



# Application Catalogue 2016

Measuring  
instruments  
and testers

# Metrel has introduced a range of Certified Training Modules based on, and adjusted to comply with, the EU-countries industry standards

## The necessary equipment

Metrel's Safety and Quality Tester Instruments cover the needs of installers, constructors, planners and inspectors. Each tester supports test procedures and measuring methods according to the main standards and other regulation. The Test instruments represent a strong tool for troubleshooting, testing, diagnosing and reporting.

**Advanced Features** and several key solutions are specifically highlighted with regard to the competitors' solutions.

**Applications and Solutions** can be found in a number of additional operation and Good to Know documents related to the relevant industry sectors.

**Certified Training Modules** and Seminars are supported by the Metrel Academy. Within the Knowledge section we make recommendations and suggestions in support of national vocational qualification schemes. We can also offer training with completely new Training Modules for new application areas.

## SOLID KNOWLEDGE BASE

Metrel is continuously investing in developing the R&D working groups, which leads to new product solutions and improved technical and application knowledge. We are pleased to say that a number of our design engineers and product managers have thoroughly developed their technical knowledge and application experience about different markets for our products, so we can proudly state that we are Experts in our Field.

Metrel work in co-operation with important external organizations and institutions like:

- IEC Technical Committees and their Working Groups
- Faculties of Electrotechnics at different Universities
- Electrotechnical Associations
- Engineers Associations
- Electrical Safety Boards
- Chambers of Engineers
- Chambers of Commerce and Industry
- Chambers of Craft and Small Business

## PARTNERSHIP

Metrel is cooperating closely with important associations and committees related to its industry sectors, and is a member of the Slovenian Institute for Standardization. We have individuals who participate in several technical committees, as well as internationally in one of the IEC Technical Committees. Metrel is also involved in the Committee for the Electrotechnical Safety and Low-voltage electrical installations (NNELI) as a partner company through »eTest scheme« in Slovenia, it is a member company at GAMBICA, the Trade Association for Instrumentation, Control, Automation and Laboratory Technology in the UK in the sector of Test and Measurement Equipment, it is a member company at E-Check Association of electrical installers in Germany, and cooperates with NICEIC, the UK's leading voluntary regulatory body for the electrical contracting industry, then with NAPIT, the UK National Association for Professional Inspectors and Testers, as well as other similar institutions in other countries.



## REFERENCES

Through our own participation in providing and supporting national vocational qualification programs in the field of electrical safety during past decades, and through our close collaboration with professionals from various industries, at Metrel Academy we are aware of the importance to continuously develop knowledge and new skills through various levels of training and qualification programs. This ensures self-confidence of the workforce in companies involved with Electrical Safety, it boosts their competitiveness, and enables safe and profitable working processes of their customers. Metrel's participation in preparation of curricula for electrical engineering in Slovenia includes the following:

- Preparation of the Knowledge and Skills catalogue
- Giving assistance in defining qualification requirements list for the candidates in the vocational qualification program
- Preparation of the Assessment Exams catalogue

Metrel also assists experts working on the vocational qualification programs through its

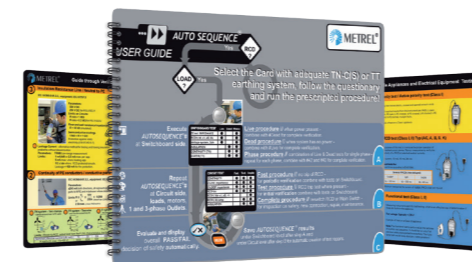
distribution – partners' network worldwide. This has been mostly related to the application of Metrel test and measurement instruments.

## CERTIFIED TRAINING MODULES

Certified Training Modules and Seminars are supported with packages of printed Handbooks, White paper, Exercises, Quick Guide Charts, and Posters together with other elements of Application and Technical Support.

## MODULE PACKAGES

E-HANDBOOKS, QUICK GUIDE CHARTS, and EXERCISES about measuring and testing based on the International / European Standardization for every participant.



## Wall Posters

- Wall posters represent in a visual way, typical testing and measurement procedures and / or troubleshooting tasks, or a list of required customized tests in certain areas of application.



## Scope of Application & Technical Support

- Demonstration Equipment
- Testing instruments
- Power Point Presentations on product solutions
- On-line Technical Support: any inquires related to Metrel products can be sent on the

following addresses:

- help@metrel.si
- info@metrel.co.uk
- metrel@metrel.de
- Bespoke product training for an individual customer or a bigger group of larger end-users
- Complete distributor set-up training (product, repair, and calibration training)
- B2B web support provides specific technical information for Metrel partners
- Download centre enables you to download files with technical product information

## QUALIFICATION CERTIFICATE

European Qualification Certificate adjusted to the EU-countries industry standards ensures the competency of individual participants who pass the final Exam on Theoretical and Practical knowledge for the specific locally approved Training Module.

**Know-How Package** - for a Transparent Localization Process

**Knowledge Catalogue** - for the specific Training Module for modification to a local - National regulation.

**Exam's Catalogue** - with the definition of the minimum level of the Entry conditions for a participant.

**Approved Certificate** - approval of the obtained qualification when signed by a local authorized organization like:

- Training organization
- Electrical Safety Board Organization, as for example NNELI estest / local - National AIE partner

**Metrel Academy** has put out a comprehensive list of training sessions in order to help you master the latest measurement and testing technologies.

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# PV Systems, Inverters, Panels, Modules Testing, Maintenance, Troubleshooting Photovoltaic Modules, Panels, Strings, Inverters...



## GENERAL FEATURES

- **Automatic** measurements on PV Systems. Combined photovoltaic tester and electrical installation safety tester. Environment measurements and calculation to STC. Insulation measurements under energised PV system. Large **PV module Data Base**;
- **PASS/FAIL** evaluation of electrical safety test results;
- **Report Creator** with powerful two way communication PC SW Tool EuroLink PRO.

## ADVANTAGES

- PV installation testing:**
- **Uoc, Isc, Irradiance** and **Temperature** measurements;
  - **I - U curve** of modules and strings on PV systems;
  - **MPP** determination and **STC** calculations;
  - **Irradiance** and **Temperature Logger**;
  - **Insulation** under Voltage of PV panels and strings;

**Power measurements on AC and DC:**

- **DC / AC TRMS Clamp-on** Current testing;
- **Efficiency** of Solar Panels and Inverters;

**Electrical Safety testing:**

- **Zloop** L-N and L-L, RCD protection;




- **Continuity** and Earth Bond test;
- **Insulation** testing through Switchboard, at Circuits;
- **Over voltage** protection testing;
- **Earth / Ground** resistance testing.
- **TRMS Clamp-on Leakage** Current testing.

## APPLICATION

- Safety testing of PV and electrical installations.
- Measuring and Testing the Efficiency of the whole System.
- MPP check, Inverter check, Working point of Inverter Testing.
- Maintenance and troubleshooting based on I-V characteristic checking for possible deviations from the standard shape.



## Selection Guide

FEATURES	Description	MI 3108 EurotestPV	MI 3109 EurotestPV Lite	A 1378 EurotestPV Remote
				
<b>ELECTRICAL</b>	Insulation resistance up to 1000 V	•	•	
<b>INSTALLATION SAFETY</b>	Continuity 200 mA	•	•	
	Line / Loop Impedance	•		
	RCD A, AC, B	•		
	Earth resistance	•		
	Rotary field	•		
<b>PV GENERATOR MEASUREMENTS</b>	Isc, Uoc	1000 V / 15 A	1000 V / 15 A	
	Automatic test sequence		•	
	I-V curve	•	•	
	Umpp, Impp, Pmax	•	•	
	Extrapolation to STC	•	•*	
	Rs (calculated in PC SW)	•	•	
<b>ENVIRONMENT MEASUREMENTS</b>	Irradiance	•	•*	•
	Module temperature	•	•*	•
	Logger			•
<b>PV SYSTEM POWER MEASUREMENTS</b>	DC side measurements U, I, P	•	•	
	AC side measurements (single phase) U, I, P	•	•	
	Single phase PV and inverter energy conversion efficiency	•	•	
	Three phase PV and inverter energy conversion efficiency	Option**	Option**	
<b>EXTENDED POWER FUNCTIONALITY</b>	P, Q, S, THDU, PF/cos φ	•		
	AC/DC current	•		
	Scope function	•		
	Energy	•		
	Harmonics (up to 11 <sup>th</sup> )	•		
<b>STANDARD/ OPTIONAL ACCESSORIES</b>	Tip Commander	Option		
	Remote unit (logger)	Option	Option	•
	PV safety probe	•	Option	
	MC3 and MC4 adaptors	•	•	
	AC/DC current clamp	•	•	
	PV reference cell	•	Option	
	Temperature probe	•	Option	
<b>PC SW</b>	PC SW EuroLink PRO Plus	•	•	

\* Environment data can be entered manually or measured with optional accessory.  
\*\* Three phase PV efficiency can be measured by synchronisation with any Metrel Power Analyser.

# LV Installation Safety & Operation Condition Quality & Switchboards & Circuit Protection Parts Continuity, Insulation, Z Loop impedance, RCD, Earth ...



## GENERAL FEATURES

- **AUTOSEQUENCE** automatic LIVE and DEAD tests, programmable, no lost or forgotten results / parameters, worst case evaluated, human error factor minimized;
- Automatic evaluation of safety at test point, up to 50 parameters, **Fuse and RCD characteristics**, adjusted limits and tested results combined together and evaluated simply as **PASS / FAIL**;
- Report Creator with powerful two way communication PC SW Tool EuroLink PRO;
- Up to 5 times faster than any existing equivalent Safety testing procedure;

## ADVANTAGES

- **TN / TT / IT** and other earthing systems support;
- **Zloop L-PE, L-N and L-L** impedances at the entry and at the end of circuits, comparison of both results and  **$\Delta U$  calculation in %, Ip<sub>sc</sub> and Ip<sub>fc</sub> calculation, Fuse protection evaluation**;
- **Test of RCD** protection at **AC / A or B** current shape on **G** or **S** type;
- **Continuity** of PE evaluation, two polarities automatic;
- **Insulation** testing through Switchboard, at Circuits, Insulation of Walls and Floors, Antistatic Floors testing, automatic insulation testing;

- **TRMS Clamp-on Leakage** Current testing;
- **Over voltage protection** with ramp;
- **IMD and ISFL testing on IT** systems, Medical site testing, Mobile Installations;
- **Earth / Ground** resistance testing 2-wire, 3-wire, 4-wire, 1 clamp, 2 clamps;
- Other tools for **Three Phase** Systems, **Locating fuses** and cables, **Illumination** measuring, high resolution Z impedance for power lines.

## APPLICATION

- Low Voltage Electrical Installation Safety.
- Low Voltage Electrical Installation Designers needs.
- Facility Management, maintenance and care of commercial or institutional buildings, such as hospitals.
- Hotels, office complexes, arenas, schools or convention centres.
- Low voltage installations maintenance, Preventive and Predictive maintenance, Corrective maintenance / Reactive repairs.
- Periodic Statutory Testing and Inspections.
- Fire Safety and Hazards, Troubleshooting of Overloaded electrical systems, hot wiring or connections, failed components.
- Electrical Safety in Working places.
- Electrical Safety in Public Areas.



## Selection Guide

FEATURES	Description	NEW MI 3152 EurotestXC	MI 3105 (EU) EurotestXA	MI 3101 EurotestAT	MI 3102H BT EurotestXE	MI 3102 BT EurotestXE	MI 3100 SE EurotestEASI	MI 3100 s EurotestEASI	MI 3125 BT EurotestCOMBO	MI 3125 EurotestCOMBO
<b>AUTOSEQUENCES</b>	AUTOSEQUENCE Programmable Auto TT (U, Zln, Zs, Uc) Auto TN/RCD (U, Zln, Zs, Rpe) Auto TN (U, Zln, Zlp, Rpe) Auto IT (U, Zi, Is, Im)	•	•	•	•	•	•	•	•	•
<b>VOLTAGE</b>	Voltage TRMS, Frequency Phase SEQUENCE L1-L2-L3	•	•	•	•	•	•	•	•	•
<b>INSULATION</b>	50 V - 1 kV / 2,5 kV PI DAR Auto L-PE, N-PE, L-N	• / -	• / -	• / -	• / •	• / -	• / -	• / -	• / -	• / -
<b>CONTINUITY</b>	Rlow (200mA) Continuity (7 mA)	•	•	•	•	•	•	•	•	•
<b>RPE</b>	RPE / RPE(rcd)	•	•	•	•	•	•	•	•	•
<b>ZLINE</b>	Zline, Ip <sub>sc</sub> , $\Delta U\%$ / FUSE tables A 1143 Euro Z adapter support	•	•	•	•	•	•	•	•	•
<b>ZLOOP</b>	Zloop, Ip <sub>fc</sub> / FUSE tables Zs(rcd)	•	•	•	•	•	•	•	•	•
<b>RCD</b>	RCD t, Uc RCD I ramp, Uc Auto PRCD-S, PRCD-K	AC / A / B / F / B+	AC / A / B / F / B+	AC / A / B / F / B+	AC / A / F	AC / A / B / F / B+	AC / A / F	AC / A / F	AC / A / B / F / B+	AC / A / F
<b>EARTH</b>	Earth 3W Earth 2 Clamps RO adapter	• Optional Optional	• Optional Optional	• Optional Optional	• Optional Optional	• Optional Optional	• • •	• • •	• • •	• • •
<b>OTHER</b>	Power (S, Q, PF, THDU) Harmonics (U, I) Current Leakage / Load IT support / IMD, ISFL Commanders Locator LUX Sensor Varistor Ring (UK installations)	• • • • / • • - Optional • •	• • • • / • • Optional Optional • •	• • • • / • • Optional Optional • •	• • • • / - • Optional Optional • •	• • • • / • • Optional Optional • •	• • • • / - • Optional Optional • •	• • • • / - • Optional Optional • •	• • • • / - • Optional Optional • •	• • • • / - • Optional Optional • •
<b>BLUETOOTH MODULE</b>	Built in External (dongle)	• •	• •	• •	• •	• •	• •	• •	• •	• •
<b>PC SW</b>	PC SW Professional / Advanced	• / Optional	• / Optional	• / Optional	• / Optional	• / Optional	• / Optional	• / Optional	• / Optional	• / Optional
<b>COMMUNICATION PORTS</b>	RS232 / USB Bluetooth	• •	• Optional	• Optional	• •	• •	• Optional+	• •	• •	• •



# Special Installations Testing, Maintenance, Troubleshooting & Integrated IT Systems

## Z Line impedance, RCD, RCM, ELM, IMD, Earth...



### GENERAL FEATURES

- **AUTOSEQUENCE** automatic tests, worst case evaluated, human error factor minimized;
- **Automatic evaluation of safety for Medical Locations, Integrated IT systems** and Installations on Vehicles, Fuse characteristics, supported **IMD, ELM, RCM devices**, adjusted limits and tested results combined together and evaluated simply as **PASS / FAIL**;
- **Insulation and Earth Bonding** Continuity for industrial environment and Special installations and Locations;
- **Earth / Ground Resistance / Soil Resistivity** in-line, triangle or mirror connection for close overlapped funnels on earthing systems, urban environment, also for industrial and noisy environment;
- Report Creator with powerful two way communication PC SW Tool EuroLink PRO.

### ADVANTAGES

- **Test of IMD, ELM and RCM** devices with ISFL pre-test and Voltage balance evaluation;
- **Zloop L-N and L-L** impedances at the entry and at the end of circuits, comparison of both results and **dU calculation in %**;
- **Earth Bond** testing with minimum 200 mA, **2 A, 10 A**, both polarities, Inductive mode supported;
- **Insulation testing** through Switchboard, at Circuits, Insulation of Walls and Floors, Antistatic Floors testing;
- **PI and DAR** factor Insulation testing on cables, transformers, motors;
- **Overvoltage varistors** and **Surge arresters** testing with up to 2.5 kV voltage ramp;

- **TRMS Clamp-on Leakage** Current testing;
- **Lightning systems** and PE Conductive loops testing with Two Clamps method;
- **Earth / Ground** resistance testing 2 wire, 3 wire, 4 wire, 1 clamp, 2 clamps.

### APPLICATIONS

- Medical Sites and Specific Medical Units, Surgery Rooms, Ambulance Vehicles and Emergency Cars, Helicopters, Boats.
- Mobile Video / Audio / Concert Halls / Fair playground, Satellite / Video Broadcast Vehicles.
- Military and Police Portable Stations and Units, Vehicles, Helicopters, Airports, Mobile Units, Mobile Restaurant Units.
- Racing Team Mobile Units, Restaurant Units.
- Fire Brigade Engines and Vehicles, Fire Boats, Emergency Vehicles and Cars.
- Working Ships and Boats Generators, Fishing Boats and Ships, Transport Ships, Tourist Cruisers Ships, Marina places, Mobile Units with Integrated IT Generators / Transformers / LV Electrical Installations.
- Gas stations, Pipes, Ground metal plates and covers, Oil tanks.
- Earth, Ground and Lightning protection Systems of Buildings and Industrial Halls, from single earthing points to complex systems.

## Selection Guide

FEATURES	Description	MI 3110 EurotestIM	MD 9272 Leakage / Power Clamp	MI 3123 Earth / Clamp	MI 3122 Z Line-Loop / RCD	MI 3121 Insulation/Continuity	MI 3121H Insulation/Continuity	MI 3242 MicroOhm 2A	MI 3309 BT DeltaGT
<b>AUTOSEQUENCES</b>	AUTOSEQUENCE Programmable Auto IT (U, ZI, Is, Im) Auto VDE Auto Custom	•							•
<b>INSULATION</b>	IMD insulation monitor 50 V - 1 kV 250 V, 500 V 2,5 kV PI DAR	•				•	•		•
<b>LEAKAGE CURRENT</b>	ISFL L1, L2 first Fault leakage Differential leakage current Touch leakage current Substitute leakage current Leakage current with clamp	•	•						•
<b>CONTINUITY</b>	Current 200 mA					•	•		•
<b>EARTH BOND</b>	Current 2 A, 4-wire							•	
<b>ZLINE</b>	Zline, Ipsc, ΔU% / FUSE tables	•			•				
<b>ZLOOP</b>	Zloop, Ipsc / FUSE tables Zs(rcd)				•				
<b>RCD</b>	RCD t, Uc RCD I ramp, Uc Auto PRCD-S, PRCD-K				AC / A				AC / A*
<b>EARTH</b>	Earth 3W Earth 2 Clamps RO adapter			•					•
<b>VOLTAGE</b>	Voltage TRMS, Frequency Phase SEQUENCE L1-L2-L3	•	•		•	•	•		•
<b>POLARITY</b>	IEC lead test Active polarity								•
<b>OTHER</b>	Power (S, Q, PF, THDU) Functional test Harmonics (U, I) Barcode Printer		•						•**
<b>BLUETOOTH MODULE</b>	External (dongle)								•
<b>PC SW</b>	PC SW	•		•	•	•	•	•	•
<b>COMMUNICATION PORTS</b>	RS232 and USB	•		•	•	•	•	•	•

\* RCD t, only  
\*\* S, only



# Portable Appliances Safety Testing, CE Marking & Machines Electrical Safety & Switchboards Safety Earth bond, Insulation, Differential / Touch / Substitute Leakage...



## GENERAL FEATURES

- **AUTOSEQUENCE** automatic testing programmable or standardized shortcuts of any kind of Machines, Switchboards, Controlgear, Portable Appliances, Fixed Appliances, IT equipment, IEC cords, portable RCD devices and extension leads;
- **Automatic evaluation** of safety with simple **PASS / FAIL** information but supported with all subresults for detailed report;
- **3-phase** appliance testing;
- **PATLink Android** scanning of the QR codes, containing information of the previous results, the test status, and the previously used test sequence;
- **Scan, test and print** barcoding system, and PASS / FAIL barcode label printing make retesting quick and simple;
- **Active polarity** for P/RCD protected extension leads testing;
- **Report Creator** with powerful two way communication PC SW Tool PATLink PRO;

## ADVANTAGES

- **HV Withstanding dielectric** test with programmable voltage ramp AC, **500 VA**, up to **5 kV**, fixed voltage levels **1 kV, 1,89 kV, 2.5 kV** and limited power **Flash tests on 1.5 kV / 3 kV**;
- **Earth bond** / continuity resistance test with test currents 200 mA and powerful **10 A / 25 A**;
- **Insulation** resistance, Touch leakage current and Substitute leakage current on inner and exposed isolated accessible conductive parts

for class **I / class II** appliances;

- **Differential** Leakage, **Touch** Leakage and **Substitute Leakage** test;
- Functional test and TRMS load currents testing;
- Innovative **Active Polarity** function for testing **RCD / PRCD** protected cords while voltage is applied to tested item;
- **Trend** function showing comparison of old and new test results on large graphic LCD display;
- Instrument can be powered from both **main supply and internal battery**;
- Results can be **read / written / sent** via USB, **Bluetooth**, External Printer, Barcoding, **QR Coding** and **RFID** system.

## APPLICATIONS

- Type testing of Appliances, Machines and Switchgears / Controlgears after production in producer's R&D phases and Laboratories.
- CE marking and Routine testing after production.
- Testing of Power Tools, Extension Leads and Appliances on Construction sites.
- Testing of Appliances protected with RCDs (type AC, A, and B), portable PRCDs (type K, S).
- Service departments (after repair testing), Hire and Rental Industry (before hire and after return testing).
- Periodic testing of Portable Appliances for Hotels, Schools, Kindergardens, Public places, Restaurants, Kitchens, Shopping Centers, Stores, Fire Brigades, Military, Expo Centers, Concert Halls, Events.
- Testing of Hard-wired Appliances.



## Selection Guide

FEATURES	Description	MI 3394 CE MultiTesterXA	MI 2094 CE MultiTester	MI 3321 MultiServicerXA	MI 3310 25A SigmaGT	MI 3310 DeltaGT	MI 3309 BT DeltaGT	MI 3311 GammaGT
<b>AUTOSEQUENCES</b>	CE marking / PAT / MACHINE / SWITCHBOARD AUTOSEQUENCE Programmable Auto VDE Auto CUSTOM	•/•/•/•	•/•/•/•	-/•/•/•	-/•/-/-	-/•/-/-	-/•/-/-	-/•/-/-
<b>WITHSTANDING</b>	Ramp test 100 ... 5000 VAC (500 VA) Ramp test 600 ... 600 VDC Test voltage 1000 VAC / 1890 VAC / 2500 VAC (500 VA) Current 200 mA	•/•/•	•/•/•	•/•/•	•	•	•	•
<b>CONTINUITY</b>	Current 4 A / 10 A / 25 A	•/•/•	•/•/•	-/•/•	-/•/•	-/-/-	-/-/-	-/-/-
<b>EARTH BOND</b>	50 VDC / 100 VDC / 250 VDC / 500 VDC / 1000 VDC	•/•/•/•/•	•/•/•/•/•	-/-/•/•/-	-/-/•/•/-	-/-/•/•/-	-/-/•/•/-	-/-/•/•/-
<b>INSULATION</b>	Differential leakage current Touch leakage current PE leakage current Substitute leakage current Leakage current measurement with optional clamp	•	•	•	•	•	•	•
<b>LEAKAGE CURRENT</b>	60 V (1 ... 5 s) 120 V (1 ... 5 s)	•	•	•	•	•	•	•
<b>DISCHARGE TIME</b>	RCD t, Uc RCD I ramp, Uc Auto PRCD-S, PRCD-K			AC / A / B	AC / A / B	AC / A / B	AC / A*	AC / A*
<b>RCD</b>	Zline, Ipsc, ΔU% / FUSE tables A 1143 Euro Z adapter support			•	•	•	•	•
<b>ZLINE</b>	Zloop, Ipfcc / FUSE tables Zs(rcd)			Optional	Optional	Optional		
<b>ZLOOP</b>	A 1322 Active 3-phase Adapter A 1422 Active 3-phase Adapter Plus			Optional	Optional	Optional		
<b>THREE PHASE APPLIANCES</b>	Voltage TRMS, Frequency Phase SEQUENCE L1-L2-L3	•/-	•/•	•/•			•/-	•/-
<b>VOLTAGE</b>	IEC lead test Active polarity Functional test			•	•	•	•	•
<b>POLARITY</b>	Power Barcode Printer	Optional	Optional	Optional	Optional	Optional	Optional	Optional
<b>OTHER</b>	Built in External (dongle)	•		•	•	•	•	•
<b>BLUETOOTH MODULE</b>	PC SW PATLink PRO Plus (CE Link*) PC SW Metrel ES Manager	•	•*	•	•	•	•	•
<b>PC SW</b>	RS232 / USB / Ethernet Remote	•/•/•	•/•/-	•/•/-	•/•/-	•/•/-	•/•/-	•/•/-
<b>COMMUNICATION PORTS</b>								

\* RCD t, only



# Power and Voltage Quality & Consumption and Disturbances

## Power, Harmonics, THD, Phase diagram, Flicker, Transient, Waveform...



### GENERAL FEATURES

- **Automatic Voltage and Power Quality Analysis** according to EN 50160 with PASS / FAIL limit evaluation, including flickers and harmonics. Compliance with power quality standard IEC 61000-4-30 Class A/S. Predefined recorder profile for EN 50160 survey;
- **Troubleshooting and Maintenance Tool** to discover voltage sags and swells, resonant states, high neutral conductor currents in 3-phase systems, asymmetry, transients;
- **Designing Tool** of filtering systems, power correction equipment, over voltage protection and UPS systems;
- Power Quality Negotiating background Tool;
- **Download, view and analyse with PowerView PC SW** platform that contains a package of functionalities needed for evaluation of power quality phenomena and creation of complex reports.

### ADVANTAGES

- **Voltage TRMS**, peak, crest factor (**4-channel**), 0 ... 1000 Vrms;
- **Current TRMS**, peak, crest factor (**4-channel**), automatic clamp recognition;
- **Power** (active, reactive, apparent), Power factor,  $\cos \phi$ , Unbalance;
- Energy (active, reactive, generated, consumed);
- **Harmonic analysis** up to 50th harmonic, THD measurement;

- **Flicker measurement**;
- **Waveform displaying and Transient snapshotting**;
- **Fast logging and Inrush Current recording**;
- Faster troubleshooting due to on-screen displaying of trends and captured events;
- Voltage events and user defined alarms capture;
- **GPS** time synchronization;
- Internal memory allows recording over one month period;
- Instrument, or a group of them, can be **remotely controlled** and programmed via **GPRS** modem.

### APPLICATIONS

- Power Quality, Maintenance, Compensation PF, Filters, Start up machines.
- Power quality assessment and troubleshooting in low and middle voltage electrical systems.
- Energy assessment to quantify the before and after installation improvements in energy consumption in order to justify energy saving devices,
- Checking power correction equipment performance.
- Long-term analysis, to uncover hard-to-find or intermittent issues.
- Predictive maintenance, to detect and prevent power quality issues before they cause downtime.
- Load studies, to verify electrical system capacity before adding loads;
- Start up current, unbalance/asymmetry recording to optimize systems efficiency.
- Electrical Safety in Public Areas.



## Selection Guide

FEATURES	Description	MI 2892 Power Master	MI 2792A PowerQ4 Plus	MI 2792 PowerQ4 Plus	MI 2592 PowerQ4	MI 2392 PowerQ Plus	MI 2492 PowerQ
<b>CLASS</b>	IEC 61000-4-30 Class A / Class S / Class B	Class A	Class A*	Class S	Class S	Class B	Class B
<b>INPUTS</b>	Number of current measuring inputs	4	4	4	4	3	3
	Number of voltage measuring inputs	4	4	4	4	3	3
<b>PERIODICS</b>	TRMS Voltage measurement (Min., Max., Avg.)	•	•	•	•	•	•
	TRMS Current measurement (Min., Max., Avg.)	•	•	•	•	•	•
	Current in neutral conductor	•	•	•	•	calculated	calculated
	Power Factor and $\cos \phi$	•	•	•	•	•	•
	Power measurement (W, VA, VAR)	•	•	•	•	•	•
	Energy measurement	•	•	•	•	•	•
	THD and harmonics analysis	•	•	•	•	•	•
	Frequency measurement	•	•	•	•	•	•
	Flicker measurement	•	•	•	•	• (without flicker)	• (without flicker)
	Voltage events (sags, swells, interruptions)	•	•	•	•	•	•
	Unbalance	•	•	•	•	•	•
	EN 50160 Analysis	•	•	•	•	•	•
<b>ON LINE</b>	Scope function	•	•	•	•	•	•
	Phase diagram	•	•	•	•	•	•
	Harmonics measurement	•	•	•	•	•	•
<b>SPECIAL TOOLS</b>	Transients measurement	•	•	•	•	•	•
	Waveform recording	•	•	•	• (snapshot)	• (snapshot)	• (snapshot)
	Inrush currents	•	•	•	•	•	•
<b>OTHER</b>	Interharmonics analysis	•	•	•	•	•	•
	Signalling	•	•	•	•	•	•
	Temperature measurement	•	•	•	•	•	•
<b>PC SW</b>	PC SW PowerView	•	•	•	•	•	•
<b>COMMUNICATION PORTS</b>	MicroSD memory card	•	•	•	•	•	•
	RS232 and USB / Ethernet	• / •	• / -	• / -	• / -	• / -	• / -
	GPS time synchronisation	•	•	Option	•	•	•
	Remote instruments control (GPRS)	•	Option	Option	•	•	•

\* Class A in range 49-51 Hz, see Instruction manuals for details.

# HV Safety and Quality in Industrial Systems & Power Generation & Distribution Systems & Equipotential Bonding, Insulation Analysis, Step / Contact, Z impedance...

HV Insulation/Continuity/Earth/Impedance



## GENERAL FEATURES

- **Equipotential Bonding and Connectivity**  
Testing with MicroOhm meter is just what needed to show reliable and stable results.
- **HV Insulation Analysis** with high EMC immunity, three wire connection with Guarded test leads in the set. Powerful generator with fast charging and discharging of Capacitive loads;
- **Voltage Funnel** during **Fault Simulation** in case of ground fault or lightning strike around objects, analysing with **Step Voltage and Contact Voltage** measuring, **Earth / Ground Resistance and Soil Resistivity** measuring with Step / Contact System;
- **Live Impedance and Fault Current Testing**, Conditions for Automatic Disconnection Evaluation with accurate results on Industrial Power Transformers and Generators;
- Report Creator with powerful PC SW Tool HVLink PRO.

## ADVANTAGES

- **Equipotential Bonding with 4 wire** MicroOhm meter with **2A, 10A or 100A** battery operated generator with results in fine resolution up to **1 nanoOhm**;
- **HV Insulation Analysis up to 10 kV, 3 wire** connection with +, - and Guard, with **PI, DAR, DD, Ramp test, Withstanding** programmable procedure and Step Voltage. Graphical presentation of results R(t);
- **Smallest Step / Contact Voltage System** with **wireless synchronized Voltmeters** all in one solution, with **powerful generator of up to 55 A**, eliminating earth current noise even in low power operating mode. It is extremely **safe operating**

on **50 V** only which is important for testing in public area surrounding;

- **Live Impedance 4 wire** testing with test current of up to **290 A**, Built-in **Fuse Characteristics**, automatically calculated **Isc max, Isc standard and Hot factor for Isc Min**.

## APPLICATIONS

- Equipotential Bonding and Connectivity of bigger crosssection conductors, bars and metal stripes, connected in paralel.
- Testing of Automatic Disconnection Ability in case of Fault in Power Transformer, Fuse characteristics evaluation with 4-wire 300 A High-Current Testing.
- Insulation Characteristics of Charging and Discharging, Influence of temperature, dirt, humidity, mechanical and electrical stresses, high-energy radiation, Testing on Capacitive loads, Long Cables and Transformers.
- Insulation testing on separated systems of gas stations, pipes, ground metal plates and covers of oil tanks.
- Overvoltage and Surge Protection Periodical Testing.
- Earth and Ground systems, Soil resistivity, Lightning protection of Power Generators, Industrial Power Systems, Power Substations.
- Ground Networks Analysing of Antenna Towers, HV Power Distribution towers, Industrial Platforms, Power Transformers, Generators, PV systems etc, research on Earthing and Spreading of Voltage Funnels.

# Construction Sites Selection Guide

FEATURES	Description	MI 3252 MicroOhm 100A	MI 3250 MicroOhm 10A	MI 3210 TeraOhm 10 kV	MI 3200 TeraOhm 10 kV	MI 3201 TeraOhm 5 kV Plus	MI 3202 GigaOhm 5 kV	MI 3295 Step Contact Voltage	A 1143 Euro Z 290 A
<b>EARTH BOND</b>	Test current range	100 A	10 A						
	Resolution	1 mΩ	0.1 μΩ						
	Single / Continuous mode	•	•						
	Inductive mode		•						
<b>INSULATION ANALYSING</b>	Custom test shortcut			•					
	Test voltage range			50 Vdc ... 10 kVdc	500 Vdc ... 10 kVdc	250 Vdc ... 5 kVdc	250 Vdc ... 5 kVdc		
	Insulation resistance measuring range			20 TΩ	10 TΩ	10 TΩ	5 TΩ		
	Calculation of DD, DAR, PI, R(t)			•	•	•	•		
	Ramp voltage test			•	•	•	•		
	Step voltage test			•	•	•	•		
	Bar graph			•	•	•	•		
	Leakage current			•	•	•	•		
	Automatic discharge			•	•	•	•		
<b>EARTH SYSTEMS</b>	Test current up to 55 A							•	
	Autonomous step voltage meter							•	
	Step voltage							•	
	Contact voltage							•	
	Earth resistance 2W, 3W							•	
	Specific earth resistance 4W							•	
<b>IMPEDANCE</b>	High precision 1 mΩ resolution								•
	Test current 290 A								•
	Line / Loop impedance								•
	Ipcs / Ipf calculated up to 400 kA								•
<b>VOLTAGE</b>	Voltage TRMS, Frequency								•
	3-phase system 440 V								•
	Voltage DC 600 V			•	•	•	•		
<b>OTHER</b>	Robust AC current rejection 4 mA			•	•	•	•		
	Noise immunity filter	•	•	•	•	•	•	•	
	3-wire / 4-wire connection	- / •	- / •	• / -	• / -	• / -	• / -	- / •	- / •
	PASS / FAIL evaluation	•	•	•	•	•	•	•	•
	Temperature compensation			•	•	•	•		•
	Dual powered	NiMH	Lead / Li-Ion	Li-Ion	NiMH	NiMH	NiMH		
<b>BLUETOOTH MODULE</b>	Built in								
<b>PC SW</b>	PC SW	•	•	•	•	•	•	•	•
<b>COMMUNICATION PORTS</b>	RS232 and USB	•	•	•	•	•	•	•	•





# Telecommunication & Local Area Network Quality

## LAN, UTP, ScTP, FTP, NEXT, ACR, Length, Scope, TDR, TDNEXT...



### GENERAL FEATURES

- **AUTOSEQUENCE** automatic LAN testing with extensive database of Autotests incorporated into the instrument's memory allows quick **LAN cabling verification** up to CAT6 (ClassE) in accordance with international standards EN50173, TIA/EIA 658B, ISO/IEC 11801 or similar;
- **Troubleshooting** Tool with Single tests functionality enabled independently from Remote unit can show the connector / socket problems and faults in a fast and easy way;
- **Report Creator** with powerful communication PC SW Tool LANlink PRO.

### ADVANTAGES

- Connectivity with **UTP, STP, ScTP, FTP** cables is further enhanced with a complete selection of adapters for Channel Link and Permanent Link measurements;
- **Complete selection of test functions** combined with easy to understand user interface makes Multi LAN 350 a good choice for LAN cabling companies and subcontractors as well as for IT administrators for troubleshooting purposes;

- Pinpoint **distance to the fault** determination with integrated professional **TDR and TDNEXT functionality**;
- Tabular or graphic presentation of test results;
- Set MI 2016 PS comprises of two Multi LAN 350 instruments that enable fast execution of measurements and double memory space for storing test results.

### APPLICATIONS

- Telecommunication cables, LAN UTP; ScTP, IT Tool, etc.



## Selection Guide

FEATURES	Description	MI 2016 Multi LAN 350	MI 2014 Cable Scanner	
<b>CLASS</b>	TIA/EIA 568B Cat 3, Cat 5, Cat 5E, Cat 6	•		
<b>MEASUREMENTS</b>	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	•		
<b>SCOPE</b>	Impedance	•		
	DC resistance	•		
	Attenuation	•		
	TDR	•	•	
<b>OTHER</b>	TDnext	•	•	
	Frequency range	0 ... 350 MHz		
	Coax cable		•	
	Cable tracer option	•		
	Talk over copper (Talk set)	•	•	
	Cable identifiers	•	•	
	Analysis of RJ 45 output	•	•	
	BNC output	•	•	
	<b>PC SW</b>	LANLink	•	
	<b>COMMUNICATION PORTS</b>	RS232 and USB	•	

# Indoor Environment Quality & Noise Analysing, Light Conditions & Emergency lights

## Sound, Air velocity, Relative humidity, Illuminance, Temperature...



### GENERAL FEATURES

- **Environment Conditions** in buildings, working places and public places, Logging, Analysing and Testing;
- **IAQ** inspectors, HVAC engineers, safety officers, building managers, industrial hygienists and lab managers can now find a complete solution in measuring and analysing temperature (air, black globe and contact), **air velocity**, relative **humidity**, **illuminance**, **luminance**, including a **sound level meter and noise frequency analyser**. All in one single unique and universal professional testing set;
- Powerful logging PC SW Tools SensorLink PRO and SoundLink PRO are used for data downloads to a computer, simplifying the creation of test reports and enabling full data analysis and charting of sound measurements.

### ADVANTAGES

- **Complies with all major international standards** such as EN ISO 7726, ISO 7730, ISO 7243 for IAQ, DIN 5032 (Part 1 - Part 7) for Luminance and illuminance, EN 12599 for **HVAC**, IEC 61672 and IEC 61260 **Class 1 and Class 2 for Sound**.
- Provides a **dew point**, **mass flow**, **PMV** (predicted mean vote), **PPD** (predicted

percentage of dissatisfied), **WBGT** (wet bulb globe temperature), luminance **contrast** calculations, as well as the real-time **octave and one third octave sound** frequency analyses.

- Provision of **air temperature**, **air velocity**, **relative humidity** measurement with all-in-one microclimatic probe.

### APPLICATIONS

- Ventilation Systems, Cooling Systems, Working Places, Noise Analysing, Luminance and Illuminance.



## Selection Guide

FEATURES	Description	MI 6201PR Multinorm	MI 6201EU	MI 6201ST	MI 6301PR FonS	MI 6301EU	MI 6401EU Poly	MI 6401ST
<b>CERTIFICATES</b>	ISO calibration certificate for complete system Calibration certificate	•	•	•	•	•	•	•
<b>SOUND</b>	Sound level, class 1 (IEC 1672) Sound level, class 2 (IEC 1672) Real time 1/1 octave analysis Real time 1/3 octave analysis	•	•	•	•	•	•	•
<b>MEASUREMENTS</b>	Air Velocity Air Flow Relative Humidity Dew point Air temperature Temperature difference K Thermocouple temperature Illuminance Luminance Contrast Black globe radiant temperature CO concentration CO2 concentration	• • • • • 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
<b>TEST PROBES</b>	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 <sub>2</sub> probe A 1181 CO probe	• 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
<b>PC SW</b>	A 1143 SensorLink PRO A 1167 SoundLink LITE A 1162 SoundLink PRO	• • Option	• • Option	• • Option	• • Option	• • Option	• • Option	• • Option
<b>COMMUNICATION PORTS</b>	RS232 and USB	•	•	•	•	•	•	•



# General testing up to high level industrial testing, electronic fault finding, field servicing & heavy TRMS AC, DC voltage / current; Capacitance; Resistance; Diode test...

Digital Multimeters / Clamp Meters



## GENERAL FEATURES

- **PC Link** software enables to download the test results to the computer;
- **Lead alert** indicates incorrect lead connection;
- **Temperature measurement** measures T1, T2 and T1 + T2 temperature in Celsius and in Fahrenheit;
- **MAX/MIN/HOLD** mode, displays maximum, minimum or average measured value;
- **Non-contact** and probe contact electric field detection;
- **Inductive pickup clip** accessory for IP-RPM Function;
- **4 Selectable Trigger-Levels** for IPRPM, IG-RPM, Dwell, %-Duty and ms Functions;
- **Selectable Cylinders** 1, 2, 3, 4, 5, 6, 8, 10 or 12 Cylinders for Dwell and IGRPM functions;
- **Selectable Trigger** positive (+) or Negative (-) Trigger for %-Duty and ms Functions.

## ADVANTAGES

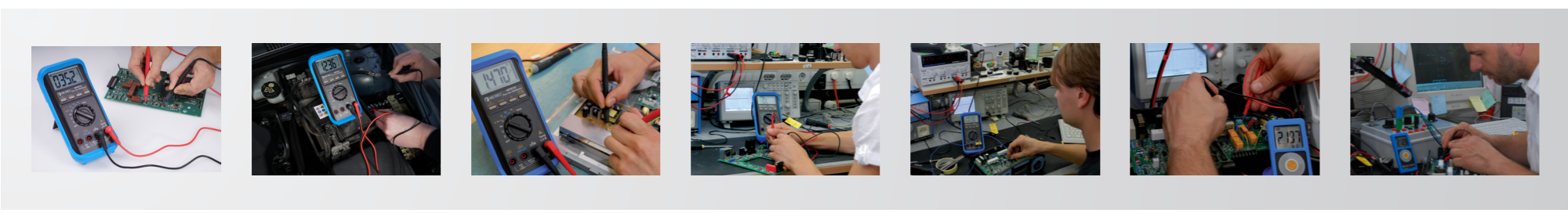
- **Relative zero mode** function for comparing the difference between signals or removing background noise;
- **100 kHz** Voltage Bandwidth;
- **Large 2-line** 500.000 counts LCD display;
- **Automatic detection** of AC voltage, DC voltage or resistance;
- **Frequency measurement** up to 1 MHz.

## APPLICATIONS

- High, Mid and Low level industrial testing.
- High, Mid and Low level electronic fault finding.
- HVAC (heating, ventilation and air conditioning) troubleshooting.
- Demanding measurement tasks in the laboratories.
- Everyday repair and maintenance practice.
- Heavy duty electrical testing.
- Field servicing.
- Automotive industry.
- Hobby work.
- Working in small enclosures.
- General purpose.

# duty electrical testing Selection Guide

FEATURES	Description	MD 9060	MD 9050	MD 9040	MD 9035	MD 9030	MD 9020	MD 9016	MD 9010
<b>MEASURING METHOD</b>	True RMS	•	•	•	•	•	•	•	•
<b>AC - MEASUREMENTS</b>	Current	0.1 uA ... 10 A	0.1 uA ... 10 A	0.1 uA ... 10 A	0.1 uA ... 10 A	0.1 uA ... 10 A	0.1 uA ... 10 A	0.1 uA ... 8 A	0.1 uA ... 2 mA
	Voltage	0.01 mV ... 999.9 V	0.01 mV ... 999.9 V	0.01 mV ... 999.9 V	0.01 mV ... 999.9 V	0.01 mV ... 999.9 V	0.01 mV ... 999.9 V	0.01 mV ... 999.9 V	1 mV ... 600 V
	Frequency	•	•	•	•	•	•	•	•
	Frequency of digital signals 100 kHz Voltage bandwidth	•	•	•	•	•	•	•	•
<b>DC - MEASUREMENTS</b>	Current	0.1 uA ... 10 A	0.1 uA ... 10 A	0.1 uA ... 10 A	0.1 uA ... 10 A	0.1 uA ... 10 A	0.1 uA ... 10 A	0.1 uA ... 8 A	0.1 uA ... 2 mA
	Voltage	0.1 mV ... 999.9 V	0.01 mV ... 999.9 V	0.01 mV ... 999.9 V	0.01 mV ... 999.9 V	0.01 mV ... 999.9 V	0.01 mV ... 999.9 V	0.01 mV ... 999.9 V	1 mV ... 600 V
<b>AUTOMOTIVE MEASUREMENTS</b>	IP-RPM (Inductive pickup type)	•	•	•	•	•	•	•	•
	IG-RPM (Contact signal type)	•	•	•	•	•	•	•	•
	Line-Level Hz (ACV, DCV)	•	•	•	•	•	•	•	•
	Inductive pickup clip for IP-RPM	•	•	•	•	•	•	•	•
	Dwell - Angle function	•	•	•	•	•	•	•	•
	Selectable Cylinders (1 ... 12)	•	•	•	•	•	•	•	•
	% - Duty Cycle Function	•	•	•	•	•	•	•	•
	Fuel injection - ms detector	•	•	•	•	•	•	•	•
<b>OTHER MEASUREMENTS</b>	Resistance	•	•	•	•	•	•	•	•
	Acoustic continuity	•	•	•	•	•	•	•	•
	Capacitance	•	•	•	•	•	•	•	•
	Diode	•	•	•	•	•	•	•	•
	Temperature T1 / T1 & T2	•/•	•/•	- / -	•/ -	•/ -	•/ -	•/ -	- / -
	EF (Electric field detection)	•	•	•	•	•	•	•	•
	Conductance	•	•	•	•	•	•	•	•
	VFD (Variable frequency drive)	•	•	•	•	•	•	•	•
	Autocheck (VAC-DC; Ω) / (VAC-DC; AAC)	•	•	•	•	•	•	•	•
	Data hold	•	•	•	•	•	•	•	•
<b>OTHER FUNCTIONS</b>	MAX hold	•	•	•	•	•	•	•	•
	MAX/MIN/AVG (recording)	•	•	•	•	•	•	•	•
	Auto ranging	•	•	•	•	•	•	•	•
	Relative zero mode	•	•	•	•	•	•	•	•
	Analogue bargraph	•	•	•	•	•	•	•	•
	Lead alert	•	•	•	•	•	•	•	•
	Count	50.000 / 500.000	6000 / 9999	6000 / 9999	6000	4000	4000	6000	6000
	Backlight	•	•	•	•	•	•	•	•
	IP protection	54	54	54	40	40	40	40	40
	PC Link	•	•	•	•	•	•	•	•
<b>COMMUNICATION OVERVOLTAGE CATEGORY</b>	CAT IV / 1000 V	•	•	•	•	•	•	•	•
	CAT IV / 300 V	•	•	•	•	•	•	•	•
	CAT III / 600 V	•	•	•	•	•	•	•	•
	CAT III / 300 V	•	•	•	•	•	•	•	•
	CAT II / 600 V	•	•	•	•	•	•	•	•
	CAT II / 1000 V	•	•	•	•	•	•	•	•







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