

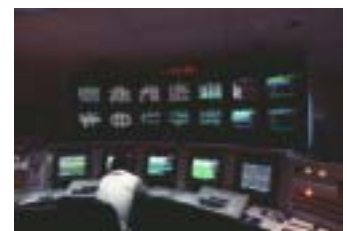


MIG-System

Protection Relay Testers



- I 1 MHz, 100 kHz Oscillation
- II 1 MHz ANSI/IEEE C37.901
- III 1.2/50 μ s with 0.5 Joule
- IV Accessories



General Information – Relevant Standards

The Different Electrical Tests

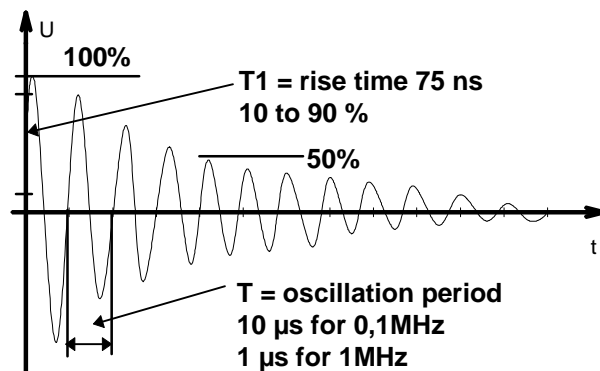
Damped oscillatory wave test

This phenomenon is representative of switching actions in HV/MV open air stations, and is particularly related to the switching of HV busbars. The oscillation frequency ranges from about 100 kHz to a few megahertz, depending on the length of the circuit and on the propagation time. The minimum repetition frequency, in respect to each phase, is twice the power frequency (100/s per phase for 50 Hz and 120/s per phase for 60 Hz). The repetition rate 40/s and 400/s represents a compromise of a three phase system.

Impedance of the test generator
For testing the input/output ports of measuring relays, the selection of the 200 Ohm impedance is a compromise. This takes into account that the characteristic impedance of cables used for this purpose (twisted pairs) has a value ranging from 120 to 150 Ohm in the frequency range above 100 kHz and for a length of the order of 100 m.

Relevant standards
IEC 255-4, IEC 255-22-1, IEC 61000-4-12, IEC834-1, VDE 435 Teil 303
ANSI / IEEE C37.901

Waveform definition



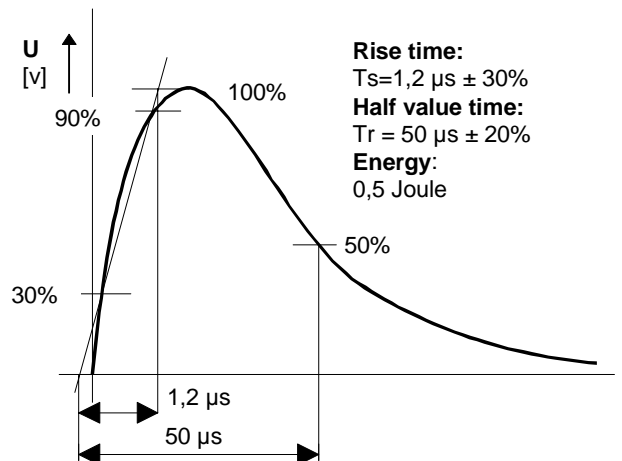
Impulse withstand test 1.2/50 μs

The classic insulation withstand test is carried out with a 1.2/50 μs waveform. This waveform must remain within tolerances, when applied to the device under test. As long as the devices under test are resistive, capacitive or inductive the 1.2/50μs wave shape can be kept within the tolerances. With protection circuits involved, it would no longer be possible to keep the waveform within tolerances. As a consequence, in IEC 255-5 a generator and a test procedure are specified for insulation withstand tests based on a defined source energy and impedance. The waveform is verified without the device under test. During tests the waveform must not be monitored.

Impedance of the test generator
The 500 ohm serial resistor of the generator defines the source impedance and limits the current through the device under test. The maximum energy of the generator must be 0.5 Joule ± 10% for each test level.

Relevant standards
IEC 255-5, 834-1
EN 61036, VDE 435 Teil 303

Waveform definition



MIG-OS-OS1

IEC 61000-4-12, IEC 60255-22-1, ANSI/IEE C37.901

The MIG-OS-OS1 is suitable to generate conducted damped oscillatory waves with frequencies of 100 kHz and 1 MHz.



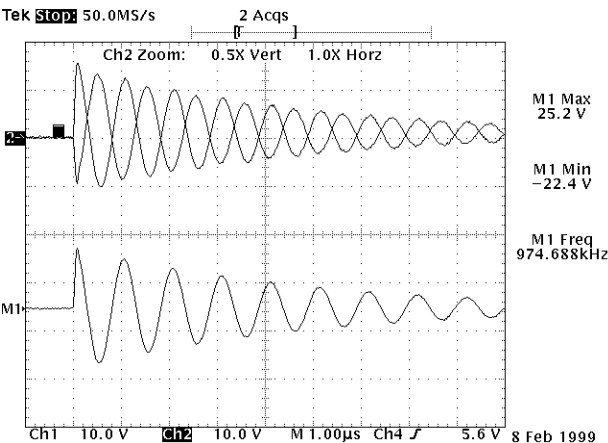
MIG-OS-OS1

Basic Data

Dimensions: 550 x 450 x 190 mm (l x w x h)
 Weight: 22 kg
 Power supply: 230 / 115 V, 400 VA

Control and Accessories

- Trigger: auto or manual
- Ramps: Voltage, Polarity
- 1 power cord depending on country
- 1 cable with HV-BNC connectors, length 0.5 m
- 1 auxiliary connector (safety circuit)
- 1 user manual with verification protocol and declarations LVD, EMC



Test levels

Level	Common mode kV	Differential mode kV
1	0.5	0.25
2	1	0.5
3	2 ²⁾	1
4	-	-
x	x	x

2) The value is increased to 2,5 kV for substation equipment

IEC 60255-22-1 and IEC 61000-4-12 high voltage circuit

- Rise time of first peak: 75 ns ± 20 %
- Oscillation frequencies: 100 kHz ±10% and 1 MHz ±10%
- Repetition rate maximum: 40/s for 0.1 MHz and 400/s for 1 MHz
- Decaying: 50% of the peak value between the third and sixth period
- Burst duration: 1 up to 99 s ± 10 %.
- Output impedance: 200 Ohm ± 20%
- Vpeak open circuit: 250 V - 10% up to 3 kV +10%

ANSI / IEEE C37.901 high voltage circuit

- Rise time of first peak: 50 to 100 ns
- Oscillation frequencies: 1 MHz - 1.5 MHz
- Repetition rate maximum: 40/s for 0.1 MHz and 400/s for 1 MHz
- Decaying: 50% of the peak value after 6 μs
- Burst duration: 1 up to 99 s ±10 %.
- Output impedance: 150 Ohm ± 20%
- Vpeak open circuit: 250 V - 10% up to 3 kV +10%

Frequency Option

Frequencies higher than 1 MHz or frequencies lower than 100 kHz are available on demand.

MIG0603OS1 IEC 61000-4-5, -9, -12

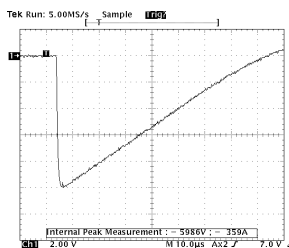
The MIG0603OS1 is suitable to carry out – in addition to the MIG-OS-OS1 – CWG tests $v = 1.2/50 \mu s$ into no load and $i = 8/20 \mu s$ into short circuit up to 6 kV and 3 kA.



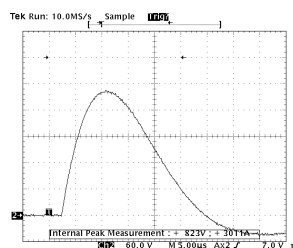
MIG0603OS1: 1.2/50 μs , 8/20 μs

High voltage circuit

- Front time 30 to 90% x 1.67: 1.2 $\mu s \pm 30\%$
- Half value time, virtual zero to 50%: 50 $\mu s \pm 20\%$
- Repetition rate maximum: 10 Impulses per minute
- Source Impedance: 2 Ohm $\pm 10\%$
- Source energy: 220 Joule at 6 kV
- Vpeak at open circuit: 0.25 up to 6 kV + 0% -10%
- Overshoot: < 5% of Vpeak



Voltage at open circuit



Current at short circuit

MIG06003OS2 IEC 60255-5

The MIG0603OS2 is suitable to carry out the 0.5 J tests $v = 1.2/50 \mu s$ at different voltage levels. The source impedance is 500 Ohm.



MIG0603OS2: 1.2/50 μs , 0.5 J

High voltage circuit

- Front time 30 to 90% x 1.67: 1.2 $\mu s \pm 30\%$
- Half value time, virtual zero to 50%: 50 $\mu s \pm 20\%$
- Repetition rate maximum: 12 Impulses per minute
- Source Impedance: 500 Ohm $\pm 10\%$
- Source energy: 0.5 Joule at voltage levels 0.5, 1, 2.5, 5 and 6 kV
- Vpeak at open circuit: 0.5, 1, 2.5, 5 and 6 kV + 0% -10%

Test Level	Energy	Generator-impedance	Impulse capacitance
0.5 kV	0.5 J	500 Ohm	4.0 μF
1 kV	0.5 J	500 Ohm	1.0 μF
3 kV	0.5 J	500 Ohm	110 nF
5 kV	0.5 J	500 Ohm	40 nF

Generator network in function of the test levels

MIG0603OM1 IEC 61000-4-5, -9, -10, -12

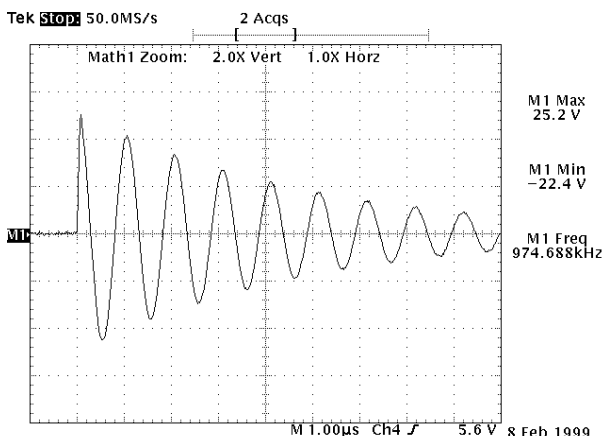
The MIG0603OM1 is suitable to carry out – in addition to the MIG0603-OS1 – magnetic field tests: 100 kHz and 1 MHz with the MF1000 antennas (in accordance with IEC 61000-4-10).



MIG0603OM1

High voltage circuit

- Oscillation frequencies: 100 kHz $\pm 10\%$ and 1 MHz $\pm 10\%$
- Repetition rate maximum: 40/s for 0.1 MHz and 400/s for 1 MHz
- Decaying: 50% of the peak value between the third and sixth period
- Burst duration: 1 up to 99 s $\pm 10\%$.
- With MF1000-1, 1 x 1 m, range 1 up to 120 A/m
- With MF1000-2, 1 x 2,6 m, range 1 up to 100 A/m



MIG0603OMI IEC 61000-4-5, -8, -9, -10, -12

The MIG0603OMI is suitable to carry out – in addition to the MIG0603-OM1 – magnetic field tests in accordance with IEC 61000-4-8.



MIG0603OMI

Test levels as specified in the standard IEC 61000-4-8

Continuous test 50/60 Hz	
Level	A/m
1	1
2	3
3	10
4	30
5	100
X	special

Short time test 1 to 3 s. 50/60 Hz	
Level	A/m
1	n.a.
2	n.a.
3	n.a.
4	300
5	1000
X	special

With the accessory **MF1000-1**:
50/60 Hz range: up to 150 A and 120 A/m

With the accessory **MF1000-3**:
Test 1 to 3 s range: up to 1200 A and 1000 A/m

Accessory CDN (not for MIG0603-OS2)

Coupling requirements
Depending on the application different coupling circuits are needed:

IEC 255-22-1 static measuring relay

Coupling capacitance: 0.5 μ F
De-coupling inductance: 1.5 mH
The path number depends on the number of tested lines.

IEC 61000-4-12 general application

Coupling capacitance: 0.5 μ F
De-coupling inductance: not specified, depends on the wanted signal

IEC 61000-4-5 CWG

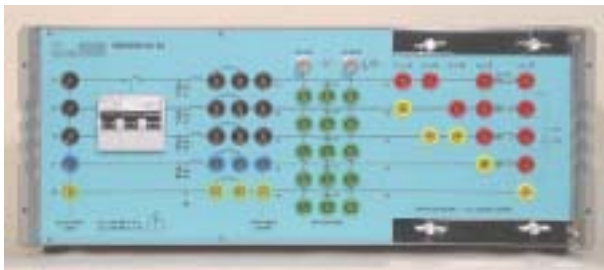
Coupling capacitance: 18 or 9 μ F
De-coupling inductance: 1.5 mH

IEC 61000-4-12 ring wave

Coupling capacitance: 10 μ F at 12 Ohm
De-coupling capacitance: 3 μ F at 30 Ohm

CDN2000-06-25

The CDN2000-06-25 fulfils all the requirements described above.
Power supply lines: 420 V, 25 A, three-phase and 4 coupling paths for I/O lines



CDN2000-06-25

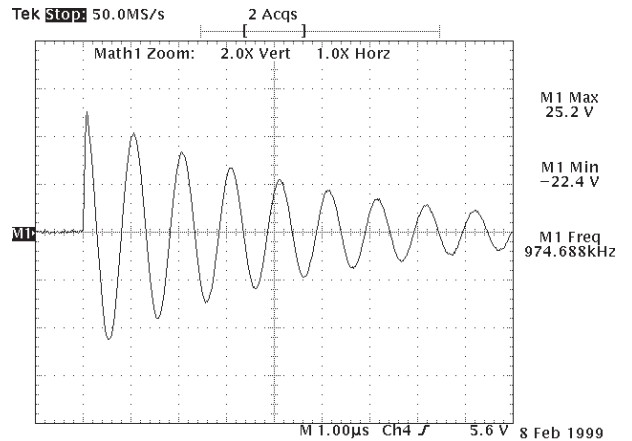
Customized filters

Additional filters are available on a application and test set-up agreement between EMC PARTNER and the enduser.

Other accessories are available on demand.

MIG-OS-MF IEC 61000-4-10

The MIG-OS-MF generates together with the magnetic field antennas 100 kHz and 1 MHz damped oscillatory magnetic fields.



Current in a 1 x 1 m antenna

Antennas

Range of standard antennas available:

- MF1000-1:** 1 x 1 m antenna
- MF1Stand:** a.c. up to 150 A/m
CWG up to 3000 A/m
1MHz up to 100 A/M
- MF1000-2:** 1 x 2,6 m antenna for a.c. up to 150 A/m
CWG up to 3000 A/m
1MHz up to 100 A/M
- MF1000-3:** 1 x 1m antenna
- MF3Stand:** a.c. up to 1000 A/m for short time up to 3s



EMC PARTNER's Product Range

Immunity Tests



The TRA2000 performs all of the following transient tests on electronic equipment that are required for the CE-mark up to full levels: **ESD, EFT, surge, dips, a.c. magnetic field, surge magnetic field and common mode tests**. A large range of accessories for different applications is available: MF antennas, three phase couplers, verification sets, coupling kits, etc. The TRA2000 complies with IEC 61000-4-2, -4, -5, -8, -9, -11, -12p, -16, -29p.



The Modular Impulse Generator (MIG) performs **damped oscillatory tests**: 100 kHz, 1 MHz, voltage and magnetic field tests. The MIG complies with IEC 61000-4-8, -9, -10, -12 as well as with IEC 60255-4, -5, -22.



The HAR1000 with the Immunity software performs the following tests: **harmonics, voltage variation and ripple on d.c.** The HARMONICS-1000 complies with IEC 61000-4-13, -14, -17, -29p.

Lightning Tests

EMC PARTNER offers a wide range of testers in accordance with FCC 68 part D, ITU K.44, ETS 300 046, Bellcore and RTCA DO-160D, etc. for telecom, aircraft and military electronic equipment testing.



Component Tests



EMC PARTNER offers a wide range of modular impulse generators (MIG) for transient component testing on: varistors, arresters, surge protective devices (SPD), capacitors, circuit breakers, watt-hour meters, protection relays, insulation material, suppressor diodes, connectors, chokes, fuses, resistors, emc-gaskets, cables, etc.

EMC PARTNER has the largest range of impulse generators in the range up to 100 kV and 100 kA. Below is an example for an insulation tester up to 24 kV.



Emission Measurements



One unit performs all measurements on the power supplies of electronic equipment and products for the CE-Mark. The HAR1000 includes an amplifier for a clean power source, a line impedance network, the measurement systems Harmonics and Flicker. Accessories: three phase extension, "Immunity" and "ANASIM" software. Complies with IEC 61000-3-2 and -3.

We look forward to working with you

For more detailed information please contact our representative in your area or EMC PARTNER in Switzerland. For information on further products please visit also our website.

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We have Representatives in:

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Asia: China, Hong Kong, Israel, Japan, Malaysia, South Korea, Taiwan, ...

Australia: Australia, New Zealand

Europe: Austria, Belgium, France, Germany, Great Britain, Hungary, Ireland, Italy, Netherlands, Scandinavia, Spain, ...

You will find contact information for all representatives at EMC PARTNER's website www.emc-partner.com.

Your local representative:

EMC PARTNER offers the largest range of impulse test equipment up to 100 kA and 100 kV in the areas of:

Immunity Tests

Lightning Tests

Component Tests

Emission Measurements