MULTI TEST UNIT
DEVICE FOR ELECTRICAL, SAFETY AND FUNCTIONAL TESTS

The multi test unit M1 allows with a single instrument to perform the safety and functional electric test in compliance with the norm CEI EN 60335-1:

- Measure of the ohmic value
- Measure of the dielectric strength
- Measure of the insulation resistance
- Measure of the ground conductor efficiency

The system allows to personalize every parameter, setting programs retrievable and to generate customized report based in the specific needs.

Summary

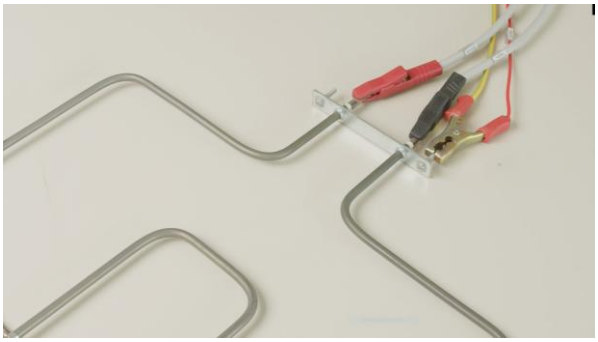
ADVANTAGES

PROGRAMMABLE TEST CYLCE

- The instrument allows a complete personalization is possible to set the sequence of the test planned, the nominal value and the tolerance per each value.
- Use personalized test programs previously saved
- Predisposed for use a barcode reader to quickly retrieve programs and products batch data

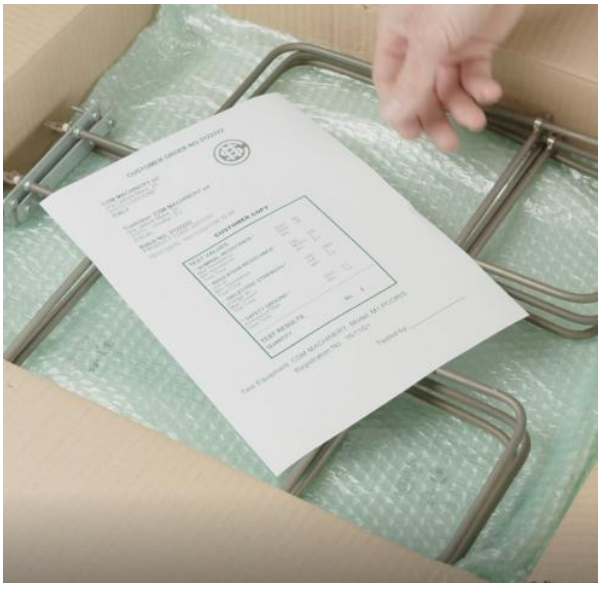
CONNECTIVITY AND SUPPORT

- Integrated PC with Windows 10 operating system
- Remote assistance
- Possibility to connect external peripherals



REPORT AND STATISTICS

- Collection of the data related to all the measures of each product tested, comparison between nominal value-tolerance, result
- Data collection for production batch
- Display during the tests cycle the values per each measurement.
- Results of the measures per batch (Total pieces tested, amount of good/rejects, %)
- Average Ω value - Scatter – Standard deviation –
- Print at the end of the test or at the end of the batch of the data collected for single item tested or for the entire lot of production



GENERAL CHARACTERISTICS

Possible measures	Measure	Standard norms
Ohmic value	500 RES (see index)	
Dielectric strength	500 PTA (see index)	CEI EN 60335-1 Art. 16.3
Insulation resistance	500 PIS (see index)	CEI EN 60335
Ground conductor efficiency	500 PIS (see index)	CEI EN 60335 – Art 27.5

TECHNICAL FEATURES

Monitor touch screen	Dim. 14”
Industrial PC with windows 10 operating system	
Thermal printer integrated	width 58 mm, maximun roll diameter 50mm
Power supply instrument	230 Vac ± 10% - 50/60 Hz (athers on request)
Device dimension	(h.p.l.) 540x400x350mm
Maximun number of programs	30.000
Porte USB 2.0	Nr. 3
Ethernet port	Nr. 1
External connector I/O port to connect functional peripherals	
Typical test cycle time	8 seconds

OPTIONS

Cod. M1.ORI-CAVI	**Cables set for instrument M1.PC.ORIS.10** Length of the cables: 2 meters
Cod. M1.2ORI-CAVI	**Cables set for instrument M1.PC.2ORIS** Length of the cables: 3 meters
Cod. M1.ORI-KIT010	**Accessory kit composed by:** • 2x Retractable Tip Gun • 2x Connection Sleeve for Gun • 1x Waterproof Junction Box • 1x Foot Pedal 
Cod. 550.LCD. CCD	**Bar code reader**

AVAILABLE VERSIONS

Models	Description
M1.PC.ORIS.10	Multi test instruments with automatic sequence test and with ohmic test on single branch.
M1.PC.2ORIS	Multi test instruments with automatic sequence test and with ohmic test on double branch.

LAYOUT

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MEASUREMENT OF OHM VALUE

This is a Volt-current test with 4 cables (2 Voltmeter and 2 Ammeter cables - Kelvin type) to eliminate any contact resistance.

The test consists in automatically applying a Constant Continuous Current to the Product being tested according to the Ohm Value provided for, for a Programmed Time, then measuring the Voltage Drop and calculating (V/I) the corresponding Ohm Value.

The test has a positive result if, for the entire test time, the "R" value (Ω) measured remains within the set range, and negative if it is outside of the set range with the subsequent interruption of the test.

When the test is started the instrument automatically sets the current value and the full-scale voltage range to match with the set ohm range. During the course of the test, the values of the current and the voltage vary automatically in order to obtain the maximum reading precision.

Values which can be set for the test

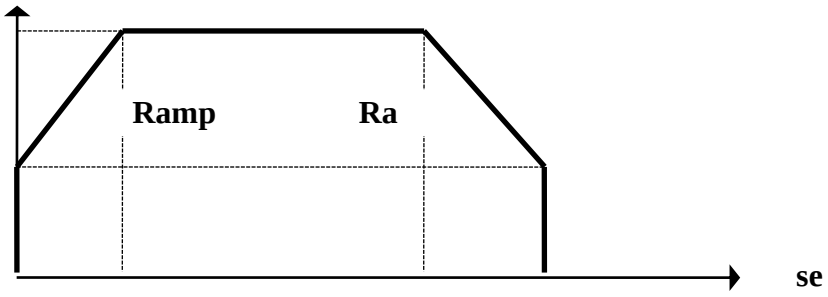
Upper threshold resistance	Ω	from	0 to	20,000
Lower threshold resistance	Ω	from	0 to	20,000
Test time	sec.	from	0.3 to	99.9
Tolerance				
* in absolute value: minimum	Ω	from	2 to	20,000
maximum	Ω	from	2 to	20,000
* in percentage	% ±	from	0.1 to	19.9

Technical data per measurement range

Range (Ω)	Test Current (mA)	Precision %
2.000	100	± 0.5
20.00	100	± 0.2
200.0	10	± 0.2
2.000 K	1	± 0.3
20.00 K	0.1	± 0.5

DIELECTRIC STRENGTH TEST (HI-POT)

The dielectric strength test is carried out as prescribed by the CEI EN 60335-1 Standard Art. 16.3, as shown in the diagram



Programmable machine parameters

U1 = Initial voltage (normally 50% of U2)	Vac	from	10 to	100 of U2
Ramp 1 = Programmable time	sec	from	0.00 to	9.99
Ramp 2 = Programmable time	sec	from	0.00 to	9.99

Values which can be set for the test

U2-Nominal test voltage	**Vac**	**from**	**500 to**	**3,000**
Resolution	Volt			1
Precision	%±			5
Maximum value of the test current	**mA**	**from**	**0.1 to**	**25**
Resolution	mA			0.1
Precision	%±			2
Test time	**sec.**	**from**	**1.50 to**	**99.9**
Resolution	Volt			1

Test description

The test consists in applying the voltage between the short circuited phase(s) and the earth for the set time and then continuously measuring the value of the leakage current.
It is possible to highlight the active component of the leakage current when working with the principle of capacitive coupling, for example noise filters, motors and others (only for test equipment, not available for test instruments).
The actual test begins when the nominal voltage (U2) is reached.
The test current is continuously monitored for the entire duration of the test and the test ends when the maximal current 25mA is reached.
For safety's sake a static switch disconnects the power supply if the test current exceeds the max accepted nominal value (35 mA peak)
When the test is interrupted a relay will separate the supply from the external circuit.
If the test current remains below the programmed value, the test will end with a positive result.

Self-Testing

When either the test voltage varies by a greater amount than the set value (+/- 5%) or the test current value is less than the set value, the warning "Fault" is displayed.

MEASUREMENT OF INSULATION RESISTANCE (CEI EN 60335)

The Insulation Measurement consists in the applying of a programmed continuous voltage between the phase(s) and the ground of the Product being tested for a set time and measuring of the current which flows.

The equivalent resistance value (MΩ) is calculated with the formula **V/I** .
The test voltage is generated by a **PWM** (Pulse Width Modulation) circuit and it is continuously monitored for the whole duration of the test. If the resistance value (MΩ = V/I) is less than the programmed value, the test is immediately suspended with a negative "Reject" result.

If the measured value is greater than the programmed value for the whole duration of the test, the test ends with a positive "Good" result.

Values which can be set for the test

Possibility of test with 3 different voltages (250 - 500 - 1.000 Vdc).
With nominal test Voltage V dc 250

Mohm value	Measurement resolution Mohm	Precision % e.o.s.
from 0.1 to 0.5	0.01	1
from 0.5 to 5	0.01	2
from 5 to 50	0.01	3
from 50 to 500	0.1	5
More than 500	1	not definable

With nominal test Voltage V dc 500

Mohm value	Measurement resolution Mohm	Precision % e.o.s.
from 0.1 to 1	0.01	1
from 1 to 10	0.01	2
from 10 to 100	0.01	3
from 100 to 1000	0.1	5
More than 1000	1	not definable

With nominal test Voltage V dc 1000

Mohm value	Measurement resolution Mohm	Precision % e.o.s.
from 0.2 to 2	0.01	1
from 2 to 20	0.01	2
from 20 to 200	0.1	3
from 200 to 2000	1	5
More than 2000	1	not definable

Test time Sec. from 0.2 to 99.9

Self-testing

If the test voltage moves out of the set tolerance, the test ends with the result "Fault" being displayed.

MEASUREMENT OF GROUND CONDUCTOR EFFICIENCY (CEI EN 60335 – ART. 27.5)

The measurement of the ground conductor efficiency consists in applying a programmed alternating current between the ground contact present on the product being tested and any metal part of the same, for the set time and in measuring the voltage drop. The ohm value is calculated using the V/I ratio and must be 0,1 Ω, according to the standard EN 60335, art. 27.5.

The applied open-circuit voltage must be 10-12 Vac. The current in the closed circuit should be between ≥10 - ≥25A. This test is carried out with four cables (2 Voltmeter and 2 Ammeter cables) to eliminate any contact resistance.

With our equipment it is possible to carry out this test in two different ways:
Type R - By ensuring that, for the entire test time, the value of the equivalent resistance (**Ω** =V/I) remains between the minimum and maximum set values (CEI EN 60335 standard, art. 27.5 max. value 0.1 Ω.)

Type V - By making sure that the value of the voltage drop normalized with the test current (at 10A or 25A) lies between the minimum and maximum set values.
If the values are included in the programmed range, the test ends with a positive result.

The test ends with a negative result if the values are out of range.

Table for max. voltage drop in relation to the cable section according to CEI EN60204-1 table 7.

Minimum section of cable with which the mass being tested is connected to the equipotential protection system (mm^2)	Maximum voltage drop allowed to the passage of a current with a value of not less than 10A (Volt)
1.0	3.3
1.5	2.6
2.5	1.9
4.0	1.4
>6.0	1.0

Values which can be set for the test

Test R
Resistance
*** maximum** Ω from 0.001 to 1.000
*** minimum** Ω from 0.001 to 1.000
Resolution 0.001
Precision % +/- 2
- Nominal current A ≥ 10 or ≥ 25
- Settling time Sec. (minimum) 0.50
- Test time Sec. from 0.5 to 15

Test V
Voltage drop
*** maximum** V ca. from 0,01 to 12.00
*** minimum** V ca from 0,01 to 12.00
Resolution V 0.01
Precision %+/- 2
- Nominal current A ≥ 10 or ≥ 25
- Settling time Sec. (minimum) 0.50
- Test time Sec. from 0.5 to 15

Self-testing

If the current value is less than the smallest set value, the warning “Fault” is displayed independently of the type of test (R or V).