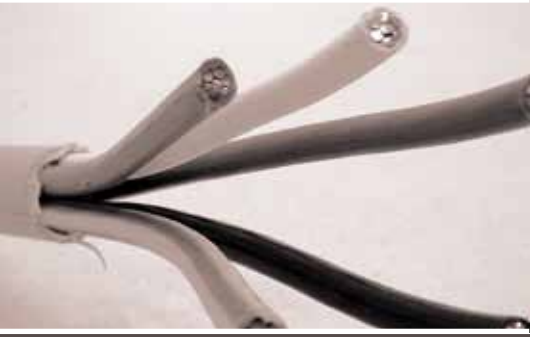
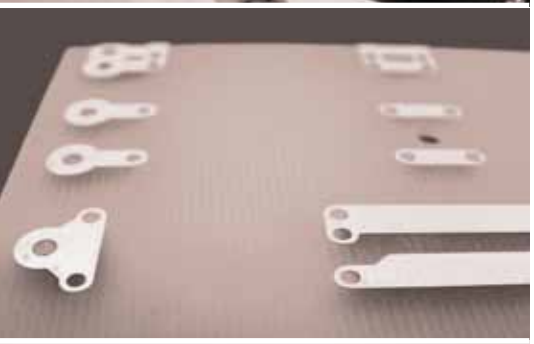
Component Tests





EMC - PARTNER

Insulation Test System

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Brief Overview of Phenomena

General

Insulation plays a great role in electro-technology, as well as electric power generation, power distribution and loads. Insulation can be stressed by a number of factors. Slowly increasing over voltages can be generated by transmission line switching, turning off heavy loads, switching of capacitive or inductive currents or by lightning strikes on power lines. The disturbance time is in the order of ms. Fast increasing over voltages are generated by switching actions related to failures and lightning in power lines and switch yards. Disturbance times are in the order of µs. Also, lightning in the vicinity of transmission power lines can induce over voltages. Very fast increasing over voltages are generated by switching or failures in gas insulated stations or substations (GIS). The very fast switching occurs as a result of high field levels before breakdown occurs in the gas (ns). Despite the fast switching phenomena, gas insulation has many advantages over conventional methods. The main advantage is that voltage withstand capability does not change with time, whereas oil/paper or solid insulators degrade with time or can even be destroyed by partial discharges. Insulation tests are to ensure that there is no breakdown or repeated flash over. Several test methods can be employed. A.C., D.C. and peak impulse are alternative test methods. It is sufficient that the equipment passes any one of the three. Impulse tests have the advantage of reduced power dissipation in the components and protection devices can be left in circuit.

EMC Partner voltage Insulation Test Systems are applied to ensure the safe operation of transformers, cables, switches and a multitude of other products. The 1.2/50 µs voltage wave is used for impulse insulation tests.

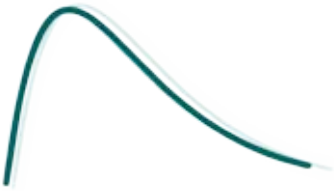
Impulse testing is performed on components and assemblies either during production or post installation as part of a routine maintenance regime. Accurate monitoring and assessment of the impulse wave shape is an essential part of the test as voltage breakdown is indicated by a change in the waveshape.

1.2/50us voltage impulse

Impulse transients can be generated by external events such as lightning or internal events like switching. The result is a voltage impulse with low energy content that appears between windings in transformers, between power lines or across physical gaps between conductors and cases etc. A normalised voltage impulse of 1.2/50us is defined in the standards IEC 60060-1 and IEC61180-1.

1.2/50us voltage & 8/20us current impulses

Surge events can be generated by lightning phenomena, switching transients or the activation of protection devices in the power distribution system. A surge itself is influenced by the propogation path taken so that impulses from the same event may have different forms depending upon where a measurement is taken. Combination Wave Generators (CWG) simulate a surge event in power lines close to or within buildings they are energy rich and should breakdown occur, an impulse current will be available that is an additional stress.



250/2500us switching impulse

Internal overvoltages as a result of breakdown or switching operations in high voltage networks generate impulses with a long time to peak and much longer duration than lightning events. Pulses to simulate these switching operations are characterized with a risetime of 250us and a duration of 2500us. Typically these long pulses are used in transformer testing.

Applicable Standards

International Electrotechnical Committee (IEC)

IEC 61000-4-5 Ed2 (2005) Electromagnetic compatibility (EMC)

Part 4-5: Testing and measurement techniques - Surge immunity test

IEC 61180-1 Ed1 (1992) High-voltage test techniques for low voltage equipment

Part 1: Definitions, test and procedure requirements

IEC 60060-1 Ed2 (1989) High-voltage test techniques.

Part 1: General definitions and test requirements IEC60335

IEC 61730-2 Ed1 (2004) Photovoltaic (PV) module safety qualification

Part 2: Requirements for testing

IEC 60664-1 Ed2 (2007) Insulation coordination for equipment within low-voltage systems

Part 1: Principles, requirements and tests

IEC 60065 Ed7.1 (2005)

Audio, video and similar electronic apparatus – Safety requirements

IEC 61010-1 Ed2 (2002) Safety Requirements for Electrical Equipment for Measurement, Control and Development use. Part 1 - General Requirements

Test System Overview

Test System Features

The Insulation Test System has many unique and outstanding features:

- Insulation test 40Ω
- Insulation test 500Ω
- Insulation test 0.5Joule
- Combination Wave Tests
- Voltages from 250V up to 96kV
- Integrated personal safety
- Integrated measurement
- Voltage ramp features
- Electronic polarity change
- Semiconductor switches
- Compact designs
- High degree of automation without software
- 2 year warranty

User Benefits

The technical excellence and many unique features of EMC PARTNERS Insulation testers translate directly into benefits for the user.

- Range of voltage / impedance combinations to meet multiple Applications
- Standard control unit, reduces user training
- Measurement system delivers information about insulation breakdown
- Integration into existing test facilities saves engineering costs.
- Pass / Fail indication for individual samples, speeds up production
- High degree of automation, reduces operator workload
- Save operator time with the automated test routines and test report facility.
- Unparalleled reliability and system up-time

Generators

A range of generators are available to cover dielectric withstand tests up to 144kV.

The generators all employ a patented EMC PARTNER voltage module that enables the same topology to be used for a generator capable of 6kV or 144kV. The same control unit and software is common across the whole range. For all generators, the most significant test parameters can be programmed as fixed values on the instrument front panel or using one of the EMC PARTNER software packages.

Photovoltaic modules

- **MIG0603**
  Impulse voltage tester 1.2/50µs voltage range 0.5kV up to 6kV. Series resistor 40ohm
- **MIG1203 and MIG1203SOLAR**
  Impulse voltage tester 1.2/50µs voltage range 1kV up to 12kV. Impedance 40ohm
- **MIG1203S250**
  Compact voltage Impulse tester with 1.2/50µs, 250/2500µs and 1/1000µs. Maximum 12kV. Impedance 40 and 500ohm.
- **MIG1803**
  Impulse voltage tester 1.2/50µs voltage range 1kV up to 18kV. Series resistor 40ohm
- **MIG1803-12**
  Impulse voltage tester 1.2/50µs voltage range 1kV up to 18kV. Series resistor 500ohm. Combination wave 0.25kV up to 18kV. Virtual impedance 12ohm
- **MIG2403**
  Impulse voltage tester 1.2/50µs voltage range 2kV up to 24kV. Series resistor 40ohm
- **MIG3603C**
  Impulse voltage tester 1.2/50µs voltage range 2kV up to 36kV. Series resistor 500ohm. Impulse voltage tester 1.2/50µs voltage range 0.25kV up to 6kV. Series resistor 500ohm. Impulse voltage tester 1.2/50µs voltage range 2kV up to 36kV. Source impedance 12ohm. Combination wave 0.25kV up to 6kV. 0.125kA up to 3kA. Virtual impedance 2ohm
- **MIG4803**
  Impulse voltage tester 1.2/50µs voltage range 2kV up to 48kV. Source impedance 50ohm. Combination wave 0.25kV up to 6kV. 0.125kA up to 3kA. Virtual impedance 2ohm
- **MIG14403 [where flexibility meets accuracy]**
  Insulation tester 1.2/50µs with two source impedances: 48 Ohm and 500 Ohm. Up to 144kV, max 3000A, current waveform approx. 8/20µs.

Generator Specifications

MIG0603

Impulse Voltage 1.2/50µs

Voltage range	0.25 up to 6kV
Voltage increment	3 digit plus comma
Impulse capacitor	10µF
Source Impedance	40 Ω
Maximum energy	200 Joule
Pulse front time	1.2 µs
Pulse duration	50 µs
Polarity	positive, negative, alternating

MIG0603

MIG1203

Impulse Voltage 1.2/50µs

Voltage range	0.5 up to 12kV
Voltage increment	3 digit plus comma
Impulse capacitor	5µF
Source Impedance	40 Ω
Maximum energy	420 Joule
Pulse front time	1.2 µs
Pulse duration	50 µs
Polarity	positive, negative, alternating

MIG1203

MIG1203SOLAR

Impulse Voltage 1.2/50µs

Voltage range	0.5 up to 12kV
Selectable Load Ranges	10 - 183nF (7 ranges)
Impulse capacitor	2.5µF
Source Impedance	40 Ω
Maximum energy	90 Joule
Pulse front time	1.2 µs
Pulse duration	50 µs
Polarity	positive, negative, alternating

MIG1203SOLAR

MIG1203S250

Impulse Voltage 1.2/50µs, 250/2500µs, 1/1000µs

Voltage range	0.5 up to 12kV
Source Impedance	40 Ω and 470 Ω
Impulse capacitor	5µF
Maximum energy	420 Joule
Pulse front time (1)	1.2 µs
Pulse duration (1)	50 µs
Pulse front time (2)	250 µs
Pulse duration (2)	2500 µs
Pulse front time (3)	1 µs
Pulse duration (3)	1000 µs

MIG1203S250

MIG1803

MIG1803

Impulse Voltage 1.2/50µs

Voltage range	0.75 up to 18kV
Voltage increment	3 digit plus comma
Impulse capacitor	3.33µF
Source Impedance	40 Ω
Maximum energy	630 Joule
Pulse front time	1.2 µs
Pulse duration	50 µs
Polarity	positive, negative, alternating

MIG1803-12

MIG1803-12

Impulse Voltage 1.2/50µs

Voltage range	0.2 up to 18kV
Voltage increment	3 digit plus comma
Impulse capacitor	1.67µF
Source Impedance	12Ω, 500Ω
Maximum energy	280 Joule
Pulse front time	1.2 µs
Pulse duration	50 µs
Polarity	positive, negative, alternating

Impulse Current 8/20µs

Voltage range	0.2 up to 18kV
Voltage increment	3 digit plus comma
Impulse capacitor	1.67µF
Source Impedance	12Ω
Maximum energy	280 Joule
Pulse front time	8 µs
Pulse duration	20 µs
Polarity	positive, negative, alternating

MIG2403

MIG2403

Impulse Voltage 1.2/50µs

Voltage range	1 up to 24kV
Voltage increment	3 digit plus comma
Impulse capacitor	2.5µF
Source Impedance	40 Ω
Maximum energy	840 Joule
Pulse front time	1.2 µs
Pulse duration	50 µs
Polarity	positive, negative, alternating

MIG3603C

Impulse Voltage 1.2/50µs

Voltage range	2 up to 36kV
Voltage increment	3 digit plus comma
Impulse capacitor	1.67µF
Maximum energy	1110 Joule
Source Impedance	12 Ω

Pulse front time	1.2 µs
Pulse duration	50 µs
Short circuit waveshape	8/20 µs
Polarity	positive, negative, alternating

Combination Wave 1.2/50µs (8/20µs)

Voltage range	0.25 up to 6kV
Voltage increment	3 digit plus comma
Impulse capacitor	10µF
Source Impedance	2 Ω
Maximum energy	180 Joule
Pulse front time	1.2 µs
Pulse duration	50 µs
Short circuit waveshape	8/20 µs
Polarity	positive, negative, alternating

Impulse Voltage 1.2/50µs

Voltage range	0.25 up to 6kV / 2 up to 36kV
Voltage increment	3 digit plus comma
Source Impedance	500 Ω
Pulse front time	1.2 µs
Pulse duration	50 µs
Short circuit waveshape	8/20 µs
Polarity	positive, negative, alternating

MIG3603C

MIG4803

Impulse Voltage 1.2/50µs

Voltage range	2 up to 48kV
Voltage increment	3 digit plus comma
Impulse capacitor	10µF
Source Impedance	50 Ω
Pulse front time	1.2 µs
Pulse duration	50 µs
Polarity	positive, negative, alternating

Combination Wave 1.2/50µs (8/20µs)

Voltage range	0.25 up to 6kV
Impulse capacitor	10µF
Source Impedance	2 Ω
Maximum energy	180 Joule
Pulse front time	1.2 µs
Pulse duration	50 µs
Short circuit waveshape	8/20 µs
Polarity	positive, negative, alternating

Impulse Voltage 1.2/50µs

Voltage range	0.25 up to 6kV
Impulse capacitor	10µF
Source Impedance	50 Ω
Maximum energy	180 Joule
Pulse front time	1.2 µs
Pulse duration	50 µs
Polarity	positive, negative, alternating

MIG4803

MIG14403

STAGE2403

MIG14403 System

24kV stages starting from 72kV (MIG7203) up to 144kV

Impulse capacitor	2.2uF
Source Impedance	48 Ω and 500 Ω
Maximum energy	650 Joule
Pulse front time	1.2 µs
Pulse duration	50 µs

MIG14403

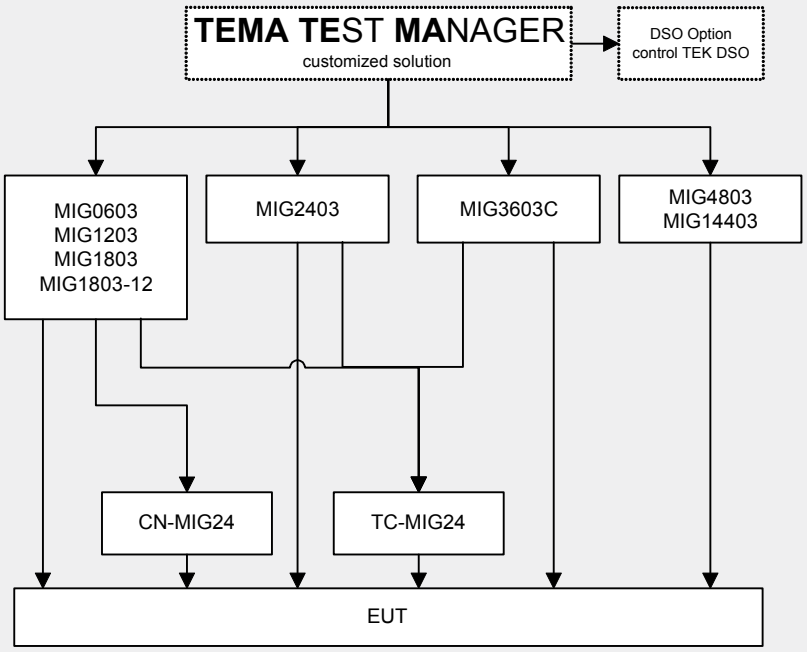
Impulse Voltage 1.2/50µs

Voltage range	4 up to 144kV
Voltage increment	4 digit plus comma
Impulse capacitor	375 nF
Source Impedance	48 Ω and 500 Ω
Maximum energy	3900 Joule
Pulse front time	1.2 µs
Pulse duration	50 µs
Polarity	positive, negative alternating up to 2 stages (48kV)

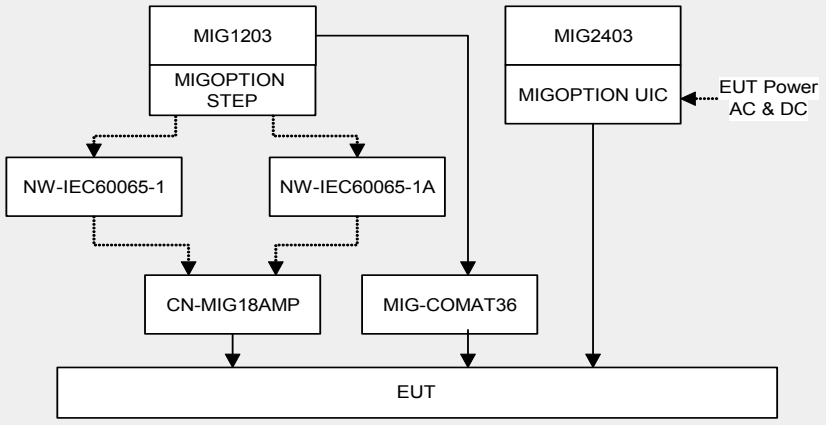
MIG7203 (72kV), MIG9603 (96kV) and MIG12003 (120kV) are upgradable with STAGE2403 up to 144kV

System Flowcharts

Insulation Testing



Insulation Testing Applications



Accessories and Options

TC-MIG24

A test cabinet for EUT with maximum dimensions 12 X 15 x 28cm. Can be used together with MIG 1206, MIG1809 and MIG2412.

TC-MIG24 is linked to the MIG 1206, MIG1809 and MIG2412 safety circuit. Opening the test cabinet disables test voltages. Safety circuit status is indicated by red and green lamps in the test cabinet.

TC-MIG24

CN-MIG-24

Accessory to MIG1206SPD insulation circuit ONLY. Two test pistols with integrated red and green warning lamps.

CN-MIG-24

CN-MIG4803

Connection box with 2 connection cables to EUT. Cable length 1.5m one red, one yellow, equipped with alligator clips at the EUT side. Personal safety at user own risk.

NW-IEC60065-1

Voltage range up to 10kV in accordance with IEC / EN 60065. Impulse capacitance 1nF. Requires MIG1203 and MIG OPTION STEP.

NW-IEC60065-1

NW-IEC60065-1A

Voltage range up to 10kV in accordance with IEC / EN 60065 >/= Ed.7: without 4 Mohm parallel resistor. Impulse capacitance 1nF. Requires MIG1203 and MIG OPTION STEP.

MIG OPTION UIC to MIG2403

Extends MIG2403 with a coupling network to superimpose the 1.2/50µs impulse to train power supplies: 3000Vd.c.; 1500Vd.c., 1500Va.c. 50Hz, 1000Va.c. 16 2/3Hz in accordance with UIC 550.

COVER BOX SMALL or LARGE

Cover box for customized connection of generators with high voltage output on top.

SMALL: Dimension 24 x 8 x 8cm. LARGE: Dimension 30 x 23 x 8cm.

COVER BOX SMALL

COVER BOX LARGE

MIG OPTION STEP

OPTION STEP to MIG1203. Must be ordered together with NW-IEC60065-1 or NW-IEC60065-1A.

STAGE2403

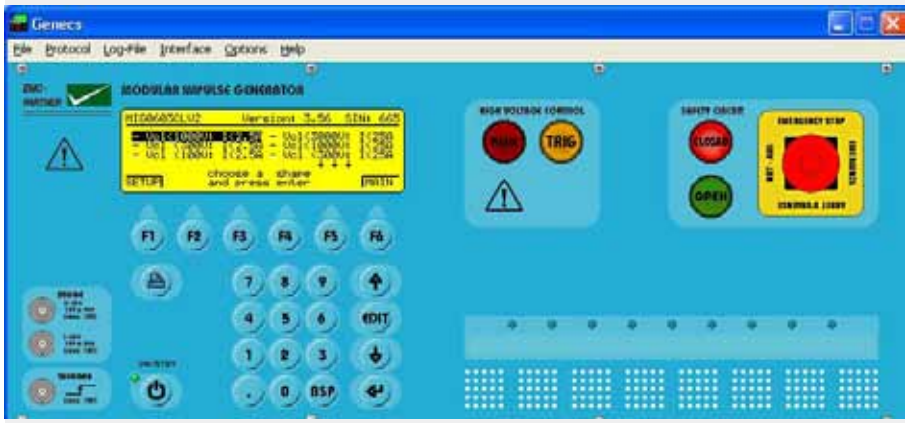
Extends the generators MIG7203, MIG9603 or MIG12003 up to 144kV. MIG14403 requires 6 stages. Extension of; MIG7303 max. 3 stages, MIG9603 max. 2 stages, MIG12003 max. 1 stage. Generator extention must be made at EMCP.

STAGE2403

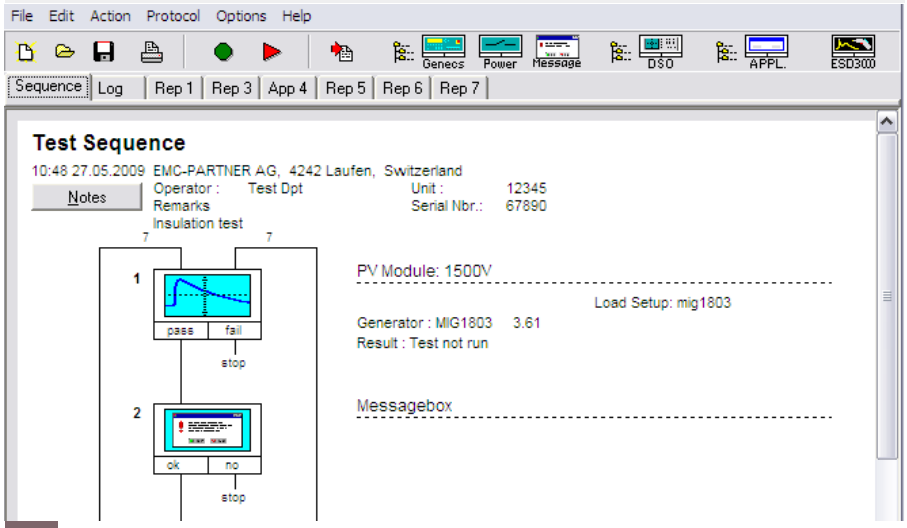
Software

For remote control of Insulation Testers, an OPTICAL LINK and one of the following software packages is needed:

- GENECS-MIG: This is a relatively simple program that reproduces generator front panel functions on a PC. In addition to remote programming and control of the generators, test report information is available to word processing or other evaluation programs such as EXCEL.
- TEMA Software: Comfortable control of EMC PARTNER generators from a PC. Enables up to four generator types to be included in the same test sequence. Generates an enhanced test report.



GENECS MIG



TEMA software

EMC PARTNER's Product Range

The Largest Range of Impulse Test Equipment up to 100kA and 100kV.

Immunity Tests

Transient Test System can be used to performs all EMC tests on electronic equipment. ESD, EFT, surge, AC dips, AC magnetic field, surge magnetic field, common mode, damped oscillatory and DC dips tests are available as stand-alone or combined test instruments. A large range of accessories for different applications is available: three phase couplers up to 690V/100A, telecom and data line couplers, verification sets, magnetic field coils. Immunity test systems fulfills IEC and EN 61000-4-2, -4, -5, -8, -9, -11, -12, -16, -18, -29.

TRA3000 and ESD3000 ideal for CE testing
Easily extended to meet other applications

Lightning Tests

A range of test equipment and accessories for aircraft, military and telecom applications. Complete solutions including all hardware and software to meet the requirements of RTCA / EUROCAE DO160 / ED14 for indirect lighting on aircraft systems, MIL-STD-461 tests CS106, CS115, CS116, for military vehicles, ITU-T .K44 basic and enhanced tests for impulse, power contact and power induction, FCC part 68 for telecom equipment testing.

MIG2000-6 – a flexible solution for military and avionic applications

Component Tests

Modular impulse generators (MIG) for transient component testing on: varistors, gas discharge tubes (GDT), surge protective devices (SPD), X Y capacitors, circuit breakers, watt-hour meters, protection relays, insulation material, suppressor diodes, connectors, chokes, fuses, resistors, emc-gaskets, cables, etc. Manual or fully automated solutions are available up to 100kA (8/20us) and 144kV (1.2/50us).

MIG1212CAP – an automatic 8 bank capacitor test system

Emission Measurements

One unit performs all measurements on the power supplies of electronic equipment and products for the CE-Mark. HAR1000 uses a novel techniques to deliver clean power source for the EUT in a compact and lightweight form. The system includes all hardware and software including line impedance networks, control and evaluation software. A basic 1-phase system can be easily extended to 3-phase by adding 2 further phases . HARCS Immunity software further expands the system by addidng interharmonic tests, voltage variation and ripple on DC tests. Complies with IEC / EN 61000-3-2, -3 IEC / EN 61000-4-13, -14,

HAR1000-3P and HARCS software a complete test system

System Automation

As addition to the basic generators, a range of accessories are available to enhance capability. Test cabinets, test pistols, adapters and software, simplify interfacing with the EUT.

PS3 programmable source is an EMC hardened supply for frequencies form 16.7Hz to 400Hz. Frequency variation tests can be made using the PS3-SOFT-EXT. Complies with IEC / EN 61000-4-28

PS3 - programmable source ideal for EMC applications

For further information please do not hesitate to contact EMC PARTNER's representative in your region. You will find a complete list of our representatives and a lot of other useful information on our website:

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