

## MGA 1030

### Magnetic field system

DC - 250 kHz



- ◆ EN 55103-1 + 2, EN 61000-4-8, Automotive, MIL-STD a.o.
- ◆ Generation and measurement of magnetic fields from DC up to 250 kHz
- ◆ Field strengths up to 1000 A/m
- ◆ Additional – Sensor coils, Helmholtz coils, Test adapter

#### Introduction

The compact magnetic field generator and analyzer MGA 1030 allows susceptibility tests against magnetic fields from DC up to 250 kHz according to the standard EN 55103-2 (product standard for professional audio, video and light control techniques) and their measurement according to EN 55103-1.

In combination with our triaxial Helmholtz coils full automated susceptibility tests are possible at magnetic field strength up to 1000 A/m for frequencies from DC to 1 kHz. Lower field strength can be generated for frequencies up to 250 kHz. Due to the triaxial set-up of our Helmholtz coil major improvement in device handling is achieved because there is no need to turn an EUT during tests.

The MGA 1030 complies to all magnetic field requirements of relevant EMC and military standards.

More EMC tests are possible according to the standards below:

- |                      |                               |                                 |
|----------------------|-------------------------------|---------------------------------|
| - IEC / EN 61000-4-8 | - SAE J 1113-2, SAE J 1113-22 | - GM W 3097                     |
| - ISO 11452-8        | - Ford ES-XW7T-1A278-AC       | - MIL-STD-461 E/F RS 101, CS101 |
| - PSA B21 7110       | - DC – 11224, DC 1014         | - and similar standards         |

Furthermore magnetic field measurements according to MIL-STD-461 E/F RE101, CE101 are possible.

Tests and measurements are controlled by a program which will set most parameters automatically. For any relevant standard, which are fulfilled by the MGA 1030, limit values are already included into the software package, although any different value can be defined by a user. After every test full reports will be created automatically. Report layout is pre-defined, though any user-defined layout is possible.

High performance is guaranteed by a self-calibration process which utilizes an internal source as reference.

#### Benefits

- ◆ **Components**  
MGA 1030 consists of three independent modules: a signal generator (DC – 250 kHz), a power amplifier (800W output maximum, DC – 1MHz bandwidth) and spectrum analyzer (16 Bit, 1 MSPS sampling rate). All modules can be used as stand-alone units.
- ◆ **Software**  
Any function is controlled via an application which also guides the user through any test or measurement. Adaptation of signal strength or measurement graphs are possible at any stage. User-defined signals complement the usage for fast and reliable tests. The application software is written in LabVIEW which guarantees stable and fast performance on any Microsoft® Windows platform.

◆ **Additional equipment**

Our company also provides many different coils and loop sensors which are ideally suited for the described tests. Not only our own equipment can be used with the MGA 1030, but also user defined coils. A calibration mode is included in the software to complement the magnetic test system with any further equipment.

◆ **Self-calibration**

Using an ultra-stable voltage source self-calibration correction values are stored in an internal EEPROM. Any voltage signal or voltage measurement device is calibrated as a self-calibration process automatically in about a minute.

## Applications

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◆ **Automotive Testing**

Intensive testing is required for new products which should be used in any automotive application. The MGA 1030 allows fast and easy testing according to many automotive standards as described before.

◆ **Magnetic Field Generation**

MGA 1030 enables a user to generate strong magnetic fields up to 1000 A/m. Even alternating fields up to 250 kHz can be generated by the magnetic test system

## Technical Data - MGA 1030

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Type	Magnetic Test System MGA 1030
Electrical Data	
Voltage input (Analyzer)	
Frequency range	DC - 250 kHz
Input impedance	1 M $\Omega$ / 50 $\Omega$ switchable
Connector	XLR, unbalanced
Max. input voltage	100 V continuous (attenuator autosest at overvoltage) 10 V at 50 $\Omega$
Gain	-20/0/20/40 dB Preamplifier 0/20 dB ADC Amplifier Self-calibration with ultra stable on-board reference
Current input	
Frequency range	DC - 250 kHz
Shunts	10 m $\Omega$ / 1 $\Omega$ / 100 $\Omega$
Max. input current	20 A continuous (overload protection) 1 $\Omega$ and 100 $\Omega$ shunt are protected by an additional 1.5 A fuse
Connector	4 mm safety jack (+, -) measurement via insulation amplifier or input jacks
Measurement range	20 A, 10 A, 1 A, 100 mA, 10 mA, 1 mA automatic offset and gain Self-calibration with ultra stable on-board reference
AD converter	
Resolution	16 Bit
Sampling rate	1.0 MSPS
Aliasingfilter	0.01dB Tschebyscheff filter, fg = 260 kHz; filter may be switched off

## Technical Data - MGA 1030 (continuation)

<b>Generator</b>	
Frequency range	DC - 250 kHz
Output impedance	50 $\Omega$
Connector	BNC, unbalanced
Signal	Sine wave / square wave / triangular / DC
Amplitude	0 – 10V AC, -10V - +10V DC
Resolution	12 Bit (2.5 mV) Switchable -20 dB Attenuator Self-calibration with ultra stable on-board reference
<b>Amplifier</b>	
Frequency range	DC - 1MHz
Connector	4mm safety jacks (output) BNC, unbalanced (input)
Current	5Arms / 16Arms (MGA1030-05 / MGA1030-16)
Voltage	50Vrms / 75 V <sub>DC</sub>
Type	Magnetic Test System MGA 1030
<b>Electrical Data</b>	
Distortion (DC – 100 kHz, load $\geq$	$\geq$ 0.10%
Gain	10 $\pm$ 0.1 % ( $\pm$ 0.01 % / 0C)
<b>General Data</b>	
EUT control / Connector	9-pin Sub-D; RS-232
Connection to Computer	USB
Temperature range	0 to 40 °C
Warm-up time	15 min
Primary Power	115 / 230 VAC $\pm$ 10%, 50-60 Hz
<b>Mechanical Data</b>	
Housing	19" Subrack or desktop case
Width / height / depth	449 mm / 177 mm / 580 mm
Weight (shipping)	approx. 40 kg (net 34 kg)

## Additional Equipment

### Loop Sensor/Radiating Loops:

For immunity tests radiating loops are necessary to generate magnetic fields. Suitable loops are available. Measuring emissions require loop sensors which can also be ordered from our company



**Loop Sensor**  
MGA\_LS040

**Radiating loop**  
MGA\_RL120

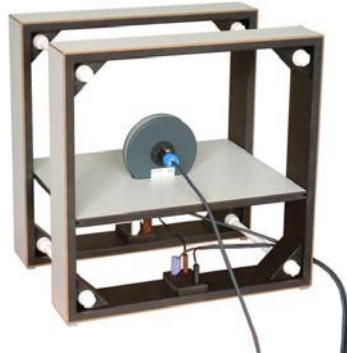
**Radiating Loop / Loop Sensor**  
MGA\_RLS133

Type	Loop sensor MGA_LS040	Radiating loop MGA_RL120	Loop sensor MGA_LS133	Loop sensor / radiating loop MGA_RLS133
<b>Mechanical Data</b>				
Diameter	40 mm	120 mm	133 mm	133 mm
Body material	PVC	MDF	MDF	MDF
Wire	7-41 Litz wire	2.0 mm copper wire	7-41 Litz wire	0.25 mm <sup>2</sup> Litz wire
Number of turns	51	20	36	36
Number of layers	1	4	4	4
Shielding	Electrostatic	none	Electrostatic	Electrostatic
Distance to EUT	5 cm	5 cm	7 cm	10 cm / 5 cm
Connector at coil	Speakon	4 mm MC socket	Speakon	Speakon
Connector at cable	XLR	4 mm MC plug	XLR	XLR / 4 mm MC plug
Coil factor (50 mm)	---	76,3 1/m	---	138,5 1/m
<b>Electrical Data</b>				
Correction factor	see calibration sheet (50 Ω / 600 Ω / 1MΩ)	---	see calibration sheet (50 Ω / 600 Ω / 1MΩ)	see calibration sheet (50 Ω / 600 Ω / 1MΩ)
DC resistance	~ 4,5 Ω	~ 0,05 Ω	~ 10 Ω	~ 1,1 Ω
Inductance	~ 130 μH	~ 120 μH	~ 340 μH	~ 340 μH
Resonant frequency	---	> 1.8 MHz	---	> 0.9 MHz
Frequency range	10 Hz - 1 MHz	DC - 500 kHz	10 Hz - 1 MHz	DC / 10 Hz - 500 kHz
Nominal current	---	15 A	---	5 A
<b>General Data</b>				
Connecting cable	Microphone cable	Litz wire 2 x 1.5mm <sup>2</sup>	Microphone cable	Microphone cable / Litz wire 2 x 1.5mm <sup>2</sup>

## Additional Equipment

### Helmholtz Coils

Several Helmholtz coils are available for susceptibility tests. Our company also offers tri-axial Helmholtz coils which are suitable for MGA1030. To achieve 1000 A/m at 1 kHz, it is absolute necessary to use our Helmholtz coils and an optional compensation board.



*Helmholtz coil MGA\_HCS\_50-28  
with loop sensor MGA\_RLS\_133*



*Triaxial  
Helmholtz coil  
MGA\_HCST\_50-28*

Type	Helmholtz Coil MGA_HCS_50-28	Helmholtz Coil MGA_HCS_125-75	Helmholtz Coil MGA_HCST_50-28
<b>Mechanical Data</b>			
Number of axes	1	1	3
Dimension [cm]	50	125	50 / 46 / 42
Number of turns (per coil)	22 + 4	40 + 10	22 + 4
Coil separation [cm]	28	75	28
<b>Electrical Data</b>			
Coil factor [m <sup>-1</sup> ] (typical)	65.9 / 11.2	47.5 / 10.3	X-axis: 66.1 / 11.3 Y-axis: 67.8 / 11.8 Z-axis: 69.1 / 12.2
Total resistance DC [Ω] (typical)	0.63 / 0.15	9.8 / 2.0	X-axis: 0.58 / 0.10 Y-axis: 0.53 / 0.09 Z-axis: 0.48 / 0.08
Total inductance [mH] (typical)	1.73 / 0.07	16.4 / 1.0	X-axis: 1.73 / 0.07 Y-axis: 1.52 / 0.06 Z-axis: 1.33 / 0.05
Resonant frequency [kHz]	> 150 kHz	> 150 kHz	> 150 kHz
Rated current [A]	16	5	16
Short term current [A]	20	7	20

## Additional Equipment

### Coupling Transformer

MIL-STD-461E CS 101 requires a coupling transformer for conducted susceptibility tests. Our company has developed a coupling transformer which meets all requirements. Due to direct coupling to voltage mains, the coupling transformer has an additional differential amplifier for common mode rejection of the AC mains. Using the coupling transformer without this amplifier can destroy any measurement instrument due to overvoltage.

*Coupling transformer MGA\_CT2.5-50AC  
with differential amplifier*



Type	Coupling Transformer MGA_CT2.5-50AC
Electrical Data	
Primary Windings	
Inductance	12.5 mH (unloaded)
Current rating	16 A
Input voltage (saturation level)	15 Hz: > 12,5 Veff 30 Hz: > 25 Veff
Connector	Safety panel receptacle Ø 4 mm
Secondary Windings	
Inductance	> 2 mH (unloaded)
Saturation	50 A (AC or DC)
Connector	Safety panel receptacle Ø 6 mm (<50 A) Integrated Ø 4 mm socket (<32A)
Secondary (monitor)	0.1 A, BNC
General Data	
Frequency range	15 Hz - 250 kHz
Turns ratio	2.5 : 1 (step down)
Precision resistor	0.5 Ohm, 1%, 100 W, active cooling
Differential Amplifier	
Frequency range	DC - 800 kHz (small signal) / DC - 200 kHz (full power)
CMRR	> 60 dB (400Hz)
Noise	< 6.5 mVrms (DC - 1 MHz)
Output	20 Vpp / 10 mA
Mechanical Data	
Dimension	170 mm x 180 mm x 365 mm (W x H x D)
Weight	approx. 20 kg

## Additional Equipment

### Testing Equipment According to EN 55103-2

EN 55103-2 requires certain immunity tests for frequencies from 50 Hz to 10 kHz. The following test equipment fulfills all requirements according to EN 55103-2, annex B



*Common mode test adapter MGA\_B1 according to Fig. B.1 (EN 55103-2)*



*Calibration network MGA\_B2 according to Fig. B.2 (EN 55103-2)*



*Current transducer incl. correction network MGA\_B4 according to Fig. B.4 (EN 55103-2)*

Type	Common mode test adapter MGA_B1	Calibration network MGA_B2	Current transducer incl. correction network MGA_B4
General Data			
Connectors	Generator in: BNC Output: XLR male	Input: XLR female Output: XLR male	Audio in: 4mm MC safety jacks Input: XLR female Output: XLR male

## Ordering Information

Type	Description
MGA_1032	Option: Coil inductance compensation board (for 1000 A/m at 1000 Hz)
MGA_1033	MGA1030-16: Magnetic Field Generator / Analyzer (16A Amp.) including software
MGA_1034	MGA1030-16/SYS: Ready to use test system for magnetic field immunity tests; incl. software, compensation board, triaxial coil MGA_2025_HCST_50-28; for the generation of magnetic fields up to 1000 A/m at 1000 Hz
MGA_VT-20	Variable transformer for short-term fields acc. to EN 61000-4-8. Pri.: 230V, sec.: 0 – 260 V/20A; including cables
MGA_LS040	Loop sensor 40 mm (acc. to MIL-STD-461E RS101) including 3m cable, calibration sheet
MGA_RL120	Radiating loop 120 mm (acc. to MIL-STD-461E RS101) including 3m cable, calibration sheet
MGA_LS133	Loop sensor 133 mm (acc. to MIL-STD-461E RE101) including 3m cable, calibration sheet
MGA_RLS133	Radiating / loop sensor 133 mm (acc. to EN 55103-1/2) including 2 x 3m cable, calibration sheet
MGA_BC-500	Radiating loop 500mm (acc. to EN 55103-2) including cables
MGA_HCS_50-28	Helmholtz coil 50x50x28 mm (acc. to MIL-STD-461E, ISO 11452-8 etc.) including cables
MGA_HCS_125-75	Helmholtz coil 125x125x75 mm (acc. to MIL-STD-461E, ISO 11452-8 etc.) including cables
MGA_HCST_50-28	Tri-axial Helmholtz coil 50x50x28 mm (acc. to MIL-STD-461E, ISO 11452-8 etc.) including cables
MGA_CT_2.5-50AC	Coupling Transformer (acc. to MIL-STD-461 CS101)
MGA_B1	Common mode test adapter acc. to Fig. B.1 (EN 55103-2)
MGA_B2	Calibration network acc. to Fig. B.2 (EN 55103-2)
MGA_B4	Current transducer incl. correction network acc. to Fig. B.4. (EN 55103-2)
MGA_SO_CE101	Software upgrade MIL-STD-461E / CE101
MGA_SO_CS101	Software upgrade MIL-STD-461E / CS101
MGA_SO	Software upgrade MIL-STD-461E / CS109
MGA_SO	Software upgrade EN 61000-4-16