MI 3394
CE MultiTesterXS

Solutions for
Electrical Safety
Test Systems

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METREL®

Safety testing of electrical equipment, why is it needed?

Electrical equipment should be safe during its whole lifetime. Common accidents caused by faulty electrical equipment are:
- Injuries due to electric shock caused by malfunctioning equipment
- Injuries due to equipment overheating
- Fire and explosions

Safety of electrical equipment is well covered by different standards that deal with product design, testing procedures, test equipment, service and maintenance, periodic verification etc.

Safety of work places. Can a work place, including high voltage test be safe?

Testing safety of electrical equipment on production lines or in laboratories usually include tests with high voltages, currents and power. Special consideration must be taken to build up safe work places and production process.

The safety of work places is covered in the EN 50191 standard. In addition, there are national guidelines like the German BGI 891. Requirements from the field of machine safety also often need considered.

To assure safety of working places Metrel introduces electronic safety systems for monitoring the following protective measures:

- protection against direct contact
- limitation of the output current in the high voltage test to a safe level,

these measures guarantee working places are safe.

Responsibilites. Who is responsible for safety?

The manufacturer is deemed responsible for the safety of electrical equipment it manufactures. The manufacturer:
- is responsible that electrical equipment is designed properly and fulfil requirements of product standards
- is responsible that the production process is safe
- is responsible for a thorough safety check of the equipment it produces
- is responsible that all the above steps are carried out consequentially and are traceable.

Compliance to directives. Why is the compliance to directives important?

Compliance marks tell us that a product conforms to electrical safety and EMC requirements.

Compliance marks
In the European Union all electrical equipment product must conform to specified safety and electromagnetic compatibility standards. The products can be tested by the producer or by independent specialized testing laboratories. The conformity is declared with the CE mark. The mark is given by the producer or importer who must also prepare and sign a conformity declaration to state that their product conforms to the relevant regulations.

Examples of independent certification marks

Types of safety testing

Type testing
A type test is a test performed to provide evidence that the design meets the requirements of the functional specification and is safe to use. Type tests are usually performed on one or representative number of specimen. The content of the tests is defined in product standards. The tests are strict and include safety, EMC, functional, climatic tests etc.

Routine testing (end of line testing, production testing)
These tests are carried out by manufacturers to ensure that their product works properly and is safe. The test is routinely made on each individual item during or after manufacture. Typical tests are insulation tests, high voltage test, continuity of protective conductors test, leakage current and functional tests. Each piece of electrical equipment produced must be subjected to this test.

Maintenance testing
If electrical equipment requires maintenance, or the maintenance is required for a system with the electrical equipment built in, then the electrical safety shall be verified for the equipment or system after maintenance is completed. Source IEV: Maintenance is a test carried out periodically on an item to verify that its performance remains within specified limits, after having made certain adjustments, if necessary.

Testing after modification or repair
After modification or repair of an appliance or other electrical equipment, it is required to verify its safe operation. This is especially important if the equipment was disassembled or components that can influence safety were changed. For the extent of testing the manufacturer's instructions must be followed.

Periodic (recurrent) testing
Test carried out periodically to determine whether the equipment is in satisfactory condition. It is not as strict as other tests. The retest period must be considered.

If the safety inspection was carried out by an independent laboratory the product can get a certification mark. Certified products are also subjected to regular controls of the production.

If the equipment is self-certified it is the responsibility of the manufacturer that all safety testing is carried out in a professional and consistent manner.

Standards and regulation. Why are the standards and regulations important?

Standards are needed to assure safety of products, to ensure that products and materials are made for their proposed use, to promote the interoperability of products and services, to facilitate trade by removing trade barriers and promote common understanding of a product. Standards are also important to have a unique and traceable testing system worldwide.

Standards for safety of electrical equipment

The design and test requirements for safety of electrical equipment is well covered by different standards. Some of main standards for safety of electrical equipment are listed below.

IEC 60335-1 is one of the most widely recognised standards in the field of testing electrical equipment on production lines. Annex A of the IEC 60335-1 specifies that routine tests are to be carried out by the manufacturer on each appliance to detect production variations that could impair safety. They are normally carried out on the completed appliance after assembly, but the manufacturer may perform the tests at an appropriate stage during production, provided that later manufacturing processes do not affect the results.

The following tests are the minimum considered necessary to cover essential safety aspects. It is the manufacturer's responsibility to decide if additional routine tests are necessary. It may be determined from engineering considerations that some of the tests are impracticable or inappropriate and therefore need not be carried out.

- Earth continuity test
- Dielectric strength test
- Functional test

Product standards

IEC/ EN 60950	Safety of information technology equipment
IEC/ EN 60335	Safety of household and similar electrical appliances
IEC/ EN 61010	Safety requirements for electrical equipment for measurement, control, and laboratory use
IEC/ EN 60598	Safety of luminaries
IEC/ EN 62368-	Audio/video, information and communication technology equipment
IEC/ EN 60601	Medical electrical equipment -Basic safety and essential performance
IEC/ EN 62353	Medical electrical equipment - Recurrent test and test after repair of medical electrical equipment
IEC/ EN 60204	Safety of machinery - Electrical equipment of machines
IEC/ EN 61439	Low-voltage switchgear and control gear assemblies

Standards for test equipment

IEC/EN 61010	Safety requirements for electrical equipment for measurement, control, and laboratory use
IEC/EN 61326	Electrical equipment for measurement, control and laboratory use – EMC requirements
IEC/EN 61557	series Electrical safety in low voltage distribution systems up to 1 000 V a.c. and 1 500 V d.c. - Equipment for testing, measuring or monitoring of protective measures

Standards for working places

EN 50191	Erection and operation of electrical test equipmentl
IEC/EN 60364	series Low voltage electrical installations

Products for test systems and test instruments

A test system is built out of a combination of different components, depending on the required application. Metrel offers test systems for protection against direct contact, as well as test systems where the safety is assured with the limitation of the output current on the HV test.

On the following pages components for building of test system are presented, starting with multi-functional test instrument which is a core for every test system.

MI 3394 CE MultiTesterXS

The MI 3394 CE MultiTesterXS is a multi-functional test instrument designed for electrical equipment safety testing. It can be used in all kinds of applications such as type testing, end of line testing, maintenance testing, testing after repair, periodic (recurrent) testing. It is specially designed to allow the connection of safety sets for independent control of dangerous measuring circuits and limitation of output current.

Note:
Please note that not all the products available are presented in this document.
For example, test leads and accessories, cable adapters, printers, scanners are not shown here.

KEY FEATURES

- Suitable for in-line testing
- Control of measuring circuits with an integrated safety systems
- Limitation of current in HV test to safe level in combination with the safety system
- Perfectly suited for use in work places in accordance with EN 50191
- With over 20 different measurements, most requirements of product standards are well covered
- In combination with different accessories it can be used in all kind of applications
- Autosequence - automated test sequences, which can be remotely driven via black-box protocol
- Accepts integration with other SW systems
- Large memory
- Powerful desktop software
- RS232, USB, Ethernet and Bluetooth communication interfaces
- Enabled for scanners, printers

SUPPORTED MEASUREMENTS AND INSPECTIONS

Visual & Functional inspection	User defined inspections can be defined in PC SW
Earth continuity test (2W, 4W)	Test current 200mA, 4A, 10A, 25A
Insulation resistance (Riso, Riso-S)	Test voltage 50V, 100V, 250V, 500V, 1000V
Substitute leakage (Isub, Isub-S)	Test voltage <50V a.c. (current recalculated to 110V or 230 V)
Differential leakage	@ mains voltage
Earth leakage (Ipe)	@ mains voltage
Touch leakage	@ mains voltage
Leaks & Power	@ mains voltage
HV AC, HV AC Programmable	100V – 5100V, 10V steps, Output power 500VAmax, Short circuit current >200mA, High limit 100mA
HV DC, HV DC Programmable	500V – 6000V, 50V steps, High limit 10mA
Discharging time	Limits (34V, 60V, 120V)
Power Measurement	P, S, Q, PF, THDu, THDi, Cosø, I, U (Test results)

ORDERING INFORMATION

Standard set MI 3394 XS
- MI 3394 CE MultiTesterXS
- A 1584 19" Rack mount adapter for MI 3394 CE MultiTesterXA/XS
- A 1493 Mains cable EU13 / Schuko, 3 x 1.5 mm², 2 m
- A 1695 Grounding cable, 2 m
- A 1495 P/L Adapter for connection of I/O signals
- A 1727 Cable USB, type AB, 1 m

MI 3394 CE MultiTesterXS


Control inputs & outputs + 2X multipurpose RS232 ports
Test terminal for connection of safety systems
INPUTS
OUTPUTS
CAT II 300 V
I LIM (HV)
MI 3394
09:33
Memory Organizer
General Settings
TEST CIRCUITS OFF / PRÜFSTROMKREISE OFF
600 Vmax
CAT II 600 V
DISCHARGING TIME / RESTSPANNUNG
ISO(+)
SUB1
ISO(-)
SUB2
INSULATION / SUBLEAKAGE
ISOLATION / ERSATZABLEITSTROM
CONTINUITY / SCHUTZLEITERWIDERSTAND
C1
P1
C2
P2
OPTION
HV START
HV(~,-)
HIGH VOLTAGE
HOCHSPANNUNG
HV(~,+)
Communication ports: USB, Ethernet, Bluetooth
Discharge time test terminal
Insulation resistance test terminal
4-wire continuity test terminals
High voltage test terminals

Intelligent test adapters

We have developed "smart" test adapters that are controlled by the central testing unit (master instrument) and support use of Auto Sequences® for fast and easy execution of even the most complex measuring and testing procedures.

A 1460 Active test adapter
The A 1460 CE Adapter is an active switch or adapter intended to run Auto Sequences® on electrical equipment in combination with the master instruments. The operation of CE test adapter is completely controlled by the master instrument, no user intervention during the tests is needed. I/O connections and LEDs for controlling the Auto Sequence® flow are integrated. The adapter is protected against applying too high voltage to its outputs (HW and SW protection).

Tip commander (A 1511) serves as a remote control for execution of passive tests, when used in combination with A 1460. The commander has a built in LED torch lamp including PASS/FAIL status LED's and start key for execution of the tests.

Note:
Tests using the adapter can only be performed as part of Auto Sequence®.

ORDERING INFORMATION

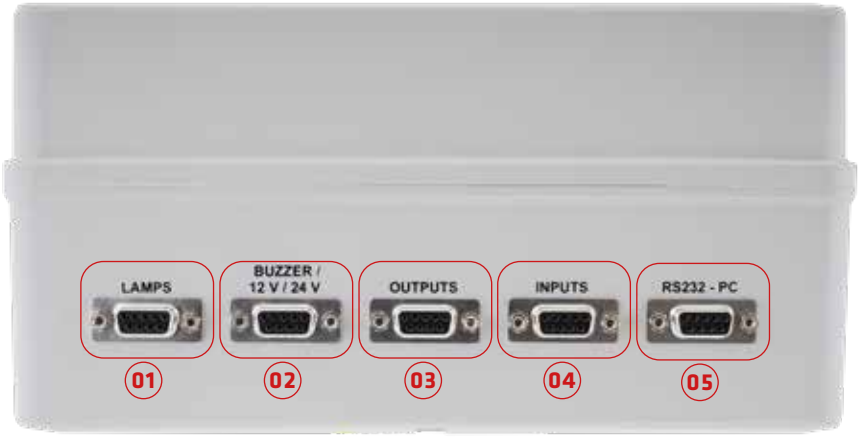
Standard set A 1460
- A 1460 CE Adapter
- A 1728 Mains cable C13 / Schuko, 3 x 0.75 mm², 2 m
- A 1511 2M5 Tip commander, 2.5 m
- A 1645 Multi-functional test cable, TC1, 1.3 m

SUPPORTED MEASUREMENTS AND INSPECTIONS

Supported tests	
Continuity test	Up to 25A, 2W & 4W
Insulation resistance (Riso, Riso-S)	Up to 1000 V d.c
Substitute leakage (Isub, Isub-S), Differential leakage, Ipe leakage, Leaks & Power, Touch leakage	•
HV, HV Programmable	Up to 1500V a.c/d.c
Discharging time	•
Power Measurement	•

Pre-programmed sequences of measurements can be carried out in the Auto Sequence menu. The sequence of measurements, their parameters and flow of the sequence testing can be programmed. The results of an auto test can be stored in the memory together with all related information. Auto tests can be pre-programmed on PC with the Metrel Electrical Safety Manager (MESM) software and uploaded to the instrument. The parameters and limits of individual single tests in the Auto Sequence can be changed or set on board the instrument.

01 External LAMPS status
02 Power ON indication
03 'COMMANDER' connector
04 P/S (C) (current) output for external probe, P/S (P) (potential) output for external probe
05 L, N, PE test outputs (in parallel with terminals of Test socket)
06 Test socket (in parallel with L, N, PE test outputs)
07 Robust fuse holders in series with L and N test conductors



01 LAMPS' connector for connecting (A 1497 or A 1496)
02 'BUZZER/ VOLTAGE' connector for connecting (A 1497 buzzer mode)
03 'OUTPUTs' connector (4 –programmable outputs can be used)
04 'INPUTs' connector (4 – programmable inputs can be used)
05 RS-232 PC connector for connection to PC (for service purpose only)

01 Inputs for connection to continuity 4-wire outputs on the instrument
02 Inputs for connection to HV outputs on the instrument
03 Input for connection to TC1 connector on the instrument - L,N,PE, P/S outputs of the instrument - Input / output command control

Intelligent test switches

High voltage testing procedures done on dedicated EOL testing lines require centrally controlled switching adapters for added safety of connected testing adapters and accessories and, ultimately, the user. Support for Auto Sequences® is another, most welcome, feature.

A 1600 Active CE Switch 5kV
The active CE Switch 5kV is an active multichannel switch/adapter intended to run Auto Sequences® on electrical equipment in combination with the master test instruments. Testing with high voltages up to 5.1kV a.c / 6kV d.c is supported. The operation of CE SWITCH is completely controlled by the master instrument, no user intervention during the tests is needed. I/O connections and LEDs for controlling the Auto Sequence® flow are integrated. Testing of electrical equipment with multiple connection points is supported. Different end adapters can be connected to the switch.

The switch recognises the adapter connected and prevents it from applying too high voltages/current to it (protection by HW and SW).

ORDERING INFORMATION

Standard set A 1600
- A 1600 CE Switch 5kV
- A 1728 Mains cable C13 / Schuko, 3 x 0.75 mm², 2 m
- A 1695 Grounding cable, 2 m
- A 1076 Continuity test lead, 2.5 m, 2 pcs
- A 1645 Multi-functional test cable, TC1, 1.3 m
- A 1601 HV test lead with test probe, red, 1.5 m
- A 1602 HV test lead with test probe, blue, 1.5 m

SUPPORTED MEASUREMENTS AND INSPECTIONS

Supported tests		Nr. of channels
Continuity test	up to 25A, 2- and 4- wire, 2	2
Insulation resistance (Riso, Riso-S)	•	
Substitute leakage (Isub, Isub-S), Differential leakage, Ipe leakage, Leaks & Power, Touch leakage	•	
HV AC, HV AC Programmable	Up to 5100V a.c	4
HV DC, HV DC Programmable	up to 6000V d.c	4
Discharging time	•	
Power Measurement		

01 Power ON indication

02 Status of LAMPS outputs

03 Fuse holders with fuses for protection of L and N test conductors (F1, F2: max 16 A / 250 V)

01 Screw-type protective earth connector

02 Mains supply connector with integrated ON/OFF switch an fuses

03 Industrial plug, intended for connection to various connection boxes

04 BUZZER connector

05 LAMPS connector

06 RS232-PC connector, for service purposes only

07 HV outputs (4 channels)

08 HV inputs for connection to HV outputs on the instrument

09 Input for connection to TC1 connectors on the instrument

10 Connerction interface to 4-wire continuity connectors on the instrument

11 OUTPUT connector array

12 INPUT connector array

Passive connection boxes

The diversity of electronic products, which need to be tested, present many challenges for the manufacturers. Different sizes, shapes and configurations of electronic device make it challenging for electrical safety examination.

Metrel has developed a selection of connection boxes, which can be easily adapted to customer's needs.

A 1626 Connection box 1 -phase

The A 1626 connection box is a passive device that acts as a connection interface between the CE Switch and the equipment under test (DUT). It is intended for connection of various 1-phase appliances to A 1600 CE Switch. Equipment with supply cords, equipment intended for fixed installation, electronic subassemblies can be tested. Connections for linking to isolated conductive parts and earthed parts are added. The connection box is coded to prevent applying too high a test voltage to its outputs.

All of the above listed connection boxes are available with different socket configurations, depending on the requirements of a particular country. Contact your local distributor for ordering specific version of the test socket.

							
Type	EU Schucko	CH Type 13	CH Type 23	AUS/ JP	UK	US/CAN	BE/FR/CZ/SK/PL
Max. Voltage	270 V a.c.	270 V a.c	270 V a.c	270 V a.c	270 V a.c	270 V a.c	270 V a.c
Max. Current	16 A	10 A	16 A	16 A	16 A	16 A	16 A
Max. Test Voltage (HV)	2000 V a.c. / 2800 d.c.	2000 V a.c. / 2800 d.c.	2000 V a.c. / 2800 d.c.	3000 V a.c. / 4200 d.c.	2000 V a.c. / 2800 d.c.	1500 V a.c. / 2000 d.c.	2000 V a.c. / 2800 d.c.
Contact assignment	L, N, PE	L, N, PE	L, N, PE	L, N, PE	L, N, PE	L, N, PE	L, N, PE

ORDERING INFORMATION

Standard set A 1626
- A 1626 Connection box, 1-phase
- A 1710 Test lead, red, 1.5 m
- A 1064 Crocodile clip, red

SUPPORTED MEASUREMENTS AND INSPECTIONS

Measuring function	
Continuity	up to 25 A
Insulation	up to 1000 V d.c
Leakage	•
Power	up to 16 A-1phase
Discharge time	•
HV / HV programmable	Up to 4 kV a.c/d.c
General	
Weight	1,8 kg
Dimensions (w / h / d)	240 mm / 160 mm / 90 mm

Passive connection boxes

A 1627 Connection box 3 - phase

The A 1627 connection box is a passive device that acts as a connection interface between the CE Switch and the DUT. The A 1627connection box is intended for connection of various 1- and 3-phase appliances to A 1600 CE Switch. Equipment with supply cords, fixed installed appliances, electronic subassemblies can be tested. Connections for linking to isolated conductive parts and earthed parts are added. The connection box is coded to prevent applying too high a test voltage to its outputs.

All of the above listed connection boxes are available with different socket configurations, depending on the requirements of a particular country. Contact your local distributor for ordering specific version of the test socket.

							
Type	EU Schucko	CH Type 13	CH Type 23	AUS/ JP	UK	US/CAN	BE/FR/CZ/SK/PL
Max. Voltage	270 V a.c.	270 V a.c	270 V a.c	270 V a.c	270 V a.c	270 V a.c	270 V a.c
Max. Current	16 A	10 A	16 A	16 A	16 A	16 A	16 A
Max. Test Voltage (HV)	2000 V a.c. / 2800 d.c.	2000 V a.c. / 2800 d.c.	2000 V a.c. / 2800 d.c.	3000 V a.c. / 4200 d.c.	2000 V a.c. / 2800 d.c.	1500 V a.c. / 2000 d.c.	2000 V a.c. / 2800 d.c.
Contact assignment	L, N, PE	L, N, PE	L, N, PE	L, N, PE	L, N, PE	L, N, PE	L, N, PE

SUPPORTED MEASUREMENTS AND INSPECTIONS

Measuring function	
Continuity	up to 25 A
Insulation	up to 1000 V d.c
Leakage	•
Power	up to 16 A-1phase
Discharge time	•
HV / HV programmable	Up to 4 kV a.c/d.c
General	
Weight	1,8 kg
Dimensions (w / h / d)	240 mm / 160 mm / 90 mm

ORDERING INFORMATION

Standard set A 1627
- A 1627 Connection box, 3-phase
- A 1710 Test lead, red, 1.5 m
- A 1064 Crocodile clip, red

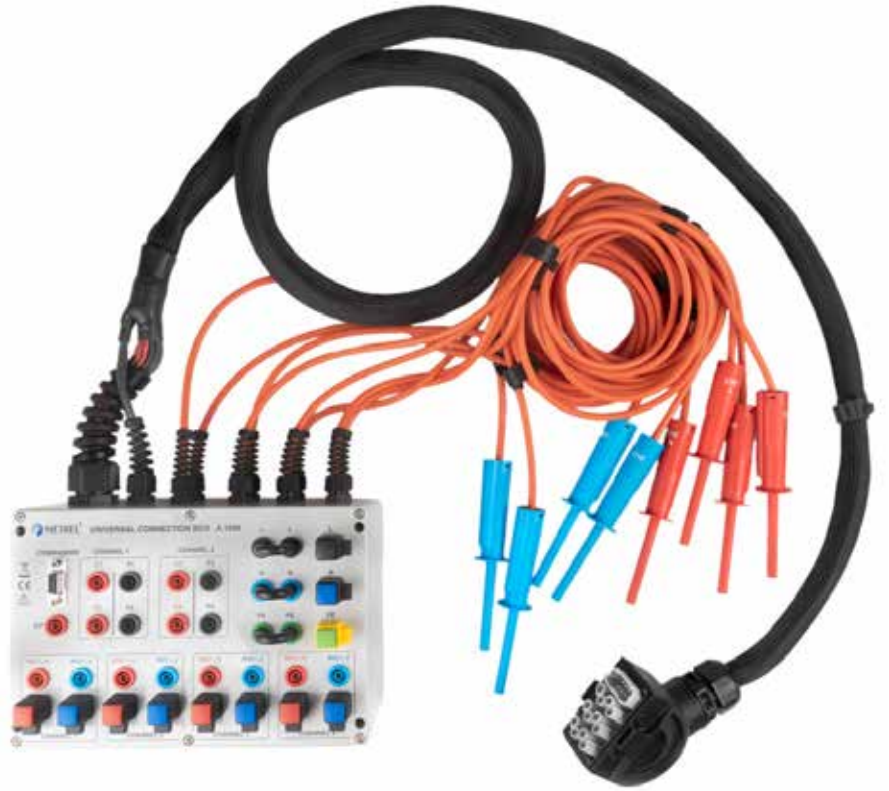
Passive connection boxes

The diversity of electronic products, which need to be tested, present many challenges for the manufacturers. Different sizes, shapes and configurations of electronic devices make it challenging for electrical safety examination.

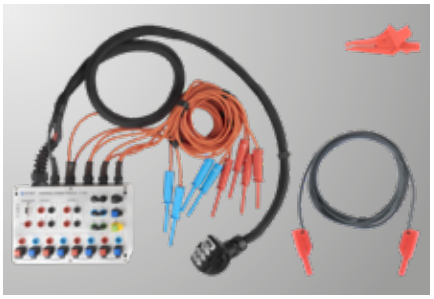
Metrel has developed a selection of connection boxes, which can be easily adapted to customer's needs.

A 1688 Universal connection box

The A 1688 connection box is a passive device that acts as a connection interface between the CE SWITCH 5 kV and the tested equipment. It is intended for connection of various 1- and 3-phase appliances to A 1600 CE SWITCH 5 kV. Equipment with intended for fixed installation and electronic subassemblies can be tested. Connections for connection to isolated conductive parts and earthed parts are added. The connection box is coded in order to prevent from applying a too high test voltage to its outputs.



ORDERING INFORMATION



Standard set A 1688
- A 1688 Universal connection box
- A 1710 Test lead, red, 1.5 m
- A 1064 Crocodile clip, red

SUPPORTED MEASUREMENTS AND INSPECTIONS

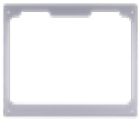
Measuring function	
Continuity	up to 25 A
Insulation	up to 1000 V d.c
Leakage	•
Power	up to 16 A-1phase
Discharge time	•
HV / HV programmable	Up to 5.1 kV AC / 6kV DC
General	
Weight	3,22 kg
Dimensions (w / h / d)	240 mm / 160 mm / 90 mm
Fastening screws	M4 x 12 DIN 912, 4 pcs

Racks and adapters for racks

One distinctive characteristic of a well-designed EOL testing system is "neatness" – i.e. how are various components integrated for best ergonomics. Housing standardized elements (central control unit, adapters etc.) in dedicated rack cabinets is usually the first step.

A 1674 Rack housing
In the A 1674 rack housing can hold the CE Multitester instrument, A 1600 SWITCH 5kV and A1460 CE Test Adapter.

Adapters for mounting in A1674 rack
The adapters enables to mount the products into standard 19'' racks

Picture	Adapter	
	A 1584	A 1584 is a rack mount adapter for 19" rack, which is designed to hold the MI 3394 CE MultiTesterXA. This product kit includes the parts needed for complete and easy installation of the adaptor kit in RITAL square hole racks, and some third-party racks.
	A 1586	A 1586 is a rack mount adapter for 19" rack, which is designed to hold the A 1460 CE Adapter. This product kit includes the parts needed for complete and easy installation of the adaptor kit in RITAL square hole racks, and some third-party racks.

ORDERING INFORMATION

Standard set A 1674
- A 1674 19" Rack housing
- A 1695 Grounding cable, 2 m

SUPPORTED MEASUREMENTS AND INSPECTIONS

Ready for integration of	
MI 3394 XS	Using adapter, A 1584
A 1600	•
A 1460	Using adapter, A 1586
General	
Weight	17,4 kg (rack without back cover) / 3,4 kg (back cover)
Dimensions (w / h / d)	622 mm / 730 mm / 526 mm

Test cages/cabinets

High voltage testing procedures require an additional physical safety layer that protects the user from accidentally touching the tested object under live voltage – a testing cage or a cabinet, preferably with a see-through door.

A 1650 Single chamber test cage

The A 1650 Single chamber test cages provides automatic protection against direct contact. Its construction is designed "ready" for integration of RFID safety module. The safety module's "coded" RFID sensor monitors the "cage closed" position, this enables the test system to prevent touching of the DUT throughout the test sequence where dangerous voltages can occur. Passive tests can be normally generated also at opened doors. Malfunction or misuse is practically impossible.

ORDERING INFORMATION

Standard set A 1650

- A 1650 Test cage, for safety system with RFID sensor

SUPPORTED MEASUREMENTS AND INSPECTIONS

Measuring function	
Test HV a.c / HV d.c	5.1 kVac / 6 kV dc max
SIL level	Up to SIL3
Recommended safety module	S 2109
General	
Weight	71 kg
Dimensions (w / h / d)	720 mm / 710 mm / 1230 mm

Test cages/cabinets

High voltage testing procedures require an additional physical safety layer that protects the user from accidentally touching the tested object under live voltage – a testing cage or a cabinet, preferably with a see-through door.

A 1676 Single chamber test cage

The A 1676 Single chamber test cage construction is designed "ready" for integration of light curtain safety module. The safety module provides the automatic protection against direct contact using light curtains. If the light curtain detects a breach into the prohibition zone, the safety module disconnects measuring circuits from the mains. No closing door is needed.

ORDERING INFORMATION

Standard set A 1676
- A 1676 Test cage, for safety system with safety light curtains

SUPPORTED MEASUREMENTS AND INSPECTIONS

Measuring function	
Test HV a.c / HV d.c	5 kVac/dc max
SIL level	Up to SIL3
Recommended safety module	S 2110
General	
Weight	33 kg
Dimensions (w / h / d)	655 mm / 995 mm / 570 mm

Safety modules

The Metrel Safety modules are electronic safety systems for monitoring the following protective measures:

- protection against direct contact
- limitation of the output current in the high voltage test to a safe level

Should any of the protection be activated power will be disconnected from the dangerous measuring circuits within a few 10 s of ms.

The safety module monitors safety independently from the main test system. Any fault in the rest of the test system cannot lead to a malfunction of the protective function of the Safety modules.

Safety Module with RFID sensor (S 2109)
This safety module is designed for test locations where a protective cover or safety door is used. The module is intended for protection with an RFID sensor and emergency switch. The RFID switch indicates the state (open or closed) of the door of the cage or cabinet. If the door is opened the safety module will disconnect the measuring circuits from the mains, which results in the maximum protection for the operator.

The safety module is equipped also with the emergency switch and the START button.

ORDERING INFORMATION

Standard set S 2109
- S 2109 Safety system with RFID sensor
- A 1728 Mains cable C13 / Schuko, 3 x 0.75 mm^2, 2 m
- A 1690 Start button
- A 1689 Emergency stop button
- A 1017 Communication cable, RS232, 2 m

Safety Module with light curtains (S 2110)
This safety module is a production friendly safety component that does not physically impact on the actions of the operator. The light curtains provide safety by stopping test system operations should an object cross a specified safety zone.

If the light curtains detect a breach the safety module will disconnect the measuring circuits from the mains immediately.

ORDERING INFORMATION

Standard set S 2110
- S 2110 Safety system with safety light curtains
- A 1728 Mains cable C13 / Schuko, 3 x 0.75 mm^2, 2 m
- A 1690 Start button
- A 1689 Emergency stop button
- A 1017 Communication cable, RS232, 2 m

Safety modules

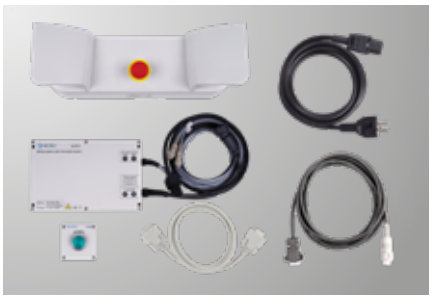
All components in the safety modules are approved safety devices.

The safety modules are a standard part of EN 50191 working place. The highest protection grades up to PLe or SIL3 can be achieved.

The CE MultiTesterXS MI 3394 XS has dedicated input/ outputs for connection to the safety modules.

Safety Module with two hand control (S 2111)
Two-hand control can be used as a safeguarding device in case of dangerous voltages on the DUT. It serves to ensure the safe location of both hands of a test system operator who controls the application dangerous test voltages. Two-hand control panel thus ensures that intervention by the operator in dangerous situations is avoided. A two-hand start control should be used for test stations where dangerous voltages are applied to tested objects without protective test covers or other protective measures such as light barriers.

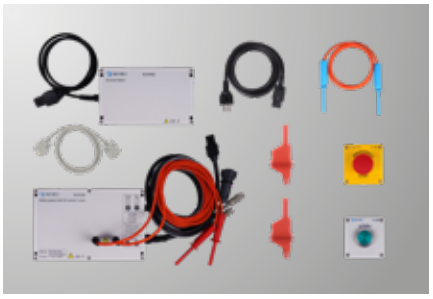
ORDERING INFORMATION



Standard set S 2111
- S 2111/1 Safety system with two-hand control
- S 2111/2 Two-hand operation console
- A 1728 Mains cable C13/Schuko, 3 x 0.75 mm², 2 m
- A 1690 Start button
- A 1696 Connection cable
- A 1017 Communication cable, RS232, 2 m

Safety Module with current limitation (S 2115)
In many countries additional workplace safety measures are not needed during the high voltage testing with a.c. up to 3mA. If the current is higher than 3 mA a special test system with automatic protection against direct contact or a sealed off area with warning light and two-handed operation is required. This Safety module is intended for limitation of the test current in the HV tests to a safe level. It consists of two boxes. The first box S 2115_1 contains resistors that are connected in series with the HV measuring circuit. The resistors significantly reduce the output power of the high voltage circuit (short circuit current < 20 mA). The second box S 2115_2 contains a current monitor. If the test current exceeds 3 mA the current monitor will disconnect the measuring circuits from the mains within a safe time. If the emergency switch is activated the test system will also be disconnected from the mains.

ORDERING INFORMATION



Standard set S 2115
- S 2115/1 Safety system with current limitaion, HV current < 3 mA
- S 2115/2 Current limiter
- A 1728 Mains cable C13 / Schuko, 3 x 0.75 mm², 2 m
- A 1773 Crocodile clip, red, (HV)
- A 1602 HV test lead with test probe, blue, 1.5 m
- A 1690 Start button
- A 1689 Emergency stop button
- A 1017 Communication cable, RS232, 2 m

Calibration boxes

Like standalone test and measurement equipment, the one used for EOL testing also requires periodic verification of accuracy and functionality. For components of Metrel EOL testing suite this is a simple box with just a few connection terminals.

A 1625 CheckBox
Verification box is an absolute must for every production line. Regular inspections reduce the risk of system malfunctioning and returning incorrect measurement results, which in turn results can lead to defective, non-functioning or even dangerous devices sent to the market. This can lead to recalls and unwanted costs.

It is wiser to inspect the test system on a daily basis. A 1625 CE CheckBox contains built-in electronic component with reference values to confirm the measuring system operates correctly. It can be used for testing correct functionality of the test system and all standard equipment.

ORDERING INFORMATION

Standard set A 1625
- A 1625 CheckBox
- A 1601 HV test lead with test probe, red, 1.5 m
- A 1602 HV test lead with test probe, blue, 1.5 m
- A 1493 Mains cable EU13 / Schuko, 3 x 1.5 mm^2, 2 m

MEASUREMENTS WHICH CAN BE VERIFIED WITH A 1625

Continuity test 2W, 4W
RISO, RISO-S,
Leakage: Differential, IPE, ISUB, ITouch
Discharge time
Power
Withstanding voltage: HV AC, HV DC up to 5kV


Mode 1
Mode 0

Software solutions

Users setting up new EOL testing lines have the benefit of using a single software, like the MESM, for controlling and communicating all elements of the suite. However, integration with 3rd party software shouldn't be a problem with SDK that comes together with the suite.

Metrel Electrical Safety Manager software (MESM)
The MESM software is a desktop application suited for users who do not need to integrate data in other software systems or platforms. This application has a unified user interface - same view same meaning. It enables the pre-treatment for the measurements, viewing and editing of the measurement results and generation of professional reports. It enables the user to create AUTOSEQUENCEs, custom tests or single tests which can be integrated into the custom created test structures and then uploaded into the measurement instrument. The downloaded measurement results can be viewed, analysed, edited and reports can be created and printed. These reports are predefined templates according to national standards and regulatory organisations where the user enters all the require test parameters while the measurement results are automatically inserted into the forms.

KEY FEATURES

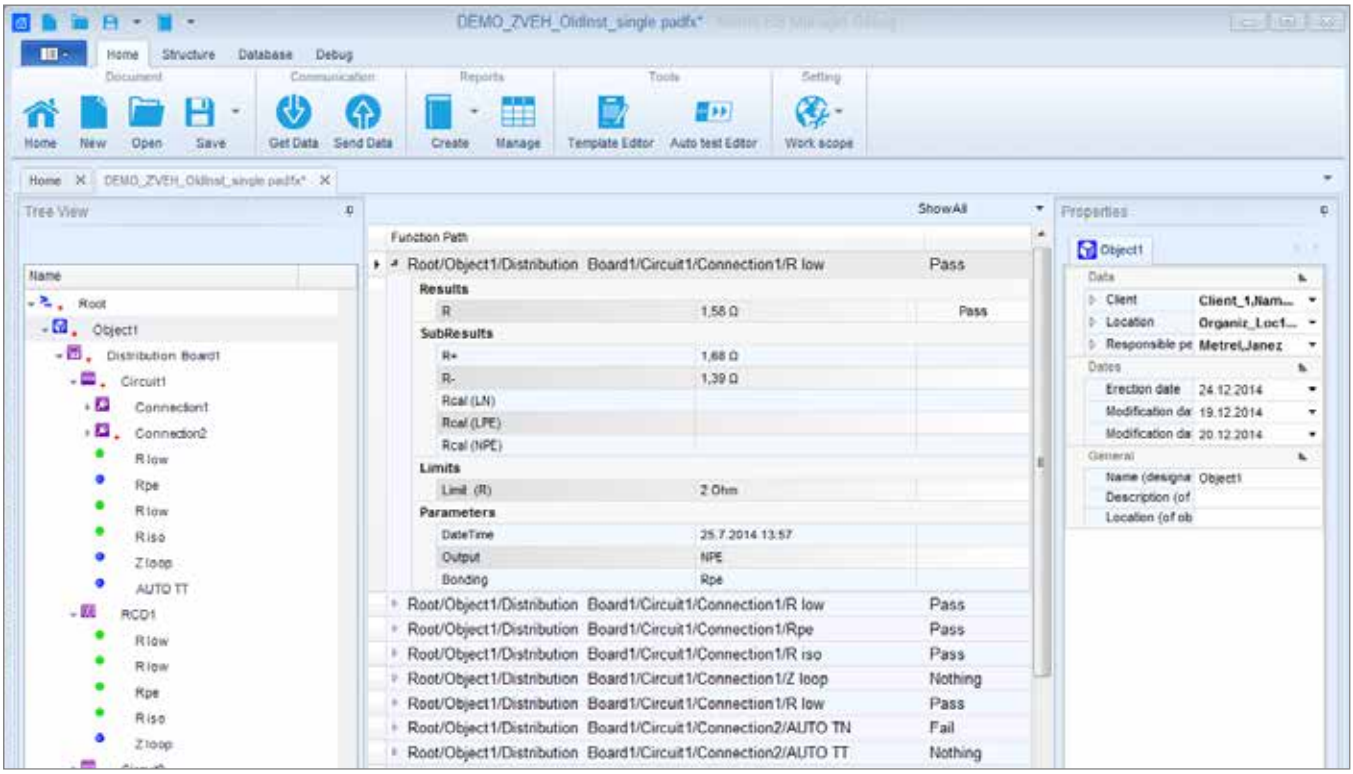
- AUTOSEQUENCE editor: application for easy and efficient preparation of AUTOSEQENCEs or custom tests.
- Report creator: enables automatic generation of professional test reports which include visual inspection of tested object and test results in tabular form.
- Multilingual reports according to local regulations: different languages for the application and reporting are supported.
- Export of test results: test results in text (.csv) or .xml format can be exported to other programs.

LICENCE BASIC

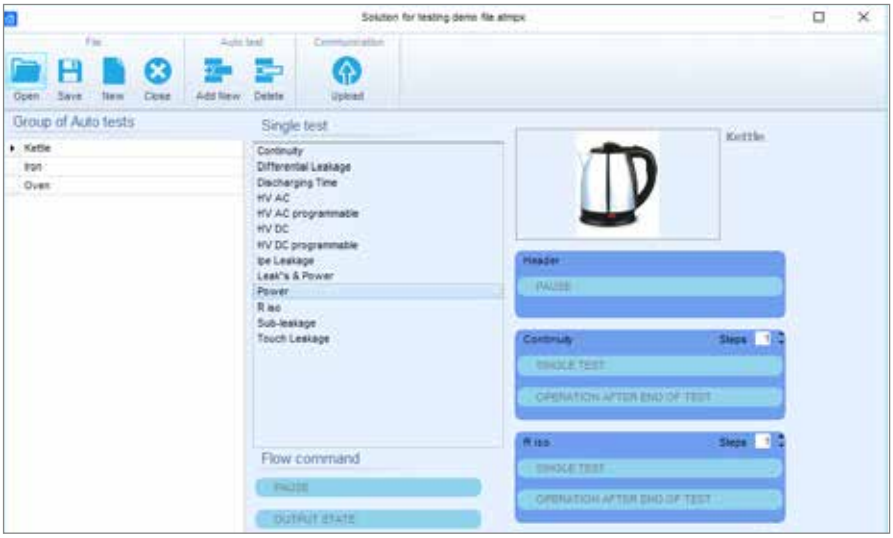
- Upload structures with empty or pre-performed measurements to the measuring device, for trending
- Upload AutoSequences
- Download structures prepared on the measuring device to MESM
- Download measured data to MESM
- Print results and create a basic report
- Upgrade FW on the device
- Synchronize licences between the measuring device and the PC

LICENCE PRO

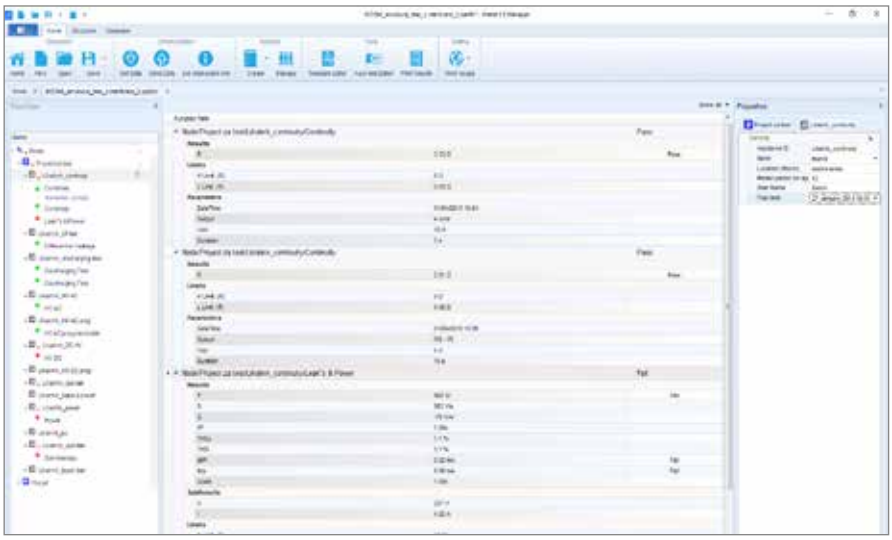
- Perform all operations as described above for BASIC licence
- Print professional reports
- PRO Export to excel



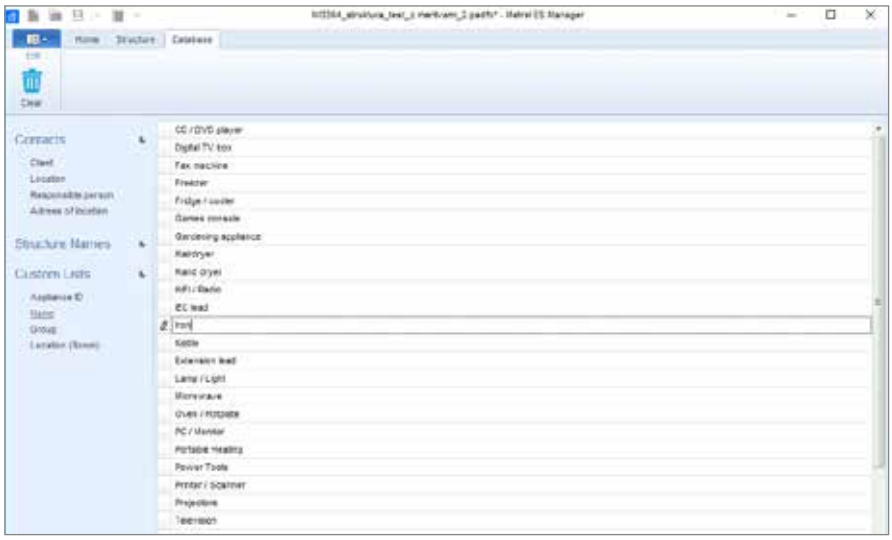
Custom Auto sequence, or group of them can be created on the PC SW and then uploaded to the instrument.



User defined structure with measurements and limits can be created on the PC SW and then uploaded to instrument.



User can define several different databases, containing information about Contacts, Structure names and Custom Lists.



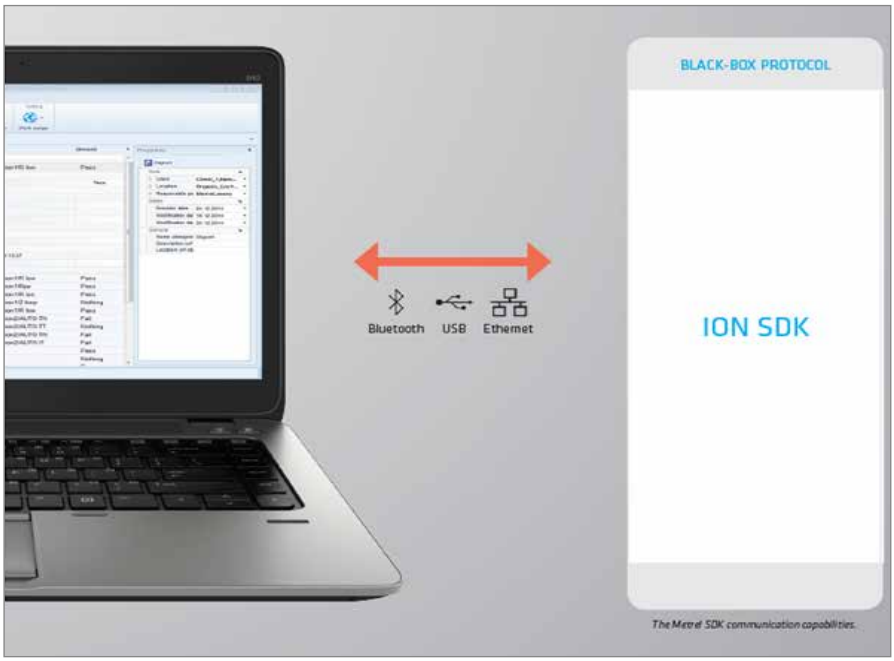
Software solutions

SDK is used by customers who employ Metrel equipment and have their own IT support to enable them to integrate the Metrel SDK solution into their systems and platforms.

Software development kit SDK
The advanced communication protocol SDK is an interface for data communication with Metrel's new generation test instruments. The SDK itself is a set of subroutine definitions, protocols, and tools for building application software. It is intended for those who want to develop software using a .NET platform and need to interface with Metrel instruments. The SDK includes a set of API calls which makes communication with Metrel instruments simple for the user. It provides a way to manipulate data from instruments using a generic data model and makes available a set of rules for extracting and viewing data.

SDK FUNCTIONALITIES

- Black-Box protocol for online communication with the measuring instrument
- Measurement upload/download based on the SDK included database
- Auto Sequence® upload/download based on the SDK included database
- SDK enables access to all measurements of measuring instrument
- Structure object creation
- Empty measurement creation
- Upload of a newly created workspace on an instrument
- Export to XM



The Metrel SDK communication capabilities.

Blackbox protocol (free)
The Black Box (BB) protocol enables a two-way communication intended for controlling an instrument as a Black-Box. The BB protocol is a system of rules that allows a PC as a master to start communication by sending the request command to the instrument, which answers according to the protocol. This enables hands free operation as the control over the tester is delegated to an automated system. The BB protocol solution is primarily suitable for automated production line testing.

The Black-Box protocol is also designed to be used with other PC SW engineering tools such as Visual Basic, C++ and LabView, which, with some effort, can be used to perform remote communications between your computer and test instrument.

Data exchange via, BlackBox protocol

Data exchange via, BlackBox protocol

Build your electrical safety testing system

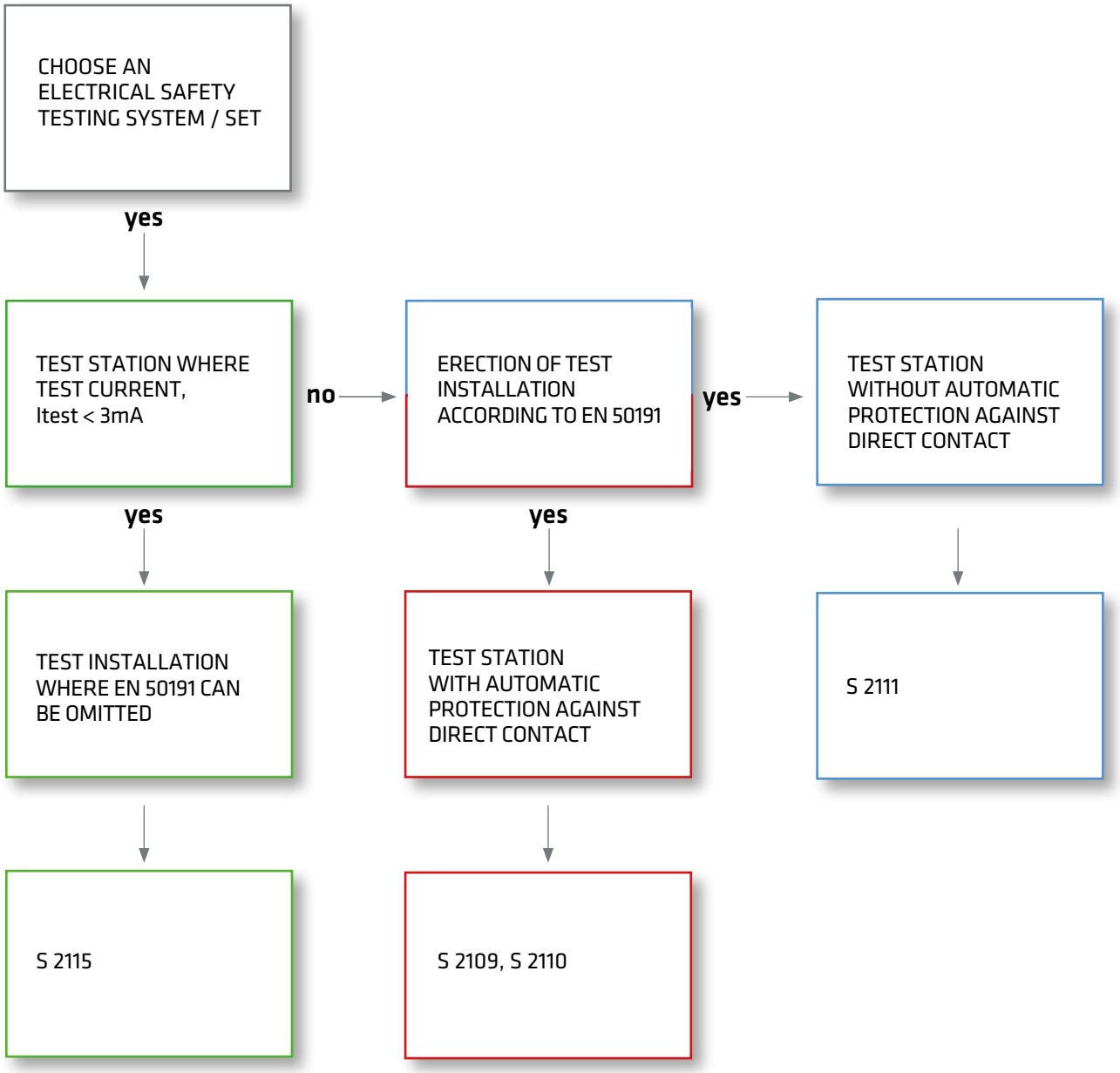
The Metrel range covers testing on production lines with several different test station models. Operator safety is implemented through three different approaches.

1. Test station with automatic protection against direct contact according to EN 50191.
a) Safety is assured with a safety module designed in the RFID sensor.
b) Safety is assured with a safety module designed in the light barrier sensor.

2. Test station without automatic protection against direct contact according to EN 50191. Safety is assured with a safety module designed on the two-hand control device.

3. Test station where test current Itest does not exceed 3 mA. Standard EN 50191 can be omitted.

Product selector



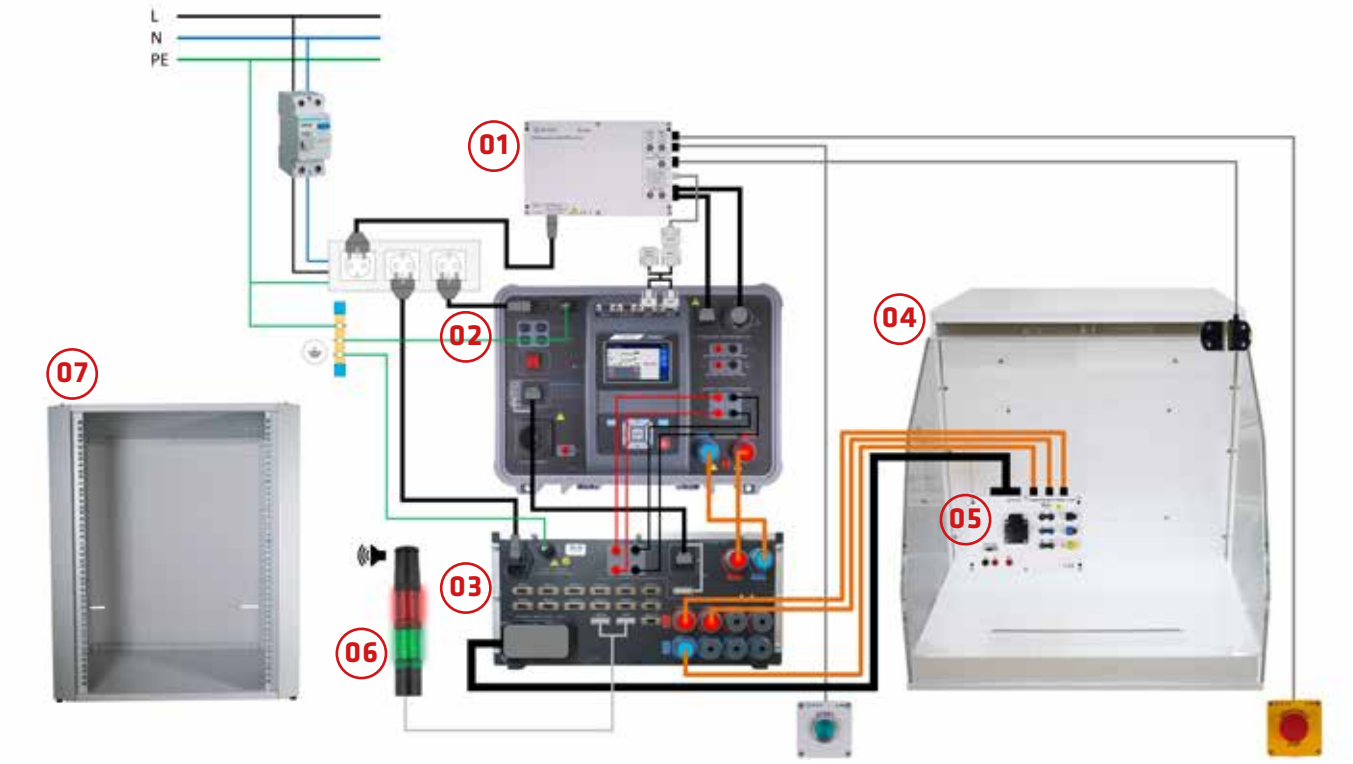
Examples of test systems

1. Test station with automatic protection against direct contact according to EN 50191.

a) Safety is assured with a safety module designed in the RFID sensor.

Test stations built with enclosures, such as test cages or hoods, are the most commonly implemented option. This type of test station is typical in serial production lines, but is also preferred in workshops, repair, and service shops. Test stations with automatic protection against direct contact may be operated without the control and supervision of a skilled person. The safety system in a test cabinet provides automatic protection against direct contact as the testing sequence can only be started when the doors are securely closed. The 'cage closed' sensor is RFID coded, therefore malfunction or misuse is practically impossible.

Examples of test systems



01	S 2109	Safery module with RFID
02	MI 3394 XS	CE MultiTesterXS
03	A 1600	CE Switch 5 kV
04	A 1650	Single chamber test cage
05	A 1626	Connection box - 1 Phase
06	A 1496	MAG Warning lamp
07	A 1674	Rack housing

Examples of test systems

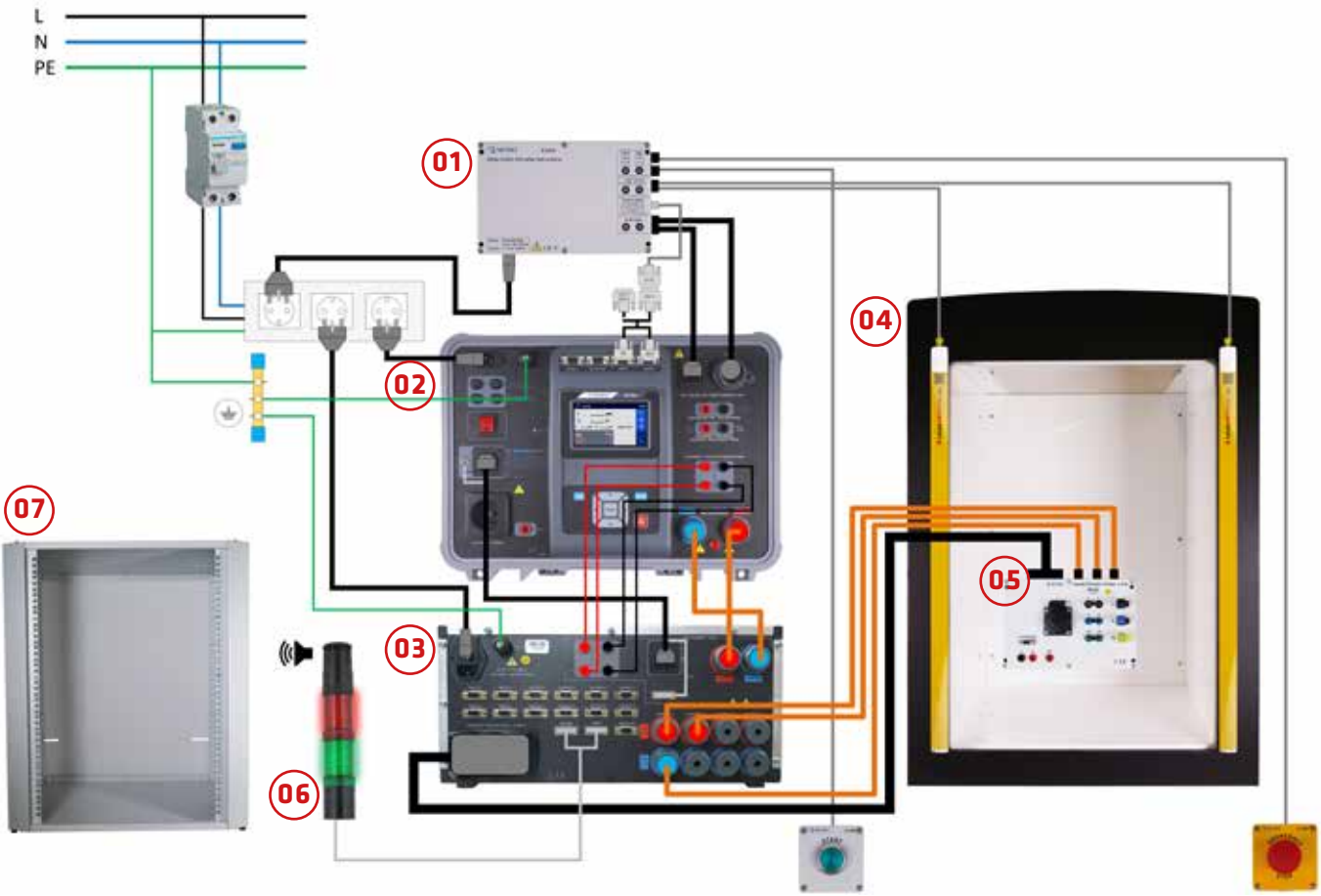
1. Test station with automatic protection against direct contact according to EN 50191.

b) Safety is assured with a safety module designed in the light barrier sensor.

Test station using enclosures such as test cages without doors is the preferred solution for production with very high frequency of testing. The safety of such system is assured with a light barrier sensor (light curtain). The light sensor monitors breaches of the prohibition zone by any object. If the light curtains detect a breach, the safety module will disconnect the measurement circuits from the mains. The testing sequence can only start when the light sensors are activated and the prohibition zone is not breached, making malfunction or misuse practically impossible.

Test stations which have automatic protection against direct contact may be operated without the control and supervision of a skilled person.

Examples of test systems



01	S 2110	Safery module with light curtain
02	MI 3394 XS	CE MultiTesterXS
03	A 1600	CE Switch 5 kV
04	A 1676	Single chamber test cage
05	A 1626	Connection box - 1 Phase
06	A 1496	MAG Warning lamp
07	A 1674	Rack housing

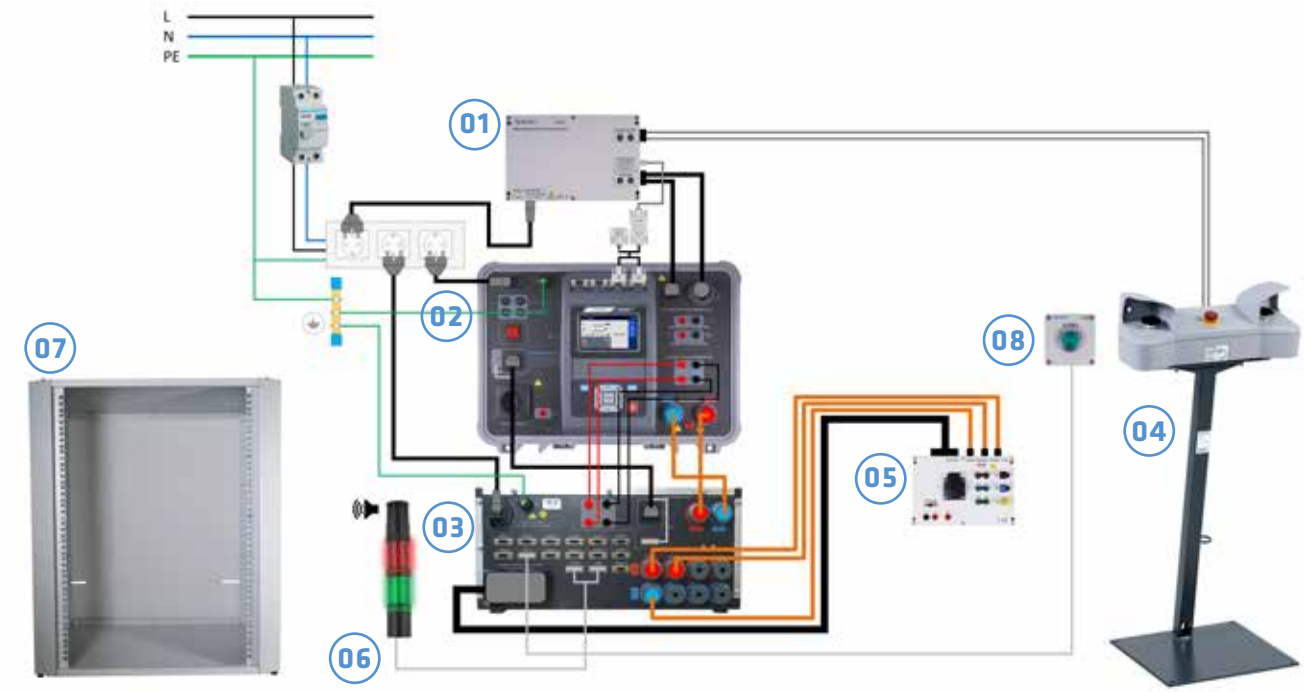
Examples of test systems

2. Test station without automatic protection against direct contact according to EN 50191. Safety is assured with a safety module designed on the two-hand control device.

Test station built with a two-hand control safety system is the preferred solution for testing larger objects. When checking the electrical safety of larger electrical devices, PE continuity must be tested on all accessible metal parts. In practice this means checking the connection of multiple locations on the device. The operator must therefore have access to the device under test some stage during the electrical safety check to perform the test on every test point. The main job of the two-handed safety device at this type of safety station is to prevent the user from performing hazardous tests when exposed to the risk of electric shock.

The device only allows the test to start when the user has both hands in contact with the safety set: both buttons on the pair of hand controls must be pressed during the test. This prevents the user from accidentally coming in to contact with the parts that become live during the test. If any of the buttons is released, the safety module disconnects the dangerous measurement circuits from the supply.

Examples of test systems



01	S 2111	Safery module with two hand control
02	MI 3394 XS	CE MultiTesterXS
03	A 1600	CE Switch 5kV
04	A 1764	Stand for two hand contol panel
05	A 1626	Connection box - 1 Phase
06	A 1496	MAG Warning lamp
07	A 1674	Rack housing
08	A 1690	Start button

Examples of test systems

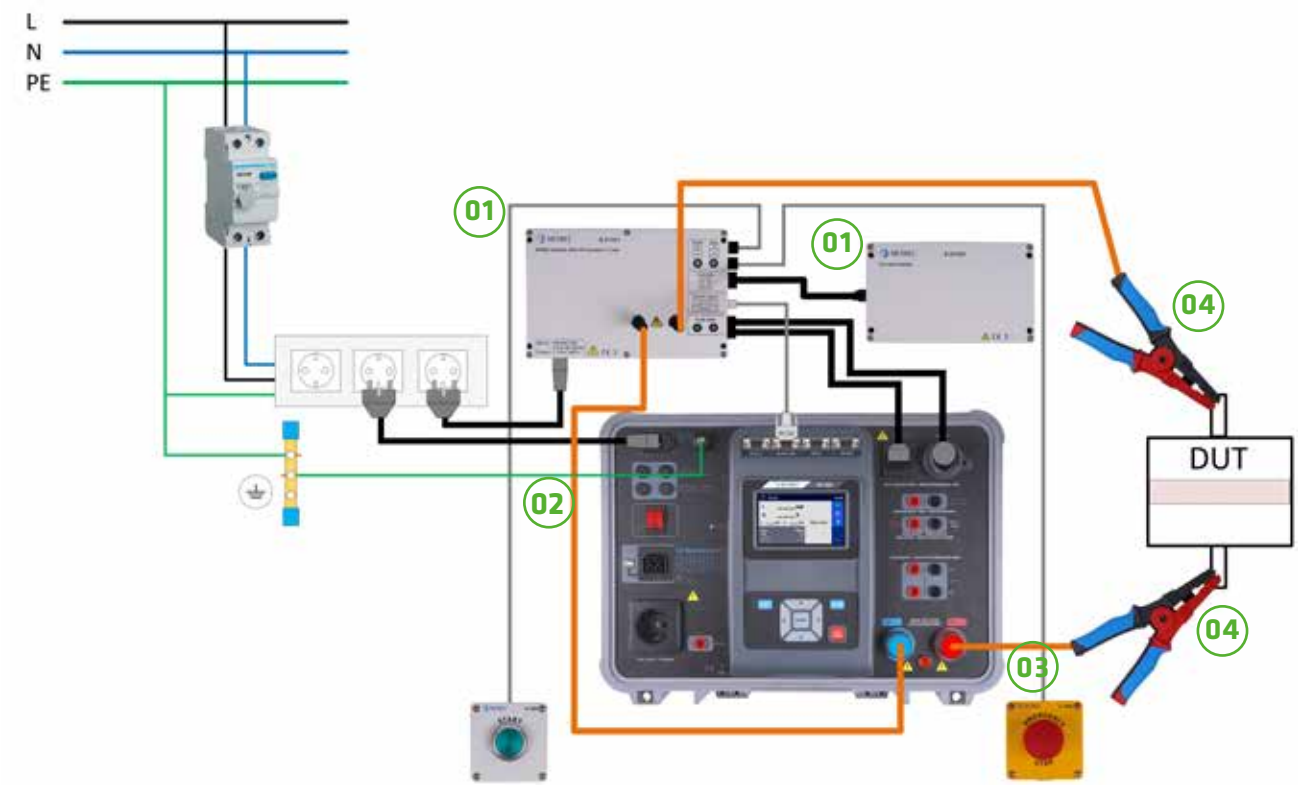
3. Test station where test current Itest does not exceed 3mA. Standard EN 50191 can be omitted.

Ensuring safety at work is a requirement of the association for employers' liability insurance. Safety requirements for preforming of high voltage test are defined in the standard EN 50191.

Test stations with a current monitoring safety module are intended for production lines where withstanding test can be performed with low current output Itest < 3 mA. When such test station is used, the requirements of EN 50191 can be omitted.

The operator initiates the test sequence using the external start key. Despite the fact that safety is ensured by the current limit, the test station is additionally protected by a safety button for emergency shutdown.

Examples of test systems



01	S 2115	Safery module with current limitation control
02	MI 3394 XS	CE MultiTesterXS
03	A 1602	HV test lead blue
04	A 1596	HV crocodile clip red 2 pcs


2.4. Test Laboratories and experimental stations
< 1kV
> 1kV
4.5. Temporary test station

How can we help?

As a help when making work stations for testing safety of electrical equipment. Metrel has prepared a special booklet **"Practical Guide for erection and operation of electrical test equipment According to EN 50191".**

Selection Guide for Accessories

Photo	Part No.	Description	Target application
	A 1560	Burn Link adapter	For performing insulation breakdown test with limited breakdown current "30 mA".
	A 1754	Universal test socket	Universal test socket for testing of devices without ground bond connection (protection class II). Suitable for plug type A, B, C, E, F, G, I, J, K and N
	A 1610	Continuity test adapter	Continuity test adapter enabling point-to-point testing of earth continuity with 10 & 25 A test current. Test voltage 5.500 V a.c / 6.000 V d.c., Test current 16 A a.c
	A 1495	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 1495 PL	Adapter for pedal and signal lamps	The adapteris designed to enable use of remote pedal and LED signal lights connected to the instrument.
	A 1511 2M5	Tip Commander 2,5 m	Tip commander serves as a remote control for performing passive tests, (4-wire continuity test, insulation resistance test with probe, substitute leakage test with probe). The commander has a built in LED torch lamp including PASS/ FAIL status LEDs and start key for initiating the tests. When used directly from instrument the connection cable A 1583 must be used
	A 1511 5M	Tip Commander 5 m	
	A 1511 10M	Tip Commander 10 m	
	A 1583	Connection cable	Connection cable for use of tip commander A 1511 directly from instrument.
	A 1497	Warning lamp / 4 LED's signal tower with buzzer	Colour - LED signal tower with build-in buzzer visually and acoustically signal ongoing tests and test conditions for use with A 1460 or A 1600. If A 1497 is used in combination with test instrument, an external power supply adaptor A 1499 is required.
	A 1496	Warning lamp / 2-LED signal tower HV	Warning lamps visually signali ongoing HV insulation test and warn the user about dangerous voltage conditions for use with A 1460 and A 1600. If A 1496 is used in combination with test instrument, an external power supply adaptor A 1499 is required.
	A 1496 MAG	Warning lamp / 2-LED signal tower HV ready for magnetic mounting	Warning lamps visually signali ongoing HV insulation test and warn the user about dangerous voltage conditions for use with A 1460 and A 1600. If A 1496 is used in combination with test instrument, an external power supply adaptor A 1499 is required.
	A 1499	External power supply 24V	For use with LED tower lamp and test instrument.

Photo	Part No.	Description	Target application
	A 1079	Discharge time cable	Adaptor for measuring discharge time on internal electronic components.
	A 1060	Power splitter for discharge time measurement	T-type power splitter for measurements of discharge time on machinery and switchgear.
	S 1058	Continuity test lead, 2 x 10 m, 2 pcs	Extension test leads for continuity measurements.
	S 2073	HV test lead 5m, without pistols	High voltage extension test leads for measurements on larger electrical equipment.
	A 1494 2M	HV test pistol with 2 m cable, blue	High voltage safety test probe for manual high voltage testing. The test tip is protected by an arc-resistant teflon tube, and it has built in almost wear-free tungsten which assures a long lifetime.
	A 1494 15M	HV test pistol with 15 m cable, blue	
	A 1486 2M	HV test pistol with 2 m cable, red	High voltage safety test probe for manual high voltage testing. The test tip is protected by an arc-resistant teflon tube, and it has built in almost wear-free tungsten which assures a long lifetime.
	A 1486 15M	HV test pistol with 15 m cable, red	
	S 2078 2M	HV test lead 2m, with pistols, 2pcs	High voltage safety test probe for manual high voltage testing. The test tip is protected by an arc-resistant teflon tube, and it has built in almost wear-free tungsten which assures a long lifetime.
	S 2078 15M	HV test lead 15m, with pistols, 2pcs	
	A 1593	Large Kelvin test clip	Large robust Kelvin crocodile clip for accurate resistance measurements on larger objects.
	A 1595	Large test crocodile, black	Large robust crocodile clip for resistance measurements on larger objects.
	A 1596	Large test crocodile, red	
	A 1639 RED-2M5	Large HV Crocodile with cable	HV test clip with cable for best contact with different contact surfaces. 35 mm jaw opening.
	A 1639 RED-5M		
	A 1639 RED-10M		
	A 1639 RED-15M		
	A 1639 BLU-2M5	Large HV Crocodile with cable	HV test clip with cable for best contactwith different contact surfaces. 35 mm jaw opening.
	A 1639 BLU-5M		

Selection Guide for Accessories

Photo	Part No.	Description	Target application
	S 1072	Continuity test lead with crocodile clip, 2 x 2.5 m, 2 pcs	Extension test leads with protective shield and with crocodile clips for continuity testing with high test currents (10 A, 25 A).
	S 2012	Continuity test lead, 10 m, 2 pcs (red, black)	Connection leads for different measurements.
	S 2025	Test lead, 1.5 m, 2 pcs (black, red)	
	A 1154	Test lead, black, 4 m	Connection lead for different measurements
	A 1331	Test lead with crocodile clip, black, 1,5 m	Test lead with crocodile clip for continuity measurements.
	A 1341	Test lead, green 1.5 m	Connection lead for different measurements.
	A 1342	Test lead, brown 1.5 m	Connection lead for different measurements.
	A 1309	Crocodile clip, green	Crocodile clip assures secure and permanent contact during the measurement.
	A 1310	Crocodile clip, blue	
	A 1297	Crocodile clip, brown	
	A 1013	Crocodile clip, black	
	A 1064	Crocodile clip, red	
	A 1062	Test probe, green	Test probe with fi 4 mm connection is suitable for performing measurements where contact probe is needed.
	A 1015	Test probe, blue	
	A 1298	Test probe, brown	
	A 1014	Test probe, black	
	A 1016	Test probe, red	
	A 1488	Bluetooth Able printer, (battery or mains operated)	Printer supports printing of simple labels which contain information such as Appliance ID, appliance name, test status, test or retest date, user name, or QR codes which contain information such as Parent object name, Test code, Object ID, test date, test period, Auto Sequence® status, Object status, user
	A 1489	Label printer Able, with power and data cables, (battery or mains operated)	Printer supports printing of simple labels which contain information such as Appliance ID, appliance name, test status, test or retest date, user name, or QR codes which contain information like Parent object name, Test code, Object ID, test date, test period, Auto Sequence® status, Object status, user.
	S 2062	Bluetooth label printer set, (mains operated)	Printer supports printing of simple labels which contain information such as Appliance ID, appliance name, test status, test or retest date, user name, or QR codes which contain information like Parent object name, Test code, Object ID, test date, test period, Auto Sequence® status, Object status, user.

Photo	Part No.	Description	Target application
	A 1450	Spare label roll for S 2062	Spare label roll for s 2062, label size 50 X 25.5mm (2500 labels per roll)
	A 1520	Labels for ABLE printer, (250 labels per roll)	Spare label roll for printer A 1488 and 1489, , label size 50 X 25.5mm (250 labels per roll)
	A 1105	Barcode scanner	Barcode scanner for identification of barcode labelled appliances.
	A 1105 2D	Barcode scanner 2D RS232 connection	2D Barcode scanner for identification of barcode or QR code labelled appliances.
	A 1652	Barcode scanner (Bluetooth)	Barcode scanner for identification of barcode labelled appliances.
	A 1653	QR / Barcode scanner (Bluetooth)	QR / Barcode scanner for identification of barcode labelled appliances.
	A 1571	NFC reader / writer	NFC reader / writer allows to read and upload test results and information about tested electrical equipment to the NFC tags (NTAG 216).
	A 1572	NFC tags, fi 34mm self-stick 50 pcs	NFC tags have sufficient memory space to store test results, test code and tested appliance information.
	A 1573	NFC labels, fi 29 mm self-stick 50 pcs	NFC labels have sufficient memory space to store test results, test code and tested appliance information.
	A 1574	NFC cable-tie, L 130 mm 50 pcs	NFC cable-ties have sufficient memory space to store test results, test code and tested appliance information.
	A 1017	Communication cable RS232	RS232 interface cable for connecting the instrument with the PC.
	A 1171	RS232 / USB adapter with 1 m cable	RS232 / USB adapter for instruments without USB communication port.

Selection Guide for Accessories

Photo	Part No.	Description	Target application
	A 1578	RS232 to USB adapter for external USB keyboard	The A 1578 adapter enables the connection of external USB keyboard, for easy data entering.
	P 1101	Metrel MESM BASIC to PRO licence key Upgrade	Licence key for upgrading the Metrel Electrical Safety Manager to advanced version with professional report creation and Excel PRO export functionality.
	P 1102	Metrel FW Profile Licence Key With PRO SW Set	Licence key for an additional FW profile and PRO MESM functionality.
	P 1104	Metrel SDK Licence Key	SDK licence key for instrument integration with 3rd party SW.
	P 1102-AND	Metrel aMESM PRO License Key Upgrade (A 1522)	The aMESM is an advanced portable appliance safety testing tool for Android devices. The Application is free for download from the Android Market via Google Play. For a full-featured application, a special licence is needed. Please contact your local distributer for further information.
	A 1521	USB isolator	It is intended as galvanic insulation of USB interface between our products and PC to prevent damage of USB connected equipment in case of accidentally applied voltage difference between two types of equipment.
	A 1458	SanDisk MicroSD card reader	Move data between your computer and memory card with memory card reader.
	A 1764	Stand for two-hand control panel	Suitable for the mount of two-hand control model S 2111.
	A 1696	Connection cable	The connection cable is intended for connection of A 1690 directly to CE SWITCH A 1600.
	A 1047	HV test lead, red, 2 m	HV test lead for Withstanding measurements on electrical equipment.
	A 1048	HV test lead, black, 2 m	
	A 1690	Start button	The start button is intended for connection to safety modules (S 2109, S 2110 or S 2115), or for connection to A 1600.
	A 1689	Emergency stop button	Emergency stop button is intended for disconnection of measuring circuits from the mains. The emergency stop button is intended for connection to safety modules (S 2109, S 2110 or S 2115).

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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.

Broshure_ Solutions for Electrical Safety Test Systems _MI 3394 XS_2021_September_Ang