

User Manual MIG2000-6 Military Test System

MIG2000-6 Mainframe



Title:
Date:
Division Manager:
Quality Manager:
Revised:

Military Tester MIG2000-6
07.02.2003
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R. Henz
5. November 2012

MILITARY - TESTER
MIL 416 E CS115, CS116 and Customised Applications



Attention Standard References and User Manual

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



Attention contact EMC PARTNER!

Before starting any test, where specifications or limits for a particular application are not included or could not be found in the EMC PARTNER documentation (User Manual, Instruction Sheet), users must contact EMC PARTNER for clarification.

Repair costs arising from incorrect use or failure to clarify an application with EMC PARTNER remain the responsibility of the user.



Achtung EMC PARTNER kontaktieren!

Wenn für eine Anwendung die notwendigen Informationen: Parameter oder Limiten nicht aufgeführt sind in der Bedienungsanleitung UM oder in der Instruktionsanweisung IS, ist der Anwender verpflichtet EMC PARTNER zu kontaktieren bevor die Prüfung gestartet wird. Anfallende Reparatur- und Kalibrationskosten bei nicht Beachtung der Limiten in Bedienungsanleitung / Instruktionsanweisung oder unterlassen der Rückfrage werden den Kunde belastet.



ATTENTION, veuillez contacter EMC PARTNER!

Lorsque, pour une application, des limites ou des informations nécessaires ne sont pas mentionnées dans la documentation, l'utilisateur est tenu de prendre contact avec EMC PARTNER afin de recevoir les informations supplémentaires avant de commencer les tests.

Les coûts de réparation dus au non respect des limites figurant dans le mode d'emploi ou dans la notice d'utilisation ainsi que l'omission d'une demande de précision seront à la charge du client.



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

The MIG2000-6 with the different plug-ins generate damped oscillatory pulses in accordance with MIL-STD-461E: CS115, CS116 and other standards. The waveform are guaranteed together with the injection probe (coupler) as specified in the MIL-STD-461E.

The MIG2000-6 is a flexible kit system, ready to quote tailored plug-ins for special test applications. The MIG is a further innovative solution of EMC PARTNER AG to cover customers requests. The basic units with control and high voltage supply are widely used for all the EMCP impulse generators. The use of one type of basic unit guarantees a high reliability and a high quality. The MIG generators are compact and represent excellent value for money.

1.1 MIL-STD-461 E

MIL-STD-461E published 20. August 1999 Requirements of the control of electromagnetic interference characteristics of subsystems and equipment
Department of Defence Interface Standard
MIL461E supersedes the 461 D and 462 standards

1.1.1 CS115, Conducted susceptibility, bulk cable injection

Introduction

The CS115 requirement is applicable to all aircraft, space, and ground system interconnecting cables, including power cables. The requirement is also applicable for surface ship and submarine subsystem and equipment when specified by the procuring agency.

Performance criteria

The EUT shall not exhibit any malfunction, degradation of performance, or deviation, beyond the tolerances indicated in the individual equipment or subsystem specification, when subjected to a signal having rise and fall times, pulse width, and amplitude as specified in , paragraph 5.13 CS115 of MIL-STD-461E.

Limits and test procedure are defined in paragraph 5.13 of the MIL461E

1.1.2 CS116, Conducted susceptibility, damped sinusoidal transients 10 kHz up to 100 MHz

Introduction

The CS116 requirement is applicable to all interconnection cables, including power cables and individual high side power leads. Power returns and neutrals need not be tested individually.

Performance criteria

The EUT shall not exhibit any malfunction, degradation of performance, or deviation, beyond the tolerances indicated in the individual equipment or subsystem specification, when subjected to a pre-calibrated signal having the waveform and a maximum current amplitude as specified in 5.14 CS116 of MIL-STD-461E.

Limits and test procedure are defined in paragraph 5.14 of the MIL-STD-461E

1.1.3 Short description of the generator MIG2000-6

The generator comprises;

- Mainframe with control, display and high voltage supply 0 up to 6 kV
- Plug-in modules in accordance with different standards.
- Injection coupler CN-MIG-BT for the frequency range 10 kHz up to 10 MHz
- Injection coupler CN-MIG-BT2 for the frequency range 10 MHz up to 100 MHz
- Calibration set up VERI-MIL in accordance with MIL 461E
- Customised frequency plug-in modules(e.g. platform resonance) can be ordered separately

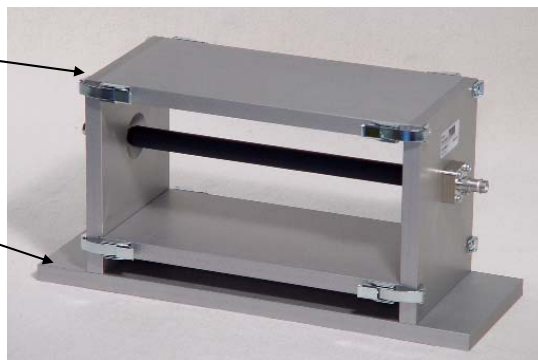
MIG2000-6 Modular Impulse Generator

MIG2000-6 mainframe



Plug-ins

VERI-MIL2 calibration fixture for CN-MIG-BT and CN-MIG-BT2



Ground reference plate

Plug-in
CS116 10 kHz up to 10 MHz



High voltage output of the plug-in

CN-MIG-BT
Coupler 10 kHz up to 10 MHz

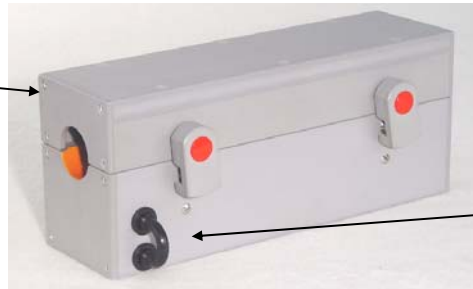


aperture for cable max. 3 cm x 8 cm

High voltage BNC input to connect coupler with generator
Coil 2 level calibrated with the generator.
Coil 1 only for evaluation process e.g. higher voltages

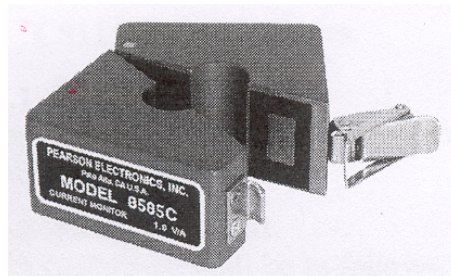
CN-MIG-BT2
Coupler 10 MHz up to 100 MHz

aperture for cable max. diameter 2.5 cm



For CS116 100MHz application the black bridge must be removed

I-Probe „Pearson 8585C“
Bandwidth 1.5kHz up to 200MHz for EUT current measurement CS116 only



aperture 13.5mm, (0.53)

1.2 Available plug-ins and instruction sheets

Plug-in	Standard	Instruction sheet (IN)
CS116-10k10M	MIL-STD-461 E CS116	C-CS116-10k10M-E-IN
CS116-30M100M	MIL-STD-461 E CS116	C-CS116-30M100M-E-IN
CS115-REC	MIL-STD-461 E CS115	C-CS115-REC-E-IN
Fx-NATO-SLOW	EURO Fighter SPE - J - 000 - E - 1000, Section 4.3.1.8	C-Fx-NATO-E-IN
Fx-NATO-FAST	EURO Fighter SPE - J - 000 - E - 1000, Section 4.3.1.8	C-Fx-NATO-E-IN
Fx-10/30ns	customised, definition similar to CS115	C-Fx-10/30ns-SPZ-E-IN
Fx-100/1000ns	customised, definition similar to CS115	C-Fx-100/1000ns-SPZ-E-IN
Fx-1/50µs	customised, definition similar to CS115	C-Fx-1/50µs-SPZ-E-IN
Fx-DO160-S17	RTCA/DO160E Section 17	C-Fx-DO-160-S17-E-IN
Fx-DO160-S19	RTCA/DO160E Section 19	C-Fx-DO-160-S19-E-IN
Fx-CS106	MIL-STD-461F CS106	
FX-MIL1275B	MIL-STD-1275B	
Fx-AMD24C1	Airbus ABD0100.1.8	

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

<p>MIG4803 Version: 1.16 SIN: 255 - 1.2/50µs 48kV/950A SETUP choose a shape and press enter MAIN</p>	<p style="text-align: center;">Insulation</p> <p style="text-align: center;">Application: voltage withstand tests</p>	<p>Waveform: 1,2/50 µs voltage</p> <p>Range: 0 to 100 kV: 12, 24, 36, 48, 96 kV</p> <p>Standards: IEC 60060-1, -2, IEC 61010</p>
<p>MIG1248 Version: 1.16 SIN: 74 - 8/20µs 12kA - 8/20µs 48kA - 8/20µs 24kA - 8/20µs 12kV 1.00hm - 8/20µs 36kA - 8/20µs 12kV 0.50hm SETUP choose a shape and press enter MAIN</p>	<p style="text-align: center;">Energy</p> <p style="text-align: center;">Application: protection elements</p>	<p>Waveform: 8/20 µs current</p> <p>Range: 0 to 100 kA: 6, 12, 24, 48kA</p> <p>Standards: IEC 60060-1, -2, IEC 61643-1</p>
<p>MIG2412SPD Version: 1.16 SIN: 202 - 1.2/50µs 40ohm - 8/20µs 2ohm - CWG (coupl. L-N) SETUP choose a shape and press enter MAIN</p>	<p style="text-align: center;">Combination</p> <p style="text-align: center;">Application: powered surge tests</p>	<p>Waveforms: 8/20 µs current 1,2/50 µs voltage</p> <p>Range: 0 to 24 kV, 0 to 12 kA</p> <p>Standard: IEC 61000-4-5</p>

Other waveforms on demand.

1.3.2 MIG Clamping Voltage Tester

<p>MIG0603CLU2 Version: 1.16 SIN: 89 - <1000V : <5A - <3000V : <50A - <3000V : <5A - <1000V : <50A - <100V : <5A - <300V : <50A SETUP choose a shape and press enter MAIN</p>	<p style="text-align: center;">Clamping Voltage Tester</p> <p style="text-align: center;">Application: Varistors Vclp =<3000V</p>	<p>Waveforms: 8/20 µs current</p> <p>Impedance: 10, 100, 1000 Ohm</p> <p>Range: 0,5 A up to 500 A</p> <p>Standard: IEC 61643-1</p>
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1.3.3 MIG for varistors and gas arrester tests

<p>MIG0624 Version: 1.16 SIN: 203 - 8/20µs 6000A - 8/20µs 24000A - 8/20µs 12000A - 8/20µs 6kV 1.00hm - 8/20µs 18000A - 8/20µs 6kV 0.50hm SETUP choose a shape and press enter MAIN</p>	<p style="text-align: center;">Surge Withstand Tester</p> <p style="text-align: center;">Application: SURGE peak current test on Varistors up to Vclp = 3000 V</p>	<p>Waveforms: 8/20 µs current</p> <p>Impedance: 1, 0.5, 0.25 Ohm</p> <p>Range: 100 A up to 100'000A</p> <p>Standard: IEC 61643-1</p>
<p>MIG0624LP1 Version: 1.16 SIN: 82 - 8/20µs 6000A - 8/20µs 24000A - 8/20µs 12000A - 10/1000µs 60A - 8/20µs 18000A - 10/1000µs 120A SETUP choose a shape and press enter MAIN</p>	<p style="text-align: center;">Energy Tester</p> <p style="text-align: center;">Application: Energy test on Varistors</p>	<p>Waveforms: 10/1000 µs current</p> <p>Range: 0,4 up to 750 A</p> <p>Standard: IEC</p>

	<p align="center">Dual Surge Tester K12</p> <p align="center">Application: SURGE peak current test on Two electrode gas arrester</p>	<p>Waveforms: $i = 8/20, 10/700, 10/350 \mu s$</p> <p>Range: $2 \times i = 6'000, 120, 240 A$ $1 \times i = 10'000, 240, 480 A$</p> <p>Standard: UIT K12</p>
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The „MIG 0603 K12 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 voltage and current wave shapes to be displayed on an oscilloscope

1.3.4 MIG for X,Y, capacitor tests, CWG

	<p align="center">1,2/50 μs Capacitor Tester</p> <p align="center">Application: Insulation test on X, Y capacitors</p>	<p>Waveforms: 1,2/50 μs voltage</p> <p>Resistor: 3, 5, 7, 9, 13, 25, 27, 45, 62</p> <p>Range: 0 up to 2 μF</p> <p>Standard: IEC 60348-14</p>
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	<p align="center">Flammability Tester</p> <p align="center">Application: flammability test on X, Y capacitors</p>	<p>Range: capacitors up to 4 μF Vmax 6000V capacitor up to 10 μF Vmax 4000V</p> <p>Standard: IEC 60348-14 Amd. 1</p>
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1.3.5 Combination wave tester CWG

	<p align="center">Different Surges</p> <p align="center">Application: Household equipment, Telecommunication equipment</p>	<p>Waveforms: 1,2/50 $\mu s, 8/20 \mu s$ CWG</p> <p>Options: Ring wave 0.5 $\mu s, 100 kHz$ 10/700 μs</p> <p>Range: 0.25 to 6.6 kV</p> <p>Coupling: for single phase included</p> <p>Standards: IEC 61000-4-5, IEC 61000-4-12, UIT K17</p>
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MIG0603-IN

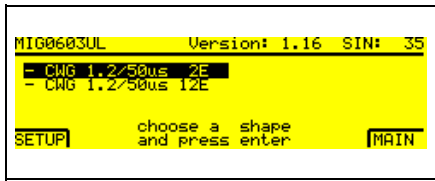
The MIG0603-IN can include up to three different waveforms such as: CWG (1,2/50; 8/20); ITU (CCITT) (10/700, 0,5/700) or 0,5/100kHz ring wave.

The MIG 0603-IN is a surge generator for simulation of indirect lightning on telecom and process and measurement lines. The relevant recommendations are ITU (CCITT) K17 and IEC 61000-4-5.

The MIG 0603-IN 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 MIG 0603-IN, 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 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 voltage and current wave shapes to be displayed on an oscilloscope

	<p style="text-align: center;">Surge Between Two Lines</p> <p style="text-align: center;">Application: equipment, varistors</p>	<p>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</p>
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MIG0606-UL

The MIG0603-UL is a Hybrid or combination generator with a voltage wave shape 1,2/50 μ s and a current wave shape 8/20 μ s. The combination waves are delivered by the MIG0603-UL 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 voltage and current wave shapes to be displayed on an oscilloscope
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, EMC PARTNER AG in Laufen (CH) or visit our Web Site

[www//emc-partner.com](http://www/emc-partner.com)

[www//emc-partner.ch](http://www/emc-partner.ch)

1.4 Technical data

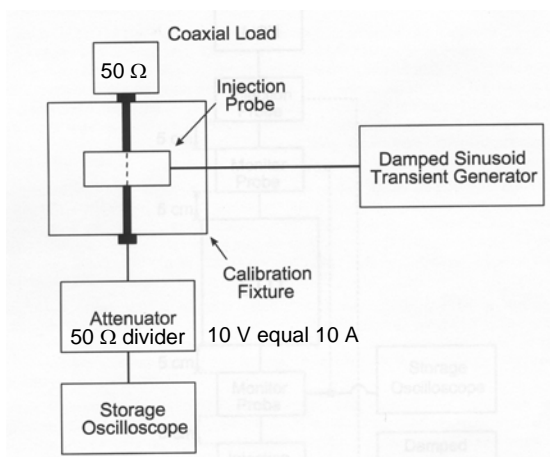
1.4.1 Technical specification of plug-ins



See Instruction sheets for each of the individual plug-ins.
The relevant instructions sheets are included for all plug-ins delivered with a MIG2000-6.

1.4.2 Generator calibration

A system calibration is only possible with a plug-in fitted in the mainframe. The waveform at the generator output is not relevant for the MIL-STD-461 E CS115 and CS116 tests. Waveforms must be calibrated together with the injection probe in the test fixture.

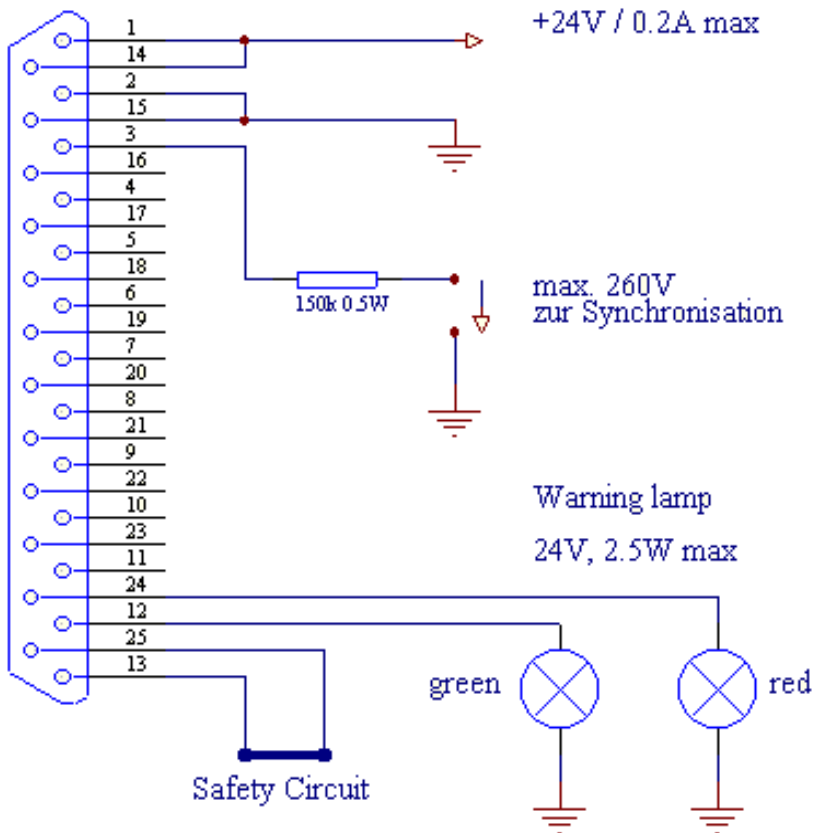


calibration set up defined in MIL-STD-461 E MIG2000-6, CN-MIG-BT, VERI-MIL

1.4.3 General information to MIG control

Set-up memory	Up to 15 memory places
Test sequences	the test set-ups can be linked serially
Ramps	automatic linear variation of one parameter e.g. voltage, frequency etc.
Pulse trigger	Manual or automatic Front panel: with Trigger button Rear panel: with BNC plug
Safety switching	Emergency stop Switches off the EMC Test and the EUT power

1.4.4 Port "Auxiliary"; Pin numbers



1.5 Mechanical dimensions

1.5.1 MIG2000-6 System Tester

MIG type	Dimensions [mm] width x depth x height	Weight [kg]	Versions
MIG2000-6	450 x 500 x 190	17	19" Rack 4 UH
Plug-ins	200 x 280 x 80	approx. 2.5	
CN-MIG-BT	200 x 140 x 200	8	
CN-MIG-BT2	220 x 90r.fiec x 90	2	

Environmental conditions		
Temperature range	°C	0 to 35 °C
Humidity	rh %	25 to 80%
Pressure	kPa	86 to 106

1.6 Power supply MIG2000-6 System

The power line input is located on the rear side of the MIG2000-6

Power :			
Power voltage	L-N single phase 230 V/ 115V ±10% plus protective earth	auto switching	
Power consumption	Maximum <400 VA Standby < 10 VA	(230 V, 50 Hz)	(115 V, 60 Hz)

MIG2000-6 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, dimensions

1.8 Included articles, dimensions

MIG2000-6 (Article No. 103519)

Mechanical Dimensions

Unit Height:	4
Length:	57 cm
Width:	45 cm
Height:	19 cm
Net Weight:	22 kg

Included Articles

According to STL-Variante 20, STL-Version 1

Qty	PN	Description
1	104839	Broschure Military Test System
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)

1.9 Standard accessories

Accessories to MIG2000-6 (Article No. 103519)

According to OP-Variante 1, OP-Version 1

Qty	PN	Description	Weight (kg)	Length (cm)	Width (cm)	Height (cm)
1	102525	Spare fuse 5AT	0	2	0.5	0
1	103167	Safety Circuit MIG AUXILIARY	0.03	5	5	1.5

2 Safety

The MIG2000-6 System belongs to safety class 1

2.1 Safety standards

The MIG2000-6 System fulfils the requirements of the safety standards IEC 61010 „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 61010) 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 MIG2000-6 System Tester. The instructions contained in the manual regarding operation and the test set up are to be strictly observed.

2.2 Climatic Conditions

MIG2000-6 System generators contain high voltage circuits in integrated form. EMC PARTNER only guarantees correct operation of the MIG2000-6 System and associated accessories, if operated within the climatic condition specified.

Temperature	15 °C to 35 °C	60 to 90°F
Relative humidity	45 % to 75 %	12.9 to 15.4 PSI
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.	

The MIG2000-6 System should be operated in a dry, clean room. If for any reason water condenses in the MIG2000-6 System, then no MIG2000-6 System operation should be started before the tester is dry.

It is strictly forbidden to operate the MIG2000-6 System in rooms with a gas explosion risk. The high voltages of the MIG2000-6 System can generate sparks, which could 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

MIG2000-6 Systems generate high voltages. 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. |
| • Never touch connectors or cables when an EMC test is in operation. |
| • High voltage must be disabled on the MIG2000-6 System and the EUT power 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. |

MIG2000-6 System must be connected to power line with a protective earth connection to safety ground. If an Isolation transformer is used, the secondary side must be grounded.

2.4 Electromagnetic Compatibility

The outputs of the MIG2000-6 System and connection cables to the EUT can emit disturbances. Please consider the national regulations applicable to the local environment..

MIG2000-6 System should not be operated near sensitive measuring and control systems.

MIG2000-6 System fulfils the following immunity requirements:

• Electrostatic discharge	Level 4 (8 kV)	(IEC 61000-4-2)
• Burst EFT	Level 4 (4 kV)	(IEC 61000-4-4)
• SURGE	Level 3 (2 kV)	(IEC 61000-4-5)

Refer to the manual



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

<p>This manual is an integral part of the MIG2000-6 System. 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 arising from non observance of safety rules and precautions in the manual.</p>
--

3 Control Panel

3.1 Front panel of the MIG generators



Fig.4.1

MIG2000-6 is a 4UH instrument

The most important elements of the front panel are:

1. Control panel (left part)
2. Operation panel (right part)
3. Handles for the 19" rack
4. Plug-ins

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

As indicators , the follow colours are generally used:

green	MIG2000-6 system is connected to the power supply. High voltage is OFF and the safety circuit is open.	No danger
red	Safety circuit is closed and high voltage can be switched on,	Danger!
yellow	General indication	

Important: :

A general system reset can be carried out as follows:

- | | |
|--|--|
| <ol style="list-style-type: none"> 1. Press „Power ON“ and number „1“ buttons simultaneously 2. Wait until beep sounds 3. Press number „2“ button immediately | <p>or use the following softkey sequence from the MIG2000-6 front panel:
Main - Menu - Menu - Util - General Reset</p> |
|--|--|



ATTENTION! All programs stored in memory spaces 1 to 15 will be deleted und must be restored. Additionally the customized % factor in the display must be newly set. When the factor in % overflows the hardware range, no output voltage will be generated.

As an alternative

Reset without deleting programs stored in locations 1 to 15
Press the following softkey sequence
Main - Menu - Menu - Reset - quit with Yes

3.1.1 Control part

control of the MIG2000-6 is carried out by a microprocessor. This controls the EMC tests, stores the inputs of the numeric keypad, updates the display, checks whether the inputs of the operators are within the instruments range, stores programs and prepares test reports. The operator communicates with the MIG2000-6 via the numeric keypad, the display and the soft keys.

Control panel elements are explained separately from the connection panel.

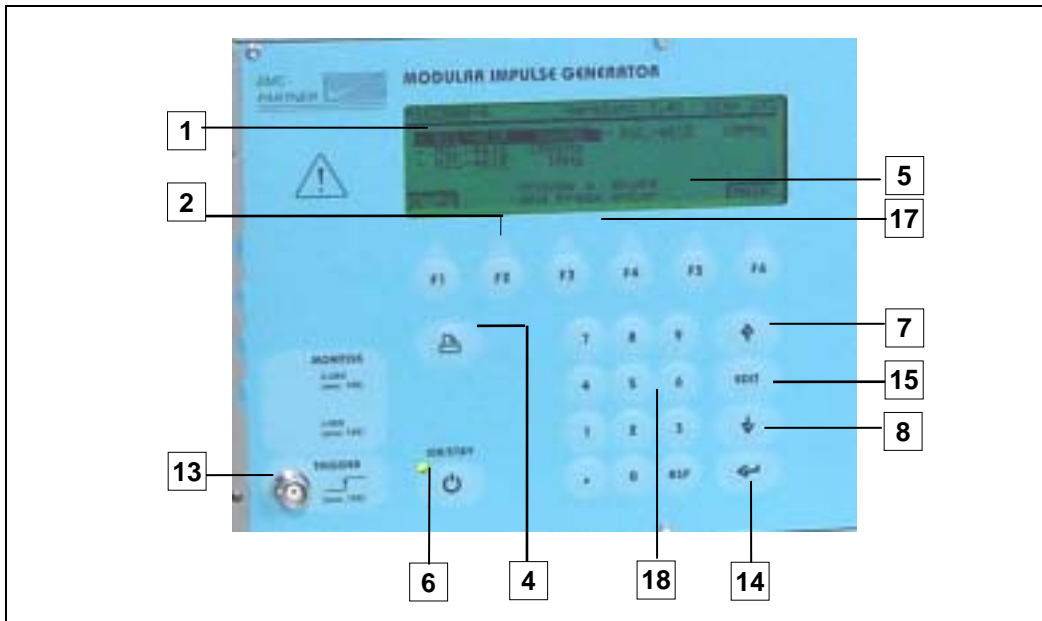


fig. 4.1.1

3.1.1.1 The Display (1)

All important information for the operator is permanently shown on the display during an EMC test. The large graphic display includes 6 soft-keys located on the lower edge. Apart from parameter inputs, user hints and setting range information is displayed.

3.1.1.2 Soft-keys“ (2)

Six soft-keys are provided to enable operators to move quickly through the program levels..

Example of function key "Main" (F6)

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 removal of set-ups
customers programmes	e.g. V-peak. Polarity Impulse repetition Synchronisation	e.g. Start - voltage voltage steps number of pulses per steps	-EUT limits -service -remote control set-up
			e.g. Store set-up Delete set-up EUT Power limits EUT Control Printer ON/OFF

3.1.1.3 Push button ON/Standby (6)

Use this button, to power MIG2000-6 ON and OFF. When turned off, the control functions and indications are deactivated. Power consumption is at a minimum of 5 W.

A green LED above the switch, indicates that MIG2000-6 is connected to the public power supply. The LED is extinguished when the power cord is removed or the power switch on the rear panel is turned off.

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

These cursor keys enable the user to move between parameter fields. .

3.1.1.5 Trigger output for oscilloscope (13)

This BNC output provides all the necessary trigger impulses to synchronise impulses on an oscilloscope.

3.1.1.6 Push button ENTER (14)

Numeric values entered by the operator are confirmed with the ENTER button.

3.1.1.7 Push-button Edit (15)

Multifunction button, used to;

- Activate the parameter input dialogue line
- Open drop down menus during parameter input.

3.1.1.8 Soft key Menus (17)

The lower line of the display is allocated to the soft keys. . Depending on the menu page, different functions are allocated.

3.1.1.9 Numeric keypad (18)

Use the keypad to enter numerical values for parameter input. Each data input must be terminated with ENTER.

The button BSP (Backspace) is used to edit an incorrect entry. .

3.1.1.10 Dialogue line (5)

Indicates a parameter input range can be selected or what action needs to be taken (manual trigger)..

3.1.1.11 Print button (5)

At test end a summarised test report can be printed..

Operation panel

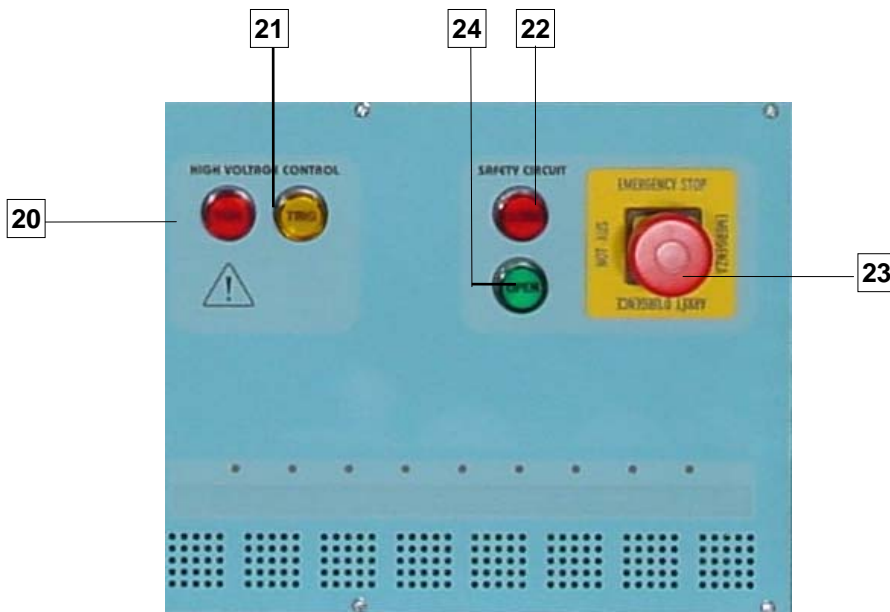


Fig. 4.1.2

3.1.1.12 High Voltage Control "RUN" (20)

Press the RUN button to charge the generator and start a test. A red lamp in the RUN switch is illuminated. When the generator is operating press RUN again to interrupt the test and discharge the high voltage capacitors.

3.1.1.13 High Voltage Control „TRIG“ (21)

When MIG2000-6 is programmed to auto trigger, a yellow lamp in the TRIG switch indicates an impulse has been released. When manual trigger is programmed and the tester is fully charged, a yellow lamp in the TRIG switch indicates the operator can release an impulse by pressing the TRIG button. ,

3.1.1.14 Emergency - Stop (23)

This switch is not linked to the software. It is placed directly in the power supply of the MIG2000-6. . Pushing the emergency stop automatically opens the safety circuit and the green lamp OPEN is illuminated.

3.1.1.15 Safety circuit open indication (24)

The green lamp indicated that there is "No Danger" to the operator from the generator high voltage circuits.. It is not possible to start the MIG2000-6. In this condition it is safe to touch or manipulate an EUT. Safety circuit open will be indicated if the emergency stop button has been pressed or if the MIG auxiliary connector is not fitted in the instrument rear panel.

3.1.1.16 Safety Circuit Closed indication (22)

The red lamp indicates a potential "**Danger**" to the operator from the generator high voltage circuits. When the red lamp is illuminated and the high voltage is turned on, the test cabinet (if fitted) cannot be opened.

3.2 Rear Panel of the MIG Testers

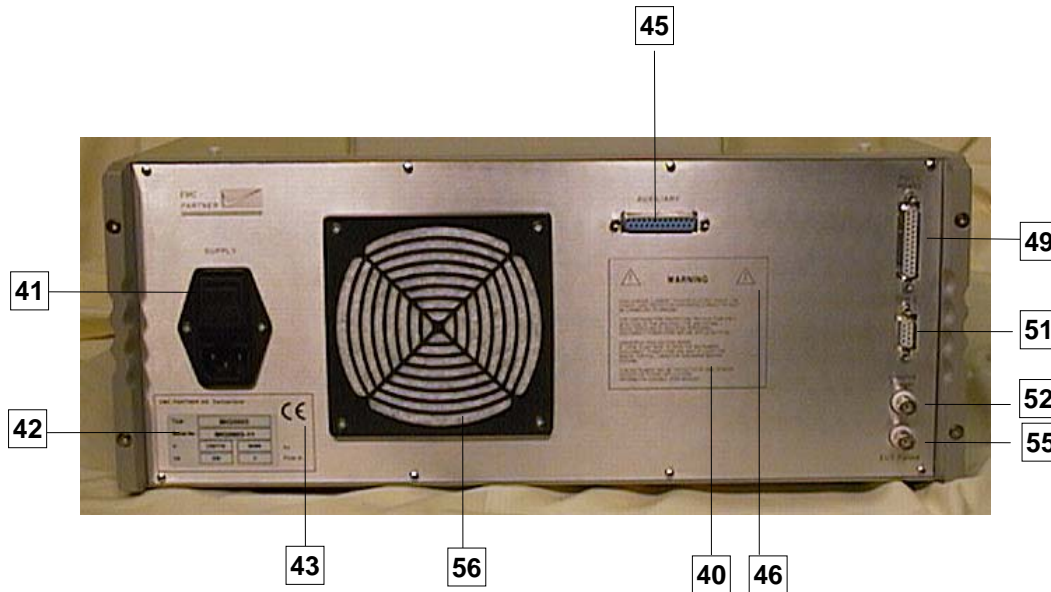


Fig. 4.2

3.2.1.1 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.

3.2.1.2 Power supply of the MIG (41)

The MIG2000-6 receives its power from the normal mains supply. A power switch, a fuse and a filter are built 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 at T 4 A / 250 V.

3.2.1.3 Type plate (42)

Type plate

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.

3.2.1.4 CE mark

(43)

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

3.2.1.5 Auxiliary Port (45)

Use this connector for MIG accessories such as Warning lamps, test cabinet, CDN filters, external safety circuit, etc.. If no MIG accessory is connected the Auxiliary connector, supplied with each generator, must be fitted..

3.2.1.6 Attention, refer to manual(46)

This expression instructs the operator to consult the users manual in detail. Only instructed personnel are allowed to operate the MIG2000-6..

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

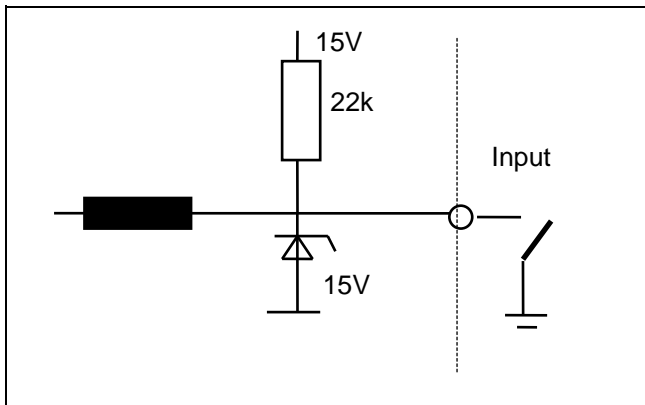
Use this interface to send a test report to an external printer. Using the same interface port, the MIG2000-6 can be controlled by an external PC. To configure the interface, refer to Chapter 13 „Remote Control“.

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

MIG2000-6 does not use this interface. I

3.2.1.9 EUT Failed Input (55)

This BNC input can be used to indicate malfunction of an EUT. This information can be used to change or interrupt the test process. It is also added to the test report. An EUT failure is equivalent to 0V being present on the BNC connector.



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

Refer to 4.2.12 Definition of the inputs EUT failed and external Trigger

3.2.1.10 Trigger Input (52)

This input is used to trigger surges on an external event.. The exact time cannot be defined as the trigger is related to the software clock rate and can differ between trigger 1 and trigger x.

3.2.1.11 Forced air cooling (56)

A ventilator is necessary to cool the impulse forming networks and the electronic high-voltage switch. A distance of about 20 cm (8") must be maintained between the rear panel , and about 3 cm (1") between the sides of the MIG2000-6 and any obstruction. The MIG2000-6 can be built into a 19" rack, with 3 cm (1") side separation.

4 Preparation for Operation

4.1 Attention, Refer to Manual

This manual is an integral part of the MIG2000-6 System. The safety rules and precautions in the manual must be observed. EMC PARTNER and their representatives accept no responsibility for damages to persons and equipment as a result of non-observance of the safety rules and precautions in this manual.

Before connecting the MIG2000-6 System to a public power supply, Chapter 2 Safety must be carefully studied.

4.2 Operators and Service Personnel

Only trained personnel should carry out EMC tests. EMC PARTNER recommends its own seminars or the seminars at the Technischen Akademie Esslingen in Germany. 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. EMC Introduction
2. EMC Standardisation
3. EMC „ESD“ immunity test
4. EMC „EFT“ immunity test
5. EMC „SURGE“ immunity test
6. EMC „DIPS“ immunity test
7. EMC „HARMONICS & FLICKER“ immunity tests
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

4.3 Checks before operation

4.3.1 Optical verification of the MIG2000-6 System

Before you unpack the MIG2000-6 System, please check whether the packing is deformed or damaged. Please retain the shipping box. The box can be folded and stored in the minimum of space.. We strongly recommend the original packaging be used in case of shipment for verification or repair.

When the MIG2000-6 System is unpacked, check whether the tester is damaged. If any damage has occurred to MIG2000-6 during shipment, immediately inform EMC PARTNER or your local representative and the shipping organisation.

4.3.2 Power supply voltage & frequency

On the rear panel, is a type plate. Check that the tester input voltage and frequency corresponds to the power line voltage at your location.. If the power supply voltage is different please inform EMC PARTNER AG in Switzerland, or your local representative.



If the input voltage on MIG2000-6 type plate are NOT the same as the voltage at your location do not connect the MIG2000-6 to the public power supply. Doing so will invalidate the warranty.

4.3.3 Connecting MIG2000-6 to AC power supplies

EMC Partner deliver the correct power cords required to connect the MIG2000-6 to your public power supply. As stated on the rear panel, the local power supply must have an earth safety wire (PE). Please check the earth connection on your power outlet before connecting the MIG2000-6. The public power supply must be protected by a 16 A fuse.

4.4 Preparing the MIG2000-6 system for a test

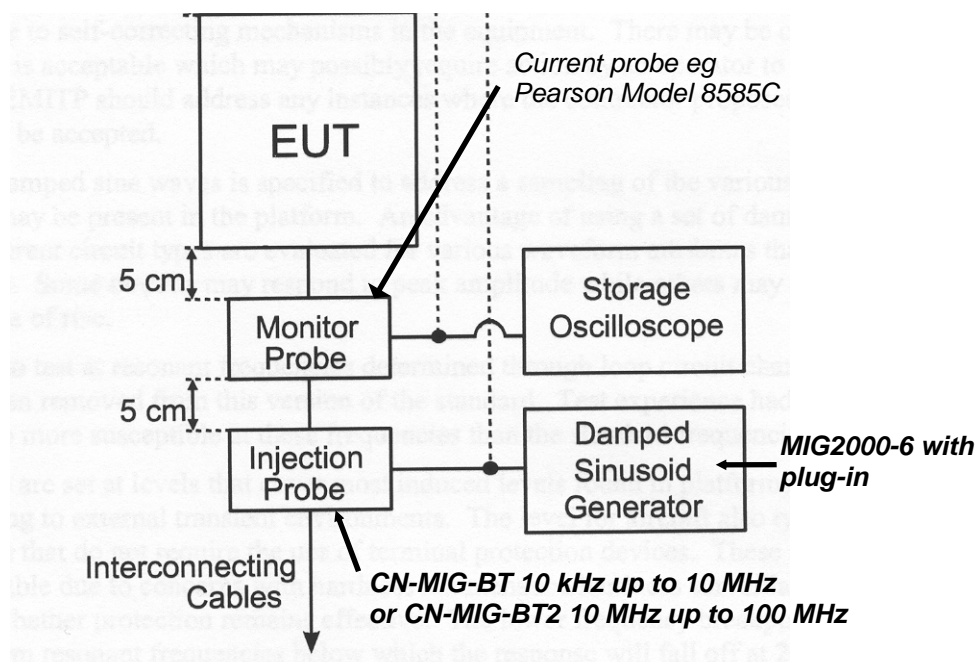
1. Insert the required pug-in module into the MIG2000-6 front panel

Changing plug-ins



Loosen the two screws on the lower side of the plug-in and pull it out. When the plug-in is inserted tighten the two screws

2. Connect the MIG2000-6 high voltage output to a corresponding coupler (CN-MIG-BT or CN-MIG-BT2), using the high voltage BNC cable supplied.
3. Prepare the test set-up of the EUT as showed below.



3. Connect MIG2000-6 to the public power supply
4. For CS115 testing it is not necessary to monitor EUT current. The test current can be selected directly in the MIG2000-6 display
5. For CS116 testing, the EUT current must be monitored. Use the RAMP function of the MIG2000-6 to find the test level for individual connections.
6. Further information related to the test set-up and test sequence can be found in the instruction sheet available for each plug-in module and in MIL-STD-461E.
7. Follow the instruction of the following pages

5 Testing with the MIG2000-6 System

5.1 Quickstart of the MIG2000-6 System

After studying Chapter 2 „Safety“ and Chapter 5 „Preparation for operation“ and all instructions have been followed, you are prepared to start using the MIG2000-6. . MIG2000-6 has been programmed to enable testing with the minimum number of operator actions.

Proceed with the follow steps:

- Enable power to MIG2000-6 using the power switch on the rear panel.
- Press the ON/STBY button on the front panel. The instrument start and the display performs a short self check.:

After the self check is finished, a menu is displayed depending on the plug-in inserted in the MIG2000-6: type of equipment

Software version

serial number

selectable tests (module dependant)

select SETUP to access pre-programmed tests in memory locations1 to 15

dialogue lines with hints relative to the actual display. Different languages can be chosen.

Select MAIN to access parameter input menus

Press "SETUP"

use arrows to move the cursor

programmed tests

programmed tests

back to selectable test

selected test can be loaded with the cursor

a modified test can be stored to the place where the cursor is

a programmed test can be deleted

programmed tests can be linked together

test locations 11 to 15

5.1.1 MIL-STD-461E CS116 Sinusoidal waveform tests

EUT current must be monitored

Type of generator

Software version and serial number of the generator

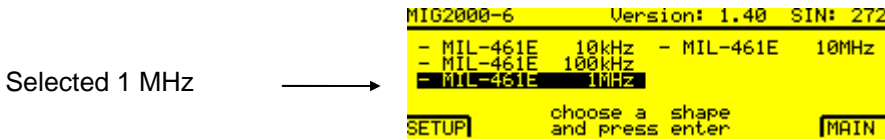
selectable frequencies

select SETUP to access pre-programmed tests in memory locations1 to 15

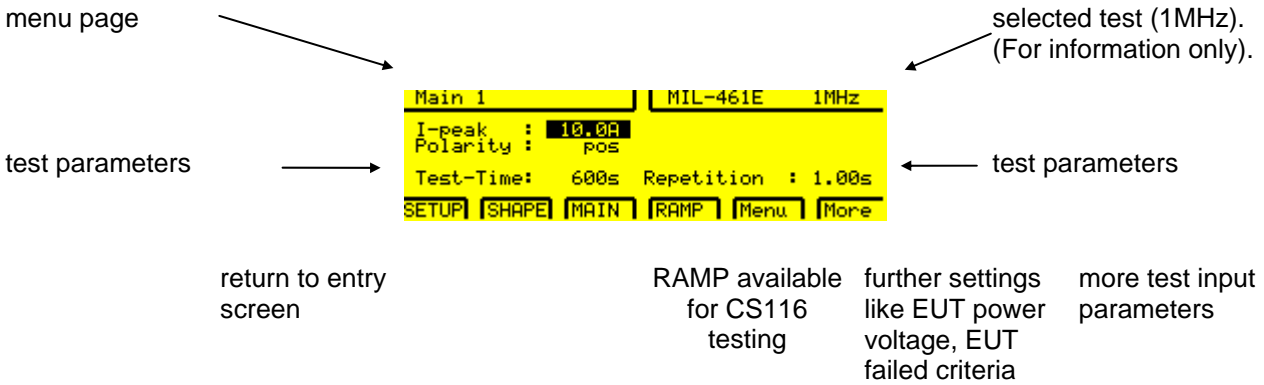
select MAIN to access parameter input menus

Quickstart 1:

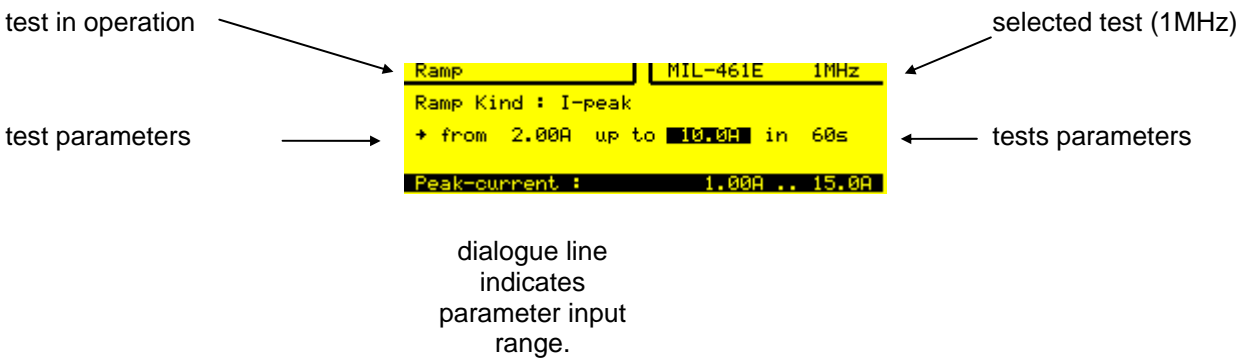
- move the cursor with the arrow to desired test (in this example 1MHz)
- Press Main



- press "MAIN" button



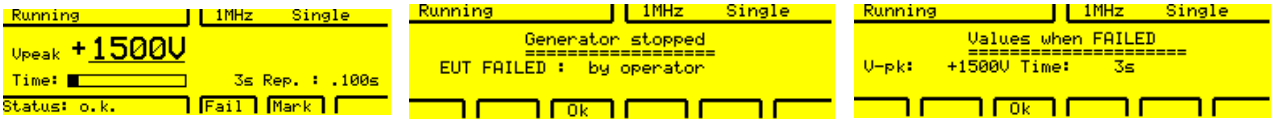
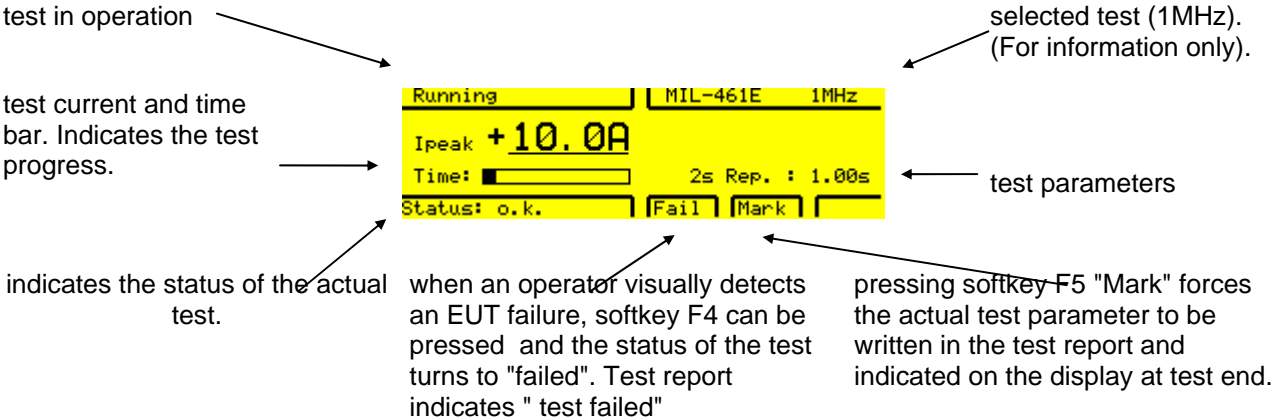
- press "RAMP" button
- Select Ipeak maximum, depending on navy or airforce test limit requirements



The RAMP test is only necessary for CS116 tests. For CS115 testing the current selected on the display is directly equal to the test current.

When the safety circuit is closed (auxiliary connector in place, emergency button not pressed) the red lamp indicates "Safety Circuit closed".

- press "RUN" button to start testing



When a printer is connected to the MIG2000-6 rear panel port1 or the MIG2000-6 is controlled from a PC with TEMA software the following test report will be printed or displayed on the PC monitor

```

EMC-Partner AG
-----
MIG2000-6   SIN-272 Version: 1.40   Test :
Date : 13.02.2003   Time : 21:00:14
Shape      : MIL-461E   1MHz
EUT       :
Comment    :

-----
Burst I-peak   : 10.0A           Polarity      : pos       Trigger : auto
Repetition    : 1.00s

-----

Test-Time : 600s
=====

Coupling of Pulses: ->CDN ,

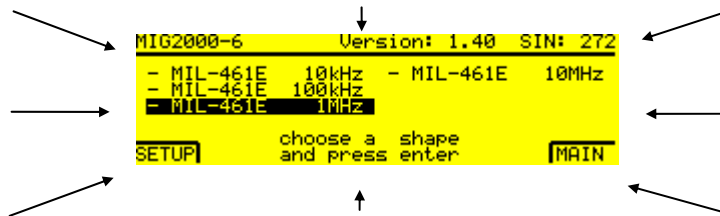
Mark          7s +10.1A
EUT failed !! 16s +10.0A
Test End ..... 18s

Test Result : EUT FAILED : by operator
    
```

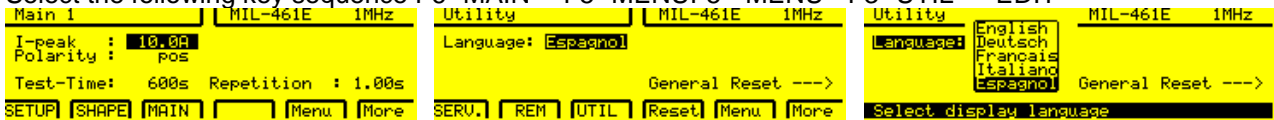
The quickstart tests described above, contain only a small part of the testing possibilities of the MIG2000-6. In the next two sections, additional MIG2000-6 capabilities will be described in more detail.

5.1.2 Select a language: English, Deutsch, Français, Italiano, Español

One of the great advantages of the MIG2000-6 tester is the language selection. The default is English. To change the language follow the instructions below.

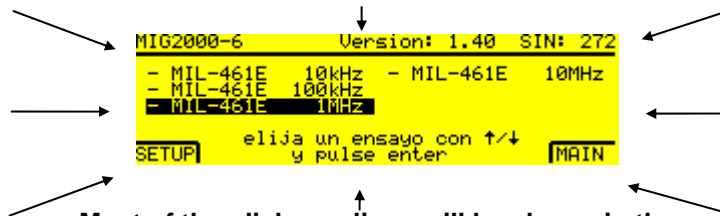


Select the following key sequence F6 "MAIN" - F5 "MENU" - F5 "MENU" - F3 "UTIL" - -EDIT



display after "Main" has been pressed
 display after pressing Menu twice
 after pressing "EDIT" button and then UTIL

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 now changed to



Most of the dialogue lines will be shown in the selected language.

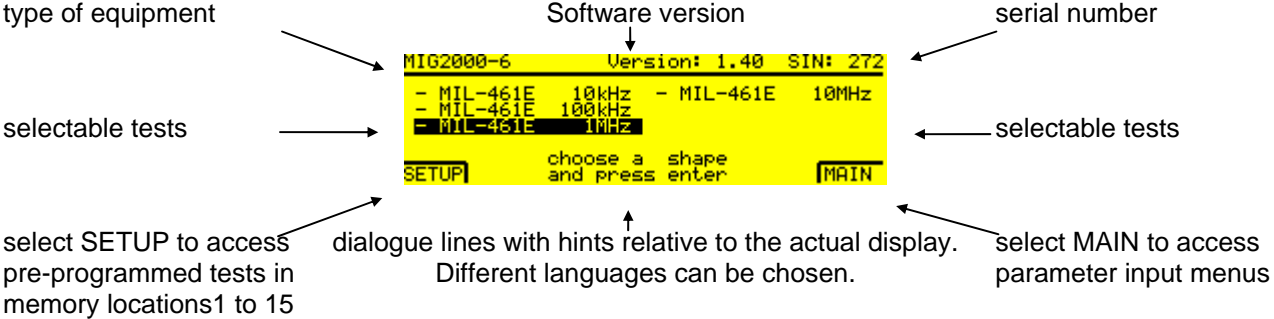
Further languages are possible on the GENECS software but not on the MIG tester.

Advantage:

All remarks on the display and the **test report** will be in the selected language.

5.1.3 Protocol and beeper possibilities

The MIG2000-6 System default values are set at in the factory to be:: Autoprint ON, Port Centronics, Beep on Trig ON, Beep on Fail ON. The default values can be changed as follow:



Select the following softkey sequence: F6 "Main" - F5 "Menu" - F1 "PROT"

<pre> Main 1 I-peak : 10.0A Polarity : pos Test-Time: 600s Repetition : 1.00s SETUP [SHAPE] [MAIN] [Menu] [More] </pre> <p>display when "Main" has been pressed</p>	<pre> Main 1 I-peak : 10.0A Polarity : pos Test-Time: 600s Repetition : 1.00s PROT. [EUT] [Menu] [More] </pre> <p>display after pressing Menu</p>	<pre> Protocol PRINTER Autoprint : on Port : Centronix BEEPER Beep on Trig: on Beep on FAIL: on PROT. [EUT] [Menu] [More] </pre> <p>after pressing "PROT." soft key</p>
---	---	---

Autoprint:

When Autoprint is set to OFF no report will be printed or sent to the GENECS software on the PC.

Port 1 connection:

When a printer with Centronics interface is used on Port 1 of the MIG2000-6 System (rear side) the "Centronics Adapter" must be fitted. The printer can now be connected using a standard printer connection cable to the MIG2000-6 System.

```

Protocol
CNG 1.2/50 20hm
PRINTER
Autoprint : on
Port : Centronix
      RS-232
BEEPER
Beep on Trig: on
Beep on FAIL: on
Printer port
                
```

display when "EDIT" has been pressed

When the serial port is used to control the MIG2000-6 System from a PC select the "Remote Control Parameter" as shown above corresponding to the PC serial port.

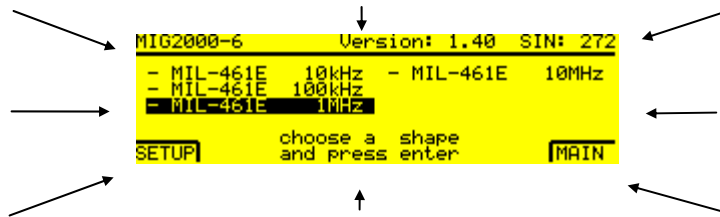
Beeper:

Turns the beep function "ON" or "OFF" as preferred.

5.2 Saving, recalling and editing test routines

Once test parameters have been entered in the MIG2000-6, it is possible to save them as a test routine to be used for repetitive testing. Enter the relevant menu pages by selecting softkey F1 SETUP.

5.2.1 Overview of programmable test with the MIG2000-6 System



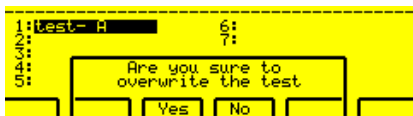
Press F1 SETUP and the display changes as follow:

one Setup consist of 15 tests

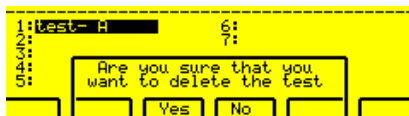
tests in one "Setup" →

← tests in one "Setup"

back to programmed tests selected test can be loaded with the cursor a modified test can be stored to the place where the cursor is a programmed test can be deleted programmed tests can be linked together test locations 11 to 15.



display when "Store" has been pressed.

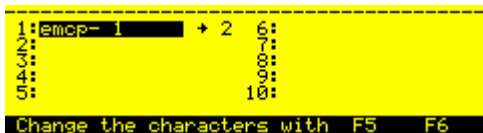


display when "Del" has been pressed.



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

Test name can be changed by placing the cursor on the test location and selecting EDIT on the front panel keypad. Then use the softkeys F5 and F6 to scroll through the alphabet. Move to the next character using the cursor keys.



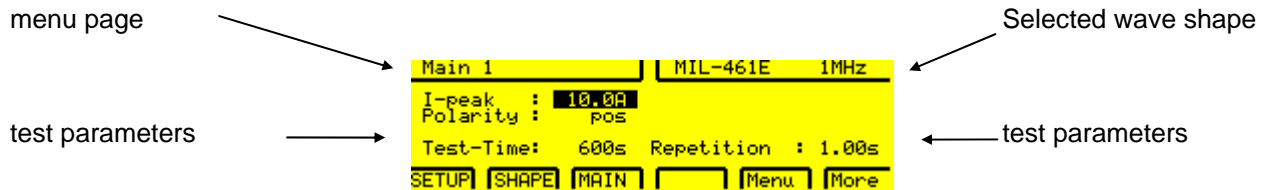
The following section summarises MIG2000-6 System operation. .

5.2.2 „Main“ Setting of nominal values

Setting nominal values

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.

5.2.2.1 Editing tests



The values can be varied as follows within the given ranges:

1. Set the cursor on the parameter to be edited using the cursor keys on the MIG front panel.
2. Edit the values as required using the numerical keys
3. Confirm that the values entered are correct by pressing the ENTER - button.

5.2.2.2 EUT Error control

EUT error information can come from three different sources:

1. From EUT failed input on the rear side of the MIG-tester,
2. From the SURGE limiter and
3. From the current limiter

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



5.3 High voltage "Start", "Stop"

Before starting testing, read the following:

„**Run Mode**“ is defined as an EMC test in operation. The high voltage circuits are active and impulses can be released. „Run Mode“ is indicated by the illuminated red RUN button on the generator front panel. Pressing the RUN-button when the generator is operating, stops the generator (Reset to standby mode).

In „**Standby Mode**“ power is available to the MIG control circuits.. The control is activated but the high voltage source is not switched on.

Depending on local safety standards, an emergency stop switch must be installed. All operators and laboratory personnel must be able to reach the emergency stop. An **EMERGENCY STOP** switch is located on the MIG2000-6 front panel.

Trigger.

After the RUN button has been pressed, the MIG generator starts charging the impulse capacitor. . As soon the generator is ready, the lamp on the trigger button is illuminated. Release of impulses occurs either automatically or when the manual trigger button is pressed.

5.3.1.1 Changing values during operation

In RUN-mode, the voltage or current can only be varied using the RAMP function. This is very helpful for exactly determining the immunity level of the EUT. Change of the nominal voltage is noted in the test report.

5.3.2 Safety circuit

For high voltage tests a safety circuit is necessary. The goal of the safety circuit is to protect the operator from potentially dangerous situations. .

A green warning lamp indicates "No Danger". The safety circuit is open and the high voltage circuit of the MIG2000-6 System generator can not be turned on.

As soon as the safety circuit is closed the red warning lamp indicates "Danger". The high voltage of the MIG2000-6 System can be turned on.

6 Maintenance and Servicing

6.1 Maintenance

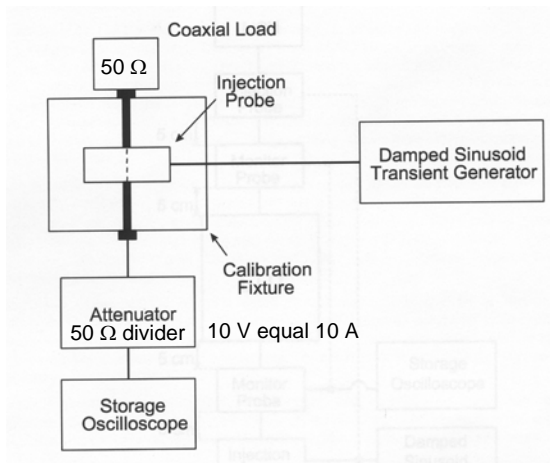
To avoid electrical shock, be sure that the power cord is disconnected before starting maintenance work.

EMC PARTNER recommends that the air filter in the ventilator be removed and cleaned. The cleaning cycle depends on the environmental conditions. Remove the air filter by taking off the plastic cover on the ventilator. Place the air filter in warm, soapy water for approximately 15 minutes. Before refitting, the air filter must be fully dried.

No further maintenance is necessary.

6.2 Verification of the MIG2000-6 System by the user

The waveform at the generator output is not relevant for the MIL-STD-461E CS115 and CS116 tests. The waveform must be calibrated together with the injection probe in the test fixture. The verification set-up is defined in each instruction sheet of the appropriate plug-in modules.



See Instruction sheets of the plug-ins for calibration set-up pictures.

MIL-STD-461E defined calibration set up

MIG2000-6, CN-MIG-BT, VERI-MIL

Calibration of the test system with an other current coupler

menu page

The 100 % factor can be used to recalibrate the system with other coupler. The factor can be set for each frequency or waveform. It will be stored as long as no reset is made. With 100% the system can be reset to the EMCP calibrated values.

test parameters

```

Main 1 | MIL-461E 10kHz100%
I-peak : .100A
Polarity : pos
Test-Time: 600s Repetition : 1.00s
SETUP| SHAPE| MAIN| RAMP| Menu| More
    
```

test parameters

return to entry screen

RAMP available for CS116 testing

further settings like EUT power voltage, EUT failed criteria

more test input parameters

6.3 Verification of the MIG2000-6 System at EMC PARTNER

EMC PARTNER verify the MIG2000-6 System generators in accordance with the applicable standards.

See separate test report of MIG2000-6 System attached to this manual.

7 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

7.1.1 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 .

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

Generator malfunctioning	Title 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.

7.1.3 Attention notice „Warning Generator stopped“

EUT FAILED: $V_{pk}: xxxV > xxxV$	The selected voltage limits have been exceeded during SURGE testing. -Check limits -EUT is defective.
EUT FAILED: $V_{pk}: xxxkV < xxxkV$	During SURGE test, the voltage has fallen below the selected voltage limits: -Check limits -EUT is defective.
EUT FAILED: $I_{pk}: xxxkA > xxxkA$	The selected current limits have been exceeded during SURGE test. -Check limits -EUT is defective.
EUT FAILED: $I_{pk}: xxxkA < xxxkA$	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..

7.2 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.

7.3 Spare parts list

No spare parts are necessary for the MIG.

7.4 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

8 Putting out of operation

Whenever the MIG2000-6 System is not needed remove the power cord.

Reasons for putting the MIG2000-6 System out of operation:

1. Maintenance work
2. Service, repair
3. Verification by EMC PARTNER
4. Shipment for outdoor tests

The MIG2000-6 System is a laboratory test equipment. When the tester is not used, store it in a dry, clean dark place.

9 Packaging and Transport

9.1 Packaging

To transport the MIG2000-6 System, pack it in the original shipping box and packing material.

9.2 Transport

When sending the MIG2000-6 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, the instrument type and serial number.

Please use the two white plastic mouldings to protect the front and rear panels of the MIG2000-6 (4 unit high) generator.



Figure: 10.1-1

10 Recycling / Disposal

10.1 RoHS directive 2002/95/EG

The MIG2000-6 complies with the directive 2002/95/EG (RoHS - Restriction of certain Hazardous Substances).

From December 2005, all EMC Partner products either hand soldered or by machine are produced using lead-free solder.

10.2 WEEE directive 2002/96/EG

The EMC Partner MIG2000-6, is exempted from the directive 2002/96/EG (WEEE) under category 9.

The product should be recycled through a professional organisation with appropriate experience for the disposal and recycling of electronic products. EMC Partner are also available to help with questions relating to the recycling of this product.

10.3 Information for dismantling



Remove always power cord fist.

There is no special danger involved in dismantling the MIG2000-6.

10.4 Parts which can be recycled

The MIG2000-6 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.

10.5 Parts which can not be recycled

All parts in the MIG2000-6 can be recycled.

11 Accessories

Mainframe

Product No.	Type	Short Description
MIG1A315M	MIG2000-6	19" 4Unit high mainframe with control and high voltage power supply for plug-in modules according to MIL 461E: CS115, CS116 and customised applications.

Plug-In Modules

Product No.	Type	Short Description
MIG1Z317M	CS116-10K10M	Plug-in module: MIL461 CS116 with the following programmable frequencies: 10, 100kHz, 1 and 10MHz on one output. One test set up with coupler CN-MIG-BT for four frequencies. Incl 1m coaxial cable with HV-BNC connector.
MIG1Z318M	CS116-30M100M	Plug-in module: MIL461 CS116 with the following frequencies: 30 and 100MHz one output per frequency. One test set up with coupler CN-MIG-BT2. Incl 1m coaxial cable with HV-BNC connector.
MIG1Z320M	CS115REC	Plug-in module: MIL461 CS115 rectangular bulk current injection rise time < 2ns, duration > 30ns. Incl 1m coaxial cable with HV-BNC connector.

Injection Probe

Product No.	Type	Short Description
MIG1Z175C	CN-MIG-BT	Injection probe for frequency range 10kHz up to 10MHz, application for MIL 461 E CS116.
MIG1Z316M	CN-MIG-BT2	Injection probe for frequency range 10MHz up to 100MHz, application for MIL 461 E CS115 and CS116.

MIG1A415M	Fx-NATO-FAST	Plug-in module in accordance with SPE-J-00-E-1000 Fast Spike generator 150ns with source impedance 50 Ohm. Waveform according to NATO figure 25. Output voltage up to 1000V.
MIG1A416M	Fx-Customised-SLOW	Customised plug-in module Slow Spike generator 10µs with source impedance 50 Ohm. Waveform according to NATO figure 25. Output voltage up to 1500V. Repetition max 10Hz.
MIG1Z513	Fx-DO-160-S17	Plug-in according to DO-160 section 17 "Voltage Spikes", waveform 2/10µs with source impedance 50 Ohm. Output voltage up to 1000V. Repetition max 2Hz, includes 10µF serial coupling capacitor. Requires SYNC-ADAPTER.
MIG1Z514	Fx-DO-160-S19	Plug-in according to DO-160 section 19 "Induced Signals", waveform bursts induced into interconnection cables. Output voltage up to 1000V, spikes repetition approximately 250kHz, and burst duration approximately 250µs

Calibration Fixture

Product No.	Type	Short Description
MIG1Z319M	VERI-MIL	Calibration set up consisting of: - 1x CN-VERI: fixture plate plus 50 Ohm coaxial cable (1m) - 2x VERI50: 50 Ohm termination with divider.
MIG1Z445	VERI50	High voltage BNC with 50 Ohm termination and integrated divider
MIG1Z446	SYNC-ADAPTER	Enables synchronisation of pulses on power supply up to 400Hz
MIG1Z443	VERI5	High voltage BNC with 5 Ohm termination and integrated divider for NATO-SLOW-10u.

12 Serial Remote Control

12.1 General

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

12.1.1 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	
	Signal	Pin	Signal	Pin	Signal	Pin	Signal	Pin
	TxD	3	TxD	Pin 3	TxD	3	TxD	Pin 2
	RxD	2	RxD	Pin 2	RxD	2	RxD	Pin 3
	RTS	7	RTS	Pin 7	RTS	4	RTS	Pin 4
	CTS	8	CTS	Pin 8	CTS	5	CTS	Pin 5
	DCD	1	DCD	Pin 1	DCD	8	DCD	Pin 8
	DSR	6	DSR	Pin 6	DSR	6	DSR	Pin 6
	DTR	4	DTR	Pin 4	DTR	20	DTR	Pin 20
	GND	5	GND	Pin 5	GND	7	GND	Pin 7
	RI	9	RI	Pin 9	RI	22	RI	Pin 22
Standard Nullmodem	TxD	3	RxD	2	RxD	3	TxD	2
	RxD	2	RTS + CTS	7 + 8	TxD	2	DCD	8
	RTS + CTS	7 + 8	DCD	1	DCD	8	RTS + CTS	4 + 5
	DCD	1	DSR + DTR	6 + 4	RTS + CTS	4 + 5	DSR + DTR	6 + 20
	DSR + DTR	6 + 4	GND	5	DSR + DTR	6 + 20	GND	7
	GND	5			GND	7		
3-Wire Nullmodem	TxD	3	RxD	2	RxD	3	TxD	2
	RxD	2	RTS+CTS+DCD	7 + 8 + 1	TxD	2	RTS+CTS+DCD	4 + 5 + 8
	RTS+CTS+DCD	7 + 8 + 1	DSR + DTR	6 + 4	RTS+CTS+DCD	4 + 5 + 8	DSR + DTR	6 + 20
	DSR + DTR	6 + 4	GND	5	DSR + DTR	6 + 20	GND	7
	GND	5			GND	7		
EMCP 25/9 pole cable	TxD	3	RxD	2	RxD	3	TxD	2
	RxD	2	RTS	7	TxD	2	DCD	8
	RTS	7	CTS + DSR	8 + 6	DCD	8	DTR	20
	CTS + DSR	8 + 6	DCD	1	DTR	20	RTS	4
	DCD	1	DTR	4	RTS	4	CTS + DSR	5 + 6
	DTR	4	GND	5	CTS + DSR	5 + 6	GND	7
	GND	5			GND	7		
Min. wiring for remote control cable	TxD	3	RxD	2	RxD	3	TxD	2
	RxD	2	RTS + CTS	7 + 8	TxD	2		
	RTS + CTS	7 + 8	GND	5	GND	7		
	GND	5						

12.2 Organisation of MIG Remote-Control Commands

12.3 Syntax of the Commands

12.3.1 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), normally a Carriage Return CR (→ ENTER) character

12.3.2 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

12.4 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>

12.4.1 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

12.4.2 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.

12.5 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 setup.
This command must be used at a generator with different wave shapes.

Arguments: Integer 1, 2, 3, ...

Example: TST 1

Command **VNOM** (Voltage NOMinal)

Explanation: Set or query V-peak [in V]

Argument: *Integer*
0..Vmax or 0..110 with DIPS

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* Range: 0..30000

Example: NBR 10

Command TRIG (TRIGger)**Explanation:** Set or query Trigger Mode.**Argument:** *Characters* AUTO, MAN**Example:** TRIG MANTRIG?
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, F2, F3, F4, F5 F1 corresponds 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 ONSYF F3
SYA 180**Command DEF (DEFaults)****Explanation:** All parameter will be reseted to the default values. This function is performed automatically after the command TST or after a Power-up.**Argument:** no argument

Example: DEF

Command TTM (Test-TiMe)

Explanation: Set or query the test-time [in sec].
This command is only useful with Burst Generators.

Argument: *Integer* Range: 1..29999

Example: TTM 600

Command BCAD (Burst-CADence)

Explanation: Set or query the pulse-spacing [in ms].
This command is only useful with Burst Generators.

Argument: *Real*

Example: BCAD 10.5

Command BDUR (Burst-DURation)

Explanation: Set or query the Burst length [in sec].
This command is only useful with Burst Generators.

Argument: *Real*

Example: BDUR 2.00

Command BRAN (Burst-RANdom)

Explanation: Set or query the Burst random-pulses.
This command is only useful with Burst Generators.

Argument: *Character* ON, OFF

Example: BRAN ON

Command CLN (Burst: Coupling Common-Mode)

Explanation: Set or query the coupling to Common-Mode with Burst generators.
This command is only useful with Burst Generators.

Argument: *Character* ON, OFF

Example: CLN ON

Command CIO (Coupling Impulse Output)

Explanation: Set or query Impulse Outputs.

This command is only useful with automatic switch for different impulse outputs.

Argument: *Characters* ON, OFF

Example: CIO ON

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

This command is only useful with automatic external CDN.

Argument: *Characters* ON, OFF

Example: CLN ON

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 than one coupling path is selected the coupling paths are switched in the following sequence: L-N, L-PE, N-PE

This command is only useful with automatic external CDN

Argument: *Characters* ON, OFF

Example: CLP ON

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

This command is only useful with automatic external CDN.

Argument: *Characters* ON, OFF

Example: CIO OFF

Command CLxy (Coupling path Lx to y)

Explanation: Set or query the coupling path CLx to y at SURGE. The coupling path is only active if the impulse output is turned off (CIO=OFF). These command is only useful with automatic external CDN.

Argument: *Characters* ON, OFF

Examples:	CL12 ON	Coupling L1 to L2 on
	CL23 ON	Coupling L2 to L3 on
	CL13 ON	Coupling L1 to L3 on
	CL2N ON	Coupling L2 to N on
	CL3N ON	Coupling L3 to N on
	CL2P ON	Coupling L2 to PE on
	CL3P ON	Coupling L3 to PE on

Command PON (EUT-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, V, P, S, F, D N : No ramps

V : Voltage Ramp

P : Alternate Polarity

S : Syncro Ramp

Example: RAK V

RAK?
Answer: V

Command RAVS (RAmp Voltage Start)

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

Argument: *Integer*

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

Command RAVD (RAmp Voltage Delta)

Explanation: Set or query V-steps [in V].
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)

Explanation: Set or query Syncro start [in degrees].

Argument: *Integer* 0..360

Example: RAK S
 SYM ON
 SYA 360
RASS 0
 Syncro-Ramps from 0° up to 360° in steps of 10°
 RASD 10

Command RASD (RAmp Syncro Delta)

Explanation: Set or query Syncro step [in degrees].

Depends on the test type:

Argument: *Integer* 0..360

Example: RAK S
 SYM ON
 SYA 360
 RASS 0
RASD 10
 Syncro-Ramps from 0° up to 360° in steps of 10°

Command RACA (RAmp Change After)

Explanation: Set or query Change after.

Argument: *Integer* 1..30000

Example: RAK P
 POL POS
 Alternate Polarity, starts with positive polarity and
RACA 5
 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: 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

Example: VMAX 600
VMIN 300
EUT INFO

Command IMAX (current MAX)

Explanation: Set or query EUT failed Limit, Surge Current max. [in A]

Argument: *Integer* 0..9999

12.5.1 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

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

Command NAME (setup NAME)

Explanation: Set or query Setup term. The setup 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. If a memory place is occupied, it must first be reset using the SETD command. No query possible.

Argument: *Integer* 1..23

Example: NAME of the test
SETD 1
SETS 1

Command SETR (SETup Recall)

Explanation: Activation of a stored setup. No query possible.

Argument: *Integer* 1..23

Example: SETR 5

Command SETD (SETup Delete)

Explanation: Deletion of a stored setup. 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 ON

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. Run-Mode can be recognised by the command ST?.
No query possible.

Argument: no argument

Example: STOP

ST?
Answer: S
Generator is in standby-Mode

Command STRT (STaRT run)

Explanation: Start of the Run-Mode. Run-Mode can be recognised by the command ST?.
No query possible.

Argument: no argument

Example: START

ST?
Answer: R
Generator is in Run-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 first (TRIG MAN).
No query possible.

Argument: no argument

Example: TRIG MAN
START
...
IT
Trigger of the pulse

Command M (Message number)

Explanation: Inquiry of Generator Error-Code. The Error-Code will be reset by the STRT command.
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
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 ST (generator SStatus)

Explanation: Query of the 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 relevant with external automatic CDN.

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 = software version number)

Example: ID?
Answer: MIG 1.15

Command REN (REmote Enable)

Explanation: Change into Remote Control Mode. No query possible.

Argument: no argument

Command GTL (Go To Local)

Explanation: Change into Local Mode (operation from the MIG front panel). No query possible.

Argument: no argument

Command E (Error number)

Explanation: Query of the last remote error-code. This error-code will be reset by the command E?

Argument: no argument

Answer: Integer with the follow codes
0: no error
1: Command only permitted in remote control mode
2: unknown command
3: Invalid argument
4: no query allowed
5: command only permitted in standby-mode
8: time-out at transmitting end
16:parity error 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-code will 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.

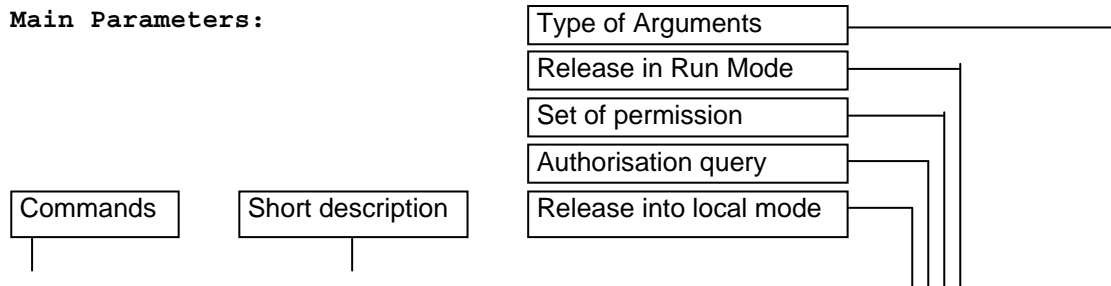
Argument: *Characters* ON, OFF

12.6 Overview MIG Commands

MIG2000 Remote Control Commands

07.12.2000 R.Casanova

Main Parameters:



Main Parameters:

TST	Test Kind (Impulsform)	.xx.	Integer, 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
BCAD	Burst Generators: Pulse Spacing (in ms)	.xx.	Real
BDUR	Burst Generators: Burst Length (in sec)	.xx.	Real
BRAN	Burst Generators: Random Pulses	.xx.	On, Off
CLN	Burst Generators: Coupling Common-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

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

MIG2000-6 Modular Impulse Generator

RASD	Syncro Step (in Deg.)	.xx.	Integer
RACA	Change after	.xx.	Integer
Power Control: (Only with automatic Coupling filter)			
PON	EUT Power ON/OFF	.xxx	On,Off
EUT Control:			
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
EUT	Action if EUT Failed	.xx.	Off,Stop, Info
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

12.7 Software for MIG Remote Control

The GENECS software delivered with each generator, , is an aid to learning about control of the MIG generator via the RS-232 port. With no additional programming work, the user can transmit commands to the MIG and receive answers. A text file-interpreter makes it possible to write simple set-up sequences without any further programming knowledge.

12.7.1 Program TRA.EXE

(TRAnsmit)

Application : TRA <Befehl>

Explanation :

The command line - order "TRA" transmits a command to the MIG. In addition the command "E?" tests whether the transmission was correct or not. If the transmission was not error free, an error message will be displayed on the PC screen. For query errors, the reply of the MIG will be displayed.

The serial port parameters (COM1,2; baudrate etc.) are defined in the text file TRA.CFG. This file can be modified using an ASCII-editor. The set-ups correspond with the default-values of the MIG. In addition the used ports of the PC must be defined PORT (COM1,COM2).

Example:TRA ID?	; query of the identification
Answer : MIG 1.15	
TRA REN	; switch over into remote mode
Answer: none	
TRA VNOM 1500	; set nominal voltage to 1500V
TRA VNOM?	; query of the nominal voltage Answer: 1500
TRA STRT	; start test
TRA STOP	; stop test
TRA GTL	; return to local mode

12.7.2 Program TT.EXE

Application: TT <filename>

Explanation:

The program TT.EXE is a simple text file interpreter. It provides the possibility of listing "TRA-commands" in a test file, as described earlier, and running the program with "TT". TT handles the local and remote modes and check these modes:

Example :

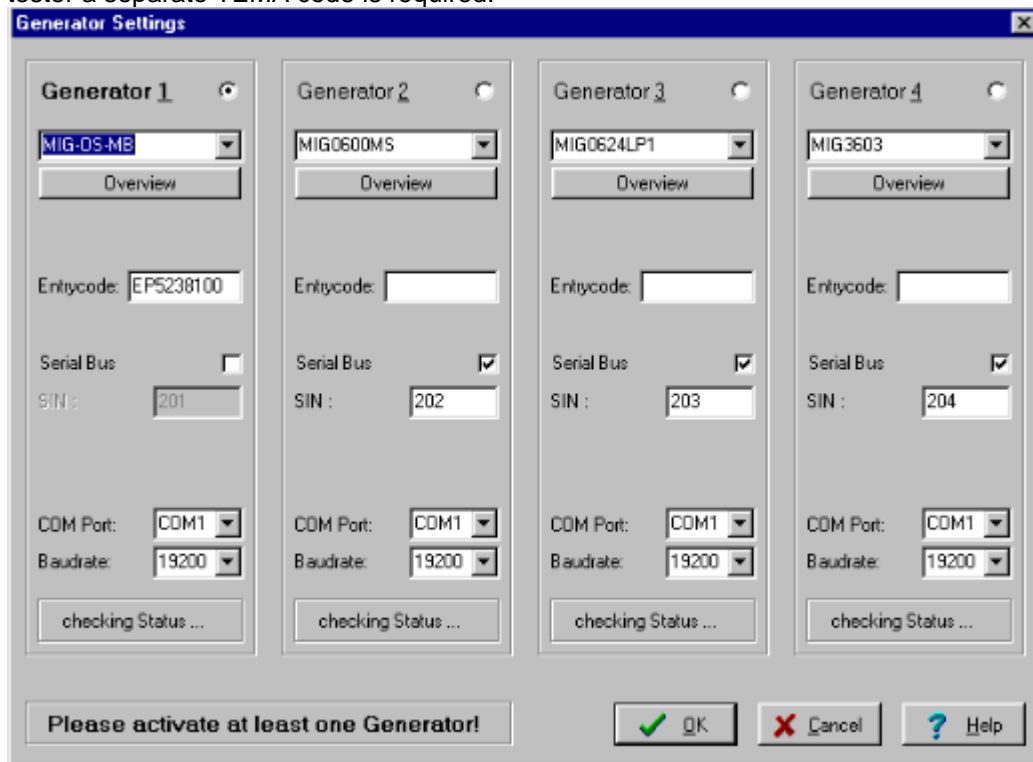
```

* This is an example program           ;comment line starts with "*"
*
BEGIN                                  ; shows the start of a sequence
*
TRA VNOM 2000                          ; V-peak = 2000V
TRA REP 5                               ; Repetition set to 5
TRA STRT                                ; start test
DELAY 7                                 ; seven seconds delay up to the end of the test
TRA STOP                                ; stop test
END                                      ; shows the end of the sequence
    
```

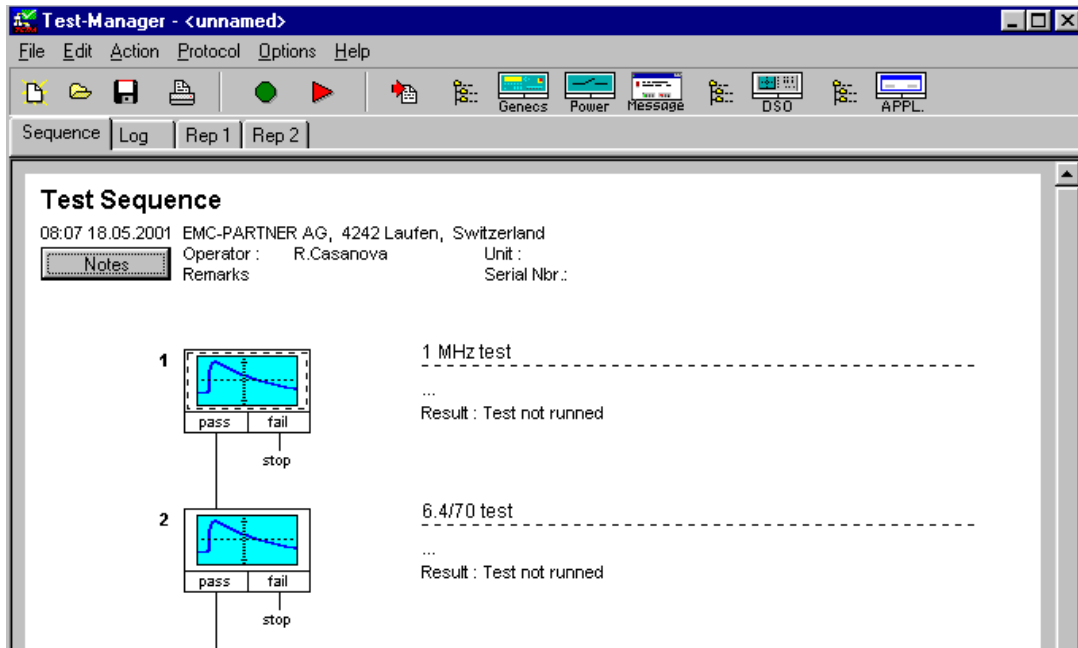
On the disk in the manual binder some further examples are given. The text file "download.tt" contains e.g. the set-ups of the EMC PARTNER programmed set-ups. (see Chapter „Quick-Starts“) By copying the set-ups into the MIG, it is possible to overwrite the set-ups in the MIG to enable it to write its own program on the PC, and transfer the own program to the Tester.

12.8 TEMA Test Manager

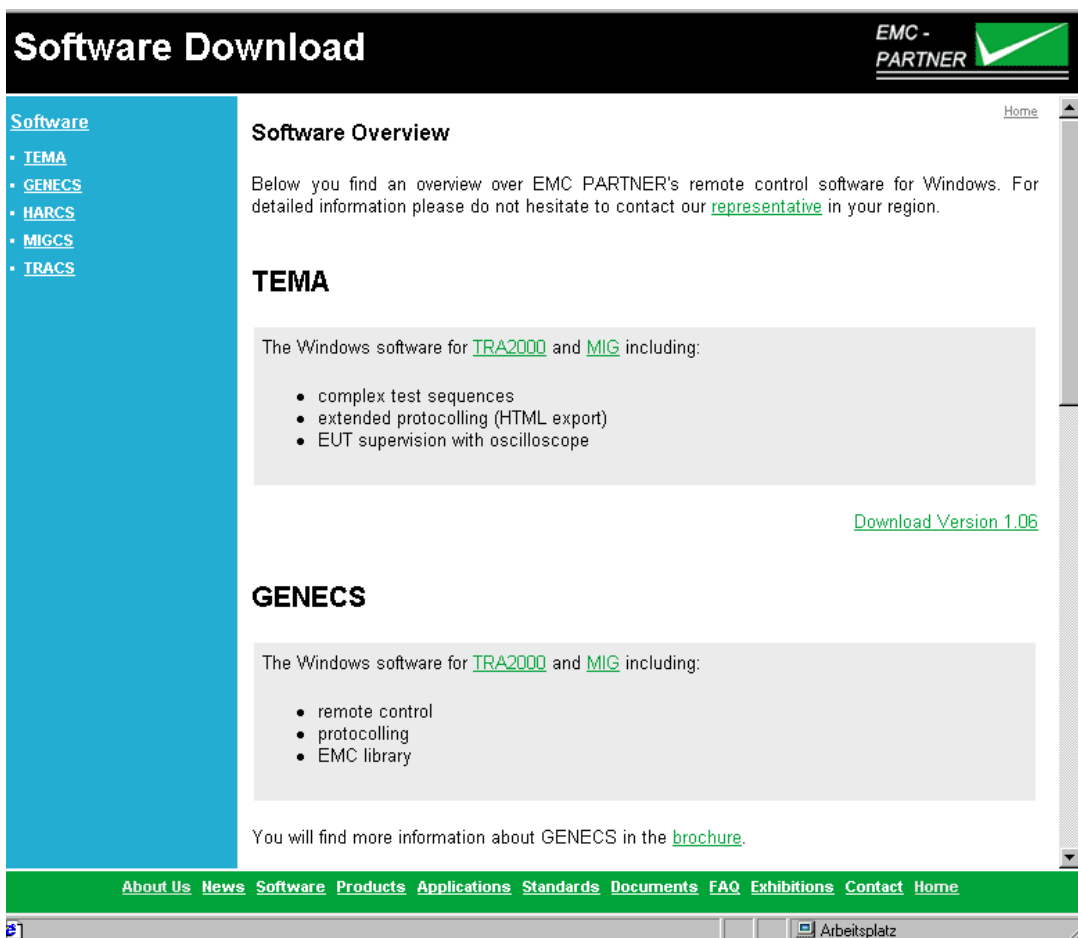
When the Test Manager has been ordered, up to four tester can be controlled by one software. For each tester a separate TEMA code is required.



Complex tests can be programmed. By adding the DSO module, external oscilloscopes can be operated and integrated in the program sequence.



12.9 Software update from EMCP Web site



From time to time compare the software version on the web with the software in use on test equipment. When newer versions occur on the Web site update the software in your instrument..

13 Appendix and Correction

13.1 Appendix

13.2 Correction

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

see appendix at the end of this documents.

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

see appendix at the end of this documents.

13.2.3 Declaration of conformity to the Basic Standards




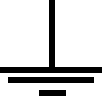
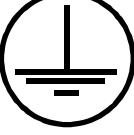
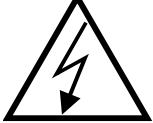

see appendix at the end of this documents.

14 Glossary

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

EUT	Equipment under Test
EST	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 μ s and current at short circuit 8 / 20 μ s.
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
Clamping voltage	Peak voltage across the varistor measured under condition of a specified V_c pulse current and specified waveform
Rated Peak Single Pulse Transient Currents	maximum peak current which may be applied for a single 8/20 μ s impulse.
Lifetime Rated Pulse Currents	Derated values of I for multiple impulses which may be applied over device rated lifetime.
Rated RMS voltage	Maximum continuous sinusoidal RMS voltage which may be applied.
Rated DC voltage	Maximum continuous DC voltage which may be applied.
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

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Declaration of Conformity to Standards

The EMC Tester

Type: MIG2000-6

complies with the following standards:

CS116
CS115

MIL-STD-461 E
MIL-STD-461E



Laufen, Switzerland

02. February 2003


Laufen, 02. February 2004

EMC PARTNER AG



M. Lutz
Managing Director

EMC PARTNER AG



R. Henz
Manager Quality

Appendix to 14.2.3 Conformity declaration with basic standards



Manufacturer Declaration Of Conformity EMC

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

The EMC Tester

Type: MIG2000-6, 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

H+H High Voltage
Technology GmbH
Im kurzen Busch 15
DE - 58640 Iserlohn

Laufen: 04. August 2009

EMC PARTNER AG

EMC PARTNER AG

M. Lutz
Managing Director

R. Henz
Manager Quality Department



Manufacturer Declaration Of Conformity LV

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

The EMC Tester

Type: MIG2000-6; 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

EMC PARTNER authorised representative established within the EC Community

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Laufen, 05.August 2009

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R. Casanova
Manager Quality Department

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

