

Lightning Tests

EMC -
PARTNER



MIG-System

Aircraft Testers

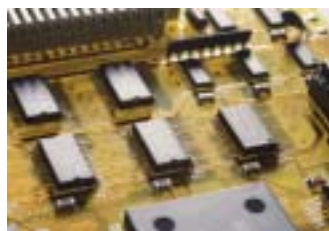


I Single Stroke (SS)

II Multiple Stroke (MS)

III Multiple Burst (MB)

IV Coupling Networks (CN)



General Information about "Induced Lightning on Aircraft", Waveshapes and Coupling

Lightning

Lightning strikes the earth once every two minutes. A recent study by the Federal Aviation Administration reveals that the average commercial aircraft is likely to be struck once a year. Needless to say, it is imperative that all aircraft must be tested against lightning. Lightning flashes differ mainly in current amplitude, in the transferred charge and in the impulse shapes of the lightning current. Two lightning simulations can be accomplished:

- the simulation of the direct current
- the simulation of the indirect current

The current waveform and the generator impedance values specified for simulation of indirect lightning (internal environment during lightning) are the results of applied lightning current to aircraft. Three idealized waveforms can be accomplished for the internal lightning simulation:

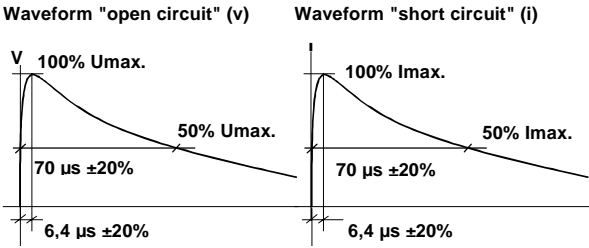
- single strokes
- multiple strokes
- multiple burst

The single stroke waveforms are used for damage assessment tests on equipment.

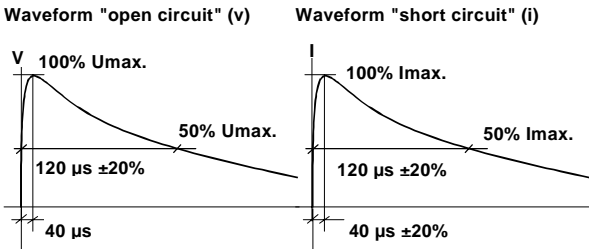
The multiple stroke and burst waveforms are used for EMC tests on equipment.

Single Stroke

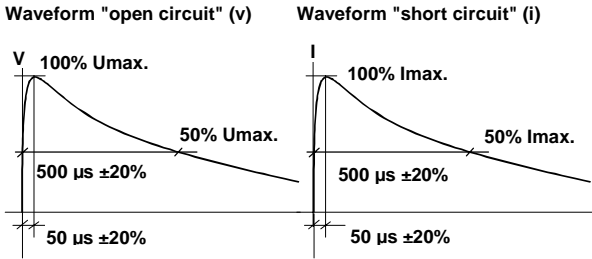
Waveform 4, RTCA/DO-160D



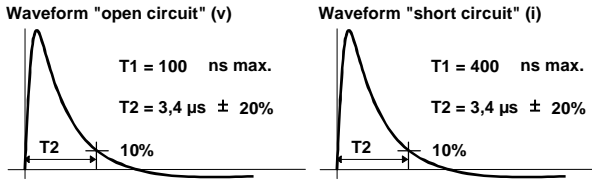
Waveform 5A, RTCA/DO-160D



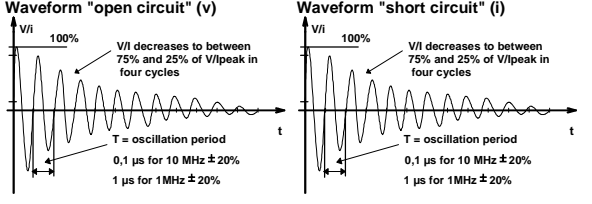
Waveform 5B, RTCA/DO-160D



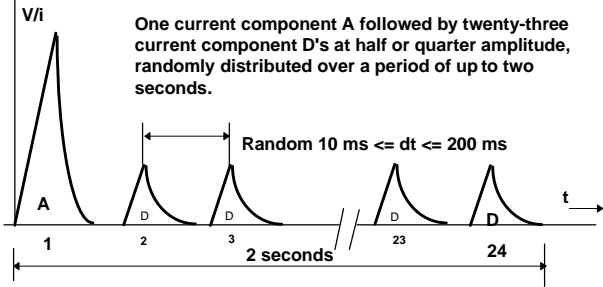
Waveform 2, RTCA/DO-160D



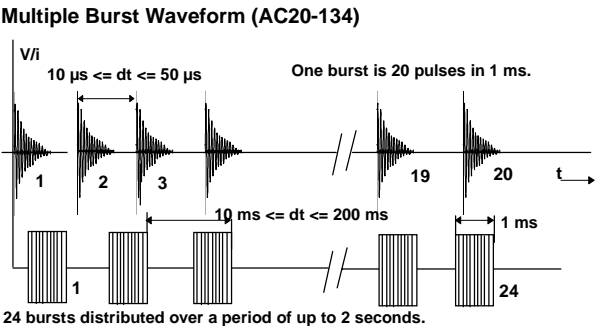
Waveform 3, RTCA/DO-160D



Multiple Stroke



Multiple Bursts



MIG0600SS Single Stroke Tester

Voltage Range 125 V up to 1600 V

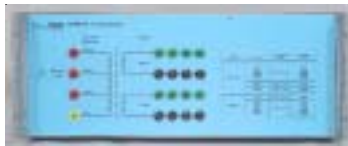
The MIG0600SS generates the required high energy μ s-impulses for indirect tests.



Accessories to MIG0600xx



CN-MIG-BT1



CN-MIG-GI



CN-MIG-TT

Basic data

Dimensions: 550 x 450 x 1800 mm (l x w x h)

Weight: 120 kg

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

Control

Counter: 1 up to 29'999

Trigger: auto or manual

Ramps: voltage, polarity, pulse spacing with constant number of pulses

Protocol: peak values, polarity, number of shots

Limits: on v/i peak for "passed-failed"

Shapes: selectable by software

Measurement

Voltage: V_{peak} on display, $V_{waveform}$ on BNC output (v) up to 1600 V

Current: I_{peak} on display, $I_{waveform}$ on BNC output (i) up to 1600 A

Outputs

- HV banana plugs

Waveforms and ranges

6.4/70 μ s

U_{range} 75 up to 1600 V

I_{range} 15 A up to 320 A (3'200 A)

40/120 μ s

U_{range} 75 V up to 1600 V

I_{range} 75 A up to 1600 A (10'000 A)

50/500 μ s

U_{range} 75 V up to 1600 V (5'000 A)

I_{range} 75 A up to 1600 A

Value in () for ground injection with CN-MIG-GI transformer

Attenuating box NW-MS-Level1

An external attenuating box is available to reach the level. The attenuating box can be used for all waveforms of MIG0600SS.



TEMA Software

All functions of the MIG0600SS can be remote controlled via a RS232 link.

Coupling of the waveform 6.4/70 μ s

This waveform can be coupled onto a cable bundle with the transformer CN-MIG-BT1 or CN-MIG-BT.



Other waveforms on demand.

MIG0600MS for Multiple Stroke

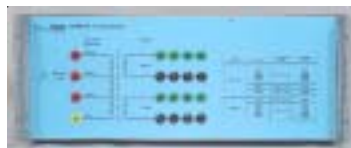
The MIG0600MS contains additionally to the MIG0600SS the battery for the 23 multiple stroke pulses.



Accessories to MIG0600xx



CN-MIG-BT1



CN-MIG-GI



CN-MIG-TT

Basic data

Dimensions: 550 x 450 x 1800 mm (l x w x h)

Weight: 200 kg

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

Control

Trigger: auto or manual

Impulse timing MIG0600MS:

Pulse spacing: 10 ms up to 500 ms

Stroke length: 0.01 s up to 50 s

Repetition: 60 s up to 999 s

Maximum pulses 25 every 10 s

Amplitudes:

First Peak A1: 160 V up to 3200 V

Followed peaks A2: 50 V up to 400 V

Outputs

- HV banana plugs
- Earth terminal screw
- Safety circuit
- Warning lamps red / green

Waveshape and ranges

The pulse amplitudes number 2 to 24 are not related to the first amplitude. The amplitudes can be selected in the range.

6.4/70 μ s

U_{range} 50 up to 400 V

I_{range} 10 A up to 80 A

40/120 μ s

U_{range} 50 V up to 400 V

I_{range} 50 A up to 400 A

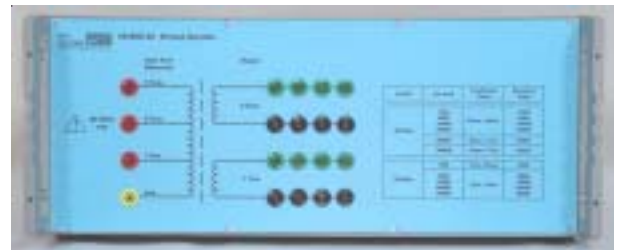
50/500 μ s

U_{range} 50 V up to 400 V

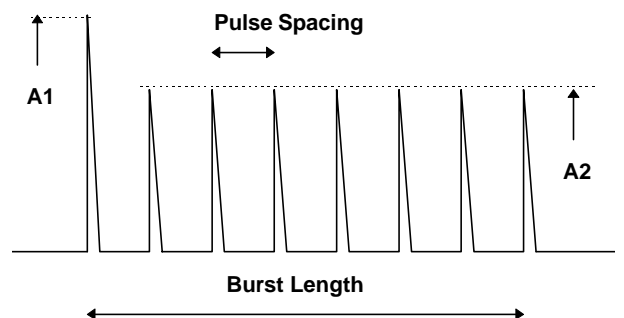
I_{range} 150 A up to 400 A

CN-MIG-GI

For ground injection of the different waveforms 40/120, 50/500 or 6.4/70 the CN-MIG-GI transfer can be used.



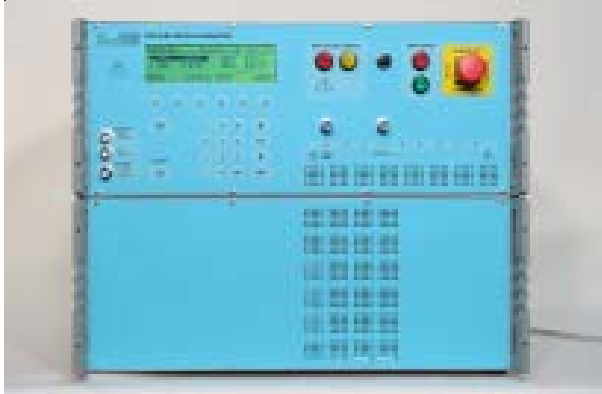
Explanation of the impulse timing for MIG0600-MS and MIG-OS-MB



Pattern included: 24 pulses with a fixed spacing of 83 ms during 2 seconds.

MIG-OS-MB for Multiple Burst

The MIG-OS-MB generates 0.1/6.4 μ s, 1 MHz and 10 MHz impulses in the single impulse multiple stroke and multiple burst mode.



Basic Data

Dimensions: 550 x 450 x 360 mm (l x w x h)

Weight: 30 kg

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

Control

Trigger: auto or manual
Pulse spacing: 0.1 ms up to 500 ms
Burst length: 0.001 s up to 5 s
Repetition: 0.1 s up to 999 s

Operation limits

Number of pulses: max. 625 every 10 s

Amplitudes:

First Peak A1: 160 V up to 3200 V

Followed peaks A2: A1 x 50 %

Special functions:

Random Mode as programmed in different patterns e.g. 20 pulses randomly distributed between 20 to 50 μ s and burst randomly distributed between 10 ms to 200 ms.

Synchro Mode: Synchronisation of the bursts to the power frequencies of 50 Hz, 60 Hz or 400 Hz.

Outputs

- HV- BNC plugs

Waveshape and ranges

All amplitudes of the impulses within one burst are within +/- 10%.

1 and 10 MHz

V_{range} 160 up to 3200 V

I_{range} 6.4 A up to 128 A

The burst and the spikes within one burst have a "random distribution".

Voltage range: minimum 160 V/6,4 A up to maximum 3200 V/128 A

0.1/6.4 μ s

V_{range} 125 V up to 1600 V

I_{range} 25 A up to 320 A

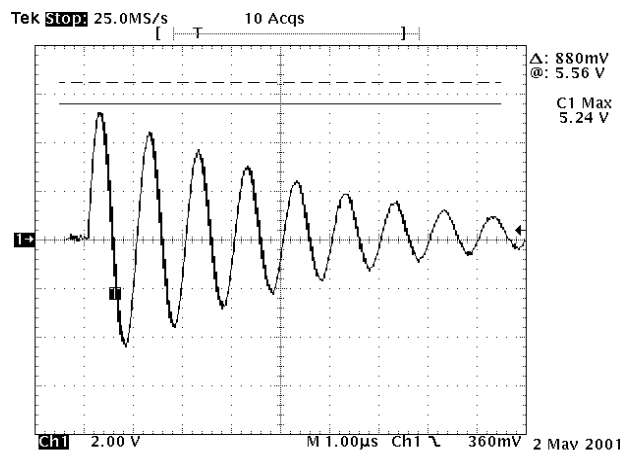
The amplitudes of number 2 up to 20 are based on the first amplitude and are 50% for 0.1/6.4 μ s.

Coupling of the waveform 1, 10 MHz and 0.1/6.4 μ s

All waveforms can be coupled onto cable bundle with the transformer CN-MIG-BT1.



Example coupling 3'200 V



Accessories, Coupling Networks

CN-MIG-BT1

Coupling transformer for cable bundle tests



Technical data

Waveforms: 6.4/70 μ s, 0.1/ 6.4 μ s, 0.1, 1, 5, 10 MHz

Cable connection between MIG-OS-MB and CN-MIG-BT: <1 m

Maximum Diameter of EUT connection that fits in the transformer: 3 cm

Maximum coupled voltages and currents depend on the EUT cable.

0.1/6.4 μ s:	1 and 10 MHz:
V_{maximum} 1600 V	V_{maximum} 3200 V
I_{maximum} 320 A	I_{maximum} 128 A

CN-MIG-TT

Test tip for pin injection tests



Technical data

Waveforms: 6.4/70 μ s, 0.1/ 6.4 μ s, 0.1, 1, 5, 10 MHz

Cable connection between MIG-OS-MB and CN-MIG-CT: 1 m

1 and 10 MHz:	0.1/6.4 μ s:
V_{maximum} 1600 V	V_{maximum} 3200 V
I_{maximum} 128 A	I_{Maximum} 320 A

TEMA Software

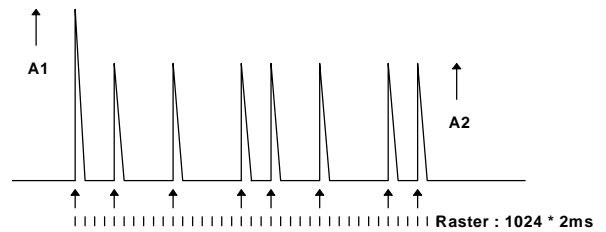
All the functions of the MIG0600SS and the MIG-OS-MB can be remote controlled via a RS232 link.

TEMA software with special patterns such as multiple bursts is available on demand.

Option "MB-PAT, MS-PAT"

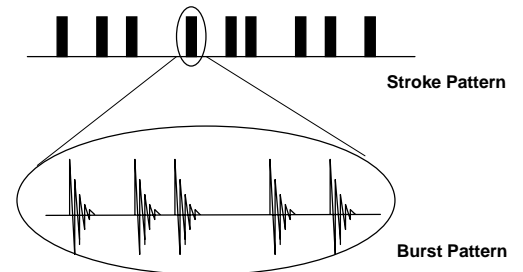
This option allows to programm pulse sets:

Multiple Strokes



Minimum spacing: 10 ms; resolution: 1024 x 2 ms; up to 25 pulses per pattern.

Multiple Burst



Stroke pattern:

Minimum spacing: 10 ms; resolution: 1024 x 2 ms; up to 25 pulses per pattern.

Burst pattern:

Minimum spacing: 20 μ s; resolution: 1024 x 2 μ s; up to 25 pulses per pattern.

Pattern selection for Multiple Stroke and Multiple Burst

Each pattern can be generated offline on a PC and downloaded with the EMC PARTNER "PATLOAD" Software. The MIG menue includes programmed pattern.

Pattern 1: 24 pulses with a fix spacing of 83 ms during 2 sec

Pattern 2: 24 pulses with a varing spacing of 83ms +/-10% during 2 sec

Pattern 3: 24 pulses with randomly spacing during 2 sec

Pattern 4: 24 pulses with a decreasing spacing during 2 sec

Pattern 5: 24 pulses with an increasing spacing during 2 sec

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