



MIG-System

Insulation Testers

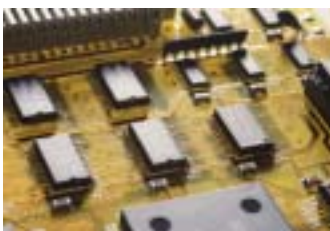


I Insulation 1.2/50 μ s

II Accessories

III Test Place incl. A.C./D.C.

IV MIGCS Software



General Information about Insulation and the Different Electrical Tests

General

Insulation plays a great role in electrotechnics, as well as in electric power generation, power distribution and loads. The insulation can be either gas, liquid or solid. Claims of insulation life span tend to be very high. Insulation is stressed by overvoltages and disturbances. Depending on the structure of the insulation of the equipment, overvoltages can reduce the amount of voltage the equipment can withstand and finally can lead to a breakdown. The dielectric voltage capability of an insulator is influenced by a number of factors such as: the amplitude of overvoltages, form and the polarity of overvoltages, the field distribution, pollution, local inhomogeneity, the ambient conditions e.g. pressure, temperature, humidity and chemical pollution, mechanical and thermal stresses during short circuits, etc. Generally the voltage withstanding capability is well known after the voltage withstanding capability test.

Of greater difficulty is the rating of the insulation after some years of operation with overvoltages and disturbances. The advantage of gas is that the voltage withstanding capability does not change over the operational time. For oil - paper insulation a continuous degradation of the voltage withstanding capability can be estimated. Solid insulators are relatively quickly destroyed when partial discharges occur.

Sources of overvoltages

Slow increasing overvoltages are generally generated by switching transmission power lines caused by failures, by turning off heavy loads, by switching of capacitive or inductive currents or by lightning hits on power lines. The variation time is in the order of *ms*.

Fast increasing overvoltages are generated by switching actions related to failures

and lightning in power lines and switch yards. The times of such overvoltages are in the order of *μs*. Also, lightning in the near zone of transmission power lines can induce overvoltages.

Very fast increasing overvoltages are generated by switching or failures in gas insulated stations or substations (GIS). The very fast switching is based on the high field before the breakdown occurs in the gas (*ns*).

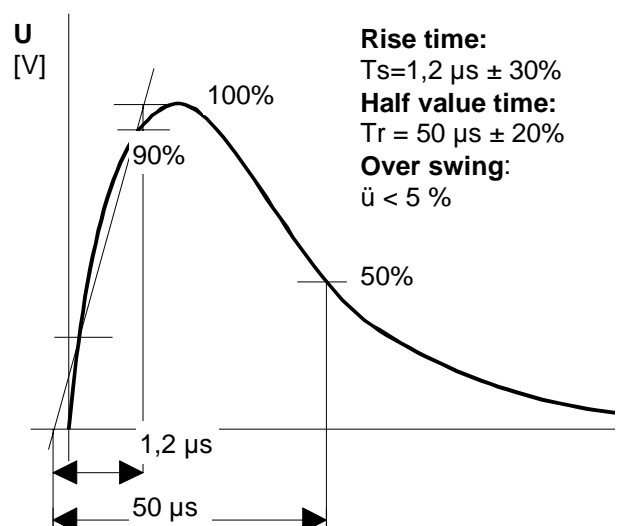
Voltage insulation tests

When voltage tests are applied, no breakdown or repeated flashover shall occur. Corona effects and similar phenomena are disregarded.

The a.c., d.c. and peak impulse tests are alternative test methods. It is sufficient that the equipment passes any of the three. The impulse test has the advantage of reduced power dissipation in the components and it is not necessary to remove protection components.

The 1.2/50 *μs* wave is used for the insulation test, specified in IEC 60, conducted for a minimum of 3 pulses of each polarity at 1 s minimum intervals.

Waveform definition 1.2/50



MIG1203, MIG1203CWG and MIG1803 for 1,2/50 μ s Insulation Tests up to 18 kV



Basic data

Dimensions: 550 x 450 x 190 mm (l x w x h)

Weight: 20, 24 kg

Power supply: 230/115 V selected automatically, power < 400 VA

Control

Counter: 1 up to 29'999
 Trigger: auto or manual
 Ramps: voltage, polarity
 Protocol: peak values, polarity, shots
 Limits: I_{peak}: V_{peak} for "passed-failed"
 Repetition: at maximum charging voltage
 15 Seconds

Load range (MIG1203 and MIG1803)

Voltage range: V_{peak} at e.g. R_s = 50 Ohm
 1000 V up to 12'000 V
 Resistance: R > 500 Ohm
 Capacitance: 0 up to 5 nF
 Inductance: > 10 mH

MIG1203

V-measurement: V_{peak} on display, V_{waveform} on BNC output (u) up to 12 kV (\pm 3%)
Waveforms: 1.2/50 μ s, <1/>2000 μ s
I-measurement: I_{peak} on display, I_{waveform} on BNC output (i) up to 300 A (\pm 3%)

MIG1203CWG

V-measurement: V_{peak} on display, V_{waveform} on BNC output (u) 12.5 kV (\pm 3%)
Waveforms: 1.2/50 μ s on output 1, CWG surge (6 kV/3 kA) on output 2
I-measurement: I_{peak} on display, I_{waveform} on BNC output (i) up to 3000 A (\pm 3%)
EUT: Watt hour meters, RCB, etc.

MIG1803

V-measurement: V_{peak} on display, V_{waveform} on BNC output (u) up to 18 kV (\pm 3%)
Waveforms: 1.2/50 μ s, <1/>2000 μ s
I-measurement: I_{peak} on display, I_{waveform} on BNC output (i) up to 300 A (\pm 3%)

Insulation co-ordination can only be achieved if transient overvoltages are controlled in line with the specific categories shown below. After the design and the production of an equipment, tests must be carried out to verify the insulation voltage withstand capability.

Overvoltages categories (Insulation co-ordination IEC 664, IEC 1010-1)

Nominal voltages phase to earth (Vac or Vdc)	Overvoltages classes and 1.2/50 μ s voltage amplitudes in V			
	CAT I	CAT II	CAT III	CAT IV
50	330	500	800	1500
100	500	800	1500	2500
150	800	1500	2500	4000
300	1500	2500	4000	6000
600	2500	4000	6000	8000
1000	4000	6000	8000	12000

MIG2403, MIG3603 and MIG4803 for 1,2/50 μ s Insulation Tests up to 48 kV

MIG2403

V-measurement: V_{peak} on display, $V_{waveform}$ on BNC output (u) up to 24 kV ($\pm 3\%$)

Waveforms: 1.2/50 μ s, <1/>2000 μ s

I-measurement: I_{peak} on display, $I_{waveform}$ on BNC output (i) up to 300 A ($\pm 3\%$)

Basic data

Dimensions: 19" rack with height of 4 units

Example IEC1010-1

Working voltage [V]	Clearance [mm]	1.2/50 μ s [V]
150	1.6	2'550
300	3.3	4'250
600	6.5	6'800
1'000	11.5	10'200
1'500	16	13'600
2'000	21	17'000
2'500	26	20'400

Either the test voltages are related to the working voltages or to the clearance or to both. Additionally, the voltage is related to pollution degree 2 and installation class II.

MIG3603 and MIG4803

The MIG3603 and MIG4803 testers are designed to fit into a 19" rack with a height of 12 units (includes control-, measurement- and high voltage part).

MIG3603

V-measurement: V_{peak} on display, $V_{waveform}$ on BNC output (u) up to 36 kV ($\pm 3\%$)

Waveforms: 1.2/50 μ s, <1/>2000 μ s

I-measurement: I_{peak} on display, $I_{waveform}$ on BNC output (i) up to 1000 A ($\pm 3\%$)

MIG4803

V-measurement: V_{peak} on display, $V_{waveform}$ on BNC output (u) up to 48 kV ($\pm 3\%$)

Waveforms: 1.2/50 μ s, <1/>2000 μ s

I-measurement: I_{peak} on display, $I_{waveform}$ on BNC output (i) up to 1000 A ($\pm 3\%$)



MIG3603

Basic data

Dimensions: 550 x 450 x 570 mm (l x w x h)

Weight: 45 kg

Power supply: 230 V or 115 V selection automatically, max. power 400 VA

Example IEC1010-1

Tester Type	Clearance [mm] up to	1.2/50 μ s [V] up to
MIG3603	46	33'500
MIG4803	68	46'800

The voltage is related to the clearance.

Control

Impulse counter: 1 up to 29'999

Trigger: auto or manual

Ramps: voltage, polarity

Protocol: peak values, polarity, shots,

Limits on I_{peak} , V_{peak} for "passed - failed"

Repetition at maximum charging voltage: 1 shot every 30 Seconds

Allowed load range

Voltage range: U_{peak} at e.g. $R_s = 50 \text{ Ohm}$
1000 V up to 12'000 V

Resistance: $R > 500 \text{ Ohm}$

Capacitance: 0 up to 5 nF

Inductance: $> 10 \text{ mH}$

Testers for Voltages Higher than 48 kV: MIG9603 as an Example

MIG testers with voltages greater than 50 kV are designed of two separate parts:

- control and measuring
- high voltage generator with divider

V-measurement: V_{peak} on display, $V_{waveform}$ on BNC output (u) up to 96 kV ($\pm 3\%$)

I-measurement: I_{peak} on display, $I_{waveform}$ on BNC output (i) up to 2000 A ($\pm 3\%$)

Energy at maximum charging voltage: 3 kJ

Basic data

Control:

Dimensions: 550 x 450 x 190 mm

Weight: approx. 18 kg

Power supply: 230 V or 115 V selection automatically, max. power 400 VA

High voltage part MIG9603:

Dimensions: 450 x 150 x 1700 mm (l x w x h)

Weight: approx. 75 kg

Power supply: only the control part is powered.



Control rack 19" for MIGxx03 up to MIG9603

Example IEC61010-1

Tester Type	Clearance [mm] up to	1.2/50 μ s [V] up to
MIGxx03	xx	xx
MIG9603	150	92'000

The voltages are related to the clearance and can be chosen in 6 kV steps for the MIGxx03.

Control

Impulse counter: 1 up to 29'999

Trigger: auto or manual

Ramps: voltage, polarity

Protocol: peak values, polarity, shots, limits on I_{peak} , V_{peak} for "passed - failed"

Repetition at maximum charging voltage: 1 shot every 60 seconds (other repetition rates on demand)

Allowed load range

Voltage range: U_{peak} at e.g. $R_s = 50 \text{ Ohm}$

1000 V up to 12'000 V

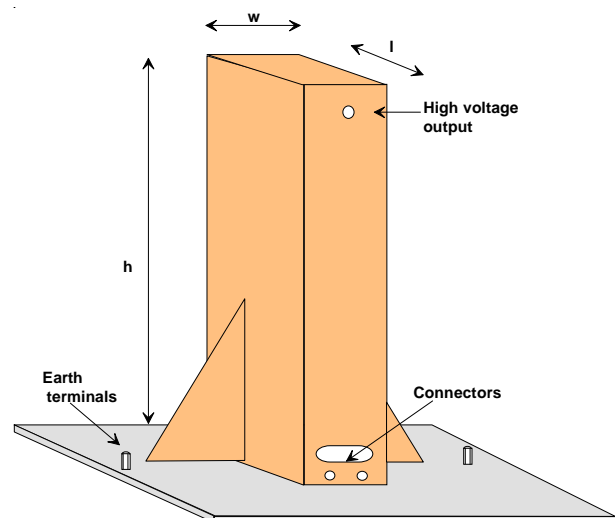
Resistance: $R > 1000 \text{ Ohm}$

Capacitance: 0 up to 5 nF

Inductance: $> 20 \text{ mH}$

Connections for the control of the high voltage part

- Trigger optical link
- Measurement cables
- Control cable



Remarks

The test cabinet cannot be used with the tester MIG9603.

A safety barrier must be set up around the tester and the test object.

Other voltages and waveforms are available on demand.

Accessories

Test cabinet TC-MIG24

The test cabinet fits on MIG1203, MIG2403, MIG3603 and MIG4803.



Basic data

Test cabinet:

Dimensions: 450 x 500 x 270 mm (l x w x h)

Weight: approx. 8 kg

Device under test:

Max. volume: 200 x 200 x 200 mm (l x w x h)

TEMA Software

The TEMA Software enables the remote control of all Modular Impulse Generators (MIG) and the TRA2000 tester.

Optional 0,5 J and 500 Ohm to MIG1203

Insulation test on counters in accordance with EN 61036 class I and II.

An additional network with 7 outputs must be placed on top of the MIG1203 to limit the energy to 0.5 Joule and 500 Ohm source impedance for all levels.



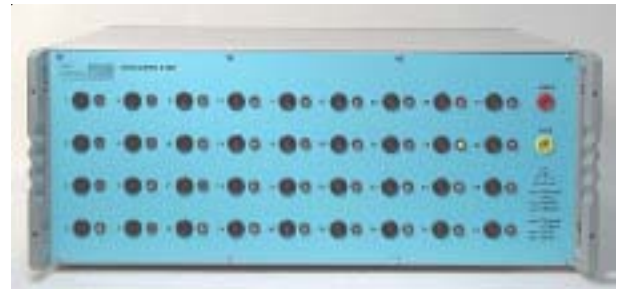
Test tips CN-MIG24

Test tips fits on MIG1203, MIG1203CWG and MIG1803.



MIG-COMAT36

The MIG-COMAT36 is a flexible switching matrix to carry out automated insulation tests on multiple port equipment. The 1.2/50 μ s voltage of the tester is switched remote controlled to different EUT ports.



- Remote control of the coupling matrix via a RS232 link
- Signalisation of closed contacts on the front panel
- Maximum working voltages when switches are closed
 - < 1000 μ s: V = 6000 V, I = 1000 A
 - a.c.: V = 400 V, I < 16 A
 - d.c.: V = 100 V, I < 16 mA

The MIG-COMAT36 is controlled by the TEMA software via the serial bus RS232 of the TRA or MIG generators.

Other voltages and configurations are available on demand.

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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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