



Advanced Test Equipment Corp.
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BOLAB



Artificial Network AN-Series

Vehicle Artificial Network
LV 123
ISO 21498
IEC 61851-23
VW 80300
MBN LV111123

Artificial Network AN-Series



Physical form A



Physical form B

AN-Series is an Artificial Network that electrically recreates the vehicular power-net impedance for component tests of voltage class B (high voltage) components in laboratories and test-benches. The AN-Series uses an analog system with a bandwidth covering up to 150 kHz. An artificial network like the AN-Series is crucial for the proper testing of all voltage class B component in both hybrid and electric vehicles. Generated DUT interferences like ripple, dynamics, spikes and other higher frequency noise is correctly absorbed and reflected by the Artificial Network, recreating conditions similar to that in a vehicular high voltage power-net. This allows for better testing of the component's robustness and its immunity to its own generated noise. Testing with AN-Series artificial network would also bring efficiency and life-cycle tests closer to real-world results and in line with standards like the ISO 21498, LV 123, IEC 61851-23, VW80300, MBN 11123 and internal-norm requirements.

- In accordance with LV123, ISO 21498, MBN 11123, VW 80300 and IEC 61851-23.
- Customer specific solutions according to in-house standards like the MBN 11123, GS 95023, VW 80303 or Impedances taken from vehicular measurements.
- Liquid cooled for stabile resistance temperature and constant ohmic value.
- True continues current loading without derating, ideal for in-the-loop testing during the development stage of HV components.
- 2x tighter tolerance than required in ISO 21498. Accredited DAkkS calibration available upon request.
- Modular and upgradable system that grows with your testing needs.
- Self-monitoring, safe and reliable system

Model Overview

MODELS	LV 123	VW 80300	ISO 21498	MBN 11123	Current
AN-AB-60	✓	✓	-	-	60 A
AN-CD-60	-	-	✓	✓	60 A
AN-ABCD-60	✓	✓	✓	✓	60 A

MODELS	LV 123	VW 80300	ISO 21498	MBN 11123	Current
AN-AB-300	✓	✓	-	-	300 A
AN-CD-300	-	-	✓	✓	300 A
AN-ABCD-300	✓	✓	✓	✓	300 A

Safety Note



High Voltage System:

This product is a high voltage and high current system and should only be used and handled by qualified professionals in proper laboratory conditions.

Large internal Cx capacitance (greater than 6 mF):

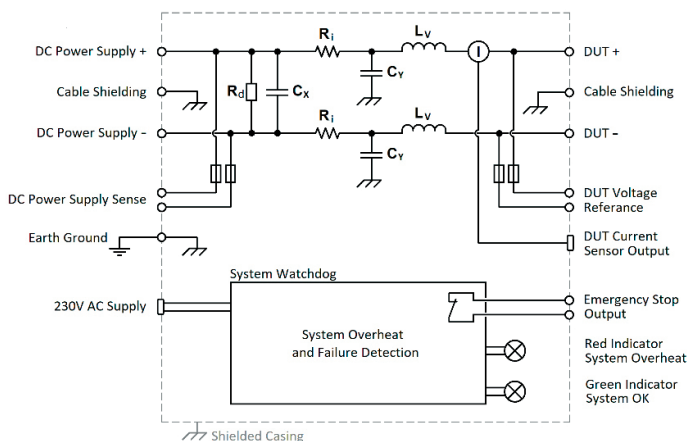
This product contains large internal Cx capacitance connected between the high voltage lines. Even when DC power supply to the Artificial Network (AN) is turned off, high voltage will linger for longer periods of time. Hence, before handling or starting any work on the high voltage system and connected equipment, always test for absence of voltage. Ensure that the high voltage lines are fully discharged (to below 10 V). Voltages above 10 V can lead to arc flashes when a short-circuit between the high voltage lines occur.

Fused voltage outputs:

High voltage measurement points "DUT Voltage Reference" and "DC Power Supply Sense" are fused and may not be electrically connected to the high voltage lines when the fuses are blown. To ensure the test for absence of voltage is valid, proceed first with a positive test or a connectivity test between "DUT Voltage Reference" and "DC Power Supply Sense". After testing for absence of voltage at the voltage measurement points "DUT Voltage Reference" and "DC Power Supply Sense", testing for absence of voltage directly at the high voltage busbar.

Internal Cy capacitance (equal or greater than 2 μF):

This product contains internal Cy capacitance between high voltage lines and ground. When connected to other devices the Cy capacitance may exceed safe values. Before beginning handling or starting any work on the high voltage system always test for absence of voltage between high voltage lines and ground.



Safety Note and Typical Application Setup

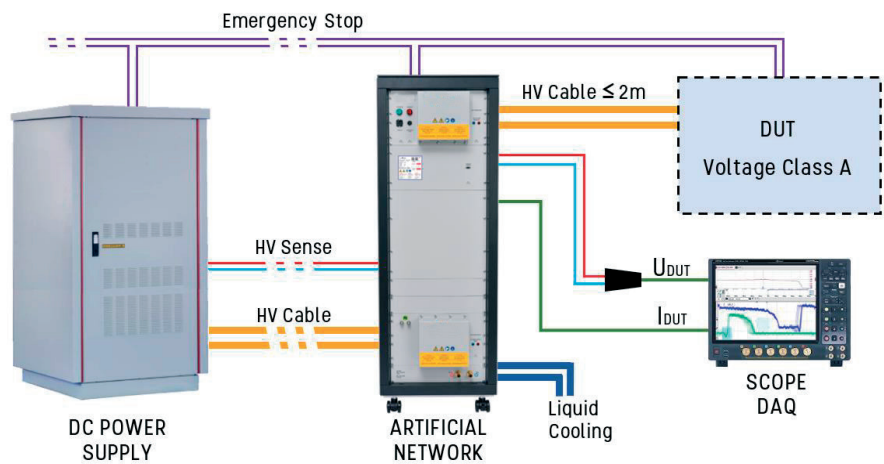
Emergency-Stop:

Before the use of this product or system, ensure that the product or system is connected to the laboratory Emergency-Stop. This product or system must be able to shut off or cut off the DC power supply and DUT in a case of overheating or internal error.

Cooling:

For Physical form B system or product, the correct temperature and flowrate of the liquid coolant must be present and running as soon as voltage is present on the high voltage lines, otherwise the internal components of the system may be damaged.

Typical Application setup:



Specification

Electrical Characteristics

High Voltage Lines

PARAMETER	MIN.	TYP.	MAX.	UNITS
Voltage			1000	V
Voltage Ripple			80	V pk
Isolation Resistance	100	200		M Ω

Passive High Voltage Components

PARAMETER	MIN.	TYP.	MAX.	UNITS
C _x capacitance tolerance	-10		10	%
C _x discharge time			5	min
C _y capacitance tolerance	-10		10	%
C _y discharge time			1	min
R _{i,HV} resistance tolerance	Tuned to match tolerances			
L _y inductance tolerance	Tuned to match tolerances			

* AN in standalone, discharge time from 1000V to 60 V

System

PARAMETER	MIN.	TYP.	MAX.	UNITS
IEC inlet voltage	90		250	V AC
IEC inlet consumption			200	W
Emergency-Stop output relay	Max.: 2 A at 250 V AC or Max. 3 A at 30 V DC			

Specification

Mechanical Data

Physical form A:



Dimensions (WxHxD): 700 mm x 250 mm x 850 mm
Weight: 42 kg

Physical form B:



Dimensions (WxHxD): 600 mm x 1670 mm x 650 mm
Weight: 140-190 kg

DC Power Supply Requirements

The High voltage DC Power Supply is connected to the AN-Series via the lower busbars labeled "DC Power Supply".

Requirements of the DC Power Supply:

1. DC Power Supply Cx output capacitance connected between the high voltage lines shall not exceed 200 uF.
2. Current limit (CC) of the DC Power Supply shall be set to not more than the max continuous current of the AN-Series as written on page 6.

The following points are recommended for the DC Power Supply:

1. Shielded cables between the DC Power Supply and the AN with shielding connected on both ends.
2. Sense input of the DC Power Supply connected to the AN sense out.
3. Sense Response bandwidth of the DC Power Supply \geq 1 kHz
4. DC Power Supply with Insulation monitoring.

Environmental Requirements

Operating conditions for Physical form A

PARAMETER	CONDITION
Operating temperature	5°C to 35°C
Storage temperature	5°C to 50°C
Operating humidity range	10 % RH to 70 % RH, non-condensing
Operating environment	Indoor laboratory condition
Ingress protection code	IP20
Operating elevation	Max. 1,500 m
Pollution degree	Max. pollution degree of 1

* customer specific solutions possible upon request

Cooling Requirement

1. Physical form A:
Ensure that all air inlets and outlet are not obstructed and filters cleaned regularly. The required clearance from air inlets and outlet for adequate cooling is 100 mm.
2. Physical form B:
In addition to liquid cooling, the AN-Series also cools its self through its overall surface area, the required clearance from all surfaces is 100 mm.

Liquid cooling requirement for physical form B

PARAMETER	CONDITION
Coolant temperature	10°C to 25°C
Overpressure (gauge pressure)	Max 6 bar
Ethylene Glycol Solution	Max 40 % by volume

Specification

Artificial Network Layout and Connections

Current Sensor Selection

Current sensor selection

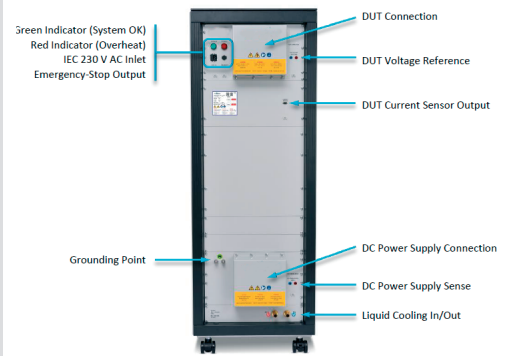
CODE	SENSOR	DATA
A	Shunt	Ri, HV
B	LEM LV1010-S	DC - 100 kHz, $\pm 0.4\%$, 1000A
C	LEM IN1000-S	DC - 440kHz, $\pm 0.018\%$, 1000A
D	Hioki CT6876	DC - 1.5MHz, $\pm 0.04\%$, 1000A
Z	Customer specific current sensor	

Order Information

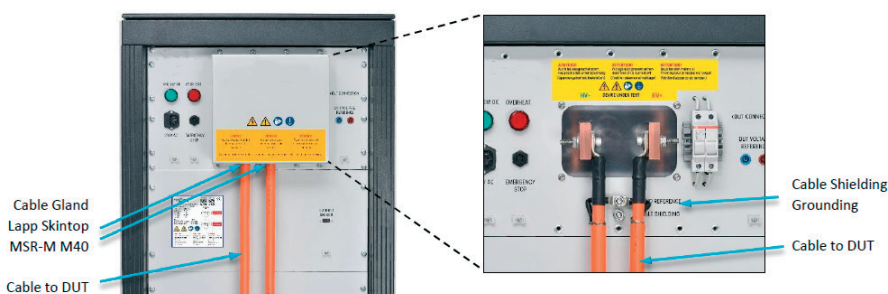
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Front View of Artificial Network



DUT HV Cable Connections



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