



ARTIFICIAL NETWORK (AN) HV-AN 500 & SME HV-AN 500 USER MANUAL



**ARTIFICIAL NETWORK (AN)
HV-AN 500 & SME HV-AN 500
USER MANUAL**

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1. SAFETY ADVICE



Observe all precautions to assure your personal safety. Read the user manual carefully. Pay special attention to safety and operation details!

1.1. Safety and warning symbols

Please take note of the following explanations of the symbols used in order to achieve the optimum benefit from this manual and to ensure safety during operation of the equipment.

		<p>This symbol warns of a potential risk of shock hazard. Use standard safety precautions to avoid personal contact with these voltages.</p>
		<p>This symbol indicates where a caution is required. Refer to the operating instructions located in the manual in order to protect against personal injury or damage the equipment. It calls attention to a procedure, practice or condition which, if not followed, could possibly cause damage to equipment. Such damage may invalidate the warranty. Do not proceed until its conditions are fully understood and met.</p>
		<p>This symbol indicates non-ionizing radiation. Non-ionizing radiation may pose a health hazard to operators. Protective measures such as switching off the RF before entering the Faraday cage, level limitation and/or spatial distance are common measures.</p>
		<p>This symbol indicates access of persons with pacemakers prohibited.</p>
		<p>This symbol indicates the ground terminal.</p>
		<p>This symbol indicates the protective earth terminal.</p>

1.2. Safety Aspects

These operating instructions form an integral part of the equipment and must be available to the operating personnel at all times. The user must obey all safety instructions and warnings.

Neither AMETEK CTS Europe GmbH nor any of its subsidiary sales organizations can accept any responsibility for personal, material or consequential injury, loss or damage that results from improper use of the equipment and accessories.



WARNING

Improper or careless handling can be fatal!
Use of the generator is restricted to authorized and trained specialists

1.3. Connection to the mains and PE

- ▶ The instrument conforms to protection class 1. Operation without a protective earth connection is forbidden!
- ▶ Before switching on the device, check whether the selected voltage matches the supply voltage. The position of the voltage selector must correspond with the mains. If you change the mains voltage, replace the fuses according to the recommended value.
- ▶ A proper protective earth connection through the connector of the power cord is essential for safe operation.
- ▶ High leakage currents can cause the residual current circuit breaker of the mains to trip. In this case, the use of an isolating transformer is required.
- ▶ Handle the power cord carefully. Hold the plug when unplugging the cord.
- ▶ Never use the product if the power cord or the plug is damaged.
- ▶ Use only power cords and connector specified for your product.
- ▶ Do not abuse the cord. Never use the cord for carrying, pulling or unplugging the unit. Keep cord away from heat, oil, sharp edges or moving parts.
- ▶ Prevent the device from being switched on or energized unintentionally. Make sure that the switch is in the off position before connecting the device to the mains.
- ▶ Disconnect the power plug if you are not going to use the device for a long period of time.

1.4. Connections to other ports with dangerous voltages (AE, EUT, RF port ...)

- ▶ Only use the connection cables and plugs specified for your product which enable safe working. They must comply with the required classification and have suitable voltage and current ratings for the application.
- ▶ Handle the connection cable carefully. Hold the plug when unplugging the cable.
- ▶ Never use the product if the connection cable or plug is damaged.
- ▶ Avoid touching conductive parts unless they have been de-energized by suitable means and secured against being switched on again for the period of handling. Industrial connectors often have insufficient protection against electric shock due to their application.

1.5. Connection to the ground plane or Faraday cage

- ▶ Remove the protective foil from under the device and adapter housing to ensure good electrical contact.
- ▶ Light equipment should be weighted down, clamped to the base plate or other measures should be taken to ensure good electrical contact over a wide surface area and on a permanent basis.



- ▶ Connect the device with the ground plane before using.
- ▶ The operation without a second, only with a tool removable earth leakage connection is prohibited.
- ▶ Check the ground connection at regular intervals.

- ▶ Ensure that a reliable return path for the interference current is provided between the equipment under test (EUT) and the generator. The reference ground plane and the earth connections to the instrument as described in the relevant test standard serve this purpose well.

1.6. Disconnection from the mains, PE, ground and control devices

- ▶ Always set the power switch to the "Off" position and wait few seconds before disconnecting the power cord.
- ▶ Disconnect the power cord and all connection cords when moving the unit.

1.7. Use proper fuses

- ▶ To avoid fire hazard, use only fuses as specified in the parts listing for your product - matching type, voltage and current rating.

1.8. Risk of electric shock



WARNING

- ▶ To reduce the risk of electric shock, do not remove parts from the housing.
- ▶ There are no user serviceable parts inside the unit. Certain parts inside the instrument work at mains voltage or at high frequency and are not provided with any protection against being touched.
- ▶ Only approved accessory items, connectors, adapters, etc. are to be used to ensure safe operation.



WARNING

- ▶ Not all lines, especially EUT supply lines, inside the device are protected by a fuse. Therefore, the user must implement the protection of the device against short-circuits by means of suitable fuses / circuit breakers.
- ▶ Avoid an overload by taking suitable precautions.
- ▶ In the event of a fault, dangerous and unexpected voltages may occur. Avoid touching conductive parts unless they have been de-energized by suitable means and secured against being switched on again for the period of handling.

1.9. Operating Environment

- ▶ Operate the equipment only in dry surroundings. Allow any condensation that occurs to evaporate before putting the instrument into operation. Do not exceed the permissible ambient temperature, humidity or altitude above sea level. Operate the unit not in explosive surroundings.
- ▶ No objects filled with liquids, such as coffee cups, shall be placed on the unit.
- ▶ Do not insert foreign objects in the ventilation holes.
- ▶ Do not obstruct the ventilation holes (also on the underside). Ventilation should not be impeded by covering the ventilation openings with items or other equipment.
- ▶ Avoid high temperatures. Allow for sufficient heat dispersion when installed in a rack. Do not place the product on radiators or fan heaters. The ambient temperature must not exceed the maximum specified temperature of this product.
- ▶ Keep the test area clean and well lit. Cluttered or dark areas invite accidents.

1.10. Test execution

- ▶ Check once again that all connections are proper including the ground and protective earth.
- ▶ Remove any adjusting key or wrench before switching on or energizing the device.
- ▶ The test area must be organized that no unauthorized persons have access during execution of a test.
- ▶ Operating the product requires special training and intense concentration. Make certain that persons who use the products are physically, mentally and emotionally fit enough to operate the products; otherwise injuries or material damage may occur.
- ▶ EUTs together with all accessories and cables are to be regarded as being live during the execution of a test.
- ▶ The safety instructions concerning all the instruments and associated equipment involved in the test setup are to be observed.
- ▶ The configuration of the test setup is to be strictly in compliance with the methods described in the relevant standard to ensure that the test is executed in a compliant manner.
- ▶ Working with high voltages alone is dangerous and prohibited by law.
- ▶ The high voltages must be switched off when nobody is present.

1.11. Dangers concerning the generator

- ▶ Local regulations for the protection of radio services must be observed. The interference generated by the generator can cause both conducted and radiated interference.
- ▶ If the radiated energy exceeds the permissible level, a shielded chamber with filtering of the supply lines or similar must be used. Decisive for the measures are the used levels, the geometry of the setup, the frequency range and the distance to the neighbor.
- ▶ Depending on the level used, the effectiveness of the connected antenna, TEM cell or similar, fields can be generated using appropriate power amplifiers, from which the operating personnel must be protected by suitable measures.
- ▶ Localized burning, arcing or ignition of explosive gases.
- ▶ Disruption of unrelated electronic, telecommunications or navigational installations or heart pacemakers through intentional and unintentional radiation of RF energy.



WARNING

Persons fitted with a heart pacemaker must not operate the instrument nor approach the test setup while it is in operation.

1.12. Dangers concerning the EUT

- ▶ EUTs are frequently simply functional samples that have not previously been subjected to any safety tests. Therefore, in some cases, the EUT is quickly damaged through internal overloads caused by the control electronics being disrupted. The EUT may even begin to burn.
- ▶ As soon as the EUT shows signs of damage the test should be stopped and the equipment under test should be switched off.
- ▶ Possible erroneous behavior by the EUT for example, a robotic device may misbehave, or a temperature regulator may fail.
- ▶ Even when power is off, capacitors may retain an electrical charge.

1.13. Applicable safety standards

- ▶ Development and manufacture of the instrument complies with ISO 9001.
- ▶ The equipment conforms with the essential requirements of the Low Voltage Directive (LVD) 2014/35/EU based on DIN EN 61010-1.

1.14. Intended use



The purpose of this instrument is the coupling of defined interferences signals for EMI immunity testing. Depending on the test stand layout, configuration, wiring, and the characteristics of the EUT itself, a significant amount of electromagnetic radiation may be generated that can affect people as well as other equipment and systems. Likewise, this device can be used to decouple interfering signals for emission measurements.



WARNING

The device is designed for operation in industrial as well as home environment. For the intended operation, electromagnetic fields are generated by the connection of coupling devices (antennas, clamps, CDN etc.) or by the injection on lines. The operator, persons in the vicinity and the environment must be protected by suitable measures, e.g. Faraday cage.

1.15. Warranty Terms

AMETEK CTS provides this written warranty covering the product stated above, and if the buyer discovers and notifies AMETEK CTS in writing of any defect in material or workmanship within the applicable warranty period stated above, then AMETEK CTS may, at its option: repair or replace the product; or issue a credit note for the defective product; or provide the buyer with replacement parts for the product.

The buyer will, at its expense, return the defective product or parts thereof to AMETEK CTS in accordance with the return procedure specified below. AMETEK CTS will, at its expense, deliver the repaired or replaced product or parts to the buyer. Any warranty of AMETEK CTS will not apply if the buyer is in default under the purchase order agreement or where the product or any part thereof:

- is damaged by misuse, accident, negligence or failure to maintain the same as specified or required by AMETEK CTS;
- is damaged by modifications, alterations or attachments thereto which are not authorized by AMETEK CTS;
- is installed or operated contrary to the instructions of AMETEK CTS;
- is opened, modified or disassembled in any way without AMETEK CTS's consent; or
- is used in combination with items, articles or materials not authorized by AMETEK CTS.

The buyer may not assert any claim that the products are not in conformity with any warranty until the buyer has made all payments to AMETEK CTS provided for in the purchase order agreement.

1.16. Prohibition of unauthorized conversions and modifications

The user is not entitled to the device to perform its own modifications and adaptations. Modifying parts on the generator by unauthorized persons will void the warranty of the device and the correct functioning cannot be guaranteed.

1.17. Specific accessories required for safety reason

Only use accessories approved by AMETEK CTS for these generators and intended as accessories for these devices. Measuring instruments for the measurement of instrument parameters shall be designed for the maximum voltage and current from the generator. Otherwise safety cannot be guaranteed.

1.18. Procedure in case of hazard

If a hazard could exist due to an unintended condition of the device, the following procedure is recommended: Disconnect the device- and EUT power supplies from the power supply and ensure that the device is always earthed via the supply lines or a different ground connection. Wait at least 15 minutes and ground all outputs via a 10 k Ω , 15 W resistor. Call an AMETEK service center.

2. UNPACKING, STORAGE AND TRANSPORT

2.1. General

Save all packing materials! They will be needed in order to safely package the equipment for calibration service or repair.

Packaging materials

- Carton: Cardboard
- Padding: CFC-free polystyrene foam
- Plastic bags: Polyethylene

▶ Avoid the risk of condensation!

If a large temperature difference has occurred, allow time for the temperature to stabilize. This may take several hours.

2.2. Storage and transport

- ▶ Do not stack, either packaged or unpacked.
- ▶ Do not stand on end; arrows on the packaging must always point upwards.
- ▶ Protect from dampness, heat, cold and rain.
- ▶ Do not throw.
- ▶ Do not sit or stand on the instrument and packaging.

2.3. Unpacking

- Is the packaging damaged? If YES  transportation company
- Are all the packages present and correct? If NO  transportation company
- Open the packaging, remove the accessories.
- Grip the instrument at the sides and lift it from the packaging.
- Are the instrument or accessories damaged? If YES  transportation company
- Are the contents of the package complete? If NO  Teseq sales office
- Keep the instruction manual with the instrument.
- Keep the packaging.

2.4. Scope of delivery HV-AN 500

Artificial network HV-AN 500
 Power supply adapter 12V/30W with country adapter EU, UK, US and AUS
 Operating manual

2.5. Scope of delivery SME HV-AN 500

SME HV-AN 500
 2x RF cable N(m)-N 90° (m), 0.15 m (11-259678)
 4x Connection brackets (13-260683)
 4x Hexagon head screw DIN 933 8.8VZ M16x40 with nuts

2.6. Options

Calibration certificate
 HV-AN 500-option-1µF
 CAS HVAN500

3. APPLICATION AND STANDARD REQUIREMENTS

Teseq's 5 μH artificial network HV-AN 500 covers several automotive applications and standards. It offers the right solution for both high-current and high-voltage EUTs and can be accommodated with a shielded box.

The artificial network is designed for conducted emission measurements and line terminations in component immunity tests. It is used to simulate the impedance of a vehicle wiring harness. Thanks to the jumper settings, the requirements of ISO 7637-2 and the HV part of CISPR 12 (draft), CISPR 25, ECE No. 10 R05 / 06, ISO 11452-1 and ISO / DTS 7637-4 are met. The optional available HV-AN 500-option-1 μF , connected on the AE port of the HV-AN 500, allows testing of the LV part of CISPR 25, ECE No. 10 R06 and ISO 11452-1. The combination of two networks in one shielded box allows testing of high voltage connections as seen in the standard CISPR 12 (draft), CISPR 25, ECE No. 10 R05 / R06 and ISO / DTS 7637-4. The shielded metal housing SME HV-AN 500 is designed to accommodate two HV-AN 500.

The signals to be measured are applied to the coaxial output of the HV-AN 500 model. A 50 Ω measuring receiver is connected to it. Any suitable measuring receiver with 50 Ω input impedance can be used to perform the measurement, provided its frequency range and sensitivity are compatible. An additional voltage limiter may be required to protect the input circuit of the receiver from transients or pulses with high amplitudes.

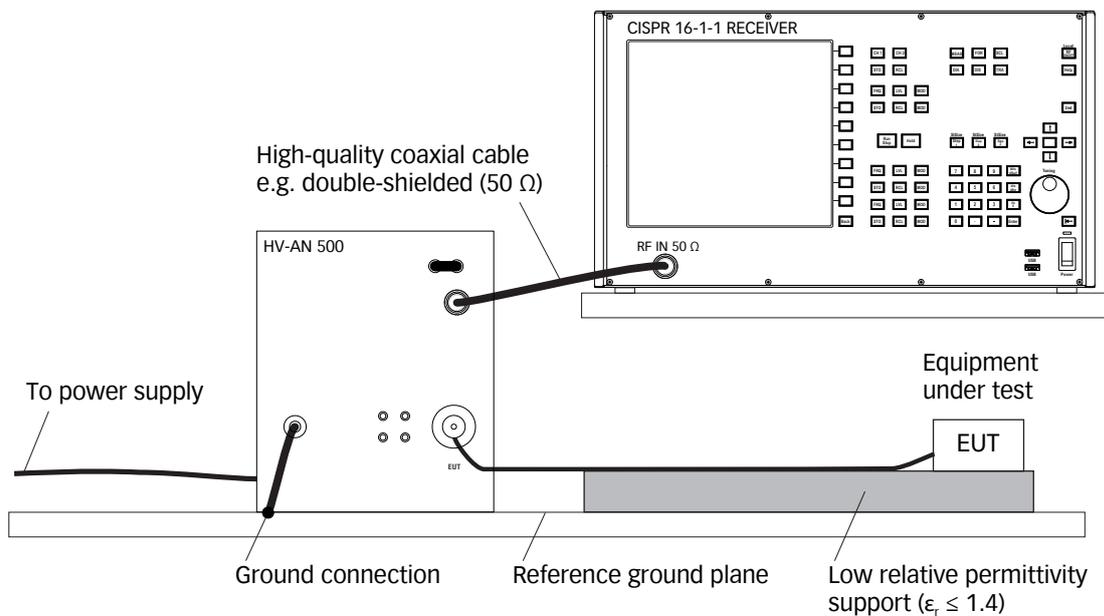


Figure 1: Example measurement set-up

The product meets the high voltage part of the following standards:

- ISO 11452-1
- CISPR 12 draft Ed. 7.0,
- CISPR 25,
- ECE Nr. 10 R05 / R06,
- ISO / DTS 7637-4,
- ISO 7637-2

The product meets the low voltage part of the following standards with HV-AN 500-option-1 μF connected on the AE port of HV-AN 500:

- ISO 11452-1
- CISPR 25,
- ECE Nr. 10 R06

4. CONSTRUCTION OF THE PRODUCT

4.1. EUT port

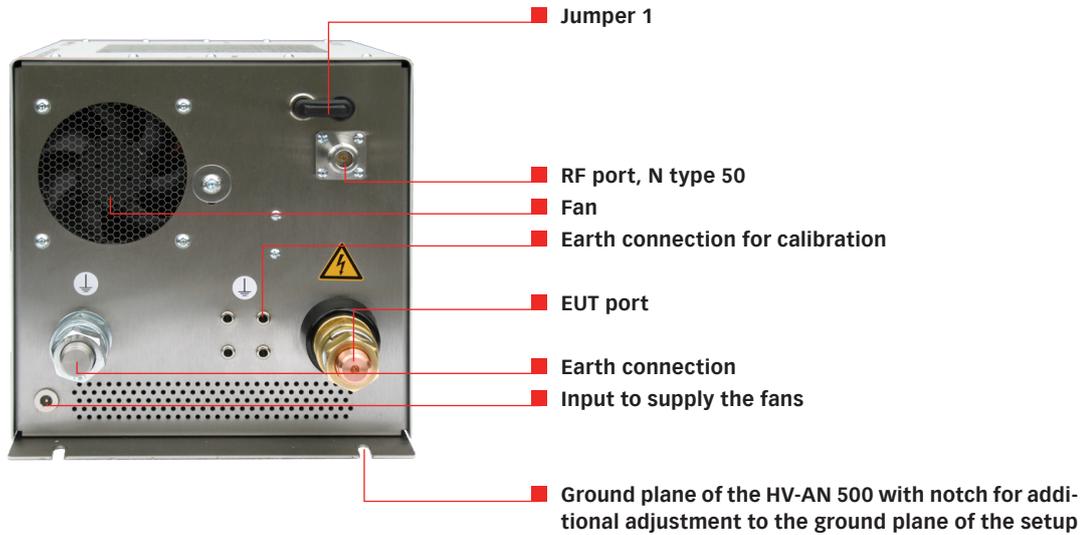


Figure 2: HV-AN 500 view to the EUT port

4.2. AE port (connection to power supply for EUT)

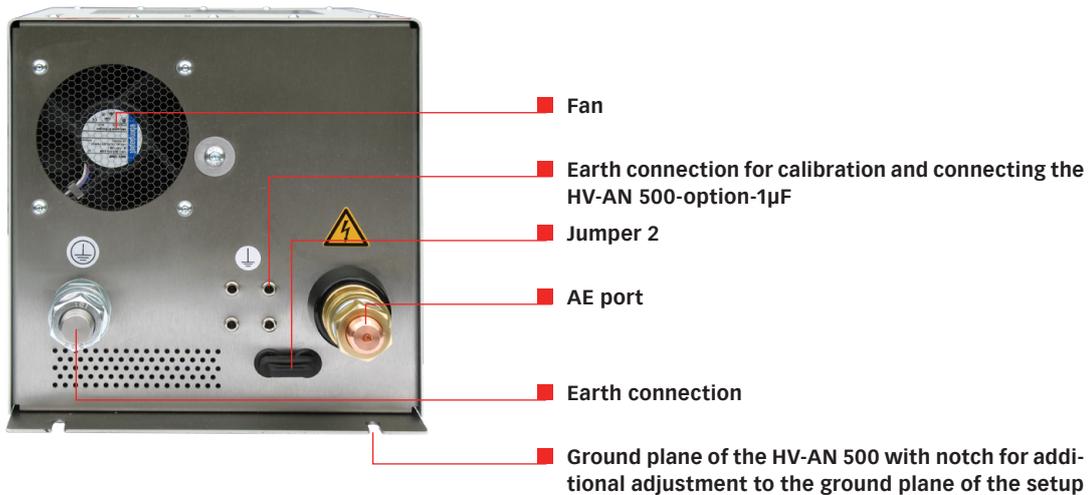


Figure 3: HV-AN 500 view to the AE port

4.3. Jumper settings

Standard	Jumper 1	Jumper 2
High voltage part of CISPR 25, CISPR 12, ECE No. 10 R05/R06, ISO 11452-1, ISO/DTS 7637-4	●	●
ISO 7637-2	○	○

“●” jumper used, connected, “○” no jumper, not connected

4.4. Equivalent circuits in relation to the jumper settings

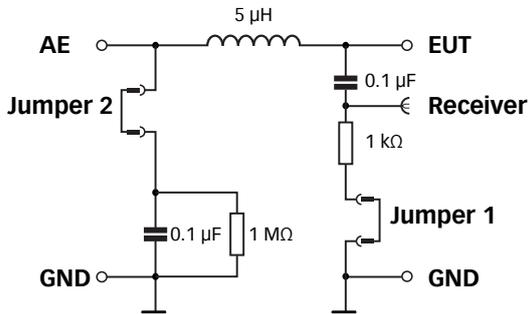


Figure 4: Equivalent circuit according the high voltage part of CISPR 12 (draft) CISPR 25, ECE No. 10 R05/R06, ISO 11452-1 and ISO / DTS 7637-4 with jumper setting 1 and 2

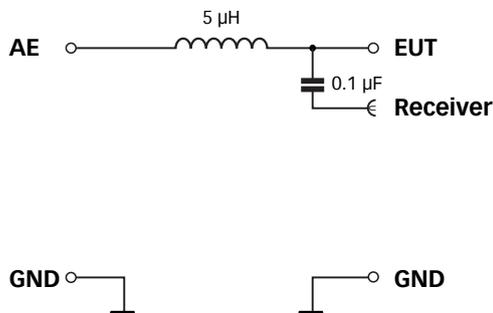


Figure 5: Equivalent circuit according ISO 7637-2 (jumper removed)

4.5. Using HV-AN 500-option-1μF

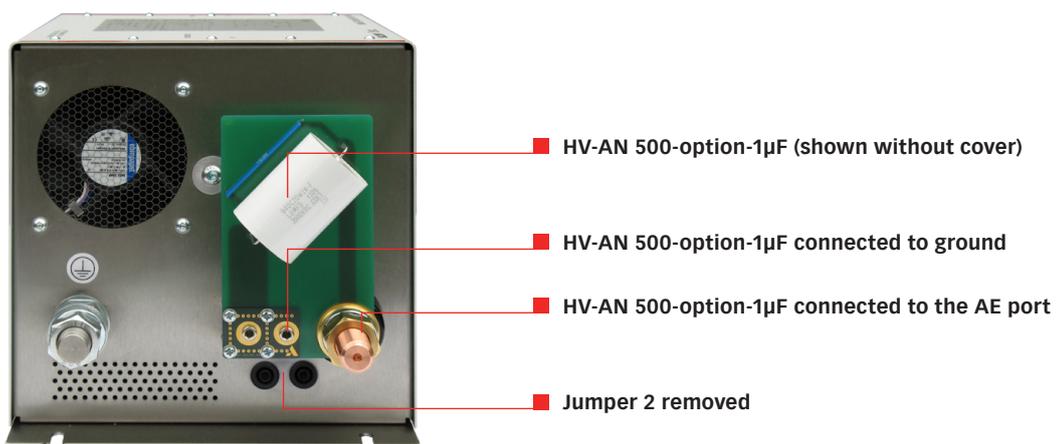


Figure 6: HV-AN 500 view to the AE port with connected HV-AN 500-option-1μF

4.6. Equivalent circuit with using HV-AN 500-option-1 μ F

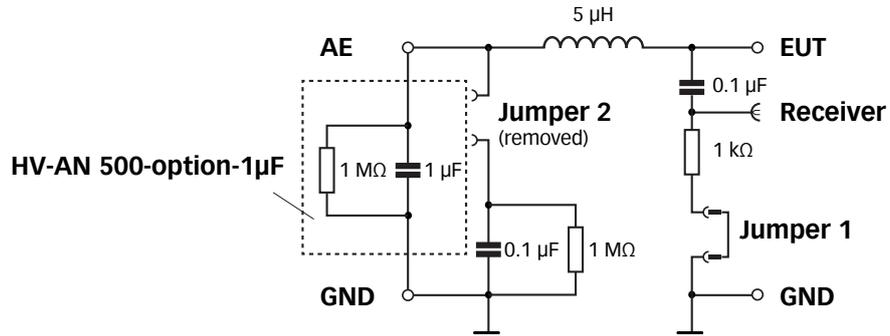


Figure 7: Equivalent circuit according the low voltage part of CISPR 25, ECE No. 10 R06, ISO 11452-1

4.7. Power supply adapter



Figure 8: Power supply adapter (adapters for UK, US, AUS are not shown)

The power supply adapter is supplied with the HV-AN 500, but can also be used for the fans inside the SME HV-AN 500.

5. USE OF THE SHIELDED METAL ENCLOSURE

5.1. View of the closed SME HV-AN 500

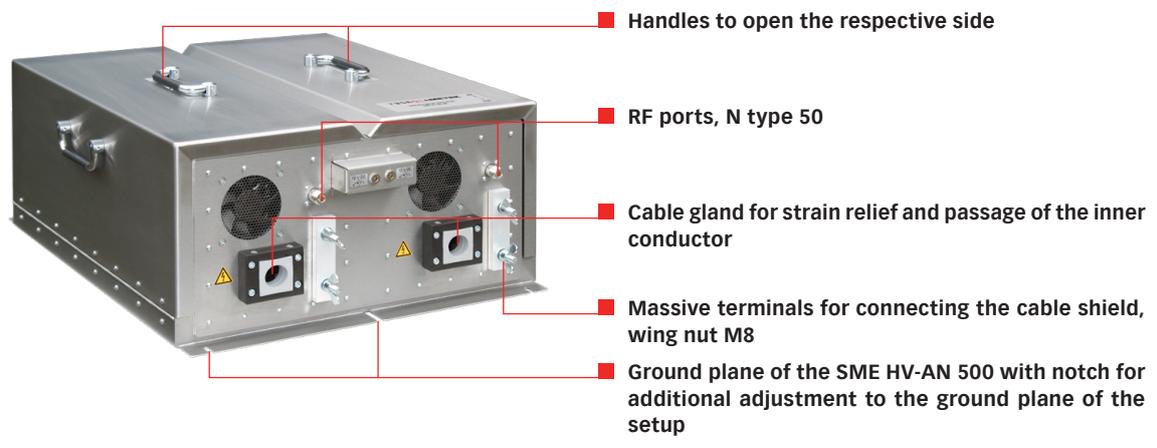


Figure 9: SME HV-AN 500 view of the closed box

5.2. View of the opened SME HV-AN 500



Figure 10: SME HV-AN 500 view of the opened box

5.3. Top view

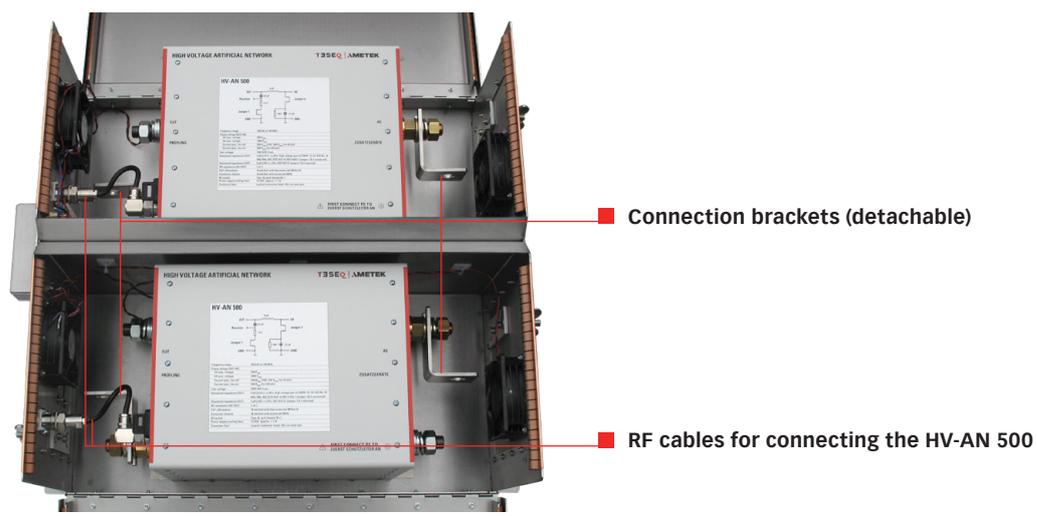


Figure 11: SME HV-AN 500 top view

5.4. Side view



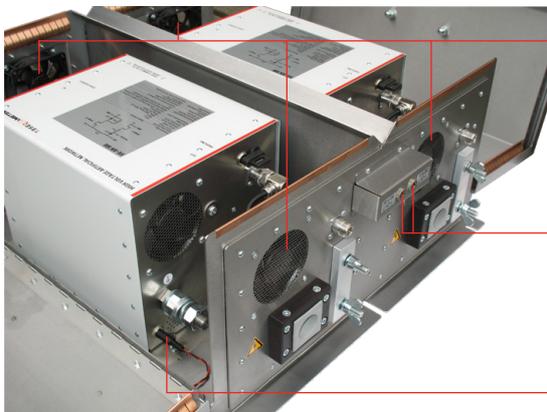
■ Wing nuts M5 for ground connection and fastening of the HV-AN 500 (One of four shown for one HV-AN 500).

Figure 12: SME HV-AN 500 side view



Attention: Fasten the HV-AN 500 to the ground plate using the wing nuts. Ensure a good conductive connection between the HV-AN 500 and the ground plate.

5.5. View to the fans and connectors to supply the fans



■ Fans

■ Input to supply the fans

■ Plug to supply the fans of the HV-AN 500

Figure 13: SME HV-AN 500 view to the fans and connectors to supply the fans



Attention: Connect the internal plug first before power up the fans from outside.

6. TECHNICAL SPECIFICATION HV-AN 500

6.1. Electrical specifications

Frequency range:	100 kHz to 100 MHz
Power ratings (EUT/AE)	
AC max. voltage:	500 V _{RMS}
DC max. voltage:	1000 V _{RMS}
Current max.	
passive, cooling (Fan) off:	200 A _{RMS} (CW), 300 A _{RMS} (for 20 min)
active, cooling (Fan) on:	500 A _{RMS} (CW) (for 2 hours)
Test voltage:	1500 VDC 2 sec.
Simulated impedance (EUT):	5 μ H 47.6 Ω \pm 20%, High voltage part of CISPR 12, 25, ECE No. 10 R05/R06, ISO/DTS 7637-4, ISO 11452-1 (jumper 1 & 2 connected) 5 μ H 50 Ω \pm 10%, ISO 7637-2 (jumper 1 & 2 removed) 5 μ H 47.6 Ω \pm 20%, Low voltage part of CISPR 25, ECE No. 10 R06, ISO 11452-1 (jumper 1 connected, jumper 2 removed, HV-AN 500-option-1 μ F connected on AE port)
DC resistance (AE/EUT):	1 m Ω
EUT/AE sockets:	16 mm bolt with fine screw nut (M16x1.5)
Connector chassis:	16 mm bolt with screw nut (M16)
RF socket:	Type-N, jack/ female 50 Ω
Connector for cooling:	coaxial connector (male, DC+ on inner pin)
Requirements for cooling:	12 V DC, approx. 1.1 A
Power supply for cooling:	12 V DC/ 2.5 A, length 1.8 m, coaxial connector (female) 5.5 x 2.5 mm

6.2. Mechanical specifications

Size (L X W x D):	365 mm x 203 mm x 203 mm
Weight:	approx. 8.5 kg

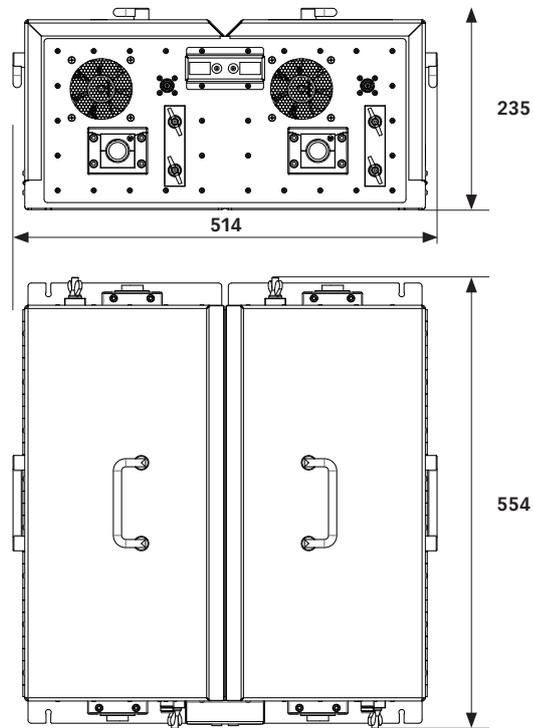
6.3. Environmental conditions

Classification:	Indoor use only
Operating temperature:	0 °C to +30 °C
Storage temperature:	-10 °C to +60 °C
Relative humidity:	up to 90 % (no moisture condensation)

7. TECHNICAL SPECIFICATION SME HV-AN 500

HF connectors front panel:	2 x N (fem)
Connector for cooling	
Front panel:	2x coaxial connector (male, DC+ on inner pin)
Inside:	2x coaxial connector (female) 5.5 x 2.5 mm
Requirements for cooling:	12 V DC, approx. 1.1 A (approx. 2.2 A with connected HV AN 500)
Weight (empty):	23.5 kg (appx.)
Weight (with 2x HV-AN 500):	40 kg (appx.)
Dimensions (LxWxH):	554 x 514x 235 mm

Outline dimensions in mm



8. MAINTENANCE

8.1. General

The HV-AN 500 needs no special maintenance. The maintenance is limited to the cleaning of the contacts. The life time of the connectors is limited because of the contact durability. Teseq can replace the worn out connectors.

No modifications are to be carried out on the HV-AN 500 and accessories by the user. It is recommended to send the unit to a AMETEK Service Centre once a year for recalibration.

8.2. Cleaning

The cleaning shall be done with dry cloth. If a wet cleaning would become necessary, make sure that no humidity will enter inside of the unit and clean the instrument housing with a damp cloth using a little mild, non-abrasive household cleanser if necessary.

Chemicals must not be used for cleaning purposes

9. DISPOSAL

The unit is constructed that it can be dismantled right down to the component level.

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