The MD 9010 unit can be used for a wide variety of applications. The high accuracy, LCD display and features including non-contact voltage detection and an autocheck function make the multimeter extremely versatile and great value for money.

MEASURING FUNCTIONS:

- AC, DC voltage measurement.
- AC, DC current measurement.
- Capacitance measurement.
- Resistance measurement
- Diod test.
- Frequency measurement.
- Continuity test.
- Electric field detection.

KEY FEATURES:

- **Autocheck function:** automatic detection of AC voltage, DC voltage or resistance.
- **Auto-ranging:** no need of manual ranging.
- **Pocket-sized:** small, thin, ergonomic design.
- **Lightweight:** 78 g only.
- **Acoustic signalling** on continuity test.
- **EF detection**: non-contact and probe-contact electric field detection.
- **Safe:** protected against wrong connection and overvoltage (CAT III / 300 V and CAT II / 600 V).
- **Easy to read:** LCD display, 3-5/6 digits, 6000 counts.

APPLICATION:

- Low level electrical testing.
- Low level electronic fault finding.
- Basic field servicing.
- Hobby work.

STANDARD SET:

- Multimeter MD 9010 with rubber holster
- Test lead with probe, 2 pcs
- Battery
- Instruction manual
- Warranty

TECHNICAL SPECIFICATION:

Function	Range	Accuracy
DC voltage	6.000 V … 600.0 V	from ±(0.5 % of reading + 3 digits) to ±(2.0 % of reading + 5 digits)
AC voltage (50 … 60 Hz)	6.000 V … 600.0 V	±(1.5 % of reading + 5 digits)
DC current	400.0 µA 2000 µA	±(1.5 % of reading + 3 digits) ±(1.2 % of reading + 3 digits)
AC current	400.0 µA 2000 µA	±(2.0 % of reading + 3 digits) ±(1.5 % of reading + 3 digits)
Diode test	Open-circuit voltage <1.6 V_{DC}	
Resistance	600.0 Ω … 6.000 MΩ	from ±(1.0 % of reading + 4 digits) to ±(2.0 % of reading + 6 digits)
Frequency	10.00 Hz … 30.00 kHz	±(0.5 % of reading + 4 digits)
Capacitance	100.0 nF … 2000 µF	±(3.5 % of reading + 6 digits)
Power supply	3 V button battery (IEC-CR2032)	
Overvoltage category	CAT III / 300 V; CAT II / 600 V	
Dimensions	113 x 53 x 10.2 mm	
Weight	78 g	

MD 9015 Electrical Field Service Digital Multimeter

The digital multimeter MD 9015 includes all necessary functions required to detect and diagnose most electrical and electrotechnical problems. Display with large easily-read figures and one-handed operation make MD 9015 an extremely easy to use. This compact instrument combines a high level of functionality and small size and portability.

MEASURING FUNCTIONS:

- AC, DC voltage measurement.
- AC, DC current measurement.
- Capacitance measurement.
- Resistance measurement.
- Diod test.
- Frequency measurement.
- Continuity test.
- Electric field detection.
- Temperature measurement.

KEY FEATURES:

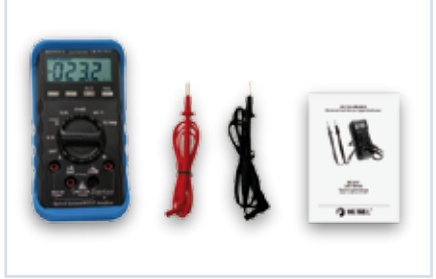
- **Temperature:** measures temperature in Celsius up to 300 °C and in Fahrenheit up to 572 °F.
- **Auto-ranging:** user can switch between auto and manual ranging.
- **EF detection**: non-contact and probe-contact electric field detection.
- **Relative zero mode:** relative function for comparing the difference between signals or removing background noise.
- **Hold:** data hold function freezes the display for later view.
- **PC Link:** test results can be downloaded to the computer via the optional PC software.
- **Safe:** CAT II / 1000 V, CAT III / 600 V and CAT IV / 300 V overvoltage protection.

APPLICATION:

- HVAC (heating, ventilation and air conditioning) troubleshooting
- Low level electrical testing.
- Low level electronic fault finding.
- Basic field servicing.
- Hobby work.

STANDARD SET:

- Multimeter MD 9015 with rubber holster
- Test lead with probe, 2 pcs
- 1.5 V battery, type AAA, 2 pcs
- Instruction manual
- Warranty



TECHNICAL SPECIFICATION:

Function	Range	Accuracy
DC voltage	250.0 mV … 1000 V	from ±(0.3 % of reading + 4 digits) to ±(1.0 % of reading + 4 digits)
AC voltage (50 … 500 Hz)	250.0 mV … 750 V	from ±(1.0 % of reading + 3 digits) to ±(2.2 % of reading + 6 digits)
DC current	250.0 µA … 10.00 A	from ±(0.8 % of reading + 3 digits) to ±(2.0 % of reading + 6 digits)
AC current	250.0 µA … 10.00 A	from ±(1.0 % of reading + 4 digits) to ±(2.5 % of reading + 5 digits)
Diode test	Open-circuit voltage <1.8 V_{DC}, Test current 1 mA	
Resistance	250.0 Ω … 25.00 MΩ	from ±(0.4 % of reading + 2 digits) to ±(1.0 % of reading + 4 digits)
Temperature	-20 °C … 300 °C	3 °C + 3 digits
Frequency	30 Hz … 200 kHz	±(0.05 % of reading + 4 digits)
Capacitance	2.500 nF … 25.00 µF	from ±(1.0 % of reading + 4 digits) to ±(6.0 % of reading + 45 digits)
Power supply	2 x 1.5 V batteries, type AAA	
Overvoltage category	CAT IV / 300 V; CAT III / 600 V; CAT II / 1000 V	
Dimensions	160 x 82 x 48 mm	
Weight	345 g	

Accessories: page 8.01

MD 9020 General Purpose Digital Multimeter

The MD 9020 is a high-quality digital multimeter, designed for everyday use in the laboratory and for maintenance and repair work in the field and in the industrial sector as well.

MEASURING FUNCTIONS:

- AC, DC voltage measurement.
- AC, DC current measurement.
- Capacitance measurement.
- Resistance measurement.
- Diod test.
- Frequency measurement.
- Continuity test (acoustic signalling).
- Temperature measurement.

KEY FEATURES:

- **Temperature measurement:** measures temperature in Celsius up to 300 °C and in Fahrenheit up to 572 °F.
- **Frequency measurement:** up to 1 MHz.
- **Lead alert:** incorrect lead connection alert.
- **Auto-ranging:** user can switch between auto and manual ranging.
- **Relative zero mode:** relative function for comparing the difference between signals or removing background noise.
- **Data Hold:** data hold feature freezes the display for later view.
- **MAX Hold:** MAX hold feature freezes the maximum measured value.
- **Safe:** CAT IV / 300 V, CAT III / 600 V and CAT II / 1000 V overvoltage protection.

APPLICATION:

- Mid level electrical testing.
- Mid level electronic fault finding.
- Field servicing.
- General purpose.

STANDARD SET:

- Multimeter MD 9020 with rubber holster
- Test lead with probe, 2 pcs
- 1.5 V battery, type AAA, 2 pcs
- Instruction manual
- Warranty

TECHNICAL SPECIFICATION:

Function	Range	Accuracy
DC voltage	400.0 mV … 1000 V	from ±(0.3 % of reading + 4 digits) to ±(1.0 % of reading + 4 digits)
AC voltage (50 … 500 Hz)	400.0 mV … 1000 V	from ±(1.5 % of reading + 5 digits) to ±(4.0 % of reading + 5 digits)
DC current	400.0 µA … 10.00 A	from ±(1.2 % of reading + 3 digits) to ±(2.0 % of reading + 5 digits)
AC current	400.0 µA … 10.00 A	from ±(1.5 % of reading + 4 digits) to ±(2.0 % of reading + 6 digits)
Diode test	Open-circuit voltage <1.6 V_{DC}, Test current 0.25 mA	
Resistance	400.0 Ω … 40.00 MΩ	from ±(0.6 % of reading + 4 digits) to ±(2.0 % of reading + 4 digits)
Temperature	-20 °C … 300 °C	±(2.0 % of reading + 3 °C)
Frequency	50.00 Hz … 1.000 MHz	±(0.5 % of reading + 4 digits)
Capacitance	500.0 nF … 3000 µF	±(3.5 % of reading + 6 digits)
Power supply	2 x 1.5 V batteries, type AAA	
Overvoltage category	CAT IV / 300 V; CAT III / 600 V; CAT II / 1000 V	
Dimensions	198 x 97 x 55 mm	
Weight	396 g	

Accessories: page 8.01

MD 9030 TRMS General Purpose Digital Multimeter

The MD 9030 TRMS digital multimeter has been designed for use both in the laboratories and in the harsh industrial maintenance and repair sector. TRMS functionality makes the multimeter suitable for a multitude of situations, while the large bright screen with backlight and incorrect lead connection alert make it ideal for working in dark areas.

MEASURING FUNCTIONS:

- TRMS AC, DC voltage measurement.
- TRMS AC, DC current measurement.
- Capacitance measurement.
- Resistance measurement.
- Diod test.
- Frequency measurement.
- Continuity test (acoustic signalling).
- Temperature measurement.

KEY FEATURES:

- **TRMS:** accurate readings on sinusoidal and non-sinusoidal signals.
- **Temperature measurement:** measures temperature in Celsius up to 300 °C and in Fahrenheit up to 572 °F.
- **Frequency measurement:** up to 1 MHz.
- **Lead alert:** incorrect lead connection alert.
- **Auto-ranging:** user can switch between auto and manual ranging.
- **Relative zero mode:** relative function for comparing the difference between signals or removing background noise.
- **Data Hold:** data hold feature freezes the display for later view.
- **MAX Hold:** MAX hold feature freezes the maximum measured value.
- **Safe:** CAT IV / 300 V, CAT III / 600 V and CAT II / 1000 V overvoltage protection.
- **Backlight:** large bright 3-3/4 digits, 4000 counts LCD display with backlight for working in dark conditions.

APPLICATION:

- Mid level electrical testing.
- Mid level electronic fault finding.
- Field servicing.
- General purpose.

STANDARD SET:

- Multimeter MD 9030 with rubber holster
- Test lead with probe, 2 pcs
- 1.5 V battery, type AAA, 2 pcs
- Instruction manual
- Warranty

TECHNICAL SPECIFICATION:

Function	Range	Accuracy
DC voltage	400.0 mV … 1000 V	from ±(0.3 % of reading + 4 digits) to ±(1.0 % of reading + 4 digits)
TRMS AC voltage (50 … 500 Hz)	400.0 mV … 1000 V	from ±(1.5 % of reading + 5 digits) to ±(4.0 % of reading + 5 digits)
DC current	400.0 µA … 10.00 A	from ±(1.2 % of reading + 3 digits) to ±(2.0 % of reading + 5 digits)
TRMS AC current	400.0 µA … 10.00 A	from ±(1.5 % of reading + 4 digits) to ±(2.0 % of reading + 6 digits)
Diode test	Open-circuit voltage <1.6 V_{DC}, Test current 0.25 mA	
Resistance	400.0 Ω … 40.00 MΩ	from ±(0.6 % of reading + 4 digits) to ±(2.0 % of reading + 4 digits)
Temperature	-20 °C … 300 °C	±(2.0 % of reading + 3 °C)
Frequency	50.00 Hz … 1.000 MHz	±(0.5 % of reading + 4 digits)
Capacitance	500.0 nF … 3000 µF	±(3.5 % of reading + 6 digits)
Power supply	2 x 1.5 V batteries, type AAA	
Overvoltage category	CAT IV / 300 V; CAT III / 600 V; CAT II / 1000 V	
Dimensions	198 x 97 x 55 mm	
Weight	396 g	

Accessories: page 8.01

MD 9040 TRMS Industrial Digital Multimeter

CAT IV / 1000 V overvoltage category and TRMS measurement of AC current and voltage are key features of the MD 9040. That's why it is particularly suitable for performing measurements on power supply sources in the most demanding applications in the industrial sector. Its high accuracy, 2-line LCD display, diverse measurement functions, fast one-handed operation and outstanding value for money open up a wide range of possible uses.

MEASURING FUNCTIONS:

- TRMS AC, DC voltage measurement.
- TRMS AC, DC current measurement.
- Capacitance measurement.
- Resistance measurement.
- Diod test.
- Mains supply frequency measurement.
- Frequency of digital signals measurement.
- Continuity test (acoustic signalling).

KEY FEATURES:

- **TRMS:** accurate readings on sinusoidal and non-sinusoidal signals.
- **Lead alert:** incorrect lead connection alert.
- **Auto-ranging:** user can switch between auto and manual ranging.
- **Relative zero mode:** relative function for comparing the difference between signals or removing background noise.
- **MAX/MIN/AVG:** recording of maximum, minimum and average values.
- **Data Hold:** data hold feature freezes the display for later view.
- **PC Link:** test results can be downloaded to the computer via the optional PC software.
- **Frequency measurement:** up to 1 MHz.
- **Safety:** CAT IV / 1000 V overvoltage protection.
- **Easy to read:** large bright 4 digits 9999 counts dual LCD display.

APPLICATION:

- High level industrial testing.
- High level electronic fault finding.
- Field servicing.
- Heavy duty electrical testing.

STANDARD SET:

- Multimeter MD 9040 with rubber holster
- Test lead with probe, 2 pcs
- 9 V battery
- Instruction manual
- Warranty

TECHNICAL SPECIFICATION:

Function	Range	Accuracy
TRMS AC voltage (40 Hz … 20 kHz)	60.00 mV … 999.9 V	from ±(0.5 % of reading + 3 digits) to ±(3.0 % of reading + 4 digits)
DC voltage	60.00 mV … 999.9 V	from ±(0.06 % of reading + 2 digits) to ±(0.12 % of reading + 2 digits)
DC current	600.0 µA … 10.00 A	±(0.2 % of reading + 4 digits)
TRMS AC current (40 Hz … 1 kHz)	600.0 µA … 10.00 A	from ±(0.6 % of reading + 3 digits) to ±(1.0 % of reading + 4 digits)
Diode test	2.000 V	±(1.0 % of reading + 1 digit)
	Open-circuit voltage <3.5 V_{DC}, Test current 0.4 mA	
Resistance	600.0 Ω … 60.00 MΩ	from ±(0.1 % of reading + 3 digits) to ±(1.5 % of reading + 5 digits)
Mains frequency	15.00 Hz … 50.00 kHz	±(0.04 % of reading + 4 digits)
Frequency of digital equipment	5.00 Hz … 1.000 MHz	±(0.004 % of reading + 4 digits)
Capacitance	60.00 nF … 25.00 mF	from ±(0.8 % of reading + 3 digits) to ±(6.5 % of reading + 5 digits)
Power supply	9 V battery (NEDA1604G, JIS006P, or IEC6F22)	
Overvoltage category	CAT IV / 1000 V	
Dimensions	208 x 103 x 64.5 mm	
Weight	635 g	

MD 9050 TRMS Heavy Duty Industrial Digital Multimeter

The MD 9050 ranks among the best multimeters on the market. High resolution and accuracy, 2-line LCD display, fast data acquisition and transfer (via optical interface), CAT IV / 1000 V, TRMS current and voltage measurement, non-contact voltage detection, conductance measurement, auto check function and fast one-handed operation are highlights of the multimeter. The MD 9050 is the ideal choice for demanding measurement tasks in industry, in the laboratories and in everyday repair and maintenance practice.

MEASURING FUNCTIONS:

- TRMS AC, DC voltage measurement.
- TRMS AC, DC current measurement.
- Capacitance measurement.
- Resistance measurement.
- Diod test.
- Mains supply frequency measurement.
- Frequency of digital signals measurement.
- Continuity test (acoustic signalling).
- Conductance measurement.
- Electric field detection.
- Temperature measurement.

KEY FEATURES:

- **TRMS:** accurate readings on sinusoidal and non-sinusoidal signals.
- **Autocheck function:** automatic detection of AC voltage, DC voltage or resistance.
- **Auto-ranging:** user can switch between auto and manual ranging.
- **Temperature measurement:** measures T1, T2 and T1 + T2 temperature in Celsius and in Fahrenheit.
- **EF detection**: non-contact and probe-contact electric field detection.
- **Lead alert:** incorrect lead connection alert.
- **Relative zero mode:** relative function for comparing the difference between signals or removing background noise.
- **MAX/MIN/AVG:** recording of maximum, minimum and average values.
- **Data Hold:** data hold feature freezes the display for later view.
- **Peak Hold:** Crest (instantaneous peak) cupture mode.
- **PC Link:** test results can be downloaded to the computer via the optional PC software.
- **Safety:** CAT IV / 1000 V overvoltage protection.
- **Backlight:** large bright 4 digits 9999 counts dual LCD display with backlight for working in dark conditions.

APPLICATION:

- High level industrial testing.
- High level electronic fault finding.
- Field servicing.
- Heavy duty electrical testing.

STANDARD SET:

- Multimeter MD 9050 with rubber holster
- Test lead with probe, 2 pcs
- Thermocouple probe, type K
- 9 V battery
- Instruction manual
- Warranty

TECHNICAL SPECIFICATION:

Function	Range	Accuracy
TRMS AC and AC+DC voltage (40 Hz … 20 kHz)	60.00 mV … 999.9 V	from ±(0.5 % of reading + 3 digits) to ±(3.0 % of reading + 4 digits)
Autocheck (ACV)	9.999 V … 999.9 V	±(1.0 % of reading + 4 digits)
DC voltage	60.00 mV … 999.9 V	from ±(0.06 % of reading + 2 digits) to ±(0.12 % of reading + 2 digits)
Autocheck (DCV)	9.999 V … 999.9 V	± (0.5 % of reading + 3 digits)
DC current	600.0 µA … 10.00 A	±(0.2 % of reading + 4 digits)
TRMS AC and AC+DC current (40 Hz … 1 kHz)	600.0 µA … 10.00 A	from ±(0.6 % of reading + 3 digits) to ±(1.0 % of reading + 4 digits)
Diode test	2.000 V	±(1.0 % of reading + 1 digit) Open-circuit voltage <3.5 VDC, test current 0.4 mA
Resistance	600.0 Ω … 60.00 MΩ	from ±(0.1 % of reading + 3 digits) to ±(1.5 % of reading + 5 digits)
Conductance	99.99 nS	±(0.8 % of reading + 10 digits)
Autocheck (resistance)	600.0 Ω … 60.00 MΩ	from ± (0,5 % of reading + 4 digits) to ±(2 % of reading + 5 digits)
Mains frequency	15.00 Hz … 50.00 kHz	±(0.04 % of reading + 4 digits)
Frequency of digital equipment	5.00 Hz … 1.000 MHz	±(0.004 % of reading + 4 digits)
Capacitance	60.00 nF … 25.00 mF	from ±(0.8 % of reading + 3 digits) to ±(6.5 % of reading + 5 digits)
Temperature	-50 °C … +1000 °C	±(0.3 % of reading +2 °C)
Power supply	9 V battery (NEDA1604G, JIS006P, or IEC6F22)	
Overvoltage category	CAT IV / 1000 V	
Dimensions	208 x 103 x 64.5 mm	
Weight	635 g	

Accessories: page 8.01

Selection Guide for Clamp Meters

Part No.:	MD 9210	MD 9220	MD 9230	MD 9240	MD 9270
					
True RMS	–	✓	✓	✓	✓
DC current range	–	–	1000 A	–	–
Basic accuracy (%)	–	–	1.5	–	–
AC current range	600 A	2000 A	800 A	1000 A	150 A
Basic accuracy (%)	1.5	1.5	1.5	1	0.8
DC voltage range	600 V	600 V	600 V	600 V	–
Basic accuracy (%)	0.3	0.5	0.3	0.5	–
AC voltage range	600 V	600 V	600 V	600 V	600 V
Basic accuracy (%)	1.5	1.5	1	0.5	0.5
Resistance range	40.00 MΩ	6.000 MΩ	40.00 MΩ	999.9 Ω	–
Basic accuracy (%)	0.6	1	0.6	1	–
Acoustic continuity test	✓	✓	✓	✓	–
Diode test	✓	✓	✓	–	–
Capacitance measurement	✓	✓	✓	–	–
Frequency measurement	✓	✓	–	✓	✓
Temperature measurement (Type K probe)	–	–	–	✓	–
Autocheck® V-Ω	–	✓	–	Auto V-A	–
Power measurement (W, VA, VAR)	–	–	–	✓	✓
Count	4000	6000	4000	4000, 6000, 9999	3000
Backlight	–	✓	✓	✓	✓
COM port (data transfer)	–	–	–	✓	–
Automatic and manual range selection	Auto	✓	✓	Auto	Auto
Automatic switch off	✓	✓	✓	✓	✓
Non-contact electrical field detection	–	✓	–	–	–
MAX hold	✓	–	✓	–	✓
Peak value	–	–	–	✓	✓
Data hold	✓	✓	✓	✓	✓
Relative value	✓		✓	–	–
Jaw opening	26 mm	45 mm	50 mm	45 mm	31 mm
Overvoltage category	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 / 600 V	CAT IV / 300 V CAT III / 600 V
Dimensions (mm)	190 x 63 x 32	224 x 78 x 40	227 x 78 x 40	224 x 78 x 40	212 x 59 x 37
Weight (g)	139	220	290	224	225
CE mark	✓	✓	✓	✓	✓

MD 9210 Mini Clamp Meter

Versatility, sturdy case, high accuracy and lots of measurement functions are key features of the current clamp MD 9210. This universal current clamp offers good value for money.

MEASURING FUNCTIONS:

- AC, DC voltage measurement
- AC current measurement
- Frequency measurement
- Resistance measurement
- Continuity testing
- Capacitance measurement
- Diod test

KEY FEATURES:

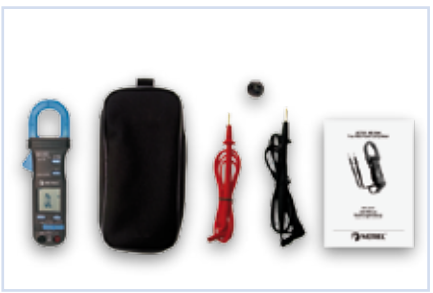
- **Jaw size:** 26 mm.
- **Lightweight:** 139 g only.
- **High specification:** readings up to 600 A with excellent accuracy.
- **Auto-ranging:** no need of manual ranging.
- **Relative zero mode:** relative function for comparing the difference between signals or removing background noise.
- **Data Hold:** data hold feature freezes the display for later view.
- **MAX Hold:** MAX hold feature freezes the maximum measured value.
- **Easy to read:** large bright 3-3/4 digits 4000 counts LCD display.

APPLICATION:

- Working in small enclosures.
- General purpose.
- 3-phase machinery testing.

STANDARD SET:

- Current clamp MD 9210
- Test lead with probe, 2 pcs
- 3 V battery
- Pouch
- Instruction manual
- Warranty



TECHNICAL SPECIFICATION:

Function	Range	Accuracy
DC voltage	400.0 mV 4.000 V, 40.00 V, 400.0 V 600 V	±(0.3 % of reading + 4 digits) ±(0.5 % of reading + 3 digits) ±(1.0 % of reading + 4 digits)
AC voltage (50 Hz … 500 Hz)	4.000 V, 40.00 V, 400.0 V 600 V	±(1.5 % of reading + 5 digits) ±(2.0 % of reading + 5 digits)
AC current (50 / 60 Hz)	40.00 A, 400.0 A, 600 A	±(1.5 % of reading + 8 digits)
Resistance	400.0 Ω 4.000 kΩ, 40.00 kΩ, 400.0 kΩ 4.000 MΩ 40.00 MΩ	±(0.8 % of reading + 8 digits) ±(0.6 % of reading + 4 digits) ±(1.0 % of reading + 4 digits) ±(2.0 % of reading + 4 digits)
Diode test	Open-circuit voltage <1.6 V_{DC}, test current 0.25 mA	
Frequency	10 Hz … 100 kHz	±(0.5 % of reading + 4 digits)
Capacitance	500.0 nF … 3000 µF	±(3.5 % of reading + 6 digits)
Power supply	3 V battery (IEC-CR2032)	
Overvoltage category	CAT IV / 300 V; CAT III / 600 V	
Dimensions	190 x 63 x 32 mm	
Weight	139 g	

Accessories: page 8.01

MD 9220 TRMS Current Clamp Meter

The MD 9220 is a high-quality TRMS current clamp meter, designed for everyday use in the laboratories and for maintenance and repair work in the field and in the industrial sector.

MEASURING FUNCTIONS:

- TRMS AC, DC voltage measurement
- TRMS AC current measurement
- Frequency measurement
- Resistance measurement
- Continuity testing
- Capacitance measurement
- Diod test
- Electric field detection

KEY FEATURES:

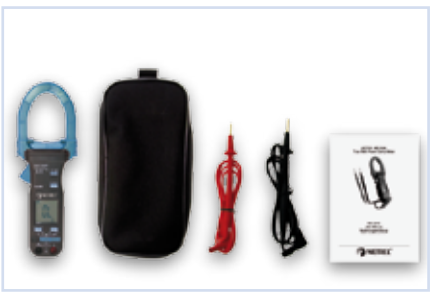
- **TRMS:** accurate measurements on sinusoidal and non-sinusoidal signals.
- **Jaw size:** 45 mm.
- **High specification:** readings up to 2000 A with excellent accuracy.
- **Autocheck function:** automatic detection of AC voltage, DC voltage or resistance.
- **Auto-ranging:** user can switch between auto and manual ranging.
- **EF detection**: non-contact and probe-contact electric field detection.
- **Data Hold:** data hold feature freezes the display for later view.
- **Easy to read:** large bright LCD screen, 3-5/6 digits, 6000 counts, with backlight.

APPLICATION:

- High powered 3-phase machinery testing.
- High level industrial testing.
- High current electrical testing.

STANDARD SET:

- Current clamp MD 9220
- Test lead with probe, 2 pcs
- 1.5 V battery, type AAA, 2 pcs
- Pouch
- Instruction manual
- Warranty



TECHNICAL SPECIFICATION:

Function	Range	Accuracy
DC voltage	6.000 V 60.00 V 600.0 V	±(0.5 % of reading + 3 digits) ±(1.0 % of reading + 5 digits) ±(2.0 % of reading + 5 digits)
AC voltage (50, 60 Hz)	6.000 V, 60.00 V 600.0 V	±(1.5 % of reading + 5 digits) ±(2.0 % of reading + 5 digits)
AC voltage (50 … 500 Hz)	6.000 V, 60.00 V 600.0 V	±(2 % of reading + 5 digits) ±(2.5 % of reading + 5 digits)
AC current (50, 60 Hz)	400.0 A, 2000 A	±(1.5 % of reading + 5 digits)
Resistance	6.000 kΩ 60.00 kΩ, 600.0 kΩ 6.000 MΩ	±(1.2 % of reading + 6 digits) ±(1.0 % of reading + 4 digits) ±(2.0 % of reading + 4 digits)
Continuity test	600.0 Ω	±(2.0 % of reading + 8 digits)
Diode test	Open-circuit voltage <1.6 V_{DC}, test current 0.4 mA	
Frequency	10 Hz … 30 kHz	±(0.5% of reading + 4 digits)
Capacitance	100.0 nF … 2000 µF	±(3.5% of reading + 5 digits)
Power supply	2 x 1.5 V batteries, type AAA	
Overvoltage category	CAT IV / 300 V; CAT III / 600 V	
Dimensions	224 x 78 x 40 mm	
Weight	220 g	

Accessories: page 8.01

MD 9230 Industrial TRMS AC/DC Current Clamp Meter

The MD 9230 is a universal current clamp for measuring DC and TRMS AC voltages up to 600 V and DC and TRMS AC currents up to 1000 A. With a broad spectrum of measuring functions and features, it is an ideal tool for service companies and works electricians in the industrial sector.

MEASURING FUNCTIONS:

- TRMS AC, DC voltage measurement.
- TRMS AC, DC current measurement.
- Resistance measurement.
- Continuity testing.
- Capacitance measurement.
- Diod test.

KEY FEATURES:

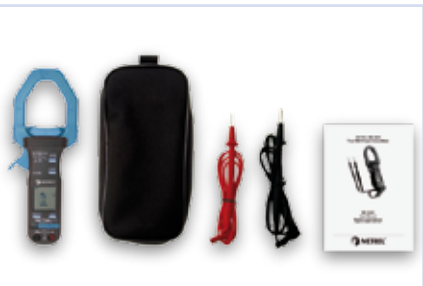
- **TRMS:** accurate measurements on sinusoidal and non-sinusoidal signals.
- **Jaw size:** 50 mm.
- **High current:** measures up to 800 A AC and 1000 A DC.
- **Auto-ranging:** user can switch between auto and manual ranging.
- **Relative zero mode:** relative function for comparing the difference between signals or removing background noise.
- **Data Hold:** data hold feature freezes the display for later view.
- **MAX Hold:** MAX hold feature freezes the maximum measured value.
- **Display:** easy to read LCD screen, 3-3/4 digits, 4000 counts with backlight.

APPLICATION:

- Solar and wind power systems testing.
- UPS systems testing.
- Utility scale battery systems testing.
- High level industrial testing.
- High current electrical testing.

STANDARD SET:

- Current clamp MD 9230
- Test lead with probe, 2 pcs
- 1.5 V battery, type AAA, 2 pcs
- Pouch
- Instruction manual
- Warranty



TECHNICAL SPECIFICATION:

Function	Range	Accuracy
DC voltage	400.0 mV, 4.000 V, 40.00 V, 400.0 V, 600.0 V	±(0.3 % of reading + 3 digits) ±(0.5 % of reading + 3 digits) ±(1.0 % of reading + 4 digits)
AC voltage 50 Hz … 500 Hz 50 Hz … 60 Hz 60 Hz … 500 Hz 50 Hz … 500 Hz	 400.0 mV 4.000 V, 40.00 V, 400.0 V 4.000 V, 40.00 V, 400.0 V 600 V	 ±(4.0 % of reading + 4 digits) ±(1.0 % of reading + 4 digits) ±(1.5 % of reading + 4 digits) ±(2.0 % of reading + 4 digits)
DC current	400.0 A,1000 A	from ±(1.5 % of reading + 4 digits) to ±(5.0 % of reading + 30 digits)
AC current (15 Hz … 1 kHz)	400 A, 800 A	from ±(1.5 % of reading + 4 digits) to ±(5.0 % of reading + 30 digits)
Resistance	400.0 Ω … 40.00 MΩ	from ±(0.6 % of reading + 4 digits) to ±(2.0 % of reading + 4 digits)
Continuity test	400.0 Ω	±(1.5 % of reading + 6 digits)
Diode test	Open-circuit voltage <1.6 V_{DC}, test current 0.4 mA	
Capacitance	500 nF … 3000 µF	±(3.5 % of reading + 6 digits)
Power supply	2 x 1.5 V batteries, type AAA	
Overvoltage category	CAT IV / 300 V; CAT III / 600 V	
Dimensions	227 x 78 x 40 mm	
Weight	290 g	

Accessories: page 8.01

MD 9240 TRMS Power Clamp Meter

The MD 9240 is a high-quality and extremely easy to handle power clamp meter. The MD 9240 enables TRMS AC current measurement up to 1000 A, AC and DC voltage measurement, single-phase power analysis, temperature measurement and more. As a result the current clamp meter is suitable for maintenance and checking of distribution systems, switchboards and motors or systems where the supply network is heavily contaminated with harmonics.

MEASURING FUNCTIONS:

- TRMS AC, DC voltage measurement.
- TRMS AC current measurement.
- Frequency measurement.
- Resistance measurement.
- Continuity test.
- Temperature measurement.
- Power parameters measurement.

KEY FEATURES:

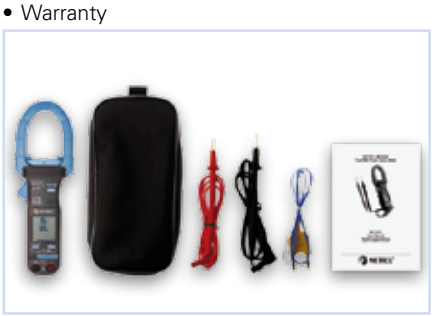
- **TRMS:** accurate measurements on sinusoidal and non-sinusoidal signals.
- **Jaw size:** 45 mm.
- **High current:** measures up to 1000 A AC.
- **Autocheck function:** automatic detection of AC voltage, DC voltage or AC current.
- **Power:** measures various power parameters (active, reactive, apparent power, THD, PF).
- **Temperature:** measures temperature in Celsius up to 300 °C and in Fahrenheit up to 572 °F.
- **PC Link:** test results can be downloaded to the computer via the optional PC software.
- **Data Hold:** data hold feature freezes the display for later view.
- **Peak Hold:** peak hold feature displays maximum RMS value of surge voltage or current.

APPLICATION:

- System maintenance.
- Power system checking.
- High level Industrial testing.
- High level electrical testing.

STANDARD SET:

- Current clamp MD 9240
- Test lead with probe, 2 pcs
- Thermocouple probe, type K
- 1.5 V battery, type AAA, 2 pcs
- Pouch
- Instruction manual
- Warranty



TECHNICAL SPECIFICATION:

Function	Range	Accuracy
DC voltage	600.0 V	±(0.5 % of reading + 5 digits)
AC voltage (50 … 60 Hz; 45 … 500 Hz; 500 Hz … 3.1 kHz)	600.0 V	from ±(0.5 % of reading + 5 digits), to ±(2.5 % of reading + 5 digits)
AC current (50 … 60 Hz)	40.00 A, 400.0 A, 1000 A	±(1.0 % of reading + 5 digits)
AC current (45 … 500 Hz)	40.00 A, 400.0 A, 1000 A	±(2.0 % of reading + 5 digits) ±(2.5 % of reading + 5 digits)
AC current (500 Hz … 3.1 kHz)	40.00 A, 400.0 A, 1000 A	±(2.5 % of reading + 5 digits) ±(3.0 % of reading + 5 digits)
Temperature	-50 °C … 300 °C	±(2.0 % of reading + 3 °C)
Resistance	999.9 Ω	±(1.0 % of reading + 6 digits)
Continuity test	10 … 300 Ω	
Frequency	5.00 Hz … 500.0 Hz	±(0.5 % of reading + 4 digits)
Power factor (PF)	0.10 … 0.99	±(3 digits), H from 1. to 21. ±(5 digits), H from 22. to 51.
Apparent power	0 … 600.0 kVA	±(2.0 % of reading + 6 digits), H 1./10. ±(3.5 % of reading + 6 digits), H 11./46. ±(5.5 % of reading + 6 digits), H 47./51.
Active power, reactive power	0 … 600.0 kW, kVar	from ±(2.0 % of reading + 6 digits)
Power supply	2 x 1.5 V batteries, type AAA	
Overvoltage category	CAT IV / 300 V; CAT III / 600 V	
Dimensions	224 x 78 x 40 mm	
Weight	224 g	

MD 9270 Leakage Clamp TRMS Meter with Power Functions

The MD 9270 is a unique earth leakage clamp meter. It not just has the ability to accurately read the TRMS AC leakage current of a system, it can also detect losses in the system and suggest possible reasons for the loss. The voltage, power, harmonic, power factor (PF), total harmonic distortion (THD) and crest factor measurements make this instrument suitable for any electrician and engineer.

MEASURING FUNCTIONS:

- TRMS AC voltage measurement.
- TRMS AC current measurement.
- Frequency measurement.
- Power parameters measurement.

KEY FEATURES:

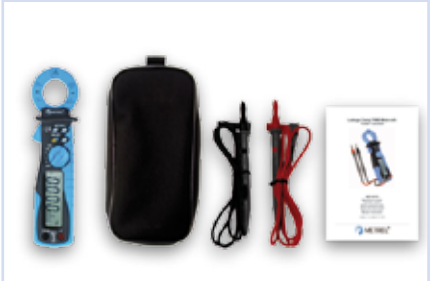
- **TRMS:** accurate measurements on sinusoidal and non-sinusoidal signals.
- **Jaw size:** 31 mm.
- **Shielded Jaw:** shielded jaw allows the clamp meter to be used in the noisiest environments.
- **Accurate:** readings of AC current with an accuracy of 0.8 % and a base resolution of 0.01 mA and voltage with an accuracy of 0.5 % and a base resolution of 0.1 V.
- **Power:** measures various power parameters (active, reactive, apparent power, THD, PF, phase displacement).
- **Intelligent loss analysis:** complex algorithms detect loss and allow determining possible reasons for current loss.
- **Harmonics:** measures current or voltage harmonic components and a percentage value of a harmonic up to the 49th.
- **THD and PF:** dual display allows readings to be displayed along with Total Harmonic Distortion (THD) or Power Factor (PF).
- **Peak value:** the peak value of the waveform or crest factor can be displayed.
- **MAX/MIN/HOLD mode:** displays maximum, minimum or average measured value.

APPLICATION:

- Load and leakage current measurement.
- System maintenance.
- Power system checking.
- RCD fault finding.
- Process engineering.

STANDARD SET:

- Current clamp MD 9270
- Test lead with probe, 2 pcs
- 1.5 V battery, type AAA, 2 pcs
- Pouch
- Instruction manual
- Warranty



TECHNICAL SPECIFICATION:

Function	Range	Accuracy
AC current	40.00 mA, 400.0 mA, 4000 mA 40.00 A 150.0 A	±(0.8 % of reading + 3 digits) ±(1.0 % of reading + 3 digits) ±(2.0 % of reading + 5 digits)
AC voltage	250.0 V, 600.0 V	±(0.5 % of reading + 2 digits)
THD	0 … 99.9 % 100 … 999 %	±(2.0 % of reading + 3 digits) ±(2.0 % of reading + 3 digits)
Crest Factor	1.00 … 2.99 3.00 … 9.99	±(2.0 % of reading + 2 digits) ±(3.0 % of reading + 5 digits)
Peak value	0 … 150.0 A 0 … 600.0 V	±(3.0 % of reading + 3 digits) ±(3.0 % of reading + 3 digits)
Power factor (PF)	0.00 … 1.00	±(1.0 % of reading + 0.01)
Phase	-180.0° … +180.0°	±(1.0 % of reading + 0.4)
Apparent power	0 … 9999 VA 10 kVA … 999.9 kVA	from ±(1% of r.+ 0.03) to ±(1% of r. + 3) from ±(2% of r. + 0.03) to ±(2% of r. + 0.3)
Active power	0 … 9999 W 10 kW … 999.9 kW	from ±(1% of r.+ 0.03) to ±(1% of r. + 3) from ±(2% of r. + 0.03) to ±(2% of r. + 0.3)
Reactive power	0 … 9999 VAr 10 kVAr … 999.9 kVAr	from ±(1% of r.+ 0.03) to ±(1% of r. + 3) from ±(2% of r. + 0.03) to ±(2% of r. + 0.3)
Power supply	2 x 1.5 V batteries, type AAA	
Overvoltage category	CAT IV / 300 V; CAT III / 600 V	
Dimensions	212 x 59 x 37 mm	
Weight	225 g	

Accessories: page 8.01

Selection Guide for Voltage detectors

Part No.:	MD 1000	MD 1100
		
AC, DC VOLTAGE TEST		
Range	12 V … 690 V	12 V … 690 V
Basic accuracy (%)	–	±(2.0 % of reading + 4 digits)
Operating time	Max. 30 s	Max. 30 s
Reaction time	< 1 s	< 1 s
Frequency range	0 … 400 Hz	0 … 400 Hz
CONTINUITY AND DIODE TEST		
Indication	acoustic and LED display	acoustic and LCD display
Resistance range	0 … 500 kΩ	0 … 2 kΩ
Test current	400 µA	4 µA
RCD TRIP-OUT TEST		
RCD check	to trip 30 mA RCD, circuit breakers	to trip 30 mA RCD, circuit breakers
PHASE TESTING		
Phase test	1-pole phase test	1-pole phase test
Phase rotation	2-pole phase rotation test	2-pole phase rotation test
Voltage display	>100 VAC	>100 VAC
GENERAL		
Display	LED bar display	3 ½ digit, LCD with backlight
Ranges	12 V, 24 V, 48 V, 120 V, 230 V, 400 V, 690 V	12 V … 690 V
Overvoltage category	CAT IV / 1000 V	CAT IV / 1000 V
Standards	IEC/EN 61243-3, DIN VDE 0682-401, IEC 61010, GS38	IEC/EN 61243-3, DIN VDE 0682-401, IEC61010, GS38
Power supply	2 x 1.5 V batteries, type AAA	2 x 1.5 V batteries, type AAA
Weight	200 g	200 g
Dimensions	238 x 70 x 30 mm	238 x 70 x 30 mm

MD 1000 LED Voltage / Continuity Tester

The MD 1000 is a multifunction voltage / continuity tester. Because of its broad spectrum of measurement functions, it is suitable for use both in the home and in trade and industrial sectors.

MEASURING FUNCTIONS:

- AC, DC voltage testing
- Phase testing
- Rotary field testing
- Continuity testing
- RCD trip-out test

KEY FEATURES:

- 12 V … 690 V DC and AC voltage range.
- Phase rotation measurement.
- RCD trip-out test (max. nominal differential current - 30 mA).
- Optical and acoustic continuity test.
- CAT IV / 1000 V overvoltage protection.

APPLICATION:

- General purpose.
- Electrical testing.

STANDARD SET:

- Voltage tester MD 1000
- 1.5 V battery, type AAA, 2 pcs
- Captive test probe protection
- Plastic probe guard (in accordance with GS38)
- Instruction manual
- Warranty

TECHNICAL SPECIFICATION:

Function	Range
Display	10 red LEDs for voltage, continuity, polarity and phase rotation measurement
Nominal voltage range	12 V, 24 V, 48 V, 120 V, 230 V, 400 V, 690 V (automatic range selection)
Frequency range	0 … 400 Hz
Resistance range	0 … 500 kΩ
RCD test current	30 mA
Phase indication	>100 V_{AC}
Phase rotation determination	100 V … 690 V, 2-pole
Reaction time	< 0.1 s
Power supply	2 x 1.5 V batteries, type AAA
Overvoltage category	CAT IV / 1000 V
Dimensions	238 x 70 x 30 mm
Weight	200 g

Accessories: page 8.01

MD 1100 LCD Voltage / Continuity Tester

The MD 1100 is a high-quality voltage / continuity tester designed for the most demanding duties. With a broad spectrum of measurement functions and CAT IV / 1000 V overvoltage category, the device is suitable for both the industrial sector and for everyday maintenance and repair practice.

MEASURING FUNCTIONS:

- AC, DC voltage testing
- Phase testing
- Rotary field testing
- Continuity testing
- RCD trip-out test

KEY FEATURES:

- 12 V … 690 V DC and AC voltage range.
- Data hold function.
- LCD display with backlight.
- Phase rotation measurement.
- RCD trip-out test (max. nominal differential current - 30 mA).
- Optical and acoustic continuity test.
- Automatic switch off.
- CAT IV / 1000 V overvoltage protection.

APPLICATION:

- Mid level electrical testing.
- Mid level electronic fault finding.
- Field servicing.
- General purpose.

STANDARD SET:

- Voltage tester MD 1100
- 1.5 V battery, type AAA, 2 pcs
- Captive test probe protection
- Plastic probe guard (in accordance with GS38)
- Instruction manual
- Warranty

TECHNICAL SPECIFICATION:

Function	Range
Nominal voltage range	12 V … 690 V (automatic range selection)
Frequency range	0 … 400 Hz
Resistance range	0 … 2 kΩ
RCD test current	30 mA
Phase indication	>100 V_{AC}
Phase rotation determination	100 V … 690 V, 2-pole
Reaction time	< 0.1 s
Display	3-1/2 digit LCD display with backlight
Power supply	2 x 1.5 V batteries, type AAA
Overvoltage category	CAT IV / 1000 V
Dimensions	238 x 70 x 30 mm
Weight	200 g

MEASURING INSTRUMENTS AND TESTERS

- Electrical Installation Safety
- High Voltage Insulation Diagnostics
- Appliance / Machine / Switchboard Safety
- Power Quality Analysis
- LAN Cabling Certification
- Indoor Environment Quality
- Digital Multimeters / Clamp Meters / Voltage and Continuity Testers
- **Accessories**

METREL®

CATALOGUE 2010

Selection Guide for Accessories

Photo	Part number	Description	Target application	MI 3125	MI 3100	MI 3002	MI 3125B	MI 3102	MI 3102H	MI 3101	MI 3105	MI 2086	MI 2087	MI 2088	MI 3121
	A 0941	Remote control pedal	Remote control pedal is used for safe remote start of high voltage insulation test and additionally allows free hand operation of the worker.	–	–	–	–	–	–	–	–	–	–	–	–
	A 0942	Warning lamp	Warning lamps visually signalizes ongoing HV insulation test and warns the user about dangerous voltage conditions.	–	–	–	–	–	–	–	–	–	–	–	–
	A 1002	Tip commander	Single phase 2-wire commander with test tip and START and SAVE function keys for installation safety measurements.	–	–	–	–	–	–	–	–	○	○	–	–
	A 1005	Fuse / fault / cable locator	Fuse / fault / cable locator is used for wire tracing, fuse identification and fault finding in low voltage electrical installations.	–	–	–	–	–	–	–	–	○	○	–	–
	A 1006	Soft carrying bag	Large soft carrying bag for transport and storage of test instrument and belonging accessories.	–	–	–	–	–	–	–	–	●	●	●	–
	A 1007	Carrying strap	Carrying strap for carrying the measuring instrument around the neck allowing free hand use of the tester.	–	–	–	–	–	–	–	–	–	–	–	–
	A 1011	Test lead, 3 x 1.5 m	3-wire test lead for measurements on single or three phase electrical installations.	●	●	●	●	●	●	●	●	○ ●	●	–	–
	A 1012	Test lead, green, 4 m	Extension test lead for continuity measurements.	○	○	○	○	○	○	○	○	●	○	–	–
	A 1013	Crocodile clip, black	Crocodile clip assures secure and permanent contact during the measurement on bus bars, fixing screws, etc.	●	●	●	●	●	●	●	●	●	●	●	●
	A 1014	Test probe, black	Test probe with ∅ 4 mm connection is suitable for performing measurements both in mains outlets and in situations when no schuko outlet is present.	●	●	●	●	●	●	●	●	●	●	●	●
	A 1015	Test probe, blue	Test probe with ∅ 4 mm connection is suitable for performing measurements both in mains outlets and in situations when no schuko outlet is present.	●	●	●	●	●	●	●	●	●	●	–	–
	A 1016	Test probe, red	Test probe with ∅ 4 mm connection is suitable for performing measurements both in mains outlets and in situations when no schuko outlet is present.	–	–	–	–	–	–	–	–	–	–	●	●

Accessories

MI 3122	MI 3123	MI 2126	MI 3103	MI 2150	MI 2093	MI 3202	MI 2077	MI 3201	MI 3200	MI 3311	MI 2142	MI 3304	MI 3305	MI 2170	MI 3321	MI 2094	MI 2092	MI 2292	MI 2492	MI 2392	MI 2592	MI 2130	MI 2016	MI 2014	MI 6401	MI 6301	MI 6201	MD 9015	MD 9020	MD 9030	MD 9040	MD 9050	MD 9240	MD 1000	MD 1100
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○ Option ● Included in Set – Not available

Accessories

Photo	Part number	Description	Target application	MI 3125	MI 3100	MI 3002	MI 3125B	MI 3102	MI 3102H	MI 3101	MI 3105	MI 2086	MI 2087	MI 2088	MI 3121
	A 1017	Communication cable RS232	RS232 interface cable for connecting the instrument with the PC.	–	–	–	–	–	–	–	–	●	●	●	–
	A 1018	Current clamp (low range, leakage)	High accuracy current clamp 1000 A / 1 A with jaw opening 52 mm and fixed 1.5 m cable for both load and low range / leakage current measurement and for earth resistance measurement as well.	–	–	–	–	○	○	–	○ ●	○ ●	–	○	–
	A 1019	Current clamp	Current clamp 1000 A / 1 A with jaw opening 52 mm for general current measurements and in combination with A 1018 for earth resistance measurement without breaking the loop.	–	–	–	–	–	–	–	○	○	–	○	–
	A 1020	Small soft carrying bag	Small soft carrying bag for transport and storage of test instrument or accessories.	–	–	–	–	–	–	–	–	–	–	–	–
	A 1021	Test lead, 4 x 1 m	4-wire test lead for measurements on electrical installations.	–	–	–	–	–	–	–	–	○	–	○ ●	–
	A 1026	Test lead, red, 20 m	Extension test lead for continuity measurements.	○	○	○	○	○	○	○	○	○	○	○	○
	A 1033	Current clamp 1000 A / 1 V	High accuracy current clamp 1000 A / 1 V with jaw opening 52 mm and fixed 1.5 m cable for power measurements with Metrel power quality analysers.	–	–	–	–	–	–	–	–	–	–	–	–
	A 1037	Current transformer 5 A / 1 V	3-phase transformer for power measurements on distribution panels with 5 A nominal output current.	–	–	–	–	–	–	–	–	–	–	–	–
	A 1039	Connection cable for current clamp	Connection cable for connecting current clamps A 1069 and A 1122 on Metrel power quality analysers.	–	–	–	–	–	–	–	–	–	–	–	–
	A 1041	Headphones with microphone, 2 pcs	Talk set with two earphones allows communication over the tested communication cable.	–	–	–	–	–	–	–	–	–	–	–	–
	A 1043	Locator set II (#5 to #16)	Locators simplify and accelerate nummerification and identification of LAN sockets. Set includes locators with number from #5 up to #16.	–	–	–	–	–	–	–	–	–	–	–	–
	A 1044	Locator set III (#17 to #28)	Locators simplify and accelerate nummerification and identification of LAN sockets. Transponders with numbers from #17 up to #28 are delivered with the set.	–	–	–	–	–	–	–	–	–	–	–	–
	A 1046	1.2 V NiMH battery, type C, 6 pcs	A set of 6 pieces of rechargeable batteries, type C.	–	–	–	–	–	–	–	–	–	–	–	–

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Accessories

MI 3122	MI 3123	MI 2126	MI 3103	MI 2150	MI 2093	MI 3202	MI 2077	MI 3201	MI 3200	MI 3311	MI 2142	MI 3304	MI 3305	MI 2170	MI 3321	MI 2094	MI 2092	MI 2292	MI 2492	MI 2392	MI 2592	MI 2130	MI 2016	MI 2014	MI 6401	MI 6301	MI 6201	MD 9015	MD 9020	MD 9030	MD 9040	MD 9050	MD 9240	MD 1000	MD 1100
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○ Option ● Included in Set – Not available

Accessories: page 8.01

Accessories

Photo	Part number	Description	Target application	MI 3125	MI 3100	MI 3002	MI 3125B	MI 3102	MI 3102H	MI 3101	MI 3105	MI 2086	MI 2087	MI 2088	MI 3121
	A 1052	PC SW EuroLink PRO (for MI 2086)	EuroLink PRO is a professional PC Software which enables downloading, data management and complete test report preparation.	–	–	–	–	–	–	–	–	○ ●	–	–	–
	A 1055	Test lead, 2 x 1.5 m	2-wire test lead for continuity and insulation resistance measurements on electrical installations.	–	–	–	–	–	–	–	–	–	–	–	●
	A 1056	PC SW TeraLink with RS232 cable	PC Software TeraLink supplied with RS232 interface cable supports test results downloading and creation of test reports.	–	–	–	–	–	–	–	–	–	–	–	–
	A 1059	Insulation and Continuity adapter	1-phase 16 A CEE plug adapter for insulation resistance and continuity measurements.	–	–	–	–	–	–	–	–	–	–	–	–
	A 1060	Power splitter for discharge time measurement	T-type power splitter for measurements of discharge time on machinery and switchgear.	–	–	–	–	–	–	–	–	–	–	–	–
	A 1061	Barcode scanner	Barcode scanner for identification of barcodelabelled appliances (for MI 2094 HW1 and HW2).	–	–	–	–	–	–	–	–	–	–	–	–
	A 1062	Test probe, green	Test probe with ∅ 4 mm connection is suitable for performing measurements both in mains outlets and in situations when no schuko outlet is present.	●	●	●	●	●	●	●	●	○	○	–	–
	A 1064	Crocodile clip, red	Crocodile clip assures secure and permanent contact during the measurement on bus bars, fixing screws, etc.	–	–	–	–	–	–	–	–	–	–	–	●
	A 1067	Test lead for R10K, 1.5 m, with built-in resistor	Test lead with probe enables fast and accurate fuse finding and current circuit allocation. To be used with A 1191.	–	–	–	–	–	–	○	○	–	–	–	–
	A 1068	Connection cable for clamp, 1.5 m	Connection cable for connecting current clamp on the instrument MI 2093.	–	–	–	–	–	–	–	–	–	–	–	–
	A 1069	Mini current clamp 100 A / 1 V	Mini current clamp 100 A / 1 V with jaw opening 15 mm for power measurements. Requires A 1039 connection cable.	–	–	–	–	–	–	–	–	–	–	–	–
	A 1073	PC SW CE Link with RS232 cable	PC SW CE Link is a multi-purpose software for programming of the MI 2094, test data downloading and evaluation and creation of test reports.	–	–	–	–	–	–	–	–	–	–	–	–
	A 1074	Mini current clamp 200 A / 0.2 A	Mini current clamp 200 A / 0.2 A with jaw opening 15 mm for current measurement in confined spaces.	–	–	–	–	○	○	–	○	○	–	○	–

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Accessories

METREL®

MI 3122	MI 3123	MI 2126	MI 3103	MI 2150	MI 2093	MI 3202	MI 2077	MI 3201	MI 3200	MI 3311	MI 2142	MI 3304	MI 3305	MI 2170	MI 3321	MI 2094	MI 2092	MI 2292	MI 2492	MI 2392	MI 2592	MI 2130	MI 2016	MI 2014	MI 6401	MI 6301	MI 6201	MD 9015	MD 9020	MD 9030	MD 9040	MD 9050	MD 9240	MD 1000	MD 1100
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○ Option ● Included in Set – Not available

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Accessories

Photo	Part number	Description	Target application	MI 3125	MI 3100	MI 3002	MI 3125B	MI 3102	MI 3102H	MI 3101	MI 3105	MI 2086	MI 2087	MI 2088	MI 3121
	A 1082	Cable tracer	Cable tracer is intended for wire tracing on dead or live low voltage installations. To be used with MI 2014.	–	–	–	–	–	–	–	–	–	–	–	–
	A 1083	Power supply adapter with 6 pcs NiMH batteries, type AA	Battery charger and a set of 6 pieces of rechargeable batteries, type AA.	●	●	●	●	●	●	●	●	–	–	–	●
	A 1095	Insulation / Subleakage adapter	The adapter equipped with CEE 16 A schuko plug supports insulation resistance and touch leakage current measurements on Class 1 portable appliances with conductive metal parts.	–	–	–	–	–	–	–	–	–	–	–	–
	A 1096	Adapter for permanently wired loads	The adapter allows continuity and insulation resistance measurement on permanently wired loads (without plug).	–	–	–	–	–	–	–	–	–	–	–	–
	A 1100	Modem ST	Modem ST allows communication between the power quality analyser and PC which further supports programming and downloading of the instrument.	–	–	–	–	–	–	–	–	–	–	–	–
	A 1101	Modem GSM	Modem GSM allows wireless communication between the power quality analyser and PC which further supports programming and downloading of the instrument.	–	–	–	–	–	–	–	–	–	–	–	–
	A 1102	Luxmeter sensor, type B	Luxmeter sensor, type B, for high-accuracy illuminance measurement.	–	–	–	–	–	–	–	–	○	○	–	–
	A 1103	Receipt printer	Receipt printer enables quick onsite printing of test results measured with PAT instruments.	–	–	–	–	–	–	–	–	–	–	–	–
	A 1105	Barcode scanner	Barcode scanner for identification of barcodelabelled appliances.	–	–	–	–	–	–	–	–	–	–	–	–
	A 1106	Barcode labels, 1000 pcs	Appliances can be marked with barcode labels for easier identification.	–	–	–	–	–	–	–	–	–	–	–	–
	A 1107	RFID reader / writer	RFID reader / writer allows to read and upload test results and informaton about tested electrical equipment to the RFID tags.	–	–	–	–	–	–	–	–	–	–	–	–
	A 1108	RFID tags, 50 pcs	RFID tags have sufficient memory space to store test results and tested appliance information.	–	–	–	–	–	–	–	–	–	–	–	–
	A 1110	Three phase adapter	3-phase test adapter for installation safety testing on 3-phase sockets type 16 A 3CEE.	○	○	○	○	○	○	○	○	○	○	–	–

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Accessories

MI 3122	MI 3123	MI 2126	MI 3103	MI 2150	MI 2093	MI 3202	MI 2077	MI 3201	MI 3200	MI 3311	MI 2142	MI 3304	MI 3305	MI 2170	MI 3321	MI 2094	MI 2092	MI 2292	MI 2492	MI 2392	MI 2592	MI 2130	MI 2016	MI 2014	MI 6401	MI 6301	MI 6201	MD 9015	MD 9020	MD 9030	MD 9040	MD 9050	MD 9240	MD 1000	MD 1100
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○ Option ● Included in Set – Not available

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Accessories

Photo	Part number	Description	Target application	MI 3125	MI 3100	MI 3002	MI 3125B	MI 3102	MI 3102H	MI 3101	MI 3105	MI 2086	MI 2087	MI 2088	MI 3121
	A 1111 A 1215 (for MI 2150)	Three phase adapter with switch	3-phase adapter with selection switch for installation safety testing on 3-phase sockets type 16 A 3CEE. The adapter allows seamless switching between measurements.	○	○	○	○	○	○	○	○	○	○	–	–
	A 1114	Crocodile clip, black	Crocodile clip assures secure and permanent contact during the measurement on bus bars, fixing screws, etc.	–	–	–	–	–	–	–	–	–	–	–	–
	A 1115	Protection case	Protection case with plastic screen for protection of the tester against dirt and damage.	–	–	–	–	–	–	–	–	–	–	–	–
	A 1117	PC SW PATLink with RS232 cable	PC SW PATLink enables downloading of saved test results and test report creation.	–	–	–	–	–	–	–	–	–	–	–	–
	A 1119	Luxmeter sensor, type C	Luxmeter sensor, type C, for illuminance measurement e.g. for general light conditions testing.	–	–	–	–	–	–	–	–	○	○	–	–
	A 1122	Mini current clamp 5 A / 1 V	Mini current clamp 5 A / 1 V with jaw opening 15 mm for power measurements. Requires A 1039 connection cable.	–	–	–	–	–	–	–	–	–	–	–	–
	A 1127	Humidity and temperature probe	Probe for simultaneous relative humidity and air temperature measurements.	–	–	–	–	–	–	–	–	–	–	–	–
	A 1128	Thermocouple probe, type K	Type K thermocouple probe with measuring range from -20 °C to 1400 °C for contact temperature measurements of various surfaces like motors, transformers, etc.	–	–	–	–	–	–	–	–	–	–	–	–
	A 1130	Telescopic rod with 2.5 m cable	The extension rod helps at measurements on remote spots like ventilation ducts and other places that cannot be easily reached by hand.	–	–	–	–	–	–	–	–	–	–	–	–
	A 1131	Black globe thermometer	Black globe thermometer serves for indoor temperature comfort measurements.	–	–	–	–	–	–	–	–	–	–	–	–
	A 1132	Luminance probe	Luminance probe performs measurement of luminance i.e. light reflected from the surface.	–	–	–	–	–	–	–	–	–	–	–	–
	A 1143	Euro Z 290 A	Euro Z 290 A is the impedance tester which enables line / loop impedance measurements with an accuracy down to 0.1 mΩ.	–	–	–	–	–	–	○	○	○	–	–	–
	A 1145	Extension cable for A 1092 and A 1132, 1 m	1 m long extension cable can be used in combination with luminance and illuminance probe for measurements on remote spots.	–	–	–	–	–	–	–	–	–	–	–	–

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MI 3122	MI 3123	MI 2126	MI 3103	MI 2150	MI 2093	MI 3202	MI 2077	MI 3201	MI 3200	MI 3311	MI 2142	MI 3304	MI 3305	MI 2170	MI 3321	MI 2094	MI 2092	MI 2292	MI 2492	MI 2392	MI 2592	MI 2130	MI 2016	MI 2014	MI 6401	MI 6301	MI 6201	MD 9015	MD 9020	MD 9030	MD 9040	MD 9050	MD 9240	MD 1000	MD 1100
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○ Option ● Included in Set - Not available

Accessories: page 8.01

Accessories

Photo	Part number	Description	Target application	MI 3125	MI 3100	MI 3002	MI 3125B	MI 3102	MI 3102H	MI 3101	MI 3105	MI 2086	MI 2087	MI 2088	MI 3121
	A 1152	Sound calibrator, class 1	Sound calibrator Class 1 is intended for periodical calibration and accuracy inspection of the instrument.	–	–	–	–	–	–	–	–	–	–	–	–
	A 1153	Test lead, black, 20 m	Extension test lead for earth and continuity measurements.	○	○	○	○	○	○	○	○	○	○	○	○
	A 1154	Test lead, black, 4 m	Extension test lead for earth and continuity measurements.	○	○	○	○	○	○	○	○	○	○	○	○
	A 1159	Tripod	Tripod is used for instrument fixing at long term measurements of sound and other indoor air quality parameters.	–	–	–	–	–	–	–	–	–	–	–	–
	A 1160	Fast charger for 8 AA batteries with a set of 6 NiMH bat., type AA	Fast battery charger for up to 8 pieces of AA rechargeable batteries, and a set of 6 pcs NiMH rechargeable batteries, type AA.	○	○	○	○	○	○	○	○	–	–	–	○
	A 1161	Tripod holder for black globe thermometer	Tripod holder assures fixing of the test instrument and Black globe thermometer on tripod.	–	–	–	–	–	–	–	–	–	–	–	–
	A 1162	PC SW SoundLink PRO	SoundLink PRO is a complete PC software for downloading, test data evaluation, profound sound analysis and test report creation.	–	–	–	–	–	–	–	–	–	–	–	–
	A 1164	Test lead, black, 50 m	Extension test lead for earth and continuity measurements.	○	○	○	○	○	○	○	○	○	○	○	○
	A 1165	Sound calibrator, class 2	Sound calibrator Class 2 is intended for periodical calibration and accuracy inspection of the instrument.	–	–	–	–	–	–	–	–	–	–	–	–
	A 1168	Plug commander (for MI 3100)	Single phase schuko plug commander with TEST and BACKLIGHT function keys for fast and simple measurements on one phase sockets.	○	○	–	–	–	–	–	–	–	–	–	–
	A 1169	Fast charger for AA, C, D and 9 V block batteries	Fast battery charger for up to 12 pcs AA, 6 pcs C or D rechargeable batteries, 4 pcs 9 V block batteries.	○	○	○	○	○	○	○	○	○	○	○	○
	A 1170	Plug commander	Single phase schuko plug commander with TEST and MEM function keys for fast and simple measurements on one phase sockets.	–	–	○	○	○	○	●	●	–	–	–	–
	A 1171	RS232 / USB adapter with 1 m cable	RS232 / USB adapter for PC's without USB comunication port.	–	–	–	–	–	–	–	–	○	○	○	–

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Accessories

MI 3122	MI 3123	MI 2126	MI 3103	MI 2150	MI 2093	MI 3202	MI 2077	MI 3201	MI 3200	MI 3311	MI 2142	MI 3304	MI 3305	MI 2170	MI 3321	MI 2094	MI 2092	MI 2292	MI 2492	MI 2392	MI 2592	MI 2130	MI 2016	MI 2014	MI 6401	MI 6301	MI 6201	MD 9015	MD 9020	MD 9030	MD 9040	MD 9050	MD 9240	MD 1000	MD 1100
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○ Option ● Included in Set – Not available

Accessories

Photo	Part number	Description	Target application	MI 3125	MI 3100	MI 3002	MI 3125B	MI 3102	MI 3102H	MI 3101	MI 3105	MI 2086	MI 2087	MI 2088	MI 3121
	A 1172	Luxmeter sensor, type B (PS/2)	Luxmeter sensor, type B, for high-accuracy illuminance measurement e.g. for emergency lightning inspection.	–	–	–	–	○	○	–	○	–	–	–	–
	A 1173	Luxmeter sensor, type C (PS/2)	Illuminance probe for light conditions measurements with 0,1Lux resolution.	–	–	–	–	○	○	–	○	–	–	–	–
	A 1175	Tip commander (for MI 3100)	Single phase 2-wire commander with test tip and TEST and BACKLIGHT function keys for installation safety measurements.	○	●	–	–	–	–	–	–	–	–	–	–
	A 1176	Tip commander	Single phase 2-wire commander with test tip and TEST and MEM function keys for installation safety measurements.	–	–	○	○	●	●	○	○	–	–	–	–
	A 1179	3-phase flexible current clamp 2000/200/20 A / 1 V	3-phase flexible current clamp with three selectable measuring ranges. Powered by alkaline or rechargeable batteries.	–	–	–	–	–	–	–	–	–	–	–	–
	A 1180	CO_2 probe	Probe measures concentration of carbon dioxide in the ambient air.	–	–	–	–	–	–	–	–	–	–	–	–
	A 1181	CO probe	Probe measures concentration of carbon monoxide in the ambient air.	–	–	–	–	–	–	–	–	–	–	–	–
	A 1191	Receiver R10K	Receiver R10K is used for wire tracing, fuse identification and fault finding in low voltage electrical installations.	–	–	–	–	–	–	○	○	–	–	–	–
	A 1192	Selective probe for R10K	Very sensitive inductive sensor serves for contactless fuse and cable finding. To be used with A 1191.	–	–	–	–	–	–	○	○	–	–	–	–
	A 1194	Tip commander, 3-wire (for MI 3100)	Single phase 3-wire commander with test tip, TEST and BACKLIGHT function keys for installation safety measurements.	○	○	–	–	–	–	–	–	–	–	–	–
	A 1197	Tip commander, 3-wire	Single phase 3-wire commander with test tip, TEST and MEM function keys for installation safety measurements.	–	–	○	○	○	○	○	○	–	–	–	–
	A 1198	Magnetic contact probe	Test probe with magnetic contact provides reliable contact with metal surface during the measurement.	○	○	○	○	○	○	○	○	○	○	○	○
	A 1199	Ro-adapter	Ro-adapter is intended for performing earth resistance measurement in combination with installation safety tester.	–	–	–	–	–	–	○	○	–	–	–	–

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Accessories

MI 3122	MI 3123	MI 2126	MI 3103	MI 2150	MI 2093	MI 3202	MI 2077	MI 3201	MI 3200	MI 3311	MI 2142	MI 3304	MI 3305	MI 2170	MI 3321	MI 2094	MI 2092	MI 2292	MI 2492	MI 2392	MI 2592	MI 2130	MI 2016	MI 2014	MI 6401	MI 6301	MI 6201	MD 9015	MD 9020	MD 9030	MD 9040	MD 9050	MD 9240	MD 1000	MD 1100
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○ Option ● Included in Set – Not available

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Accessories

Photo	Part number	Description	Target application	MI 3125	MI 3100	MI 3002	MI 3125B	MI 3102	MI 3102H	MI 3101	MI 3105	MI 2086	MI 2087	MI 2088	MI 3121
	A 1201	Insulated rod for CONTINUITY measurement	Insulated rod enables insulation resistance and continuity measurement on hard-to-reach objects, e.g. luminaries.	○	○	○	○	○	○	○	○	○	○	○	○
	A 1202	Additional extension part for A 1201	Additional extension part for Insulated rod for CONTINUITY measurement A 1201.	○	○	○	○	○	○	○	○	○	○	○	○
	A 1203	Upgrade code PATLink PRO to PATLink PRO Plus	Password for upgrading standard PC software PATLink PRO to advanced PC SW PATLink PRO Plus with professional report creation facility.	–	–	–	–	–	–	–	–	–	–	–	–
	A 1207	Three phase adapter	The 3-phase adapter for substitute leakage current, insulation resistance and continuity measurements on electric loads equipped with 16A and 32A CEE 3P sockets.	–	–	–	–	–	–	–	–	–	–	–	–
	A 1226	RS232 / DB 25 cable for printer A 1103	Communication cable for printer A 1103.	–	–	–	–	–	–	–	–	–	–	–	–
	A 1227	1-phase flexible current clamp 3000/300/30 A / 1 V	Single phase flexible current clamp with three selectable measuring ranges. Does not require external power supply as it is powered by the measuring instrument.	–	–	–	–	–	–	–	–	–	–	–	–
	A 1244	Tip commander, 2-wire (straight cable)	Single phase 2-wire commander with test tip, TEST and SAVE function keys for installation safety measurements.	–	–	○	–	○	○	○	○	○	○	–	○
	A 1245	Holder for commander	Holder enables free hand operation with the tester by fixing the test commander and other test cables when not in use.	–	○	○	–	○	○	○	○	–	–	–	–
	A 1256	Plug commander (straight cable)	Single phase schuko plug commander with TEST and MEM function keys for fast and simple measurements on one phase sockets.	–	–	○	○	○	○	○	○	○	○	–	–
	A 1257	3-phase flexible current clamp 3000/300/30 A / 1 V,	3-phase flexible current clamp with three selectable measuring ranges. Powered by alkaline or rechargeable batteries.	–	–	–	–	–	–	–	–	–	–	–	–
	A 1268	Test probe, brush type, 4 mm	Test probe, brush type, assures good galvanic contact when measuring on revolving parts, flat surfaces, screw connections and similar. Equipped with standard 4 mm connector.	–	–	–	–	–	–	–	–	–	–	–	–
	A 1270	Tip commander (for Smartec)	Single phase 2-wire commander with test tip, TEST and MEM function keys for installation safety measurements.	–	–	–	○	–	–	–	–	–	–	–	○
	A 1271	Small soft carrying bag	Small soft carrying bag for transport and storage of test instrument or accessories.	○	–	–	○	–	–	–	–	–	–	–	○

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Accessories

MI 3122	MI 3123	MI 2126	MI 3103	MI 2150	MI 2093	MI 3202	MI 2077	MI 3201	MI 3200	MI 3311	MI 2142	MI 3304	MI 3305	MI 2170	MI 3321	MI 2094	MI 2092	MI 2292	MI 2492	MI 2392	MI 2592	MI 2130	MI 2016	MI 2014	MI 6401	MI 6301	MI 6201	MD 9015	MD 9020	MD 9030	MD 9040	MD 9050	MD 9240	MD 1000	MD 1100
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○ Option ● Included in Set – Not available

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Accessories

Photo	Part number	Description	Target application	MI 3125	MI 3100	MI 3002	MI 3125B	MI 3102	MI 3102H	MI 3101	MI 3105	MI 2086	MI 2087	MI 2088	MI 3121
	A 1272	Plug commander (for Smartec)	Single phase schuko plug commander with TEST and MEM function keys for fast and simple measurements on one phase sockets.	–	–	–	○	–	–	–	–	–	–	–	–
	A 1275	PC SW TeraLink PRO (MI 3200, MI 3201)	TeraLink PRO is a downloading and data management PC software with R=f(t) graph printing possibility. It comes delivered with RS232 and USB communication cables.	–	–	–	–	–	–	–	–	–	–	–	–
	A 1276	Label printer with power and data cables	Printer supports printing of identification labels containing a complete appliance information and PASS or FAIL evaluation of test results.	–	–	–	–	–	–	–	–	–	–	–	–
	A 1283	Shielded leakage current clamp	Current clamp with high resolution for accurate leakage current measurements.	–	–	–	–	–	–	–	–	–	–	–	–
	A 1287	1-phase flexible current clamp 3000/300/30 A / 1 V,	Single phase flexible current clamp with three selectable measuring ranges. Powered by alkaline or rechargeable batteries.	–	–	–	–	–	–	–	–	–	–	–	–
	A 1289	Soft carrying bag	Large soft carrying bag for transport and storage of test instrument and belonging accessories.	○	●	●	○	●	●	●	●	–	–	–	○
	A 1290	PC SW EuroLink PRO Plus with USB and RS232-PS/2 cable	Professional PC Software EuroLink PRO Plus enables downloading, data management and complete test report preparation. Delivered with RS232-PS/2 and USB communication cables.	–	–	–	–	–	–	–	–	–	–	–	○
	A 1291	PC SW EuroLink PRO with USB and RS232-PS/2 cable	PC Software EuroLink PRO enables downloading and test results management and printing of test reports. Delivered with RS232-PS/2 and USB communication cables.	–	–	–	–	–	–	–	–	–	–	–	○
	A 1292	Upgrade code EuroLink PRO to EuroLink PRO Plus	Password for upgrading standard PC software EuroLink PRO to advanced PC SW EuroLink PRO Plus with professional report creation facility.	–	–	○	○	○	–	○	○ ●	–	–	–	○
	A 1293	PC SW Eurotest2Mobile/Smartphone with modem and data cable	PC Software Eurotest2Mobile/Smartphone enables Bluetooth connection between Smart Mobile phones and Metrel installation safety testers.	–	–	–	–	–	–	○	○	–	–	–	–
	A 1295	Spare label roll for A 1276	Spare label rolls for printer A 1276 (O'NEIL).	–	–	–	–	–	–	–	–	–	–	–	–
	A 1300	Tip commander, 3-wire (for Smartec)	Single phase 3-wire commander with test tip, TEST and MEM function keys for installation safety measurements.	–	–	–	○	–	–	–	–	–	–	–	–
	A 1302	Set of carrying straps	Set of carrying straps for carrying the measuring instrument around the neck allowing free hand use of the tester.	●	–	–	●	–	–	–	–	–	–	–	○

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MI 3122	MI 3123	MI 2126	MI 3103	MI 2150	MI 2093	MI 3202	MI 2077	MI 3201	MI 3200	MI 3311	MI 2142	MI 3304	MI 3305	MI 2170	MI 3321	MI 2094	MI 2092	MI 2292	MI 2492	MI 2392	MI 2592	MI 2130	MI 2016	MI 2014	MI 6401	MI 6301	MI 6201	MD 9015	MD 9020	MD 9030	MD 9040	MD 9050	MD 9240	MD 1000	MD 1100
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○ Option ● Included in Set – Not available

Accessories: page 8.01

Accessories

Photo	Part number	Description	Target application	MI 3125	MI 3100	MI 3002	MI 3125B	MI 3102	MI 3102H	MI 3101	MI 3105	MI 2086	MI 2087	MI 2088	MI 3121
	A 1303	Soft hand strap	Soft hand strap for holding the instrument.	○	–	–	○	–	–	–	–	–	–	–	●
	A 1305	PC SW PATLink PRO with USB and RS232-PS/2 cable	PC Software PATLink PRO enables downloading, data management and printing of test reports. Comes delivered with RS232-PS/2 and USB communication cables.	–	–	–	–	–	–	–	–	–	–	–	–
	A 1306	PC SW PATLink PRO Plus with USB and RS232-PS/2 cable	PATLink PRO Plus is an advanced PC SW which enables downloading, test results analysis, data upload to the instrument and professional test report creation. Delivered with RS232 and USB COM cables.	–	–	–	–	–	–	–	–	–	–	–	–
	A 1309	Crocodile clip, green	Crocodile clip assures secure and permanent contact during the measurement on bus bars, fixing screws, etc.	●	●	●	●	●	●	●	●	○	○	–	–
	A 1310	Crocodile clip, blue	Crocodile clip assures secure and permanent contact during the measurement on bus bars, fixing screws, etc.	●	●	●	●	●	●	●	●	○	○	–	–
	A 1316	Three phase adapter (16 A CEE-Schuko)	Three phase adapter for testing three phase appliancess.	–	–	–	–	–	–	–	–	–	–	–	–
	A 1317	Three phase adapter (32 A CEE-Schuko)	Three phase adapter for testing three phase appliancess.	–	–	–	–	–	–	–	–	–	–	–	–
	A 1328	Hi-Q DT labels (for printer MF2TE)	High quality spare label rolls for printer MF2TE.	–	–	–	–	–	–	–	–	–	–	–	–
	A 1331	Test lead with crocodile clip, black, 1,5 m	Test lead with crocodile clip for PAT testing.	–	–	–	–	–	–	–	–	–	–	–	–
	S 1057	HV test lead, 6 m, 2 pcs	High voltage extension test leads for measurements on larger electrical equipment.	–	–	–	–	–	–	–	–	–	–	–	–
	S 1058	Continuity test lead, 2 x 10 m, 2 pcs	Extension test leads for continuity measurements.	–	–	–	–	–	–	–	–	–	–	–	–
	S 1072	Continuity test lead with crocodile clip, 2 x 2.5 m, 2 pcs	Extension test leads with protection shield and with crocodile clips for continuity testing with high test currents (10 A, 25 A).	–	–	–	–	–	–	–	–	–	–	–	–
	S 2001	Earth test set, 4-wire, 20 m	Earth test set for earth resistance measurement on distance up to 20 m; set includes: test lead, 4 x 1 m; test lead, 20 m, 2 pcs; test lead, 4 m, 2 pcs; earth spikes, 4 pcs; soft carrying bag.	–	–	–	–	–	–	–	–	○	–	○	–

Accessories: page 8.01

Accessories

MI 3122	MI 3123	MI 2126	MI 3103	MI 2150	MI 2093	MI 3202	MI 2077	MI 3201	MI 3200	MI 3311	MI 2142	MI 3304	MI 3305	MI 2170	MI 3321	MI 2094	MI 2092	MI 2292	MI 2492	MI 2392	MI 2592	MI 2130	MI 2016	MI 2014	MI 6401	MI 6301	MI 6201	MD 9015	MD 9020	MD 9030	MD 9040	MD 9050	MD 9240	MD 1000	MD 1100
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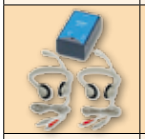
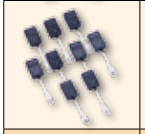
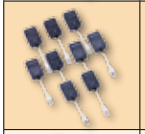
○ Option ● Included in Set – Not available

Accessories

Photo	Part number	Description	Target application	MI 3125	MI 3100	MI 3002	MI 3125B	MI 3102	MI 3102H	MI 3101	MI 3105	MI 2086	MI 2087	MI 2088	MI 3121
	S 2002	Earth test set, 4-wire, 50 m	Earth test set for earth resistance measurement on distance up to 50 m; set includes: test lead, 4 x 1 m; test lead, 50 m, 2 pcs; test lead, 4 m, 2 pcs; test lead, 1 m, 2 pcs; earth spikes, 4 pcs; carrying bag.	–	–	–	–	–	–	–	–	○	–	○	–
	S 2003	5 kV test lead set, 2 m, 2 pcs	5 kV test lead set, including 2 test leads and 2 crocodil clips, for safe insulation testing.	–	–	–	–	–	–	–	–	–	–	–	–
	S 2004	Talk remote unit with headphones set	Talk set includes Talk remote unit and two earphones and enables communication over the tested computer or phone line. To be used with MI 2014.	–	–	–	–	–	–	–	–	–	–	–	–
	S 2005	Standard remote set (#2 ... #6)	Standard remote set contains a package of locators with numbers from #2 up to #6 for detailed measurements on communication connections and identification of sockets. To be used with MI 2014.	–	–	–	–	–	–	–	–	–	–	–	–
	S 2006	Standard remote set (#7 ... #15)	Standard remote set contains a package of locators with numbers from #7 up to #15 for detailed measurements on communication connections and identification of sockets. To be used with MI 2014.	–	–	–	–	–	–	–	–	–	–	–	–
	S 2007	Earth test set, 4-wire, 50 m (for Smartec)	Earth test set for earth resistance measurement on distance up to 50 m; set includes: test lead, 50 m, 2 pcs; test lead, 4 m, 2 pcs; test lead, 1 m, 2 pcs; earth spikes, 4 pcs; soft carrying bag.	–	–	–	–	–	–	–	–	–	–	–	–
	S 2009	Test lead set, 2 m, 4 pcs	Set of 4 test leads is intended for two clamp earth resistance measurement to connect current clamps on the instrument.	–	–	–	–	–	–	–	–	–	–	–	–
	S 2012	Continuity test lead, 10 m, 2 pcs (red, black)	2 pieces of extension test lead for continuity measurements.	○	○	○	○	○	○	○	○	○	○	○	○
	S 2014	Safety fuse adapter, 3 pcs	Fuse adapters protect the instrument and the user against current strike and overload.	–	–	–	–	–	–	–	–	–	–	–	–
	S 2015	Safety flat clamp, 4 pcs	Safety flat clamps assure good contact when connecting the test leads on busbars and other larger flat surfaces.	–	–	–	–	–	–	–	–	–	–	–	–
	S 2025	Test lead, 1.5 m, 2 pcs (black, red)	Connection leads for different measurements.	○	○	○	○	○	○	○	○	○	○	○	○
	S 2026	Earth test set, 3-wire, 20 m	Earth test set for earth resistance measurement on distance up to 20 m; set includes: test lead, 20 m, 2 pcs; test lead, 4.5 m; earth spikes, 2 pcs; soft carrying bag.	–	–	–	○	●	●	○	○	–	–	–	–
	S 2027	Earth test set, 3-wire, 50 m	Earth test set for earth resistance measurement on distance up to 50 m; set includes: test lead, 50 m, 2 pcs; test lead, 4.5 m; test lead, 1 m, 2 pcs; earth spikes, 2 pcs; soft carrying bag.	–	–	–	○	○	○	○	○	–	–	–	–

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Accessories

MI 3122	MI 3123	MI 2126	MI 3103	MI 2150	MI 2093	MI 3202	MI 2077	MI 3201	MI 3200	MI 3311	MI 2142	MI 3304	MI 3305	MI 2170	MI 3321	MI 2094	MI 2092	MI 2292	MI 2492	MI 2392	MI 2592	MI 2130	MI 2016	MI 2014	MI 6401	MI 6301	MI 6201	MD 9015	MD 9020	MD 9030	MD 9040	MD 9050	MD 9240	MD 1000	MD 1100
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○ Option ● Included in Set – Not available

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Accessories

Photo	Part number	Description	Target application	MI 3125	MI 3100	MI 3002	MI 3125B	MI 3102	MI 3102H	MI 3101	MI 3105	MI 2086	MI 2087	MI 2088	MI 3121
	S 2029	10 kV shielded test lead with test probe, 8 m, 2 pcs	10 kV shielded test leads improve accuracy of HV insulation resistance measurement in environments with high content of external electromagnetic interferences.	–	–	–	–	–	–	–	–	–	–	–	–
	S 2030	10 kV shielded test lead with test probe, 15 m, 2 pcs	10 kV shielded test leads improve accuracy of HV insulation resistance measurement in environments with high content of external electromagnetic interferences.	–	–	–	–	–	–	–	–	–	–	–	–
	S 2036	HV crocodil clip, 2 pcs (red, black)	10 kV crocodile clips for HV insulation resistance measurement assure secure and permanent contact during the measurement on bus bars, fixing screws, etc.	–	–	–	–	–	–	–	–	–	–	–	–
	S 2039	5 kV shielded test lead, 15 m, 2 pcs	5 kV shielded test leads for MI 2077 improve accuracy of HV insulation resistance measurement in environments with high content of external electromagnetic interferences.	–	–	–	–	–	–	–	–	–	–	–	–
	S 2042	5 kV shielded test lead, 10 m, 2 pcs	5 kV shielded test leads with test probe for MI 2077 improve accuracy of HV insulation resistance measurement in environments with high content of external electromagnetic interferences.	–	–	–	–	–	–	–	–	–	–	–	–
	S 2044	5 kV shielded test lead with test probe, 15 m, 2 pcs	5 kV shielded test leads with test probe improve accuracy of HV insulation resistance measurement in environments with high content of external electromagnetic interferences.	–	–	–	–	–	–	–	–	–	–	–	–
	CS 2099	Eurocheck	Eurocheck is a professional multifunctional field calibrator intended for use with installation safety testers.	○	○	○	○	○	○	○	○	○	○	○	○
	AMD 9023	Thermocouple probe, type K	Probe for contact temperature measurement.	–	–	–	–	–	–	–	–	–	–	–	–
	AMD 9024	Adapter for thermocouple probe AMD 9023	Adapter is intended to connect the thermocouple probe with a multimeter.	–	–	–	–	–	–	–	–	–	–	–	–
	AMD 9025	PC Software for MD 9015 with RS232 cable	Basic downloading software supplied on CD and RS232 communication cable.	–	–	–	–	–	–	–	–	–	–	–	–
	AMD 9050	USB interface set	Communication set contains USB adapter, USB and RS232 drivers and PC software on CD.	–	–	–	–	–	–	–	–	–	–	–	–
	AMD 9240	PC interface set for MD 9240	PC interface set enables data transferring to the PC. Set contains optical adapter, cable and PC software on CD.	–	–	–	–	–	–	–	–	–	–	–	–
	AMD 1100	Soft carrying bag	Small soft bag for storage of the multitester.	–	–	–	–	–	–	–	–	–	–	–	–

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Accessories

MI 3122	MI 3123	MI 2126	MI 3103	MI 2150	MI 2093	MI 3202	MI 2077	MI 3201	MI 3200	MI 3311	MI 2142	MI 3304	MI 3305	MI 2170	MI 3321	MI 2094	MI 2092	MI 2292	MI 2492	MI 2392	MI 2592	MI 2130	MI 2016	MI 2014	MI 6401	MI 6301	MI 6201	MD 9015	MD 9020	MD 9030	MD 9040	MD 9050	MD 9240	MD 1000	MD 1100
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○ Option ● Included in Set – Not available

Accessories: page 8.01

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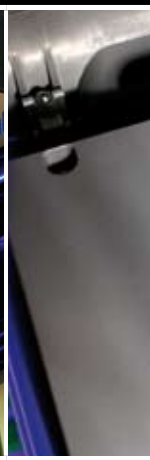

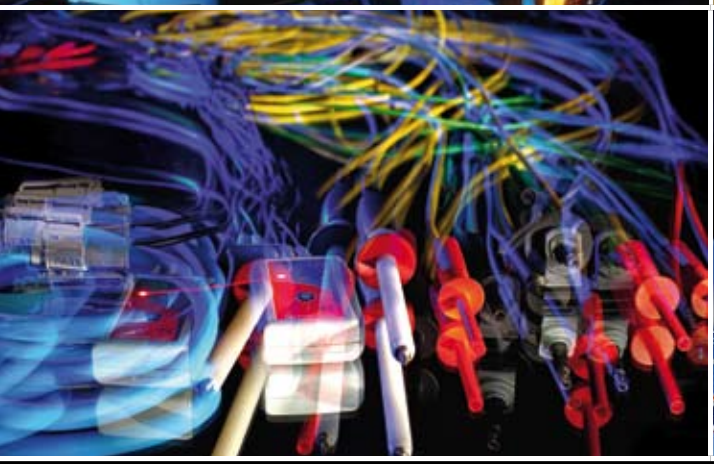

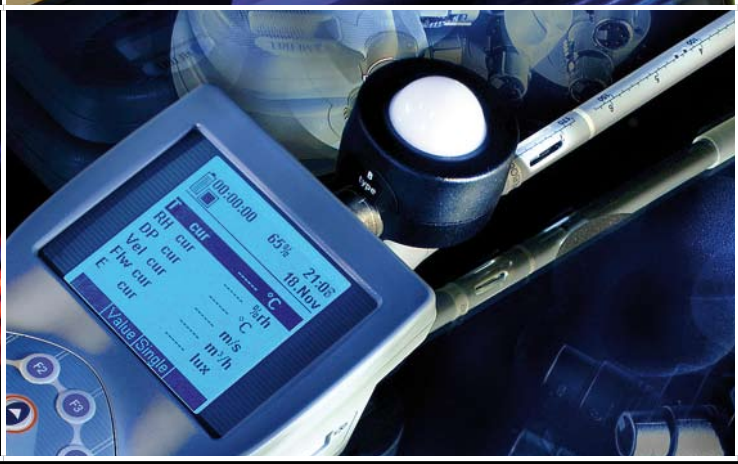

Note! Photographs in this catalogue may slightly differ from the instruments at the time of delivery.
Subject to technical change without notice.

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