User Manual "Damped Oscillatory Wave Tester "

MIG-OS-OS1

Waveforms: damped oscillatory 100 kHz, 1MHz

MIG0603OSI

Waveforms: damped oscillatory 100 kHz, 1MHz, surge 1.2/50, 8/20 µs, 1.2/50 µs 0.5 J

MIG-OS-OS1 4UH and MIG0603OSI 8 UH

Title:	MIG - Modular Impulse Generator
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1 MHz, 100 kHz, SURGE 1.2/50, 8/20 µs, 1.2/50 µs 0.5J

MIG - Modular Impulse Generator

ATTENTION

This user manual provides information necessary for operation of the test equipment.

Throughout the users manual, standard references are used as an aid to understanding only.

The relevant standard(s) **must** be obtained and used in conjunction with this users manual

Declaration of Conformity

See sheets attached at the end of this user manual:

- **Declaration of conformity to product standards**
- **Declaration of conformity to low voltage directive**
- **Declaration of conformity to EMC directive**

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1 Description

1.1 The different application of the MIG0603-Oxx

1.1.1 Voltage "Damped Oscillatory Wave Tester

Introduction: "
The damped oscillatory wave is a typical oscillatory transient, induced in low voltage supply of measuring cables due to the switching of three phase electrical networks in HV/N`MV open air station.

In electrical stations, the opening and closing operations of HV isolators give rise to sharp front-wave transients, with time of the order of some tens of nanoseconds. The voltage front-wave has an evolution that includes reflection, due to mismatching of the characteristic impedance of HV circuits involved. In this respect, the resulting transient voltage and current in HV busbars are characterised by a fundamental oscillation frequency that depends on the length of the circuit and on the propagation time.

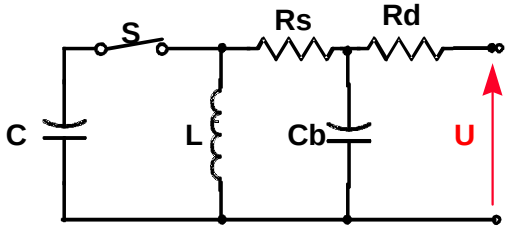
The oscillation frequency ranges from about 100 kHz to a few megahertz, depending on the influence of the parameter mentioned above and the length of the busbars, which may vary from some tens of meters to hundreds of meters. In this respect, the oscillation frequency of 1 MHz may considered respective of most situations, but 100 kHz has been considered appropriate for large HV substations.

The repetition frequency is variable and a function of the distance between the switching contacts. The minimum repetition frequency in respect of each phase, is twice the power frequency. The repetition rates selected, 40/s and 400/s represents therefore a compromise, taking into account the different duration of the phenomena, the suitability of the different frequencies considered and the problem related to the energy to which the circuits under test are subjected.

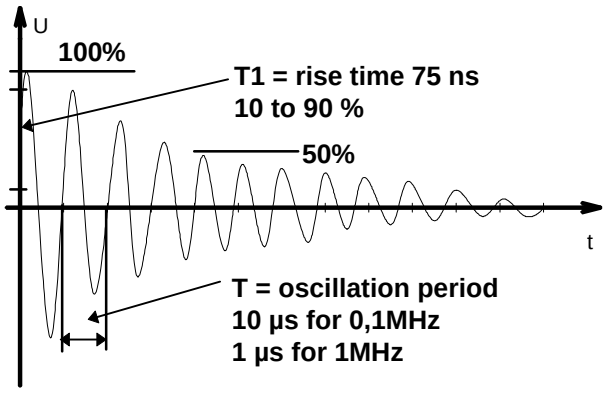
Impedance of the test generator
For testing the input/output ports of measuring relays, the selection of the 200 Ohm impedance is a compromise. This takes into account that the characteristic impedance of cables used for this purpose (twisted pairs) has a value ranging from 120 to 150 Ohm in the frequency range above 100 kHz and for a length of the order of 100 m. ANSI/IEEE C37.90.1 document a 150 Ω impedance, frequency 1 to 1.5 MHz are specified and 50% damping must be after 6 µs.

Relevant standards:
IEC 60255-4, IEC 6055-22-1, IEC 61000-4-18, IEC60834-1, VDE 435 Teil 303, ANSI/IEEE C37.90.1

Damped oscillatory wave Generator



Voltage at no load



1.1.2 "CWG Combination Wave Generator"

Introduction, "Combination wave test"
Long wires to sensors or supplies are very often connected to the inputs and outputs of industrial electronic equipment. The most frequent damages are overvoltages, caused either by switching actions in the equipment itself or by atmospheric discharges such as lightnings. To avoid the destruction of electronic equipment by overvoltages, protection elements and circuits are placed at the inputs and outputs of the equipment ports.
Consumer electronic devices such as antenna ports on television set, telephones, faxes, can also be influenced by atmospheric discharges. Mostly the disturbances are tolerable because of their single event. To protect such equipment from damages, protection elements and circuits are installed. Tests must be carried out to determine whether these protective circuits are really effective.

The following aspects of surge testing electronic systems are relevant:
- Testing 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, will be influenced by the voltage front applied by the generator, that senses a high-impedance test piece, until operation of the crowbar.

Therefore the generator must be capable to generate a waveform 1,2/50 µs or a current waveform of 8/20 µs at clamping status of the protection circuit. Traditionally, the 1,2/50 µs voltage waveform was used for testing the basic impulse level of insulation, which is approximately an open circuit until the insulation fails. The 8/20 µs current waveform was used to inject large currents into surge protective devices. Since both the open circuit voltage and short circuit current are different aspects of the same phenomenon, such as an overstress caused by lightning, it was necessary to combine them to a single waveform when the load is not known in advance.

The combination wave generator has been defined first for Electro Magnetic Compatibility tests up to 4 kV in the document IEC 61000-4-5 or IEEE 587. EMC test must be carried out on powered equipment. There are several reasons for performing powered test:
- From a standpoint of a good practice, it is best to perform laboratory tests in a manner that most closely simulates the actual service environment.
- It is the applied ac that furnishes the energy following the surge, that can establish sustained arcing faults, tracking on insulation, destruction of printed wiring, and so on
- The application of normal ac power generally rises the EUT to an initial level of stress. Without power current following a surge-induced flashover, the resulting defect might not be detected.

The loading by the EUT might cause appreciable discrepancy between the preset nominal voltage open-circuit voltage or short circuit current and the actual voltage across or current in the load. This effect is the reason why surge parameters are not specified with the EUT connected.

Equations for standards waveform:

1,2/50 µs Wave

$$V(t) = AVp(1 - \exp\frac{-t}{\tau 1})\exp(\frac{-t}{\tau 2})$$

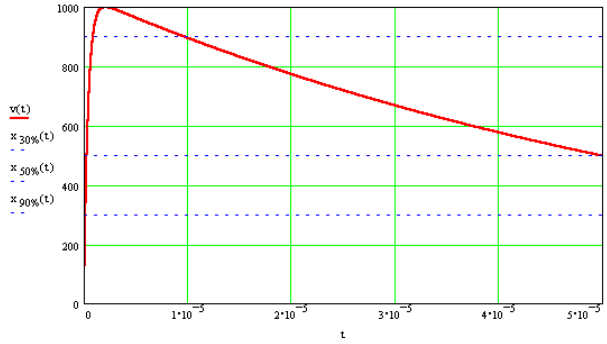
8/20 µs Wave

$$I(t) = AIpt^{3}\exp(\frac{-t}{\tau})$$

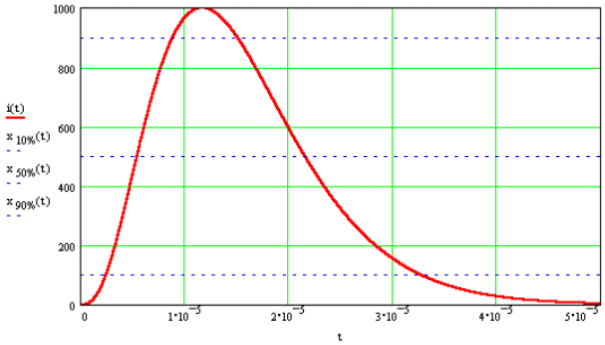
In all the equations above:
t = time
Vp = maximum or peak value of the open-circuit voltage
Ip = peak value of the short circuit current

Calculated waveform with the equation above:

1,2/50 µs Wave



8/20 µs Wave



The circuit diagram of a generator capable to generate the two waveform above is showed below.

Generators to carry out combination wave tests

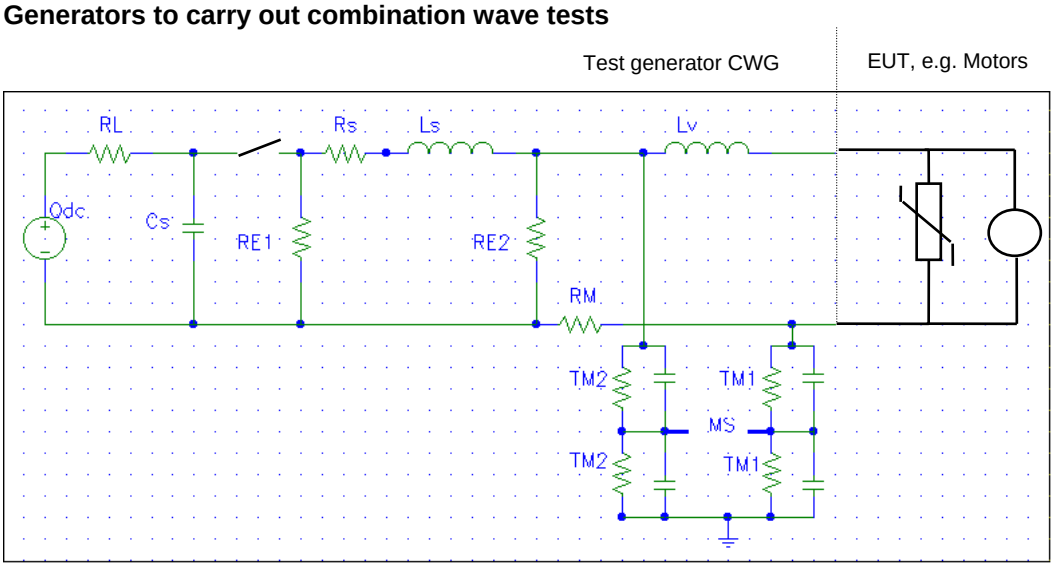


Figure: 1.0.3-2

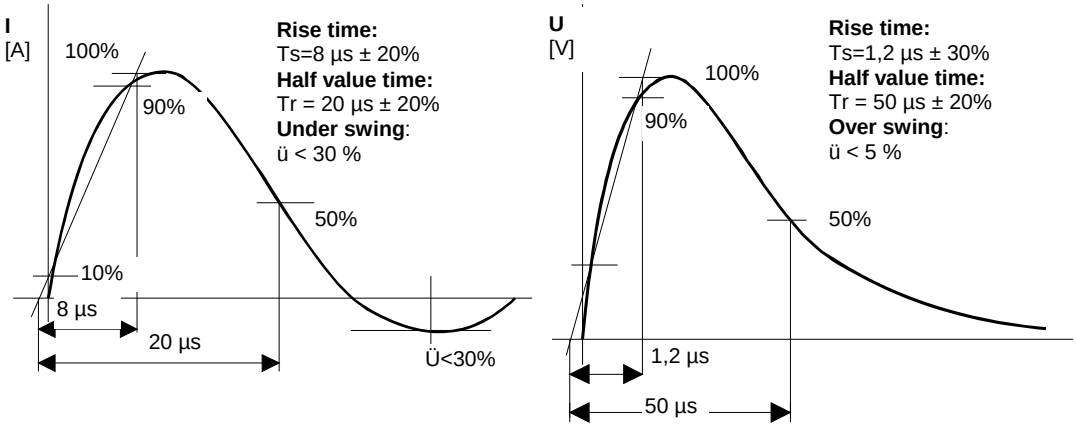
Legend:

RL	Charging resistor	Cs	Impulse capacitor	S	High voltage switch
RE1	Discharge resistor	Ls	Inductance of the generator	Rs	Serial resistor
RM	Shunt	RE2	Discharge resistor	TM1	Divider
Lv	Inductance of the connection	MS	Measurement equipment	TM2	Divider

A dc source charges the capacitors within the different modules via the charging resistors. Closing the switch S discharge the capacitors into the parallel branches RE1, RE2 and EUT. When the EUT has a high impedance the CWG generates a voltage rise defined by the serial inductance Ls and by the parallel resistor RE2. The half value time is determined by Cs and the both RE1 // RE2. When the EUT has a low impedance the generated current is determined by the elements Cs, Ls, Rs and the EUT.

The current and voltage waveforms are defined in IEC 61000-4-5 as follows:

Wave shapes and tolerances



Current into short circuit Voltage at no load Figure: 1.0.1-3

The waveforms are verified in open circuit (voc)and short circuit (isc). No load limitation exists, because for different load impedance (EUT) the waveforms are within the open circuit voltage waveform and the short circuit current waveform.

Superimposing surge onto power supply

To superimpose the surge pulses onto power line supply, coupling filters must be used. The aim of the coupling filter is to couple the generated surge waveform without deformation of rise time, half value time and amplitude onto the operated EUT and to protect the auxiliary equipment from surge pulses.

When surges are superimposed onto power supply lines, the synchronisation angle must be chosen to correspond to the half wave of the power supply. The picture below shows that pseudo tests can be carried out, when the synchronisation angle is not correctly selected. When a positive surge is superimposed at 270°, the clamping voltage of the varistor is not reached and no real test is carried out.

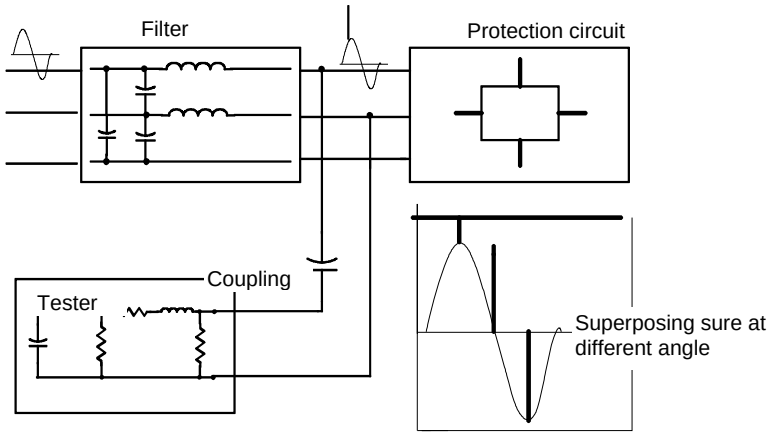


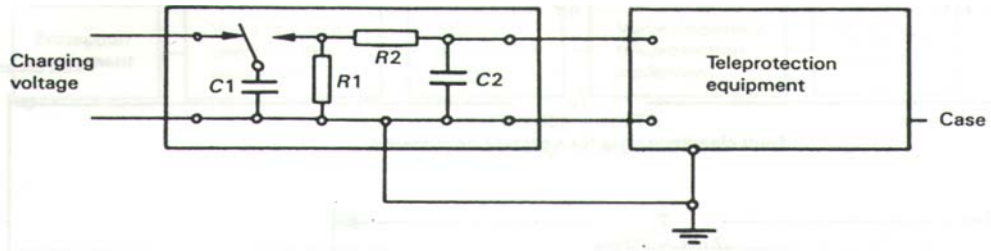
Figure: 1.0.1-4

1.1.3 Voltage tests with 1.2/50 µs 0.5 J and 500 Ω

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 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 is no longer 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.

Circuit of the generator as defined in IEC 834-1, (IEC 255-4)



Components	Test conditions		
	5 kV	2.5 kV	1 kV
*R*1	1 800 Ω	450 Ω	80 Ω
*R*2	500 Ω	500 Ω	500 Ω
*C*1	0.035 µF	0.16 µF	1.0 µF
*C*2	0.000 8 µF	0.000 8̊ µF	0.000 8 µF

FIG. 5. — Circuit for impulse generator.

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

Test voltage	Energy	Generator-impedance	Impulse Capacitor	Voltage waveform oc	Current waveform sc
0.5 kV	0.5 J	500 Ohm	4.0 µF	0.5kV 1.2/50us	1A 1.2/50us
1 kV	0.5 J	500 Ohm	1.0 µF	1kV 1.2/50us	2A 1.2/40us
3 kV	0.5 J	500 Ohm	110 nF	3kV 1.2/50us	6A 1.2/25us
5 kV	0.5 J	500 Ohm	40 nF	5kV 1.2/50us	10A 1.2/10us

1.2 Combined MIG testers, Special MIG testers

1.2.1 Overview about the "Damped Oscillatory Testers

1.2.1.1 MIG Voltage Oscillatory Wave Testers

Pos.	Product No.	Type	Short Description	Delivery
97	MIG1A103C	MIG-OS-OS1	IEC 255-4, ANSI C37.90.1 and 22 or IEC 61000-4-18 section "damped oscillatory wave" 1MHz and 100kHz up to 3kV	1 month
99	MIG1A102C	MIG0603OSI	1MHz and 100kHz up to 3kV; CWG 6kV, 3kA, 1.2/50µs 0.5J up to 6kV, IEC 61000-4-18, 61000-4-5 without CDN, 60255-4 and -5	1 month

1.2.1.2 Accessory to MIG Voltage Oscillatory Wave Testers

Pos.	Product No.	Type	Short Description	Delivery
100	MIG1A92C	CDN2000-06-25	Three phase CDN with line voltages L to N 280V and L to L 415V, line current 25A per phase, manually coupling path selection for EFT, damped oscillatory and SURGE. Incl. accessories according to user manual	from stock
101	MIG1A352C	CDN2000-06-25 OPTION 480V	Three phase CDN with line voltages L to N 280V and L to L 480V, line current 25A per phase, manually coupling path selection for EFT, damped oscillatory, SURGE and Ring Wave. Incl accessories according to user manual	1 month

Special generators on demand

1.3 MIG generator range

With the MIG current generators also other applications are possible like: measurement of earth impedance, impulse impedance of connectors, release of fault current switches, demagnetisation of magnetic metal, etc.

1.3.1 Standard MIG Tester "Insulation, Energy, CWG

	**Insulation** Application: voltage withstand tests	Waveform: 1,2/50 µs voltage **Range:** **0 to 100 kV:**12, 24, 36, 48, 96 kV Standards: IEC 60060-1, -2, IEC 61010
	**Energy** Application: protection elements	Waveform: 8/20 µs current **Range:** **0 to 100 kA:** 6, 12, 24, 48kA Standards: IEC 60060-1, -2, IEC 61643-1
	**Combination** Application: powered surge tests	Waveforms: 8/20 µs current 1,2/50 µs voltage **Range:** **0 to 24 kV, 0 to 12 kA** Standard: IEC 61000-4-5

Other waveforms on demand.

1.3.2 MIG Clamping Voltage Tester

	**Clamping Voltage Tester** Application: Varistors Vclp =<3000V	Waveforms: 8/20 µs current Impedance: 10, 100, 1000 Ohm Range: 0,5 A up to 500 A Standard: IEC 61643-1

1.3.3 MIG for varistors and gaze arresters tests

	**Surge Withstand Tester** Application: SURGE peak current test on Varistors up to Vclp = 3000 V	Waveforms: 8/20 µs current Impedance: 1, 0.5, 0.25 Ohm Range: 100 A up to 100'000A Standard: IEC 61643-1
	**Energy Tester** Application: Energy test on Varistors	Waveforms: 10/1000 µs current Range: 0,4 up to 750 A Standard: IEC

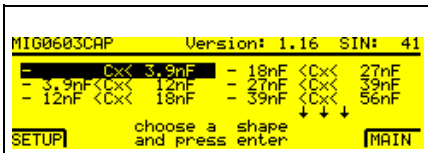
	**Dual Surge Tester K12** Application: SURGE peak current test on Two electrode gaze arrestor	Waveforms: i = 8/20, 10/700, 10/350 µs Range: 2 x i = 6'000, 120, 240 A 1 x i = 10'000, 240, 480 A Standard: UIT K12

The „MIG0603K12 is a dual output surge current generator for testing protective elements like arresters, or Transzorbe diodes with different waveforms.
The dual output allows testing of three electrode elements .The current ranges are: for 8/20 µs up to 2x6'000 A, for 10/700 µs up to 2x120 A and for 10/350 µs up to 2x240 A.

For two electrode elements the outputs of the generator can be connected in parallel, to increase the current capability up to 240 A for 10/700 µs, 480 A for 10/350 µs and 12 kA for 8/20 µs.

The charging voltage up to 6300 V is sufficient for most of the protection elements, also for elements with relatively high clamping voltages.
The peak output voltage and current of the MIG are indicated on the front display. The two BNC monitor outputs (v,i) allow monitoring the voltage and current wave shapes by an oscilloscope connected onto.

1.3.4 MIG for X,Y, capacitor tests, CWG

	**1,2/50 µs Capacitor Tester** Application: Insulation test on X, Y capacitors	Waveforms: 1,2/50 µs voltage Resistor: 3, 5, 7, 9, 13, 25, 27, 45, 62 Range: 0 up to 2 µF Standard: IEC 60348-14

	**Flammability Tester** Application: flammability test on X, Y capacitors	Range: capacitors up to 4 µF Vmax 6000V capacitor up to 10 µF Vmax 4000V Standard: IEC 60348-14 Amd. 1

1.3.5 Combination wave tester CWG

	**Different Surges** Application: Household equipment, Telecommunication equipment	Waveforms: 1,2/50 µs, 8/20 µs CWG Options: Ring wave 0.5 µs, 100 kHz 10/700 µs Range: 0.25 to 6.6 kV Coupling: for single phase included Standards: IEC 61000-4-5, IEC 61000-4-12, UIT K17

MIG0603IN
The MIG0603-IN can include up to three different waveforms like: CWG (1,2/50; 8/20); CCITT (10/700, 0,5/700) or ANSI, IEC 61000-4-12 ring wave 0,5/100kHz.
The MIG0603IN is a surge generator for simulation of indirect lightning on telecom and process and measurement lines. The relevant recommendations are CCITT K17 and IEC 61000-4-5.
The MIG0603IN is a hybrid generator with a voltage waveshape 1,2/50 µs at "no load" and a current wave-form 8/20 µs at short circuit.
At 2 Ohm source impedance of the MIG0603IN, the voltage and current waveform can be guaranteed at the terminal of a 1 m connection cable. Instead of the cable connection a test cabinet can be placed on the top of the generator. The test cabinet is so designed that the cover can not be opened during the test. The green and red warning lamps are integrated in the test cabinet.
The peak output voltage and current of the MIG are indicated on the display. The two BNC monitor outputs allow monitoring the voltage and current wave shapes by an oscilloscope

	**Surge Between Two Lines** Application: equipment, varistors	Waveform: 1,2/50 µs, 8/20 µs CWG Impedance: 2 and 12 Ohm Ranges: current 3'000A or 500 A voltage 0 up to 6'000 V Coupling: between two line included Standards: UL 1449 August 15. 1996

MIG0606UL

The MIG0603UL is a Hybrid or combination generator with a voltage wave shape 1,2/50 µs and a current wave shape 8/20 µs. The combination waves are delivered by the MIG0603UL when applying the specified voltage waveform across an open circuit (oc) and the specified current waveform into a short circuit (sc). The exact waveform delivered is a function of the surge generator and the impedance to which the surge is applied.

The peak output voltage and current of the MIG are indicated on the front display. The two BNC monitor outputs (v,i) allow monitoring the voltage and current wave shapes by an oscilloscope connected onto.

A coupling and de-coupling network is included to superimpose the SURGE on a two wire power supply.

Should you have test needs not listed above, contact an EMC PARTNER representative, direct EMC PARTNER AG in Laufen (CH) or visit our Web Site

www//emc-partner.com

www//emc-partner.ch

1.4 Technical data

1.4.1 Voltage: 1 MHz, 100 kHz Damped Oscillatory Wave

1.4.1.1 Voltage 1 MHz, 100 kHz IEC 61000-4-18

Waveform at no load:	No load = R > 1kΩ	
Rise time	75ns	± 20%
Oscillation frequency	1 MHz	± 10%
Decay:	50% of the peak value between the 3rd and 6th periods	
Adjustable voltage range	200 up to 3000 V	
Settings	1 V steps	
Maximum voltage	3000 V	+10% -0%
Burst repetition rate	2/s to **400/s** to 500/s	+10% -0%
Test duration	1s to **2s** to 29999	+10% -0%
Polarity	pos. / neg. / alternate	
Random Pulses	on / off	
Burst Synchronisation	on / off	
Synchronisation Angle	0° to 360°	
Synchronisation Frequency	40Hz / 50Hz / 60Hz / 400Hz / 16.6Hz	

MIG0603OSI Circuit Parameter

Source impedance Umax. / Imax	200 Ω	± 10%

MIG0603OSI Control, Measurement

Trigger	auto or manual synchronisation	
Protocol	Peak values, Polarity, Trigger, Pulse Spacing, Burst Length, Repetition, Random Spikes, Burst Synchro	

Voltage 100 kHz, IEC 61000-4-18

Waveform at no load:	No load = R > 1kΩ	
Rise time	75ns	± 20%
Oscillation frequency	100 kHz	± 10%
Decay:	50% of the peak value between the 3rd and 6th periods	
Adjustable voltage range	200 up to 3000 V	
Settings	1 V steps	
Maximum voltage	3000 V	+10% -0%
Burst repetition rate	2/s to **40/s** to 50/s	+10% -0%
Test duration	1s to **2s** to 29999	+10% -0%
Polarity	pos. / neg. / alternate	
Random Pulses	on / off	
Burst Synchronisation	on / off	
Synchronisation Angle	0° to 360°	
Synchronisation Frequency	40Hz / 50Hz / 60Hz / 400Hz / 16.6Hz	

MIG0603OSI Circuit Parameter

Source impedance Umax. / Imax	200 Ω	± 10%

MIG0603OSI Control, Measurement

Trigger	auto or manual synchronisation	
Protocol	Peak values, Polarity, Trigger, Pulse Spacing, Burst Length, Repetition, Random Spikes, Burst Synchro	

1.4.1.2 Voltage 1 MHz, ANSI/IEEE C37.901 (1989)

Waveform at no load:	No load = R > 1kΩ	
Rise time	75ns	50 up to 100 ns
Oscillation frequency	1 up to 1.5 MHz	
Decay:	50% of the peak value after 6 µs	
Adjustable voltage range	200 up to 3000 V	
Settings	1 V steps	
Maximum voltage	3000 V	±10%
Burst repetition rate	2/s to **400/s** to 500/s	+10% -0%
Test duration	1s to **2s** to 29999	+10% -0%
Polarity	neg.	
Random Pulses	on / off	
Burst Synchronisation	on / off	
Synchronisation Angle	0° to 360°	
Synchronisation Frequency	40Hz / 50Hz / 60Hz / 400Hz / 16.6Hz	

MIG0603OSI Circuit Parameter

Source impedance Umax. / Imax	150 Ω	± 10%

MIG0603OSI Control, Measurement

Trigger	auto or manual synchronisation	
Protocol	Peak values, Polarity, Trigger, Pulse Spacing, Burst Length, Repetition, Random Spikes, Burst Synchro	

1.4.2 **Combination Wave Generator 1,2/50; 8/20 µs**

SURGE part

Waveform at no load:	No load = R > 100 Ω	
Rise time	1.2 µs	± 30%
Time to half value	50 µs	± 20%
Adjustable voltage range	250 V up to 6'300 V	
Settings	1 V steps	
Maximum voltage	6000 V	+10% -0%
Minimum Voltage	500 V	-10% +0%
Polarity	pos. / neg. / alternate	
Waveform at short circuit:	Short circuit R < 0,1 Ω	
Rise time	8 µs	± 20%
Time to half value	20 µs	± 20%
Underswing	< 30%	
Maximum current	3000 A	+10% -0%

MIG0603OSI Circuit Parameter

Impulse capacitance	10 µF	± 10%
Energy at max. charging voltage	220 Joule	
Source impedance Umax. / Imax.	2 Ω	± 10%

MIG0603OSI Control, Measurement

Minimum time between successive shots at maximum charging voltage	8 Seconds	1s steps
Impulse counter	1 up to 29'999	
Trigger	auto or manual synchronisation onto the power line voltage	
Ramps	- Voltage; - Polarity, - Synchronisation	
Voltage measurement: Peak value on Display Voltage waveform BNC output (u)	Accuracy 250 up to 6'600 V 10 V equals 6'000 V	± 3%
Current measurement: Peak value on Display Current waveform BNC output (i)	Accuracy 125 up to 3'300 A 10 V equals 3'000 A	± 3%
Protocol	Peak values, Polarity, Number of shots, Angle of Synchronisation	
Limits on peak current and peak voltage for "passed - failed". The measuring range equal of current and voltage peak values	• stop test • protocol • next test	

1.4.3 **Voltage tester 1,2/50, 0.5 J, 500 Ω**

SURGE part

Waveform at no load:	No load = R > 100 Ω	
Rise time	1.2 µs	± 30%
Time to half value	50 µs	± 20%
Adjustable voltage range	250 V up to 6'300 V	
Automatic range changing	250 v up to 575 V 575 up to 1150 V 1150 V up to 3450 V 3450 V up to 6300 V	4 µF 1 µF 110 nF 40 nF
Settings	1 V steps	
Maximum voltage	6000 V	+10% -0%
Minimum Voltage	500 V	-10% +0%
Polarity	pos. / neg. / alternate	

Test voltage	**Energy**	**Generator-impedance**	**Impulse Capacitor**	**Voltage waveform oc**	**Current waveform sc**
0.5 kV	0.5 J	500 Ohm	4.0 uF	0.5kV 1.2/50us	1A 1.2/50us
1 kV	0.5 J	500 Ohm	1.0 uF	1kV 1.2/50us	2A 1.2/40us
2.5 kV	0.5 J	500 Ohm	120 nF	2.5kV 1.2/50us	6A 1.2/30us
5 kV	0.5 J	500 Ohm	40 nF	5kV 1.2/50us	10A 1.2/10us

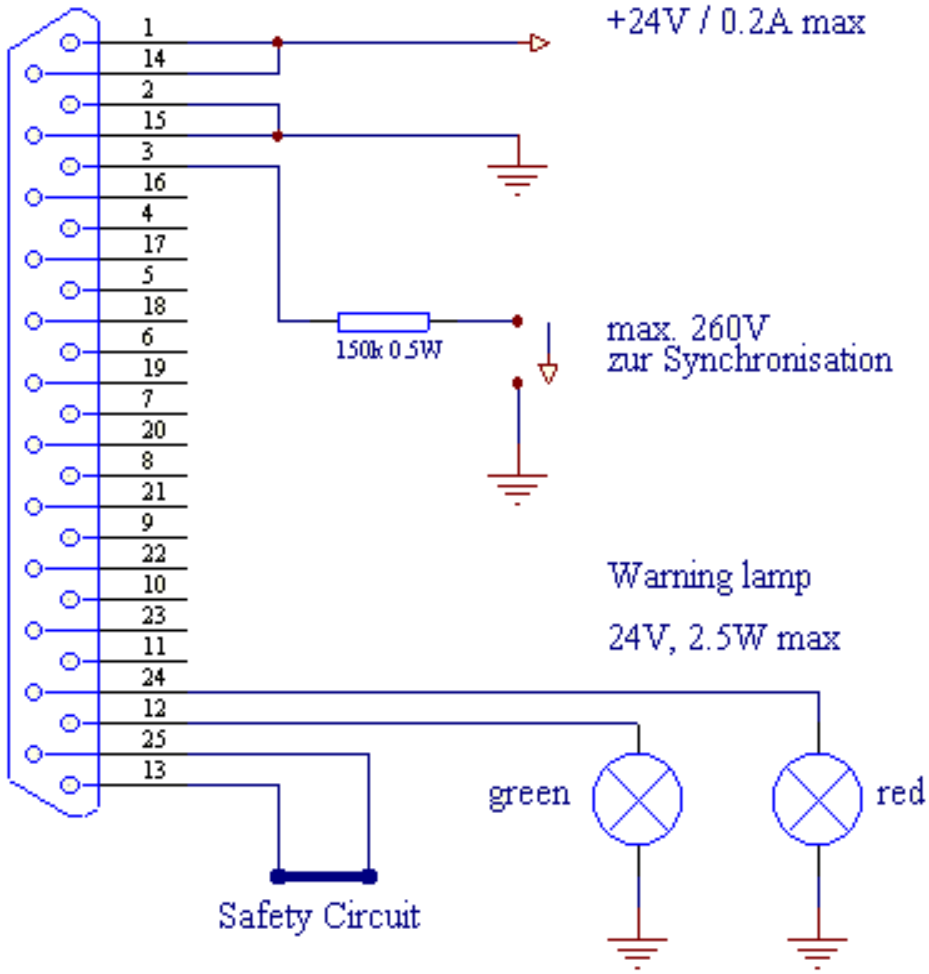
MIG0603OSI Control, Measurement

Minimum time between successive shots at maximum charging voltage	8 Seconds	steps
Impulse counter	1 up to 29'999	
Trigger	auto or manual synchronisation onto the power line voltage	
Ramps	- Voltage; - Polarity, - Synchronisation	
Voltage measurement: Peak value on Display Voltage waveform BNC output (u)	Accuracy 250 up to 6'600 V 10 V equals 6'000 V	± 3%
Current measurement: Peak value on Display Current waveform BNC output (i)	Accuracy 125 up to 3'300 A 10 V equals 3'000 A	± 3%
Protocol	Peak values, Polarity, Number of shots, Angle of Synchronisation	
Limits on peak current and peak voltage for "passed - failed". The measuring range equal of current and voltage peak values	• stop test • protocol • next test	

1.4.4 General information to MIG control

Set-up memory	Up to 23 memory places
Test sequences	the test set-ups can be linked serially
Ramps	automatic linear variation of one parameter e.g. voltage, frequency etc.
Synchronisation on different power line frequencies (CWG only)	16,$^{2}/_{3}$;40; 50; 60
Pulse trigger	Manual or automatic Front panel: with Trigger button Rear panel: with BNC plug
Failure detection on EUT	-External Input EUT failed -Selectable limit value for impulse voltage and current for SURGE
Safety switching	Emergency stop Switch off the EMC Test and the EUT power
EUT failed detection during the test.	With accessory monitor via RS485 remote control
Test report	Printer, connected to the standard port RS 232
Control of external CDN	via RS 485 port e.g. IN-1000

1.4.5 Port "Auxiliary"; pin numbers



1.5 Mechanical dimensions

1.5.1 MIGxxxxOSx Tester

Type	Dimensions [mm] l x w x h	Weight [kg]	Versions
	width x depth x height		
MIG-OS-OS1	450 x 570 x 380	28	19" Rack 4 UH
MIG0603OSI	450 x 570 x 380	28	19" Rack 8 UH

1.5.2 CDN2000-06-25

	Dimensions [mm]	Weight [kg]	Versions
Combination	width x depth x height		
CDN2000-06-25	450 x 570 x 190	26	19" Rack 4 UH

1.6 Power supply inputs

The power line input is located on the rear side of the MIG testers

Single phase voltage MIG0603OMX selects voltage 230 or 115 automatically	230 V (50 Hz) or 115 V (60 Hz)	± 10 % ± 10 %
Power consumption	Max. Operation mode < 400 VA standby < 50 VA power off < 5 VA	(230 V, 50 Hz) (115 V, 60 Hz)

MIG0603OMX generator selects the power supply voltage automatically when connected to the public power supply.
Following power cords can be ordered:
Europe (CEE-7/VII) England (BS-1363) Switzerland (SEV Type 12) USA (NEMA5-15P)

1.7 Accessories, diemensions

1.7.1 Included articles, dimensions

MIG0603OSI (Article No. 103518)

Mechanical Dimensions

Unit Height:	8
Length:	57 cm
Width:	45 cm
Height:	37 cm
Net Weight:	32 kg

Included Articles

According to STL-Variante 20, STL-Version 1

Qty	*PN*	*Description*
1	104842	Broschure Oscillatory Wave Test System
1	104802	Standard calibration report
1	103191	Standard accessories pack
1	103194	CD-UM-IN-ALL includes all User Manuals and Instruction sheets of all EMC PARTNER AG sales products.
1	104816	Power Cord 3 pole (10/13/16A)

MIG-OS-OS1 (Article No. 103514)

Mechanical Dimensions

Unit Height:	4
Length:	57 cm
Width:	45 cm
Height:	19 cm
Net Weight:	24 kg

Included Articles

According to STL-Variante 20, STL-Version 1

Qty	*PN*	*Description*
1	104842	Broschure Oscillatory Wave Test System
1	104802	Standard calibration report
1	103191	Standard accessories pack
1	103194	CD-UM-IN-ALL includes all User Manuals and Instruction sheets of all EMC PARTNER AG sales products.
1	104816	Power Cord 3 pole (10/13/16A)

1.7.2 Standard accessories

Accessories to MIG0603OSI (Article No. 103518)

Qty	PN	Description	Weight (kg)	Length (cm)	Width (cm)	Height (cm)
1	102525	Spare fuse 5AT	0	2	0.5	0
1	103015	Plastic pack for standard accessories 90x75mm	0	9	7.5	0
1	103027	Accessory plastic pack	0	0	0	0
1	103068	MC safety cable with protected banana plug, yellow	0	50	0	0
1	103069	MC safety cable with protected banana plug, red	0	50	0	0
2	103112	Coaxial cable 50 Ohm SHV-BNC-SHV f/f	0	50	0	0
1	103116	MC safety test tip black 1kV, 32A	0	14	0	0
1	103117	MC safety test tip red 1kV, 32A	0	14	0	0
1	103122	Adapter SHV-BNC / Banana	0	0	0	0
1	103133	Adapter SHV-BNC / Banana, black	0	0	0	0
2	103134	HV-BNC connector m. with 1 ring loop	0	0	0	0
1	103135	HV-BNC connector short circuited	0	0	0	0
1	103167	Safety Circuit MIG AUXILIARY	0.03	5	5	1.5

Accessories to MIG-OS-OS1 (Article No. 103514)

Qty	PN	Description	Weight (kg)	Length (cm)	Width (cm)	Height (cm)
1	102525	Spare fuse 5AT	0	2	0.5	0
1	103015	Plastic pack for standard accessories 90x75mm	0	9	7.5	0
1	103027	Accessory plastic pack	0	0	0	0
2	103112	Coaxial cable 50 Ohm SHV-BNC-SHV f/f	0	50	0	0
1	103116	MC safety test tip black 1kV, 32A	0	14	0	0
1	103117	MC safety test tip red 1kV, 32A	0	14	0	0
1	103122	Adapter SHV-BNC / Banana	0	0	0	0
1	103133	Adapter SHV-BNC / Banana, black	0	0	0	0
2	103134	HV-BNC connector m. with 1 ring loop	0	0	0	0
1	103135	HV-BNC connector short circuited	0	0	0	0
1	103167	Safety Circuit MIG AUXILIARY	0.03	5	5	1.5

2 Safety

The MIG0603-Oxx belongs to safety class 1

2.1 Safety standards

The MIG0603-Oxx fulfils the requirements of the safety standards IEC 1010 „Safety requirements for electrical equipment for measurement, control and laboratory use and the safety standard VDE 0104 (Safety circuits, warning lamps or connector for warning lamps). Based on EN 61010 (IEC 1010) the declaration of conformity to low voltage directive LVD 73/23/EEC (O.J. N° L77, 1973-03-26) is given.

This manual is a integral part of the MIG0603OMX Tester. The instructions contained in the manual regarding operation and the test set up are to be strictly observed.

2.2 Climatic Conditions

The MIG0603-Oxx generators contain high voltage circuits in integrated form. EMC PARTNER only guarantees a correct functioning of the MIG0603-Oxx Tester and the associated accessories, if the MIG0603-Oxx is operated in the climatic condition specified.

Temperature	15 °C to 35 °C	
Relative humidity	45 % to 75 %	
Atmospheric pressure	86 kPa to 106 kPa	(860 to 1060 mbar)
Not influenced by:	direct solar radiation, rain or condensate water, dust or larger electro magnetic fields as specified in the EMC compatibility chapter.	

Tab. 2.2

The MIG0603-Oxx should be operated in a dry, clean room. If for any reason water condenses in the MIG0603-Oxx, then no MIG0603-Oxx operation should be started before the tester is dry.

It is strictly forbidden to operate the MIG0603-Oxx generators in rooms with of gas explosion risk. The high voltage of the MIG0603OMX can generate sparks, which can ignite the gas.

People with heart pacemakers should not be in the vicinity of the test set up during operation.

2.3 Precautionary measure during use

The MIG0603-Oxx Generators generate high voltage. The energy content of the SURGE impulse is high and can be dangerous with improper use. It is wise to observe the following rules:

• Never touch the EUT when a test is in operation.
• Touch no connectors of connection cable when a EMC test is in operation.
• The high voltage of the MIG0603-Oxx GENERATORS and the power on the EUT must turned off before a manipulation on the EUT is carried out.
• For all services, e.g. check of the fuses, the power cord must first be unplugged.

Tab. 2.3

The MIG0603-Oxx GENERATORS must be connected to power line with a safety ground. If an Insulation transformer is involved in TRANSIENT supply the secondary side of the isolating transformer must be grounded.

2.4 Electromagnetic Compatibility

The outputs of the MIG0603OMX GENERATORS and the links between MIG0603-Oxx GENERATORS and the EUT can emit disturbances. Please consider the national PTT rules.
The Test System MIG0603-Oxx GENERATORS should not be operated near sensitive measuring and control systems.
The MIG0603-Oxx GENERATORS fulfils the following immunity requirements:

• Electrostatic discharge	Level 4 (8 kV)	(IEC 1000-4-2)
• Burst EFT	Level 4 (4 kV)	(IEC 1000-4-4)
• SURGE	Level 3 (2 kV)	(IEC 1000-4-5)

Fig. 2.4

2.5 The manual is an integral part of the equipment. Refer to the manual.

This manual is an integral part of the MIG0603-Oxx GENERATORS. The safety rules and precautions in the manual must be observed. EMC PARTNER and their representatives are not responsible for damage to persons and equipment by not observance the safety rules and precautions in the manual.

3 Mechanical Structure

3.1 General

The MIG "Modular-Impulse-Generator" is a flexible kit system, ready to quote tailored generators for special test applications.

The basic units are discharge modules (patent pending) which can be configured in serial or parallel, to offer an optimum solution for the customer need. The use of one type of discharge module guarantees a high reliability and a high quality.

The MIG generators are compact and have an excellent value for money.

For better understanding the MIG will be divided in different parts:

- The left hand part of the MIG contain the control measurements. The left hand side of the front panel, with edged border is called the control panel.

- The right hand part contains all high voltage operation controls. Depending on MIG type the number of modules and impulse forming network change. This part is called the operation panel.

Only the control front panel is showed.

Fig.3.1

The MIG 4 height unite GENERATORS are available with different options.
Not applicable to MIG 12 UH Generator:

Standard with handles as showed in Figure 3.1. This version is recommended for use in development and EMC test laboratories.

19“ insert version. The handle is removed and angle brakes are fixed on both sides for fixing the MIG GENERATORS in a 19“ rack.

Standard with handle in a military case. This version is recommended for outdoor EMC testing.

3.2 EMC PARTNER High Voltage Module

The basis of the MIG generators are the high voltage modules. One module includes the impulse capacitor, the electronic switches, the trigger circuit, the polarity reversal circuit and a part of the impulse shaping circuit. The modules can be connected in serial or in parallel.

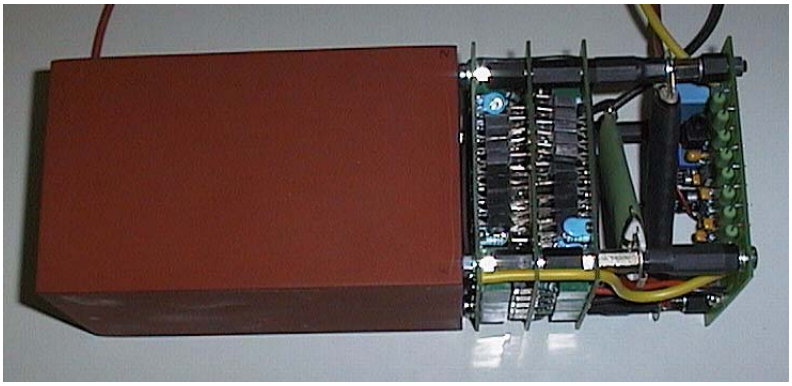


Figure: 3.2-1

3.3 Measuring Circuits CWG

The MIG0603-Oxx generator is equipped with different measurement circuits: For the CWG peak voltage and peak current are measured. The SURGE impulse voltage is measured differentially with two internally-located voltage dividers. The current is measured with a current monitor with differential amplifier. The peak values of voltage and current are memorised and shown in the display. With the two CRO outputs, the voltage and current waveform can be monitored on a oscilloscope.

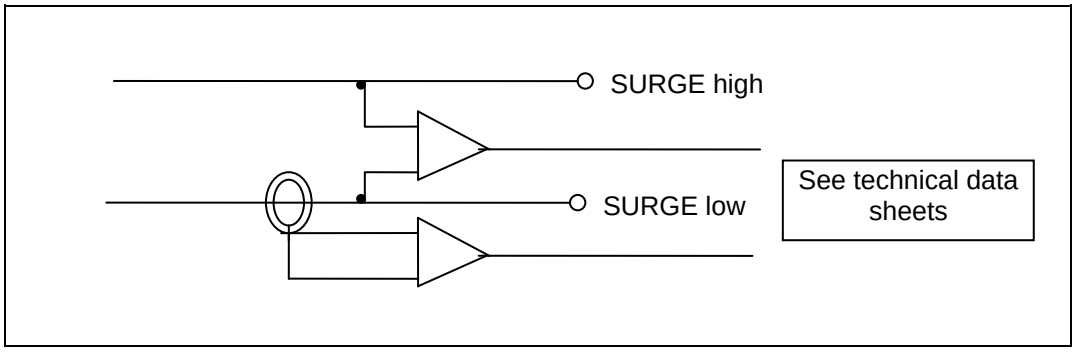


Fig. 3.3-1

For the damped oscillatory tester the output at no load is calibrated to the charging voltage. Charging voltage are equal the output voltage at open circuit.

For Magnetic Field test the field in the centre of the antenna is calibrated with the charging voltage of the tester. See diagram in the instruction manual.

4 Control Panel

4.1 Front panel of the MIG0603-Oxx

Fig.4.1

The most important elements of the front panel are:

1. Control panel (left part)
2. Operation panel (right part)
3. Angle bracket for the 19" rack
4. Ventilation holes

The controls on the front and rear panels are protected by the angle bracket (3).

For the signalisation, the follow colours are generally used:

green	MIG0603-OxxX is connected onto the power supply. High voltage is OFF and the safety circuit is open. No Danger
red	HS can be switched on, danger
yellow	Signalisation general

Important: :

A system reset can be carried out as follows:
1. Press „page up“ and „1“ buttons simultaneously
2. Wait until beep sounds
3. Press button „2“ immediately

All programs stored in 1 to 15 memory space will be deleted.

4.1.1 Control part

The control of the MIG0603OMX is carried out by a microprocessor. The microprocessor controls the EMC tests, stores the inputs of the numeric input terminal, updates the display, checks whether the inputs of the operators are allowed values or not, stores the program and prepares test reports. The operator communicates with the MIG0603OMX via the numeric input terminal, the display and the soft keys.

For better understanding, the control panel elements will be explained separately from the connection panel.

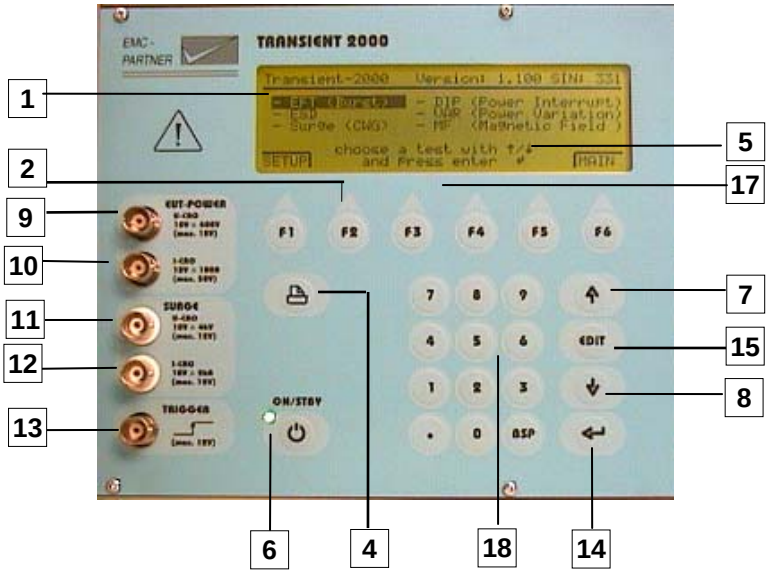


fig. 4.1.1

4.1.1.1 The Display

All important information for the operator are permanently shown on the display during the EMC test. The large graphic display includes additionally 6 soft-keys and some hints or setting range information.
(1)

4.1.1.2 Soft-keys“ (2)

The program in the MIG-tester is a large program, therefore six soft-keys are provided in order to be able to move and quickly change to different menus.
Example of "Main"
Menu overview

Test	Main	Ramp	General
Choice of test set-ups storage space 1 to 23	-pre-setting of nominal values	-definition of different ramps	-storage and deletion of set-ups -EUT limits -service -remote control set-up
customers programmes	e.g. V-peak. Polarity Impulse repetition Synchronisation	e.g. Start - voltage voltage steps number of pulses per steps	e.g. Store set-up Delete set-up EUT Power limits EUT Control Printer ON/OFF

4.1.1.3 Push button ON/OFF (6)

With this button, the MIG0603OMX will be set into the power OFF mode. In the turn off mode, the control and the signalise are deactivated. In this status of the MIG0603OMX, the power consumption is at a minimum of 5 W.
The LED signalise that the MIG0603OMX is connected to the public power supply. The LED turns off when the power cord is removed or the power switch on the rear side is turned of.

4.1.1.4 Push button Page up and Page down (7,8)

These two buttons make it possible to turn the pages in the MIG0603OMX menu programs.

4.1.1.5 Measuring outputs SURGE: Voltage (11) and Current (12)

Depending on MIG0603OMX generator type both measuring voltage and current are available or only current or voltage. For detailed information as accuracy, ranges, etc. see technical data On the BNC connector 11 the voltage wave shape and on the BNC connector 12 the current wave shape can be monitored.

4.1.1.6 Measuring outputs SURGE: Voltage (11) and Current (12)

During SURGE tests, voltage sequence of the SURGE waveform can be measured at the output socket 11 and the current sequence at output socket 12. The range and the accuracy of the measuring system is given in the Chapter 1.2 Technical data Section 1.2.8 measuring circuits, measuring outputs.

4.1.1.7 Trigger output for oscilloscope (13)

This output provides all the necessary trigger impulses for the different tests. The different trigger levels and the time delays are listed in Chapter 1.2 Technical data Section 1.2.9.

4.1.1.8 The Push button ENTER (14)

Numeric read in will be quit with the ENTER button.

4.1.1.9 Push-button Edit (15)

This button has a multifunctional use:

- Activate the dialogue line
- Open pull down windows

4.1.1.10 Push buttons F1 to F6 (17)

The buttons F1 to F6 are allocated to to the showed function of the display. Depending on the menu page, different functions are allocated to the four buttons.

4.1.1.11 Numeric control panel (18)

If the cursor is activated in one line of the display, then data can be input with the numeric key board. Each data input must be terminated with ENTER.
The button BSP (Backspace) enables correction of a wrong data input.

4.1.1.12 Dialogue line within the display (5)

Indicates what range can be selected or which next step must be done.

4.1.1.13 Print button (5)

At test end a summarised test report can be print out

Operation panel

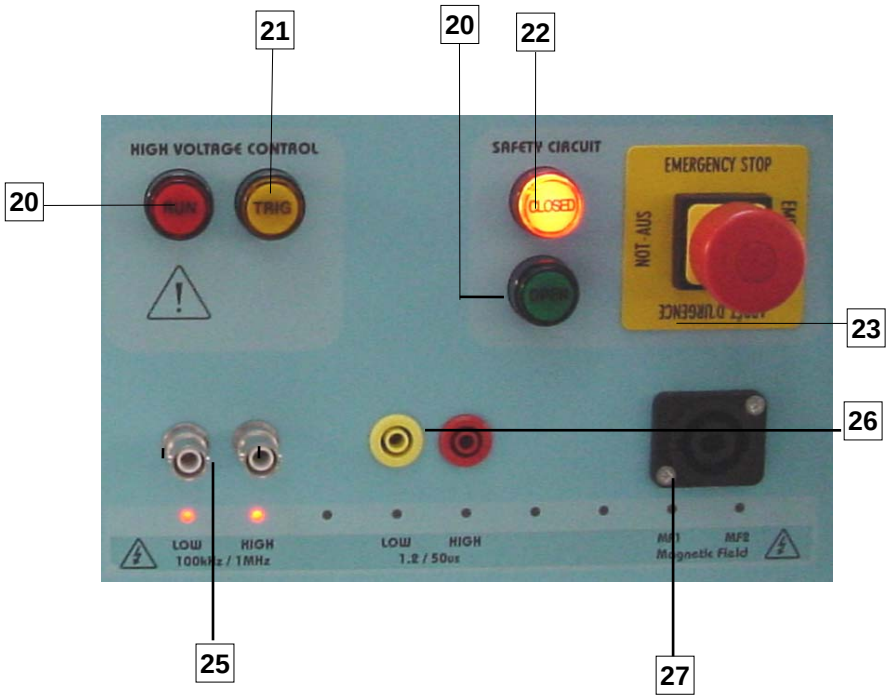


Fig. 4.1.2

4.1.1.14 Button High Voltage "RUN" (20)

With the „Start“ button the test can be started. With the same button the high voltage test can be interrupted and the high impulse capacitor discharged

4.1.1.15 Manual Trigger (21)

When manual trigger is programmed and the tester is ready for manual trigger, this will be signalled by the LED. As soon as the signal occurs the pulse can be released.

4.1.1.16 Emergency - Stop (23)

This switch is not linked to the software. This switch is placed directly as hardware in the power supply of the MIG0603OMX generator.

4.1.1.17 Signalisation "Safety circuit open" (22)

The green lamp signalises "No Danger". Only with the green lamp EUT can be changed in the test cabinet or the connection to the EUT can be changed.

4.1.1.18 Signalisation "Safety Circuit Closed" (21)

The green lamp signalises **"Danger"**. When the red lamp is "ON" the test cabinet can not be opened when additionally the high voltage is turned "ON". As long as the safety circuit is closed the red lamp is "ON". When only the high voltage is turned "OFF" and safety circuit is not open the red lamp is still "ON". When the high voltage is turned "OFF" the button 22 can be pressed to turn the lamp to green.

4.1.1.19 "CWG " high voltage output (26)

)
"Red" is the high voltage pin of the circuit
"Yellow" is the common of the impulse circuit

4.1.1.20 "Damped oscillatory outputs" (25)

Both high voltage BNC connectors are equivalent.

4.1.1.21 "MF " high voltage output (24)

)
"Red" is the high voltage pin of the circuit
"Yellow" is the common of the impulse circuit

4.2 Rear Panel of the MIG0603-Oxx

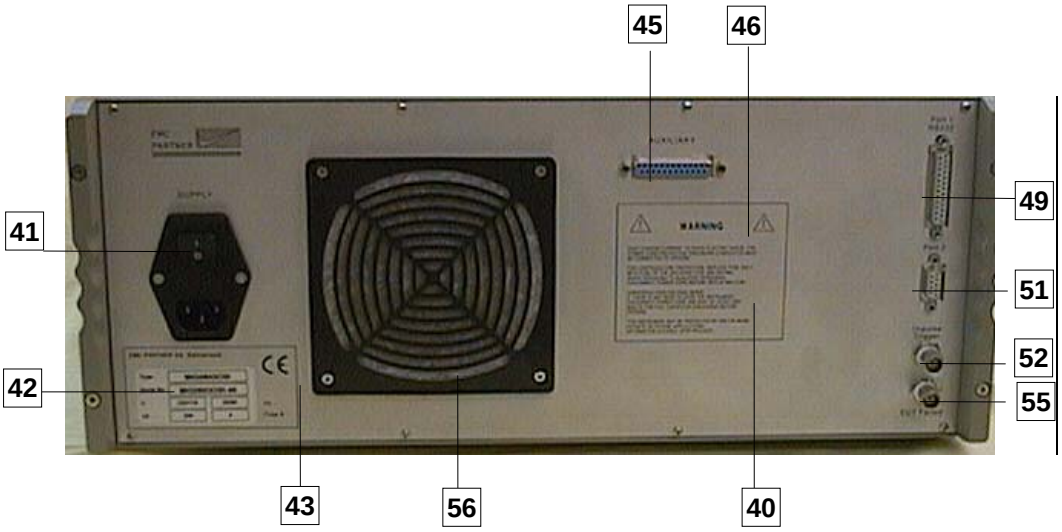


Fig. 4.2

4.2.1.1 Warnings (40)

High leakage currents. To avoid electric shock the power cord protective grounding conductor must be connected to ground.

For continued fire protection, replace fuse only with fuse of the specified type and rating. Refer servicing to qualified personnel. Disconnect power cord before replacing fuse.

Dangerous high-voltage inside. If there is any need to open the instrument, disconnect power cord and wait at least one minute for full capacitor discharge before opening.

This instrument may be protected by one or more patents or patent applications. Information available upon request.

4.2.1.2 Power supply of the MIG (41)

The MIG receives its power via power connection (41). A power switch, a fuse and a filter are build in directly at the plug The equipment can be connected to a 230 V 50 Hz or 115 V 60 Hz ac power supply. The power supply of the MIG will be automatically adapted.
Power consumption: turned on minimum < 50 W; maximum power consumption < 400 W, Standby < 5 W
The fuse is rated with T 4 A / 250 V.

4.2.1.3 Type plate (42)

All important supply information is written on the type plate. Please quote the serial number and type of the equipment when requesting service or repair.
Type plate

4.2.1.4 CE mark (43)

This plate is reserved for the CE mark. The CE -mark is needed for the free movement of the goods into and within European community.

4.2.1.5 Auxiliary Port (45)

Via this port MIG accessories as Warning lamps, test cabinet, CDN filters, external safety circuit, etc. can be controlled. If no MIG accessories is connected the Auxiliary - connector must be place onto the port.

4.2.1.6 Attention, refer to manual(46)

This expression requests the operator to consult the manual in detail. Only instructed personnel are allowed to operate the MIG0603OMX.

4.2.1.7 Interface „Port 1“ RS232 for printer and controller PC (49)

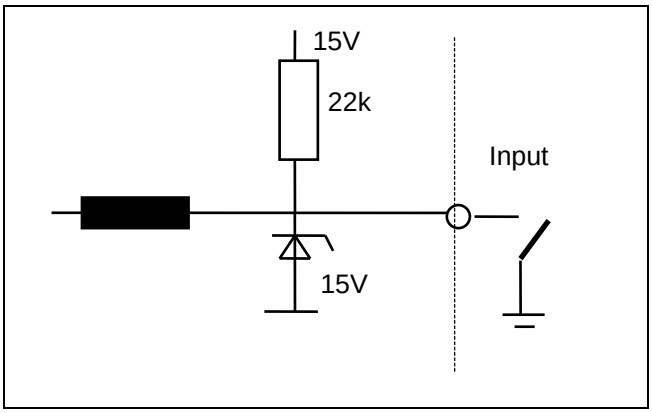
Via this interface a test report can be printed out on a external printer. Using the same interface port, the MIG0603OMX can be also controlled by an external PC. To configure the interface, see Chapter 13 „Remote Control“.

4.2.1.8 Interface „Port 2“ RS 485 for controlling external coupling networks or checking the EUT failed status(51)

Via this interface, the coupling path of external CD-networks can be controlled.
For further information, see the CD-networks manual.
With an additional EMC PARTNER module, a multiple channel EUT-failed control can be built. The control system operates during the EMC tests.

4.2.1.9 EUT Failed Input (55)

This input can be used fo a single channel the EUT during the test. EUT failed is equal to 0V.



The trigger value at the output is approximately 3V
Low: active
High: inactive
Driving with an open-collector output is recommended.

4.2.12 Definition of the inputs EUT failed“ and external Trigger

4.2.1.10 Trigger Input (52)

This input can be used for an external trigger of surges. The time can not be defined as the trigger is related to the software clock rate and can differ between trigger 1 and trigger x.

4.2.1.11 Forced cooling of the (56)

A ventilator cools the MIG0603OMX internally. Forced cooling is necessary for the impulse forming network devices and the electronic high-voltage switch. A distance of about 20 cm must be maintained between the rear panel of the TRANSIENT 100 and any wall, and about 3 cm between the sides of the MIG0603OMX and any equipment or wall. The MIG0603OMX can be built into a 19“ rack, with 3 cm side separation.

5 Preparation for Operation

5.1 Attention, Refer to Manual

This manual is an integral part of the equipment MIG0603-Oxx. The safety rules and precautions in the manual must be observed. EMC PARTNER and their representatives accept no responsibility not responsible for damages to persons and equipment as a results of non-observation of the safety rules and precautions in this manual.

Before connecting the MIG0603-Oxx to a public power line, Chapter 3 „Safety must be carefully studied.

5.2 Operators and Service Personnel

Only trained personnel should carry out EMC tests. EMC PARTNER recommends its own seminars. For small groups of maximum 10 persons EMC PARTNER AG offers the following in-house seminars in English or German at the customer's location:

1. EMV Introduction
2. EMV Standardisation
3. EMC „ESD" immunity test
4. EMC „EFT" immunity test
5. EMC „SURGE" immunity test
6. EMC „DIPS" immunity test
7. EMC „HARMONICS" immunity test
8. EMC „MAGNETIC FIELD" immunity test
9. EMC „CW CURRENT INJECTION" immunity test
10. EMC „CE-MARK" transient immunity tests
11. „NEMP" immunity test
12. „AC, DC, IMPULSE" insulation test
13. Flicker

5.3 Checks before operation

5.3.1 Optical verification of the MIG0603-Oxx

Before you unpack the MIG0603-Oxx, please check whether the packing is deformed or damaged. When the MIG0603-Oxx is unpacked, also check whether the tester is damaged. If you detect a damage, please inform EMC PARTNER and the shipping organisation immediately.

Figure: 5.3.1-1

Please keep the shipping box on stock. The must be used in case of shipment for verification or repair.

5.3.2 Power source check

On the rear panel, you will find a type plate. Please check whether the Tester has been prepared for the correct power line voltage of your public power. If the power supply voltage is different please inform EMC PARTNER AG in Switzerland, or your EMC PARTNER AG representatives.

5.3.3 Connecting the MIG0603OMX to the power line

Please use the supplied power cord for connecting the MIG0603-Oxx to your public power supply. As stated on the rear panel, the power supply must have an earth safety wire. Please check the earth connection on your power outlet before you connect and turn on the MIG0603-Oxx. The public power supply must be protected by 16 A fuse.

5.4 Hints for the test set-ups

5.4.1 Test set-up combination 1,2/50, 8/20 µs

Test set-up
What will be tested with combination wave pulses?
Protection circuit for inputs, and outputs as shown in the figure below.

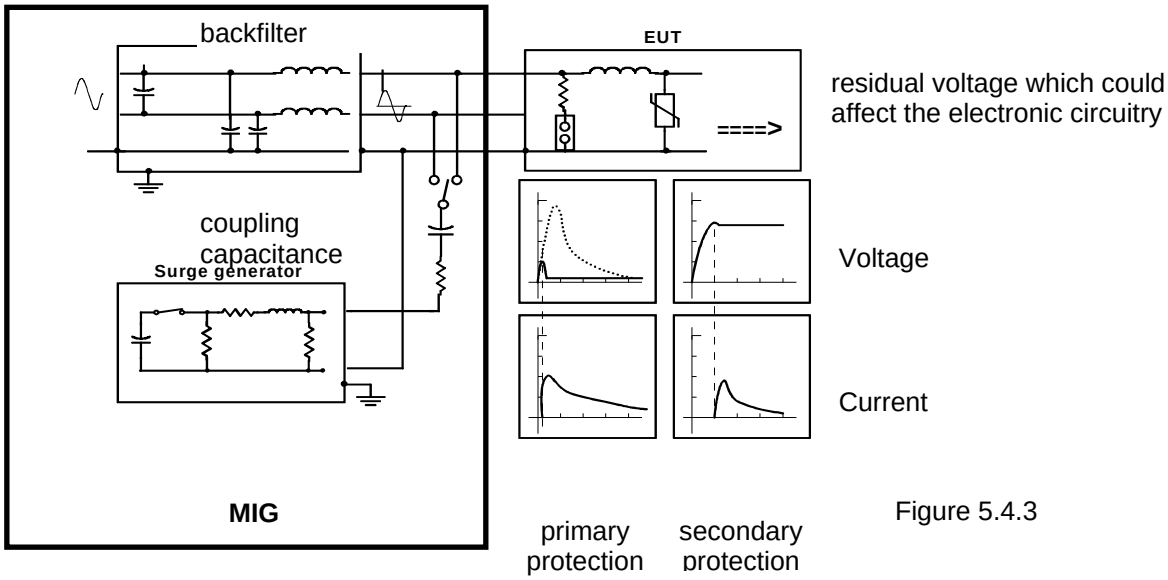


Figure 5.4.3

Superimposing SURGE pulses onto power lines is carried out using a capacitance between the tester and the power line. With the SURGE test, the effectiveness of the protection circuit will be tested. The residual voltage after the protection circuit could affect the electronic parts of the EUT.
Synchronisation with the power line frequency is important, and must be considered.

With the cable connection (current injection method), the bonding of screen and earth connections can be tested.

Safety:
The SURGE pulses can be dangerous for persons. The EUT and its cables should not be touched during SURGE EMC tests.
In case of a breakdown in the EUT, it must be remembered that high currents can flow from power supply.

5.4.2 Test set-up damped oscillatory wave

When carry out damped oscillatory wave test the follow must be considered:

- Repetition Rate
- Amplitude
- Coupling to the test object consult product family standard
-

Test levelsIEC

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		

5.4.3 Test set-up for 0.5 J, 500 Ω tests

Test levels IEC

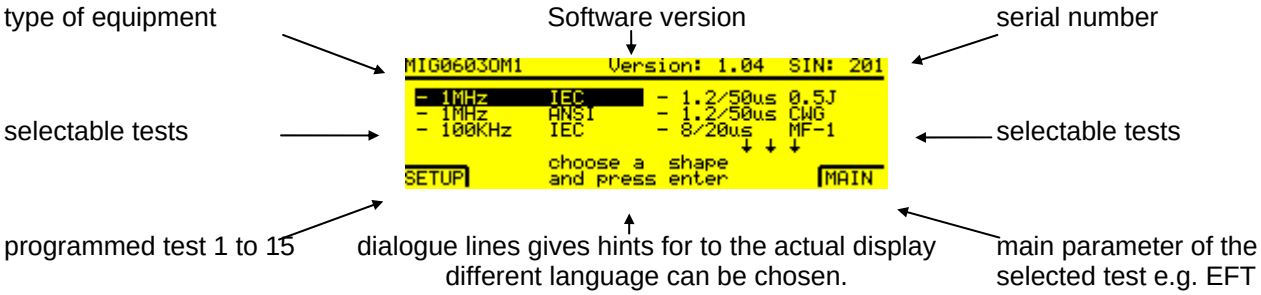
6 Testing with the MIG0603-Oxx

6.1 Quickstart of the MIG0603-Oxx

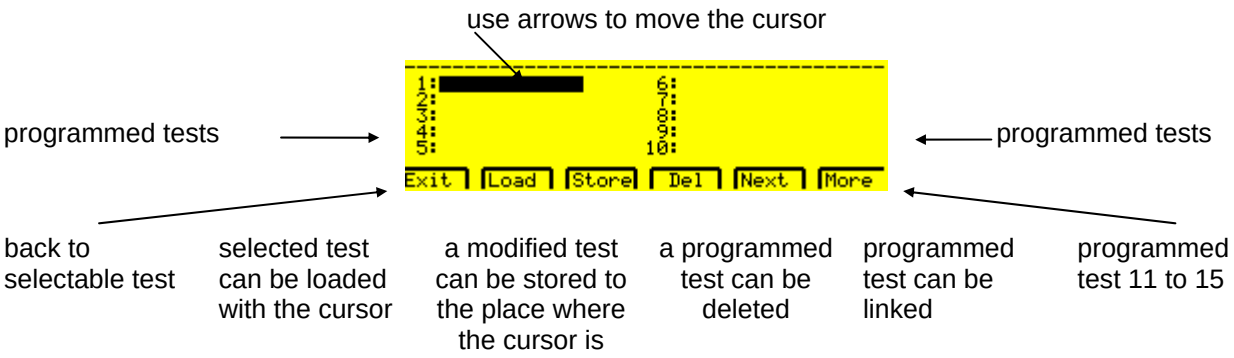
When you have studied Chapter 2 „Safety“ and Chapter 5 „Preparation for operation“ and all instructions have been followed you have green light for a quick start. The quick start includes the most important tests using the MIG0603-Oxx.

To start a set-up, the follow steps must carried out:

- Turn the power switch on the rear side to position I
- Operate the ON/STBY button on the front panel the display turns to:

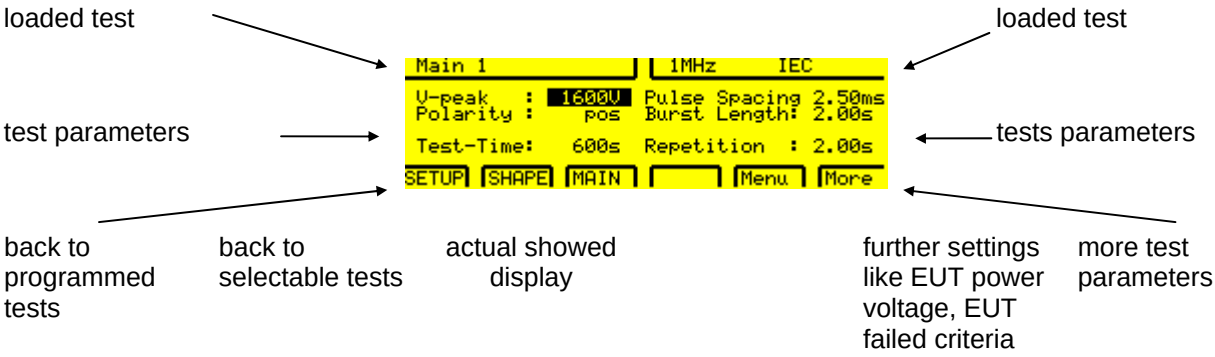


Press "SETUP"

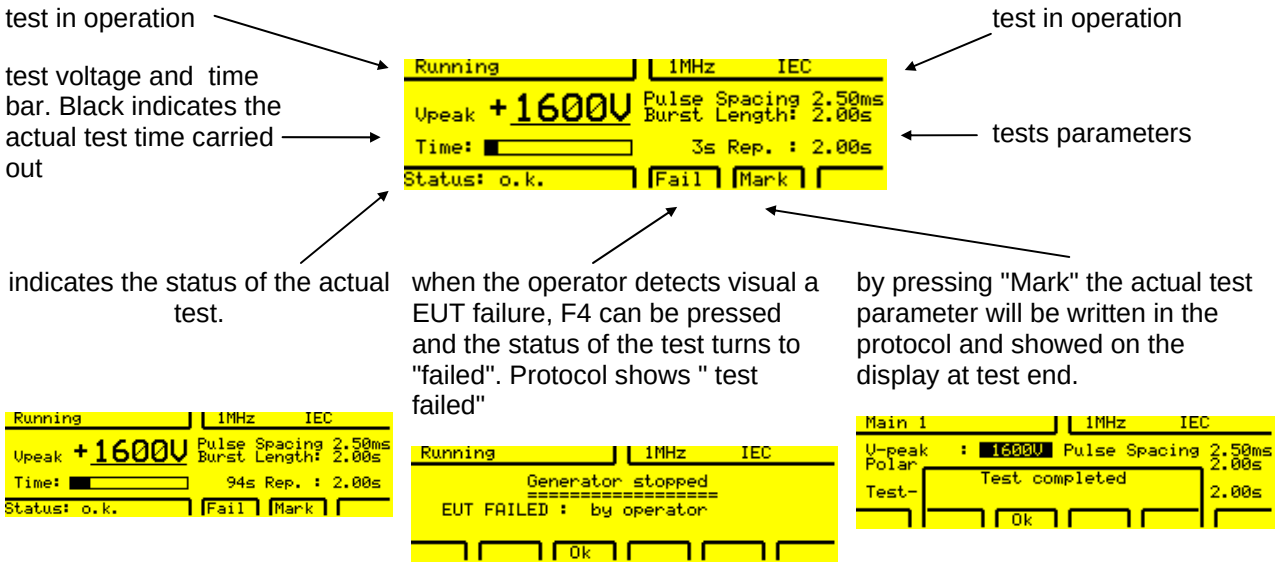


Quick test example 1MHz:

- move the cursor with the arrow to number 3
- press F2 Load



- press "RUN" button



When a printer is connected to the MIG tester or the MIG is controlled from a PC with GENECS the following protocol will be printed or showed on the monitor:

```
EMC-Partner AG
--------------------------------------------------------------------------------
MIG06030M1   SIN-201 Version: 1.04     Test :
                                       Date :  06.12.2000  Time :  20:36:50
Shape     :  1MHz     IEC
EUT :                                  Operator :
Remarks   :


--------------------------------------------------------------------------------
  Burst V-peak    :  1600V         Polarity      : pos      Trigger : auto
  Pulse Spacing   :  2.50ms        Random Pulses : off
  Burst Length    :  2.00s         Burst Syncro  : off
  Repetition      :    10s


--------------------------------------------------------------------------------


       Test-Time :                        20s
       ============================================================================


       Coupling of Pulses: ->CDN , Common Mode


          Mark                             8s  +    0V  2.50ms 2.00s
          Mark                            18s  +    0V  2.50ms 2.00s
                          8               14s  +1600V  2.50ms 2.00s
          Test End ......................  20s




       Test Result :    EUT FAILED :  by operator
```

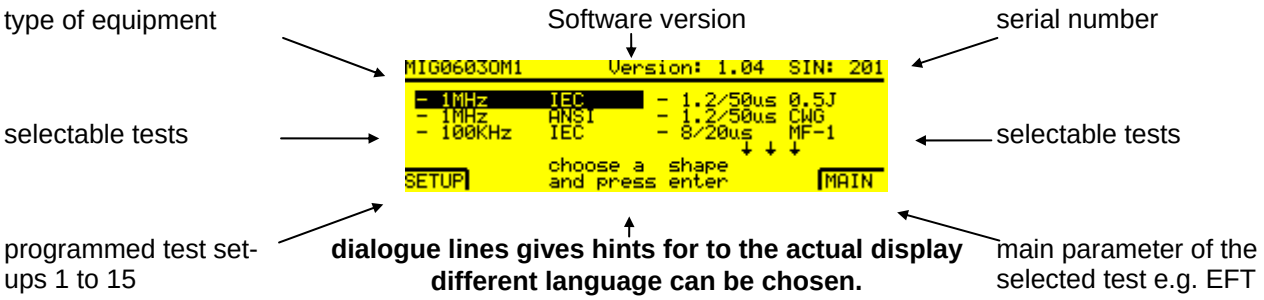
Well that's easy isn't it ?

All other 14 programmed tests can be started and carried out on the same way. All test can be stared or stopped with the "RUN" button.

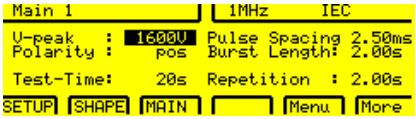
The Quickstart tests contain only a small part of the testing possibilities of the MIG0603-Oxx. In the next two sections, the additional possibilities of the MIG0603-Oxx will be explained in detail.

6.1.1 Selection of a language: Deutsch, Français, Italiano, Espagnol

One of the great advantages of the TRANSIENT-2000 is the language selection. The equipment are shipped with English language selected. To change the language follow the instruction below.



Press "Main" - and twice "Menu" - "UTIL" - -EDIT button

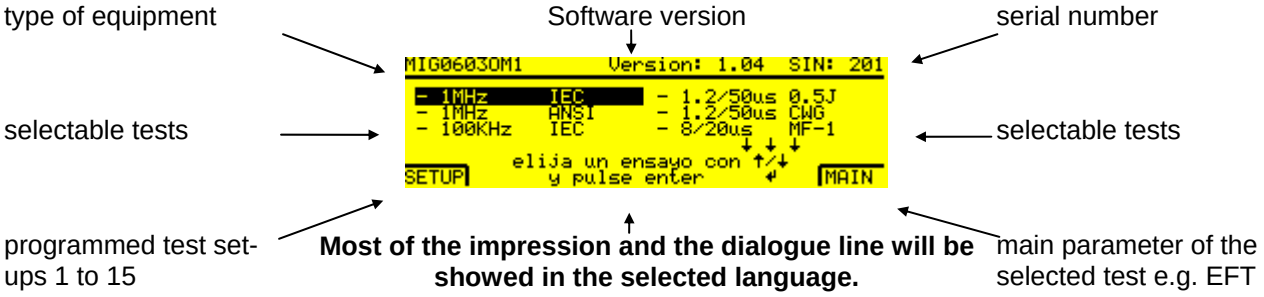


display when "Main" has been pressed

display after pressing twice Menu and UTIL

after pressing "EDIT" button

Chose the desired language (e.g. Spanish) with the arrows and quit with the ENTER button and press soft key F2 "TEST". The display "TEST" has know changed to

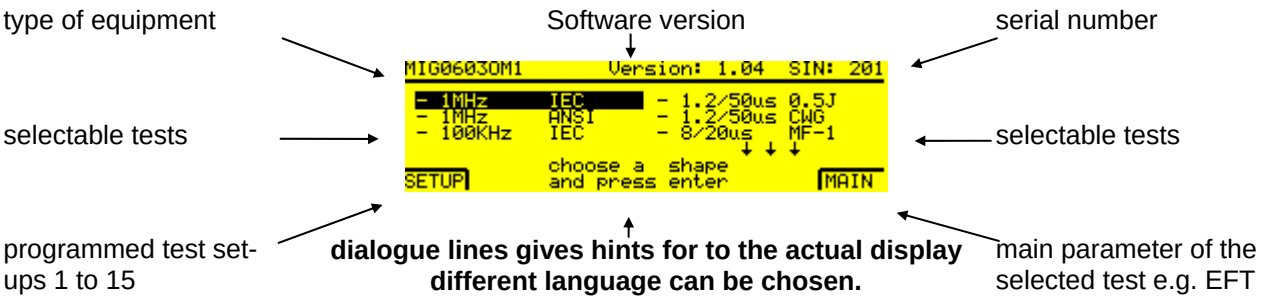


Further languages are possible on the GENECS software but not on the MIG tester level.

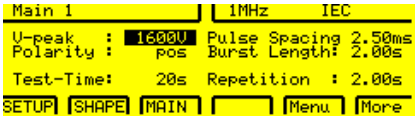
Advantage:
Automatically all expression and remarks on the display and the **protocol** will be written in Spanish or in the selected language.

6.1.2 Protocol and beeper possibilities

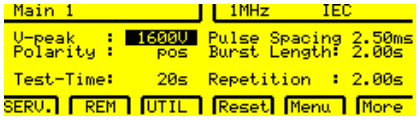
The TRANSIENT-2000 can be adapted to printer with serial or Centronics ports. The TRANSIENT-2000 default value are set at shipment: Autoprint ON, Port Centronics, Beep on Trig ON, Beep on Fail ON. The default values can be changed as follow:



Press "Main" - and twice "Menu" - "PROT"



display when "Main" has been pressed



display after pressing twice Menu

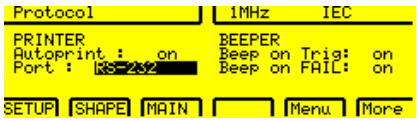
after pressing "PROT." soft key

Autoprint:
When Autoprint is set to OFF no protocol will be printed or send to the GENECS soft on the PC.

Port:
When a printer with Centronics port is used on the Port 1 of the MIG tester (rear side) the "Centronics Adapter" must be plugged. The printer can know be connected with a standard printer connection cable to the MIG tester.

When a printer with RS232 port is used remove the Centronics adapter and change the remote control of the MIG tester to serial port set-up of the printer.

display when "EDIT" has been pressed



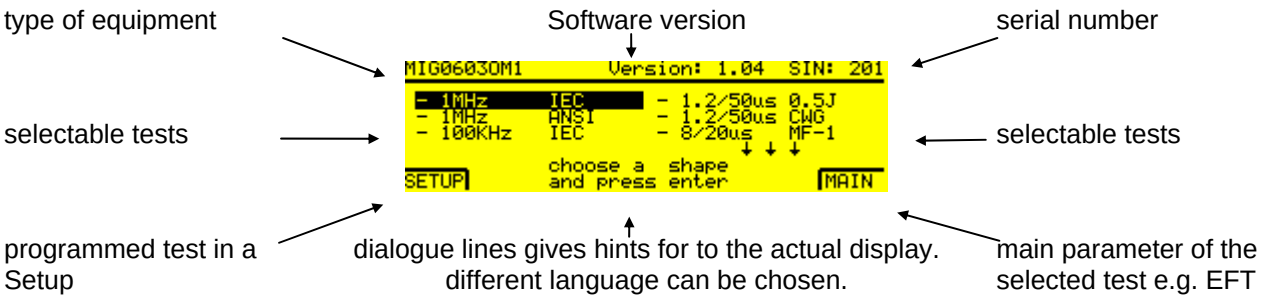
press "ENTER" and REM soft key

after pressing "REM" soft key

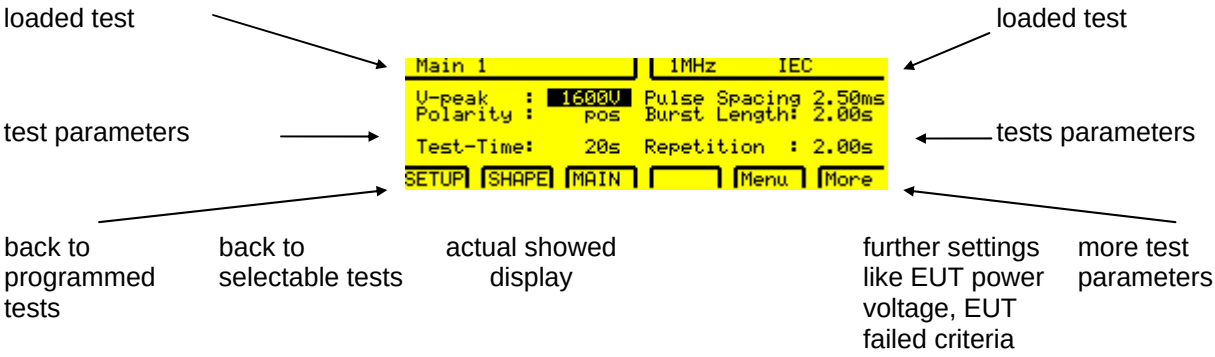
When the serial port is used to control the MIG tester from a PC select the "Remote Control parameter" as showed above corresponding to the PC serial port.

Beeper:
Turn the beep function "ON" or "OFF" as personally preferred.

6.1.3 Damped oscillatory wave test



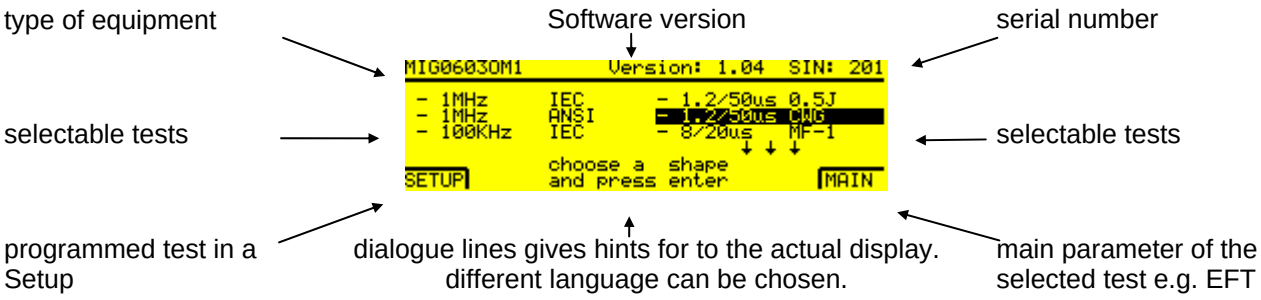
When you press the **„Main“** button the stored default values are displayed



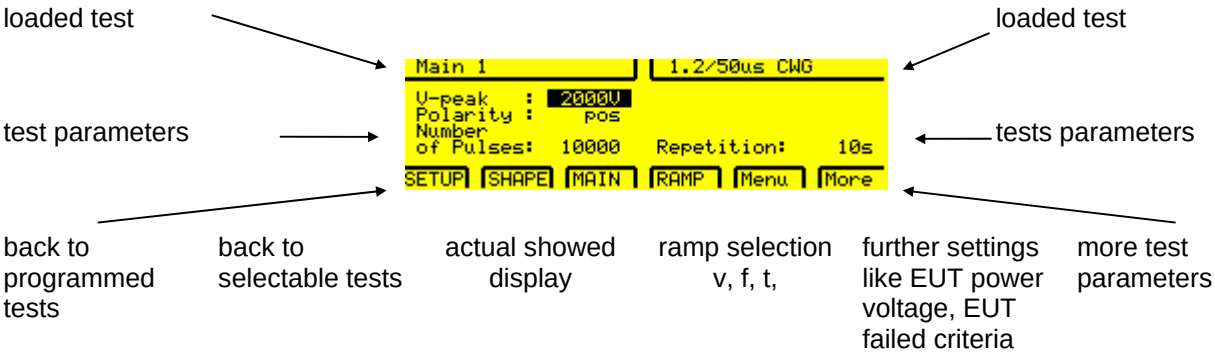
- Close the safety circuit (auxiliary connector placed, emergency button not pressed) the red lamp signalise "Safety Circuit closed".

With the **"RUN"** button the test with the default values will be started. Press again the **„RUN“** button to stop the test.

6.1.4 Combination Wave Test



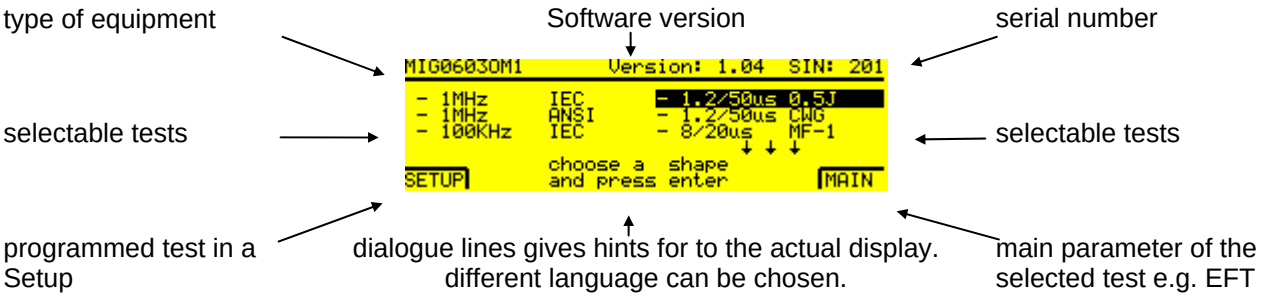
When you press the **„Main“** button the stored default values are displayed



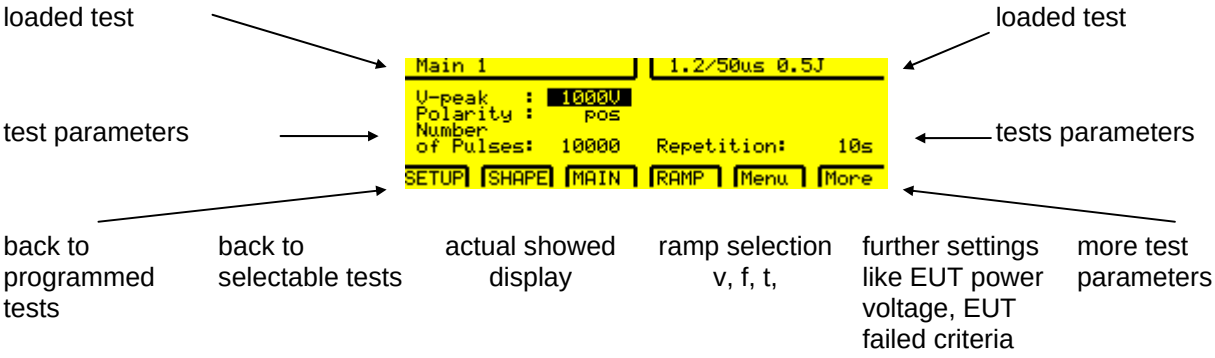
- Close the safety circuit (auxiliary connector placed, emergency button not pressed) the red lamp signalise "Safety Circuit closed".

With the **"RUN"** button the test with the default values will be started. Press again the **„RUN“** button to stop the test.

6.1.5 Tester 0.5J, 500 Ohm



When you press the **„Main“** button the stored default values are displayed



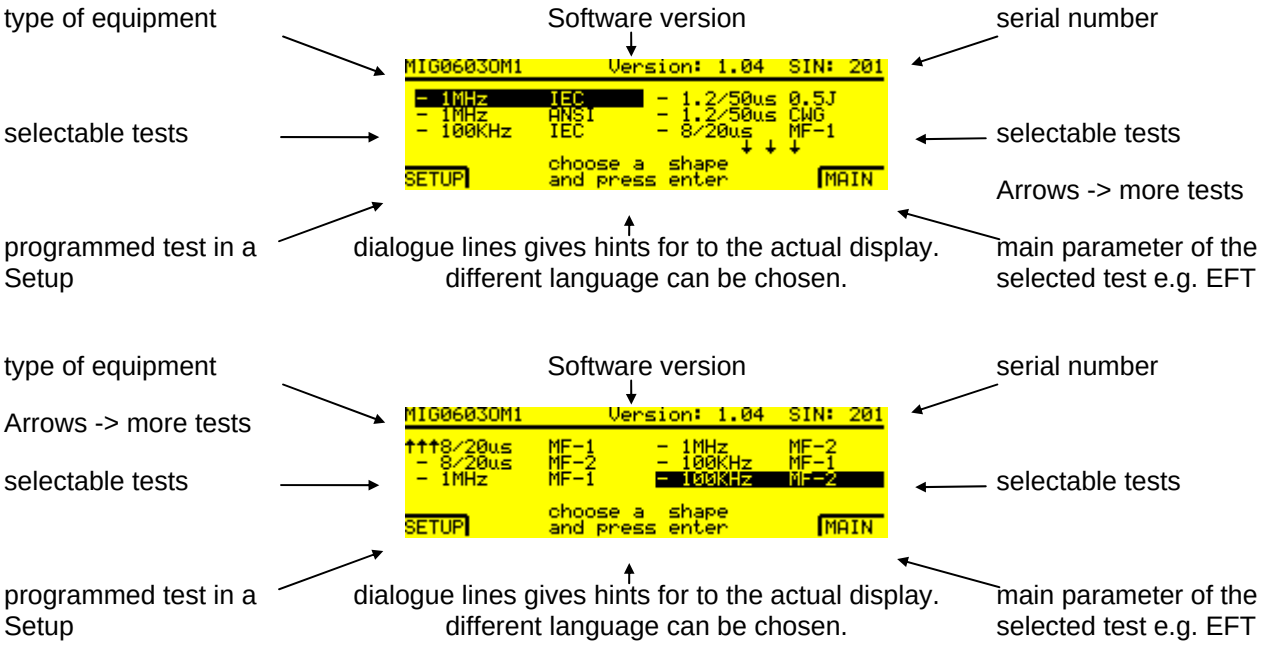
- Close the safety circuit (auxiliary connector placed, emergency button not pressed) the red lamp signalise "Safety Circuit closed".

With the **"RUN"** button the test with the default values will be started. Press again the **„RUN“** button to stop the test.

6.2 Description of different functions, Set-ups

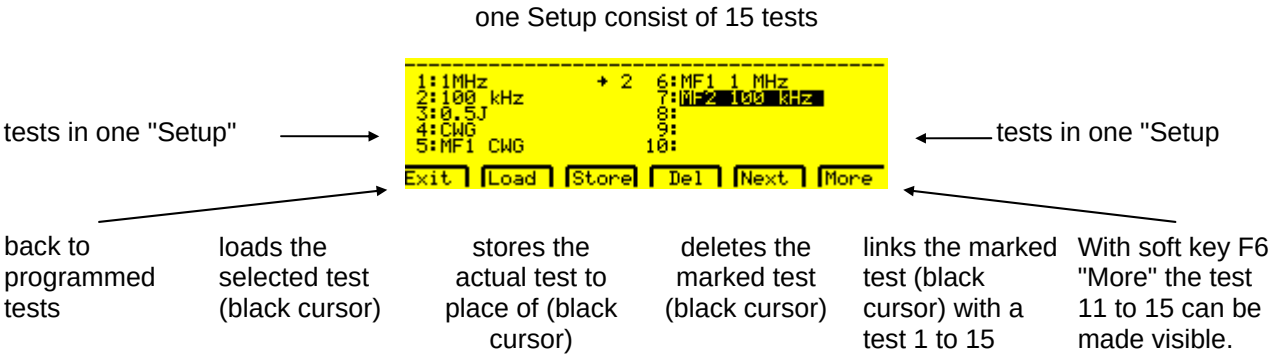
Up to 15 storage places can be used for write your own test set-ups. In the following sections, the menu which you need to write your own set-ups will be described.
The sequence of the menu presentation corresponds with the soft key sequence on the front panel:
Test, Main, Ramp, General.
The installed set-ups can be edited or deleted.

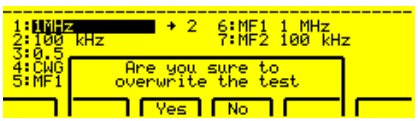
6.2.1 Overview of programmable test with the MIG damped oscillatory testers.



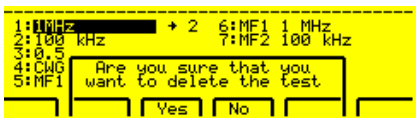
Versions of MIG0603OMI can only partly carry out listed tests.

Press F1 SETUP the display changes as follow:

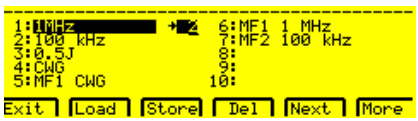




display when "Store" has been pressed.



display when "Del" has been pressed.



after pressing "Next" a small black cursor ask for link 1 to 2 to 15

Test name should be written with the GENES software. The keyboard of the PC can be used. See chapter GENECS software.

6.2.2 „Main“ Setting of nominal values

When you press the **„Test“** button a selection of installed set-ups depending of the MIG version will be visible as showed on the following pages.
The parameter values can only be selected within the range given. If values are chosen that are above or below the given range the maximum or minimum value will be input automatically.
Setting nominal values

6.2.2.1 Damped Oscillatory Wave 1 MHz Test

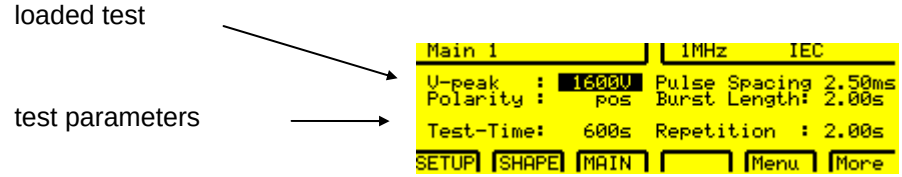
After pressing Menu "**Main**" button:

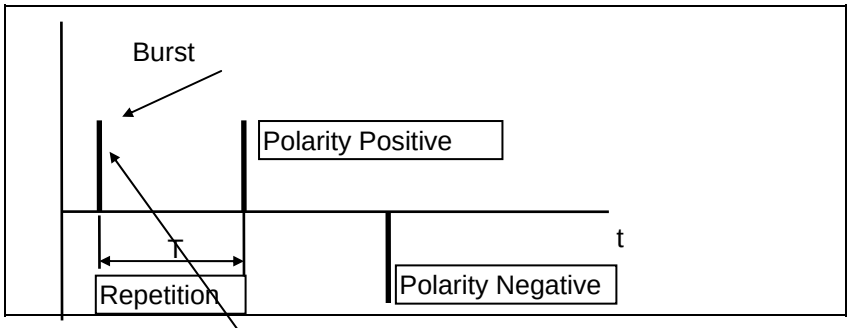
loaded test

test parameters

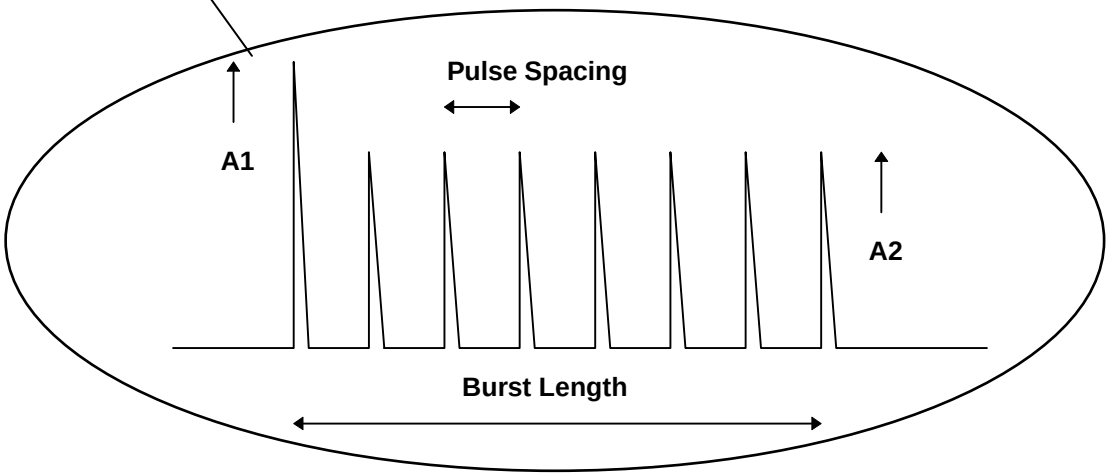
loaded test

tests parameters





6.2.2.1-1 Definition of parameter



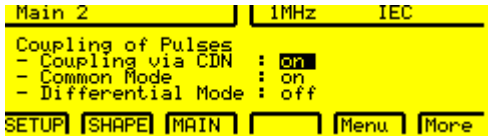
With pulse spacing the repetition frequency of the 1MHz or 100 kHz can be selected 1/tperiode = frequency. e.g. 400 Hz = 2.5 ms pulse spacing

With burst length the duration of a 1MHz or 100 kHz burst can be defined.

After pressing Menu "**More**" button:

loaded test

Coupling modes



loaded test

Coupling modes

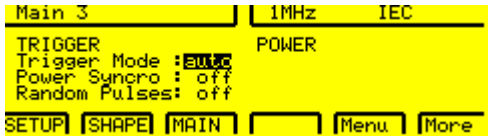
CDN = external coupling filter e.g. CDN2000-06-25

Common mode: one BNC output will be connected to ground

After pressing Menu "**More**" button

loaded test

Trigger modes



loaded test

trigger modes

Power Syncro: trigger synchronised to filter e.g. CDN2000-06-25

Random Pulses damped oscillatory pulses are randomly distributed

After pressing Menu "**More**" button the first display Main 1 will be showed.

6.2.2.2 Damped Oscillatory Wave 100 kHz Test

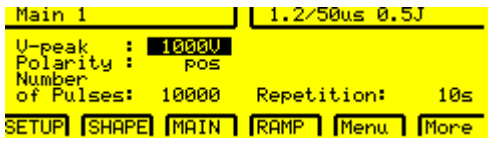
Same displays Main1 to Main3 will be showed for the 100 kHz or 1 MHz ANSI as for 1 MHz IEC

6.2.2.3 Editing 0.5 J, 500 Ω Test

After pressing Main "**Menu**" button:

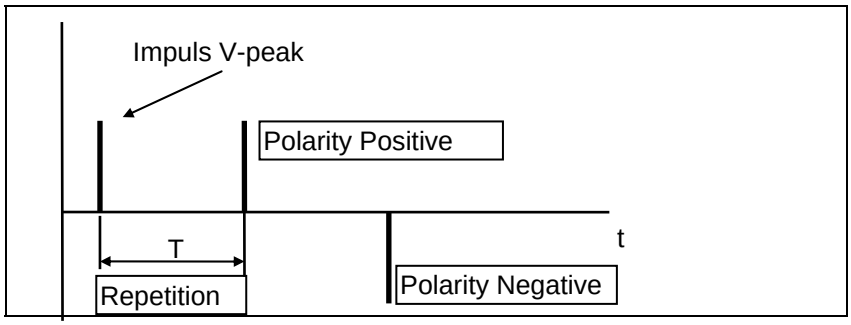
loaded test

test parameters



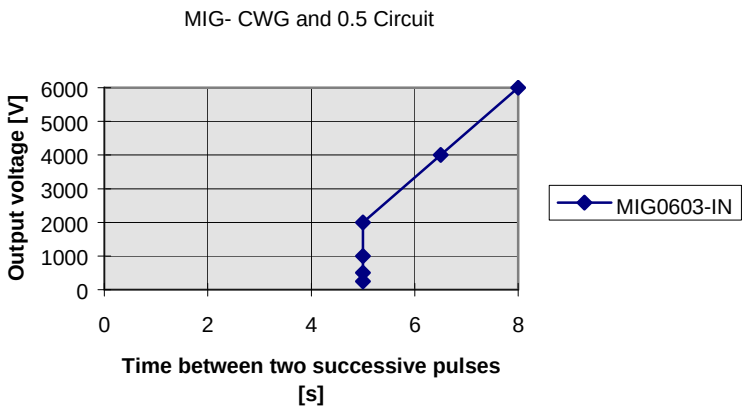
loaded test

tests parameters



6.2.2.1-1 Definition of parameter

Information to the maximum allowed repetition:



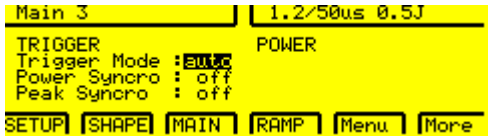
Repetition is defined as the time between two successive impulses. For each discharge the capacitor in the MIG0603-Oxx must be charged. The stored energy is a function of the charging voltage, therefore the repetition rate is a function of the voltage.

Higher repetition rate on demand!

6.2.2.1-2

After pressing Menu "**More**" button

Menu → loaded test



Trigger modes → trigger modes

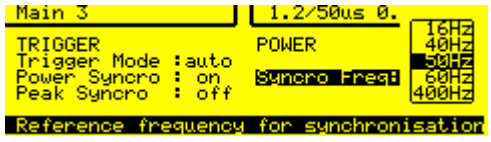
Power Syncro: trigger synchronised to filter e.g. CDN2000-06-25

Peak Syncro: the impulse will be released on a.c. peak

After pressing Menu "**More**" button the first display Main 1 will be showed.

When Power Sncro **„ON“** is selected

Menu → loaded test



Trigger modes → Frequencies

Power Syncro: trigger synchronised to filter e.g. CDN2000-06-25

select the EUT power line frequency

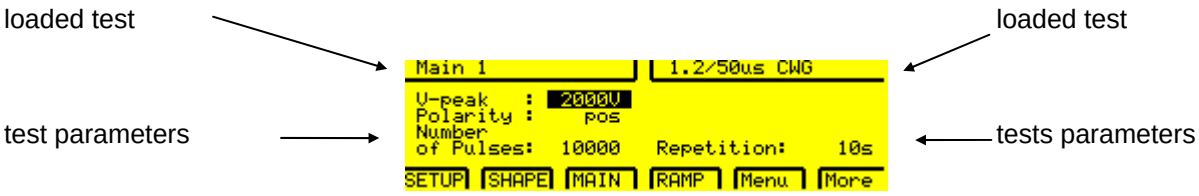
After pressing Menu "**More**" button

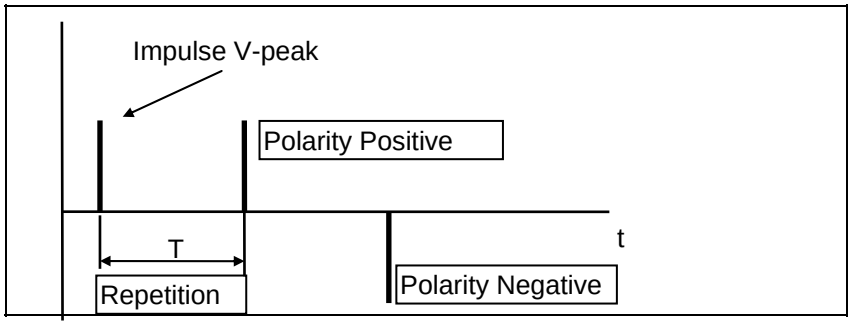
Menu → loaded test

Test parameter → Angle selection

6.2.2.4 Editing Combination Wave Test

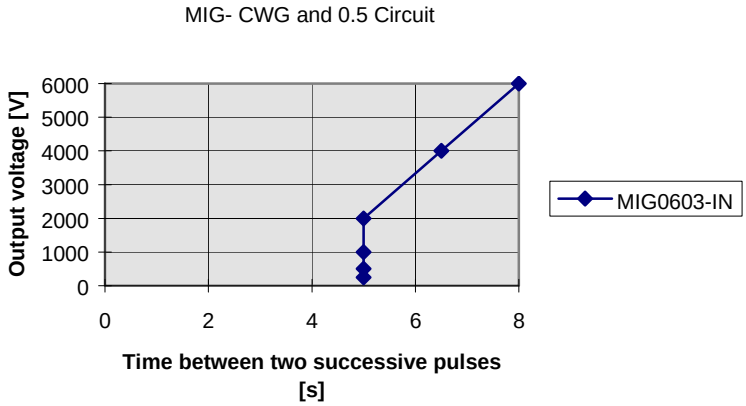
After pressing Main "**Menu**" button:





6.2.2.2-1 Definition of parameter

Information to the maximum allowed repetition:

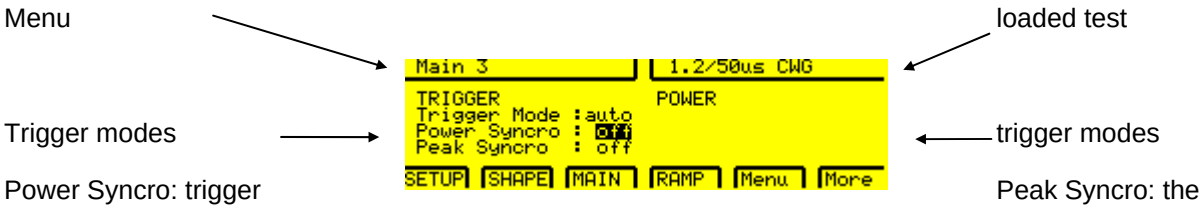


Repetition is defined as the time between two successive impulses. For each discharge the capacitor in the MIG0603-Oxx must be charged. The stored energy is a function of the charging voltage, therefore the repetition rate is a function of the voltage.

Higher repetition rate on demand!

6.2.2.1-2

After pressing Menu "**More**" button



Power Syncro: trigger synchronised to filter e.g. CDN2000-06-25

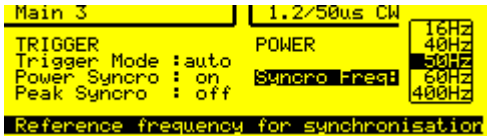
Peak Syncro: the impulse will be released on a.c. peak

After pressing Menu "**More**" button the first display Main 1 will be showed.

When Power Sncro **„ON“** is selected

Menu

loaded test



Trigger modes

Frequencies

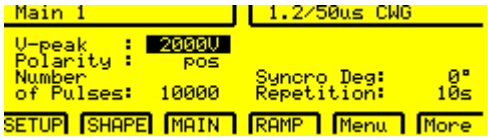
Power Syncro: trigger synchronised to filter e.g. CDN2000-06-25

select the EUT power line frequency

After pressing Menu "**More**" button

Menu

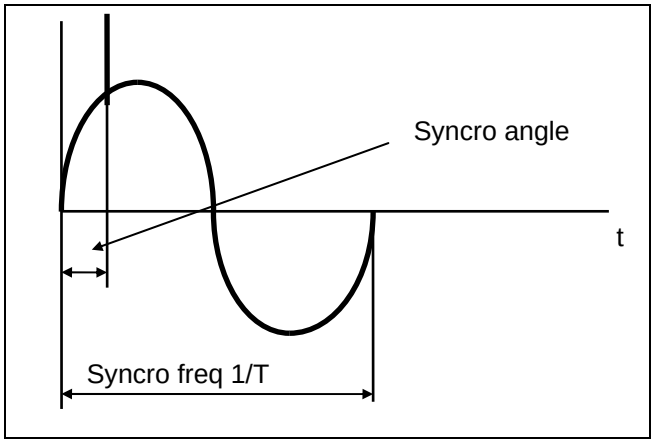
loaded test



Test parameter

Angle selection

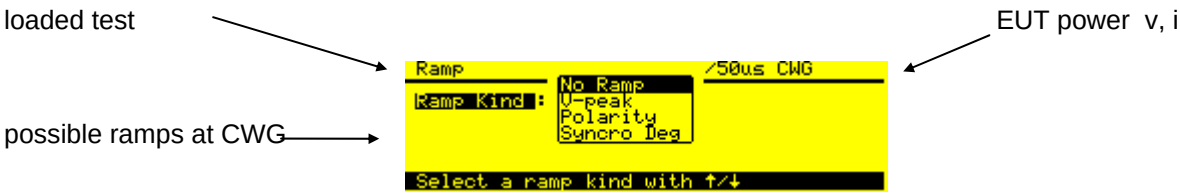
At Synchro =ON, the surges are released synchronous to the main frequency of an external coupling filter e.g. CDN2000-06-25

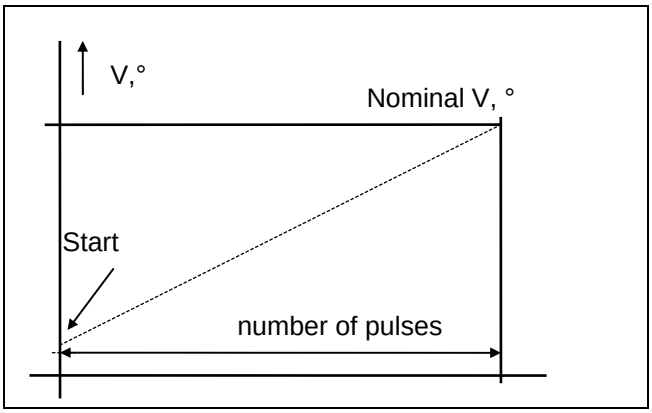


At SURGE Trigger = Manual, the surge is not automatically released after the repetition time, but operation of the Man-Trigger button.

6.2.2.1-3 Definition synchronisation

6.2.3 „Ramp“ Automatic change of a parameter only active for SURGE and 1.2/50 0.5 J

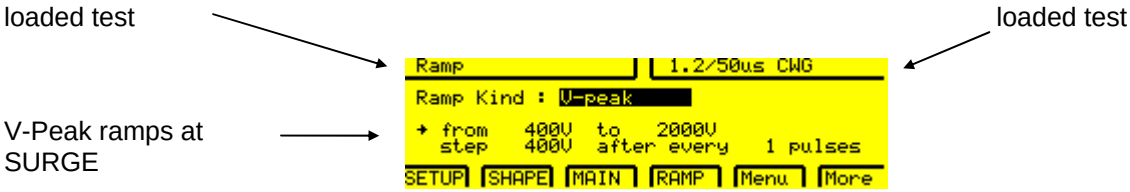


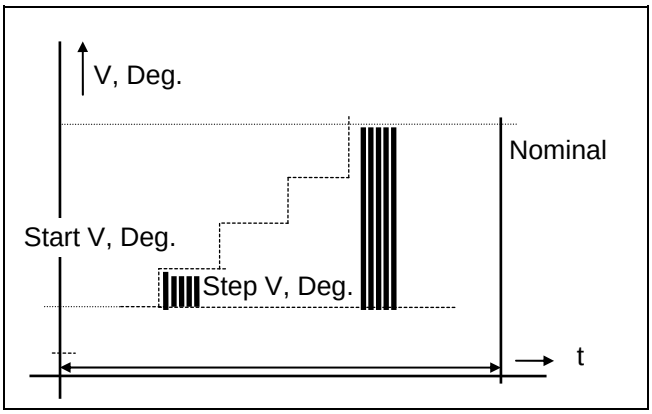


6.2.3.-1 Definition SURGE ramp

A „Ramp“ is defined as a linear change of either voltage, angle, frequency, etc. as a function of time.

6.2.3.1 Ramp functions Voltage
Example Voltage

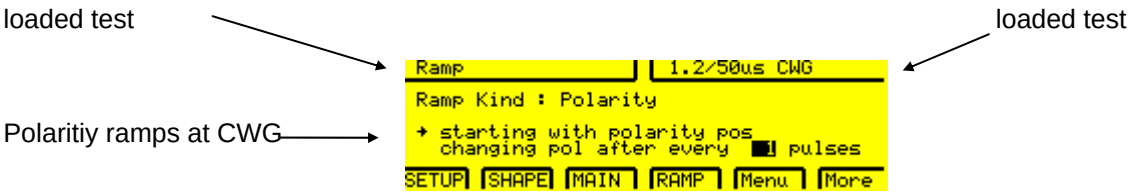




The nominal voltage is selected in the menu "Main“.

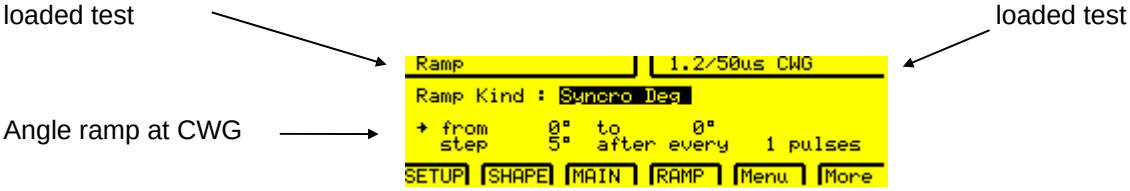
6.2.3-2 Definition Ramp with SURGE Impulses

6.2.3.2 Ramp functions Polarity



The polarity change „change after“ number of pulses. Start is always with the polarity selected in „Main Menu“.

6.2.3.3 Ramp functions Synchronisation only with an external CDN activated



6.2.3.4 EUT error control

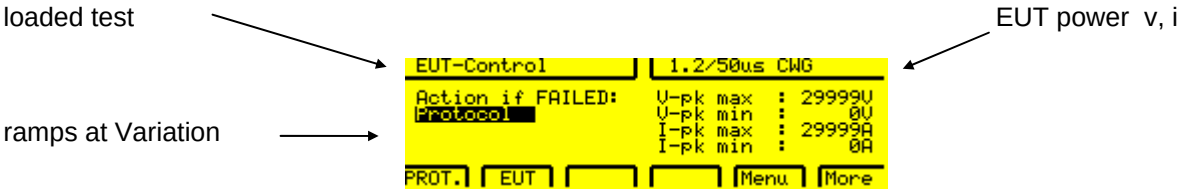
EUT error information can come from three different sources:

1. From EUT failed input on the rear side of the MIG testers,
2. From the SURGE limiter and
3. From the current limiter only MIG with a.c. source capabilities e.g. MIG0603IN

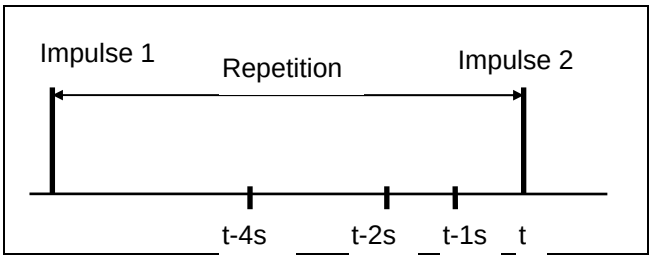
The error can initiate different actions:

	Acoustic signal	Remark in the report	Message on display	Abort the test
Protocol	**x**	**x**		
Next Setup	**x**	**x**	**x**	
Stop Run	**x**	**x**	**x**	**x**

SURGE peak limits



Limits for SURGE peak measurements:
If selected limits are exceeded a message appears on the display. An error will be registered within a limited time. (See diagram on next page).



6.2.4.3 Time window for error message SURGE

At t-4 seconds, the charging of the SURGE capacitor for the next impulse number 2 starts.
t-2 seconds is the last possible opportunity to give an error message from impulse number 1 via the EUT failed input on the rear side of the TRANSIENT-2000.
At t-1second, the data of impulse 1 will be printed out and the error message will possibly be reset.

The error can initiate different actions:

	Acoustic signal	Remark in the report	Message on display	Abort the test
No Action	**x**	**x**		
Info Only	**x**	**x**	**x**	
Stop Run	**x**	**x**	**x**	**x**

6.3 High voltage "Start", "Stop"“

Before you start an EMC test, you should be familiar with the following:

With „RUN“ the charging of the pulse capacitor starts. At trigger Mode "Auto" the pulse will be released as soon as the selected voltage is reached (example CWG or 0.5J). For EMC tests as 1 MHz or 100 kHz the „Run Mode“ is indicated by the blinking LED on the operation panel of the front. During RUN Mode, the corresponding test-LED on the operation part blinks and the corresponding coupling path is illuminated.
Renewed pressing of the RUN-button stops the generator (Reset to the standby mode).

In **„Standby Mode**“ the power to the TRANSIENT is switched on. The control is activated. No high voltage source is switched on.

With **"EMERGENCY STOP"** or **"NOT - AUS"** located on the front panel the operation of the MIG0603OMX generators can be stopped. The **"EMERGENCY STOP"** interrupt directly the power supply of the MIG0603OMX generator (the MIG0603OMX software are not involved).

Depending on local safety standards, an emergency stop must be installed. All operators and laboratory personnel must be able to reach the emergency stop. On the rear side of the MIG0603OMX there is an "**Auxiliary Port"** with two pins for an additional external Emergency switch.

The Trigger button.
The mode „**Manual Trigger“** has been chosen (Trigger = Man).
After the "Run" button has been pressed, the tester is started, the charging process starts. As soon the generator is ready (e. g., the impulse capacitor is charged), the LED on the trigger button is illuminated. As soon as the LED is illuminated a single pulse can be initiated. The next trigger can take place when the LED is illuminated again.

6.3.1 Safety circuit

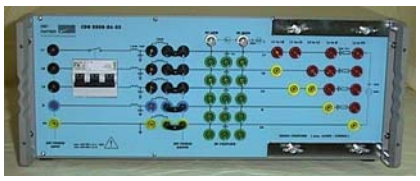
For high voltage tests a safety circuit is a "must". The goal of the safety circuit is to prevent the operators from dangerous situation.
The green warning lamp signalise "No Danger". The safety circuit is open and the high voltage circuit of the MIG0603-Oxxgenerator can not be turned on.
As soon as the safety circuit is closed the red warning lamp signalise the "Danger". The high voltage of the MIG0603-Oxx can be turned on.

6.3.2 EUT Connections

1 MHz, 100 kHz IEC differential mode
2 x 0.5m coaxial cable with HV-BNC tips

1 MHz, 100 kHz IEC common mode
1 short circuit connector HV-BNC-sc plug to low or high
1 x 1m coax cable to the free HV-BNC plug

1MHz ANSI only common mode. The plug "high" is internally connected to ground. No external HV-BNC sc plug must be connected.
1 x 1m coax cable plug to output "low"



For all other coupling the CDN2000-06-25 must be used.
SURGE (IEC 61000-4-5) on three phase power supply
EFT (IEC 61000-4-4) on three phase
Damped oscillatory waves (IEC 61000-4-18) on three phase power supply
Damped Oscillatory waves (IEC 60255) up to four I(O lines

7 Maintenance and Servicing

7.1 Maintenance

To avoid electrical shock, be sure that the power cord is disconnected before starting maintenance work.

EMC PARTNER recommends to that the air filter of the ventilator from time to time be cleaned. The cleaning cycle depends on the environmental conditions. Place the air filter of the ventilator in soapy water for 15 minutes . After 15 minutes, the air filter must be dried before being reinstalled.

No further maintenance is necessary on the MIG0603-Oxx.

7.2 Verification of the MIG0603-Oxx by the user

A simple verification whether high voltage pulses occur at the tester outputs can be carried out using an oscilloscope of a bandwidth of 20 MHz.

7.2.1 Combination Wave Tester

Verification as specified in the Basic Standard 61000-4-5 for CWG.

- Measurement of output voltage at no load
- Measurement of short circuit current with short circuit output
- Check that voltage and current waveform are within the tolerances.
- Calculate the source impedance from the peak voltage divided by the peak current.

1. **Setting „Main Menu“**
   V = 2000 V; Repetition 10s

2. **Measuring point:**
   SURGE U-CRO for the voltage measurement at no load
   SURGE I-CRO for current measurement at short circuit (make a short circuit on the EUT power output phase to neutral on the front panel of the MIG0603OMX generator)

3. **Settings at the oscilloscope**
   Time base 5 µs,
   Vertical deflection 0.5 V / Division
   Definition of the wave forms and their tolerances see chapter Insulation

7.2.2 Damped Oscillatory Wave tester

Verification as specified in the Basic Standard 61000-4-18.

1. **Settings „Main Menu“**
   V = 16000 V; Repetition 10 s

2. **Measuring point:**
   High voltage output measurement at no load

3. **Setting of the oscilloscope**
   Time base 10 µs,
   Vertical deflection 0.5 V / Division
   Definition of the wave forms and their tolerances see chapter energy

7.3 Verification of the MIG0603OMX at EMC PARTNER

EMC PARTNER verify the MIG0603-Oxx generators in accordance with different standards.

Before a MIG0603-Oxx is delivered, all verifications are carried out in accordance with the basic documents.

See separate test report of MIG0603-Oxx attached to this manual.

8 What must be done following failed operation

The MIG generators have many messages to assist the operator in solving possible problems with the generator, that provide information regarding incorrect operation, or to rectify an incorrect system configuration.

Basically, three different messages can be differentiated:
- Error message based on incorrect inputs
- Error message based on incorrect operation of the generator
- Warning messages

8.1.1 Errors caused by incorrect inputs „Generator not ready for run“

Message	Description
Safety circuit open	The auxiliary plug is not fitted or the emergency stop switch has been pressed.
Pulse spacing to low	The time interval between impulses is too short, the generator automatically suggests the minimum time.
No nominal defined	voltage or current
V-start > V-nominal	For voltage ramp functions. The impulse start voltage must be lower than the nominal.
Pulse rate > xxxxx pulses/rep. reduce spacing, length or repetition	For MIG generators with „Burst“ function. The number of pulses exceeds the generator specification.
No coupling path defined	For MIG generators with built in CDN, no coupling path has been selected..
Repetition < 100ms	When synch mode = On, the Burst repetition must be greater than 100 ms.
To high nominal	Reduce nominal value
Repetition too low (<xxsec)	The minimum repetition depends on the charging voltage. Increase the repetition rate in „Main“ menu .
Wait for capacitor discharge	For MIG generators with big energy storage capacitors. Wait until the capacitors are fully discharged. .
Wrong generator configuration	For MIG generators with multiple circuits. The software and hardware configurations do not match .

8.1.2 Failure messages based on error at the generator „Generator malfunction“

Generator malfunctioning	Tittle of the message followed by the information below
no voltage on hv-trafo	The voltage at the high voltage source of the MIG generator cannot be increased or is not present. Press any of the front panel buttons. Repeat the test. If there is no change contact EMC PARTNER.
High-voltage overshoot	The high voltage has exceeded a voltage limit. Press any of the front panel buttons. Repeat the test. If there is no change contact EMC PARTNER.
self firing	The pulse release occurred before the trigger signal. Press any of the front panel buttons. Repeat the test. If there is no change contact EMC PARTNER
no firing	The pulse release did not work. Press any of the front panel buttons. Repeat the test. If there is no change contact EMC PARTNER
earth switch fault	The earth switch did not work correctly. Press any of the front panel buttons. Repeat the test. If there is no change contact EMC PARTNER.
High voltage regulation fault	Regulation of the high voltage source is not functioning correctly. Press any of the front panel buttons. Repeat the test If there is no change contact EMC PARTNER
Polarity change has failed	For ICON3000 control units only
GAP distance setting has failed	For ICON3000 control units only
MAFS distance setting has failed	For ICON3000 control units only
Earth switch does not open	For ICON3000 control units only
No discharge	The generator did not trigger.

8.1.3 Attention notice „Warning Generator stopped“

EUT FAILED: Vpk: xxxxV > xxxxV	The selected voltage limits have been exceeded during SURGE testing. -Check limits -EUT is defective.
EUT FAILED: Vpk: xxxkV <xxxkV	During SURGE test, the voltage has fallen below the selected voltage limits: -Check limits -EUT is defective.
EUT FAILED: Ipk: xxxkA > xxxkA	The selected current limits have been exceeded during SURGE test. -Check limits -EUT is defective.
EUT FAILED: Ipk: xxxkA <xxxkA	During SURGE test, the current has fallen below the selected limits: -Check limits -EUT is defective.
EUT FAILED: External event	The input EUT failed has been activated (grounded). -Check EUT failed -EUT is defective
EUT FAILED: by operator	The operator has pressed FAIL on the MIG front panel. .
Overcurrent: I-power : xxxA (>xxA)	FOR MIG generators with built in CDNs. The continuous current of the EUT limit has been exceeded (AC)
Manual Trigger Timeout (>100sec)	During SURGE and with manual trigger, the high voltage will be switched off after 100 seconds, if no pulses have been released..

8.2 Service; Repairs

The MIG is a compact equipment and servicing or repairing the tester can only be carried out by EMC PARTNER authorised service companies.

8.3 Spare parts list

No spare parts are necessary for the MIG.

8.4 Service department of EMC PARTNER AG

EMC PARTNER AG
Baselstrasse 160
CH - 4242 Laufen
Switzerland
Tel. ++41 61 775 20 50
Fax ++41 61 775 20 59
Email service@emc-partner.ch
Web www.emc-partner.com

9 Putting out of operation

Whenever the MIG0603-Oxx is not needed remove the power cord.

Reasons for putting the MIG0603OMX out of operation:

Maintenance work
Service, repair
Verification by EMC PARTNER
Shipment for outdoor tests

The MIG0603-Oxx is a laboratory test equipment. When the tester is not used, store it in a dry, clean dark place.

10 Packaging and Transport

10.1 Packaging

If you transport the MIG0603-Oxx, pack it in the original shipping box and packing material.

10.2 Transport

If you transport the MIG0603-Oxx for outdoor EMC tests, the military box from EMC PARTNER is recommended.

If you are transporting the MIG to an EMC PARTNER field office for repair, attach a tag to the equipment showing the instrument owner and address, the name of the person to contact about the instrument, the instrument type and the serial number.
Please use the two wite plastic to protect the front and rear of the MIG0603-Oxx generator.

Figure: 10.1-1

11 Recycling / Disposal

11.1 Information for dismantling

There is no danger involved in dismantling the MIG0603-Oxx.

11.2 Parts which can be recycled

The MIG0603-Oxx contains parts made from steel, aluminium, PVC, two-component sealing compound. The impulse capacitors are filled with non-poisonous mineral oil. The various parts can be separated and recycled.

11.3 Parts which can not be recycled

All parts in the MIG0603-Oxx can be recycled.

12 Accessories

12.1 Accessories to MIGxxxOxx System

Pos.	Product No.	Type	Short Description	Delivery
17	TRA1Z77B-HW	Connexion 25 / 9 poles	Serial connexion 25 / 9 poles between PC and generator	from stock
18	TRA1Z67B-HW	Optical link	Serial, optical connexion between PC and TRANSIENT-1000; length 10 m	from stock

The MIG has two serial ports. Most printers on the market have parallel ports (Centronics). The remote control interpreter can be used as interface between the serial and parallel ports.

12.1.1 Accessories to MIG-OS-OS, MIG0603OSI Testers

Pos.	Product No.	Type	Short Description	Delivery
63	MIG1A92C	CDN2000-06-25	Three phase CDN for coupling CWG, ring wave and damped oscillatory, manual operated 440V 25A to MIG0603-IN or MIG0603	1 month

13 Serial Remote Control

13.1 General

The MIG remote-control-option enables remote control of the MIG via the RS-232 serial port.
.

13.1.1 Technical Data of the RS 232C serial port

The V.24 serial port uses the data lines TxD and RxD for the information transfer.

Baudrate:	1200, 2400, 4800, 9600, **19200**
Databits:	7, **8**
Parity:	**None**, Even, Odd
Stop:	**1**, 2
Protocol:	**None**, RTS/CTS, XON/XOFF
End of sequence:	**CR**, LF, CR+LF

With the pinning below the remote control of a TRA2000 or MIG2000 generator is guaranteed.

Pinning	Signal	9 pol SubD		Signal	25 pol SubD
	TxD	Pin 3		TxD	Pin 2
	RxD	Pin 2		RxD	Pin 3
	RTS	Pin 7		RTS	Pin 4
	CTS	Pin 8		CTS	Pin 5
	DCD	Pin 1		DCD	Pin 8
	DSR	Pin 6		DSR	Pin 6
	DTR	Pin 4		DTR	Pin 20
	GND	Pin 5		GND	Pin 7
	RI	Pin 9		RI	Pin 22
Standard Nullmodem	**TxD**	**3**	**>>>>>>>**	**RxD**	**3**
	RxD	**2**	**>>>>>>>**	**TxD**	**2**
	RTS + CTS	**7 + 8**	**>>>>>>>**	**DCD**	**8**
	DCD	**1**	**>>>>>>>**	**RTS + CTS**	**4 + 5**
	DSR + DTR	**6 + 4**	**>>>>>>>**	**DSR + DTR**	**6 + 20**
	GND	**5**	**>>>>>>>**	**GND**	**7**
3-Wire Nullmodem	**TxD**	**3**	**>>>>>>>**	**RxD**	**3**
	RxD	**2**	**>>>>>>>**	**TxD**	**2**
	RTS+CTS+DCD	**7 + 8 + 1**		**RTS+CTS+DCD**	**4 + 5 + 8**
	DSR + DTR	**6 + 4**		**DSR + DTR**	**6 + 20**
	GND	**5**	**>>>>>>>**	**GND**	**7**
EMCP 25/9 pole cable	**TxD**	**3**	**>>>>>>>**	**RxD**	**3**
	RxD	**2**	**>>>>>>>**	**TxD**	**2**
	RTS	**7**	**>>>>>>>**	**DCD**	**8**
	CTS + DSR	**8 + 6**	**>>>>>>>**	**DTR**	**20**
	DCD	**1**	**>>>>>>>**	**RTS**	**4**
	DTR	**4**	**>>>>>>>**	**CTS + DSR**	**5 + 6**
	GND	**5**	**>>>>>>>**	**GND**	**7**
Min. wiring for remote control cable	**TxD**	**3**	**>>>>>>>**	**RxD**	**3**
	RxD	**2**	**>>>>>>>**	**TxD**	**2**
	RTS + CTS	**7 + 8**			
	GND	**5**	**>>>>>>>**	**GND**	**7**

Change Communication Parameters:
To change the communication values on the generator go to the REM (Remote) menu:
after power-on push → MAIN → MENU → MENU → REM. There you can change the values.
Recommended parameters are:

19200 Baud, CR, no protocol, 8 databit, 1 stopbit, no parity

13.2 Organisation of MIG Remote-Control Commands

13.3 Syntax of the Commands

13.3.1 Separation signs:

Within a command, when limiting a command or ending a command-block the following characters have to be used:

< > space after the header command
< ; > ending a command within a command block
<EOS> Closing the command block (End Of Sequence), normaly a Carriage Return CR (→ ENTER) character

13.3.2 Commands Format:

Integer Positive number in the range 0 to 29999, transmitted as an ASCII-string. The units and the formats correspond to inputs/outputs in the MIG-display.

Real Floating decimal point in the format .xxx to xxx. without an exponent, transmitted as ASCII-string. The units and the format correspond to the inputs/outputs on the MIG display.

Character Sequence of letters and numbers

13.4 Setup Commands:

Setup commands consist of the following three parts:

<set command> = <head> < > <argument>

<head> Sequence of 2 to 4 ASCII-characters 'A'..'Z'; 'a'..'z' as start of a command. No difference is made between capital and small letters.

< > Separation sign (Space) between <head> and <argument>

<argument> argument, in form of a integer-, real- or a sequence of characters. No difference is made between capital and small letters.

Example: VNOM 2000 ***<EOS>*** or POL POS ***<EOS>***

Several commands can be reduced to single commands, and be terminated with the sign ***<EOS>***. Single commands are separated by semicolons:

<set command> { ; <set command> } . . . ***<EOS>***

Example: VNOM 4000;POL NEG;REP 10 ***<EOS>***

13.4.1 Inquire Commands

Inquire commands get the generator to transmit internal data to the system controller.
The data consists of two parts:

<Inquire commands> = <head> {< >} <?>

Instead of an argument, a question mark is used in inquire commands.
Several inquire commands are allowed:

Examples:

Based on the inquire command ...	VNOM ? ***<EOS>***
…the following answer can occur :	2000
Controller (PC)	POL? ***<EOS>***
Generators answer	NEG
Controller (PC)	VNOM 1000;E? ***<EOS>***
Generators answer	0

13.4.2 Failure messages:

input buffer ovfl	...	overflow of the read buffer (>100 characters)
time-out occurred	...	Time-out at transmission end
header >4 characters	...	header larger than 4 characters
unknown header	...	unknown command
invalid argument	...	
time-out while talk	...	handshake error
no query here	...	no query for this command
query expected	...	
not valid in local	...	this command is not allowed in local mode
not valid while run	...	this command is only allowed in standby mode

Remote Control Debug Utility
The remote control debug utility makes it possible to check interfaces and user software on the system controller, the PC.

With the command DEB ON ***<EOS>*** the debug-mode will be turned on.

The display immediately shows a range of error messages and/or the contents of the reader buffer.

With DEB OFF ***<EOS>***, the debug-mode will be turned off.

13.5 Remote Control Command set

Command *TST* (TeST)

Explanation: set or query the test mode. This command resets all test-specific parameters to the factory initialisation defaults. The reset must be at the beginning of a parameter set-up.

Arguments: *characters* IMP1, IMP2, IMP3....., IMP11

Example: TST IMP1
This command must be used at a generator with different wave shapes.

Command VNOM (Voltage NOMinal)

Set or query V-peak [in V]

Argument: *Integer*
0..Vmax resp. 0..110 bei DIP

Example: VNOM 1500

VNOM?
Answer: 1500

Command POL (POLarity)
Explanation: Set or query the Polarity.

Argument: *Characters* POS, NEG

Example: VNOM 1500
POL NEG

Command REP (REPetition)
Explanation: depends on the type of test:

Argument: *Integer*

Example: VNOM 1500
POL NEG
REP 10

Command NBR (NumBeR)
Explanation: depends on the type of test:

Argument: *Integer* 0..30000

Example: NBR 10

Command TRIG (TRIGger)
Explanation:
Set or query **Trigger Mode**.

Argument: *Characters* AUTO, MAN

Example: TRIG MAN

TRIG?
Answer: MAN

Command SYM (SYncro Mode)
Explanation: Set or query Syncro Mode.

Argument: *Characters* ON, OFF

Example: **SYM ON**
SYF F3
SYA 180

Command SYF (SYncro Frequency)
Explanation: Set or query Syncro Frequency (fundamental frequency).

Argument: *Characters* F1 correspond 16 Hz
F2 corresponds 40 Hz
F3 corresponds 50 Hz
F4 corresponds 60 Hz
F5 corresponds 400 Hz

Example: SYM ON
SYF F3
SYA 180

Command SYA (SYncro Angle)
Explanation: Set or query **Syncro Angle** [in degrees].

Argument: Integer 0..360

Example: SYM ON
SYF F3
SYA 180

Command DEF (DEFaults)
Explanation: All parameter will be resetted to the default values. This function is made automatically after the command TST or after a Power-up.

Argument: no argument

Command CIO (Coupling Impulse Output)

Explanation: Set or query **Impulse Outputs**.

Argument: *Characters* ON, OFF

Example: VNOM 2000
CIO ON

These command is only useful with automatic switch to different impulse outputs.

Command CLN (Coupling path L-N)

Explanation:
Set or query the coupling path **L-N** at SURGE.
The coupling path is only active if the impulse output is turned off (CIO=OFF).
When more than one coupling path is chosen the coupling paths are switched in the following sequence: L-N, L-PE, N-PE

Argument: *Characters* ON, OFF

Example: CLN ON; CLN?
Answer: ON

These command is only useful with automatic external CDN.

Command CLP (Coupling path L-PE)

Explanation: Set or query of the coupling path **L-PE** at SURGE.
The coupling path is only active if the impulse output is turned off (CIO=OFF).
When more then one coupling path is selected the coupling paths are switched in the following sequence: L-N, L-PE, N-PE

Argument: *Characters* ON, OFF

Example: CIO OFF;CLN OFF;CLP ON

These command is only useful with automatic external CDN.

Command CNP (Coupling path N-PE)

Explanation: Set or query the coupling path **N-PE** at SURGE.
The coupling path is only active if the impulse output is turned off (CIO=OFF).
When more than one coupling path is chosen the coupling paths are switched in the following sequence:
L-N, L-PE, N-PE

Argument: *Characters* ON, OFF

Example: CIO OFF;CLN OFF;CLP ON;CNP ON

These command is only useful with automatic external CDN.

Command PON (Power ON)
Explanation:
Turn on/off the **EUT power**, or query the condition of the EUT power e. g. voltage value. These command is only useful with automatic external CDN.

Argument: *Characters* ON, OFF

Example:
SYF F3 (50Hz)
PON ON (turn on the EUT power)
PON?
Answer: ON
PON OFF (turn off the EUT power)

Command RAK (RAmp Kind)
Explanation: Set or query the different Ramps.

Argument: *Characters*

N :	No ramps
V :	Voltage Ramp
P :	Alternate Polarity
S :	Syncro Ramp

Example: **RAK V**

RAK?
Answer: V

Command RAVS (RAmp Voltage Start)

Explanation: depends on the test type
Set or query **V-peak start** [in V].

Argument: *Integer*

Example: RAK V;VNOM 2000;RAVS 500;**RAVS 100**
(Voltage-Ramps from 500V up to 2000V in 100V steps)

Command RAVD (RAmp Voltage Delta)

Explanation: depends on the test type

Argument: *Integer*

Example: RAK V;VNOM 2000;RAVS 500;**RATD 100**
(Voltage-Ramps from 500V up to 2000V in 100V steps)

Command RASS (RAmp Syncro Start)

Set or query **Syncro start** [in degrees].

Argument: *Integer* 0..360

Example: RAK S;SYM ON;SYA 360;**RASS 0**;RASD 10
(Syncro-Ramps from 0degree up to 360degrees in steps of 10degrees)

Command RASD (RAmp Syncro Delta)

Explanation: depends on the test type:
Set or query **Syncro step** [in degrees].

Argument: *Integer* 0..360

Example: RAK S;SYM ON;SYA 360;RASS 0;**RASD 10**
(Syncro-Ramps from 0degree up to 360degrees in steps of 10Grad)

Command RACA (RAmp Change After)

Explanation: Set or query **Change after**.

Argument: *Integer* 1..30000

Example:
RAK P;POL POS;**RACA 5**
(Alternate Polarity, starts with positive polarity, changes after 5 pulses)

Command EUT (EUT failed action)

Explanation: Set or query Action if EUT failed.

Argument:	*Characters*	OFF	No Action
	STOP	Stop RUN	
	INFO	Info only	

Example: IMAX 500;**EUT STOP**

Command VMAX (Voltage MAX)
Explanation: Set or query EUT failed Limit, Surge Voltage max. [in V].

Argument: *Integer 0..9999*

Example: **VMAX 600**;VMIN 300;EUT INFO

Command VMIN (Voltage MIN)
Explanation: Set or query EUT failed Limit, Surge Voltage min [in V]

Argument: *Integer 0..9999*

Command IMAX (current MAX)
Explanation: Set or query EUT failed Limit, Surge Current max. [in A]

Argument: *Integer 0..9999*

Example: **IMAX 500**;IMIN 300;EUT INFO

Command IMIN (current MIN)
Explanation: Set or query EUT failed, Surge Current min [in A].

Argument: *Integer 0..9999*

Command NAME (setup NAME)
Explanation: Set or query Setup term.
The set-up term is a freely defined character sequence of maximum 12 characters. The name is displayed in the test list of the MIG.

Argument: *Characters* max. 12 Character

Example: NAME first TEST

NAME?
Answer: first TEST

Command SETN (SETup Next)
Explanation: Set or query Next Setup.

Argument: *Integer* 0..23

Example: SETN 1

Command SETS (SETup Store)
Explanation: Stores of a Setup.
No query possible
If a memory place is occupied, it must first be reset using the SETD command.

Argument: *Integer* 1..23

Example: NAME of the test;SETD 1;**SETS 1**

Command SETR (SETup Recall)
Explanation: Activation of a stored set-up
No query possible.

Argument: *Integer* 1..23

Example: SETR 5

Command SETD (SETup Delete)
Explanation: Deletion of a stored set-up.
No query possible

Argument: *Integer* 1..23

Example: NAME of the test; **SETD 1**;SETS 1

Command PRT (PRinTer)
Explanation: Set or query Print Protocol to Port 11.

Argument: *Characters* ON, OFF

Example: PRT ON

Command BTR (Beep on TRigger)
Explanation: Set or query Beep on Trigger.

Argument: *Characters* ON, OFF

Example: BTR?
Answer: ON

Command BOF (Beep On Failed)
Explanation: Set or query Beep on Failed

Argument: *Characters* ON, OFF

Example: BOF ON

Command STOP (STOP run)
Explanation: Interrupts the Run-Mode.
No query possible. Run-Mode can be recognised by the command ST?..

Argument: no argument

Example:
START
ST?
Answer: R (Generator is in Run-Mode)
STOP
Answer: S (Generator is in standby-Mode)

Command STRT (STaRT run)
Explanation: Start of the Run-Mode.
No query possible. Run-Mode can be recognised by the command ST?..

Argument: no argument

Example:
START
ST?
Answer: R (Generator is in Run-Mode)
STOP
ST?
Answer: S (Generator is in Standby-Mode)

Command PAU (PAUse)
Explanation: Set or query the condition pause

Argument: *Characters* ON, OFF

Example:
START
PAU ON

Command IT (Initiate Trigger)
Explanation: Trigger with the same function as the trigger button on the front panel of the MIG
The trigger mode manual must be chosen (TRIG=MAN).
No query possible.

Argument: n o argument

Example:
TRIG MAN
START
...
IT (Trigger of the pulses)

Command M (Message number)
Explanation: inquiry of Generator Error-Code.
The Error-Code will be reset by the STRT command (Start). Each SURGE will also reset the error code

Argument: no argument

Answer: Integer with the following Code:

0:	no error
100:	value out of range
101:	Safety circuit open
103:	V-start > V-nominal
105:	no path defined
107:	repetition too low
109:	printer not ready
110:	Trafo overheat
111:	wait for discharge
112:	No discharge
113:	Spacing spikes to low
202:	generator error
301:	EUT failed (external event)
302:	EUT failed (V-peak > limit)
303:	EUT failed (V-peak < limit)
304:	EUT failed (I-peak > limit)
305:	EUT failed (I-peak < limit)
500:	manual trigger time out

Example: M?
Answer: 304

Command SR (Status Register)
Explanation: query of Generator Status Register

Argument: no argument

Answer:

Byte	: the different Bits have the following meanings:
Bit1	: EUT failed
Bit2	: Error Code >0 (question A?)
Bit3	: Generator in Local Mode
Bit4	: Transmitting error (will be reset by the command E?)
Bit5	: Command error (will be reset by the command E?)
Bit6	: Generator in Run-Mode
Bit8	: New Trigger

Command ST (generator STatus)
Explanation: query of Generator Status .

Argument: no argument

Answer: Characters have the following meanings:
S : Standby
B : Busy (e.g. during charging process)
R : Run-Mode

Example: START
ST?
Answer: R (Generator im Run-Mode)
STOP
ST?
Answer: S (Generator im Standby-Mode)

Command LN (Last Number)
Explanation: query of the last pulses

Argument: no argument

Answer: Integer

Example: LN?
Answer: 5

Command LV (Last Voltage)
Explanation: query of the current voltage [in V] or. Level [in %] at ramps.

Argument: no argument

Answer: Integer

Example: LV?
Answer: +2100

Command LS (Last Syncro)
Explanation: query of the current syncro angle [in degrees] at ramps.

Argument: no argument

Answer: Integer 0..360

Example: LS?
Answer: 190

Command LC (Last Coupling)
Explanation: query of the current coupling paths. Only with external automatic CDN relevant

Argument: no argument

Answer: Characters
IMP-OUT, L-N, L-PE, N-PE

Example: LC?
Answer: IMP-OUT

Command VPK (Voltage PeaK)
Explanation: query of the Surge voltage peak measurement [in V] of the last pulse.

Argument: no argument

Answer: Integer 0..5000

Example: VPK?
Answer: 2345 (positive Impulse)
or Answer: -2100 (negative Impulse)

Command IPK (current PeaK)
Explanation: query of the Surge peak current measurement [in A] of the last pulse.

Argument: no argument

Answer: Integer 0..2500

Example: IPK?
Answer: 1345 (positive Impulse)
or Answer: -1100 (negative Impulse)

Command ID (IDentification)
Explanation: Inquiry of the type of equipment.

Argument: no argument

Answer: Characters : MIG v.vv
v.vv stays for the software version

Example: ID?
Answer: MIG 1.15

Command REN (REmote Enable)
Explanation: change-over into Remote Control Mode.
No query possible

Argument: no argument

Command GTL (Go To Local)
Explanation: change-over into Local Mode. (manipulation from the MIG front panel)
No query possible

Argument: no argument

Command E (Error number)
Explanation: query of Remote Error-Code.
The remote error-code will be reset by the command E?

Argument: no argument

Answer: Integer with the follow codes
0: no error

1:	Command only allowed in remote
2:	unknown command
3:	unpermissible argument
4:	no query allowed
5:	command only allowed in standby-mode
8:	timeout at transmitting end
16:	parity errror at transmitting end
32:	overflow of the input buffer
64:	other errors

Error-Code 1 to.5 always relate in any case to the preceding command.
The Error-Codewill be reset after each query.

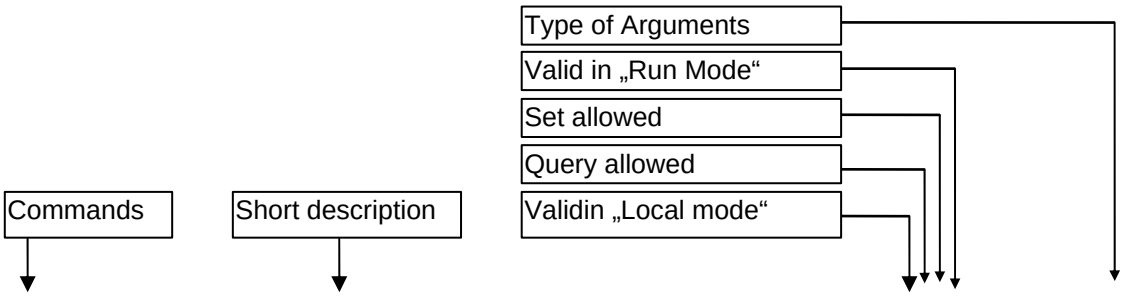
Example: VNOM 4ç*"6
E?
Answer: 3

Command DEB (DEBug mode)
Explanation: Set and query of Remote Control Debug Mode.

Argument: *Characters* ON, OFF

13.6 Overview MIG Commands

MIG Remote Control Commands 06.03.2000 R.Casanova



Main Parameters:

TST	Test Kind (Impulsform)	.xx.	IMP1..IMP9, IMPA,IMPB
VNOM	V-charge resp. V-peak or I-peak (in V or A)	.xx.	Integer
POL	Polarity	.xx.	Pos,Neg
REP	Repetition (in sec or ms)	.xx.	Integer
NBR	Number of Pulses	.xx.	Integer
TRIG	Trigger Mode (Auto/Man)	.xx.	Auto,Man
SYM	Syncro Mode (ON/OFF)	.xx.	On,Off
SYF	Syncro Frequency (F1..F5)	.xx.	F1,F2,F3, F4,F5
SYA	Syncro Angle (in Deg.)	.xx.	Integer

Burst Generator only:

TTM	Burst Generators: Test-Time (in sec)	.xx.	Integer
ESF	Burst Generators: Pulse Spacing (in ms)	.xx.	Real
EBD	Burst Generators: Burst Length (in s)	.xx.	Real
MD	Burst Generators: Random Pulses	.xx.	On,Off
CLN	Burst Generators: Coupling Common-Mode	.xx.	On,Off
CLP	Burst Generators: Coupling Differential-Mode	.xx.	On,Off

Coupling: (Only with automatic Coupling filter)

CIO	Impulse Output	.xx.	On,Off
CLN	Coupling to L1-N	.xx.	On,Off
CLP	Coupling to L1-PE	.xx.	On,Off
CNP	Coupling to N-PE	.xx.	On,Off
CL12	Coupling to L1-L2	.xx.	On,Off
CL23	Coupling to L2-L3	.xx.	On,Off
CL13	Coupling to L1-L3	.xx.	On,Off
CL2N	Coupling to L2-N	.xx.	On,Off
CL3N	Coupling to L3-N	.xx.	On,Off
CL2P	Coupling to L2-P	.xx.	On,Off
CL3P	Coupling to L3-P	.xx.	On,Off

Power Control: (Only with automatic Coupling filter)

PON	EUT Power ON/OFF	.xxx	On,Off

Ramps:

RAK	Ramp Kind	.xx.	N,V,S,P,F,D
RAVS	V-peak- resp. V-ch-Start (in V)	.xx.	Integer
RAVD	V-peak-Step (in V)	.xx.	Integer
RASS	Syncro Start (in Deg.)	.xx.	Integer
RASD	Syncro Step (in Deg.)	.xx.	Integer
RACA	Change after	.xx.	Integer

EUT Control:

EUT	Action if EUT Failed	.xx.	Off,Stop, Info
VMAX	Failed Limit: Surge Max.Voltage (in V)	.xx.	Integer
VMIN	Failed Limit: Surge Min.Voltage (in V)	.xx.	Integer
IMAX	Failed Limit: Surge Max.Current (in A)	.xx.	Integer
IMIN	Failed Limit: Surge Min.Current (in A)	.xx.	Integer

Setup:

NAME	Setup Name	.xx.	String[12]
SETN	Next Setup	.xx.	Integer
SETS	Store Setup	..x.	Integer
SETR	Recall Setup	..x.	Integer
SETD	Delete Setup	..x.	Integer

General Parameters:

PRT	Printer	.xx.	On,Off
BTR	Beep on Trigger	.xx.	On,Off
BOF	Beep on Failed	.xx.	On,Off

Generator Control:

STOP	Stop RUN	..xx	
STRT	Start RUN	..x.	
PAU	Pause	.xxx	On,Off
IT	Initiate Trigger	..xx	

Generator Supervision:

M	Generator Error Message Number (Integer)	xx.x
SR	Status Register (Byte)	.x.x
ST	Actual Status of Generator (S,B,R)	.x.x
LN	Number of last Pulse (Integer)	.x.x
LV	Nominal Voltage of last Pulse (in V, Integer)	.x.x
LS	Syncro of last Pulse (in Degree, Integer)	.x.x
LC	Coupling of last Pulse	.x.x

Measuring:

VPK	Peak Voltage of last Pulse (in V, Integer)	.x.x
IPK	Peak Current of last Pulse (in A, Integer)	.x.x

"Remote Mode" Control:

ID	Identify System and Version	xx.x	
SIN	System Identification number	xx.x	
REN	Go to Remote Mode	x.x.	
GTL	Go to Local Mode	..x.	
E	Get Communication Error Code (Byte)	xx.x	
DEB	Remote Control Debug Utility	.xx.	On,Off

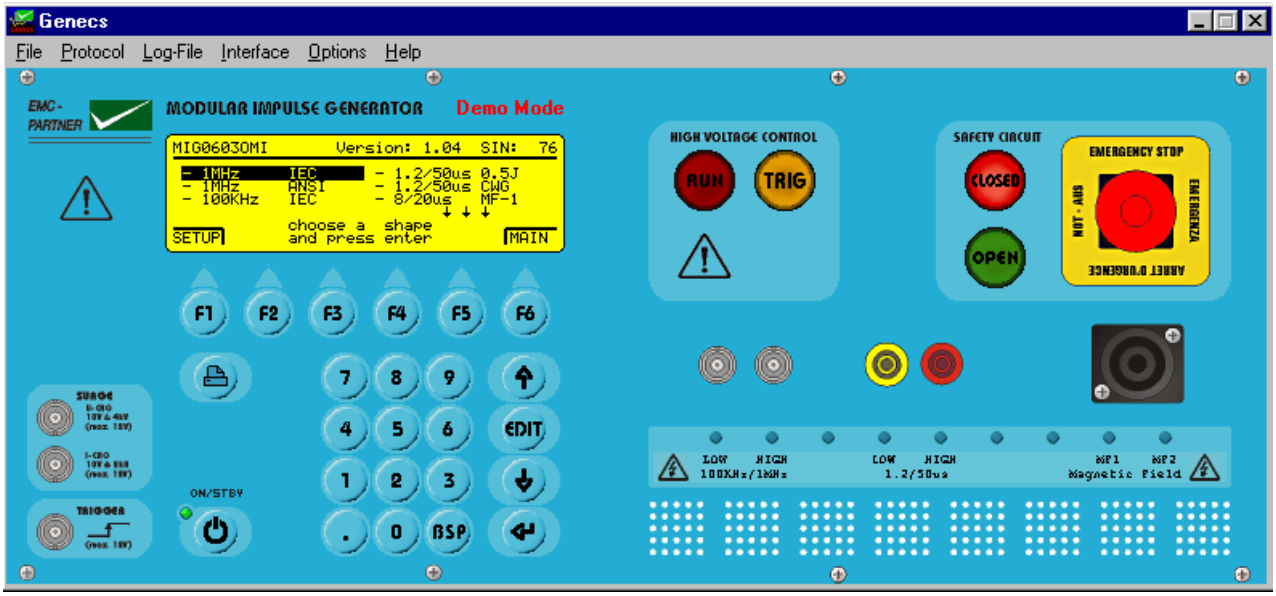
13.7 Software "GENECS" for MIG Remote Control

The GENECS software delivered on a CD (the CD can be found in the cover of the manual binder), can be used to control the MIG-Tester via the RS-232 port. The MIG tester can only be controlled when the software is ordered and the entry code is available when installing GENECS.

13.7.1 Setup GENECS

See instruction on the CD. Follow the instruction of the installer program. When the GENECS is installed and the MIG-Tester via the RS232 connected the display of the MIG-Tester and the display of the GENECS must show the same figure.

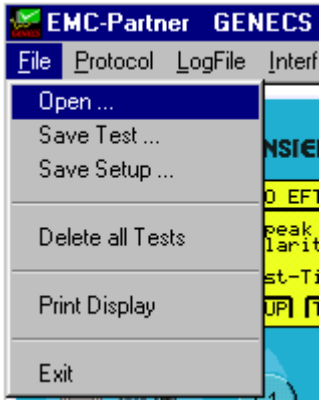
13.7.2 GENECS Windows



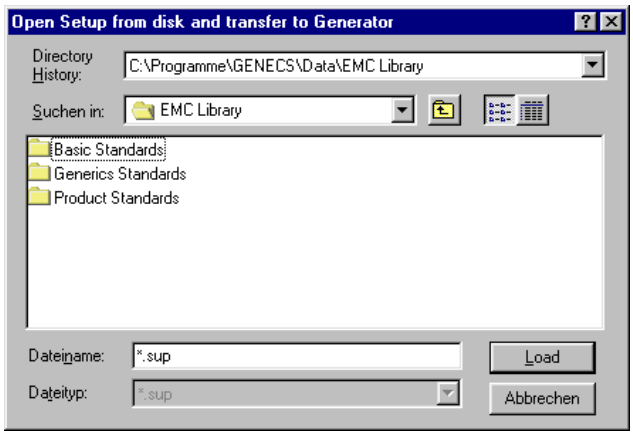
The GENECS windows is equal the MIG tester front plate. Online the MIG tester can be remote controlled by pressing the buttons with the mouse cursor as on the real front plate.

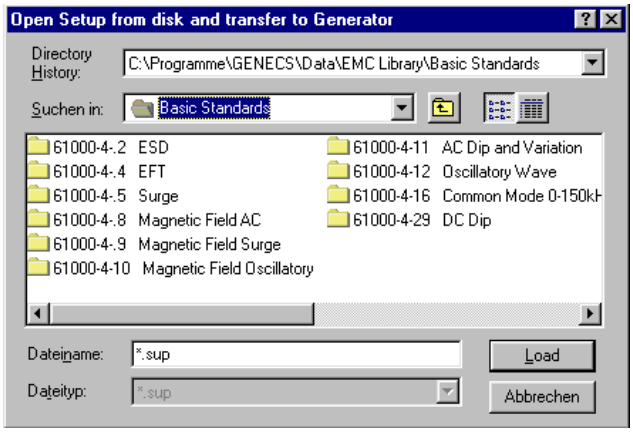
Detailed information can be get from the "help index".

13.7.3 GENECS Library



In the file pull down menu press "open" and activate Library. The Library includes test specified in the relevant basic and generic standards.





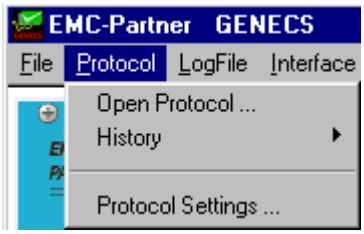
with "Load" the tests are loaded into the MIG tester. During the loading process a pointer indicator shows the loading status.

Save test: Saves a test in a test place 1 to 15

Save Set-up: Saves all 1 to 15 tests. 15 tests is equal a set-up

Delete all test: Deletes all 1 to 15 tests in the TRANSIENT-2000

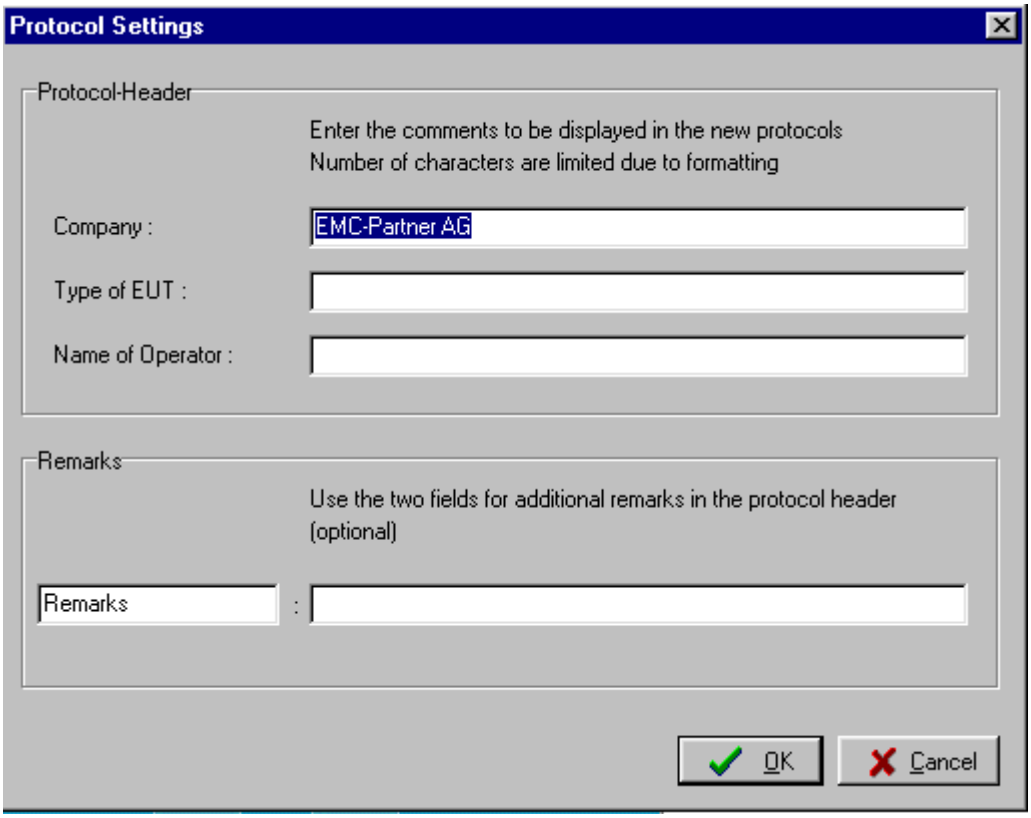
13.7.4 GENECS Protocol possibilities



Open protocol: Saved protocol of carried out tests can opened

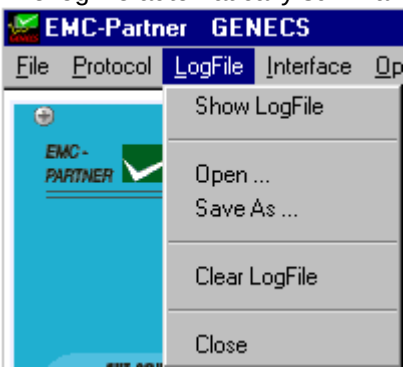
History: Last 20 tests are automatically stored and can be opened in the history pull down menu

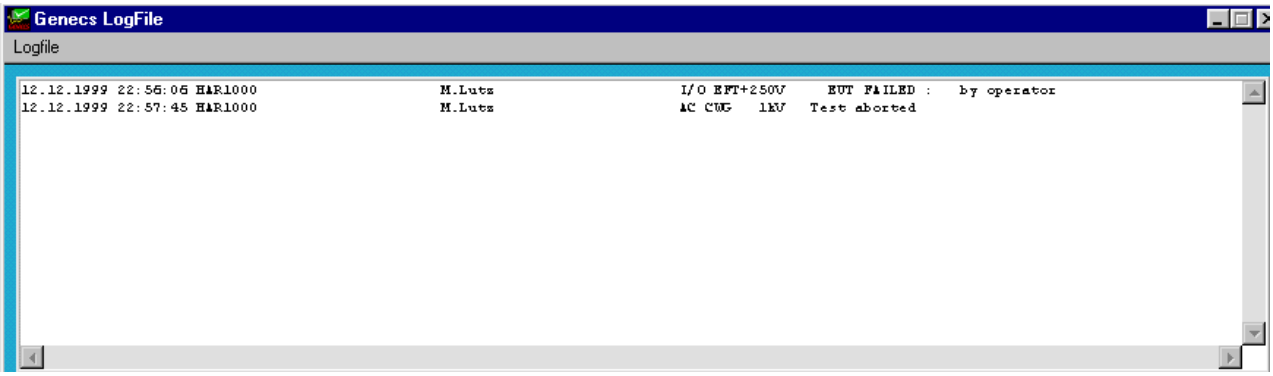
Protocol setting: For each test the EUT operator etc. can be defined. The header of the test report will include the protocol setting



13.7.5 GENECS Log File

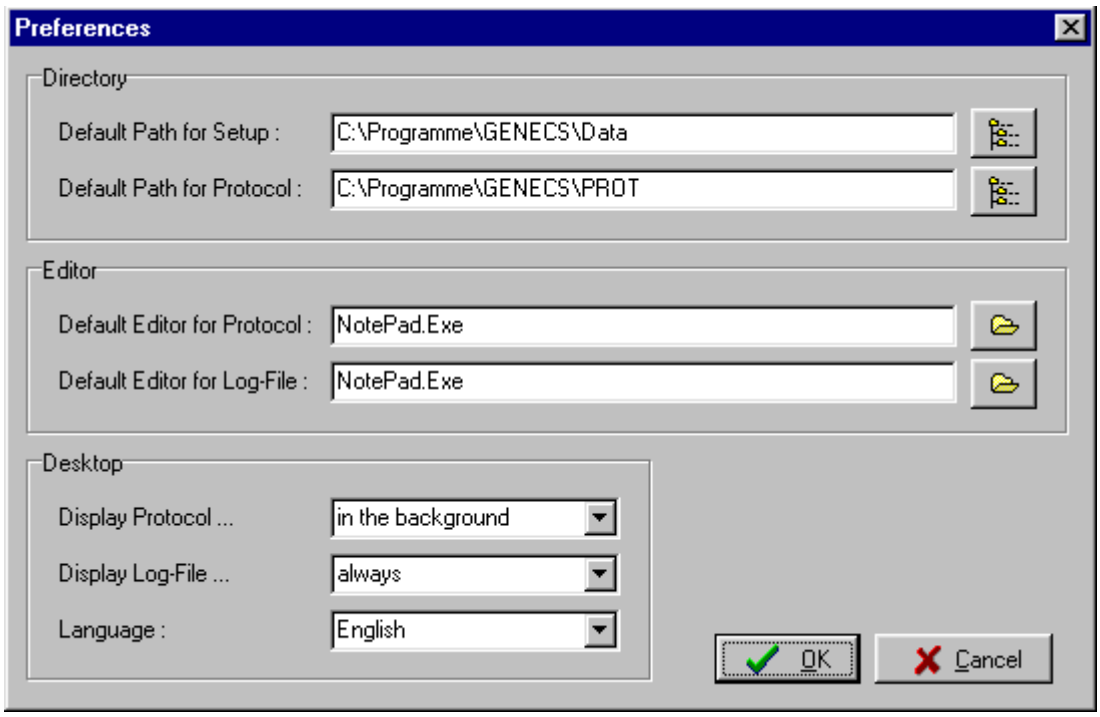
The log file automatically summarises the test results with the most important parameter.





all started tests will be stored. With "Clear Log-File all stored tests are deleted.

13.7.6 GENECS Preferences



Default Editor for Protocols: With the button ... a text program on your computer can be activated and automatically the test report will be loaded into this program. e.g. Word

Default Editor for Log-File: With the button ... a data bank or calculation program on your computer can be activated and automatically the data will be loaded into this program. e.g. Access or Excel

Display Log-File: When the logfile is not necessary on the monitor it can be turned off. The Log file can be loaded with open logfile.

14 Appendix and Correction

14.1 Appendix

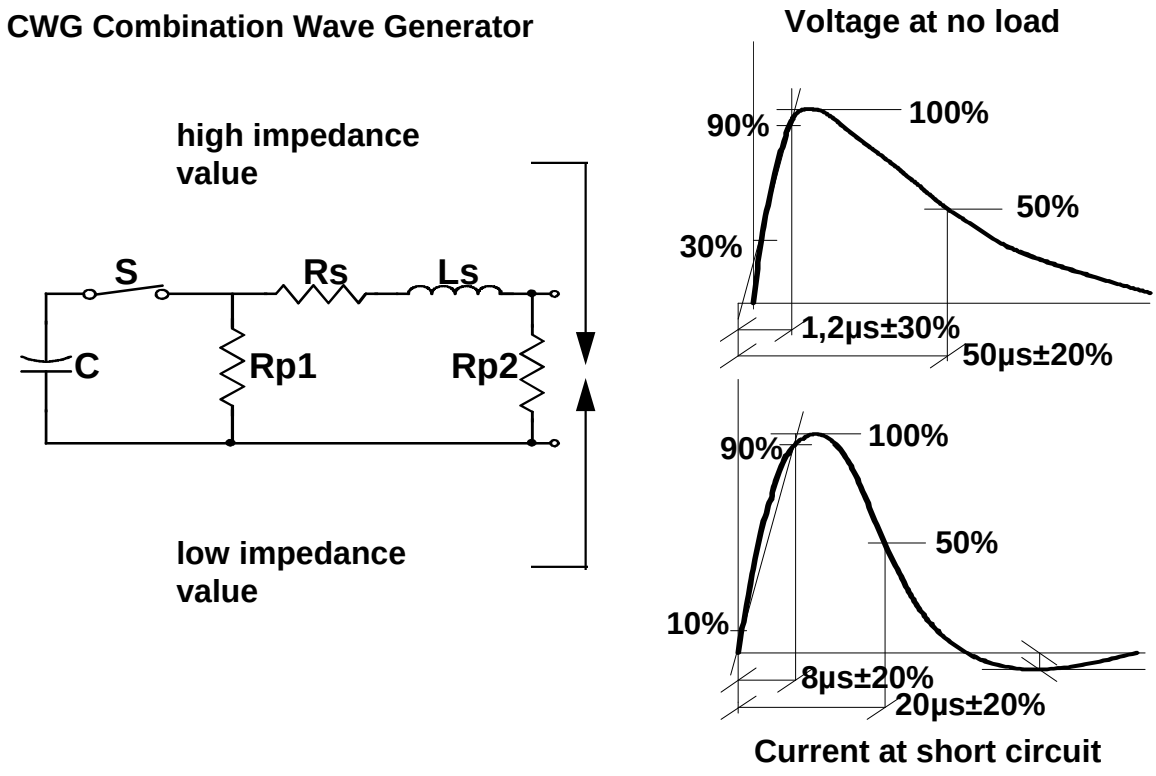
14.1.1 Definition of the wave form combination

See chapter clamping voltage tests 8/20 µ

14.1.2 Definition of the wave form energy ring wave

See chapter energy tests 10/1000 µs

14.1.3 Definition of the wave form 10/700 µs



With this information the SURGE circuit of the MIG can be easily verified.

Example: "Voltage"
- choose 1 kV charging voltage
- measure the no load voltage at the generator output. Check whether the wave-form is within the tolerances or not.

Surge voltage front time T1=1.2 µs ±30%	0.84 - 1.56 µs
Time to half value T2= 50 µs ±20%	40 - 60 µs

measure Umax.

Example "Current"
- choose 1 kV charging voltage
- measure the short circuit current at the generator output. Check whether the waveform is within the tolerances or not.

Surge current front time T1= 8 µs ±20%	6.4 - 9.6 µs
Time to half value T2=20 µs ±20%	16 - 22 µs

measure Imax

Check the source impedance:

Umax / Imax = 2 Ohm ±10%

14.2 Correction

14.2.1 Declaration of conformity to the EMC directive 89/336/EEC

see appendix at the end of this documents.

14.2.2 Declaration of conformity to the LV directive 93/68/EEC

see appendix at the end of this documents.

14.2.3 Declaration of conformity to the Basic Standards

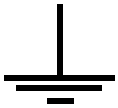
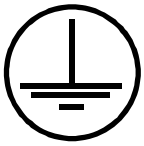
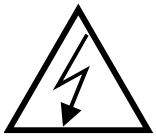
see appendix at the end of this documents.

15 Glossary

Wherever possible, definitions in accordance with IEC 50 (IEV 161) are used.

EUT EST	Equipment under Test French abbreviation of EUT
EMV = EMC = CEM	Electro Magnetic Compatibility German:Elektromagnetische Verträglichkeit French: compatibilité elctromagnetique
Hybrid pulse	Voltage at no load 1.2 / 50 µs and current at short circuit 8 / 20µs.
CWG	Definition in IEC 1000-4-5 used for Surge Tester Combination wave generator.
Coupling network	Electric circuit for transferring energy with low losses from one circuit into another circuit.
Decoupling network	Electric circuit to prevent transmitting energy from one circuit into another circuit.
CDN coupling decoupling network (single or three phase unit)	Consist of a coupling and a de-coupling network.
EFT	Electric Fast Transient (switched inductance)
ESD	Electric Static Discharge
SURGE	Transients with high energy content with relatively low frequency content as produced by lightning and switching of power lines.
DIP	Short voltage interruption or short voltage drop
IEC	International standardisation organisation for electronic technology
VARIAC	Voltage variable transformer
SPIKE	One pulse of the burst
CRO	oscilloscope
HV	High Voltage
rms.	root mean square; effective value
Insulation test	The voltage waveform is relevant
Energy test	The current waveform is relevant
Combination test	The voltage and current waveform is relevant

Used symbols:

	Direct current
	Alternating current
	Three phase alternating current
	Earth (ground) terminal
	Protective conductor terminal IEC 417, No. 5019
	Caution, risk of electric shock ISO 3864, No. B.3.6
	Caution (refer to accompanying documents) ISO 3864, No. B.3.1

16 Index

0

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Declaration of Conformity to Standards

The Tester

Type: MIGxxx-Osx, S/N > 200

complies with the following standards:

MIG-OS-OS1	**IEC 61000-12 damped oscillatory part**
MIG0603OSI	**IEC 61000-4-9, -12 damped oscillatory part, IEC 60255-4**

Laufen, 02. February 2004

EMC PARTNER AG

M. Lutz
Managing Director

EMC PARTNER AG

R. Henz
Manager Service Department

Appendix to 14.2.3 Conformity declaration with basic standards

CE

EMC - PARTNER

Manufacturer Declaration Of Conformity EMC

Directive 89/336/EWG with table VII 2004/108/EG

The Tester **Type: MIGxxx-OSx, S/N > 200**

has been tested in accordance with the following standards:

harmonised:
EN 61000-6-3: 2007
EN 61326: 2006

international
IEC 61000-6-3
IEC 61326-1

Fulfilling the directions of the EMC - Directive 89/336/EWG and with table VII 2004/108/EG

EMC PARTNER authorised representative established within the EC Community

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Laufen: 04. August 2009

EMC PARTNER AG

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Appendix to 14.2.2 K Conformity declaration with the EMC directive

CE

EMC - PARTNER

Manufacturer Declaration Of Conformity LV

Directive 73/23/EWG; with table VI 2006/95/EG

The EMC Tester

Type: MIGxxx-OSx, S/N > 200

is designed and manufactured complying with the following harmonised standards:

Harmonised:
EN 61010-1: 2001

international
IEC 61010-1

in accordance with the regulation of LV - directive of the members states 73/23/EWG and with table VI 2006/95/EG

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Appendix to 14.2.2 Conformity declaration with Low Voltage Directive 93/68/EEC and with table VI 2006/95/EG