EMC - PARTNER

TRA- and MIG-System

Surge Testers

Immunity Tests

I CWG 1.2/50 µs, 8/20 µs
II Ring Wave, 100 kHz
III ITU K17 10/700 µs
IV Accessories
General Information About Disturbance Sources

**CWG 1.2/50 µs, 8/20 µs**

The following aspects of surge testing electronic systems are relevant:
- Tests for failure modes that involve flashover are influenced by the surge current that would flow after flashover.
- The surge let-through of a protective device depends on the applied voltage front.
- The response of a crowbar-type device, subjected to an intended current test, is influenced by the voltage front applied by the generator which senses a high-impedance test piece, until operation of the crowbar. Therefore, the generator must be capable of generating a waveform 1.2/50 µs or a current waveform of 8/20 µs at clamping status of the protection circuit.

**ITU K44 10/700 µs**

The 10/700 µs wave generator has been defined in CCITT K44 for outdoor telecommunication lines. The same definition of the 10/700 µs generator has been brought over into the document IEC 61000-4-5.

**Ring Wave, 100 kHz**

Ring waves are used to simulate lightning or switching effects in public single or three phase supplies behind a primary protection. The current and voltage waveforms are defined in IEC 61000-4-12 and ANSI C62.41 as follows:

Combination waves or Hybrid, are used in a wide range of test application. The most common use is to simulate lightning impulses onto the public single or three phase supply. The current and voltage waveforms are defined in IEC 61000-4-5 and ANSI C62.41.
Overview of tester types

MIG0603IN3: CWG 1.2/50, 8/20 µs
   6.3 kV, 3.15 kA
   Ring 100 kHz 6.3 kV
   Single phase CDN
   10/700 µs, 6 kV

MIG0603-3P: CWG 1.2/50, 8/20 µs
   6.3 kV, 3.15 kA
   Automatically or manually operated CDN up to 100 A per phase

MIG1206-3P: CWG 1.2/50, 8/20 µs
   12 kV, 6 kA
   Automatically or manually operated CDN up to 100 A per phase

Control
- Trigger: auto or manual
- Ramps: Voltage, Polarity, Synchronisation
- Protocol: Peak values, Polarity, Number of shots, Synchronisation
- Measurement: CWG, v and i

Accessories
- 1 power cord depending on country
- cables or connectors for EUT connections
- 1 auxiliary connector (safety circuit)
- 1 user manual, with verification protocol and declarations LVD, EMC

Test levels

CWG 1.2/50, 8/20 µs and ring wave as specified in ANSI/IEEE C62.41

<table>
<thead>
<tr>
<th>Location Category</th>
<th>Voltage 10 kV or more</th>
<th>Currents 10 kA or more</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>6 kV Impulse or Ring</td>
<td>3 kA Impulse 500 A Ring</td>
</tr>
<tr>
<td>B</td>
<td>6 kV Ring</td>
<td>200 A Ring</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Category</th>
<th>Wave Form</th>
<th>OCV Open Circuit Voltage [kV]</th>
<th>SCI Short Circuit Current [kA]</th>
<th>Generator Source Impedance [Ω]</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Combination CWG</td>
<td>&gt;6 kV</td>
<td>&gt;3 kA</td>
<td>2Ω</td>
</tr>
<tr>
<td>B</td>
<td>Combination CWG</td>
<td>6 kV</td>
<td>3kA</td>
<td>2Ω</td>
</tr>
<tr>
<td></td>
<td>Ring Wave</td>
<td>6 kV</td>
<td>500 A</td>
<td>2Ω</td>
</tr>
<tr>
<td></td>
<td>Ring Wave</td>
<td>6 kV</td>
<td>200 A</td>
<td>30Ω</td>
</tr>
</tbody>
</table>

Ring wave 100 kHz as specified in IEC 61000-4-12

<table>
<thead>
<tr>
<th>Test level</th>
<th>Common mode [kV]</th>
<th>Differential mode [kV]</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0.5</td>
<td>0.25</td>
</tr>
<tr>
<td>2</td>
<td>1.0</td>
<td>0.5</td>
</tr>
<tr>
<td>3</td>
<td>2.0</td>
<td>1.0</td>
</tr>
<tr>
<td>4</td>
<td>4.0</td>
<td>2.0</td>
</tr>
<tr>
<td>x</td>
<td>special</td>
<td>special</td>
</tr>
</tbody>
</table>

Note: x is an open class. This level can be specified in the product specification.

Test voltages in accordance with IEC 61000-4-5

<table>
<thead>
<tr>
<th>Installation class</th>
<th>POWER SUPPLY</th>
<th>UNSYM. OPERATED CIRCUITS, LDB</th>
<th>SYMM. OPERATED CIRCUITS/LINES</th>
<th>DB,SDB (1)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Coupling mode</td>
<td>Coupling mode</td>
<td>Coupling mode</td>
<td>Coupling mode</td>
</tr>
<tr>
<td></td>
<td>Line to Line</td>
<td>Line to ground</td>
<td>Line to line</td>
<td>Line to ground</td>
</tr>
<tr>
<td></td>
<td>kV</td>
<td>kV</td>
<td>kV</td>
<td>kV</td>
</tr>
<tr>
<td>0</td>
<td>NO TEST is advised (N.T.)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
The MIG0603IN is suitable to surge single-phase power supply line 230 V, 16 A up to 6.3 kV and 3.15 kA.

**High voltage circuit**
- Voltage (oc): 1.2/50 µs
- Current (cs): 8/20 µs
- Repetition rate maximum: 10/min
- Source Impedance: 2 Ohm ±10%
- Vpeak range 0.25 up to 6 kV ±10%
- Ipeak range 0.125 up to 3 kA ±10%
- Measurement accuracy ±3% (v,i)
- CDN single-phase 260V 16 A
- Coupling path L to N, 18 µF
- Coupling path L-PE, 9 µF and 10 Ohm

**Basic data**
Dimensions: 450 x 500 x 190 mm
Weight: approx. 28 kg
Power supply: 230 V or 115 V, 400 VA

The MIG0603IN3 is suitable to carry out CWG, Ring and 10/700 µs test on different lines. CWG and Ring specification see MIG0603IN and -IN4 as well as 10/700 µs below.

**High voltage circuit**
- Voltage (oc): 10/700 µs
- Current (cs): 4/300 µs, 40 Ohm
- Repetition rate maximum: 4/min
- Impulse capacitance: 20 µF
- Source energy: 440 Joule at 6 kV
- Vpeak range 0.25 up to 6 kV ±10%
- Ipeak range 0.125 up to 3 kA ±10%
- Measurement accuracy ±3%
- Damping resistor 25 Ohm
- Serial resistor 15 Ohm

**Basic data**
Dimensions: 450 x 500 x 190 mm
Weight: approx. 25 kg
Power supply: 230 V or 115 V, 400 VA
The MIG1206 with CDN-MIG-12-32 is suitable to surge three-phase power supply line 440 V, 32 A up to 12 kV and 6 kA.

**Application**
The three-phase coupling filter CDN-MIG12-32 can be used up to 12 kV and 6 kA. Power supply three-phase up to 440 V per phase and 32 A per phase.

**High voltage circuit**
- Voltage (oc): 1.2/50 µs
- Current (cs): 8/20 µs
- Repetition rate maximum: 10/min
- Source Impedance: 2 Ohm ±10%.
- Source energy: 880 Joule at 12 kV
- Vpeak range 0.5 up to 12 kV ±10%
- Ipeak range 0.25 up to 6 kA ±10%
- Measurement accuracy ±3% (v,i)
- CDN three-phase 440V 32 A
- Coupling path L to N, 18 µF
- Coupling path L-PE, 9 µF and 10 Ohm
- Two boxes solution, which allows to use the MIG1206 together with the test cabinet TC-MIG24 for component testing.
- Coupling paths switching manual

The MIG1203-2P is suitable to surge single-phase power supply line 230 V, 16 A up to 12 kV and 6 kA.

**Application**
- Surge protective devices (SPD) or varistor testing
- Surge superimposed on power supply

**High voltage circuit**
- Voltage (oc): 1.2/50 µs
- Current (cs): 8/20 µs
- Repetition rate maximum: 10/min
- Source Impedance: 2 Ohm ±10%.
- Source energy: 220 Joule at 12 kV
- Vpeak range 0.5 up to 12 kV ±10%
- Ipeak range 0.25 up to 6 kA ±10%
- Measurement accuracy ±3% (v,i)
- CDN single-phase 250 V 16 A
- Coupling path L to N, 18 µF
- Coupling path L-PE, 9 µF and 10 Ohm

Two boxes solution, which allows to use the MIG1206 together with the test cabinet TC-MIG24 for component testing.
The MIG0603IN4 is suitable to carry out “Ring Wave” tests on single-phase supply line 230 V, 16 A up to 6.3 kV. Source impedance: 12 and 30 Ohm.

**High voltage circuit**
- Rise time: 500 ns ± 30 %
- Frequencies: 100 kHz ± 10%
- Repetition rate maximum: 10/min
- Decaying: 60% first to second peak
- Impedance: 12, 30 Ohm
- Vpeak range 0.25 up to 6 kV ±10%
- Ipeak range 0.125 up to 3 kA ±10%
- Measurement accuracy ±3%
- CDN single-phase 260V 16 A
- Coupling 12 Ohm, 10 µF
- Coupling 30 Ohm, 3 µF

**Basic data**
Dimensions: 450 x 500 x 190 mm
Weight: approx. 30 kg
Power supply: 230 V or 115 V, 400 VA

**Accessories: CDN, Special Networks**

**Three-phase coupling filter**
*CDN2000-06-25*
- CDN three-phase L to L 445 V, 25 A
- Coupling path L to L/ N, 18 µF
- Coupling path L-PE, 9 µF and 10 Ohm
- Synchronization onto different phases
- Coupling Ring wave 10 µF at 12 Ohm
- Coupling Ring wave 3 µF at 30 Ohm
- Damped oscillatory 100 k, 1 MHz

**I/O and data line coupling kits**
*CDN2000A-06-32*
- Automatically coupling paths switching for surge, ring wave and EFT
- Control of the CDN2000A-06-32 with TRA2000, TRA2000INx and MIG0603INx

**CDN-KIT1000T for ISDN balanced lines**
- Two coupling circuits
- Two decoupling circuits
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.

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.

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.

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.
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

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