EMC PARTNER

DO-160 & MIL-STD-461G TEST SYSTEM

Indirect Lightning Testing

This document has been
optimized for electronic media

Accredited Calibration

Quality at EMC PARTNER is based on an ISO 9001 management system. This is the foundation for an ISO 17025 accreditation verified by the Swiss Calibration Service (SCS). SCS No. 146 is the accreditation number of EMC PARTNER AG. Locally accredited but recognized worldwide through affiliation with the ILAC organisation

WHEN GETTING RESULTS MATTERS

THERE IS ONLY ONE CHOICE

Military and avionic testing is all about quality and precision. AVI3000 brilliantly fulfills these requirements.

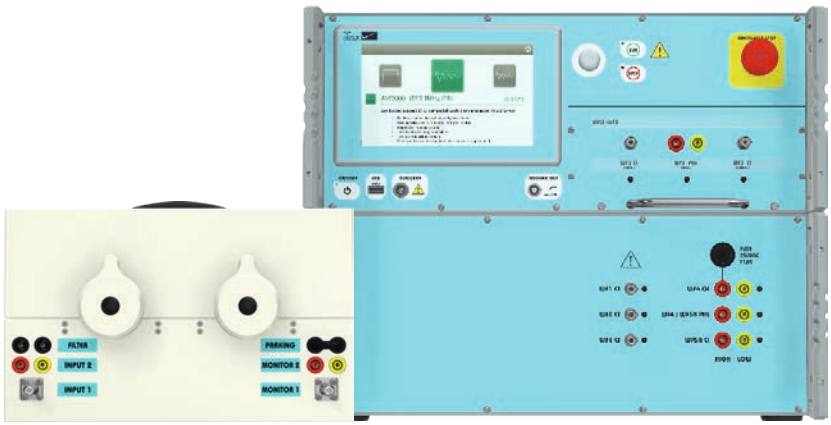
A flexible solution that includes:

- MIL-STD-461: CS117, Level 1
- RTCA DO-160: SECTION 22, Level 3
- EUROCAE ED-14: SECTION 22, Level 3

Ease of use, compact size and large aperture coupler makes AVI3000 the most efficient and technically advanced instrument in this category.

MULTI TALENTED SOLUTION

The first System to fully integrate all waveforms from MIL-STD-461G and DO-160. Combined with a single coupler where the EUT cable passes only once, AVI3000 is a compact and resourceful solution to indirect lightning testing needs.



AVI3000 Test System

- AVI3000 compact unit

Test Accessories

- **CN-BT7**
  Only one couplter for all 6 wave-forms. No change of the EUT cable. Aperture (55x80mm)
- **CN-GI-CI-V**
  Voltage coupler for WF4 cable bundle testing. Aperture (60x120mm)

Included Benefits

Stable	Pulse reproducibility during test cycle
Precise	Repeatable test results over long time
Fast	Minimum setup and calibration time
Flexible	User selectable MS and MB timing
Polarity	Maintain test integrity by electronic switching
Automated	Save and repeat test routines.

Pre-programmed Multiple Stroke (MS) and Multiple Burst (MB) functions

AVAILABLE CIRCUITS

AVI3000 is a compact unit that includes all waveforms for RTCA DO-160: Section 22 and MIL-STD-461G: CS117 testing. All event types are available: PIN Injection, Calbe Injection and Ground Injection

Waveform 1 (6.4/69µs) — **MIL-STD-461 / CS117**

Current Impulse

- Cable Bundle Single Stroke
- Cable Bundle Multiple Stroke

Waveform 2 (0.1 and 0.3/6.4µs) — **RTCA DO-160 / S.22**

Voltage Impulse

- Cable Bundle Single Stroke
- Cable Bundle Multiple Stroke

Waveform 3 (1MHz & 10MHz) — **RTCA DO-160 / S.22**

Voltage & Current Impulse

- PIN injection
- Cable Bundle Single Stroke
- Cable Bundle Multiple Stroke
- Cable Bundle Multiple Burst

Waveform 4 (6.4/69µs) — **RTCA DO-160 / S.22**

Voltage Impulse

- PIN Injection
- Ground Injection Single Stroke
- Ground Injection Multiple Stroke

Waveform 5A (40/120µs) — **RTCA DO-160 / S.22**

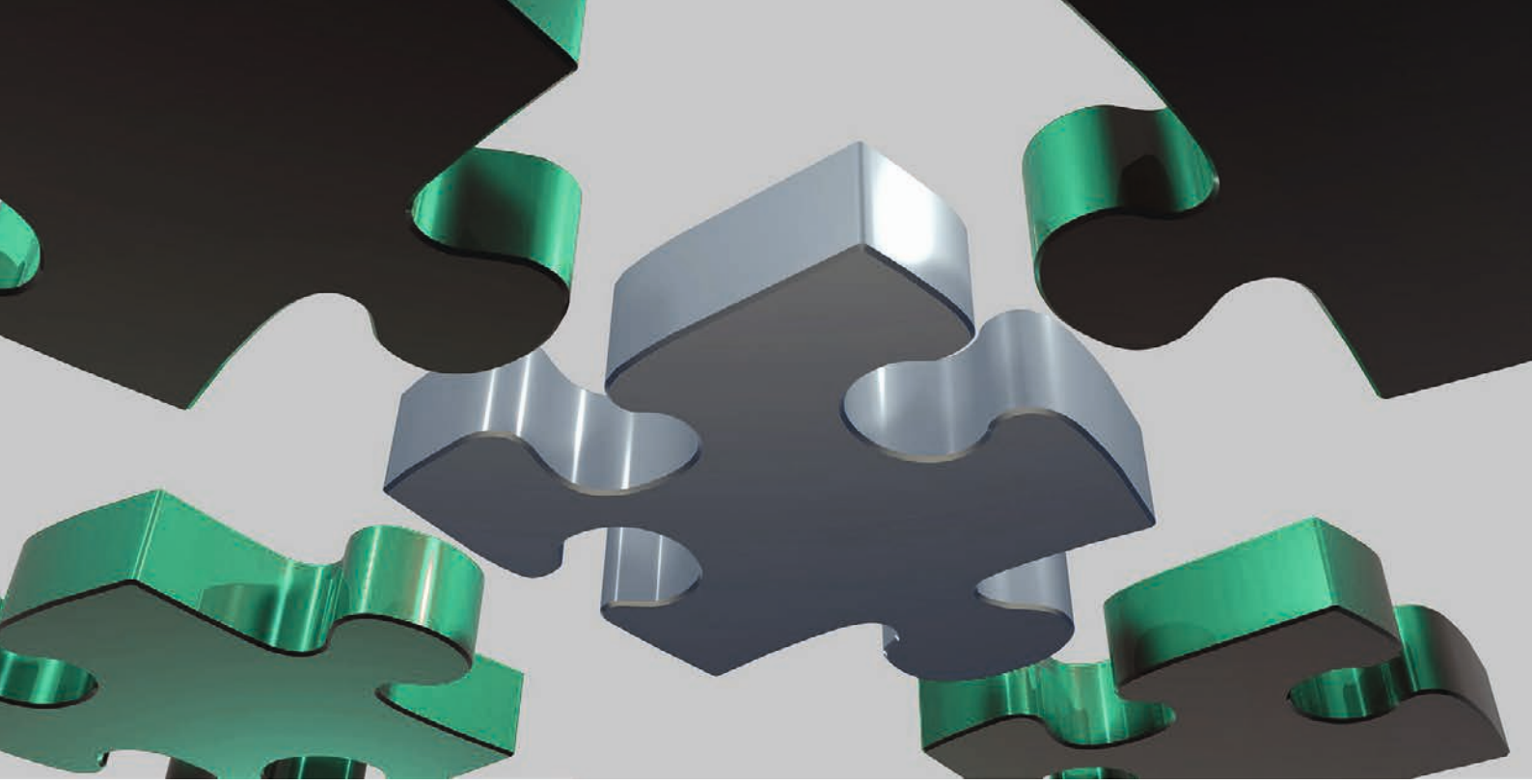
Current Impulse

- PIN Injection
- Cable Bundle Single Stroke
- Cable Bundle Multiple Stroke

Waveform 6 (0.25/4µs) — **RTCA DO-160 / S.22**

Current Impulse

- Cable Bundle Multiple Burst



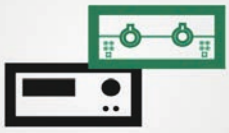
UNIQUE FEATURES

Leading technology - New designs take advantage of latest innovations.

Fast and stable

No generator or coupler adjustments required. System is ready for calibration and long duration testing.

Efficient coupler



One coupler for all cable induction tests. Test cable passes only one time.

Adjust pulse

Multiple Stroke adjustment for DO-160 and MIL-STD-461.

Integrated decouplers

No external couplers needed to decouple powered EUTs for PIN Injection or ground injection testing.

EPOS – TOUCH THE FUTURE

EMC PARTNER Operating System (EPOS) is an independant software with free-of-charge updates for lifetime. EPOS is based on a full colour graphic interface and easy to follow on-screen graphics. Pop-up help gives information when needed, directly during the setting process. EPOS is full of features found only in top of the range instrumentation.

Integrated web server

Use any browser to access test reports from the generator via ethernet.

Simple touch screen navigation

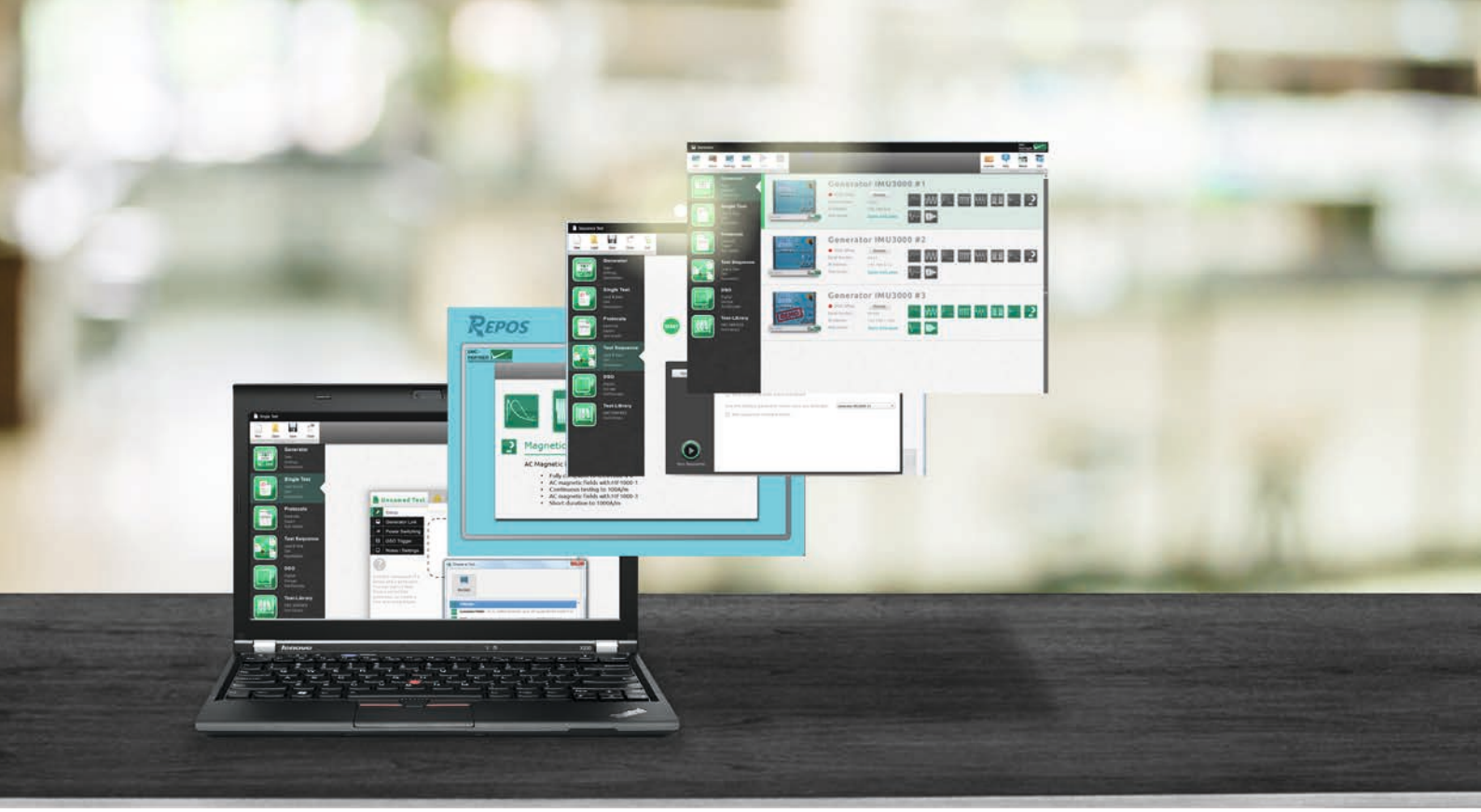
Save time with the latest in intuitive menu structures.

Interactive interface

User interface adapted to specific circuits.

We speak your language

Select between English, German, French, Italian, Spanish, Russian, Chinese (simplified + traditional)



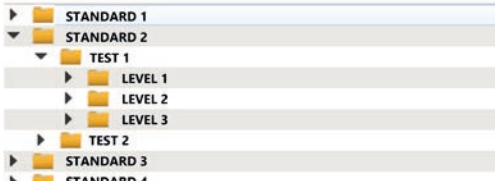
TEMA3000 SOFTWARE SUITE

The best solution for professional EMC Test Labs enables comfortable test setups, easy parameter changes and customizable test reports and DSO integration.

Customizable test reports

- Customize & edit your protocols
- Export to multiple file formats
- Integrate DSO measurements

Manage tests and sequences



- Predefined test setups
- Save and load own tests and sequences

Productive workflow

- Minimal learning time
- Integrated assistant function

Smart connectivity

- Transfer tests / reports to PC
- Remote control from computer

Other systems for indirect lightning PIN injection & Cable bundle tests

DO-160 section 22

MIL-STD-461 CS117

Aircraft OEM specific standards

Established worldwide

www.emc-partner.com

Technical Specifications

TEST SYSTEM

DO-160 G SECTION 22 LEVEL 3 & MIL-STD-461G CS117 LEVEL 1 (INTERNAL EQUIPMENT)

Test equipment	DO-160G Section 22 level 3	MIL-STD-461G CS117 level 1 (internal equip.)
AVI3000	✓	✓
Accessories & coupling devices		
DN-LISN160-32	✓	✓
SHUNT0E1	✓	✓
V-PROBE-SI	✓	✓
I-PROBE-MB-P1	✓	✓
CN-BT7	✓	✓
CN-GI-CI-V	optional	✓
Software		
TEMA3000 & Modules	✓	✓

TEST SYSTEM

1. AVI3000 TEST SYSTEM

AVI3000 circuit: WF1 cable induction

Standards	DO-160G S22, MIL-STD-461G CS117, other
Coupling mode	Cable Induction (CI)
Current waveform WF1	6.4 µs ± 20 % / 69 µs ± 20 %
Test level	specified at coupler output
Test level single stroke	25 A – 900 A +20%, -0%
Test level multiple stroke	25 A – 900 A +20%, -0% (first stroke)
	25 A – 300 A +50%, -0% (subsequent stroke)
Pulse repet. single stroke	up to 2 / 1 s @ 25 A, 1 / 7 s @ 900 A
Polarity	positive, negative, alternating
Programmable ramp	current
Requires	CN-BT7

AVI3000 circuit: WF2 cable induction

Standards	DO-160G S22, MIL-STD-461G CS117, other
Coupling mode	Cable Induction (CI)
Voltage waveform WF2	rise time: < 100 ns or < 340 ns selectable
	pulse duration: 6.4 µs ± 20 %
Test level	specified at coupler output
Test level single stroke	25 V – 1600 V +20%, -0%
Test level multiple stroke	25 V – 700 V +20%, -0% (first stroke)
	25 V – 350 V +50%, -0% (subsequent stroke)
Pulse repet. single stroke	up to 2 / 1 s @ 25 V, 1 / 1.5 s @ 1600 V
Polarity	positive, negative, alternating
Programmable ramp	voltage
Requires	CN-BT7

AVI3000 circuit: WF3, 1 MHz, pin injection

Standards	DO-160G S22, other
Coupling mode	pin injection / direct application
Output impedance	25 Ω
Voltage, current WF3	frequency: 1 MHz ± 20 %
	damping: 25 – 75 % (1st to 5th peak)
Test level	specified at application point
Test level single stroke	100 V – 700 V +10%, -0%
	4 A – 28 A +10%, -0% in short circuit
Pulse repet. single stroke	up to 2 / 1 s @ 100 V – 750 V
Polarity	positive, negative, alternating
Synchronization	automatic on power peak or 0 – 359°, step 1°
Programmable ramp	voltage
EUT max. AC-voltage	230 V

EUT max. supply frequency	800 Hz
EUT max. DC-voltage	± 50 V

AVI3000 circuit: WF3, 1 MHz, cable induction

Standards	DO-160G S22, MIL-STD-461G CS117, other
Coupling mode	Cable Induction (CI)
Voltage, current WF3	frequency: 1 MHz ± 20 %
	damping: 25 – 75 % (1st to 5th peak)
Test level	specified at coupler output
Test level single stroke	50 V – 1900 V +20%, -0%
Test level multiple stroke	50 V – 1900 V +20%, -0% (first stroke)
	50 V – 1000 V +50%,-0% (subseq. stroke)
Test level multiple burst	50 V – 700 V +20%, -0%
Pulse repet. single stroke	up to 2 / 1 s @ 100 V – 750 V
Polarity	positive, negative, alternating
Programmable ramp	voltage
Requires	CN-BT7

AVI3000 circuit: WF3, 10 MHz, cable induction

Standards	DO-160G S22, MIL-STD-461G CS117, other
Coupling mode	Cable Induction (CI)
Voltage, current WF3	frequency: 10 MHz ± 20 %
	damping: 25 – 75 % (1st to 5th peak)
Test level	specified at coupler output
Test level single stroke	50 V – 1100 V +20%, -0%
Test level multiple stroke	50 V – 1100 V +20%, -0% (first stroke)
	50 V – 800 V +50%, -0% (subsequent stroke)
Test level multiple burst	50 V – 800 V +20%, -0%
Pulse repet. single stroke	up to 2 / 1 s @ 100 V – 1100 V
Polarity	positive, negative, alternating
Programmable ramp	voltage
Requires	CN-BT7

AVI3000 circuit: WF4, pin injection

Standards	DO-160G S22, other
Coupling mode	pin injection / direct application
Output impedance	5 Ω
Voltage, current WF4	6.4 µs ± 20 % / 69 µs ± 20 %
Test level	specified at application point
Test level single stroke	50 V – 500 V +10%, -0%
	10 A – 100 A +10%, -0% in short circuit
Pulse repet. single stroke	up to 2 / 1 s @ 50 V, 1 / 3 s @ 500 V
Polarity	positive, negative, alternating
Synchronization	automatic on power peak
Programmable ramp	voltage
EUT max. AC-voltage	230 V
EUT max. supply frequency	800 Hz
EUT max. DC-voltage	± 50 V

AVI3000 circuit: WF4 ground injection

Standards	DO-160G S22
Coupling mode	Ground Injection (GI)
Voltage waveform WF4	6.4 µs ± 20 % / 69 µs ± 20 %
Test level	specified at application point
Test level single stroke	10 V – 1600 V +20%, -0%
Test level multiple stroke	10 V – 800 V +20%, -0% (first stroke)
	10 V – 400 V +50%, -0% (subsequent stroke)
Pulse repet. single stroke	up to 2 / 1 s @ 50 V, 1 / 9 s @ 1600 V
Polarity	positive, negative, alternating
Programmable ramp	voltage
EUT max. power	230 V / 16 A AC 50/60Hz and DC

AVI3000 circuit: WF4 cable induction

Standards	MIL-STD-461G CS117, other
Coupling mode	Cable Induction (CI)
Voltage waveform WF4	6.4 µs ± 20 % / 69 µs ± 20 %
Test level	specified at coupler output
Test level single stroke	10 V – 600 V +20%, -0%
Test level multiple stroke	10 V – 300 V +20%, -0% (first stroke)
	10 V – 150 V +50%, -0% (subsequent stroke)
Pulse repet. single stroke	up to 1 / 8 s @ 600 V
Polarity	positive, negative, alternating
Programmable ramp	voltage
Requires	CN-GI-CI-V

AVI3000 circuit: WF5A, pin injection

Standards	DO-160G S22, other
Coupling mode	pin injection / direct application
Output impedance	1 Ω
Voltage, current WF5A	40 µs ± 20 % / 120 µs ± 20 %
Test level	specified at application point
Test level single stroke	50 V – 500 V +10%, -0%
	50 A – 500 A +10%, -0% in short circuit
Pulse repet. single stroke	up to 2 / 1 s @ 50 V, 1 / 5 s @ 500 V
Polarity	positive, negative, alternating
Synchronization	automatic on power peak
Programmable ramp	voltage
EUT max. AC-voltage	230 V
EUT max. supply frequency	800 Hz
EUT max. DC-voltage	± 50 V

AVI3000 circuit: WF5A cable induction

Standards	DO-160G S22, MIL-STD-461G CS117, other
Coupling mode	Cable Induction (CI)
Current waveform WF5A	40 µs ± 20 % / 120 µs ± 20 %
Test level	specified at coupler output
Test level single stroke	30 A – 1800 A +20%, -0%
Test level multiple stroke	30 A – 1800 A +20%, -0% (first stroke)
	20 A – 390 A +50%, -0% (subsequent stroke)
Pulse repet. single stroke	up to 2 / 1 s @ 50 A, 1 / 14 s @ 1800 A
Polarity	positive, negative, alternating
Programmable ramp	current
Requires	CN-BT7

AVI3000 circuit: WF6 cable induction

Standards	DO-160G S22, MIL-STD-461G CS117, other
Coupling mode	Cable Induction (CI)
Current waveform WF6	0.25 µs ± 20 % / 4 µs ± 20 %
Test level	specified at coupler output
Test level single stroke	2.5 A – 75 A +20%, -0%
Test level multiple burst	2.5 A – 75 A +20%, -0%
Pulse repet. single stroke	up to 2 / 1 s @ 5 A – 75 A
Polarity	positive, negative, alternating
Programmable ramp	current
Requires	CN-BT7

AVI3000 control features

Operating system	EPOS proprietary firmware
Languages	8 menu languages, selectable
User interface	7” colour touch display
Connectivity	ethernet, USB, RS485
Programmable patterns	DO-160, multiple stroke, multiple burst, custom
Trigger out	BNC, max. 15 V
Trigger in	auto, manual, external (BNC input)
Synchro. source	EUT Power
Power synchro.	automatic peak synchronisation as per norm
Emergency stop	Emergency button on front panel, safety circ.

AVI3000 supply, weight, dimensions, climatic conditions

Operating voltage	100 V - 240 V ± 10% (50/60 Hz)
Power consumption	ON < 400 VA, standby < 15 VA
Weight	50 kg
W x d x h	45 x 60 x 37 cm
Version	19“ unit, 8 UH
Temperature range	10 – 35 °C
Humidity	< 80 % non-condensing
Air pressure	86 – 106 kPa
Included articles	
Power cord	with country plug
User manual	with conformity declaration
Calibration certificate	factory calibration

AVI3000 accessories

LISN	DN-LISN160-32
Calibration load	SHUNT0E1, for WF2 and WF3 short circuit
Voltage probe	V-PROBE-SI, common and differential mode
Current probe	I-PROBE-MB-P1
Coupling devices (CI)	CN-BT7, for WF 1, 2, 3, 5A, 6
	CN-GI-CI-V, for WF4 in MIL-STD-461G, CS117
Software	TEMA3000 and modules

COUPLING DEVICES

CN-BT7

Application	coupling device for AVI3000 / cable induction
Suitable for waveforms	WF1, WF2, WF3, WF5A, WF6
Turn ratio	1 : 1
EUT voltage max.	500 V AC or DC
EUT current max.	16 A / 800 Hz (when testing WF2)
	32 A / 400 Hz (when testing WF2)
	32 A / 800 Hz (when testing all other WFs)
	426 A / 50-60 Hz (when testing all other WFs)
Aperture	5.5 x 8 cm
Dimensions	34 x 18 x 21 cm
Weight	18 kg
For generator	AVI3000

CN-GI-CI-V

Standards	MIL-STD-461G CS117, DO-160G S22, other
Application	injection probe for WF4, WF5A (voltage) in cable induction mode
Test level WF4 (CI)	max. 600 V with AVI3000
Test level WF5A (CI)	max. 600 V with AVI3000
EUT supply	max. 130 A @ 50-60 Hz with AVI3000
	max. 20 A @ 400 Hz with AVI3000
	max. 10 A @ 400 Hz with AVI3000
Aperture	6 x 12 cm
Dimensions	53 x 65 x 50 cm
Weight	190 kg
For generators	AVI3000, MIG0600MS, MIG0618SS
Included	connection cables

ACCESSORIES

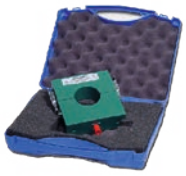
SHUNT0E1

Application	calibration of WF2, WF3 short circuit current
Impedance	0.1 Ω ± 2 %
Output	100 mV/A
Maximum setting AVI3000	WF2: 1600 V, WF3: 1900 V
Weight	0.15 kg
Dimensions	12 x 2.5 x 2.5 cm
Requires	AVI3000, CN-BT7

V-PROBE-SI

Standards	DO-160G S22, MIL-STD-461G CS117, other
Type of probe	differential (can measure CM as well)
Input voltage	max. 7 kV DC + peak, max. 2.5 kV r.m.s.
Waveforms	all AVI3000 waveforms and voltage test levels
Bandwidth	DC – 70 MHz (-3 dB)
Accuracy	± 2 %
Input impedance	10 MΩ || 10 pF
Attenuation ratio	1:100 or 1:1000
Power supply	4 x AA batteries and/or mains adapter
Weight	1.5 kg (packed)
Dimensions	29 x 34 x 8 cm (packed)
For generator	AVI3000
Included	carrying case, mains adapter, AA batteries

I-PROBE-MB-P1



Standards	DO-160G S22, MIL-STD-461G CS117, other
Application	measurement of SC current / clamp on probe
Output impedance	50 Ω (BNC connector)
Input current	max. 100 A r.m.s., max. 5 kA impulse
Waveforms	all AVI3000 current waveforms
Bandwidth (-3 dB)	5 Hz – 15 MHz
Sensitivity	0.1 V/A into 1 MΩ
Accuracy	+ 1 / - 0 %
Current time product	0.5 As
I/f	3.5 A/Hz
Usable rise time	25 ns
DSO input selection	1 MΩ AC
Weight	1.68 kg
Dimensions	12 x 13 x 4 cm (inner diameter 5 cm)
For generators	AVI3000, MIG-OS-MB, other
Included	carrying case

DN-LISN160-32

Standards	DO-160G S22, MIL-STD-461G CS117, other
Application	Line Impedance Stabilization Network (5 µH)
Inductance	5 µH per line (for both AC and DC lines)
Capacitance	10 µF included, 33000 µF included
	LISN is calibrated with capacitors connected
Number of lines	2 AC lines (L, N or L1, L2), 2 DC lines (+ / -)
AC voltage max.	L-N: 480 V @50/60 Hz, L-PE: 280 V @50/60 Hz
	L-N: 150 V @ 400 Hz, L-PE: 85 V @ 400 Hz
AC current max.	32 A
DC voltage max.	50 V
DC current max.	32 A
EUT protection	yes, at 275 V
Weight	13 kg
Dimensions	45 x 57 x 19 cm, 19'' unit, 4 UH
For generators	AVI3000,MIG0600MS,MIG0618 SS,MIG-OS-MB
Requirements	for 3-phase EUTs, two pieces are required

SOFTWARE

TEMA3000

Suitable for generator	AVI3000
Type of license	modular:
	TEMA3000 basic license (remote control)
	TEMA3000 PROTOCOL (automatic test report)
	TEMA3000 DSO (DSO control, supports most
	of nowadays oscilloscopes on Ethernet)
	TEMA3000 LIBRARY (pre-programmed
	test levels according to standards)
Operating system required	Windows, latest
Communication port	ethernet
Updates	lifetime updates at no additional cost
Latest version	available on EMC PARTNER website

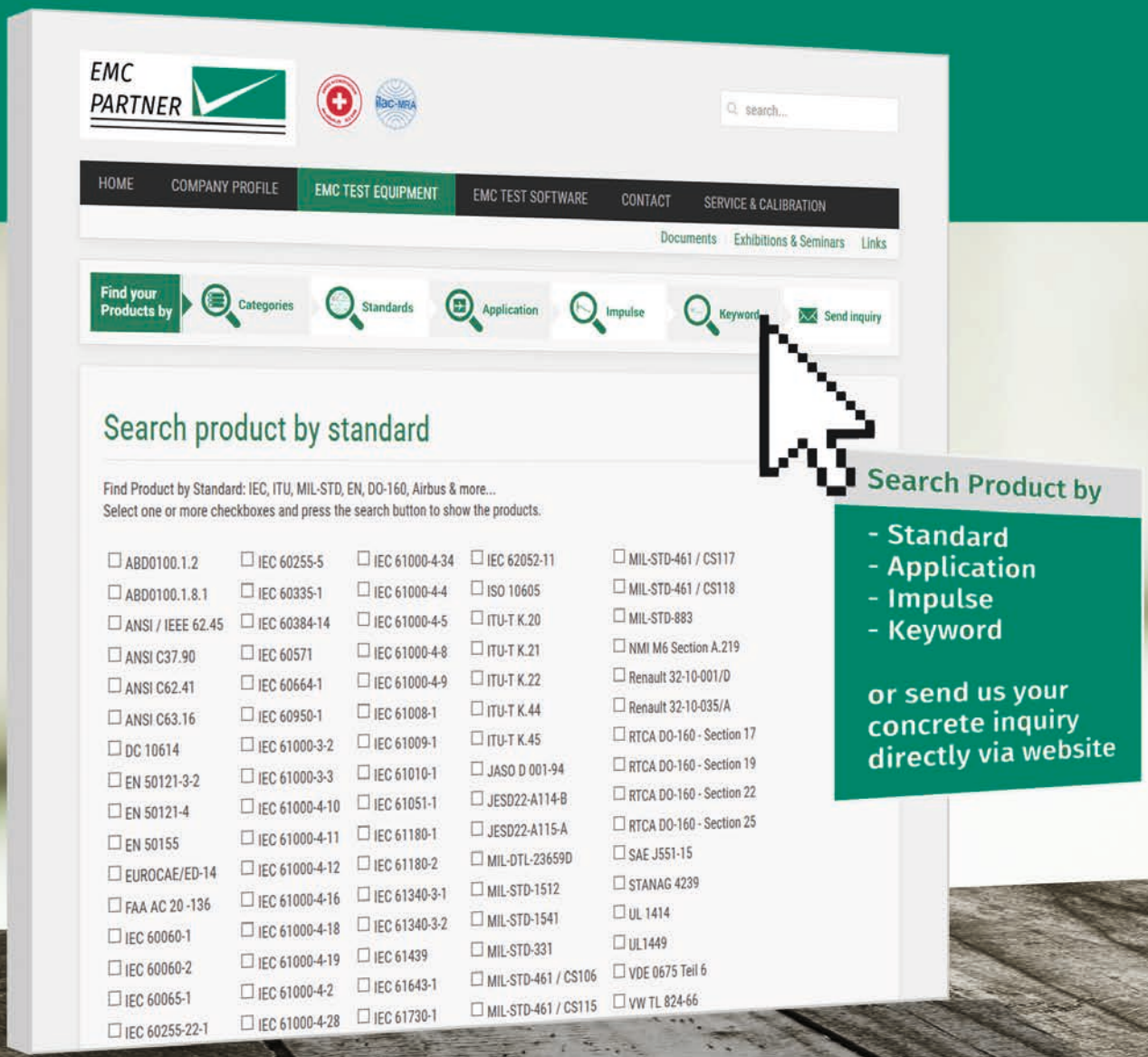
NOTES

NOTES

Specific EMC test requirements ?

Search & find your required test equipment with our powerful **QUICK SELECTOR** tool at

www.emc-partner.com



THE EMC PARTNER PRODUCT RANGE

Find further brochures on our website emc-partner.com/brochures or contact your local representative for a hardcopy.

IMMUNITY TESTS

Transient Test Systems for all EMC tests on electronic equipment. ESD, EFT, surge, AC dips, AC magnetic field, surge magnetic field, common mode, damped oscillatory and DC dips. According to IEC and EN 61000-4-2, -4, -5, -8, -9, -10, -11, -12, -13, -14, -16, -18, -19, -29.

LIGHTNING TESTS

Impulse test equipment and accessories for aircraft, military and telecom applications. Complete solutions for RTCA / DO-160 and EUROCAE / ED-14 for indirect lighting on aircraft systems, MIL-STD-461 tests CS106, CS115, CS116, CS117, CS118 and Telecom, ITU-T .K44 basic and enhanced tests for impulse, power contact and power induction.

EMISSION MEASUREMENTS

Measurement of Harmonics and Flicker in 1-phase and 3-phase electrical and electronic products according to IEC /EN 61000-3-2 and 61000-3-3 . HARCS Immunity software adds interharmonic tests, voltage variation according to IEC/EN 61000-4-13, -4-14.

SYSTEM AUTOMATION

A full range of accessories enhance the test systems. Test cabinets, test pistols, adapters and remote control software, simplify interfacing with the EUT. Programmable PSU, EMC hardened for frequencies from 16.7Hz to 400Hz. PS3-SOFT-EXT complies with IEC / EN 61000-4-14 and -4-28.

SERVICE

Our committment starts with a quality management system backing up our ISO 17025 accreditation. With the SCS number 146, EMC PARTNER provide accredited calibration and repairs. Our customer support team are at your service!

For further information please do not hesitate to contact your local EMC PARTNER AG representative.
Visit our website for more information and contact details.

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