

DO-160 & MIL-STD-461G

# **Indirect Lightning Test System**AVI-LV3







Smart navigation through technical specifications. Click the green links.





# **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. AVI-LV3 brilliantly fulfills these requirements.

A flexible solution that includes:

- > MIL-STD-461: CS117, Level 1 (internal equipment)
- > RTCA DO-160: SECTION 22, Level 3
- > EUROCAE ED-14: SECTION 22, Level 3

Ease of use, compact size and large aperture coupler makes AVIL-LV3 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, AVI-LV3 is a compact and resourceful solution to indirect lightning testing needs.



#### **AVI-LV3 Test System**

AVI-LV3 compact unit

#### **Test Accessories**

CN-BT7

Only one couplter for all 5 waveforms. No change of the EUT cable. Aperture (55x80mm)

CN-GI-CI-V

Voltage coupler for WF4 cable bundle testing. Aperture (60x120mm)

#### **Included Benefits**

StablePulse reproducibility during test cyclePreciseRepeatable test results over long timeFastMinimum setup and calibration timeFlexibleUser 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

AVI-LV3 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, Cable 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

MIL-STD-461 / CS117



#### **Voltage Impulse**

- Cable Bundle Single Stroke
- Cable Bundle Multiple Stroke



## Waveform 3 (1MHz & 10MHz)

RTCA DO-160 / S.22

MIL-STD-461 / CS117



# **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

MIL-STD-461 / CS117



# **Voltage Impulse**

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



## Waveform 5A (40/120μs)

RTCA DO-160 / S.22

MIL-STD-461 / CS117



#### **Current Impulse**

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



## Waveform 6 (0.25/4μs)

RTCA DO-160 / S.22

MIL-STD-461 / CS117

#### **Current Impulse**

Cable Bundle Multiple Burst

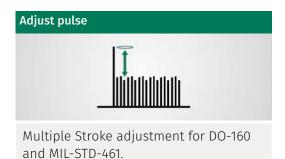


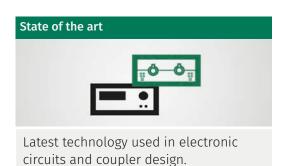
# UNIQUE FEATURES

Leading technology - New designs take advantage of latest innovations.



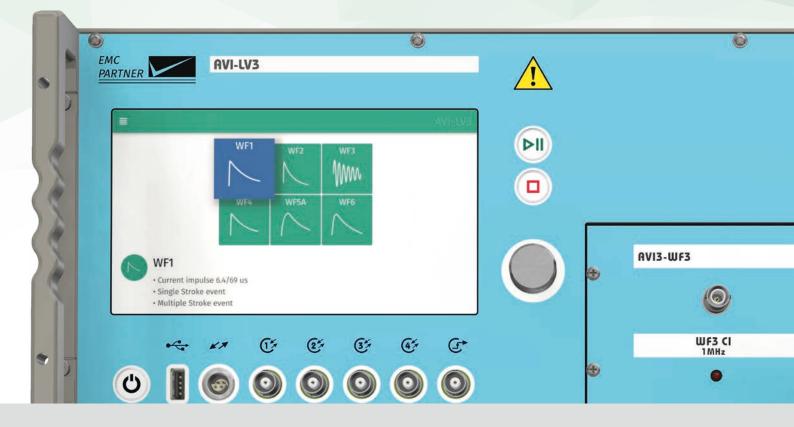
No generator or coupler adjustments required. System is ready for calibration and long duration testing.







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 independent software with free-of-charge updates for lifetime. EPOS is based on a full colour graphic interface and easy to follow onscreen 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.





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

## Interactive interface



User interface adapted to specific circuits.

# Simple touch screen navigation



Save time with the latest in intuitive menu structures.

# We speak your language



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



# TEMA3000 SOFTWARE SUITE

TEST PASSED

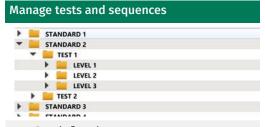
The best solution for professional EMC Test Labs enables comfortable test setups, easy parameter changes and customizable test reports and DSO integration.

# Customizable test reports WASHER3840 SERIA RUMBER 184446

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



- Minimal learning time
- > Integrated assistant function



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



- > 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.)	Manufacturers (Airbus, Boeing, etc)
AVI-LV3	✓	✓	✓
Accessories & coupling devices			
DN-LISN160-32	✓	✓	✓
SHUNT0E1	✓	✓	✓
V-PROBE-SI	✓	✓	✓
I-PROBE-MB-P1	✓	✓	✓
CN-BT7	✓	✓	✓
CN-GI-CI-V	optional	✓	optional
WARNING-LAMP	optional	optional	optional
EMERGENCY-STOP	optional	optional	optional
Software			
TEMA3000 & Modules	✓	✓	✓

# TEST SYSTEM

# 1. AVI-LV3 TEST SYSTEM

# AVI-LV3 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)
	20 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



# AVI-LV3 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

# AVI-LV3 circuit: WF3, 1 MHz, pin injection

DO-160G S22, other
pin injection / direct application
25 Ω
frequency: 1 MHz ± 20 %
damping: 25 – 75 % (1st to 5th peak)
specified at application point
50 V – 750 V +10%, -0%
2 A – 30 A +10%, -0% in short circuit
100 V - 750 V +10%, -0%
4 A – 30 A +10%, -0% in short circuit
up to 2 / 1 s @ 100 V - 750 V
positive, negative, alternating
automatic on power peak or 0 – 359°, step 1°
voltage
230 V

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

# AVI-LV3 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	10 V – 1900 V +20%, -0%
Test level multiple stroke	10 V - 1900 V +20%, -0% (first stroke)
	10 V – 1000 V +50%,-0% (subseq. stroke)
Test level multiple burst	10 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

# AVI-LV3 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

# AVI-LV3 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

# AVI-LV3 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 – 800 Hz and DC

# AVI-LV3 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	max. 10 V - 600 V +20%, -0%
Test level multiple stroke	max. 10 V - 300 V +20%, -0% (first stroke)
	max. 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

# AVI-LV3 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	25 V – 50 V +20%, -0%
	25 A – 50 A +20%, -0% in short circuit
	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

# AVI-LV3 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	20 A - 1800 A +20%, -0%
Test level multiple stroke	20 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

# AVI-LV3 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

# **AVI-LV3 control features**

Operating system	EPOS propietary firmware
Languages	8 menu languages, selectable
User interface	7" capacitive touch display
Connectivity	gigabit ethernet, USB, RS485
Programmable patterns	DO-160, multiple stroke, multiple burst, custom
	Airbus ABD patterns, Boeing D6 patterns for
	multiple stroke, multiple burst (waveforms 3, 4, 5A)
Synchronization on signals	40 – 800 Hz
Synchronization source	EUT Power
Synchronization angle	automatic peak synchronization as per standard
Impulse polarity	positive, negative, electronic switching
Automatic ramp	test level
Trigger out	BNC, max. 6 V
Programmable connectors	6 BNC connectors (inputs/outputs) as follows
Programmable input functions	Trigger input, Start Test, Stop Test, EUT Fail, EUT Mark, Emergency Stop
Programmable input max. voltage	low range: 0 – 1.5 V, high range: 2.3 – 24 V
Programmable output functions	Running State, Safety Circuit State

Programmable output max. U, I	max. 24 V, max. 300 mA
Safety features (standard)	Emergency stop button on front panel red/yellow as per IEC 60947-5-5, IEC 60204-1, ISO 13850, Safety circuit
Safety accessories (optional)	WARNING LAMP (24 V, max. 2.4 W),
	Remote EMERGENCY STOP button

AVI-LV3 supply, weight, dimensions, climatic conditions

Avi Evo Suppty, weight	, annensions, cumatic conditions	
Operating voltage	100 V - 240 V ± 10% (50/60 Hz)	
Power consumption	ON < 400 VA, standby < 15 VA	
Weight	50 kg	
Wxdxh	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	

# **AVI-LV3** 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 AVI-LV3 / 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	AVI-LV3



# 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 AVI-LV3
EUT supply	max. 130 A @ 50-60 Hz with AVI-LV3
	max. 20 A @ 400 Hz with AVI-LV3
	max. 10 A @ 400 Hz with AVI-LV3
Aperture	6 x 12 cm
Dimensions	53 x 65 x 50 cm
Weight	190 kg
For generators	AVI-LV3, 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 AVI-LV3	WF2: 1600 V, WF3: 1900 V
Weight	0.15 kg
Dimensions	12 x 2.5 x 2.5 cm
Requires	AVI-LV3, 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 AVI-LV3 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	AVI-LV3
Included	carrying case, mains adapter, AA batteries



# I-PROBE-MB-P1

DO-160G S22, MIL-STD-461G CS117, other
measurement of SC current / clamp on probe
50 Ω (BNC connector)
max. 100 A r.m.s., max. 5 kA impulse
all AVI-LV3 current waveforms
5 Hz – 15 MHz
0.1 V/A into 1 MΩ
+ 1 / - 0 %
0.5 As
3.5 A/Hz
25 ns
1 ΜΩ ΑС
1.68 kg
12 x 13 x 4 cm (inner diameter 5 cm)
AVI-LV3, 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 μΗ)
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	AVI-LV3,MIG0600MS,MIG0618 SS,MIG-OS-MB
Requirements	for 3-phase EUTs, two pieces are required
·	



# **WARNING-LAMP**

Cable length	5 m
Dimensions	diameter 7x cm x 25 cm
Weight	0.5 kg



## **EMERGENCY-STOP**

Cable length	5 m
Dimensions	8 cm x 8 cm x 10cm
Weight	0.3 kg



# SOFTWARE

# **TEMA3000**

Suitable for generator	AVI-LV3
Type of license	modular:
	TEMA3000 basic license (remote control)
	TEMA3000 REPORT (automatic test report)
	TEMA3000 DSO (DSO control, supports most
	current 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

# **Tradition meets Technology**

Over 25 years devoted to combining latest technologies into the best products.



100% Swiss made products



# Specific EMC test requirements?

Search & find your required test equipment by application, standard or test type

www.emc-partner.com



#### **EMC PARTNER**

# PRODUCT APPLICATION RANGE

#### **CONSUMER & INDUSTRIAL ELECTRONICS**

Transient Test Systems for conducted EMC tests on electronic equipment. ESD, EFT, surge, ring wave, DOW, dips, magnetic field, common and differential mode. Compliant to IEC, EN and ANSI standards.



#### **AEROSPACE ELECTRONICS**

Impulse generators and couplers for avionic applications. Single stroke, multiple stroke and multiple burst according to RTCA / DO-160, EUROCAE / ED-14 and aircraft manufacturer standards.



#### **COMPONENT TESTING**

Voltage and current Impulse generators for design and production testing of varistors, gas discharge tubes, surge protective devices, X / Y capacitors and specialist impulse generators for semiconductor tests.



#### **DEFENCE ELECTRONICS**

Complete test solutions for MIL-STD-461 requirements CS06, CS106, CS115, CS116, CS117 and CS118.



#### **TELECOM & DATA LINE TESTING**

Voltage and current impulse generators, CDNs, power contact, power induction equipment for exchange and customer equipment according to ITU, IEC, EN and ETSI requirements.



# **ENERGY & UTILITY EQUIPMENT**

High current CDNs combined with transient test equipment fulfil requirements to test renewable and classical energy distribution network and monitoring equipment.



#### **CUSTOMER SERVICES**

Customer support throughout an equipment's lifetime is central to the EMC PARTNER AG philosophy. Directly from our ISO accredited facility in Switzerland or through our network of services centres, we provide support wherever you are.



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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