AMETEK®
COMPLIANCE TEST SOLUTIONS

QUICK-START GUIDE
AND SAFETY INSTRUCTIONS

ESD Simulators:

esd NX30
esd NX30.1
Dito
NSG 435
NSG 437
NSG 438
NSG 438A

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1. Safety

1.1. Safety Aspects

Observe all precautions to assure your personal safety. The generators comply with Installation Category II (excess voltage section).

Pay special attention to safety and operation details!

1.2. Safety and warning label on the device

Take note of the following explanations of the symbols used ensure safe during operation of the equipment.

This symbol warns of a potential risk of shock hazard. The symbol on an instrument shows that that it can source 1000 volt or more, including the combined effect of normal and common mode voltages. Use standard safety precautions to avoid personal contact with these voltages.

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.

GROUND Indicates protective Ground Terminal

***CAUTION"** The “CAUTION” symbol indicates a potential hazard. 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. If a “CAUTION” is indicated, do not proceed until its conditions are fully understood and met.

“WARNING” The “WARNING” symbol indicates a potential hazard. It calls attention to a procedure, practice or condition which, if not followed, could possibly cause bodily injured or death. If a “WARNING” is indicated, do not proceed until its conditions are fully understood and met.

Power Supply & Charger
The must be connected with mains power not to exceed 250 volts between phase and neutral or between phase and ground. A proper ground connection through the ground connector of the power cord is essential for safe operation.

Grounding the Generators
The generators must be grounded through the power cord. To avoid electric shock, plug the power cord into a properly installed receptacle which was tested by a qualified electrician. Have the test performed before connecting equipment.

Without the protective ground connection, all parts of the generators are potential electric shock hazards. This may include components which appear to be insulated. The equipment MUST NOT BE USED if this protection is altered.

Use the Proper Power Cord
Use only power cords and connector specified for your product. Use only power cords in good condition.

Do Not Remove Covers or Panels
To avoid personal injury, do not operate the generators without panels and covers.

Do Not Operate in an Explosive Environment

Electric Overload
Never apply power to a connector which is not specified for that particular voltage/current.

1.3. Responsibility of the operator

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

CAUTION: The purpose of this instrument is the generation of defined interferences signals for EMI immunity testing. Depending on the arrangement of the test rig, the configuration, the cabling and the properties of the EUT itself, a significant amount of electromagnetic radiation may result that could also affect other equipment and systems.

The equipment is designed to operate in industrial environment. For operating in other or sensitive environment, such as light industry, medical or airport facilities, the user may use a shielded room for operation.

The user himself or herself is ultimately responsible for the correct and controlled operation of the rig. In case of doubt, the tests should be carried out in a Faraday cage.

1.4. General hazard

Before applying power to the system, verify that your product is configured properly for your particular application.

WARNING: The generators and their accessories operate at high voltages.

Hazardous voltages may be present when covers are removed. Qualified personnel must use extreme caution when servicing this equipment.

Circuit boards, test points, and output voltages also may be floating above (below) chassis ground.

The design of external insulation must be such that it exceeds the maximum impulse voltages of the generator.

Only qualified personnel who are specifically trained to handle the hazards in immunity generators, are allowed to perform installation and servicing.

Ensure that the AC power line ground is connected properly to the power adapter. Similarly, other power ground lines including those to application and maintenance equipment must be grounded properly for both personnel and equipment safety.

Guard against risks of electrical shock during open cover checks by not touching any portion of the electrical circuits. Even when power is off, capacitors may retain an electrical charge. Use safety glasses during open cover checks to avoid personal injury by any sudden component failure.

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

WARNING: Personnel fitted with a heart pacemaker must neither operate instrument nor approach the test setup while a test is being executed.

Only approved accessories, connectors, adapters, etc. are to be used to ensure safe operation.

1.5. Qualification of personnel

The generator must be operated only by authorized and trained specialists with detailed knowledge of the international, national or manufacturer's test standard as well as intimate knowledge of the workings and hazards of the Device Under Test (DUT) or Equipment Under Test (EUT).

2. Testing and Precautions

All tests produced EMC generators are immunity tests on electronic equipment or devices. These tests are potentially dangerous to the operator. It is the responsibility of the user to avoid critical failures and risks to the environment and the operator.

National and International regulations regarding human safety must be followed.

Individuals with certain health conditions (e.g. with a heart pacemakers or similar devices), may not participate in testing.

Long power supply lines to the EUT may radiate energy which may interfere with other instruments unrelated to the generator. It is the responsibility of the user to determine whether to conduct immunity tests in a given area.

The most significant interference components of an electrostatic discharge are of a high frequency nature. The interference paths and effects have to be assessed in the range from about 30 MHz to multi-GHz.

The extremely rapid rise time of a discharge affects an object under test mostly through:

- Magnetic HF-coupling between electrical conductors in the electronics and the discharge current path.
- Electrical coupling between the discharge current and signal lines. A discharge current to the EUT flows proportionally through all the associated conductors (earth, mains, data lines, screening, etc.) according to their relative impedance.

Malfunctions in insufficiently immune electronic equipment and systems make themselves apparent through:

- Program crashes
- Blocking of command sequences
- Incorrect commands, statuses or data being further processed
- Partial system resets (e.g. only in peripheral modules, which lead to errors that the system does not recognize)
- Disturbance or destruction of interface modules
- Destruction of insufficiently protected MOS components.

ESD (electrostatic discharge) testing usually shows up all the weak spots in the HF-range of a piece of equipment simultaneously. The uses to which the esd NX30 ESD simulator can be put hence go way beyond those called for in standard-conform applications.

This instrument provides the engineer with a means to detect sources of error caused by unsuitable earthing, poor ground connections, insulation problems, etc.

The generator also serves as a reliable aid for localizing hidden wiring faults during acceptance trials on installations.

Use can also be made of the instrument as an insulation tester to determine the breakdown voltage of switches, relay contacts, insulators, etc.

2.1. Standard Testing and Trained Operators

Operators must have read and understood the manufacturer or international standard to be applied.

This document does not replace an intimate understanding of the standard and the DUT which is required for safe, correct, compliant testing. The equipment is to be used by trained operators only.

2.2. Precautions to be taken

- EMC and High Voltage test areas must always be supplied by a decoupled and well-known power supply.
- EMC and High Voltage test areas must always have a clear grounding strategy in exact accordance to the standard.

2.3. Failures and Damage

If it is determined that a safe operation of the equipment due to failure or heavy strain is no longer possible, the supply voltage must be disconnected, and the equipment protected from unintentional use.

Unsafe operation is determined as follows:

- the equipment shows visible damage
- the equipment is not working
- the equipment has experienced severe stress during transport
- the equipment was stored in an unsuitable environment for an extended period of time.

2.4. Interference to the environment

CAUTION

CAUTION: The AMETEK CTS interferences generators are instruments which intentionally emit electromagnetic interference during the test (e.g., ESD, EFT, conducted RF, etc.). Therefore, a disturbance of the environment and surrounding equipment cannot be excluded.

The user has an obligation to use a suitable test environment in order to minimize influences to the environment. This may require a suitable screening or to test in a shielded room.

2.4.1. Safety Precautions

- The test area must be secured that only authorized test personnel may enter it.
- Working alone with high voltages is dangerous
- The high voltages must be switched off when nobody is present
- Neither the EUT nor cables or accessories must be touched during the test
- Make sure all high voltage connections are adequately insulated to prevent accidental contact by you or neighboring systems
- Keep one hand in your pocket when probing high voltage circuits or discharging capacitors. This reduces the peril to touch the high voltage with both hands
- While working on the EUT, the test procedure should be stopped and the EUT disconnected from the voltage power supply
- The EUT must be tested within a safety container or within a protected area. In extreme circumstances the EUT may ignite or explode as a result of internal damage

2.5. Danger from EUT

CAUTION

CAUTION: The device being tested may become defective and ignite due to the influence of the applied test signal.

The stored energy inside the test simulator must be considered. This energy can destroy or damage the EUT even when the EUT operates under normal conditions.

CAUTION

CAUTION: Moving parts may move in an unexpected way due to the interference of the applied signal.

Never approach a test setup that uses actuators or electric motors during the test run!

Therefore, the operator shall take the following precautions:

- As soon as the EUT ceases to operate as intended, the test shall be stopped immediately.
- In case of internal damage, the operator may be exposed to high frequency signals of high power (up to 75 Watts and more) anywhere on the EUT.
- Cables and connectors can be overloaded by high voltages or energies.
- Due to internal damage of components fire and/or explosion may occur.
- Unintended use of the EUT may cause hazardous situations in the vicinity of the test area.
- The user is responsible for the correct EUT protection. The device under test is to be secured in such a way that no dangerous conditions arise.
- Some generators, such as the PFM and PFS 200-series do not generate high voltage on their own. Nevertheless, a DUT with heavy inductance will self-generate high voltage due to switching processes in all generators, or when switching them on or off using the 200-series.

CAUTION: Never touch the EUT or anything connected to the EUT during a test!

Never approach an EUT or anything connected to the DUT during a test!

It is absolutely necessary to observe and comply with all safety precautions.

3. Before Activating the Equipment

3.1. Unpacking and inspection

The instrument was tested before shipment and was packed carefully on a transport palette. Each box is marked with a detailed list of the contents.

Before activating the equipment, check for damage which may have occurred during shipment. Check each container as well as the generator itself. In case of physical damage, contact the manufacturer before operating the unit.

ESD simulators are packaged in a plastic carrying case or cardboard box. These contain fitted foam, suitable for safely holding the simulators during transport. These containers must be retained and used when shipping the unit for calibration, repair or maintenance.

3.2. Power requirements

Prior to turning the equipment on, check that the selected voltage corresponds to the supply voltage listed on the bottom of the power supply or charger.

3.3. Charging the battery

Power to the instrument is provided through a universal mains unit suitable to your region. Ensure that your mains power conforms to the label on the power supply. To charge, connect the provided charger to the battery.

Charging of the battery takes between two to four hours.

4 30 kV models

By using the latest materials, construction methods and manufacturing techniques for the robust housing shell, together with highly insulated modules, the newest high voltage technology, the touch-sensitive operating panel and a control unit built using the SMD technique, it has been possible to integrate all the functions that a comprehensive simulator system should offer into one compact instrument.

Professional industrial designers have ensured an optimized ergonomic concept. The instrument, with its well-balanced handgrip, sits comfortably in the user's hand and guarantees non-tiring operation. Both the operating elements and the display window remain in view of the user while work is in progress.

As supplied in the basic set, the system is equipped with a 150 pF / 330 Ω discharge network for the IEC / EN 61000-4-2 and ISO 10605 standards.

The instrument is well equipped to cope with other (and future) standards. The accessories include various networks and discharge tips that can be attached by the user himself.

The basic set contains everything necessary for general use. A rich assortment of accessories for special tasks is available such as a remote triggering unit, further discharge networks, an ergonomically shaped carrying case, a tripod adapter, test tips, etc.

4.1 Operating Elements 30 kV models

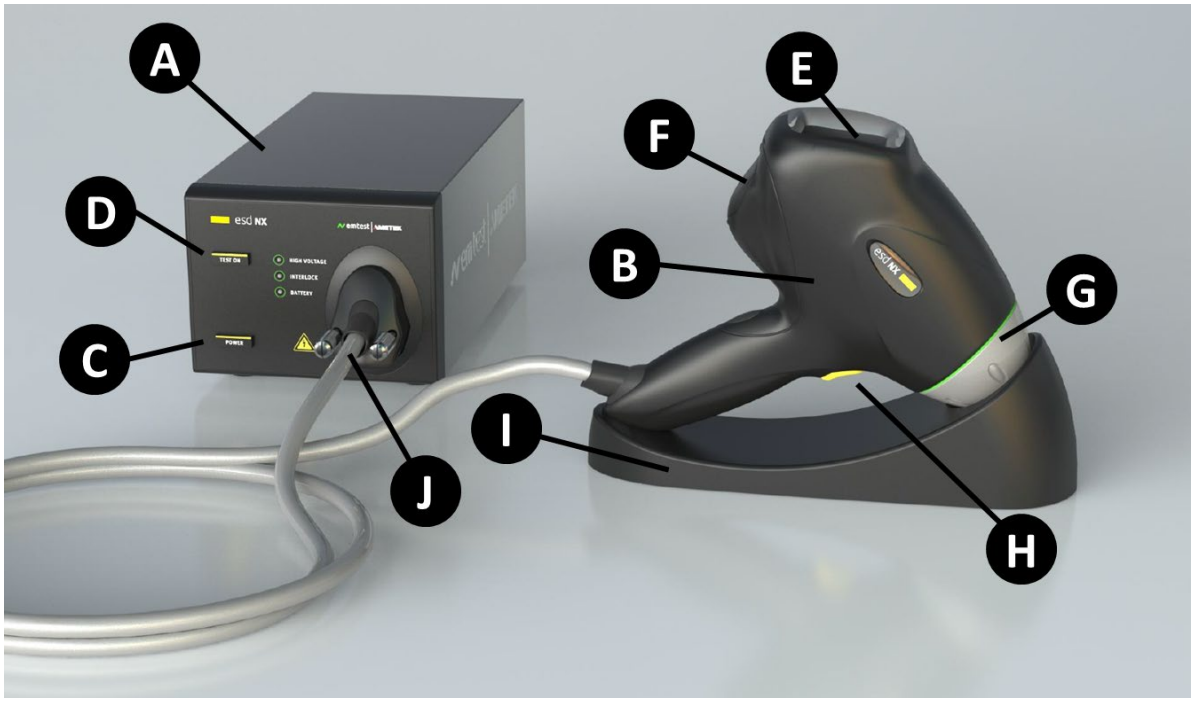


Figure 1 - Operating Elements, 30 kV models

A. Base station containing the high voltage power supply and control functions
B. The discharge pistol
C. POWER ON/OFF
D. NSG 438, INTERLOCK,
   esd NX30, esd NX30.1 TEST ON
E. Touch display
F. R/C Network
G. Air or Contact Discharge Tip
H. ESD Pulse Trigger
I. Optional pistol holder
J. Communication and high voltage cable

The base station contains the optional battery the high voltage generator and regulator as well as several safety features.

The pistol houses the interchangeable pulse network, high voltage relay, the exchangeable discharge tip, measuring electronics and the touch sensitive input / display panel.

4.1.1 Quick Start 30 kV Models

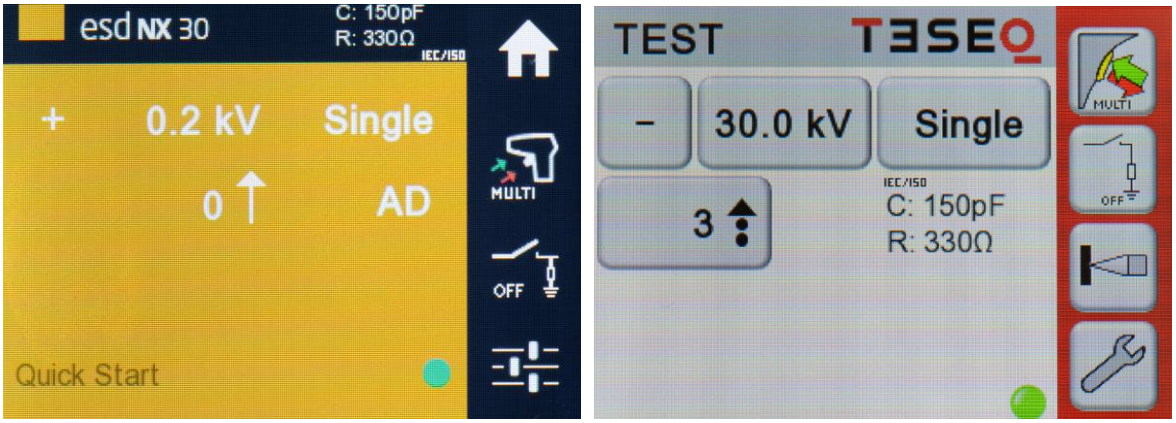


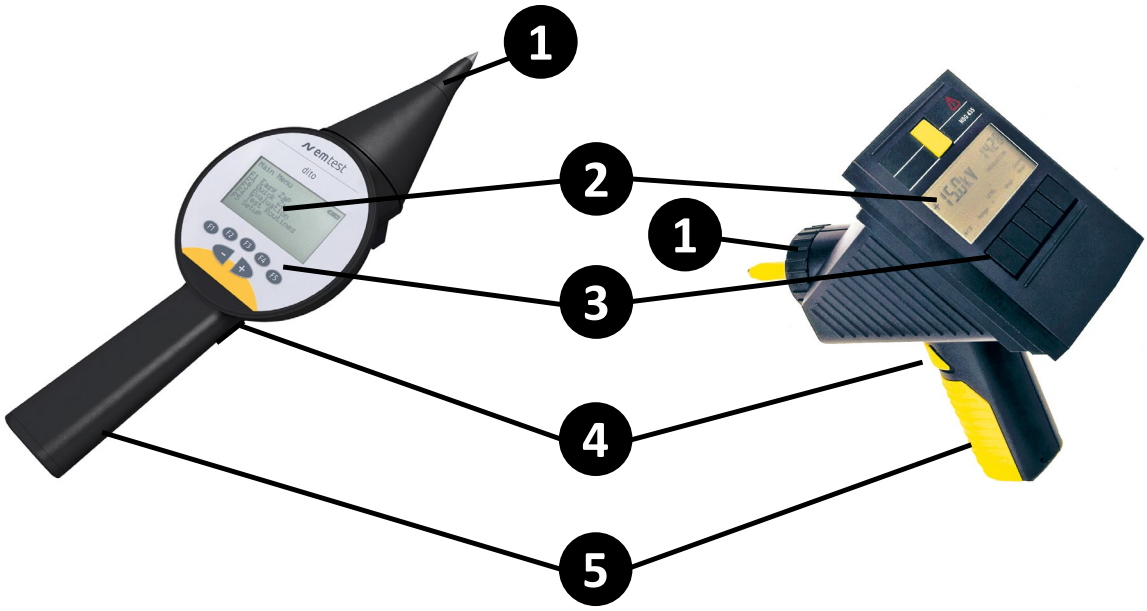
Figure 2 - User Interface, 30 kV models

1) Setup the test area according to IEC 61000-4-2 or ISO 10605 and the test plan
2) Ensure cable and base station earth are connected
3) Connect the proper Air (round) or Contact (pointed) discharge tip to the front of the discharge pistol
4) Insert the proper R/C network according to the standard and test plan.
5) Connect the supplied power supply
6) Press POWER/POWER ON switch.
7) Press the TEST ON or INTERLOCK button and release the “Emergency Power Off” switch if equipped
8) Wait for the Self Check and Calibration to finish.
9) On the display, tap on the voltage to set the voltage
10) Press the trigger to fire a pulse

5 16 kV models

The 16 kV models dito and NSG 435 feature lightweight simulators with battery power for compliance to IEC 61000-4-2.

5.1 Operating Elements 16 kV models



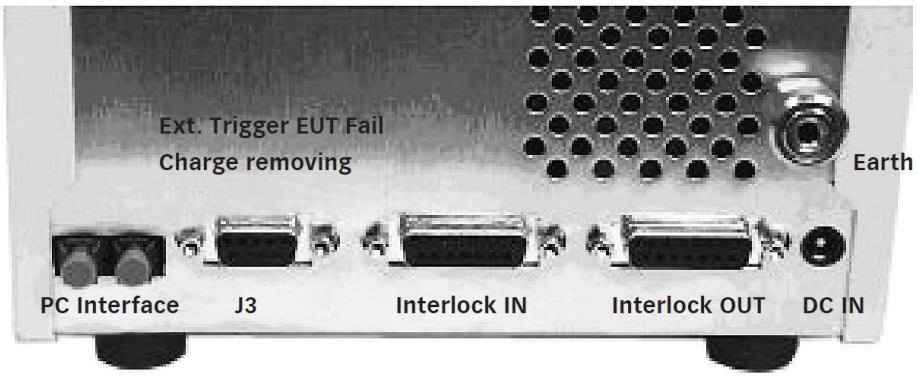
1 The discharge pistol with display
2 Exchangeable tip containing
3 Buttons for adjusting settings
4 ESD Pulse Trigger
5 Exchangeable battery

5.1.1 Quick Start 30 kV Models

1) Charge the battery fully
2) Setup the test area according to IEC 61000-4-2 and the test plan
3) Ensure earth cable is connected
4) Connect the proper Air (round) or Contact (pointed) discharge tip to the front of the discharge pistol
5) Switch on the device
   NSG 435: Press and hold the yellow button to start the simulator
   Dito: Press and hold the trigger to start the simulator.
   Dito: Press F2 to go to Quick Start mode
6) Press the corresponding +/- key to set the voltage
7) Press the corresponding discharge mode (Air or Contact)
8) Press the trigger to fire a pulse

5.1.2 Ports (esd NX30, NSG 438 models only)

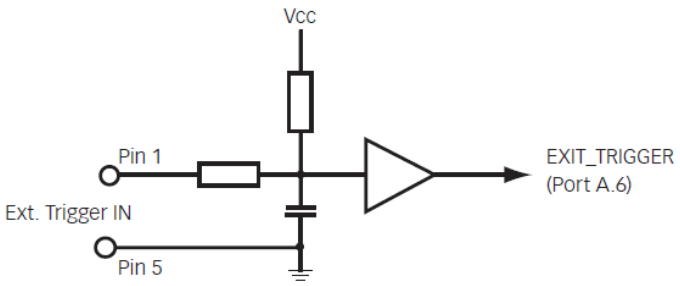
This port is indented to allow the user to connect external signals in order to remote control the generator, as well as to connect external accessories like the charge removing device. See tables and graphs below for detailed signal description and drive circuitry information.



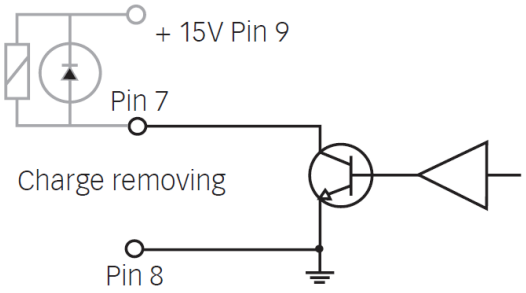
Connector J3: Pin Assignment

Pin	Signal Name	Description
1	EXT_TRIGGER	External trigger input
2	NC	-
3	NC	-
4	EUT_FAIL	EUT failure input (reserved for future use)
5	GND	Earth
6	NC	-
7	Charge remove	Charge remover drive output
8	GND	Earth
9	+15V	Voltage output (max 500 mA)

Ext. Trigger (esd NX30 only):
The following circuit is built in behind the external trigger input connector. This function is similar to the function of the yellow trigger knob on the handle. Trigger signal active low, i.e. to be pulled to ground.



Charge removing connection:
This function is to drive an external bleedoff switch option or an external relay.



5.1.3 Interlock (esd NX30, NSG 438 models only)

The esd NX30 has an integrated interlock system in accordance with standard practice for high voltage test equipment.

This system has the following functions:

- Inputs
  1. Input for external monitoring purposes of, for example, special coupling networks and access control.
  2. Internal emergency off button opens the interlock.
- Outputs
  1. Operating mode: the esd NX30 can generate no high voltage as long as the interlock is not closed. High voltage generation is prevented if the interlock is opened during a test procedure.
  2. Interlock output for other system devices

The instrument is equipped with two 15-way connectors for interlock input and output. The interlock loop must always be correctly terminated at both ends. In achieving this, the interlock wiring must connect all the safety contacts together.

An arbitrary number of instruments or accessories can be incorporated in this safety concept.

The high voltage supply can only be activated if the safety requirements in all the associated devices are fulfilled (emergency off buttons released, safety contacts closed).

The control of the warning lamps must make use of the interlock feature. The instruments can be switched on and the red lamp lights up as soon as the interlock circuit is closed.

The pair of terminating connectors supplied must be utilized in the case of not making use of external interlock contacts.

Signal specifications:	Voltage 48VDC max. Current 20mA min., 1A max
Connector	Socket, D-sub, 15 pin.
Max. permissible cable length:	Correct operation guaranteed up to 10m (screened cable)

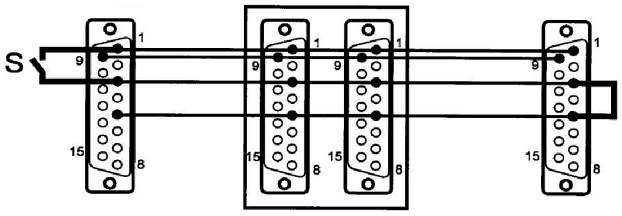
Operation should be insured via potential-free switch contacts.

All signals are active low, i.e. switched to GND.

The pin-out of the interlock input and output connector is identical. All the pins are connected together. The connection to pin 3 is made internally through the emergency off button. This link is broken when the internal interlock is activated.

Pin number	Function
1	Earth (GND), 0V
2	NC, linked through the other connector socket
3	Interlock input / output (connected inside the instrument)
4	NC, linked through the other connector socket
5	Interlock status (triggers the interlock function in the instrument by relay from +12 to +48 V)
6	NC, linked through the other connector socket
7	NC, linked through the other connector socket
8	NC, linked through the other connector socket
9	Switches warning lamps and peripherals on (active, provided that esd NX30 is switched from standby to on).
10	NC, linked through the other connector socket
11	NC, linked through the other connector socket
12	NC, linked through the other connector socket
13	NC, linked through the other connector socket
14	NC, linked through the other connector socket
15	NC, linked through the other connector socket
Shell	Shielding

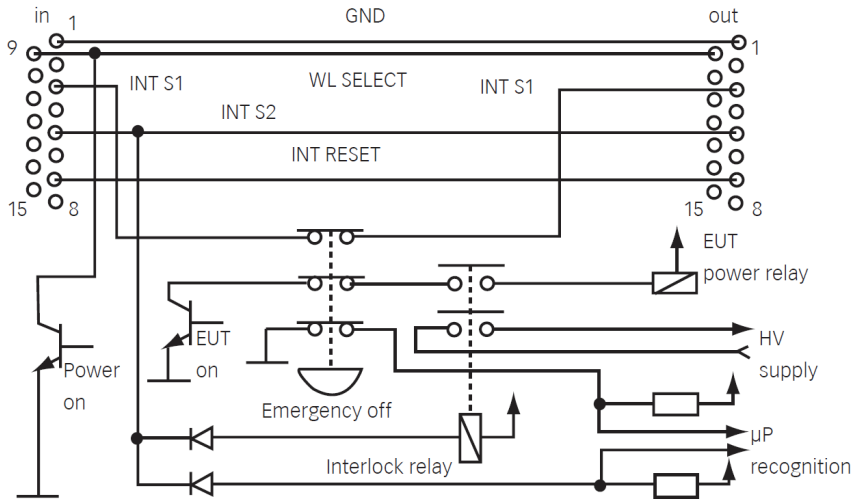
Wiring diagram for the interlock system:



S**:** External safety switch (e.g. test enclosure hood, door contact, panic button, etc...)

Several interlock inputs of this type may be connected in series.

The contacts should be connected in series if numerous access barriers are necessary. Either one open contact or a voltage of more than 1.5 V at the input is sufficient to disable the simulator.



6 MAINTENANCE

6.1 Cleaning

The housing can be cleaned with a moist cloth with possibly just a trace of detergent liquid. Industrial spirit is also a suitable cleaning agent. Other solvents are not permitted.

Fuses

The instrument contains no fuses that are accessible to the user.

6.2 Calibration

Trimming procedures in the ESD simulator are carried out digitally and automatically. The instrument contains no elements that are foreseen for adjustment by the user. Calibration must be performed regularly based on local policy. AMETEK CTS recommends annual calibration, for which AMETEK has accredited laboratories in many countries worldwide. A component defect must be suspected if the calibration measurements differ from the published technical data and the instrument is to be returned to an authorized EM Test/AMETEK service center.

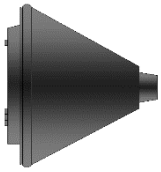
6.3 Exchanging the R/C network

CAUTION: If a network needs to be exchanged, the test has to be stopped first, followed by a waiting time of at least 5 s to ensure the voltage being internally discharged.

Switch the simulator off.

NSG 437/438, esd NX30: Open the flap under the display and rotate the pistol backwards until the network drops out under its own weight.

Dito: The R/C network can be simply pulled forward from the main unit and exchanged with another R/C network.



NSG 435: Some disassembly is necessary. Networks may only be changed by trained operators under direction of Support or Service staff.

6.4 Repairs

Repair work is to be carried out exclusively by an authorized AMETEK CTS repair department.

WARNING: Voltages in excess of 30 kV are generated within the instrument. Do not open the cover.

Only original replacement parts and accessories are to be used.

Do not continue to use the instrument in the event of mechanical damage occurring. The plastic housing also performs insulating and protective functions, which are only assured as long as it is in its original condition. A damaged instrument should be returned without delay to a EM Test service center.

6.5 Disposal

For the disposal of electronic devices, the country-specific regulations are to be considered. The equipment should be delivered to a specialized waste collection center.

EM TEST and Tees' devices can be returned to AMETEK CTS in Switzerland or to their agency for adequate disposal. Alternatively, the equipment can be handed over to a specialized enterprise for disposal of electronic devices.

Details to used material and components

- Built in capacitors contain no polychlorinated biphenyl (PCB).
- Back-up batteries and rechargeable batteries must be disposed separately.